Weyerhaeuser

Pembina 2017-2026

Forest Management Plan

Annex VI: Net Landbase Development

March 19, 2018

Executive Summary

Weyerhaeuser's Pembina Timberlands Defined Forest Area (DFA) is located within a single Forest Management Unit (FMU), R15. Within the DFA, of which the total land area is 1,067,415 hectares, forest area is allocated to Weyerhaeuser through their Forest Management Agreement (FMA) area as well as through coniferous timber quotas (CTQ) and deciduous timber allocations (DTA) on the non-FMA areas within the DFA. The FMA covers 89.5% (955,220 ha) of the DFA with the remaining 10.5% being non-FMA area. A number of other coniferous operators also have access to timber on the DFA through CTQs.

As part of the 2017-2026 Forest Management Plan (FMP), a landbase netdown was developed to support the Timber Supply Analysis (TSA) and Annual Allowable Cut (AAC) determination for the DFA. This document describes the datasets used and summarizes the process followed to create the classified landbase, which describes the condition of the forest as of May 1, 2015, and was assembled to meet the requirements of the Alberta Forest Management Planning Standard (Version 4.1 – April 2006).

The final proposed landbase netdown is summarized in Table 0-1. Approximately 51% (547,464 ha) of the DFA area falls within the active or contributing landbase, while the remaining 49% is either non-forested or has been removed from the active landbase and will not contribute to the AAC for the DFA.

This report and submission data supersede the report and data submitted on February 27, 2017

Table 0-1. Summary of landbase netdown.

Landbase Category	Area (Ha)	% of DFA
Passive Landbase		
Administrative Deletions		
First Nations	19,066	1.79
Parks and Protected Areas	18,280	1.71
Special Land Use Areas	3,065	0.29
Hamlets	339	0.03
Private Land	11,978	1.12
Administrative Subtotal	**52,729**	**4.94**
Landscape Deletions		
Roads	25,141	2.36
Anthropogenic Non-Vegetated	1,639	0.15
Anthropogenic Vegetated	33,840	3.17
Grazing	10,751	1.01
PNTs	2,844	0.27
PSPs	515	0.05
DIDs	26,340	2.47
FireSmart	409	0.04
Cabins	7	0.00
HRVs	293	0.03
Water	11,772	1.10
Flood	1,739	0.16
Aquatic	161	0.02
Water Buffers	48,056	4.50
Trumpeter Swan Buffers	739	0.07
Naturally Non Vegetated	310	0.03
Naturally Non Forested	11,594	1.09
AVI	239	0.02
Landscape Subtotal	**176,388**	**16.52**
Operational Deletions		
Unproductive Areas	177,769	16.65
TPR	6,316	0.59
Horizontal Structure	427	0.04
Burn	230	0.02
Other Disturbances	488	0.05
Slope	2,363	0.22
Post91 Openings with no ARIS#	0	0.00
Post91 Openings not reconciled	19	0.00
Perf Surveyed NSR Openings <50% Stocking	29	0.00
Operational Deletions	1,875	0.18
SHS Deletions	211	0.02
Operational Buffers	9,990	0.94
Larch	48,823	4.57
Birch	1,486	0.14
Pine	24,069	2.25
Black Spruce	13,506	1.27
Isolated Stands	3,233	0.30
Operations Subtotal	**290,835**	**27.25**
Passive Landbase Subtotal	**519,951**	**48.71**
Active Landbase		
Deciduous (D)	183,695	17.21
Deciduous/Coniferous (DC)	51,722	4.85
Coniferous/Deciduous (CD)	45,250	4.24
Coniferous (C)	266,797	24.99
Active Landbase Subtotal	**547,464**	51.29
Gross Landbase	**1,067,415**	**100.00**

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1. Overview

1.1 Objective

The purpose of the landbase netdown is to identify and classify Weyerhaeuser's Pembina Timberlands Defined Forest Area (DFA) into areas of active (managed) and passive (non-managed) landbase. The forested stands within the landbase are stratified into similar cover types which form the basis for forecasting growth and yield for the duration of the Forest Management Plan (FMP). Only forested stands on the active landbase will contribute to future timber harvesting activities and AAC determination.

The objective of this document is to describe the datasets used to generate the net landbase (NLB), describe all processing completed on those datasets to prepare them for the netdown process, and describe the business rules applied to the amalgamated landbase to classify and stratify each polygon for the purposes of FMP development.

The level of detail provided in this document should be sufficient to allow any qualified Geographic Information System (GIS) Analyst or GIS/Forestry Analyst to repeat the process, using the prepared input datasets (i.e. ARIS, Cutblocks, etc.), and achieve the same result reported in Section 5.

1.2 Landbase Effective Date

The datasets are current or were extracted as of May 1, 2015.

1.3 Landbase Products

Three separate landbases are created through this process, each representing the same information in slightly different ways. Each database is developed for a specific purpose and has the same geographic extent, area deletions, and strata distribution.

1.3.1 TSA Landbase

The TSA landbase is used as a source layer for Timber Supply Analysis (TSA) purposes. The TSA landbase is spatial and contains all of the landbase information with the exception of seismic lines. The unique key from the TSA landbase is carried forward to the classified landbase for quality control and validation purposes.

1.3.2 Classified Landbase

The classified landbase is created to satisfy the requirements of the Alberta Forest Planning Standard Version 4.1 (Alberta, 2006). This landbase is spatial and is generated by combining the TSA landbase with the seismic line layer. The classified landbase is used to calculate the area and distribution of all features found on the landbase, particularly to generate summaries of seismic detail, and carry this into the modelling landbase. This landbase contains the greatest number of polygons.

1.3.3 Modelling Landbase

The modelling landbase is both tabular and spatial. The tabular data is created to make the landbase suitable for both strategic and operational TSA modelling. The spatial component is used for harvest scheduling. The goal is to represent the necessary information with simplified assignments (where possible) suitable for forecasting the timber supply. The landbase represents the identical spatial features as the TSA landbase, but carries attributes for the modelling component. In addition, the modelling landbase contains three area fields for each stand, *i.e.*, gross area, seismic area and net area.

1.4 Spatial Landbase Process

Developing the net landbase for Weyerhaeuser Pembina involved five distinct steps:

1. Identify and assemble all data required to classify the landbase (Section 2)
2. Process input datasets to develop submission datasets that represent the data themes required for inclusion in the landbase (Section 2.3)
3. Spatially process input datasets to generate the spatial landbases (Section 3)
4. Process attributes to stratify the landbase (Section 3)
5. Identify area available for forest management activities (Section 4)

Figure 1.1 illustrates the data processing steps and the scripts used in this process. The scripts referenced in this figure are provided in the delivered media.

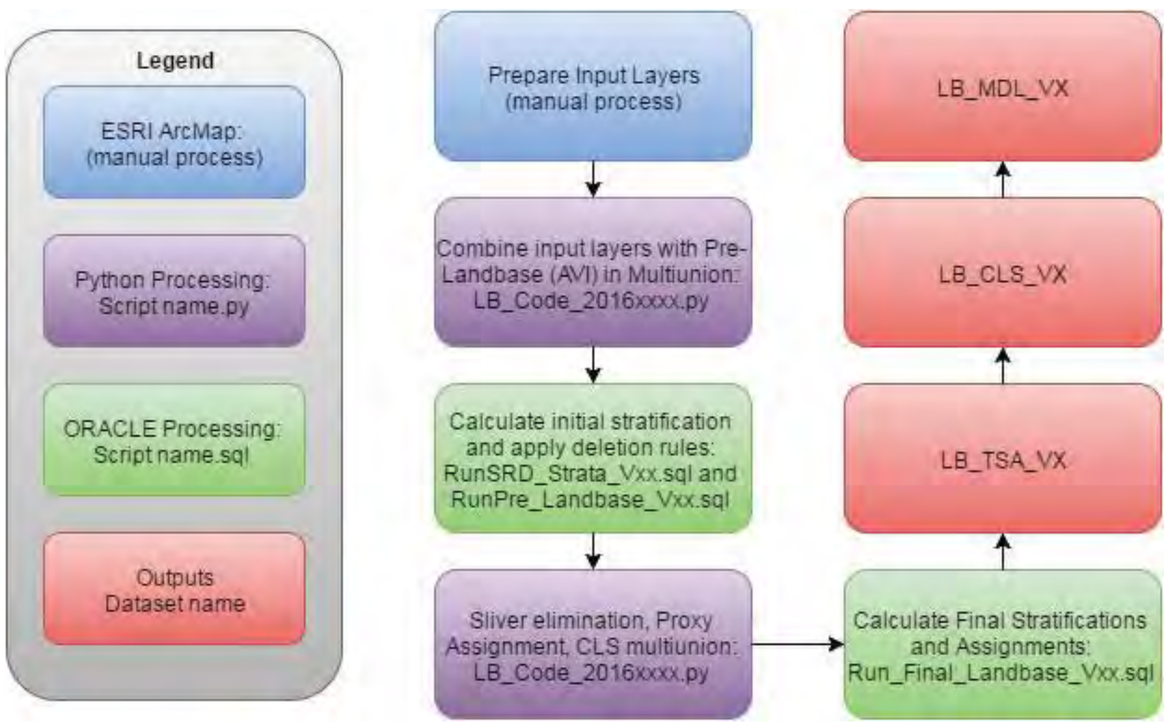

Figure 1.1: Processing steps and products created through the landbase process in this document.

2. Summary of Datasets

This section describes the input datasets and associated processing steps necessary to prepare the data for inclusion in the landbase. Each dataset is described as to its source, content, processing, and important attributes used for the netdown process. A full data dictionary of the input datasets is provided in Appendix VII – Data Dictionary.

2.1 Summary of Landbase Input Datasets

The input datasets are the source datasets that are processed and then combined to create the spatial landbase. The standard processing of the input datasets involved:

- Ensuring all attribute fields names are valid (no reserved words or characters, duplicate keys, etc.);
- Carrying forward the important fields to the output dataset and dropping all non-required fields;
- Projecting the layer to Universal Transverse Mercator (UTM) Zone 11N, North American Datum (NAD) 83, units = meters; and clipping the layer to the DFA boundary; and
- Converting to Environmental Systems Research Institute (ESRI™) shapefile format, accepting default settings (default XY tolerance = 0.001), and cleaning topology when the feature class is a polygon or polyline.

Table 2-1 provides an overview of the input datasets included in the landbase. The list of datasets contains the following:

- Layer Name: a general theme name describing the contents;
- Source(s): the source (supplier) of the input dataset. GOA refers to the Government of Alberta with the specific ministry being listed in the section listed in the reference column;
- Description: a short description of the dataset contents;
- Usage: the method used to apply the dataset to the landbase, where “Absolute” means that the linework from the layer is preserved or cut-in to the final landbase and “Proxy” means that the linework is not preserved but the attributes are assigned to each stand in the landbase using a spatial process;
- Reference: the section number in this document where this data layer is described in detail.

Table 2-1: Data layers used in the creation of the net landbase.

Layer	Source	Description	Usage	Reference
Forest Inventory				
Alberta Vegetation Inventory (AVI)	Silvacom	Photo Interpreted Forest polygon boundaries	Absolute	2.3.1
Landbase Boundaries				
DFA Boundary	AltaLIS	R15 FMU Boundary	Absolute	2.3.2
Land Use Framework	AltaLIS	LUF Zones	Proxy	2.3.3
Previous FMUs	AltaLIS	Old FMU Boundaries present prior to the creation of R15	Absolute	2.3.4
Volume Supply Areas	AltaLIS	Volume Supply Areas	Absolute	2.3.5
FMA Boundary	AltaLIS	Weyerhaeuser (Pembina Timberlands) FMA Boundary	Absolute	2.3.6
Compartments	Weyerhaeuser	Weyerhaeuser Harvest Compartment boundaries	Absolute	2.3.7
Working Areas	Weyerhaeuser	Weyerhaeuser Working Area Boundaries	Absolute	2.3.8
Woodsheds	Weyerhaeuser	Weyerhaeuser Woodshed Boundaries	Proxy	2.3.9
Townships	AltaLIS	ATS boundaries	Proxy	2.3.10
Landscape Level Features				
Ecosites	Weyerhaeuser	Ecosite assignments for AVI polygons	Absolute	2.3.11
Natural Subregions	GOA	Provincial Natural Subregion Boundaries	Absolute	2.3.12
Tree Seed Zones	GOA	Provincial seed source zones	Proxy	2.3.13
Tree Improvement Zones	GOA	Tree Improvement Zones	Proxy	2.3.14
HUC Watersheds	GOA	HUC watershed boundaries	Proxy	2.3.15
Forestry Watersheds	Weyerhaeuser	Forestry Watershed boundaries	Absolute	2.3.16
Fish Management Zones	AltaLIS	Provincial Fish Management Zones	Proxy	2.3.17
Rainbow Trout	GOA	Rainbow trout bearing streams within the DFA	Proxy	2.3.18
Hydrology Features	Weyerhaeuser, GOA and AltaLIS	Hydrology features within the DFA, drawn from the AVI, provincial hydrology and Trumpeter Swan Lake layers.	Absolute	2.3.19
Hydrology Buffers	Weyerhaeuser, GOA and AltaLIS	Hydrology buffers developed from the hydrology layer. This layer also identifies the rainbow trout bearing features within the DFA	Absolute	2.3.20
Wildlife Management Units	AltaLIS	Provincial Wildlife Management Units	Proxy	2.3.21
Grizzly Bear Habitat Zones	GOA	Primary and Secondary Grizzly Bear Habitat Zones	Absolute	2.3.22
Grizzly Bear Watersheds	GOA	Grizzly Bear Watersheds	Proxy	2.3.23
Colonial Nesting Birds	GOA	Great Blue Heron nesting sites located within the DFA	Absolute	2.3.24
Registered Fur Management Areas	AltaLIS	Traplines	Proxy	2.3.25
MPB Stand Risk R values	GOA	MPB stand risk R values	Proxy	2.3.26
MPB SSI	GOA	MPB Stand Susceptibility Index	Proxy	2.3.27
Wildfire Management Zones	AltaLIS	Wildfire Management Zones	Proxy	2.3.28
FireSmart Community Zones	GOA	FireSmart Community Zones that intersect the DFA	Absolute	2.3.29

Layer	Source	Description	Usage	Reference
Landscape Level Features				
FireSmart Deletions	GOA	Forest polygons that have undergone FireSmart treatment	Absolute	2.3.30
Historical Wildfires	GOA	Historical wildfires occurring on the landbase that were not identified in the AVI	Absolute	2.3.31
Anthropogenic Feature Boundaries				
First Nations Reserves	AltaLIS	First Nations Reserves within the DFA	Absolute	2.3.32
Parks and Recreation Areas	AltaLIS	Parks and Protected Areas within the DFA	Absolute	2.3.33
Natural Areas	AltaLIS	Provincial Natural Areas within the DFA	Absolute	2.3.34
Hamlets	AltaLIS	Cynthia and Lodgepole Hamlet boundaries	Absolute	2.3.35
Private Land	GOA	Private land holdings within the DFA	Absolute	2.3.36
Post-AVI Road Dispositions	GOA	Roads dispositions added to the landbase that were not identified in the AVI.	Absolute	2.3.37
Grazing Dispositions	AltaLIS	Grazing dispositions to be removed from the landbase	Absolute	2.3.38
Protected Nations (PNTs)	GOA	PNTs to be removed from the landbase	Absolute	2.3.39
Permanent Sample Plots (PSPs)	GOA and Weyerhaeuser	GOA and Weyerhaeuser PSPs within the DFA	Absolute	2.3.40
Digital Integrated Dispositions (DIDs)	GOA	DIDs dispositions added to the landbase that were not identified in the AVI, not including road dispositions.	Absolute	2.3.41
Hard Linear Features	GOA	Hard linear features as identified by the Songbird Model	Proxy	2.3.42
Historical Resource Values	GOA	HRV 1 and 3 values within the DFA	Absolute	2.3.43
Historic Cabins	Weyerhaeuser	Historical cabins identified by Weyerhaeuser	Absolute	2.3.44
Temporary Exclusions	Weyerhaeuser	Temporary Exclusions from the landbase	Absolute	2.3.45
Steep Slopes	Weyerhaeuser	Slopes greater than 55% - identified as being inoperable.	Absolute	2.3.46
Operational and SHS Deletions	Weyerhaeuser	Weyerhaeuser identified operational deletions	Absolute	2.3.47
Operational Buffers	Weyerhaeuser	Weyerhaeuser identified operational buffers	Absolute	2.3.48
Seismic Lines	Weyerhaeuser	Seismic Lines	Absolute	2.3.49
Forest Attribute Data				
Reforestation Standard Of Alberta (RSA)	Weyerhaeuser and other operators	RSA survey blocks for all operators from both aerial and non-aerial programs	Absolute	2.3.50
Cutblocks	Weyerhaeuser and other operators	Post AVI cutblocks from all operators added to the landbase	Absolute	2.3.51
Planned Cutblocks	Weyerhaeuser and other operators	Cutblocks planned for harvest after the landbase effective date – May 1, 2015.	Absolute	2.3.52

2.2 Processing of Landbase Spatial Input Datasets

The management and processing of the input datasets were completed using ArcGIS software including ArcMap and ArcCatalog (Version 10.3). Processes were managed using a combination of manual processing, Python scripting, and database processing via Oracle SQL scripting. The use of scripts to process data from start to finish allowed a fully transparent process to be applied, and ensured that the process is repeatable. Where required, additional software such as Microsoft Excel was also used to process data in a limited capacity.

Datasets are described with regards to:

- Source(s): Where the datasets were sourced from;
- Source Filename(s): The names of the datasets used in the creation of the output file;
- Description of Source File: A description of the datasets listed in the Source Filename(s) section;
- Projection/Datum: The projection and datum of the source datasets;
- Important Attributes: The attributes in the source datasets that are to be used to create the output dataset;
- Required Processing: The processing methods used to create the output dataset;
- Assumptions/Processing Issues: Identified issues and assumptions that had to be resolved to create the output dataset;
- Programs: A list of the processing programs/tools used to create the output dataset;
- Output Filename: The name of the output dataset;
- Output Description: A description of the output dataset;
- Output Attributes: A summary of the attributes in the output dataset;
- Polygon Area/Line Length: The total polygon area or line length of the dataset; and
- Delivered Theme Name: The name of the theme that the output dataset will be located in.

Input datasets were typically scale independent, meaning that each layer was derived at a specific resolution to serve a specific purpose at the time of creation. When overlaid, these large scale and small scale datasets did not always offer the same level of detail. The comparison often showed boundaries of the small scale datasets as being fuzzy. As a result, slivers were often created along polygon boundaries which complicated the landbase development process. One of the objectives of the landbase netdown process was to minimize the size of the deliverable spatial file to make the spatial data easier and faster to query and transfer from system to system; as well as to ensure that the polygons created "had meaning" in the context of resource management. To manage this, each input dataset was assigned as either an Absolute layer or a Proxy layer. Absolute layers were layers which were used directly (cut-in) in the creation of the landbase and divided the landbase regardless of the number of slivers created. Proxy features were linked to AVI polygons indirectly by identifying which AVI polygons had their centroid within the proxy features. This process helped to reduce the number of sliver polygons created. Table 2-1 distinguishes between these two data types within the "Usage" column.

2.3 Summary of Submission Input Datasets

The input datasets listed in Table 2-1 are described in the following sections. For each layer, a brief description of the data is provided, along with the steps taken to process the data to create the submission dataset. Note that the column “Reference” in Table 2-1 indicates the heading number in this section that describes that specific data layer. For each layer, an overview map is also provided. Note that each map is intended only to put the data into context within the DFA boundary. The size of smaller features may have been increased to ensure visibility on these maps, while true boundaries are provided in the spatial datasets that accompany this plan.

2.3.1 Alberta Vegetation Inventory

New leaf-on imagery was obtained for most of the DFA in 2012. This imagery was interpreted to the AVI standard 2.1.1 (Alberta, 2005) by Silvacom. Where gaps existed in the new imagery, a combination of old AVI or older imagery was used to fill in the missing information. For example in the south western townships of the DFA, 2007 imagery was interpreted (Appendix VIII, Silvacom 2016). Final approval of the AVI for use in forest management and operational planning was obtained from AAF on March 7, 2016 (Appendix II). AVI from the previous FMPs was used to fill in small areas that were not interpreted in the new AVI. This AVI was approved for use in the previous FMPs (2005 for Drayton Valley and 2006 for Edson). Figure 2.1 shows the final AVI by imagery photo year.

Item	Description
Source(s)	Silvacom
Source Filename(s)	New AVI: **FinalDelivery_20151203.shp** Old AVI: **Forest** – Geodatabase download from Silvacom Online on 02/02/2016
Description of Source File	Alberta Vegetation Inventory data for the Weyerhaeuser DFA
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	*All attributes were used*
Required Processing	1. Clip the New AVI to the R15 boundary 2. Save result as **AVI_Clip1.shp** 3. Erase AVI_Clip1.shp from the R15 polygon boundary, to determine the remaining areas that do not have AVI coverage 4. Save result as **AVI_NoNewCoverage.shp** 5. Clip Old AVI to AVI_NoNewCoverage.shp to determine the areas of old AVI coverage that weren't interpreted in the new AVI 6. Save result as **AVI_Clip2.shp** 7. Merge both AVI Clip layers into a single AVI layer 8. Save result as **AVI_Merge.shp** 9. Move attributes from any duplicated fields into a single field to simplify the attributes table 10. Ensure all parts of the Brazeau Reservoir and Pembina River are identified. Adjust Nat_Non attributes as necessary 11. Save result as **AVI_Edit.shp** 12. Calculate geometry within attributes table to determine the area (ha) of each polygon. 13. Export as **AVI_*Combined*.shp**
Assumptions/ Processing Issues	The Pembina river and parts of the Brazeau reservoir have no polygon representation in any version of the AVI used.
Programs	ESRI ArcGIS
Output Filename	**AVI_Combined.shp**
Output Description	AVI layer consisting of new AVI coverage and old AVI coverage where new interpretation is not available. This layer is the source layer used to create the pre-landbase AVI (PLB).

Item	Description
Output Attributes	*All input attributes are maintained. Output attributes are listed in Appendix VII: Data Dictionary.*
Polygon Area/Line Length	Total Area - 1,051,223 ha
Delivered Theme Name	**AVI**

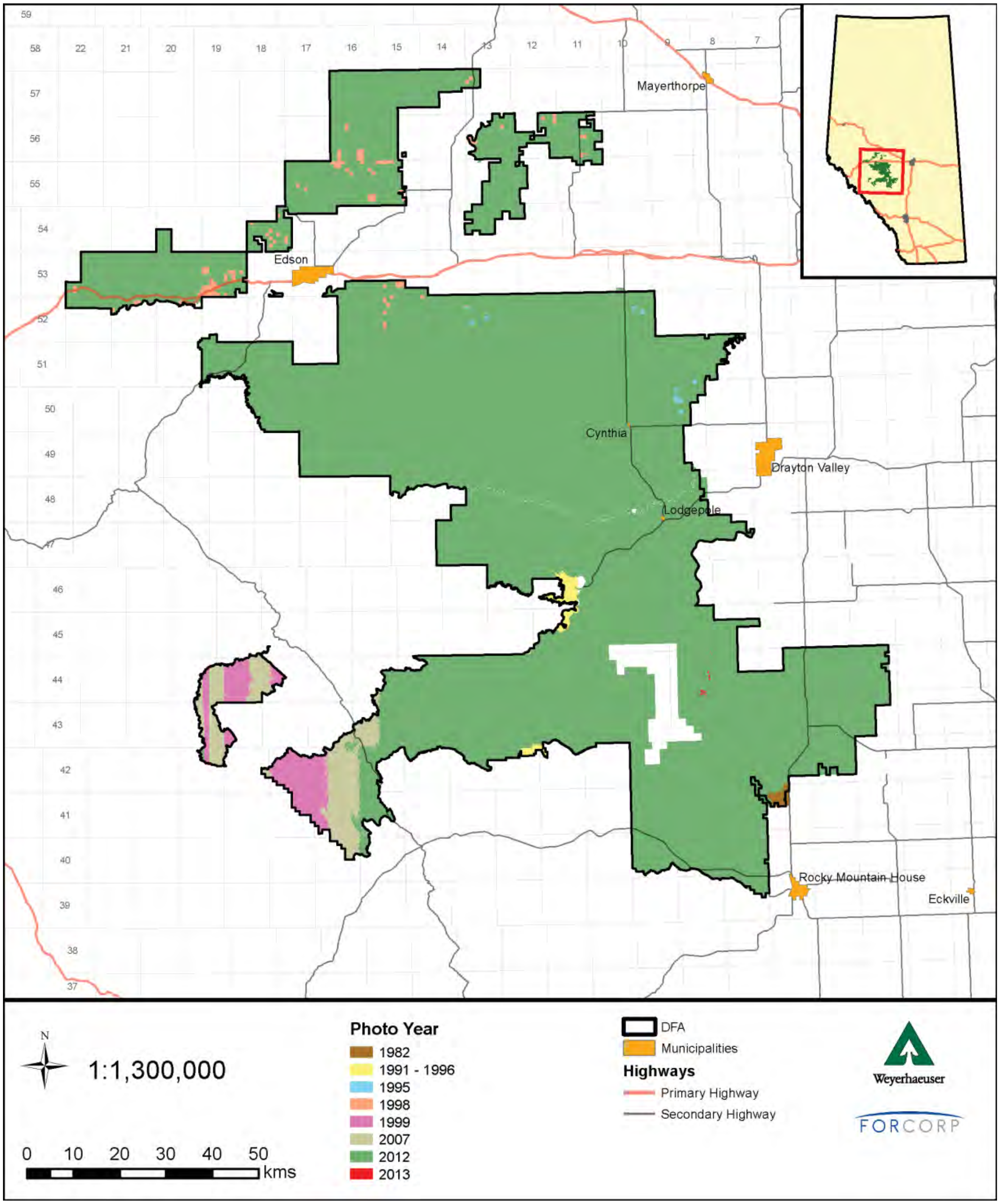

Figure 2.1. AVI photo year for AVI coverage in the DFA.

2.3.2 Defined Forest Area Boundary

Item	Description
Source	GOA –Agriculture and Forestry
Source Filename	**FMU_R15.shp** (Date Received: 2015/09/17)
Description of Source File	Boundary of FMU R15
Projection/Datum	Projected, NAD 1983, 10TM-AEP Forest
Important Attributes	*FMU_NAME, FMU_CODE*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **R15_Projected.shp** 3. Create singlepart shapefile. 4. Save result as **R15_Singlepart.shp** 5. Calculate geometry within attributes table to determine the area (ha) of each polygon. 6. Export as **R15.shp**
Assumptions/ Processing Issues	Extents of FMU R15 as specified by AAF.
Programs	ESRI ArcGIS
Output Filename	**R15.shp**
Output Description	Singlepart shapefile showing the boundaries of the R15 Forest Management Unit.
Output Attributes	*FMU_NAME*
Polygon Area/Line Length	Total Area - 1,067,415 ha
Delivered Theme Name	**Forest Management Units**

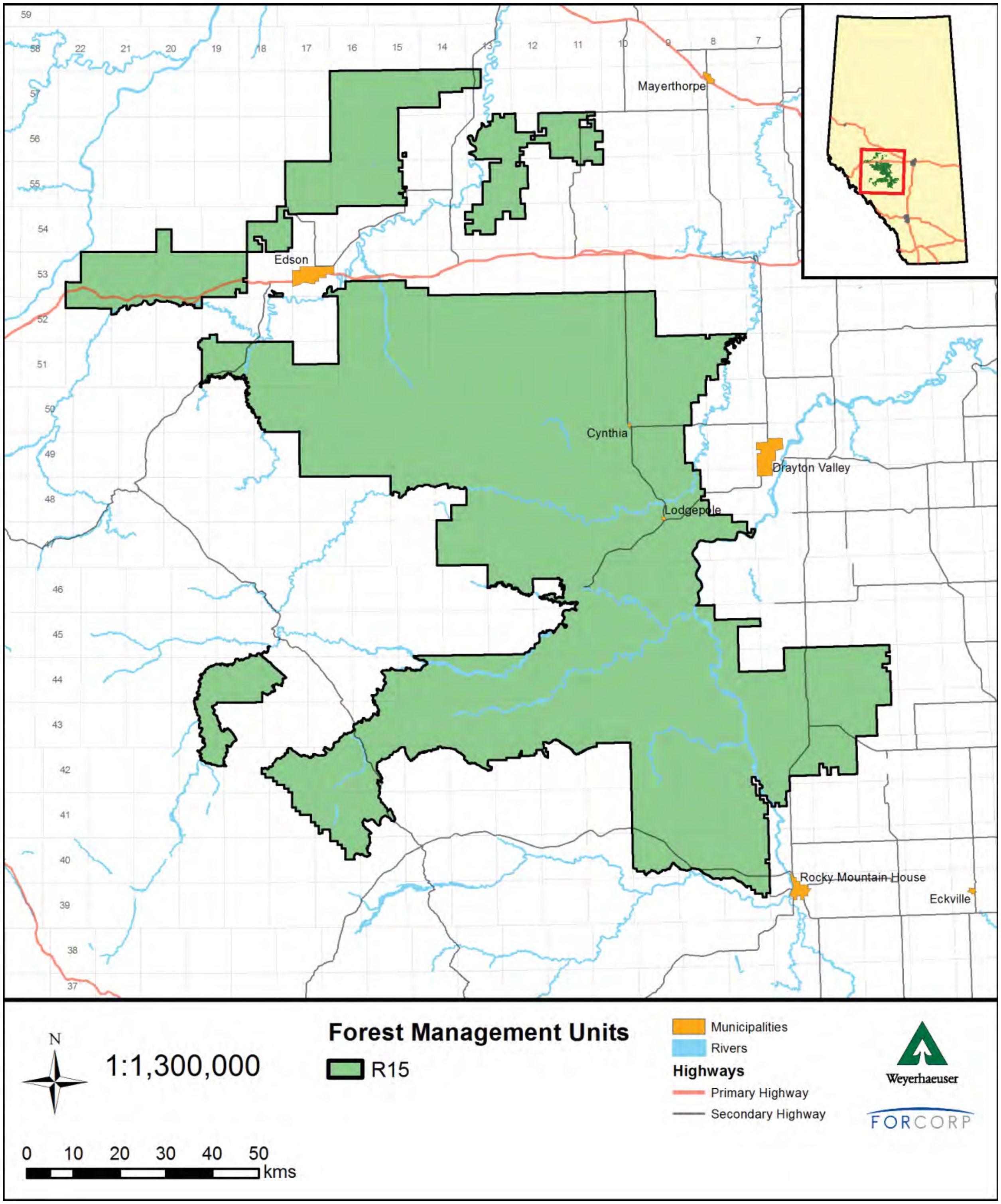

Figure 2.2. Boundary of the DFA.

2.3.3 Land Use Framework

Item	Description
Source	AltaLIS
Source Filename	**BF_LAND_USE_FRAMEWORK.shp** (Calendar Date: 2012/10)
Description of Source File	Alberta Land Use Framework Zones
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*LUF_NAME, LUF_CODE*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **Land_Use_Framework_Projected.shp** 3. Select all polygons that intersect the R15 boundary 4. Save result as **Land_Use_Framework_Select.shp** 5. Create singlepart shapefile. 6. Save result as **Land_Use_Framework_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Export as **Land_Use_Framework.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Land_Use_Framework.shp**
Output Description	Single part shapefile showing the Alberta Land Use Framework Zones found within the R15 Forest Management Unit.
Output Attributes	*LUFNAME, LUFCODE*
Polygon Area/Line Length	Total Area – 21,949,291 ha North Saskatchewan – 8,594,981 ha Red Deer – 5,046,630 ha Upper Athabasca – 8,307,680 ha
Delivered Theme Name	**Land Use Framework**

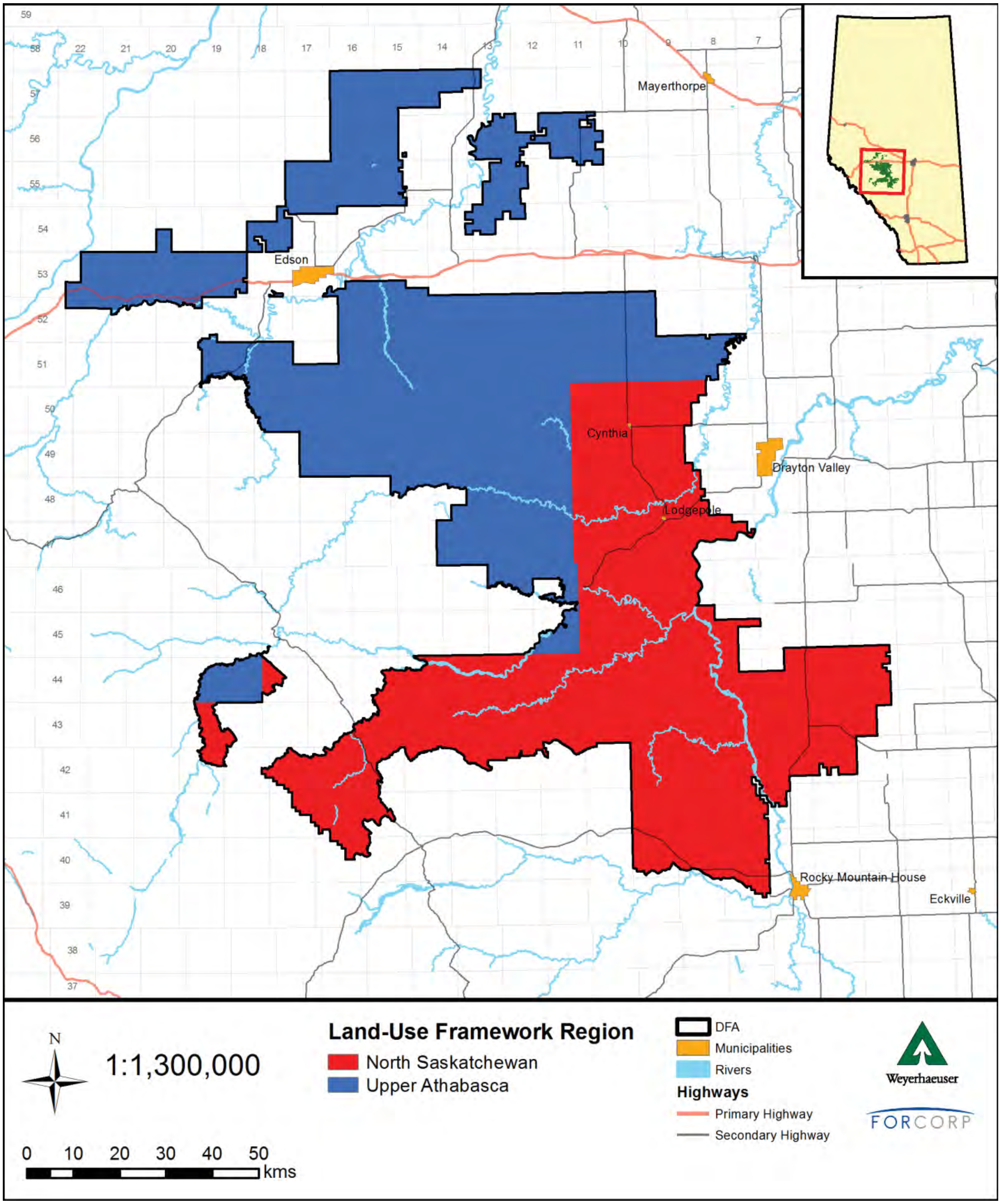

Figure 2.3. The Alberta Land Use Framework regions located within the DFA.

2.3.4 Previous Forest Management Units

Item	Description
Source	AltaLIS
Source Filename	**BF_FMU_POLYGON.shp** (Calendar Date: 2014/05/01)
Description of Source File	Alberta Forest Management Units
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FMU_NAME, FMU_CODE*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FMU_Projected.shp** 3. Clip the layer to the R15 FMU 4. Save result as **FMU_Clip.shp** 5. Create singlepart shapefile. 6. Save result as **FMU_Singlepart.shp** 7. Edit features to ensure all polygons belong to one of the five Weyerhaeuser FMUs (E2, E15, R12, W5, or W6). If a polygon borders multiple FMUs then dissolve polygon with FMU that shares the most perimeter. 8. Edit features to shift the R12 boundary to the south border of the Pembina River, and ensure that compartment and working area boundaries match where appropriate. 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Export as **FMU.shp**
Assumptions/ Processing Issues	The provincial FMU boundaries were clipped to the new R15 boundary. Areas of neighbouring FMUs that fell within the R15 boundary were amalgamated into one of the five Weyerhaeuser FMUs to ensure total area was equal to the R15 area. All FMU area from the five Weyerhaeuser FMUs that fell outside of the R15 boundary was no longer considered part of the DFA. Where required, FMU boundaries were adjusted to account for updates to linework along the Pembina river, and to better align the boundaries with the compartments and working areas boundaries.
Programs	ESRI ArcGIS
Output Filename	**FMU.shp**
Output Description	Single part shapefile showing the boundaries of the old Forest Management Units (FMUs) that overlap with the R15 FMU.
Output Attributes	*OLDFMU*
Polygon Area/Line Length	Total Area (R15) – 1,067,415 ha E2 – 121,327 ha E15 – 112,507 ha R12 – 530,375 ha W5 – 68,928 ha W6 – 234,278 ha

Item	Description
Delivered Theme Name	**Forest Management Units**

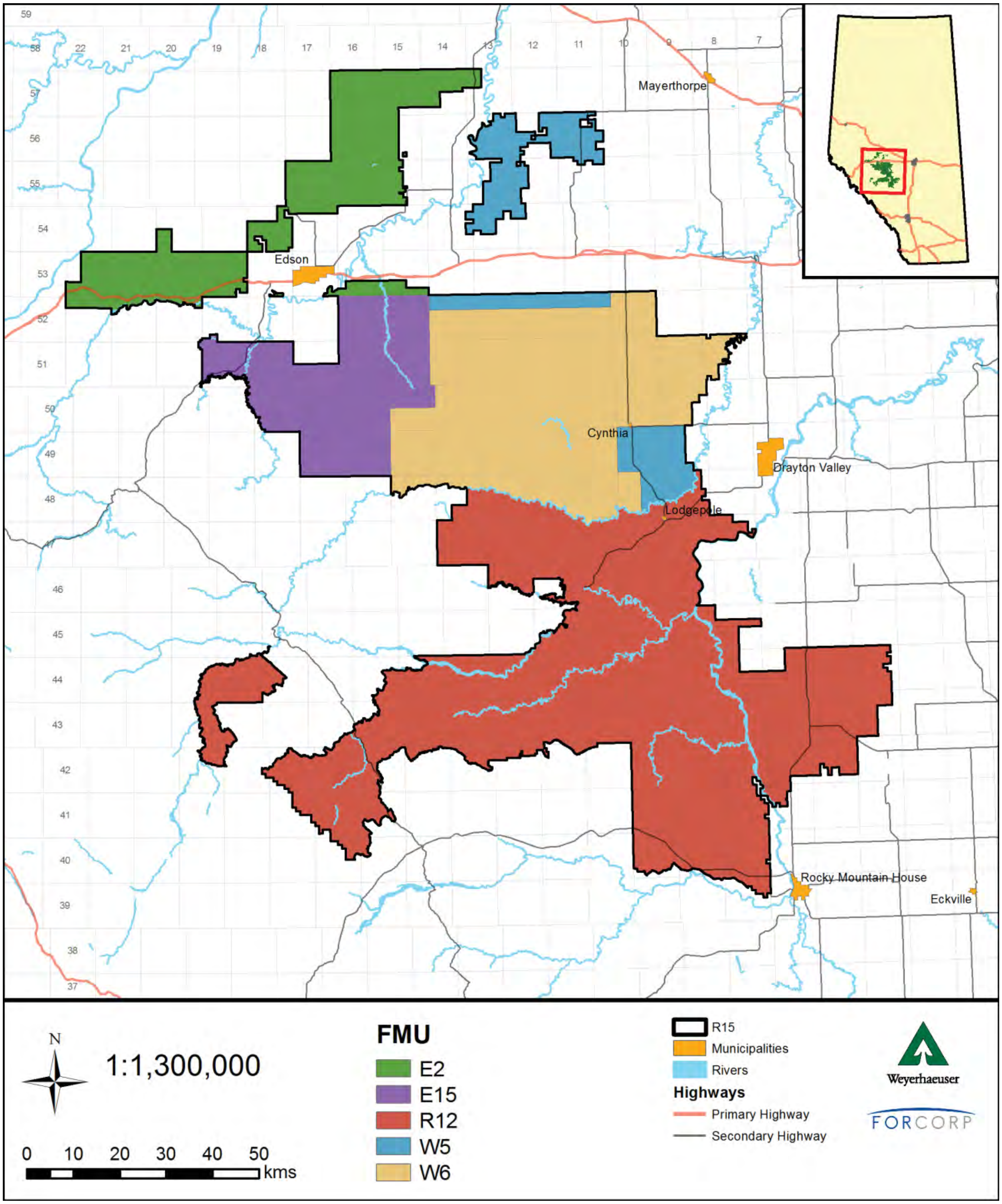

Figure 2.4. Previous FMUs that were amalgamated to create the R15 FMU.

2.3.5 Volume Supply Areas

Item	Description
Source	AltaLIS
Source Filename	**BF_FMU_POLYGON.shp** (Calendar Date: 2014/05/01)
Description of Source File	Alberta Forest Management Units
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FMU_NAME, FMU_CODE, VSA*
Required Processing	1. Follow steps 1 through 9 in Section 2.3.4 2. Add short integer field to attributes table: "VSA" 3. Assign VSA values to old FMUs as follows: 3.1. VSA 1 = FMU E2 3.2. VSA 2 = FMU W5 3.3. VSA 3 = FMUs E15 and W6 3.4. VSA 4 = FMU R12 4. Dissolve the layer by the VSA attribute. 5. Save Result as **VSA_Dissolve.shp** 6. Create singlepart shapefile. 7. Save result as **VSA_Singlepart.shp** 8. Calculate geometry within attributes table to determine the area (ha) of each polygon. 9. Export as **VSA.shp**
Assumptions/ Processing Issues	The FMUs within each Volume Supply Area were specified by Weyerhaeuser.
Programs	ESRI ArcGIS
Output Filename	**VSA.shp**
Output Description	Single part shapefile showing the boundaries of the Volume Supply Areas (VSAs) within the R15 Forest Management Unit.
Output Attributes	*VSA*
Polygon Area/Line Length	Total Area – 1,067,415 ha VSA 1 – 121,327 ha; VSA 3 – 346,785 ha VSA 2 – 68 ,928 ha; VSA 4 – 530,375 ha
Delivered Theme Name	**Volume Supply Areas**

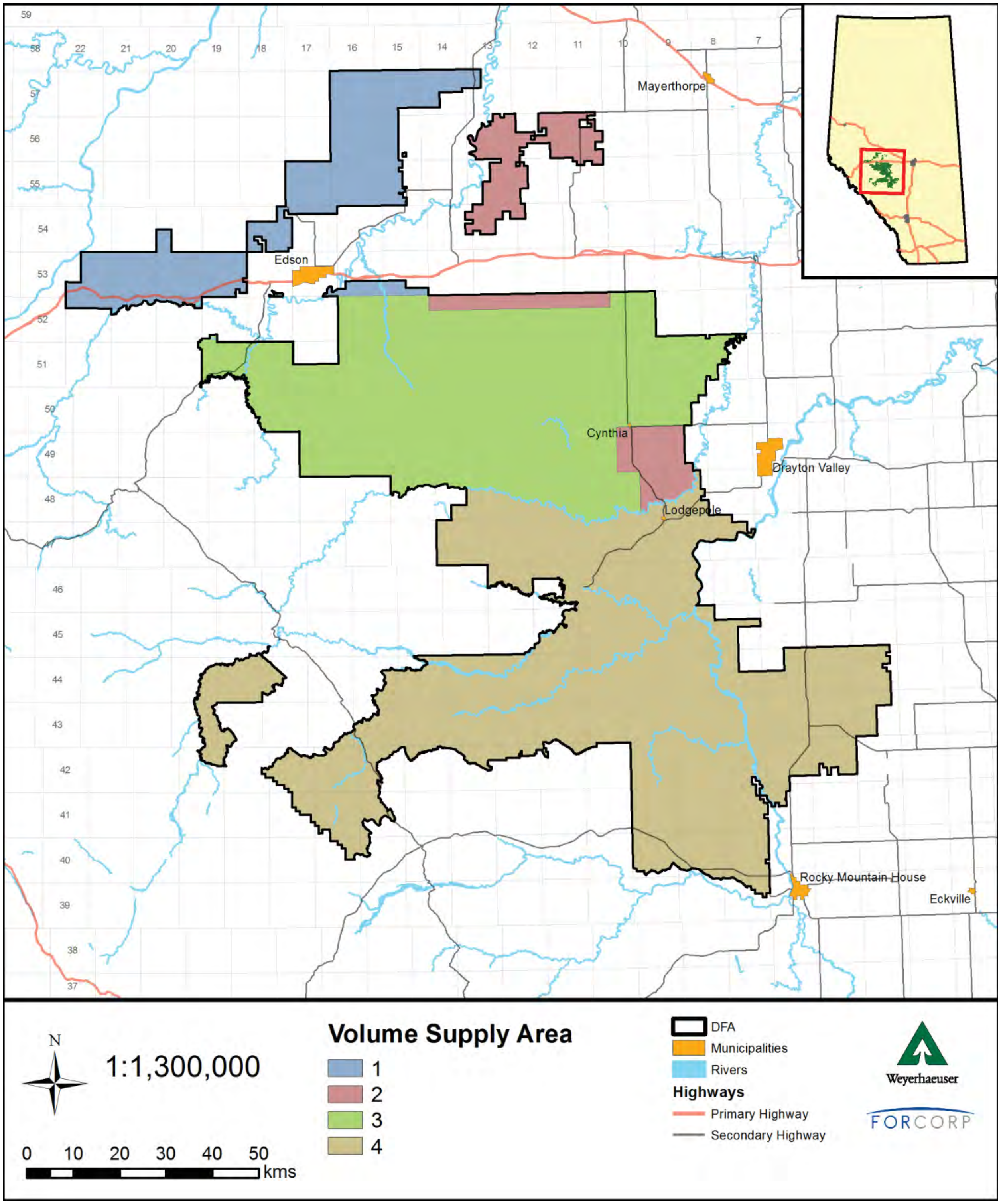

Figure 2.5. Volume Supply Areas within the DFA.

2.3.6 Forest Management Agreement Area Boundary

Item	Description
Source	AltaLIS
Source Filename	**BF_FMA_POLYGON.shp** (Calendar Date: 2014/05/01)
Description of Source File	Alberta Forest Management Agreement Areas
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FMA_NAME, FMA_CODE*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FMU_Projected.shp** 3. Select polygons with FMA_NAME = 4. "Weyerhaeuser Company Limited (Pembina Timberland)" 5. Save result as **FMA_Select.shp** 6. Clip shapefile to the R15 boundary 7. Save result as **FMA_Clip.shp** 8. Create singlepart shapefile. 9. Save result as **FMA_Singlepart.shp** 10. Calculate geometry within attributes table to determine the area (ha) of each polygon. 11. Export as **FMA.shp**
Assumptions/ Processing Issues	The R15 FMU boundary does not align with the outer FMA boundary in all areas. For the purpose of this FMP all slivers of the Weyerhaeuser FMA that are not within R15 were not considered part of the landbase in this FMP. Slivers of other FMAs that fell within the DFA were also not considered part of the landbase.
Programs	ESRI ArcGIS
Output Filename	**FMA.shp**
Output Description	Single part shapefile showing the boundaries of the Forest Management Agreement Area (FMA) belonging to Weyerhaeuser (Pembina Timberlands).
Output Attributes	*FMA*
Polygon Area/Line Length	955,220 ha
Delivered Theme Name	**Forest Management Agreement Area**

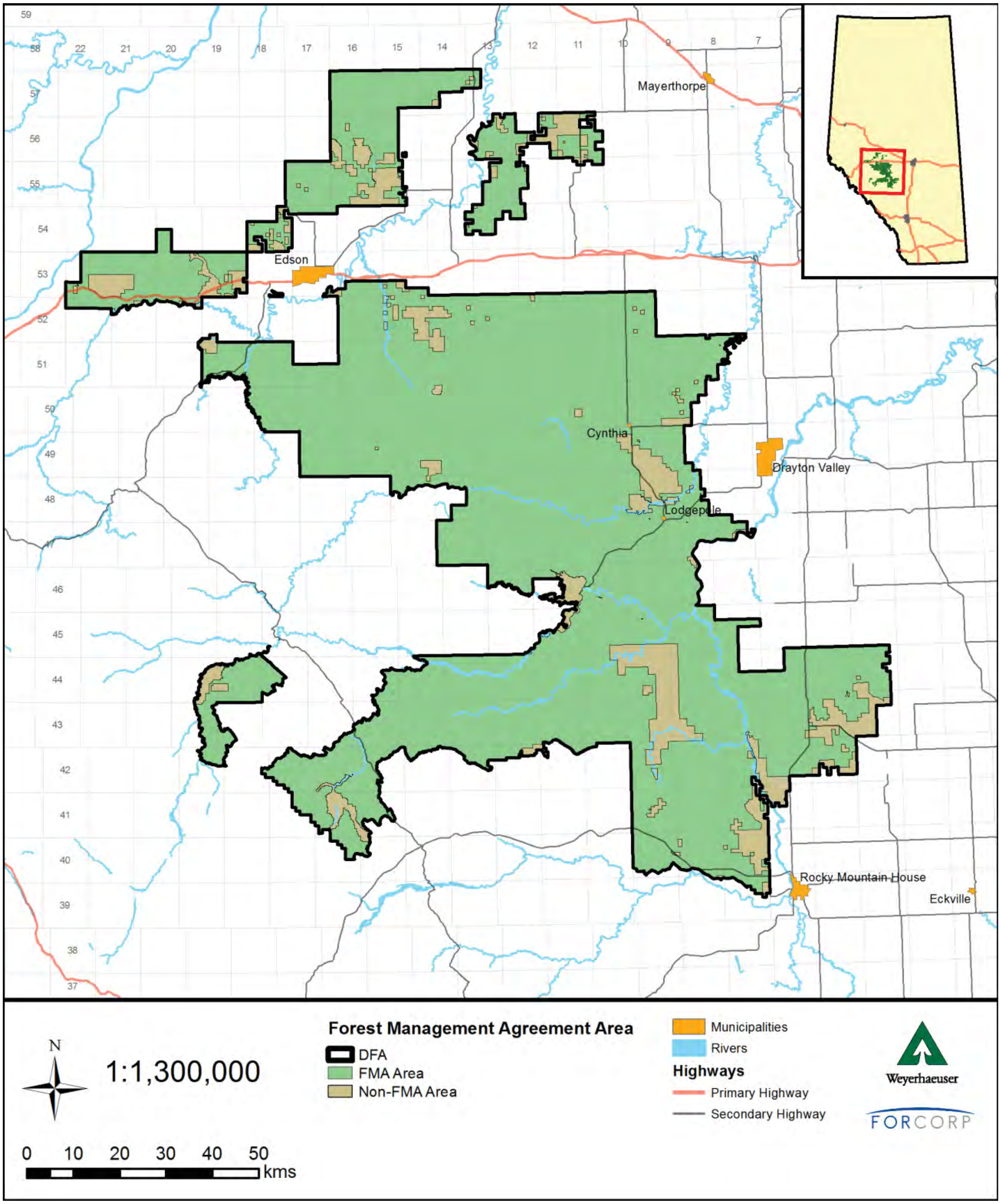

Figure 2.6. Weyerhaeuser (Pembina Timberlands) FMA Area.

2.3.7 Compartments

Item	Description
Source	Weyerhaeuser
Source Filename	**Compartments_Dec22.shp** (Delivered on 2015/01/26)
Description of Source File	Weyerhaeuser compartment boundaries within the FMA
Projection/Datum	Projected, UTM, NAD 1983, UTM Zone 11N
Important Attributes	*COMPARTMEN, FMA*
Required Processing	1. Union Compartments_Dec22.shp with R15.shp 2. Save result as **CompartmentR15_Union.shp** 3. Clip CompartmentR15_Union.shp to R15 boundary 4. Save result as **Compartments_Clip.shp** 5. Edit attributes table to ensure all polygons have assigned Compartment and FMA (DV or ED) attributes 6. Dissolve by *COMPARTMEN* and *FMA* attributes 7. Save result as **Compartments_Dissolve.shp** 8. Create singlepart shapefile. 9. Save result as **Comparments_Singlepart.shp** 10. Clean the topology to remove overlaps and isolated slivers 11. Create CompCode field and populate with abbreviated Compartment names. 12. Create CompRisk field 13. Populate CompRisk with the following values for each compartment 13.1. Low: Baptiste, Nordegg, and West Country 13.2. Moderate: Medicine Lake, South Canal 13.3. High: Beaver Meadows, Brazeau 13.4. Very High: Edson, Macmillan, Wolf Lake 14. Calculate geometry within attributes table to determine the area (ha) of each polygon 15. Export as **Compartments.shp**
Assumptions/ Processing Issues	The union of the compartments layer with the R15 boundary is conducted to ensure all areas within the DFA are part of a compartment. Areas that fell outside the DFA are no longer included in the compartment layer. The compartment risk references the mountain pine beetle risk for the compartment (Section 3.6.2).
Programs	ESRI ArcGIS
Output Filename	**Compartments.shp**
Output Description	Single part shapefile showing the 10 compartments set by Weyerhaeuser that are within the Weyerhaeuser Pembina DFA.
Output Attributes	*COMPARTMEN, COMPCODE, COMPRISK*
Polygon Area/Line Length	Total Area – 1,067,415 ha Baptiste – 77,460 ha Beaver Meadows – 34,278 ha Brazeau – 108,883 ha Edson – 115,485 ha Macmillan – 190,878 ha Medicine Lake – 86,036 ha Nordegg – 68,540 ha South Canal – 123,452 ha West Country – 66,005 ha Wolf Lake – 196,398 ha
Delivered Theme Name	**Compartments**

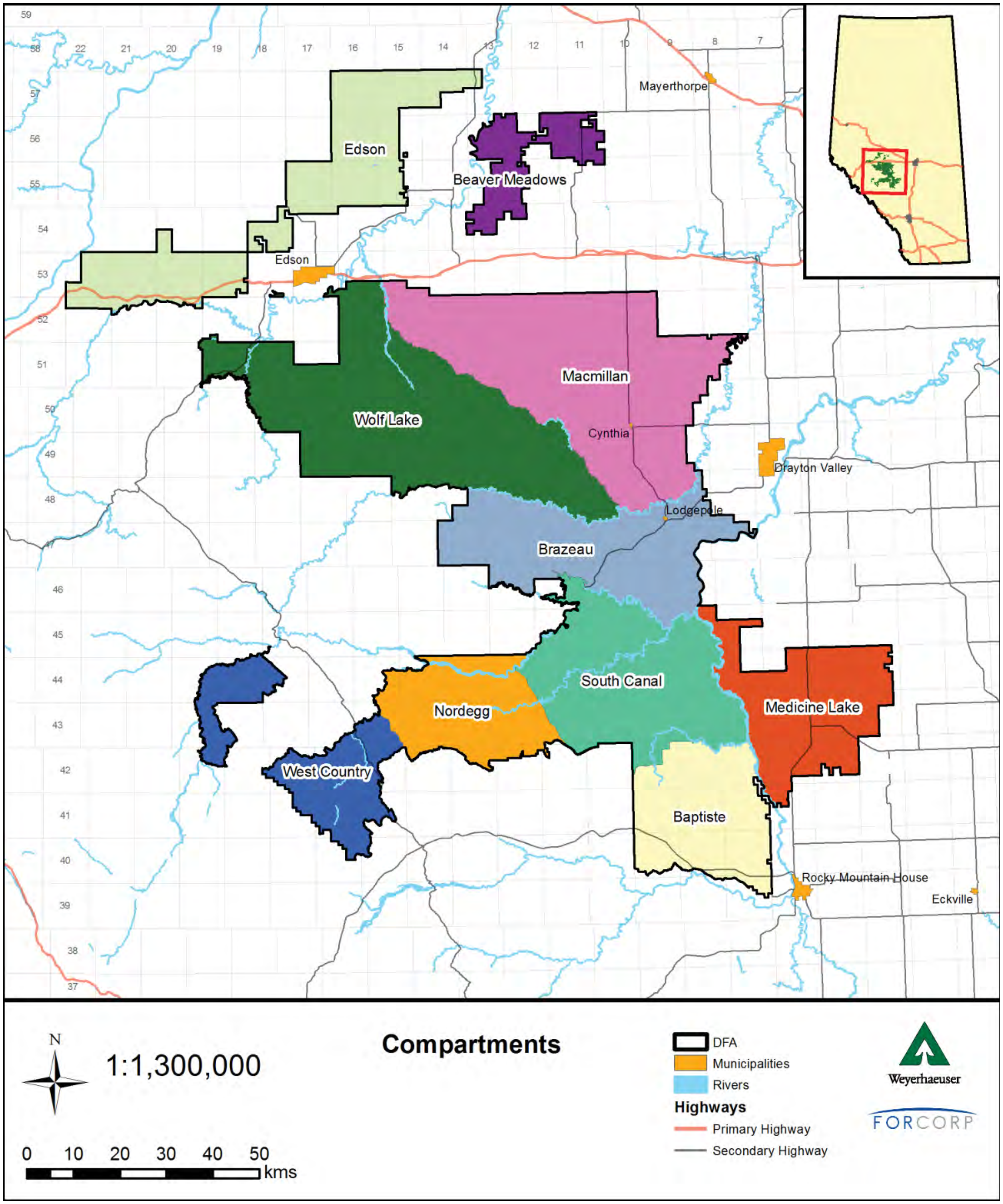

Figure 2.7. Compartment boundaries within the DFA.

2.3.8 Working Areas

Item	Description
Source	Weyerhaeuser
Source Filename	**WorkingAreas_Dec22.shp** (Delivered on 2015/01/26)
Description of Source File	Weyerhaeuser working area boundaries within the FMA
Projection/Datum	Projected, UTM, NAD 1983, UTM Zone 11N
Important Attributes	*WORKAREA, FMA*
Required Processing	1. Union WorkingAreas_Dec22.shp with R15.shp 2. Save result as **WorkingAreas_Union.shp** 3. Clip WorkingAreas_Union.shp to R15 boundary 4. Save result as **WorkingAreas_Clip.shp** 5. Create singlepart shapefile 6. Save result as **WorkingAreas_Singlepart.shp** 7. Edit attributes table to ensure all polygons have assigned working areas, and that all working areas are contained within a single compartment. Where required, adjust boundaries to match Compartment and Old FMU layers. 8. Dissolve by *WORKAREA* 9. Save result as **WorkingArea_Dissolve.shp** 10. Clean the topology to remove overlaps and isolated slivers 11. Adjust the linework to ensure 12. Create WorkCode field and populate with abbreviated Compartment names. 13. Calculate geometry within attributes table to determine the area (ha) of each polygon 14. Save result as **WorkingAreas.shp**
Assumptions/ Processing Issues	The union of the working areas with R15 is completed to ensure all area within the R15 boundary has the potential to be assigned to a working area before the erase is conducted in step 10.
Programs	ESRI ArcGIS
Output Filename	**WorkingAreas.shp**
Output Description	Single part shapefile showing the 91 working areas set by Weyerhaeuser Pembina that are within the DFA.
Output Attributes	*WORKAREA, WORKCODE*
Polygon Area/Line Length	Total Area – 1,036,062 ha Number of working areas – 91
Delivered Theme Name	**Working Areas**

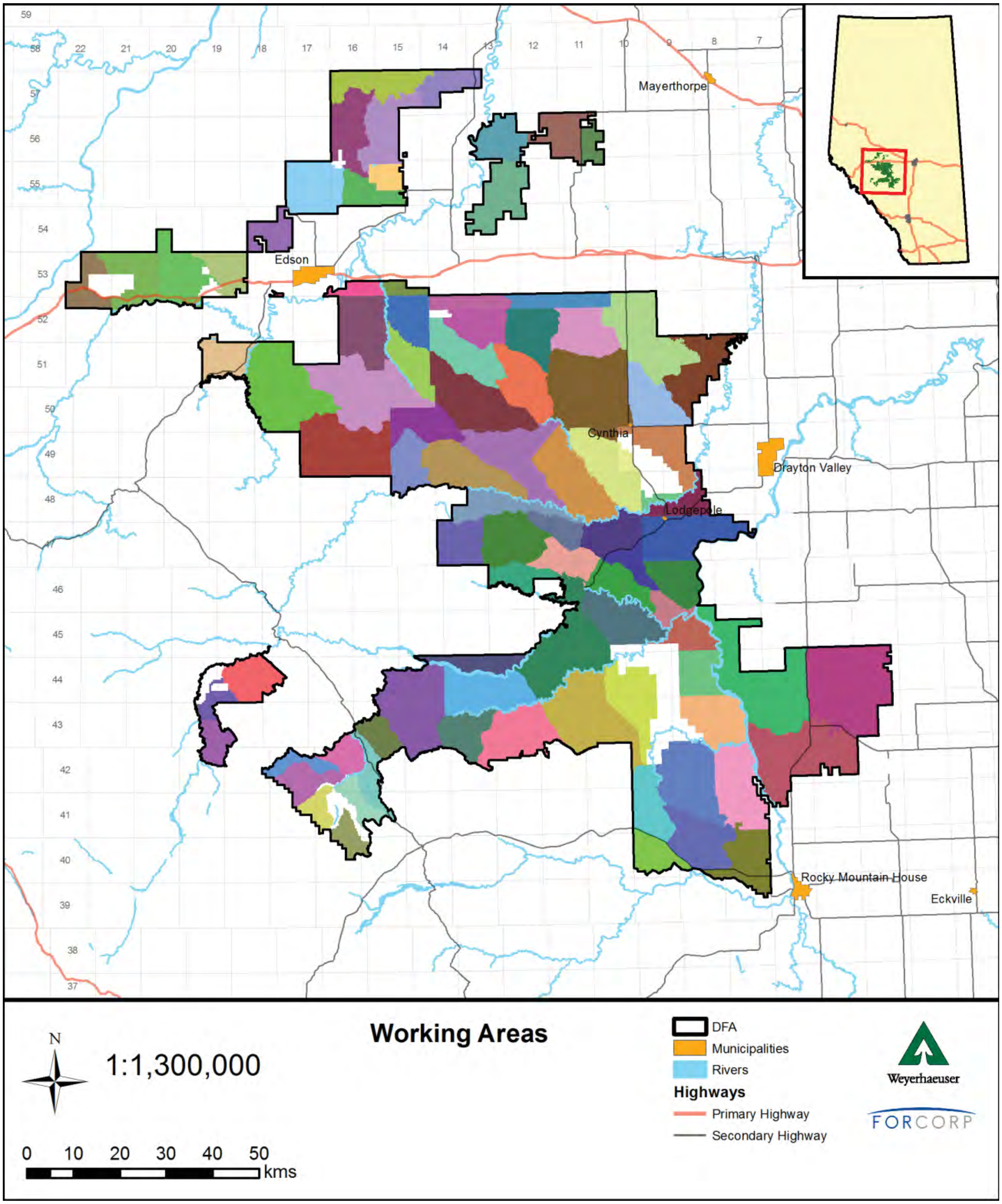

Figure 2.8. Working Area boundaries within the DFA.

2.3.9 Woodsheds

Item	Description
Source	Weyerhaeuser
Source Filename	**December_2011.shp** (Delivered on 2016/01/11)
Description of Source File	Weyerhaeuser woodsheds
Projection/Datum	No Defined Projection
Important Attributes	*WOODSHED*
Required Processing	1. Define projection as: UTM, NAD 1983 UTM Zone 11N 2. Union the layer with R15 3. Save result as **Woodsheds_Union.shp** 4. Clip layer to the R15 Boundary 5. Save result as **Woodsheds_Clip.shp** 6. Create singlepart shapefile. 7. Save result as **Woodsheds_Singlepart.shp.** 8. Clean the topology to remove overlaps and isolated slivers 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Save result as **Woodsheds.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process.
Programs	ESRI ArcGIS
Output Filename	**Woodsheds.shp**
Output Description	Weyerhaeuser Pembina woodsheds, adjusted to the R15 Forest Management Unit boundary.
Output Attributes	*WOODSHED*
Polygon Area/Line Length	Total Area – 982,960 ha Number of Woodsheds - 179
Delivered Theme Name	**Woodsheds**

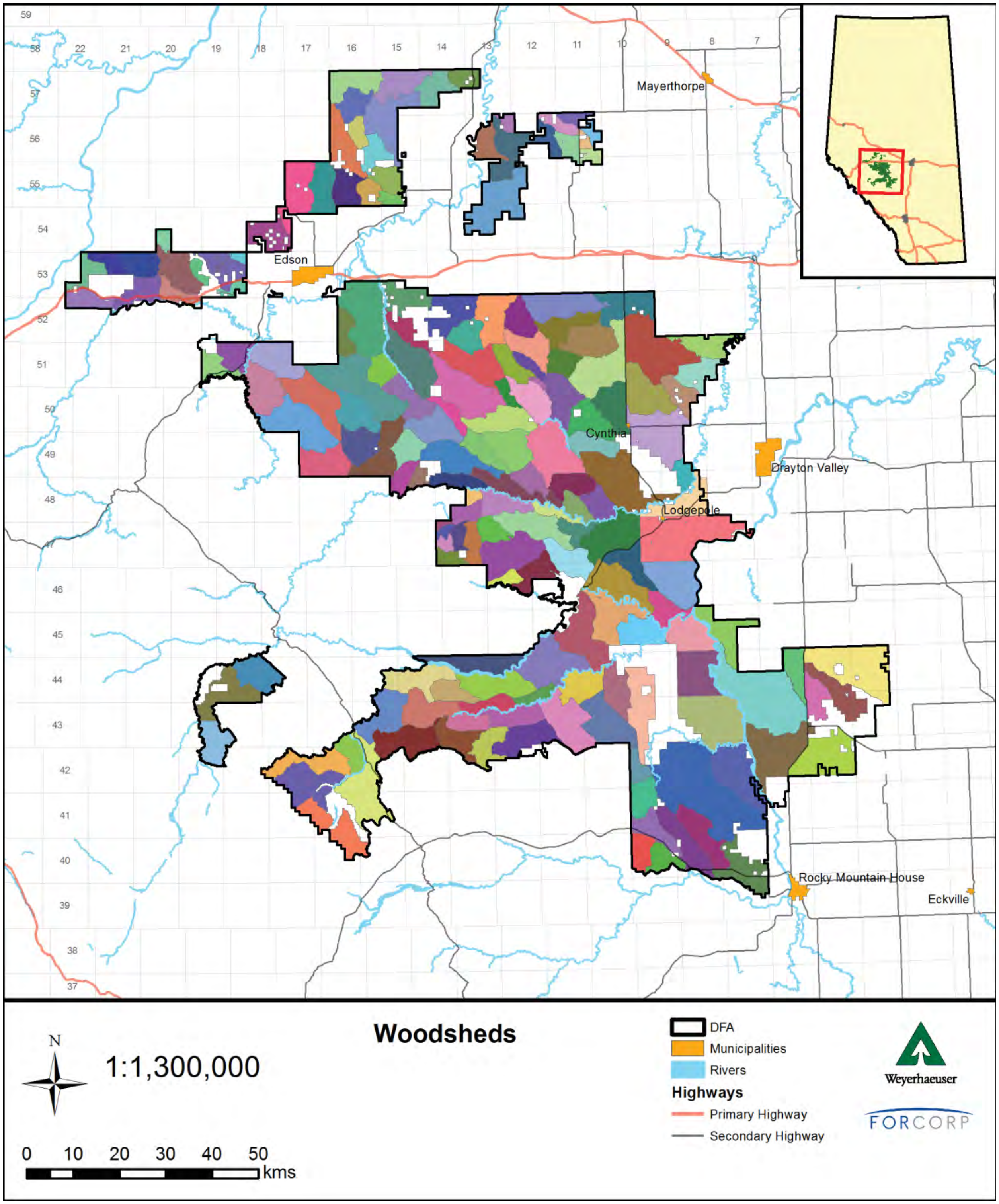

Figure 2.9. Woodsheds within the DFA.

2.3.10 Townships

Item	Description
Source	Weyerhaeuser
Source Filename	**BF_ATS_POLYGON.shp** (Calendar Date: 2005/10/06)
Description of Source File	Alberta Township System Grid
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*MER, RGE, TWP*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **Townships_Projected.shp** 3. Select polygons that intersect the R15 FMU boundary 4. Save result as **Townships_Select.shp** 5. Dissolve layer by TWP, RGE, and MER. Ensure that multipart features are not created. 6. Save result as **Townships_Dissolve.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Export as **Townships.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Townships.shp**
Output Description	Single part shapefile showing the ATS townships that intersect the DFA.
Output Attributes	*TWP, RGE, MER*
Polygon Area/Line Length	Total Area – 2,030,228 ha
Delivered Theme Name	**Townships**

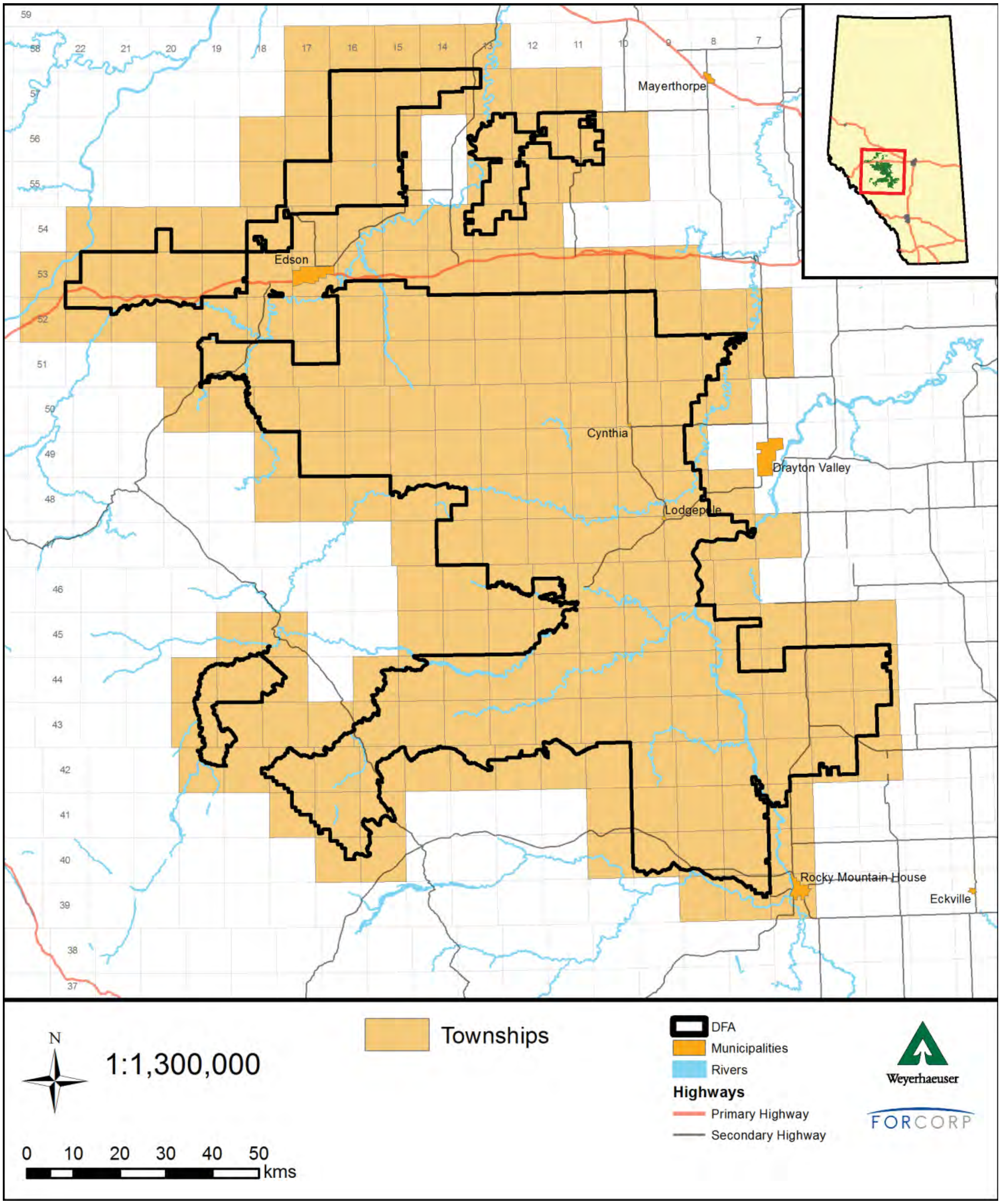

Figure 2.10. Townships that intersect the DFA.

2.3.11 Ecosite

Item	Description
Source	Weyerhaeuser
Source Filename	**PEM_OUT_JAN28_2016_wAVIv2.shp** (Delivered to Forcorp: 2016/02/02)
Description of Source File	AVI with Ecosite and Ecophase classifications
Projection/Datum	UTM, NAD83, Zone 11
Important Attributes	*POLYNUM, MAPCODE, NSRCODE, ECO1, ECO_NAME, PHASE1, PHASE_NAME*
Required Processing	1. Clip layer to the R15 Boundary 2. Save result as **Ecosite_Clip.shp** 3. Create singlepart shapefile. 4. Save result as **Ecosite_Singlepart.shp** 5. Calculate geometry within attributes table to determine the area (ha) of each polygon. 6. Export as **Ecosite.shp**
Assumptions/ Processing Issues	The Ecosite layer is to be joined with the AVI by the POLYNUM attribute, as a step to create the pre-landbase AVI. This process brings the ecosite (ECO1) and natural subregion (NSRCODE) into the pre-landbase AVI. This join is to be completed prior to running the Landbase Python Script.
Programs	ESRI ArcGIS
Output Filename	**Ecosite.shp**
Output Description	Single part shapefile showing the ecosites and natural subregions found within the Weyerhaeuser Pembina DFA.
Output Attributes	*POLYNUM, MAPCODE, NSRCODE, ECO1,*
Polygon Area/Line Length	Total Area – 1,034,708 ha
Delivered Theme Name	**Ecosite**

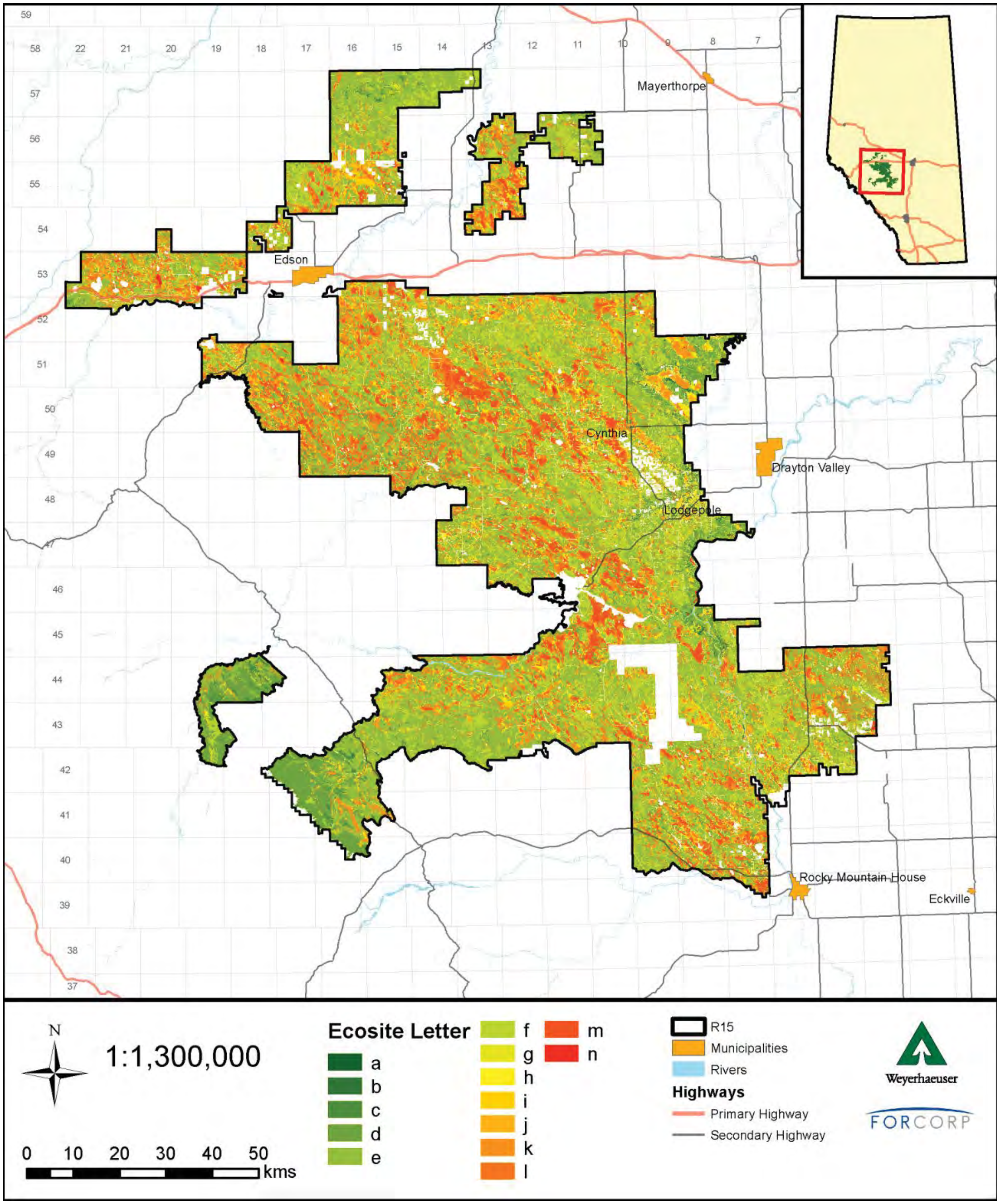

Figure 2.11. Ecosites assigned to polygons within the DFA.

2.3.12 Natural Subregions

Item	Description
Source	GOA – Environment and Parks
Source Filename	**Natural_Regions_Subregions_of_Alberta.shp** (Publication Date 2005/06/02)
Description of Source File	Alberta Natural Subregions
Projection/Datum	Geographic, NAD 1983, Decimal Degrees projected to NAD 1983 10TM AEP Forest
Important Attributes	*NRNAME, NSRCODE, NSRNAME*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **NaturalSubregions_Projected.shp** 3. Clip the layer to the R15 FMU 4. Save result as **NaturalSubregions_Clip.shp** 5. Create singlepart shapefile. 6. Save result as **NaturalSubregions_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Export as **NaturalSubregions.shp**
Assumptions/ Processing Issues	Natural Subregion information (NSRCODE) from this layer is to be added to the pre-landbase AVI file for all polygons that were not assigned an Ecosite and Natural Subregion using the Ecosite.shp file created in Section 2.3.10. This can be done manually by identifying AVI polygons that have their centroids within each Natural Subregion. This addition is required prior to running the Landbase Python script. NRNAME and NSRNAME can be added to the pre-landbase for all polygons for descriptive purposes.
Programs	ESRI ArcGIS
Output Filename	**NaturalSubregions.shp**
Output Description	Single part shapefile showing the Natural Subregions found within the Weyerhaeuser Pembina DFA.
Output Attributes	*NRNAME, NSRCODE, NSRNAME*
Polygon Area/Line Length	Total Area – 1,067,415 ha Alpine – 798 ha Central Mixedwood – 53,454 ha Dry Mixedwood – 939 ha Lower Foothills – 912,968 ha Subalpine – 25,379 ha Upper Foothills – 73,877 ha
Delivered Theme Name	**Natural Subregions**

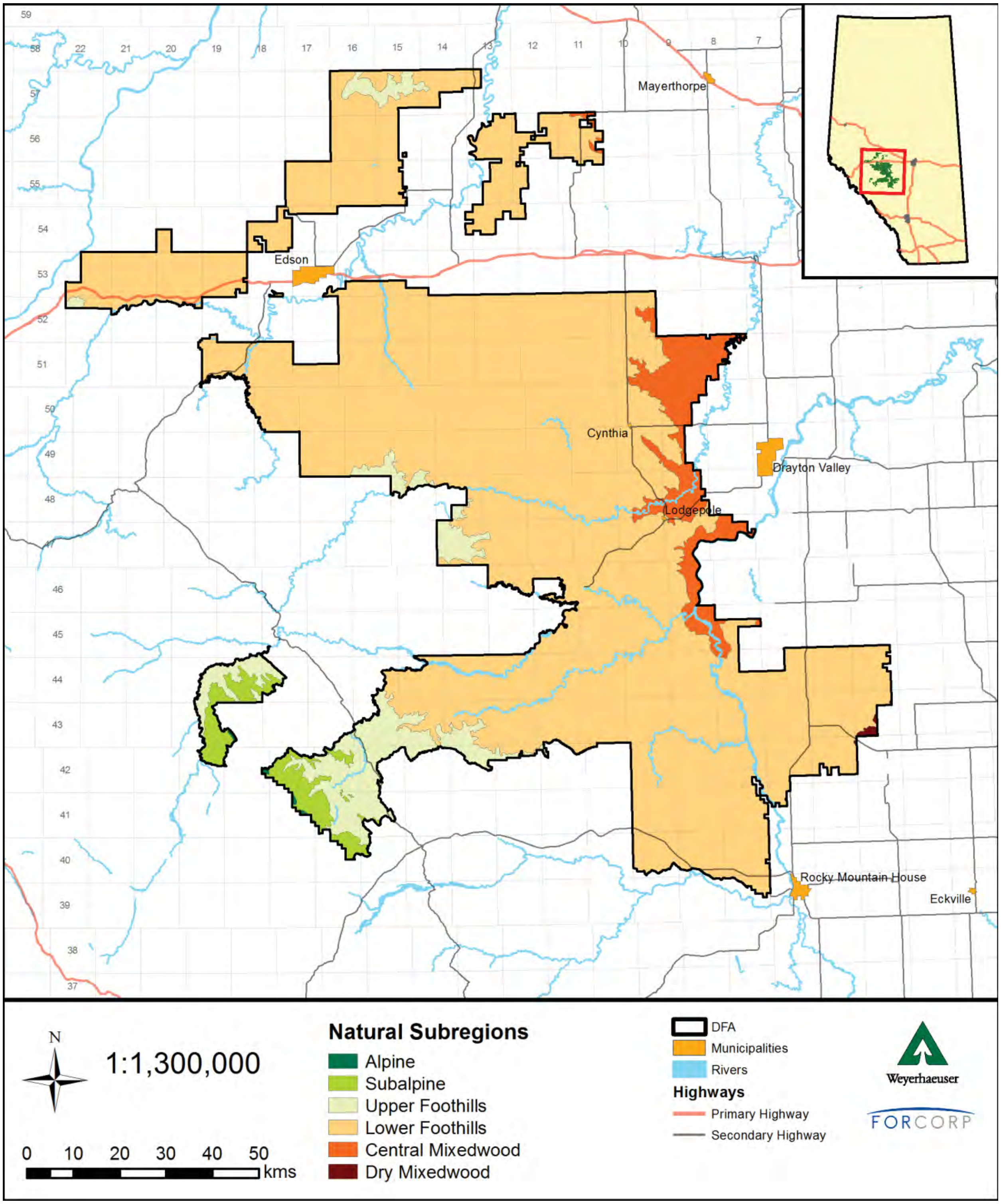

Figure 2.12. Alberta Natural Subregions found within the DFA.

2.3.13 Tree Seed Zones

Item	Description
Source	GOA – Environment and Parks
Source Filename	**SeedZonesOfAlberta.shp** (Publication Date 2014/12/17)
Description of Source File	Tree Seed Zones of Alberta
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*SEEDZONE, NSRNAME*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **SeedZones_Project.shp** 3. Select all polygons that intersect the R15 boundary 4. Save result as **SeedZones_Select.shp** 5. Create singlepart shapefile 6. Save result as **SeedZones_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **SeedZones.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Tree_Seed_Zones.shp**
Output Description	Single part shapefile showing the tree seed zones found within the Weyerhaeuser Pembina DFA.
Output Attributes	*SEEDZONE*
Polygon Area/Line Length	Total Area – 4,141,604 ha A 1.2 – 6,143 ha CM 3.5 – 421,965 ha DM 2.3 – 526,332 ha LF 1.5 – 1,000,619 ha LF 2.1 – 664,208 ha LF 2.2 – 335,560 ha SA 1.2 – 294,735 ha SA 2.2 – 265,798 ha UF 1.2 – 85,159 ha UF 1.4 – 472,150 ha UF 2.4 – 68,935 ha
Delivered Theme Name	**Tree Seed Zones**

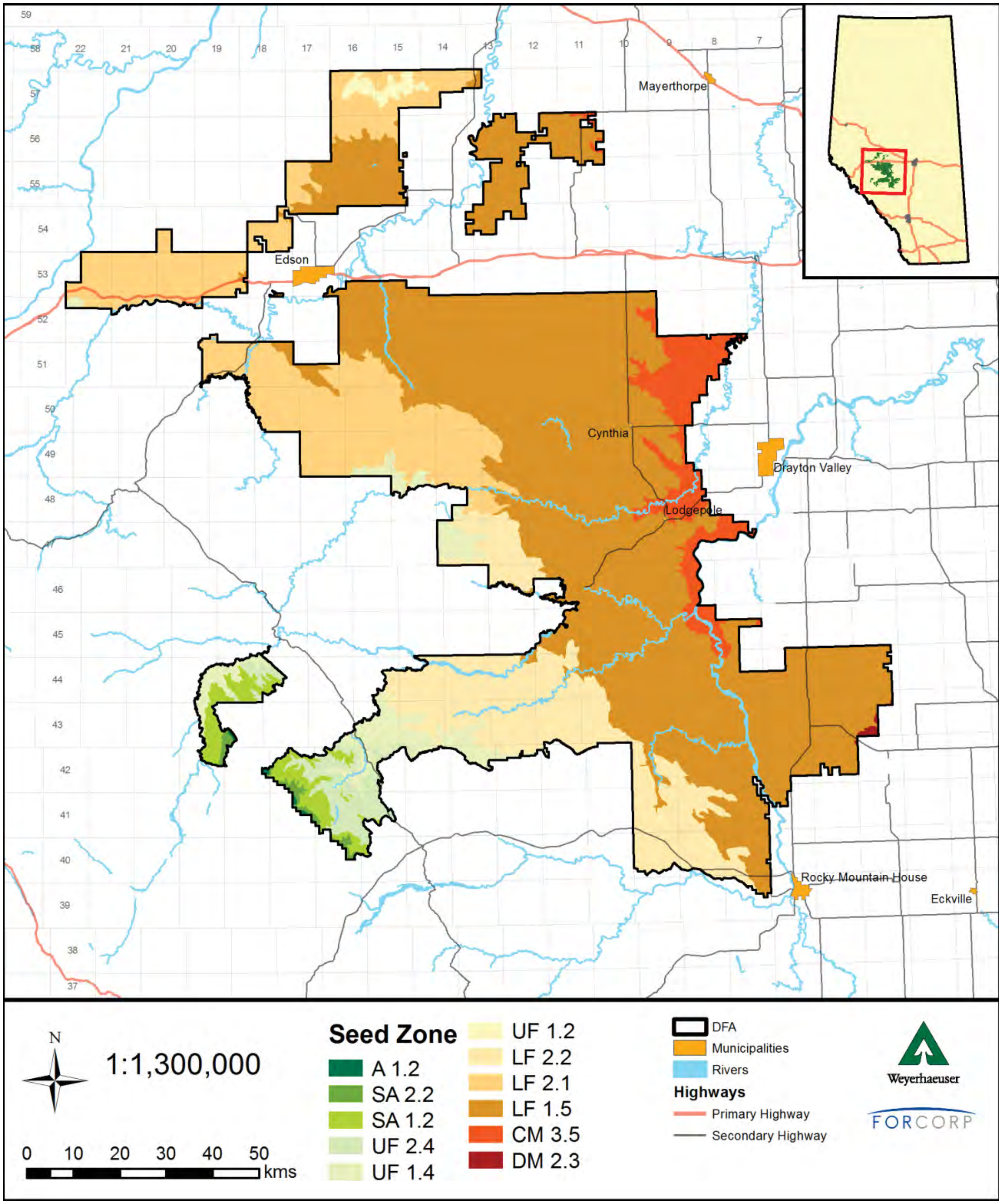

Figure 2.13. Tree seed zones found within the DFA.

2.3.14 Tree Improvement Zone

Item	Description
Source	Weyerhaeuser
Source Filename	**i_breeding_region.shp**
Description of Source File	Region I White Spruce Tree Improvement Zone for western Alberta.
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	*IN_RANGE*
Required Processing	1. Select polygons with an IN_RANGE value = 1 2. Save result as **TreeImprovementZones_Select.shp** 3. Dissolve layer by IN_RANGE attribute 4. Save result as **TreeImprovementZones_Dissolve.shp** 5. Create singlepart shapefile 6. Save result as **TreeImprovementZones_Singlepart.shp** 7. Create attribute titled “TREEIMP” and populate field with “TREEIMP” to indicate that all polygons are part of the tree improvement zone 8. Calculate geometry within attributes table to determine the area (ha) of each polygon 9. Export result as **TreeImprovementZones.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Tree_Improvement_Zones.shp**
Output Description	Region I White Spruce Tree Improvement Zone in and around the Weyerhaeuser DFA
Output Attributes	*TREEIMP*
Polygon Area/Line Length	Total Area – 3,312,731 ha
Delivered Theme Name	**Tree Improvement Zones**

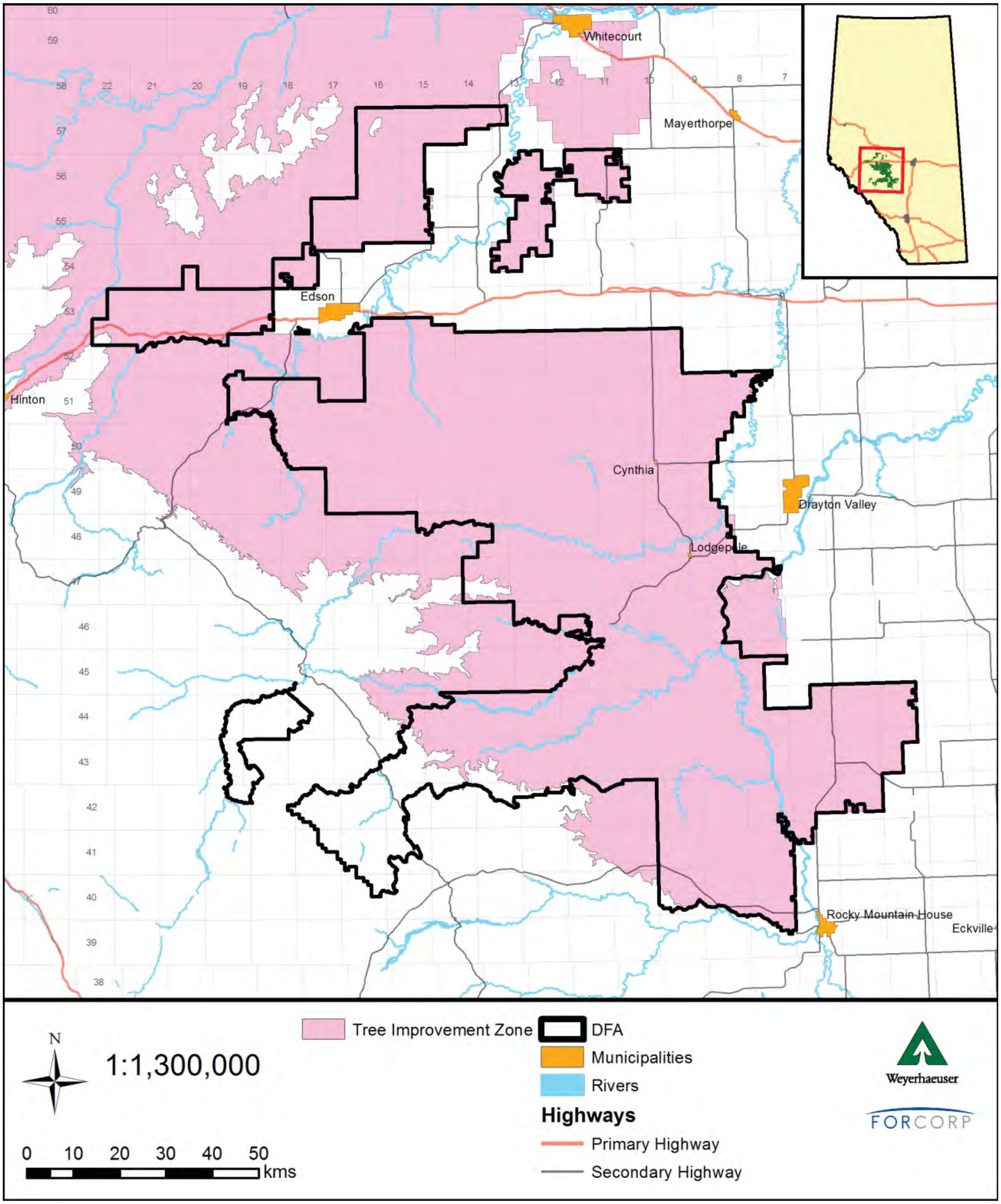

Figure 2.14. Region I White Spruce Tree Improvement Zone within and around the DFA.

2.3.15 Hydrologic Unit Code 8 Watersheds

Item	Description
Source	GOA – Environment and Parks
Source Filename	**HydrologicUnitCode8WatershedsOfAlberta.shp** (Delivered on 2015/10/16)
Description of Source File	Provincial Code 8 Hydrologic Unit Code (HUC) Watersheds
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*HUC_8, NAME, BASIN*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **HUCWatersheds_Projected.shp** 3. Select all polygons that intersect the R15 Boundary 4. Save result as **HUCWatersheds_Select.shp** 5. Create singlepart shapefile. 6. Save result as **HUCWatersheds_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Export as **HUCWatersheds.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**HUCWatershed.shp**
Output Description	Single part shapefile showing the Code 8 watersheds found within the DFA.
Output Attributes	*HUC*
Polygon Area/Line Length	Number of Code 8 HUC watersheds within the DFA – 24 Mean Watershed Area within the DFA (ha) – 44,476 ha
Delivered Theme Name	**Watersheds**

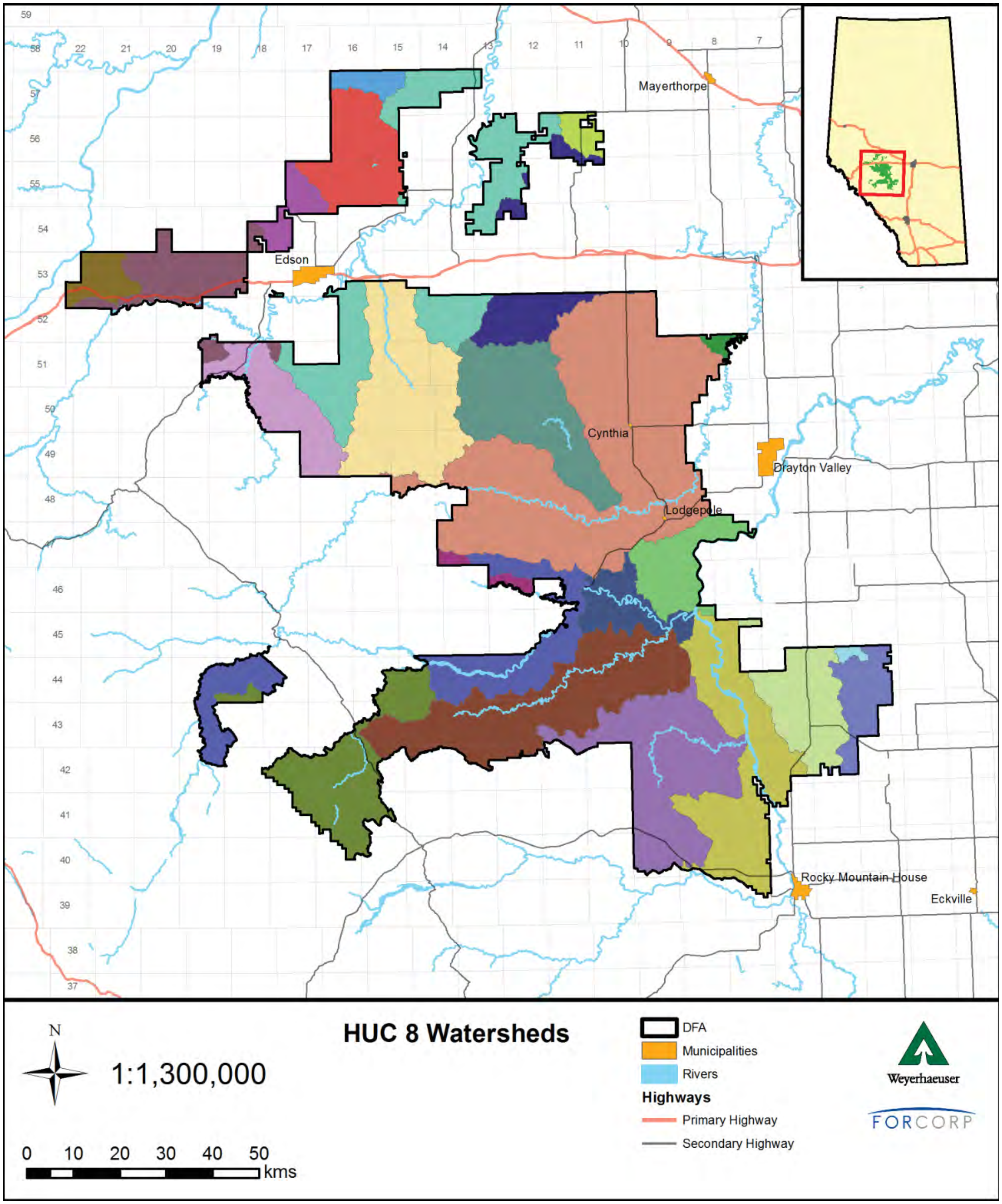

Figure 2.15. Hydrologic Unit Code 8 watersheds within the DFA.

2.3.16 Watersheds

Item	Description
Source	GOA – Agriculture and Forestry
Source Filename	**Weyer_PMB_Watersheds.shp** (Delivered on 2015/01/13)
Description of Source File	Watersheds within the Weyerhaeuser Pembina DFA
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*Watersheds*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **ForestryWatersheds_Projected.shp** 3. Clip layer to the R15 Boundary 4. Save result as **ForestryWatersheds_Clip.shp** 5. Create field titled WatShdCode and number each watershed. 6. Create singlepart shapefile 7. Save result as **ForestryWatersheds_Singlepart.shp** 8. Clean the topology to remove overlaps and isolated slivers 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Export as **ForestryWatersheds.shp**
Assumptions/ Processing Issues	All watersheds are to remain as distinct units regardless of size. However, watersheds smaller than 500 ha will not have an assessment completed on them because the entire watershed is not being assessed. No watershed amalgamation will occur.
Programs	ESRI ArcGIS
Output Filename	**Watersheds.shp**
Output Description	Single part shapefile showing the watersheds found within the Weyerhaeuser Pembina DFA.
Output Attributes	*Watersheds, WatShdCode*
Polygon Area/Line Length	Total number of watersheds – 167 Number of watersheds smaller than 500 ha – 24 Mean watershed area (ha) within the DFA – 118 ha Number of watersheds greater than 500 ha – 143 Mean watershed area (ha) within the DFA – 7,445 ha
Delivered Theme Name	**Watersheds**

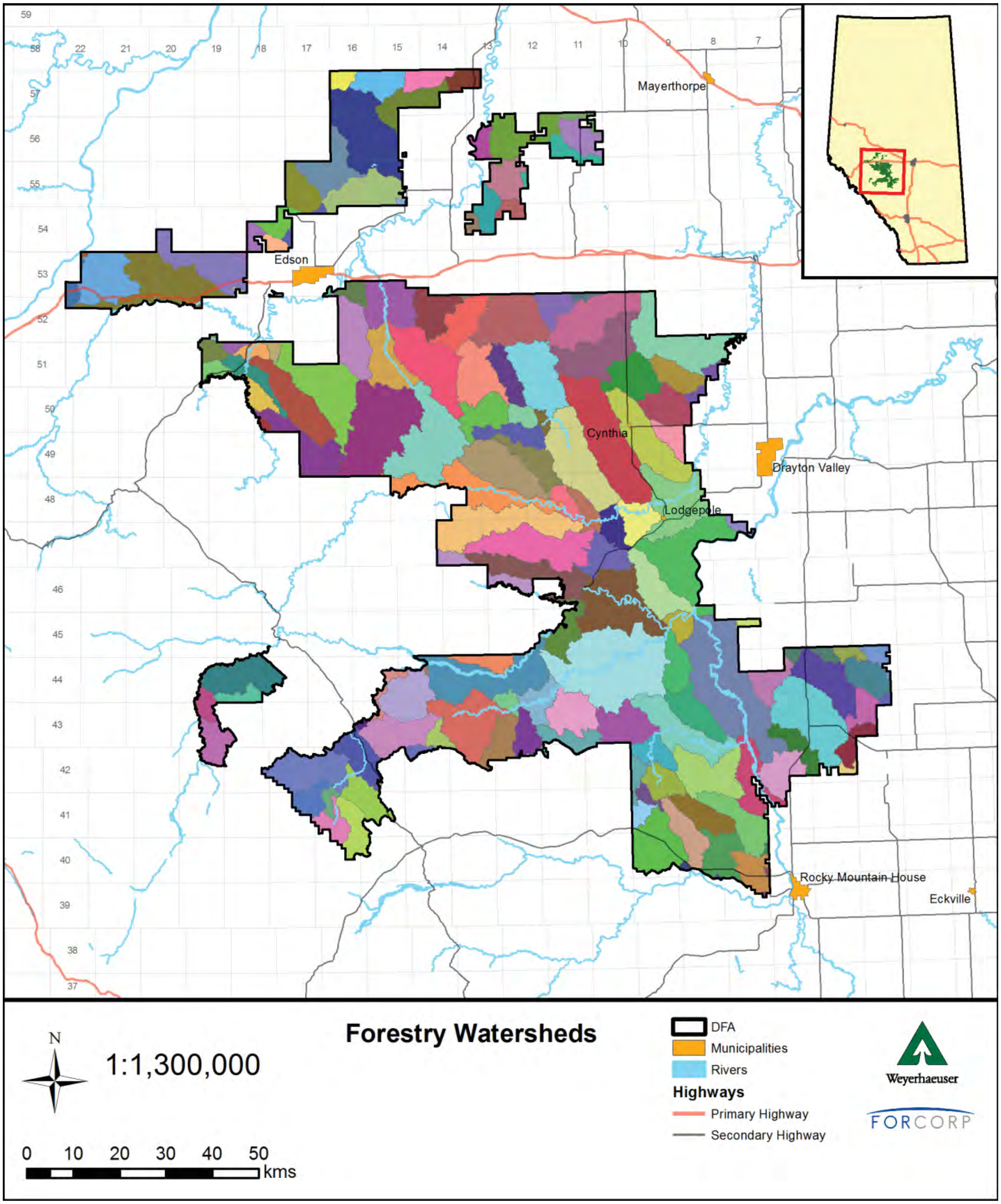

Figure 2.16. Forestry watersheds within the DFA.

2.3.17 Fish Management Zones

Item	Description
Source	AltaLIS
Source Filename	**BF_FISH_MGMT_ZONE_POLYGON.shp** (Calendar Date 2008/05/01)
Description of Source File	Provincial Fish Management Zones
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FISHMGMT_N, FISHMGMT_C*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FishMgmtZones_Projected.shp** 3. Select all polygons that intersect the the R15 Boundary 4. Save result as **FishMgmtZones_Select.shp** 5. Create singlepart shapefile. 6. Save result as **FishMgmtZones_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **Fish_Management_Zones.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Fish_Management_Zones.shp**
Output Description	Single part shapefile showing the watersheds found within the Weyerhaeuser Pembina DFA.
Output Attributes	*FISHMGMT_C, FISHMGMT_N*
Polygon Area/Line Length	Total Area – 60,867,132 ha Eastern Slopes Zone – 12,271,620 ha Northern Boreal Zone – 33,014,617 ha Parkland-Prairie Zone – 15,580,895 ha
Delivered Theme Name	**Fisheries**

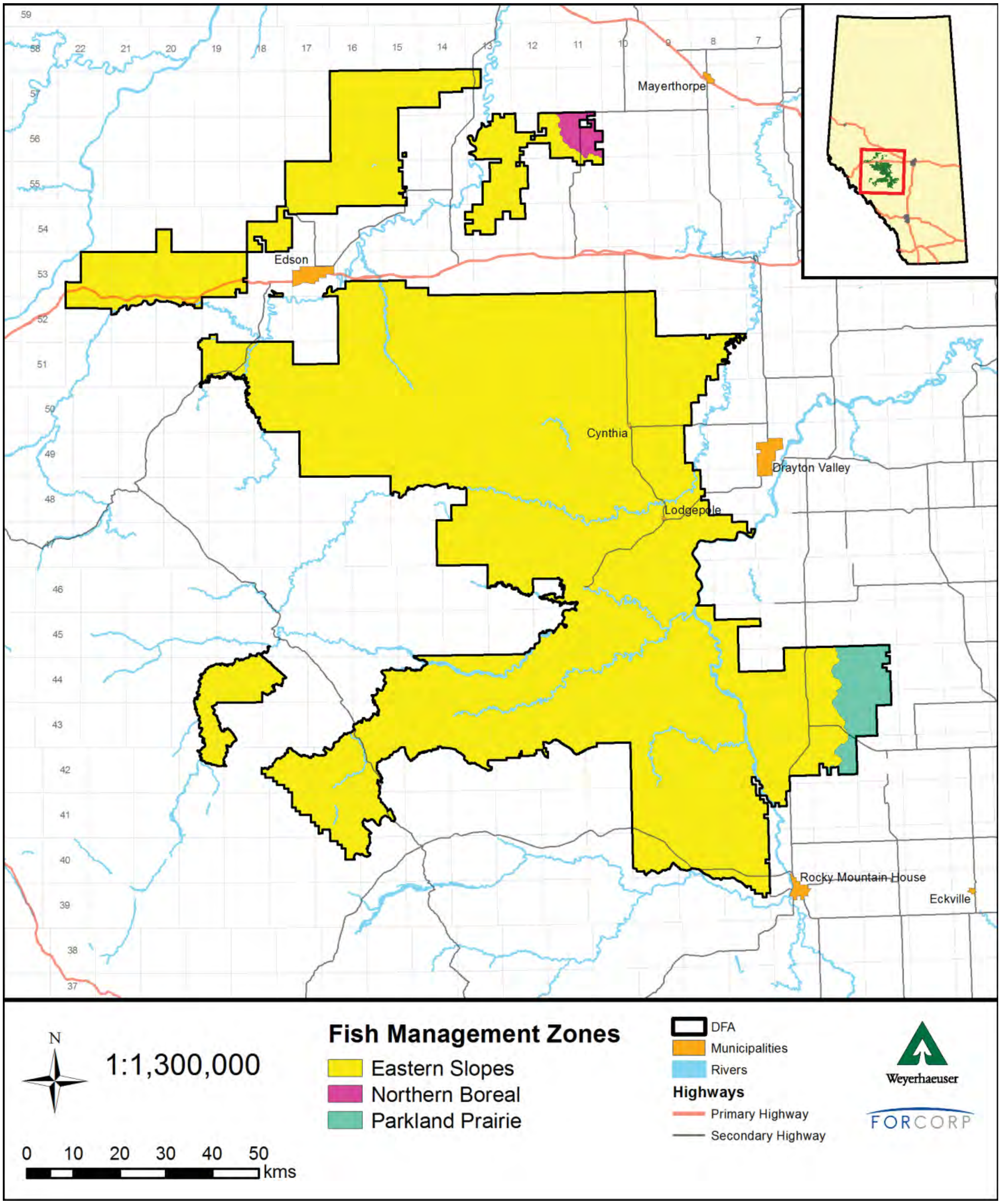

Figure 2.17. Fish Management Zones within the DFA.

2.3.18 Rainbow Trout Streams

Item	Description
Source	GOA – Environment and Parks
Source Filename	**All_ARTR_Range_RNTR_Occupied_water.shp** (Delivered on 2015/08/11)
Description of Source File	Rainbow Trout Occupied Streams within Alberta
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*SpeciesPre*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **RainbowTroutStreams_Projected.shp** 3. Clip layer to the R15 Boundary 4. Save result as **RainbowTroutStreams _Clip.shp** 5. Create singlepart shapefile. 6. Save result as **RainbowTroutStreams _Singlepart.shp** 7. Calculate geometry within attributes table to determine the length (km) of the streams within R15. 8. Create new attribute "TroutMgmt" 9. Assign all line features within layer as "Trout" streams in the new attribute. 10. Save result as **RainbowTroutStreams.shp**
Assumptions/ Processing Issues	This layer is to be combined with the Hydrology Buffers layer to identify rainbow trout bearing streams.
Programs	ESRI ArcGIS
Output Filename	**RainbowTroutStreams.shp**
Output Description	Single part shapefile showing the rainbow trout occupied streams within the DFA.
Output Attributes	*TROUTMGMT*
Polygon Area/Line Length	Length of Streams within the DFA – 684 km
Delivered Theme Name	**Hydrology**

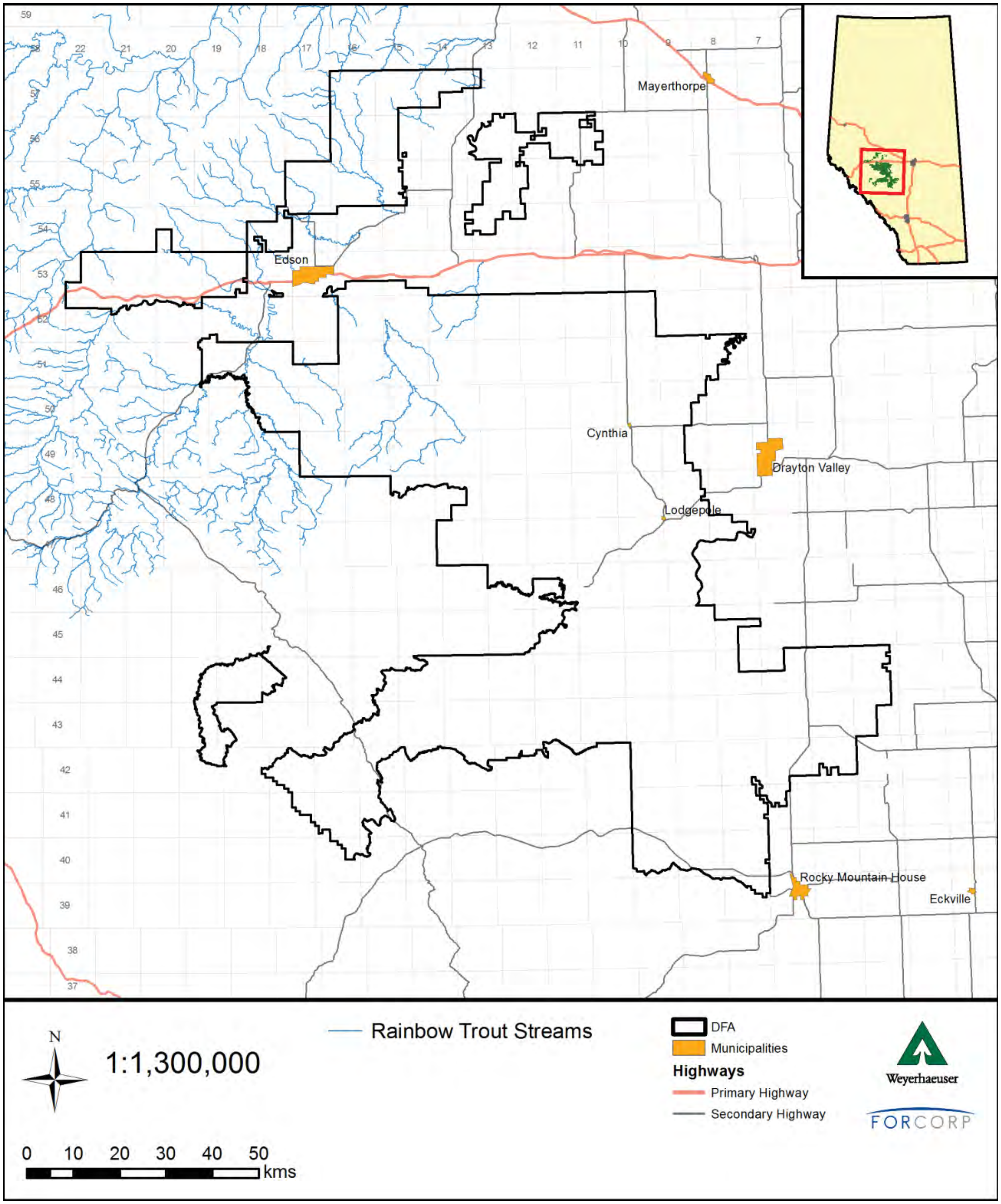

Figure 2.18. Rainbow trout occupied streams within and near the DFA.

2.3.19 Hydrology Features

Item	Description
Sources	AltaLIS for hydrology polygons GOA – Environment and Parks for Trumpeter Swan lake classifications Weyerhaeuser for the AVI layer
Source Filenames	**BF_HYDRO_POLYGON.shp** (last modified: 2004/10/25) **TrumpeterSwamWaterbodies_Watercourse.shp** (publication date: 2013/03) **AVI**
Description of Sources Files	Hydrology layers
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FEATURE_TY*
Required Processing	1. Project each hydrology source layer into UTM, NAD 1983, UTM Zone 11N 2. Save results as: **HydroPolygons_Project.shp** **SwanPolygons_Project.shp.** 3. Clip each hydrology layer to the DFA boundary 4. Save results as: **HydroPolygons_Clip.shp** **SwanPolygons_Clip.shp.** 5. Select all hydrology features (NWL, and NWR) from the AVI layer 6. Save results as **AVIHydro_Clip.shp** 7. Merge the three Clip layers into a single hydrology layer 8. Save result as **HydroFeatures_Merge.shp** 9. Dissolve the layers to remove internal boundaries. 10. Save result as **HydroFeatures_Dissolve.shp** 11. Create singlepart shapefile 12. Save result as **HydroFeatures_singlepart.shp** 13. Calculate geometry within attributes table to determine the area (ha) of each polygon. 14. Save result as **HydroFeatures.shp**
Assumptions/ Processing Issues	The use of the three source layers in the creation of the hydrology layer ensures that all recent interpretations of these features are accounted for. Hydrology features that are buffered in Section 2.3.20 will not correspond directly to these features as smaller streams that require buffers were buffered from polyline layers and do not have polygon interpretations.
Programs	ESRI ArcGIS
Output Filename	**HydroFeatures.shp**
Output Description	Single part shapefile showing the large hydrology features within the DFA.
Output Attributes	*HYDRO*
Polygon Area/Line Length	Total Area –20,888 ha
Delivered Theme Name	**Hydrology**

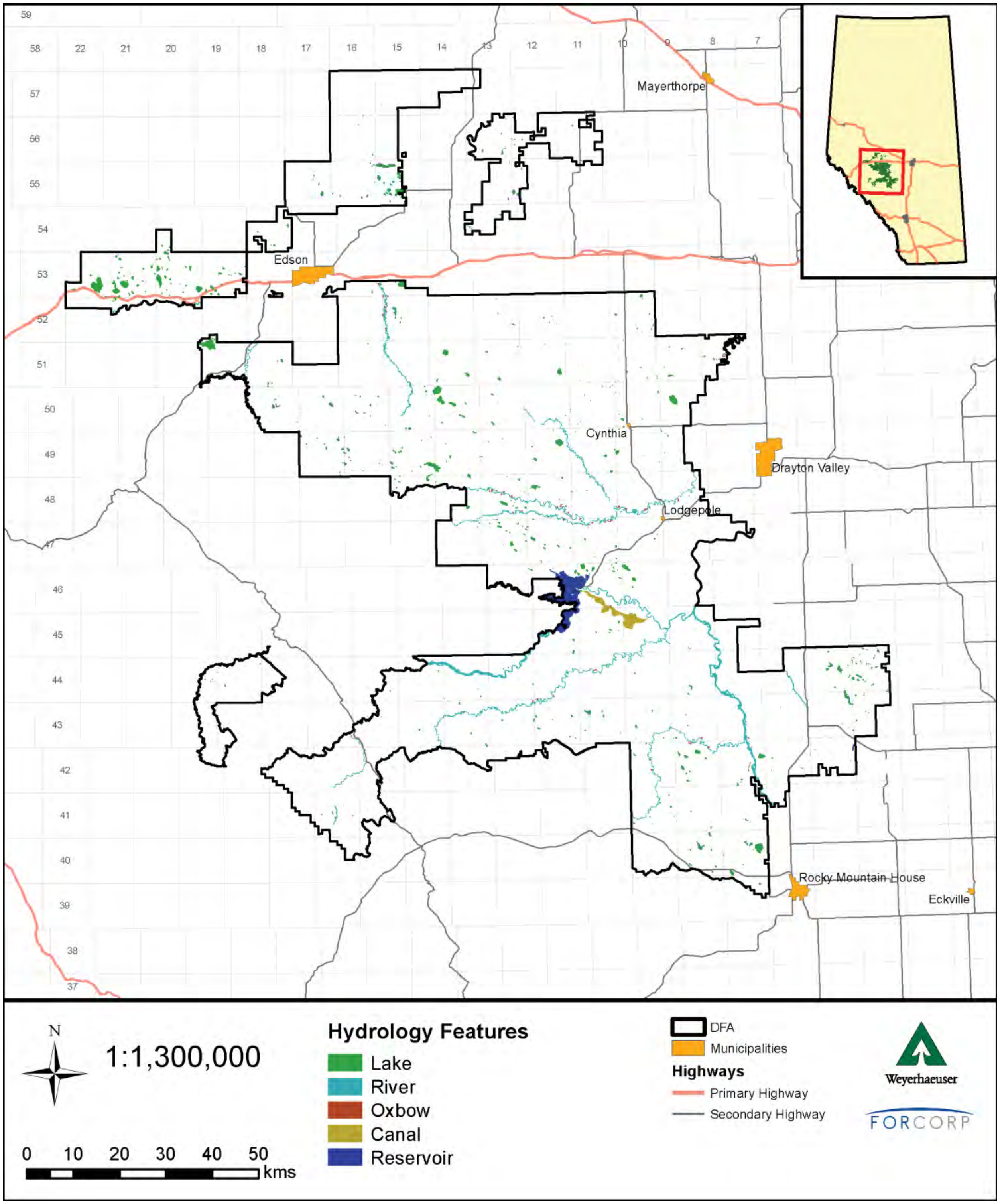

Figure 2.19. Hydrology features within the DFA.

2.3.20 Hydrology Buffers

Item	Description
Sources	AltaLIS for hydrology polygons and single line network; GOA – Environment and Parks for Trumpeter Swan lake classifications Weyerhaeuser for AVI
Source Filenames	**BF_HYDRO_POLYGON.shp** (last modified: 2004/10/25) **BF_SLNET_ARC.shp** (creation date: 2000/09/05) **TrumpeterSwamWaterbodies_Watercourse.shp** (publication date: 2013/03) **AVI**
Description of Sources Files	Hydrology layers
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*FEATURE_TY*
Required Processing	1. Project each hydrology source layer into UTM, NAD 1983, UTM Zone 11N 2. Save results as: **HydroPolygons_Project.shp** **HydroArcs_Project.shp** **SwanPolygons_Project.shp**. 3. Buffer the R15 boundary by 200 meters 4. Clip each hydrology layer to the buffered Weyerhaeuser Pembina DFA boundary 5. Save results as: **HydroPolygons_Clip.shp** **HydroArcs_Clip.shp** **SwanPolygons_Clip.shp**. 6. Select all hydrology features (NWL, and NWR) from the AVI layer 7. Save results as **AVIHydro_Clip.shp** 8. Select all hydrology polygons from HydroPolygons_Clip.shp and AVIHydro_Polygons that correspond to the Swan Lakes in SwanPolygons_Clip.shp 9. Save results as **AVIHydro_SwanSelect.shp** **HydroPolygons_SwanSelect.shp** 10. Merge the layers created in step 9 with the SwanPolygons_Clip.shp 11. Save result as **SwanPolygons_Merge.shp** 12. Dissolve merged swan polygons to remove internal line boundaries. 13. Save result as **SwanPolygons_Dissolve.shp** 14. Buffer the dissolved swan lakes layer by 200 meters with full sides 15. Save the result as **SwanPolygons_Buffer.shp**. 16. Dissolve the swan buffers to remove internal line boundaries. Save result as **SwanPolygons_Dissolve2.shp**

Item	Description
	17. Select the permanent lakes and major rivers from **HydroPolygons_Clip.shp** LAKE-PER OXBOW-PER RIV-MAJ CANAL-MAJ (Brazeau Canal) RESERVOIR (Brazeau Reservoir) 18. Save result as **Lake_Select.shp** 19. Merge Lake_Select.shp with AVI_HydroSelect.shp and SwanPolygons_Clip.shp 20. Save results as **Lake_Merge.shp** 21. Dissolve features to remove internal linework 22. Save results as **Lake_Dissolve.shp** 23. Buffer the HydroPolygons_Select.shp by 100 meters 24. Save result as **HydroPolygons_Buffer.shp** 25. Erase the Buffered Hydro polygons from the Swan buffers 26. Save result as **SwanPolygons_Erase.shp** 27. Create buffer zones within the HydroArcs_Clip.shp file around line features based on the following criteria: 28. Add field to the attributes tables with the following values 60 meters for large creeks (str-per) 30 meters for small streams (str-indef) 29. Buffer the layer based on these values 30. Save results as **HydroArcs_Buffer.shp** 31. Union all buffers into a single layer, do not allow gaps within product layer 32. Save result as **HydroBuffers_Union.shp** 33. Create an attribute titled “Buffer” in the attributes table 34. Assign polygons to one of six categories to simplify the landbase: Swan, Lake, Creek, Stream, Island 35. Edit the layer to delete all isolated polygons larger than 10 ha 36. Clip the layer to the R15 FMU Boundary 37. Save the layer as **HydroBuffers_Clip.shp** 38. Erase the hydrology polygons created in Section 2.3.17 from the layer 39. Save result as **HydroBuffers_Erase.shp** 40. Dissolve the layer by the “Buffer” attribute 41. Save result as **HydroBuffers_Dissolve.shp** 42. Correct topology as necessary, merging polygons with smaller buffer widths into polygons with larger buffer widths. 43. Create singlepart shapefile 44. Save result as **HydroBuffers _Singlepart.shp** 45. Create a new field titled “TroutMgmt” 46. Overlay the Trout stream layer created in Section 2.3.18 and identify each trout bearing stream using “Trout” in the newly created field. 47. Calculate the geometry within attributes table to determine the area (ha) of each polygon. 48. Save result as **HydroBuffers.shp**

Item	Description
Assumptions/ Processing Issues	In Step 26, erasing the buffered hydro polygons from the swan buffers allows for the swan buffers only to consist of the second 200 meters of the buffer (100 through 200) and not the entire lake. In Step 32, not allowing gaps within the product will identify all islands of land isolated by hydrology buffers created by the buffer union. Islands larger than 10 ha can then be identified and removed from the layer.
Programs	ESRI ArcGIS
Output Filename	**HydroBuffers.shp**
Output Description	Single part shapefile showing hydrology buffers within the Weyerhaeuser Pembina DFA.
Output Attributes	*BUFFER, TROUTMGMT*
Polygon Area/Line Length	Total Area – 58,061 ha Trumpeter Swan Lakes – 1,116 ha Lakes and Rivers – 27,931 ha Large Creeks – 15,814 ha Small Streams – 12,953 ha Isolated Islands – 248 ha
Delivered Theme Name	**Hydrology**

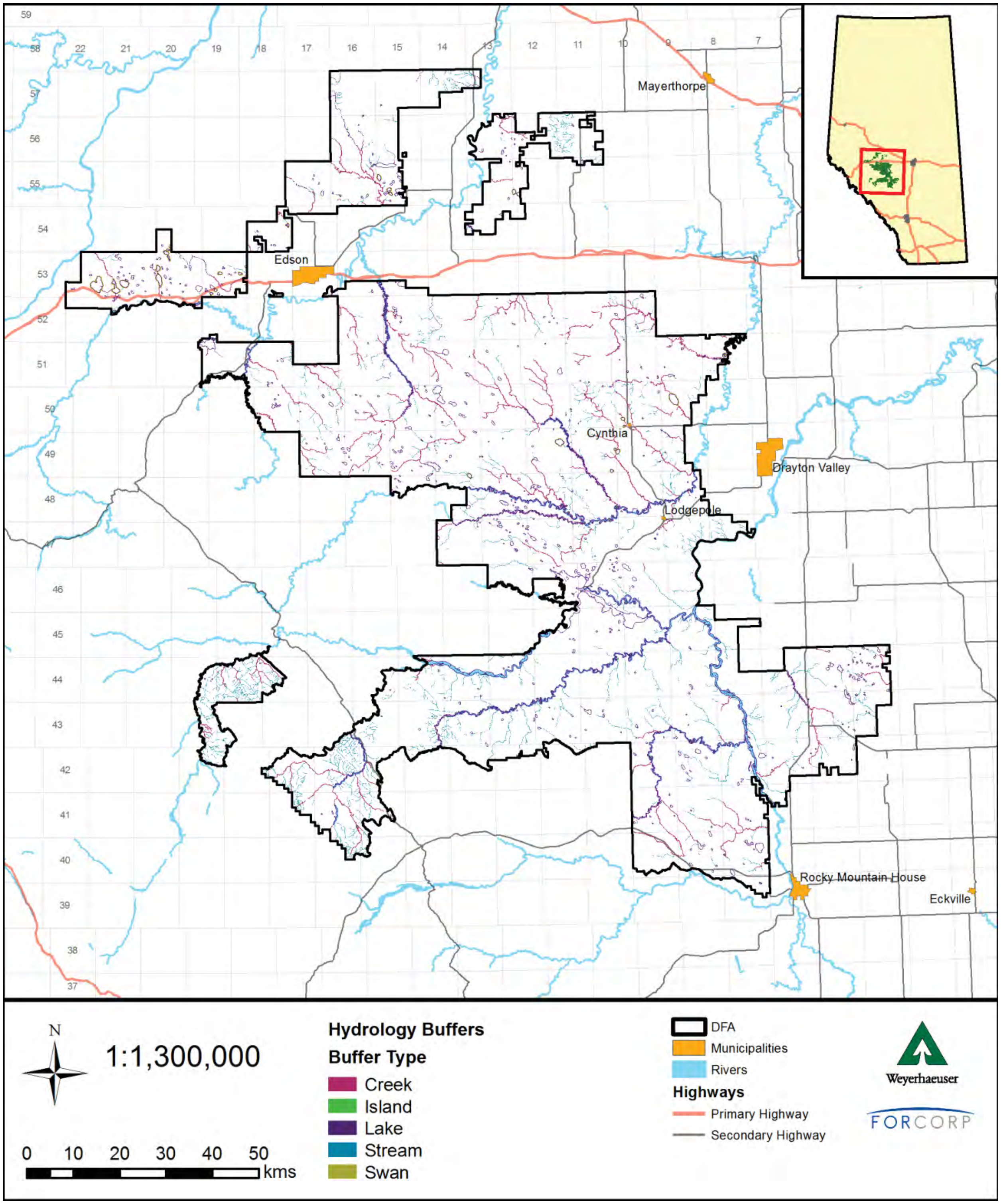

Figure 2.20. Hydrology buffers within the DFA.

2.3.21 Wildlife Management Units

Item	Description
Source	AltaLIS
Source Filename	**BF_WMU_POLYGON.shp** (Calendar Date: 2015/01/13)
Description of Source File	Provincial Wildlife Management Units (WMU)
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	WMUNIT_NAM, WMUNIT_COD
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **WMUs_Projected.shp** 3. Select polygons that intersect the R15 Boundary 4. Save result as **WMUs_Select.shp** 5. Create singlepart shapefile. 6. Save result as **WMUs_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **WildlifeMgmtUnits.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Wildlife_Mgmt_Units.shp**
Output Description	Single part shapefile showing the wildlife management units found within the Weyerhaeuser Pembina DFA.
Output Attributes	*WILDLIFE*
Polygon Area/Line Length	Total Area – 3,086,941 ha Alder Flats – 287,423 ha Bighorn – 81,429 ha Bigoray – 202,841 ha Blackstone – 145,849 ha Cardinal – 61,051 ha Carrot Creek – 254,646 ha Chip Lake – 299,010 ha Elk River – 210,882 ha McLeod River – 150,314 ha O'Chiese – 217,098 ha Red Cap – 109,335 ha Schunda – 287,059 ha Shiningbank – 521,629 ha Wolf River – 258,376 ha
Delivered Theme Name	**Wildlife**

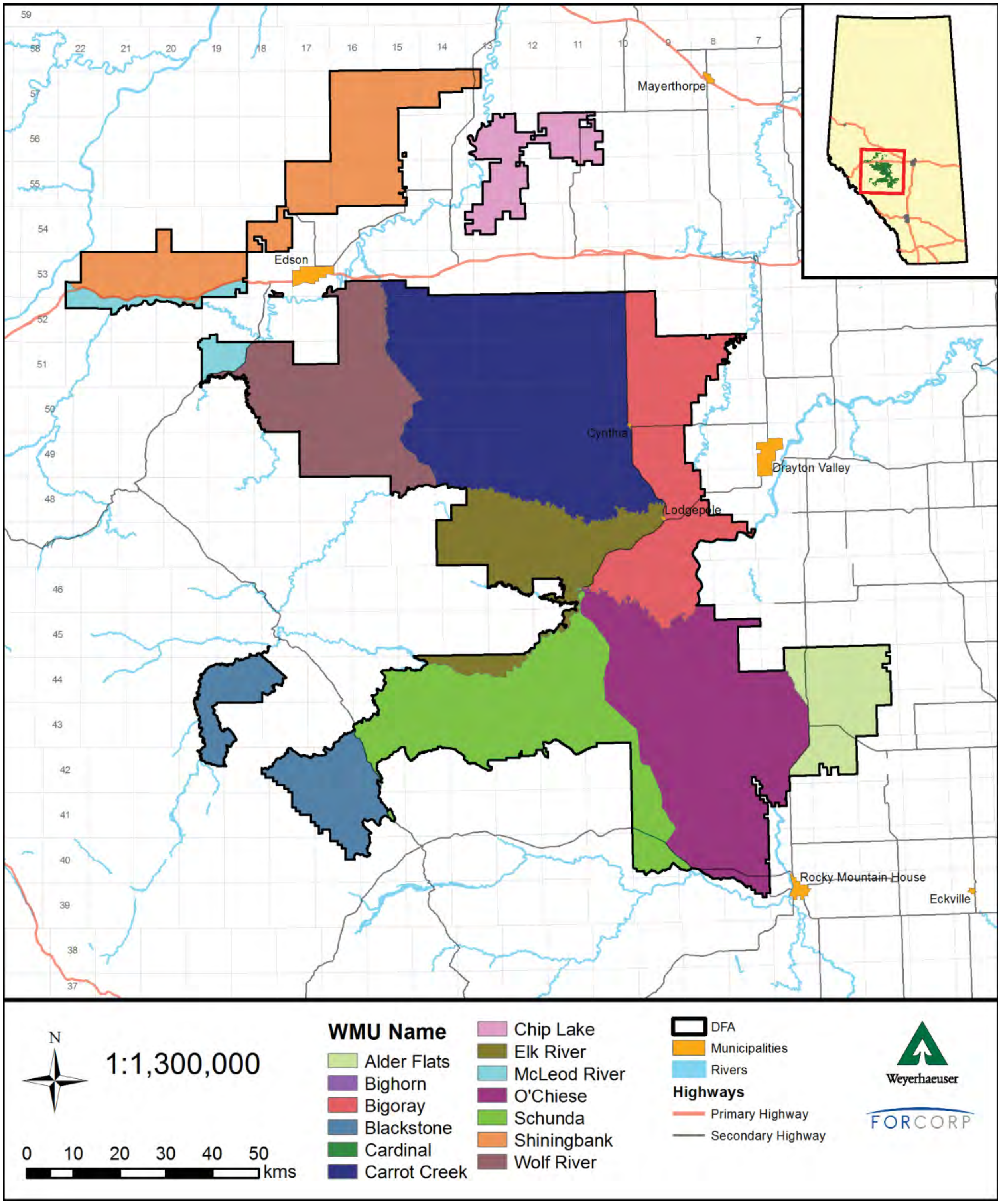

Figure 2.21. Wildlife Management Units within the DFA.

2.3.22 Grizzly Bear Habitat Zones

Item	Description
Source	GOA –Environment and Parks
Source Filename	**Grizzly_Bear_Zone.shp** (Publication Date 2008/09/24)
Description of Source File	Provincial grizzly bear zones
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	GB_POPUNIT, GB_POPTYPE
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **GrizzlyBearZones_Project.shp** 3. Clip the boundary to the R15 boundary 4. Save result as **GrizzlyBearZones _Clip.shp** 5. Create singlepart shapefile 6. Save result as **GrizzlyBearZones _Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **GrizzlyBearZones.shp**
Assumptions/ Processing Issues	None
Programs	ESRI ArcGIS
Output Filename	**Grizzly_Bear_Zones.shp**
Output Description	Single part shapefile showing the grizzly bear zones that intersect the Weyerhaeuser Pembina DFA.
Output Attributes	*GB_POPUNIT, GB_POPTYPE*
Polygon Area/Line Length	Total Area – 183,041 ha Core – 112,227 ha Secondary – 70,814 ha
Delivered Theme Name	**Wildlife**

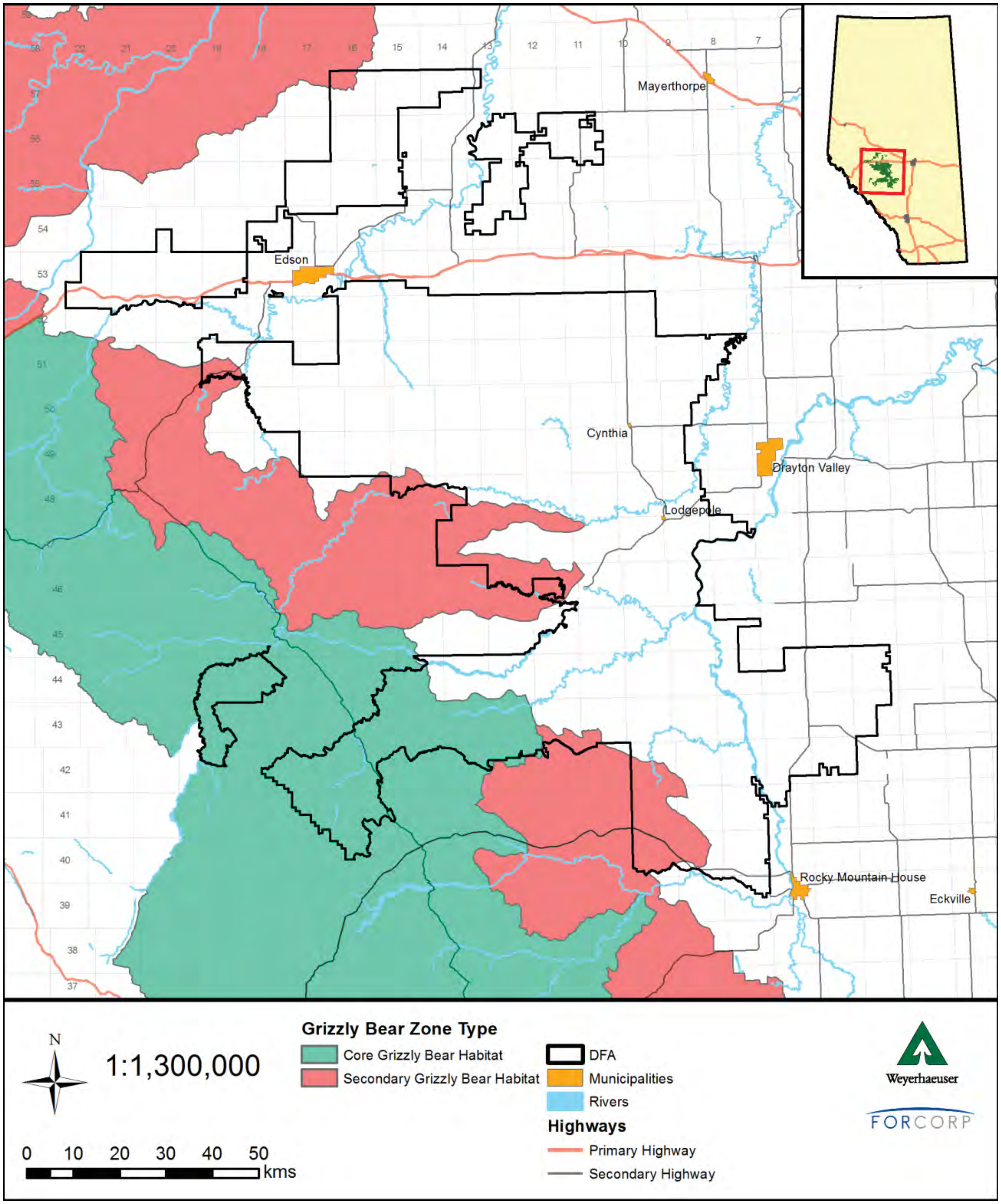

Figure 2.22. Grizzly Bear Zones found within and around the DFA.

2.3.23 Grizzly Bear Watersheds

Item	Description
Source	GOA –Environment and Parks
Source Filename	**P6wsheds.shp** (Publication Date 2008/09/24)
Description of Source File	Grizzly Bear watersheds
Projection/Datum	Projected, UTM, NAD 1983 UTM Zone 11N
Important Attributes	zoneid
Required Processing	1. Select all polygons that intersect the R15 boundary 2. Save result as **GrizzlyBearWatersheds _Select.shp** 3. Create singlepart shapefile 4. Save result as **GrizzlyBearWatersheds _Singlepart.shp** 5. Calculate geometry within attributes table to determine the area (ha) of each polygon. 6. Save result as **GrizzlyBearWatersheds.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**Grizzly_Bear_Watersheds.shp**
Output Description	Single part shapefile showing the grizzly bear zones that intersect the Weyerhaeuser Pembina DFA.
Output Attributes	*BEARSHED*
Polygon Area/Line Length	Total Area – 2,625,902 ha Number of Grizzly Bear Watersheds – 40 Mean watershed area (ha) – 65,647 ha
Delivered Theme Name	**Wildlife**

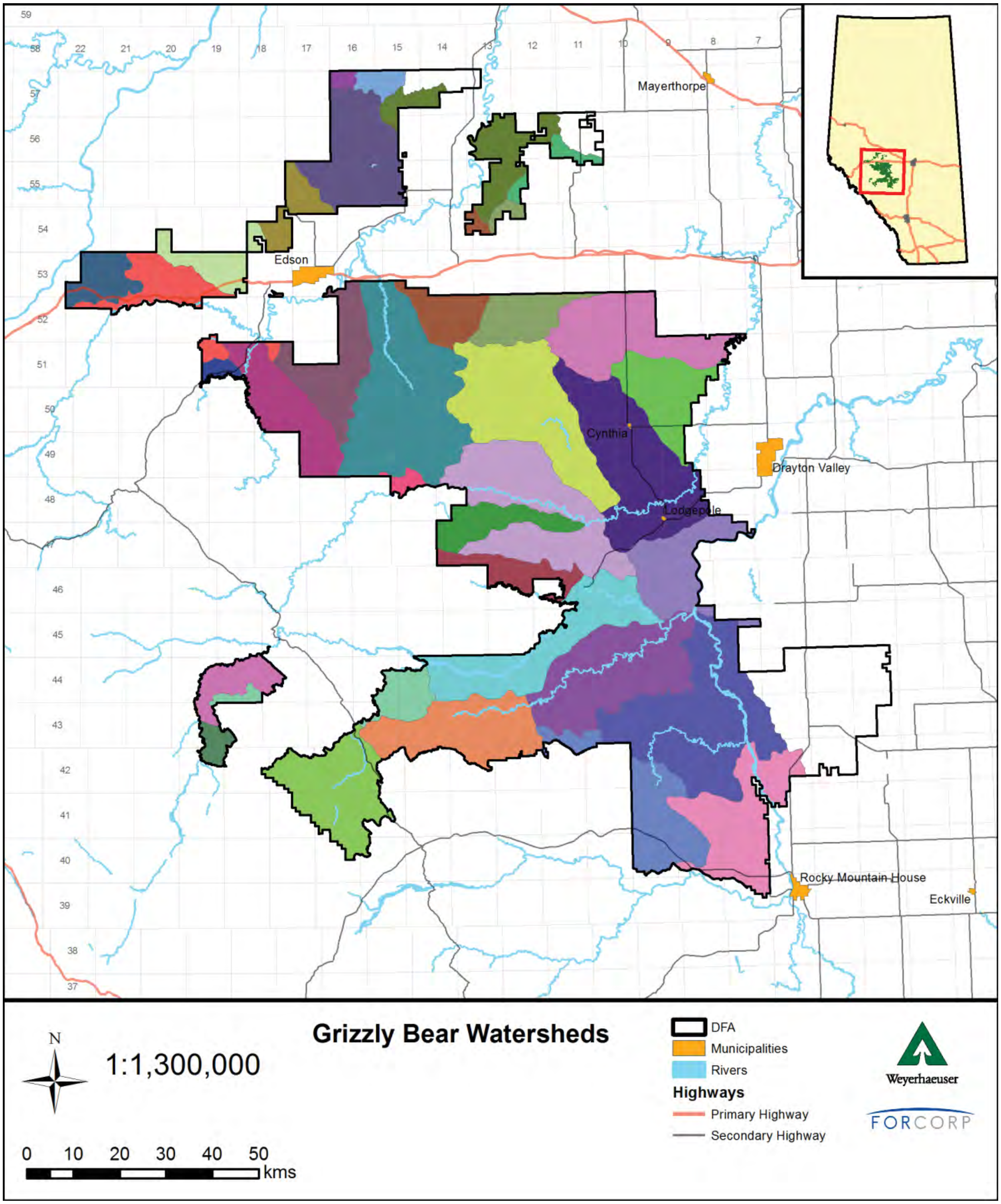

Figure 2.23. Grizzly Bear Watersheds within the DFA.

2.3.24 Colonial Nesting Bird Buffers

Item	Description
Source	GOA –Environment and Parks
Source Filename	**ColonialNestingBirds.shp**
Description of Source File	Locations of colonial nesting bird sites located in Alberta
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*SPECIES, BUFF_DIST*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **ColonialNestingBirds_Project.shp** 3. Clip the boundary to the R15 boundary 4. Save result as **ColonialNestingBirds_Clip.shp** 5. Create singlepart shapefile 6. Save result as **ColonialNestingBirds_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **ColonialNestingBirds.shp**
Assumptions/ Processing Issues	Locations in the source file are buffered points; no buffering of these polygons is required.
Programs	ESRI ArcGIS
Output Filename	**Colonial_Nesting_Birds.shp**
Output Description	Colonial nesting bird sites located within the Weyerhaeuser DFA
Output Attributes	*COLONIAL*
Polygon Area/Line Length	Total Area – 6 ha
Delivered Theme Name	**Wildlife**

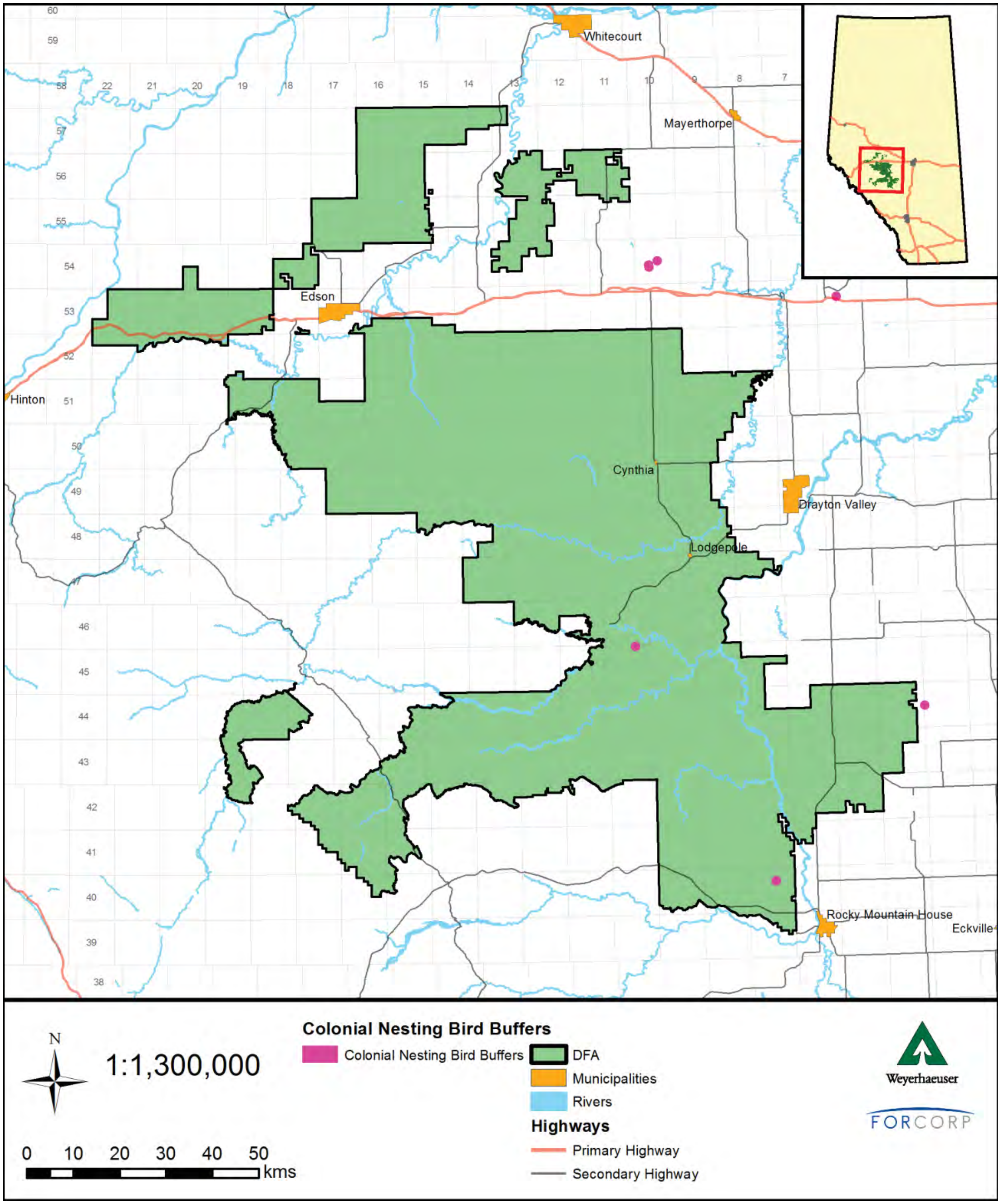

Figure 2.24. Colonial nesting bird site buffers within and near the DFA.

2.3.25 Registered Fur Management Areas

Item	Description
Source	AltaLIS
Source Filename	**BF_REG_FUR_MGMT_POLYGON.shp**
Description of Source File	Registered Fur Management Areas (RFMA) of Alberta
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	RFMA_NAME, RFMA_CODE
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **RFMA_Project.shp** 3. Select all polygons that intersect the R15 boundary 4. Save result as **RFMA_Select.shp** 5. Create singlepart shapefile 6. Save result as **RFMA_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **RFMA.shp**
Assumptions/ Processing Issues	Used as a proxy layer in the landbase process. The total layer area is larger than the DFA area to ensure all polygons are assigned a value through the proxy process.
Programs	ESRI ArcGIS
Output Filename	**RFMA.shp**
Output Description	Single part shapefile showing the Registered Fur Management Zones that intersect the Weyerhaeuser DFA.
Output Attributes	*RFMA*
Polygon Area/Line Length	Total Area – 2,055,624 ha Number of RFMAs – 124 Mean RFMA area (ha) – 16,578 ha
Delivered Theme Name	**Wildlife**

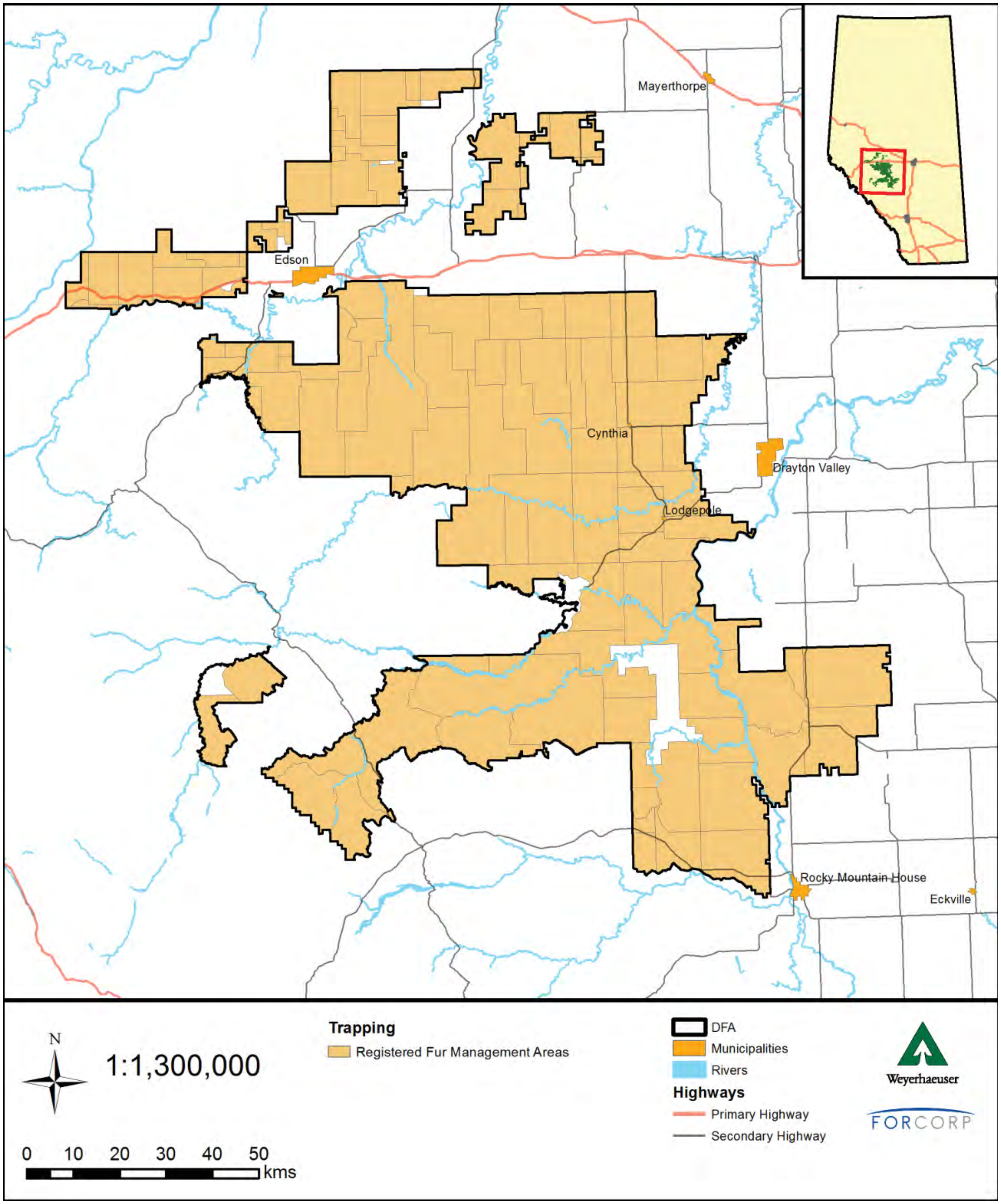

Figure 2.25. Registered Fur Management Areas within the DFA.

2.3.26 Mountain Pine Beetle R Value

Item	Description
Source	GOA – Agriculture and Forestry
Source Filename	Stand_Level_Predicted_RValue
Description of Source File	Raster showing the predicted MPB R values across the province.
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*Value*
Required Processing	1. Project Raster to UTM, NAD 1983 UTM Zone 11N 2. Save result as **RVal_Project** 3. Buffer the R15 boundary (Section 2.3.2) by 1000 meters 4. Save result as **R15_Buffer1000.shp** 5. Clip RVal_Project to the buffered R15 Boundary, using the input features for clipping geometry 6. Save the result **RValue_Clip** 7. Using the raster calculator, multiply the raster pixel value by 10,000 8. Save result as **Times1000** 9. Using the raster calculator convert the value from a floating point value to an integer 10. Save result as **Integer** 11. Build attributes table for raster 12. Covert the raster to a vector file. 13. Save result as **MPBRValue_RasterToPolygon.shp** 14. Add double field to attributes table titled Value2 15. Calculate value of Value2 field by dividing GRIDCODE field (Value field from Integer raster) carried forward from original raster by 10,000 16. Round value of field down to two significant digits 17. Add text field to attributes table titled RValue 18. Based on values of Value2 field assign the following values to RValue field 18.1. Low (0 – 2) 18.2. Moderate (2.1 – 4.5) 18.3. High (4.6 – 5.8) 18.4. Very High (5.9 – 9.2) 19. Dissolve layer by RValue field, ensuring that multipart polygons are not created. 20. Save result as **MPBRvalue_Dissolve.shp.** 21. Calculate geometry within attributes table to determine the area (ha) of each polygon. 22. Save result as **MPBRvalue.shp**
Assumptions/ Processing Issues	The 1,000 meter buffer is required to ensure that all polygons will be assigned an R value through the proxy process. Values in original raster are multiplied by 10,000 to ensure no data is lost when values are converted to integers. Conversion to an integer is required so that raster can be converted to vector file. Stand level assignment values shown in Step 18 were specified by GOA

Item	Description
Programs	**ESRI ArcGIS**
Output Filenames	**MPB_Rvalue.shp**
Output Description	MPB Stand risk based on RValue calculations.
Output Attributes	*RValue*
Polygon Area/Line Length	Total Area - 1,219,175 ha Low -24,534 ha High – 422,988 ha Moderate - 72,883 ha Very High – 698,771 ha
Delivered Theme Name	**Wildlife**

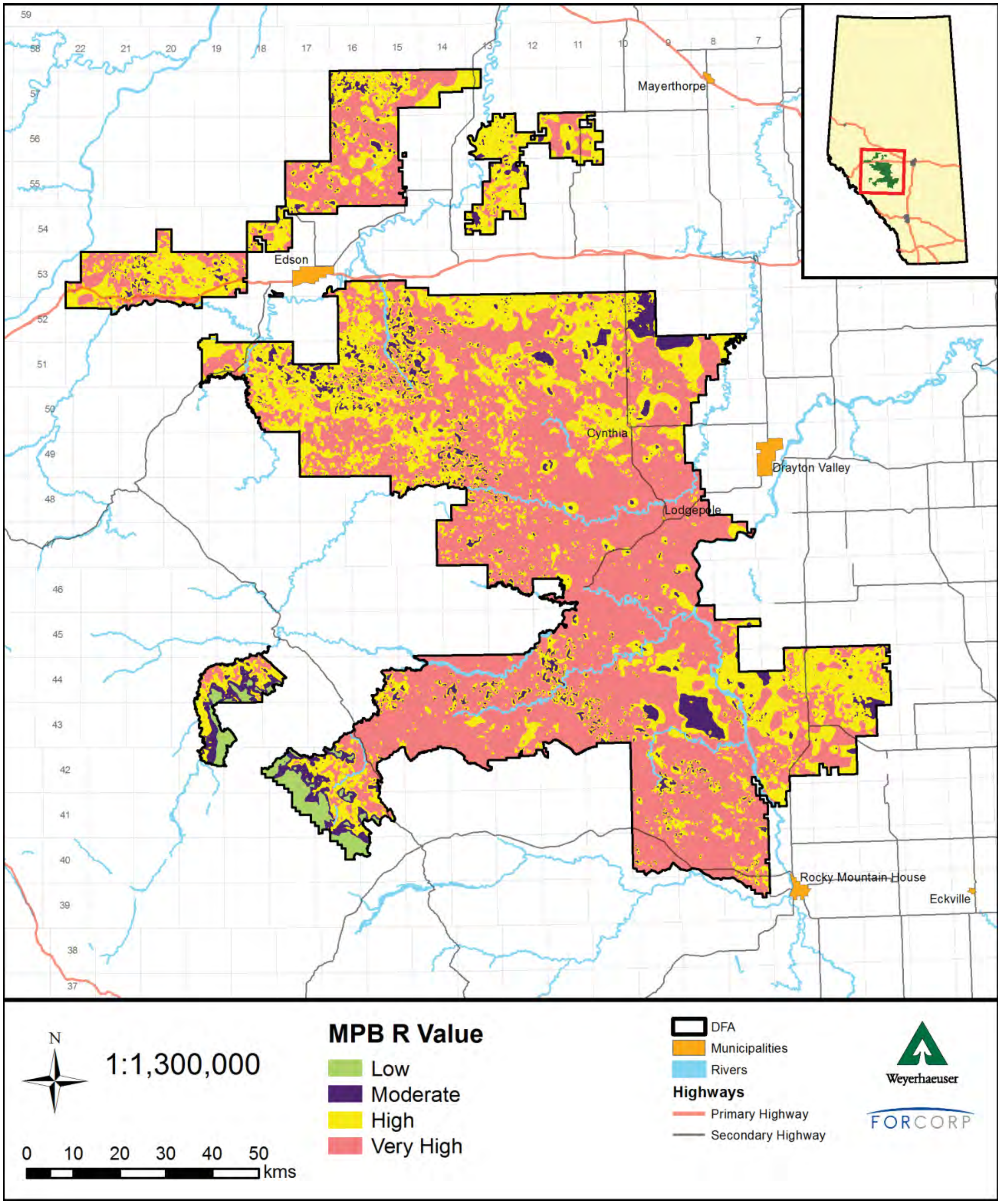

Figure 2.26: MPB R value within the DFA

2.3.27 Mountain Pine Beetle Stand Susceptibility Index

Item	Description
Source	GOA – Agriculture and Forestry
Source Filename	STAND_SUSC_INDEX_MPB
Description of Source File	Province wide polygon layer with MPB stand susceptibility index calculated for applicable polygons.
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	*SSI*
Required Processing	1. Project Raster to UTM, NAD 1983 UTM Zone 11N 2. Save result as **MpbSSI_Project.shp** 3. Select all polygons that intersect the Weyerhaeuser Pembina DFA 4. Save result as **MpbSSI_Select.shp** 5. Dissolve layer by SSI field, ensuring that multipart polygons are not created. 6. Save result as **MpbSSI_Dissolve.shp.** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **MPBSSI.shp**
Assumptions/ Processing Issues	
Programs	**ESRI ArcGIS**
Output Filenames	**MpbSSI.shp**
Output Description	MPB Stand Susceptibility Index
Output Attributes	*MPB_SSI*
Polygon Area/Line Length	Total Area - 389,191 ha SSI 1 to 22 – 112,299 ha SSI 23 to 63 – 263,431 ha SSI 64 to 100 – 13,461 ha
Delivered Theme Name	**Wildlife**

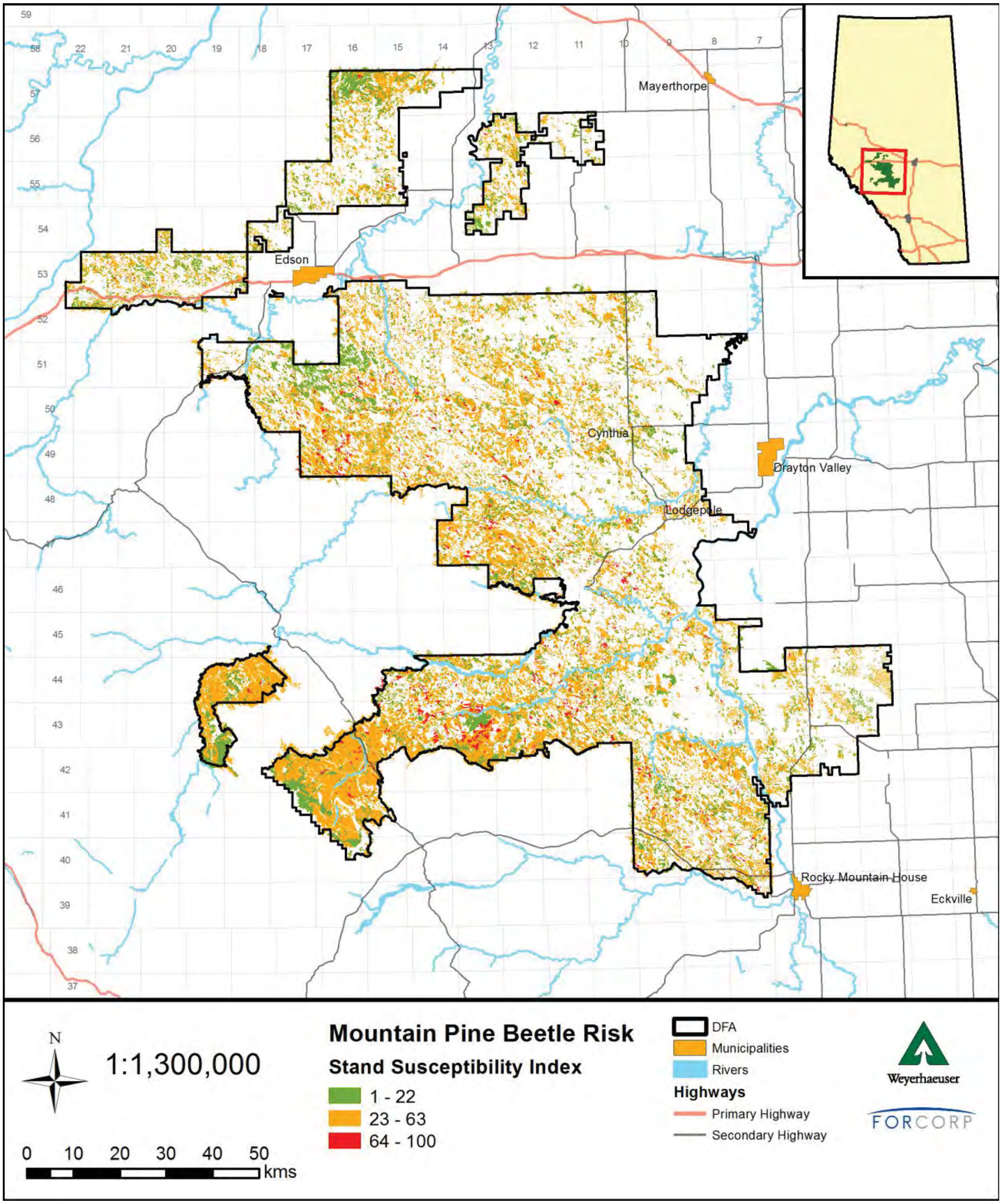

Figure 2.27: MPB SSI category within the DFA

2.3.28 Wildfire Management Zones

Item	Description
Source	AltaLIS
Source Filename	**BF_WILDFIRE_MGMT_POLYGON.shp** (Calendar Date 2008/05/01)
Description of Source File	Provincial Wildfire Management Zones
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	WMA_NAME
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **WildfireMgmtZones_Projected.shp** 3. Clip layer to the R15 Boundary 4. Save result as **WildfireMgmtZones_Clip.shp** 5. Create singlepart shapefile. 6. Save result as **WildfireMgmtZones_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **WildfireMgmtZones.shp**
Assumptions/ Processing Issues	None
Programs	ESRI ArcGIS
Output Filename	**Wildfire_Mgmt_Zones.shp**
Output Description	Single part shapefile showing the wildfire management zones found in Forest Management Unit R15.
Output Attributes	*WILDFIRE*
Polygon Area/Line Length	Total Area – 6,710,557 ha Edson – 2,949,973 ha Rocky Mountain House – 2,104,814 ha Whitecourt – 1,655,770 ha
Delivered Theme Name	**Fire**

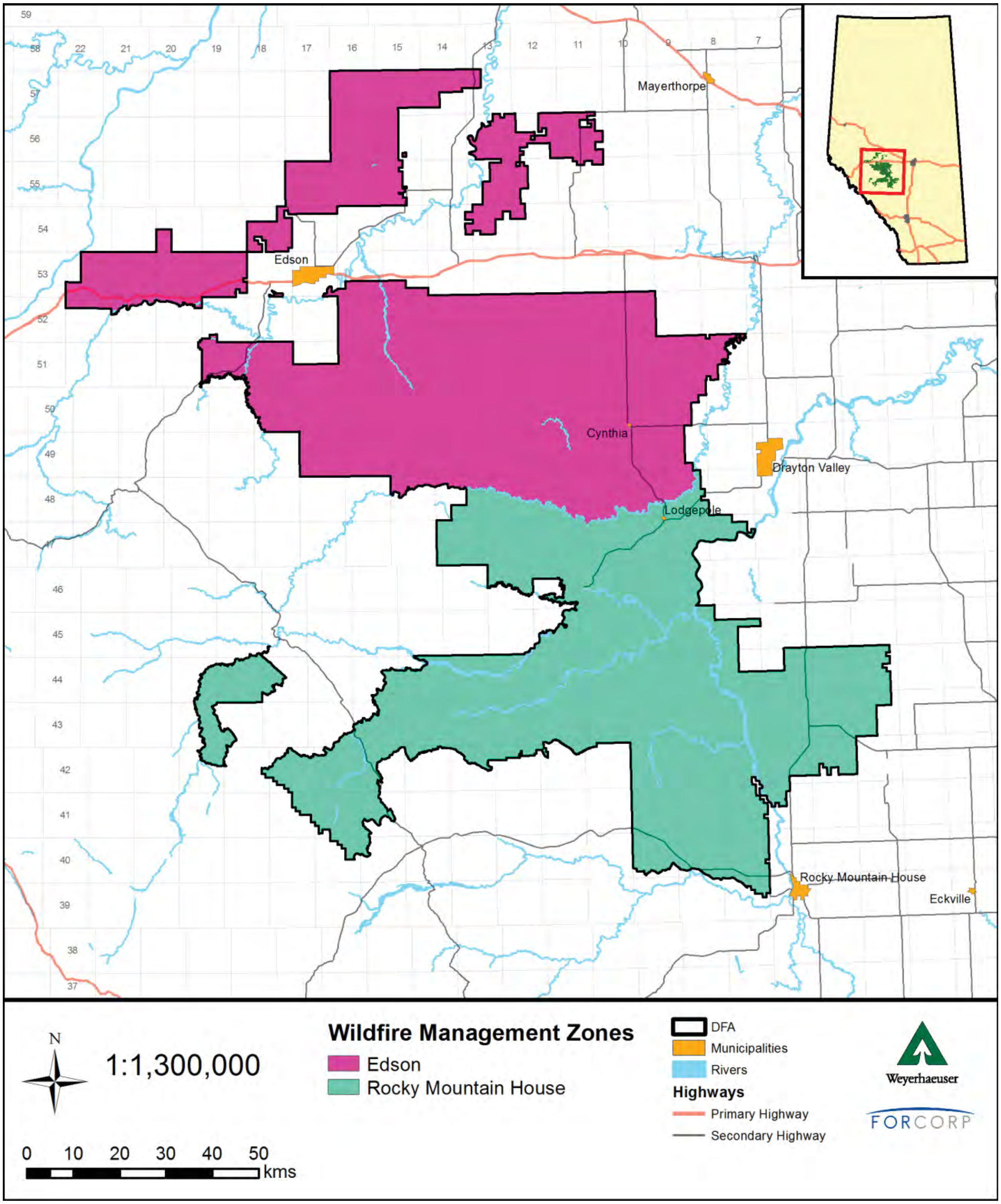

Figure 2.28. Wildfire Management Zones within the DFA.

2.3.29 FireSmart Community Zones

Items	Description
Source	GOA – Agriculture and Forestry
Source Filename	**comm_zones_2015.shp** (Delivered to Forcorp on 2015/03/12)
Description of Source File	FireSmart community zone boundaries for Alberta
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	CZ_NAME
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FireSmart_Project.shp** 3. Select polygons within the layer that intersect the R15 FMU 4. Save result as **FireSmart_Select.shp** 5. Dissolve the boundaries between the community zones 6. Save result as **FireSmart_Dissolve.shp** 7. Clip the boundary to the R15 boundary 8. Save result as **FireSmart_Clip.shp** 9. Create singlepart shapefile 10. Save result as **FireSmart_Singlepart.shp** 11. Calculate geometry within attributes table to determine the area (ha) of each polygon. 12. Save result as **FireSmart.shp**
Assumptions/ Processing Issues	Dissolve is run on the layer to ensure that overlapping FireSmart zone area is not reported multiple times.
Programs	ESRI ArcGIS
Output Filename	**FireSmart.shp**
Output Description	Single part shapefile showing the FireSmart Community Zones that intersect the DFA.
Output Attributes	*FIRESMART*
Polygon Area/Line Length	Total Area – 247,912 ha
Delivered Theme Name	**Fire**

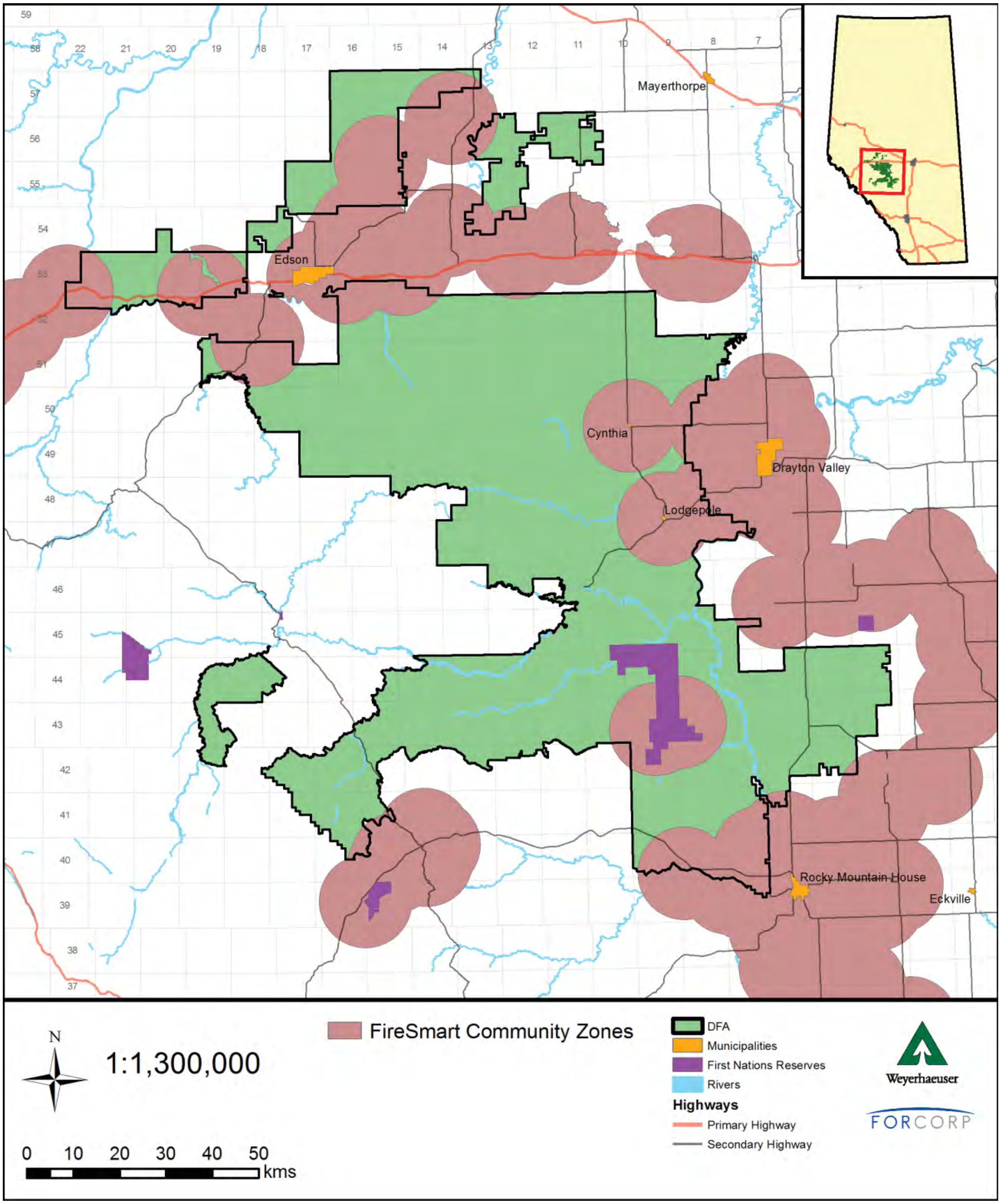

Figure 2.29. FireSmart boundaries that intersect the DFA.

2.3.30 FireSmart Deletions

Item	Description
Source	GOA – Agriculture and Forestry
Source Filenames	**Cythina_FireSmart.shp** **Fire_Smart_Area.shp** **Lodgepole_Treatment.shp** (All delivered to Forcorp on 2015/07/19)
Description of Source File	FireSmart Treatment Areas within the DFA.
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest and Geographic, NAD 1983, Decimal Degrees
Important Attributes	*None*
Required Processing	1. Project all layers to UTM, NAD 1983 UTM Zone 11N 2. Save results as: **Cynthia_FireSmart_Projected.shp** **Fire_Smart_Area_Projected.shp** **Lodgepole_Treatment_Projected.shp** 3. Merge the projected layers to create a single layer of treated polygons 4. Save result as **FireSmartDeletions_Merge.shp** 5. Clip the boundary to the R15 boundary 6. Save result as **FireSmartDeletions_Clip.shp** 7. Add text field to attributes table named FSmart_Del and populate all records with “FireSmart_Deletion” 8. Create singlepart shapefile 9. Save result as **FireSmartDeletions_Singlepart.shp** 10. Calculate geometry within attributes table to determine the area (ha) of each polygon. 11. Save result as **FireSmartDeletions.shp**
Assumptions/ Processing Issues	FireSmart Deletions are forested areas on the landbase that have been treated to reduce the wildfire risk to neighbouring communities or resources. While these areas may remain forested, the treatments often reduce the merchantable timber within a polygon and will likely remain unmerchantable to maintain FireSmart safety.
Programs	ESRI ArcGIS
Output Filename	**FireSmartDeletions.shp**
Output Description	Single part shapefile showing the historical FireSmart Treatment areas that intersect the Weyerhaeuser Pembina DFA.
Output Attributes	*FSMART_DEL*
Polygon Area/Line Length	Total Area – 543 ha
Delivered Theme Name	**Fire**

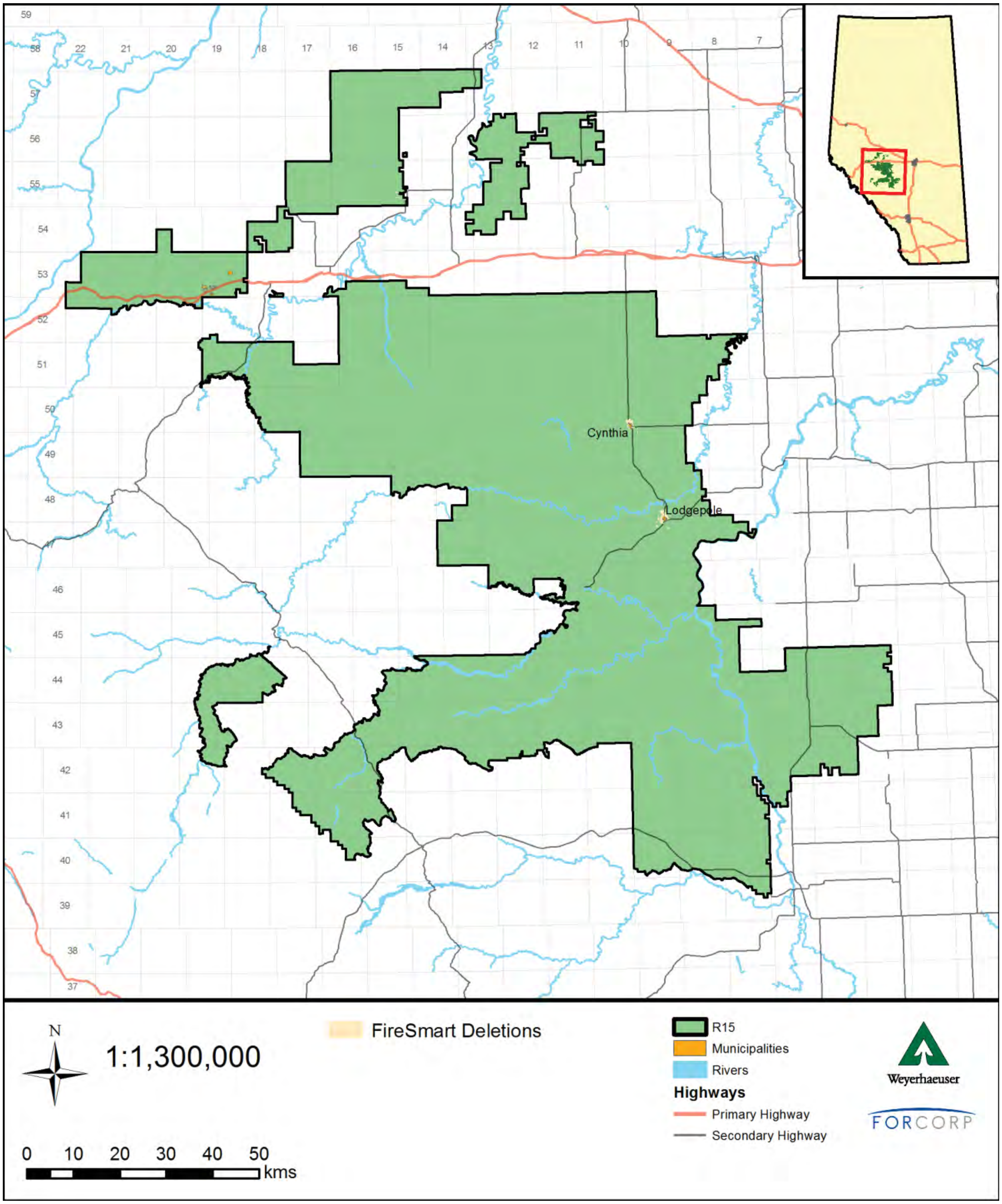

Figure 2.30. FireSmart Deletions that intersect the DFA.

2.3.31 Wildfires

Item	Description
Source	GOA – Agriculture and Forestry
Source Filename	**WildfirePerimeters1931to2014.shp** (Delivered to Forcorp on 2015/06/01)
Description of Source File	Provincial wildfire boundaries
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	FIRENUMBER, YEAR
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **Wildfires_Project.shp** 3. Select polygons within the layer that intersect the R15 FMU with a fire year of 2013 or 2014 and a Burn Class of 5 4. Save result as **Wildfires_Select.shp** 5. Clip the boundary to the R15 boundary 6. Save result as **Wildfires_Clip.shp** 7. Create singlepart shapefile 8. Save result as **Wildfires_Singlepart.shp** 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Save result as **Wildfires.shp**
Assumptions/ Processing Issues	Fires from the 2013 and 2014 fire years occurred after the photo date and are not included in the AVI. Of these fires, only those 5 ha or larger are cut into the landbase (RWF-020-2013 and RWF-042-2013).
Programs	ESRI ArcGIS
Output Filename	**Wildfires.shp**
Output Description	Single part shapefile showing the historical wildfires that intersect the Weyerhaeuser Pembina DFA.
Output Attributes	*FIRENUM*
Polygon Area/Line Length	Total Number of Fires not included in AVI – 2 Total Area – 589 ha
Delivered Theme Name	**Fire**

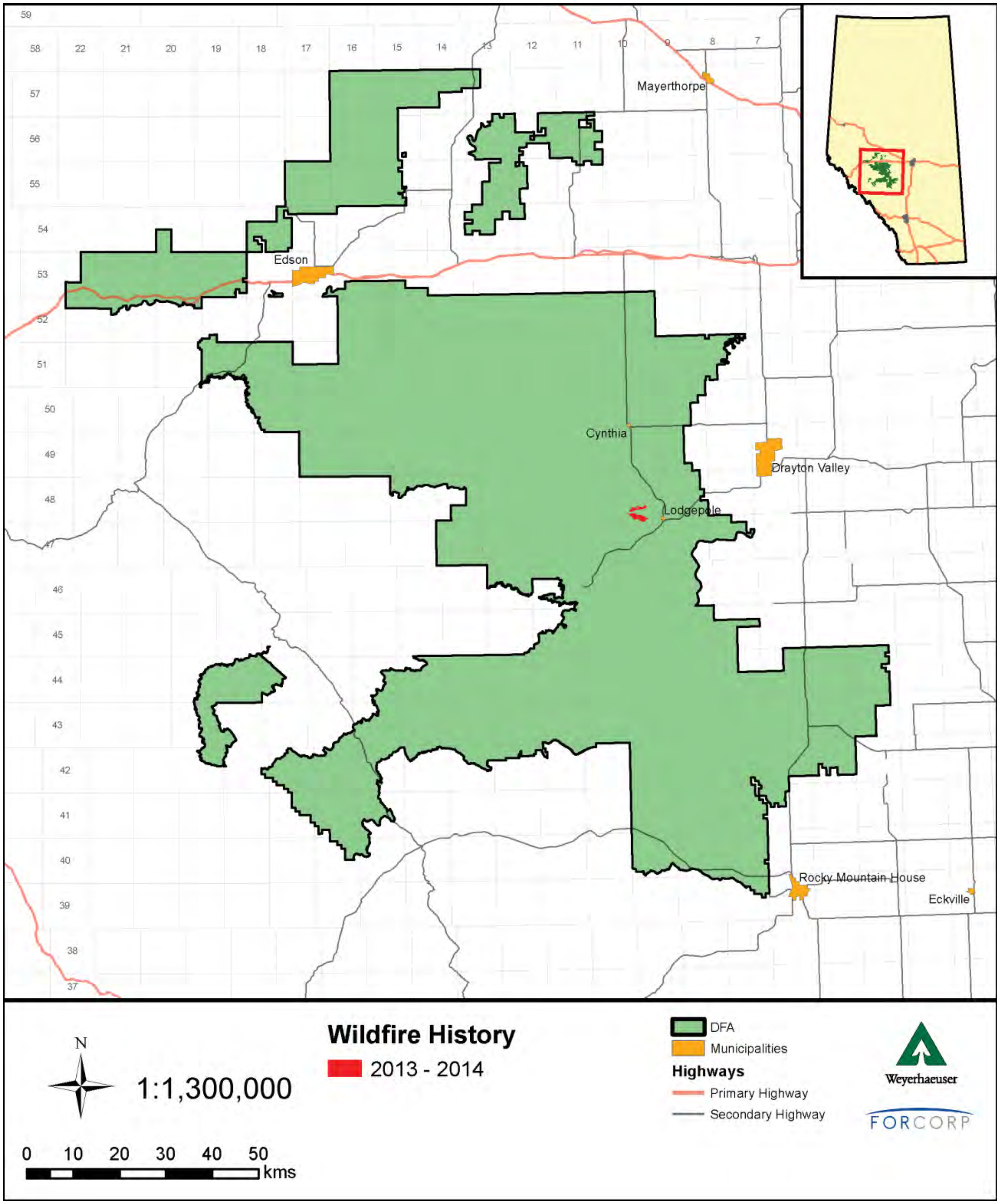

Figure 2.31. Wildfires that occurred within the DFA during the 2013 and 2014 fire years.

2.3.32 First Nations Reserves

Item	Description
Source	AltaLIS
Source Filename	**BF_INDIAN_RES_POLYGON.shp** (Calendar Date 2011/03/31)
Description of Source file	First Nations Reserves within Alberta
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	IRES_NAME
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FirstNations_Projected.shp** 3. Select the following Reserves by IRES_NAME O'Chiese No. 203 Sunchild No. 202 Alexis Cardinal River No. 234 Alexis Elk River No. 233 Big Horn No. 144A Buck Lake No. 133C 4. Save result as **FirstNations_Select.shp** 5. Create singlepart shapefile 6. Save result as **FirstNations _Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **FirstNations.shp**
Assumptions/ Processing Issues	O'Chiese No 203 and Sunchild No. 202 are the only reserves that are within the R15 FMU and are the only reserves with reported polygon areas below. Other First Nations included in this map are part of the First Nations consultation process.
Programs	ESRI ArcGIS
Output Filename	**FirstNations.shp**
Output Description	Single part shapefile showing the First Nations reserves found within and bordering the Weyerhaeuser Pembina DFA.
Output Attributes	*IRES_NAME*
Polygon Area/Line Length	Total Area – 19,065 ha O'Chiese – 13,853 ha Sunchild – 5,212 ha
Delivered Theme Name	**First Nations**

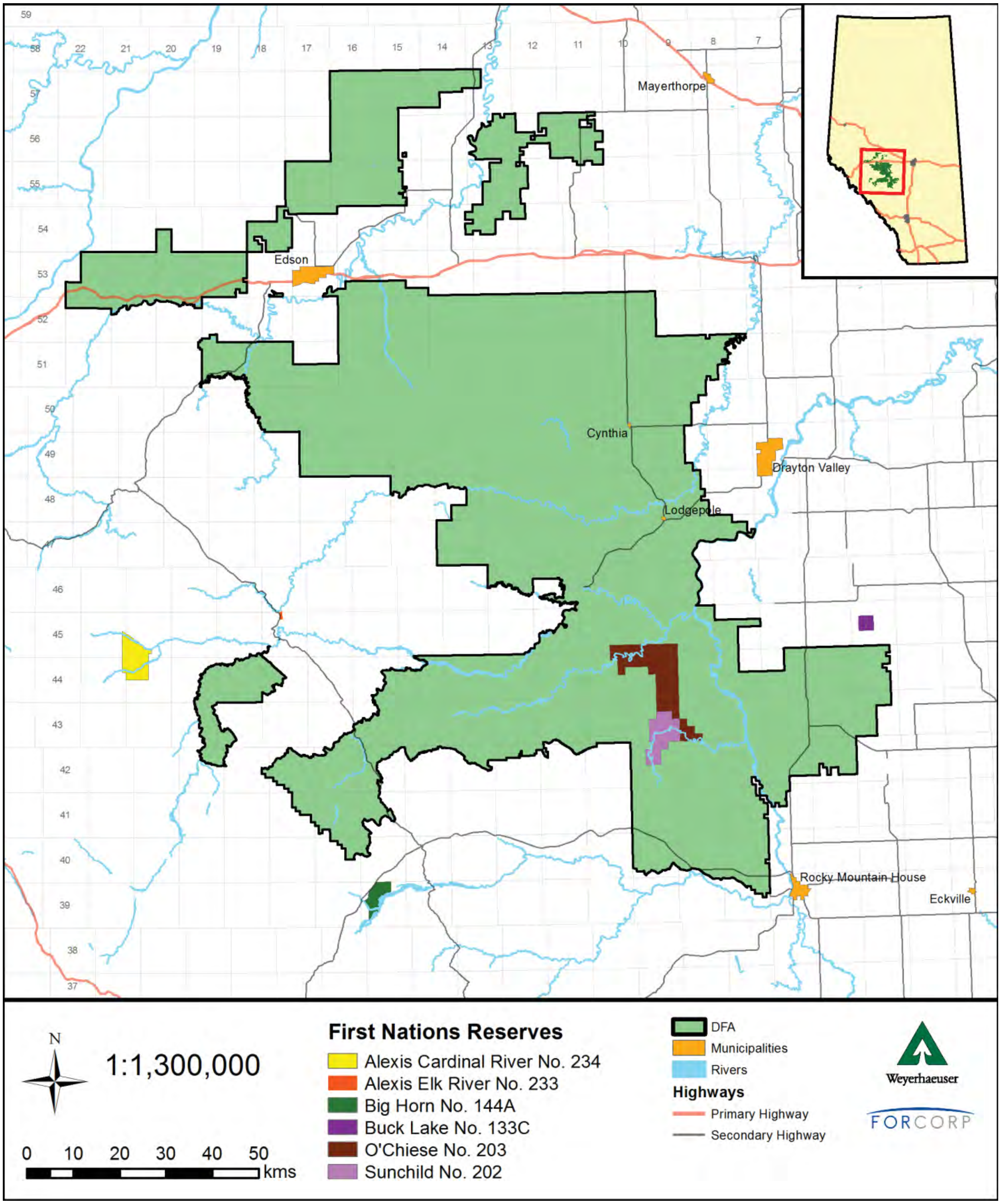

Figure 2.32. First Nations Reserves located in and around the DFA.

2.3.33 Parks and Recreation Areas

Item	Description
Source	AltaLIS
Source Filenames	**BF_ECO_RESERVE_POLYGON.shp** (Calendar Date: 2008/04/25) **BF_NATIONAL_PARK_POLYGON.shp** (Calendar Date: 2008/07/09) **BF_PROVINCIAL_PARK_POLYGON.shp** (Calendar Date: 2012/06/21) **BF_PRA_POLYGON.shp** (Calendar Date: 2013/02/20) **BF_PUBLND_REC_AREA_POLYGON.shp** (Calendar Date: 2011/09/12) **BF_WILDLAND_PARK_POLGYON.shp** (Calendar Date: 2010/09/10)
Description of Source F0iles	National, provincial and wildland parks as well as provincial recreation areas, public land recreation areas and ecological reserves that are within or bordering the Weyerhaeuser Pembina DFA.
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*Type*
Required Processing	1. Project all source layers to UTM, NAD 1983 UTM Zone 11N 2. Save each result as: **NationalParks_Project.shp** **ProvincialParks_Project.shp** **EcoReserves_Project.shp** **PublicLandRecArea_Project.shp** **PRA_Project.shp** **WildlandParks_Project.shp** 3. Select all polygons that intersect the R15 FMU 4. Save each result as: **NationalParks_Select.shp** **ProvincialParks_ Select.shp** **EcoReserves_ Select.shp** **PublicLandRecArea_ Select.shp** **PRA_ Select.shp** **WildlandParks_ Select.shp** 5. Merge the layers to create a single Parks layer 6. Save result as **Parks_Merge.shp** 7. Clip the layers to the R15 Forest Management Unit 8. Save result as **Parks_Clip.shp** 9. Create singlepart shapefile 10. Save result as **Parks _Singlepart.shp** 11. Calculate geometry within attributes table to determine the area (ha) of each polygon. 12. Save result **Parks.shp**
Assumptions/ Processing Issues	There is no National Park area within the DFA, however, Jasper National Park shares a boundary with the DFA. Marshybank eco reserve was cut into Brazeau wildland to ensure topology did not overlap.
Programs	ESRI ArcGIS
Output Filename	**Parks.shp**

Item	Description
Output Description	Single part shapefile showing the Parks and Protected Areas found within the Weyerhaeuser Pembina DFA.
Output Attributes	*PARKTYPE*
Polygon Area/Line Length	Total Area – 18,281 ha Provincial Parks (3) – 8,170 ha Wildland Parks (1) – 2,569 ha Provincial Recreation Areas (12) – 6,134 ha Public Land Recreation Area (6) – 561 ha Eco Reserve (1) – 845 ha
Delivered Theme Name	**Parks**

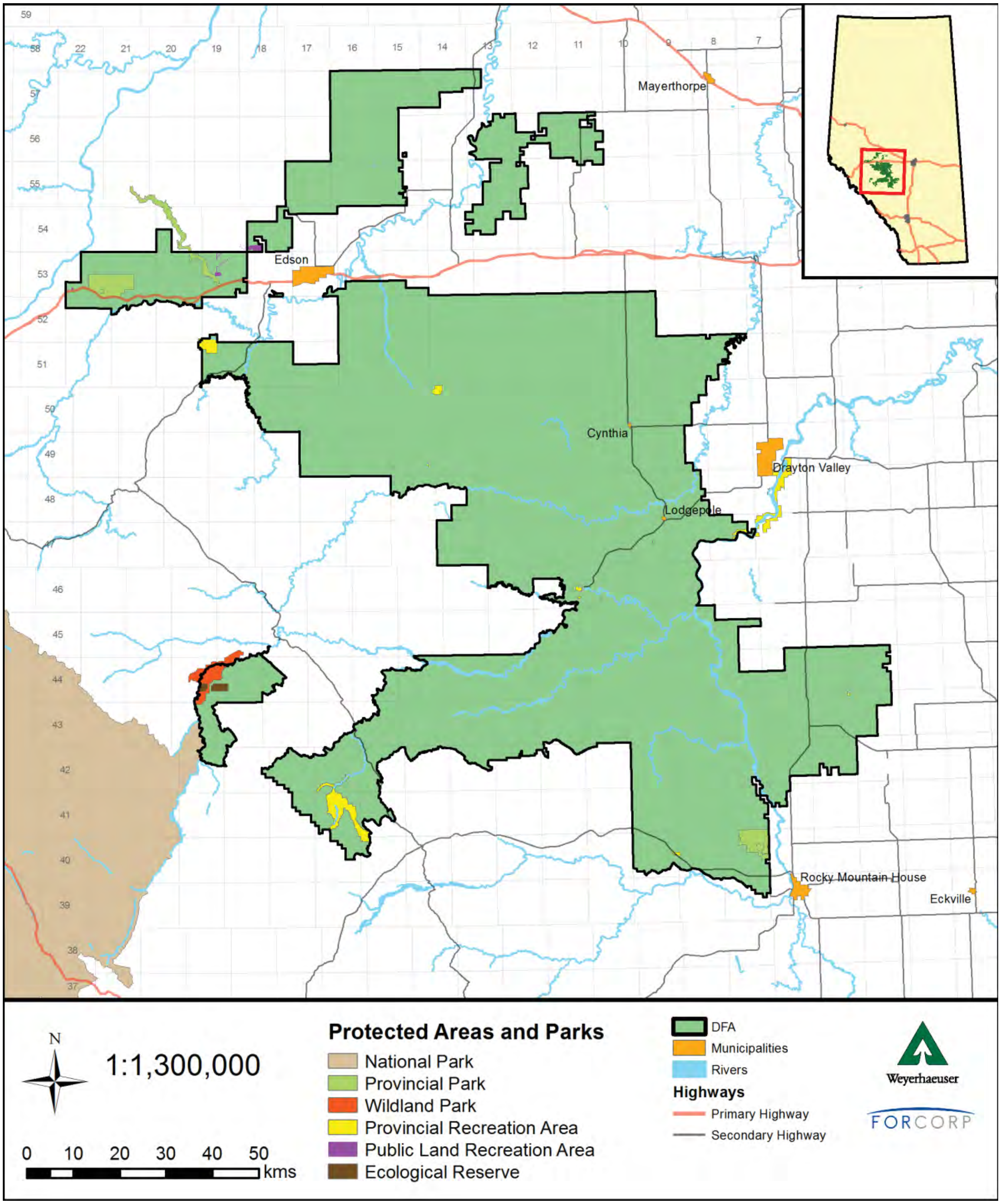

Figure 2.33. Parks and protected areas in and around the DFA.

2.3.34 Natural Areas

Item	Description
Source	AltaLIS
Source Filename	**BF_NATURAL_AREA_POLYGON.shp** (Calendar Date 2012/09/06) **BF_EASTRN_SLPS_LUZ_POLYGON.shp** (Calendar Date 1997/04/01)
Description of Source File	Designated Natural Areas within Alberta Eastern Slopes Land Use Zoning
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	NATAREA_NA, NATAREA_CO
Required Processing	1. Project both layers to UTM, NAD 1983 UTM Zone 11N 2. Save result as **NaturalAreas_Project.shp** and **ESLUZ_Project.shp** 3. Select the Prime Protection Areas within the **ESLUZ_Project.shp** 4. Save result as **ESLUZ_Select.shp** 5. Clip the layer to the R15 FMU boundary 6. Save results **NaturalAreas_Clip.shp** and **ESLUZ_Clip.shp** 7. Merge shapefiles into a single shapefile. 8. Save results as **NaturalAreas_Merge.shp** 9. Create new filed named NATAREA and name each polygon appropriately. 10. Create singlepart shapefile 11. Save result as NaturalAreas _Singlepart.shp 12. Calculate geometry within attributes table to determine the area (ha) of each polygon. 13. Save result NaturalAreas.shp
Assumptions/ Processing Issues	None
Programs	ESRI ArcGIS
Output Filename	**NaturalAreas.shp**
Output Description	Single part shapefile showing the Natural Areas found within the Weyerhaeuser Pembina DFA.
Output Attributes	*NATAREA*
Polygon Area/Line Length	Total Area – 1,283 ha Aurora – 908 ha Eastern Slopes Prime Protection Area – 1,782 ha O'Chiese – 376 ha
Delivered Theme Name	**Natural Areas**

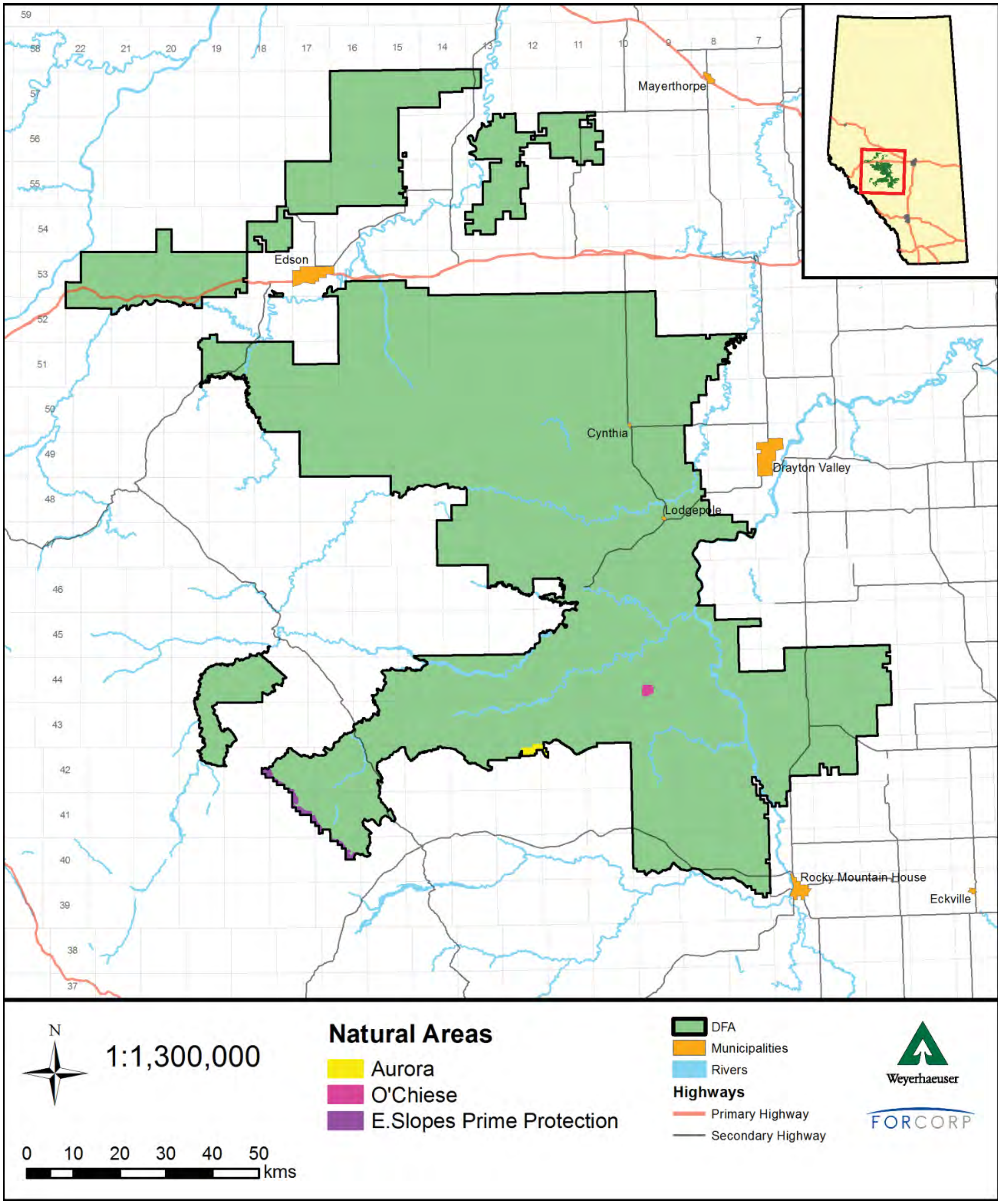

Figure 2.34. Natural Areas within the DFA.

2.3.35 Hamlets

Item	Description
Source	AltaLIS
Source Filenames	**BF_TOWN_POLYGON.shp** (Calendar Date 2014/05/01) **BF_FMA_POLYGON.shp** (Calendar date 2014/05/01) **Ownership.shp** (Delivered on 2016/01/29)
Description of Source files	Town and FMA layers for Alberta
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*None*
Required Processing	1. Project all source layers to UTM, NAD 1983 UTM Zone 11N 2. Save results as **Towns_projected.shp**, **FMA_Projected.shp and Ownership_Project.shp** 3. Create a layer showing hamlet boundaries: 4. Erase the FMA from the R15 boundary to create a polygon layer of all areas within R15, but outside the FMA. 5. Select the two polygons that correspond to Cynthia and Lodgepole 6. Save the result as **Hamlets_Select.shp** 7. Create singlepart shapefile 8. Save result as **Hamlets _Singlepart.shp** 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Select all Municipal polygons from Ownership_Project.shp and merge these polygons with the Hamlets_Singlepart.shp 11. Save result as **Hamlets.shp** 12. Merge **Hamlets.shp** with **Towns_projected.shp** to create a shapefile that has both the Hamlets within, and the towns in the vicinity of R15. 13. Save result as **Municipalities_Merge.shp** 14. Create singlepart shapefile 15. Save result as **Municipalities _Singlepart.shp** 16. Calculate geometry within attributes table to determine the area (ha) of each polygon. 17. Save result as **Municipalities.shp**
Assumptions/ Processing Issues	The hamlets layer was created using this methodology because hamlet boundaries were not available.
Programs	ESRI ArcGIS
Output Filenames	**Hamlets.shp** and **Municipalities.shp**
Output Description	Single part shapefile showing the municipalities both within and around the Weyerhaeuser Pembina DFA.
Output Attributes	*HAMLET*

Polygon Area/Line Length	Total Area – 341 ha Cynthia –53 ha Lodgepole – 58 ha Brazeau County – 58 ha Clearwater County – 2 ha Yellowhead County – 170 ha
Delivered Theme Name	**Hamlets**

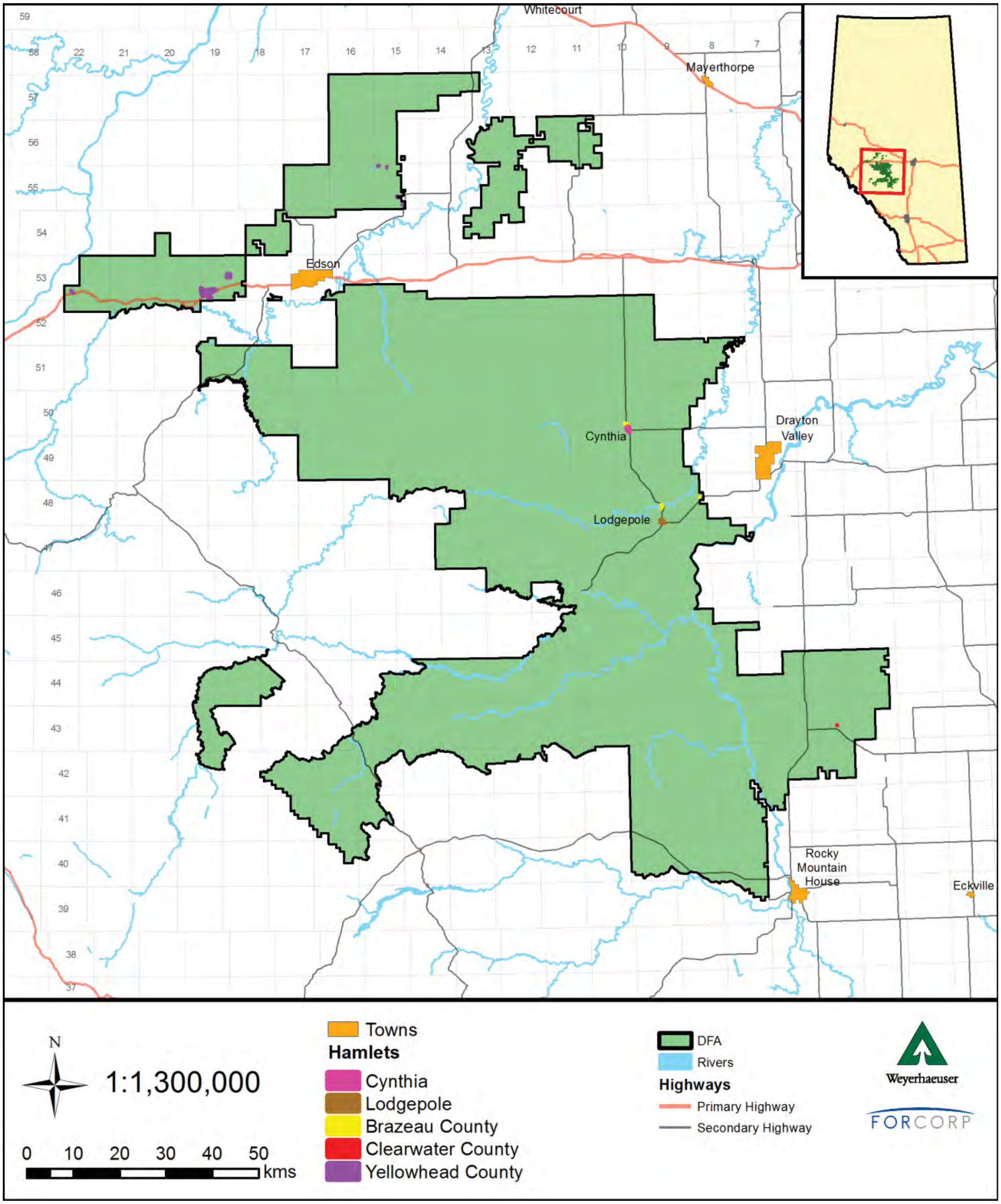

Figure 2.35. Hamlets in and around the DFA.

2.3.36 Private Land

Item	Description
Source	GOA – Agriculture and Forestry
Source Filenames	**Ownership.shp** (Delivered on 2016/01/29)
Description of Source file	Private land found in and bordering the DFA
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	CROWNCLASS
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **PrivateLand_Project.shp** 3. Select all private land and federal land polygons that intersect **R15.shp** 4. Save result as **PrivateLand_Select.shp** 5. Clip the layer to the R15 FMU boundary 6. Save result **PrivateLand_Clip.shp** 7. Create singlepart shapefile 8. Save result as **PrivateLand_Singlepart.shp** 9. Compare singlepart layer to Alberta Townships and add road allowances or other slivers that are found between or bordering the private land polygons. 10. Calculate geometry within attributes table to determine the area (ha) of each polygon. 11. Save result as **PrivateLand.shp**
Assumptions/ Processing Issues	Adding road allowances to this layer (Step 9) cleans this data layer by smoothing boundaries between polygons. This reduces the number of slivers that would be created in the landbase process that would have to be eliminated later in the process.
Programs	ESRI ArcGIS
Output Filename	**PrivateLand.shp**
Output Description	Private land found in the Weyerhaeuser Pembina DFA.
Output Attributes	*PRIVATE*
Polygon Area/Line Length	Total Area - 11,977 ha Private Land – 11,912 ha Federal Land – 64 ha
Delivered Theme Name	**Private Land**

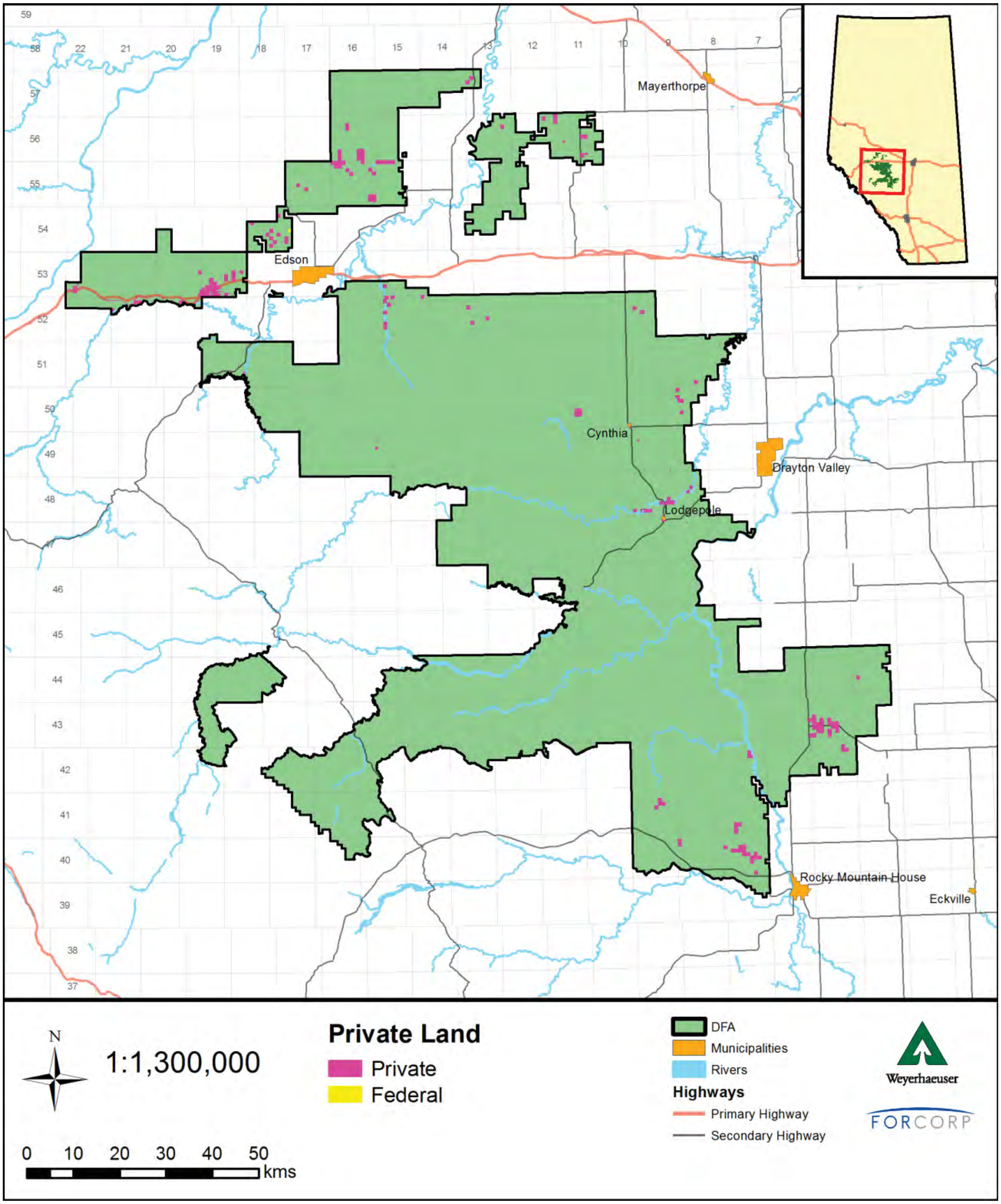

Figure 2.36. Private land found within the DFA.

2.3.37 Post AVI Road Dispositions

Item	Description
Source	GOA – Environment and Parks: Digital Integrated Dispositions (DIDs)
Source Filename	**APPL.shp** (DIDs layer, Download Date 2015/05/06)
Description of Source File	Shapefile that contains the provincial lands dispositions found throughout the province.
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	DISP_TYPE, DISP_NUM
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Select by location, all roads that intersect the R15 polygon layer 2.1. DLO 2.2. FRD 2.3. LOC 2.4. RDS 2.5. RRD 3. Filter these selections to include only those roads with an activity date of beginning in 2011 or later 4. Save result as **LOC_Select.shp** 5. Clip layer to R15 boundary 6. Save result as **LOC_Clip.shp** 7. Calculate the geometry for the line layer to determine total line length within the DFA 8. Create singlepart shapefile. 9. Save result as **LOC_Singlepart.shp** 10. Calculate the geometry of the layer to determine the total buffered area. 11. Save file as **LOC.shp**
Assumptions/ Processing Issues	All road dispositions with an activity date prior to 2011 are assumed to have been identified in the AVI and built by the disposition holders prior to the AVI photo date. Following this assumption aims to capture roads as they were built and not the planned roads from the DIDs extract.
Programs	ESRI ArcGIS
Output Filename	**LOC.shp**
Output Description	Single part shapefile showing the roads that were added to the landbase after the AVI photo date.
Output Attributes	*LOC*
Polygon Area/Line Length	Total Area – 1,549 ha
Delivered Theme Name	**DIDs**

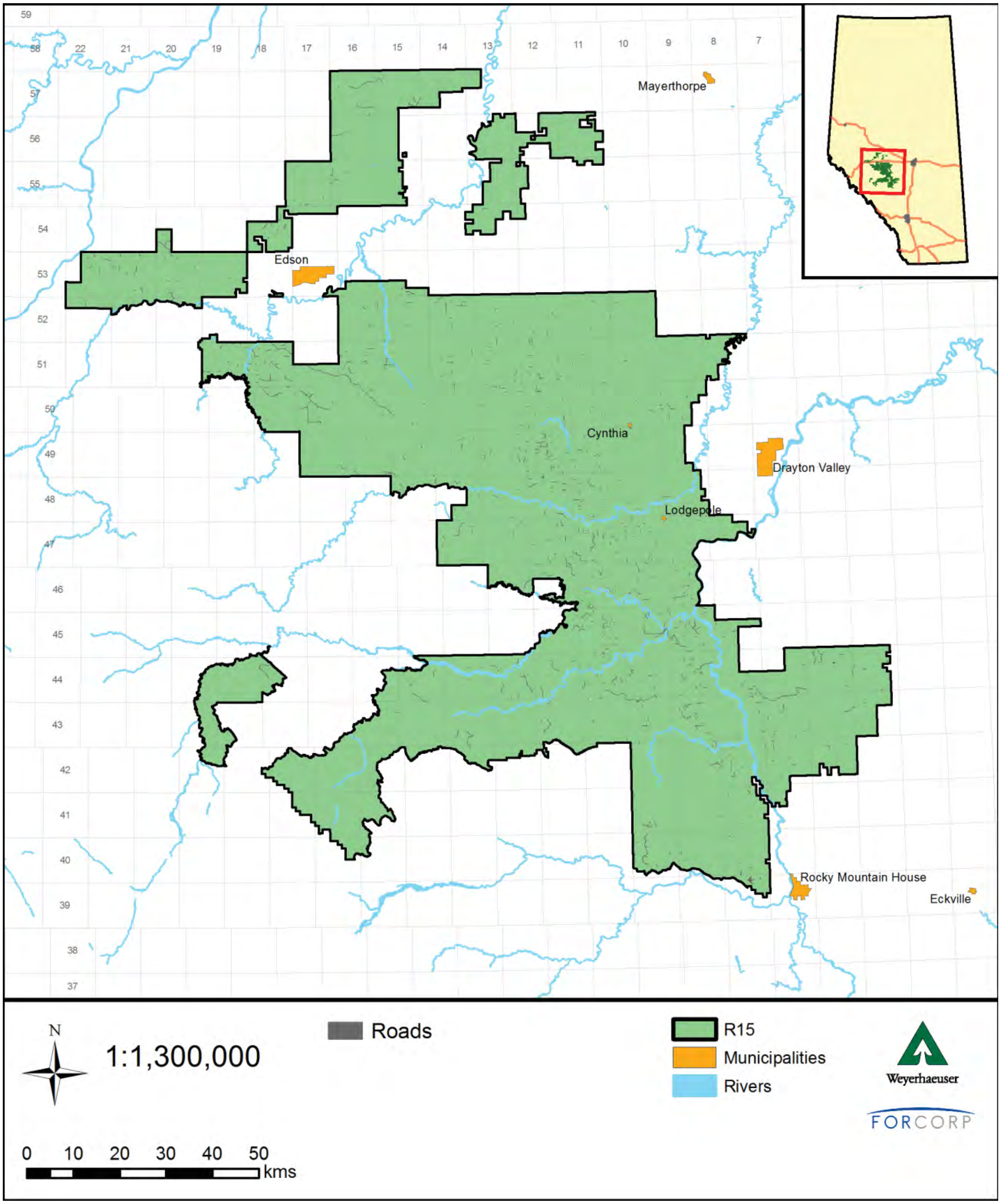

Figure 2.37. Roads dispositions within the DFA not captured by the AVI.

2.3.38 Grazing Dispositions

Item	Description
Source	GOA – Environment and Parks: Digital Integrated Dispositions (DIDs)
Source Filename	**APPL.shp** (DIDs Layer, Download Date 2015/05/06)
Description of Source file	Shapefile showing Lands dispositions found throughout the province.
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*DISP_TYPE, DISP_NUM*
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FullDIDs_Project.shp** 3. Select all dispositions that intersect R15 4. Save result as **FullDIDs_Select.shp** 5. Select the following Dispositions by DISP_TYPE: FGL, GRL, GRP and GRR 6. Save result as **Grazing_Select.shp** 7. Clip the layer to the R15 FMU Boundary 8. Save result as **Grazing_Clip.shp** 9. Where necessary, fill in the road allowance gaps between individual polygons. 10. Create singlepart shapefile 11. Save result as **Grazing _Singlepart.shp** 12. Calculate geometry within attributes table to determine the area (ha) of each polygon. 13. Save the result as **GrazingDispositions.shp**
Assumptions/ Processing Issues	When conducting the landbase netdown, the following rules apply: 1. Forest Grazing Licenses (FGLs) are included in the FMA and are in the active landbase. 2. Grazing Leases (GRLs) are not included in the FMA, but are part of the active landbase. 3. Grazing Permits (GRPs) are included in the FMA and are in active landbase. 4. Provincial Grazing Reserves (GRRs) are not in the FMA and are in the passive landbase. Step 9 is conducted to fill in gaps between polygons to reduce the number of slivers created in the landbase process.
Programs	ESRI ArcGIS
Output Filename	**Grazing.shp**
Output Description	Single part shapefile showing the different grazing dispositions found in the Weyerhaeuser Pembina DFA
Output Attributes	*GRAZING*
Polygon Area/Line Length	Total Area – 65,652 ha Forestry Grazing Licenses (FGLs) – 13,717 ha Grazing Leases (GRLs) – 30,694 ha Grazing Permits (GRPs) – 2,319 ha Provincial Grazing Reserves (GRRs) – 18,922 ha

Item	Description
Delivered Theme Name	**DIDs**

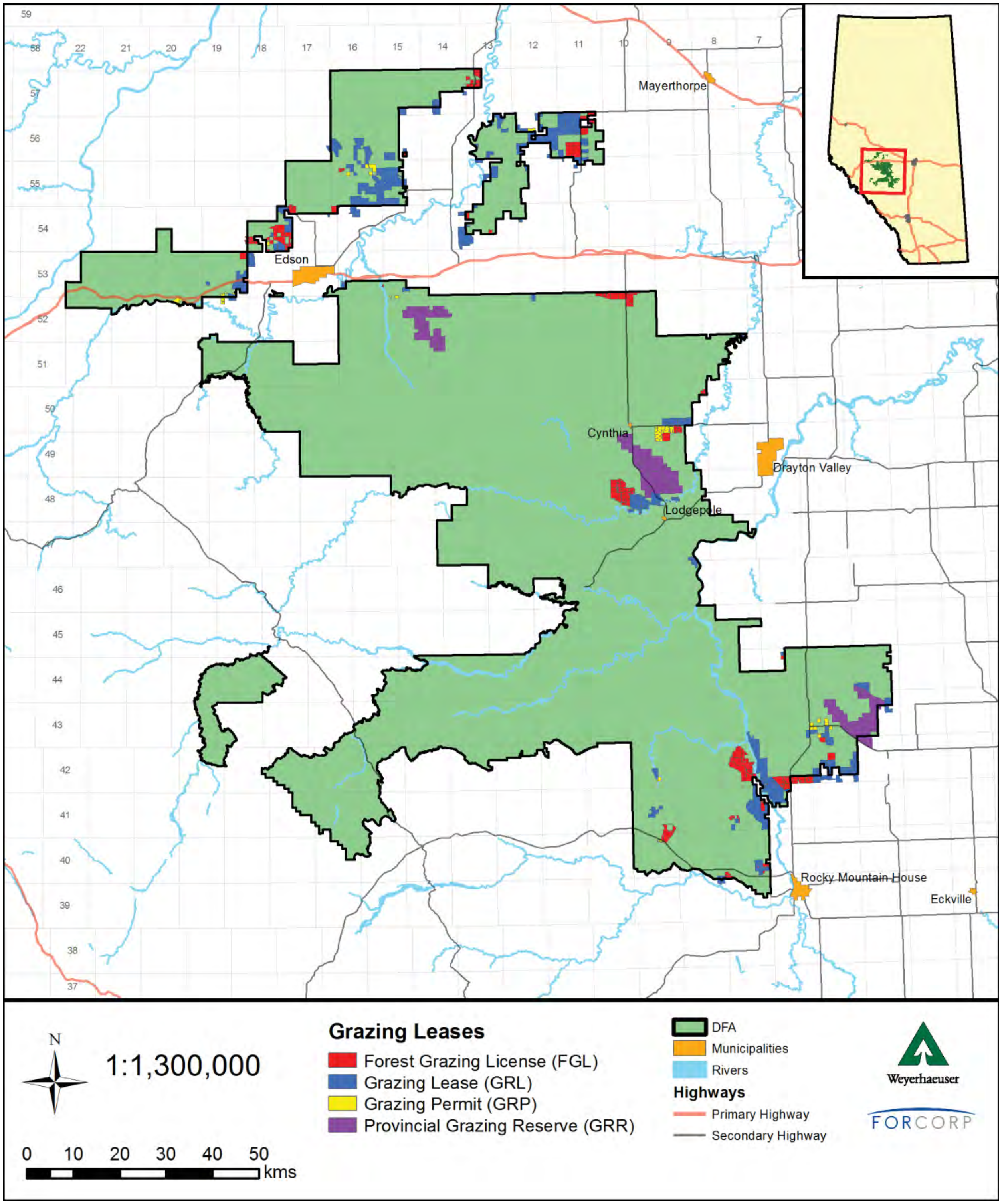

Figure 2.38. Grazing dispositions found within the DFA.

2.3.39 Protective Notations (PNTs)

Item	Description
Source	GOA – Environment and Parks
Source Filename	**APPL.shp** (DIDs layer, Download Date 2015/05/06)
Description of Source file	Shapefile that contain the provincial lands dispositions found throughout the province.
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	*DISP_TYPE*
Required Processing	1. Project the source layer to UTM, NAD 1983 UTM Zone 11N 2. Save result as **FullDIDs_Project.shp** 3. Select all dispositions that intersect R15 4. Save result as **FullDIDs_Select.shp** 5. Select the PNT Dispositions by DISP_TYPE 6. Save result as **PNT_Select.shp** 7. Clip the layer to the R15 FMU Boundary 8. Save result as **PNT_Clip.shp** 9. Create a text attribute titled “IN_OUT” 10. Assign PNTs as “In” if they are part of the active landbase 11. Assign PNTs as “Out” if they are out of the active landbase 12. Assign PNTs as “Split” if some area is to be in and some is out of the active landbase 13. For polygons listed as “Split” complete digitization of areas that need to be divided. 14. Select all PNTs that are “Out” 15. Save result as **PNT_Select.shp** 16. Dissolve layer to remove internal linework 17. Save result as **PNT_Dissolve.shp** 18. Create singlepart shapefile 19. Save result as **PNT_Singlepart.shp** 20. Calculate geometry within attributes table to determine the area (ha) of each polygon. 21. Save the result as **PNTs.shp**
Assumptions/ Processing Issues	A list of PNTs was reviewed between Weyerhaeuser and GOA to determine which PNTs are assigned as In or Out of the active landbase (Weyerhaeuser, 2016a). PNTs assigned as “In” remain part of the active landbase, while PNT’s assigned as “Out” are assigned to the passive landbase. Where necessary, PNTs were split to allow some parts of PNTs to remain part of the active landbase. This was done by georeferencing maps and then splitting the polygons. Provincial Grazing Reserves are also identified as PNTs but were not included in the map and reported area.
Programs	ESRI ArcGIS
Output Filename	**PNT.shp**
Output Description	PNTs within the DFA.

Item	Description
Output Attributes	*PNT*
Polygon Area/Line Length	Total Out PNT Area –3,340 ha
Delivered Theme Name	**DIDs**

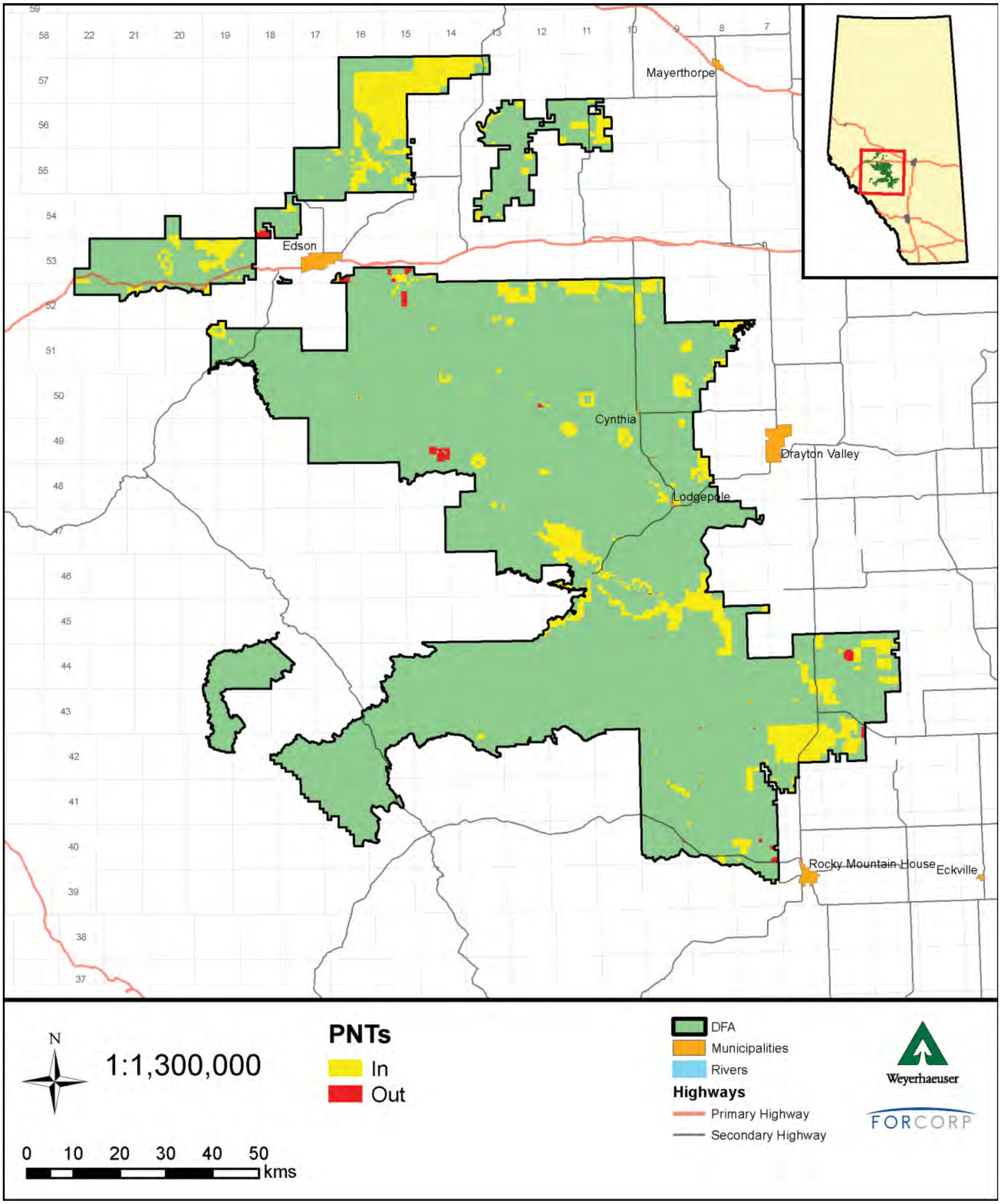

Figure 2.39. PNTs within the DFA.

2.3.40 Permanent Sample Plots

Item	Description
Source	GOA – Environment and Parks
Source Filename	**psp_buffer2007_geo83.shp** (Provincial PSP layer, Download Date 2015/03/09) **APPL.shp** (DIDs layer, Download Date 2015/05/06)
Description of Sources file	Shapefile that contain the provincial permanent sample plot locations and shapefile that contains the Lands dispositions found throughout the province. All plots include buffer area.
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	*DISP_TYPE, PSP_NUM*
Required Processing	1. For the Weyerhaeuser PSPs: 2. Project the source layers to UTM, NAD 1983 UTM Zone 11N 3. Save result as **FullDIDs_Project.shp** 4. Select all dispositions that intersect R15 5. Save result as **FullDIDs_Select.shp** 6. Select the ISP Dispositions by DISP_TYPE 7. Save result as **ISP_Select.shp** 8. Clip the layer to the R15 FMU Boundary 9. Save result as **ISP_Clip.shp** 10. Create singlepart shapefile 11. Save result as **ISP_Singlepart.shp** 12. For the Provincial PSPs: 13. Project the source layers to UTM, NAD 1983 UTM Zone 11N 14. Save result as **GoAPSPs_Project.shp** 15. Select all dispositions that intersect R15 16. Save result as **GoAPSPs_Select.shp** 17. Clip the layer to the R15 FMU Boundary 18. Save result as **GoAPSPs_Clip.shp** 19. Create singlepart shapefile 20. Save result as **GoAPSPs_Singlepart.shp** 21. Merge the two singlepart layers into a single shapefile 22. Save the result as **PSPs_Merge.shp** 23. Clip layer to the R15 boundary 24. Save result as **PSP_Clip.shp** 25. Calculate geometry within attributes table to determine the area (ha) of each polygon. 26. Save the result as **PSPs.shp**
Assumptions/ Processing Issues	Provincial PSPs are not included in the active landbase and therefore cannot be harvested. Weyerhaeuser PSPs are part of the active landbase. PSPs have been represented as points on map for visibility, but are polygon shapefiles.
Programs	ESRI ArcGIS
Output Filename	**PSP.shp**

Item	Description
Output Description	Single part shapefile showing the provincial permanent sample plots and the industrial sample plots within the DFA.
Output Attributes	*PSP*
Polygon Area/Line Length	Total Area – 2,097 ha Provincial PSPs – 555 ha Weyerhaeuser PSPs – 1,542 ha
Delivered Theme Name	**DIDs**

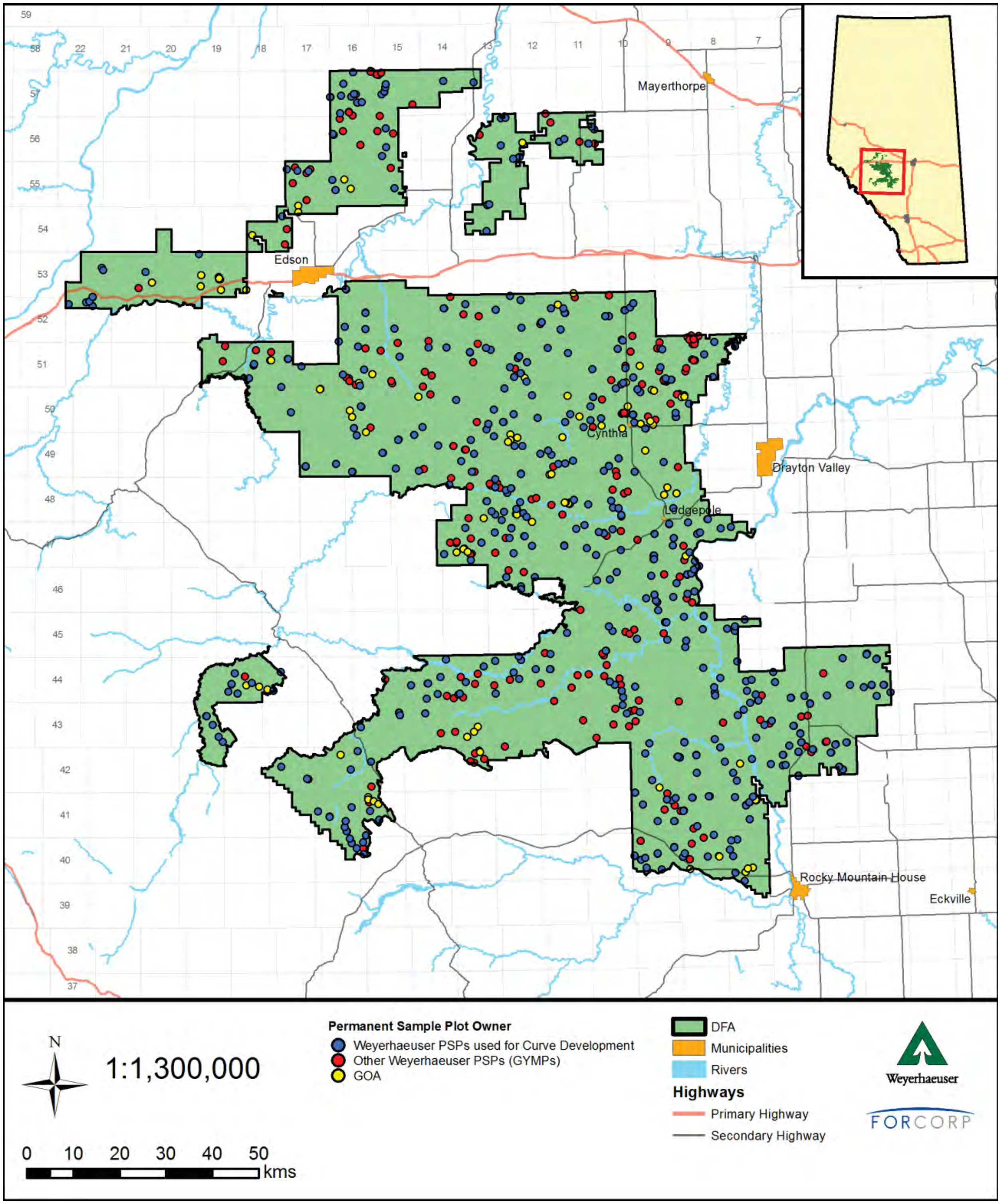

Figure 2.40. Provincial and Industrial sample plots found within the DFA.

2.3.41 Digital Integrated Dispositions (DIDs)

Item	Description
Source	GOA – Environment and Parks
Source Filename	**APPL.shp** (received by Forcorp on 2015/05/06)
Description of Source File	Lands Dispositions
Projection/Datum	Geographic, NAD 1983, Decimal Degrees
Important Attributes	DISP_TYPE
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Select polygons within the layer that intersect the Weyerhaeuser Pembina DFA with a DISP_TYPE of DHR, DML, DPI, DPL, DRS, EZE, FDL, MLL, MLP, MSL, PEZ, PIL, PLA, PLC, PLS, PML, PMS, PPA, PRL, PSM, REA, REC, ROE, RVC, SMC, SME, SML, VCE. 3. Remove all cancelled dispositions from the list of dispositions. 4. Save result as **DIDs_Select.shp** 5. Clip layer to R15 boundary 6. Save result as **DIDs_Clip.shp** 7. Create singlepart shapefile 8. Save result as **DIDs_Singlepart.shp** 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Export as **DIDS.shp**
Assumptions/ Processing Issues	Dispositions selected in step 2 are not part of other layers in the landbase. The dispositions within this layer do not include any dispositions that have been cancelled.
Programs	ESRI ArcGIS
Output Filename	**DIDS.shp**
Output Description	Single part shapefile showing the post-AVI lands dispositions deletions that intersect the Weyehaeuser DFA
Output Attributes	*DIDS*
Polygon Area/Line Length	59,125 ha
Delivered Theme Name	**DIDS**

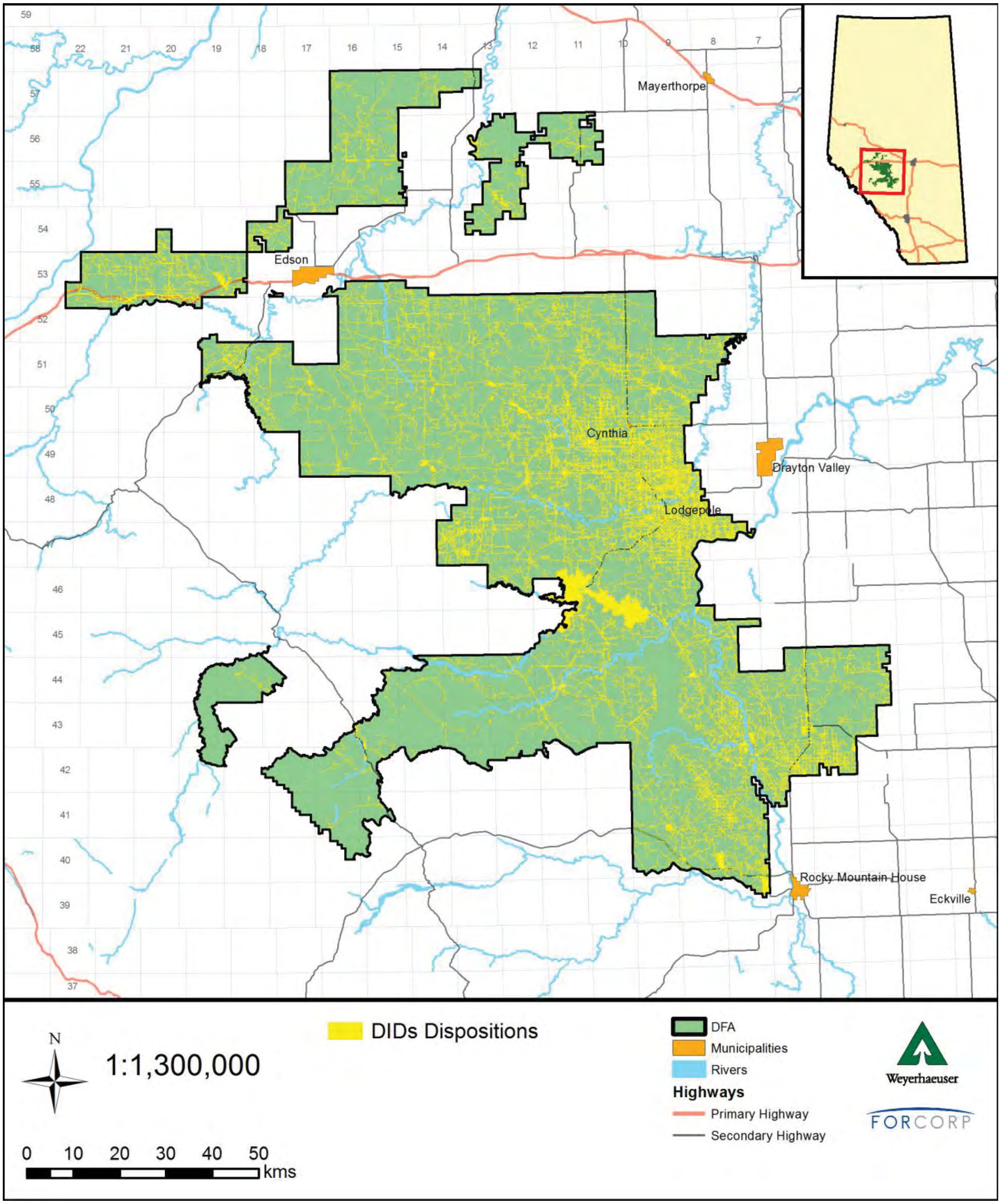

Figure 2.41. Digital Integrated Dispositions within and overlapping the DFA.

2.3.42 Hard Linear Features

Item	Description
Source	Songbirds Model Output
Source Filename	**GRID_HSln** (part of the Songbirds model output)
Description of Source File	Hard and soft linear features located within the DFA
Projection/Datum	Projected, NAD 1983, 10TM AEP Forest
Important Attributes	HLIN
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as HLIN_Projected.shp 3. Select by attributes all polygons where HLIN = 1 4. Save result as HLIN_Select.shp 5. Dissolve feature class by HLIN, creating singlepart polygons 6. Save result as **DIDs_Singlepart.shp** 7. Calculate geometry within attributes table to determine the area (ha) of each polygon. 8. Export as **HLIN.shp**
Assumptions/ Processing Issues	This layer is generated through the songbirds model process. A polygon was considered to have a hard linear feature within it if at least 0.5% of the area consisted of hard linear features. It is assumed that the model is generating the appropriate result. This layer is included in the landbase as a proxy to reduce polygon splitting.
Programs	ESRI ArcGIS
Output Filename	**HLIN.shp**
Output Description	Single part shapefile showing the hard linear features across the DFA.
Output Attributes	*HLIN*
Polygon Area/Line Length	210,326 ha
Delivered Theme Name	**HLIN**

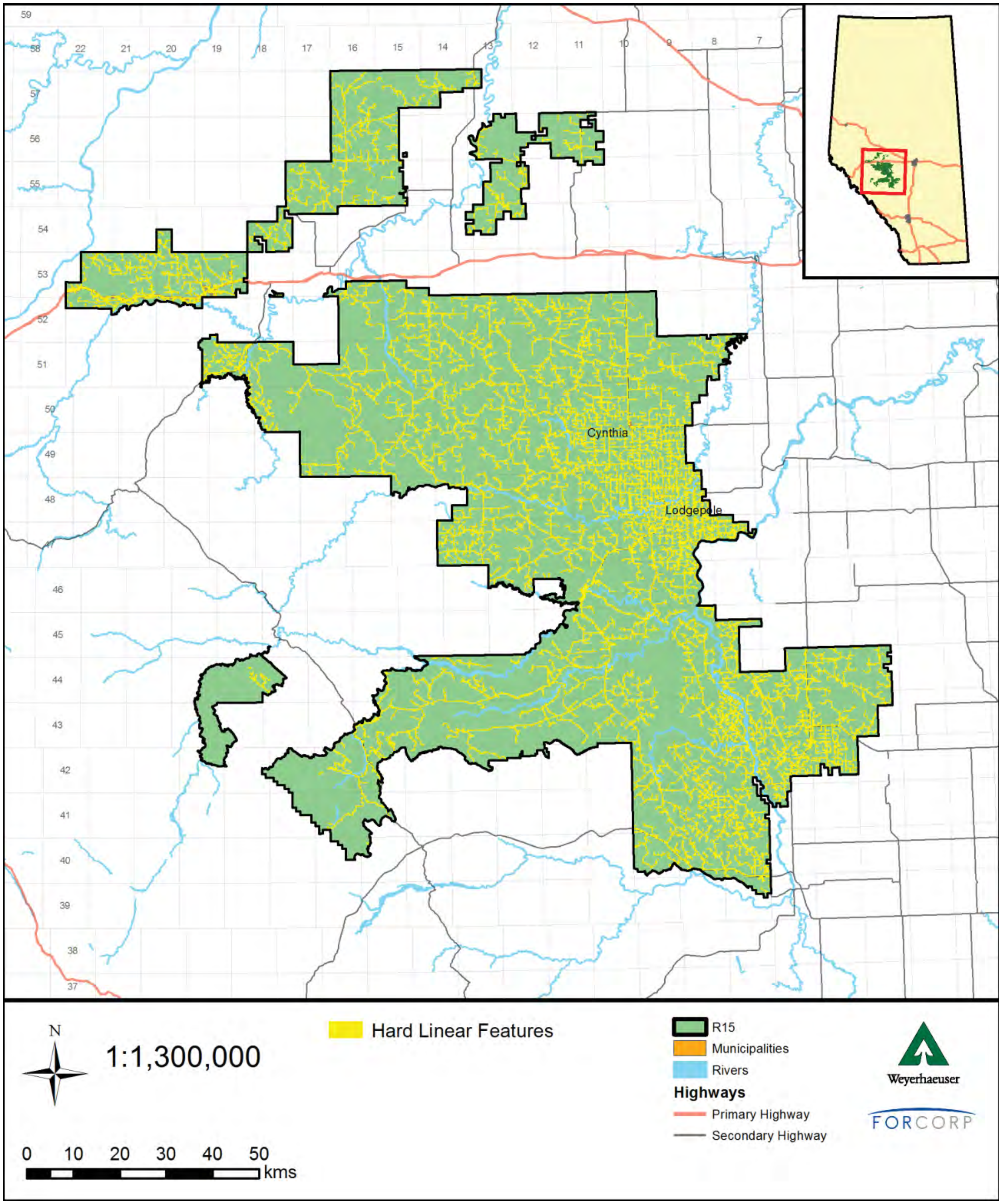

Figure 2.42. Hard Linear Features within the DFA.

2.3.43 Historic Resource Values

Item	Description
Source	GOA – Culture and Tourism
Source Filename	**List_of_Historic_Resources_March2015_Public.shp** (Downloaded on 2015/06/01)
Description of Source File	Historic Resource Values (HRVs) within Alberta
Projection/Datum	NAD 1983 10TM AEP Forest
Important Attributes	HRV
Required Processing	1. Project to UTM, NAD 1983 UTM Zone 11N 2. Save result as **GoAHistoricResources_Project.shp** 3. Select polygons within the layer that intersect the R15 FMU 4. Save result as **GoAHistoricResources _Select.shp** 5. Clip the boundary to the R15 boundary 6. Save result as **GoAHistoricResources _Clip.shp** 7. Create singlepart shapefile 8. Save result as **GoAHistoricResources _Singlepart.shp** 9. Calculate geometry within attributes table to determine the area (ha) of each polygon. 10. Save result as **GoAHistoricResources.shp**
Assumptions/ Processing Issues	In cases where features overlap, topology was cleaned in favour of the higher priority HRV classes. HRV 1 and HRV 3 features will become part of the passive landbase.
Programs	ESRI ArcGIS
Output Filename	**GoAHistoricResources.shp**
Output Description	Single part shapefile showing the ATS legal subdivisions sections within the R15 Forest Management Unit in which historic resources have been found.
Output Attributes	*HRV*
Polygon Area/Line Length	Total Area – 56,418 ha HRV 1 (Provincial Historic Resources) – 151 ha (2) HRV 3 (Significant Historic Resources Likely Requiring Avoidance) – 285 ha (5) HRV 4 (Historic Resources that may Require Avoidance) – 20,464 ha (308) HRV 5 (Believed to Contain a Historic Resource) – 35,518 ha (493)
Delivered Theme Name	**Historic Resources**

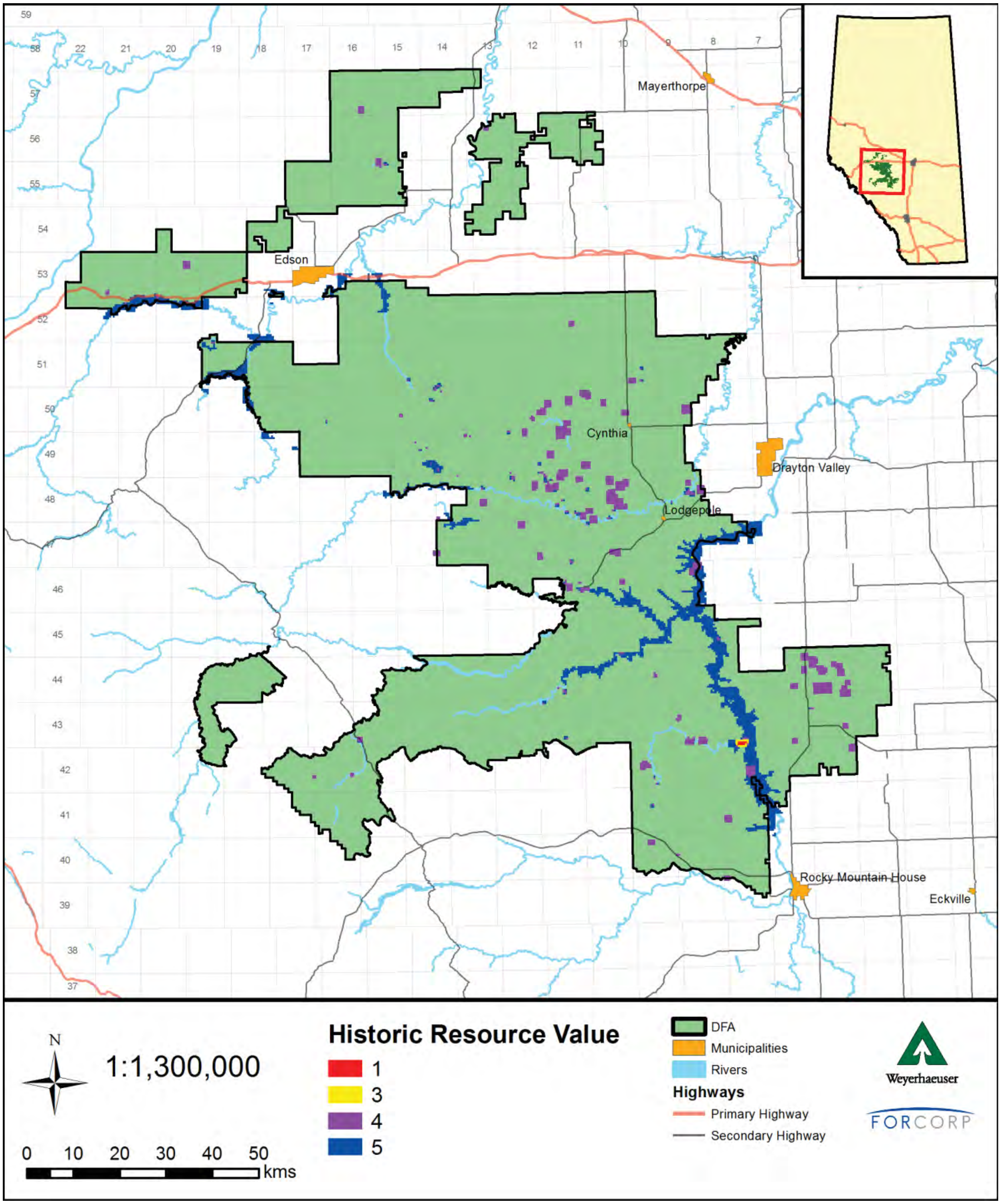

Figure 2.43. GOA identified historic resources found within the DFA.

2.3.44 Historic Cabins

Item	Description
Source	Weyerhaeuser
Source Filename	**List_of_Historic_Resources_March2015_Public.shp** (Downloaded on 2015/06/01)
Description of Source File	Historic Cabins identified by Weyerhaeuser
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	DESCRIPTIO
Required Processing	1. Select points from this layer that are identified as cabins 2. Save result as **Cabins_Select.shp** 3. Buffer each point by 50 meters 4. Save result as **Cabins_Buffer.shp** 5. Clip the boundary to the R15 boundary 6. Save result as **Cabins_Clip.shp** 7. Dissolve layer to remove internal linework 8. Save result as **Cabins_Dissolve.shp** 9. Create singlepart shapefile 10. Save result as **Cabins_Singlepart.shp** 11. Calculate geometry within attributes table to determine the area (ha) of each polygon. 12. Save result as **Cabins.shp**
Assumptions/ Processing Issues	None
Programs	ESRI ArcGIS
Output Filename	**Cabins.shp**
Output Description	Polygons of buffered points where historic cabins have been identified by Weyerhaeuser for avoidance.
Output Attributes	*CABIN*
Polygon Area/Line Length	Total Area – 7 ha
Delivered Theme Name	**Historic Resources**

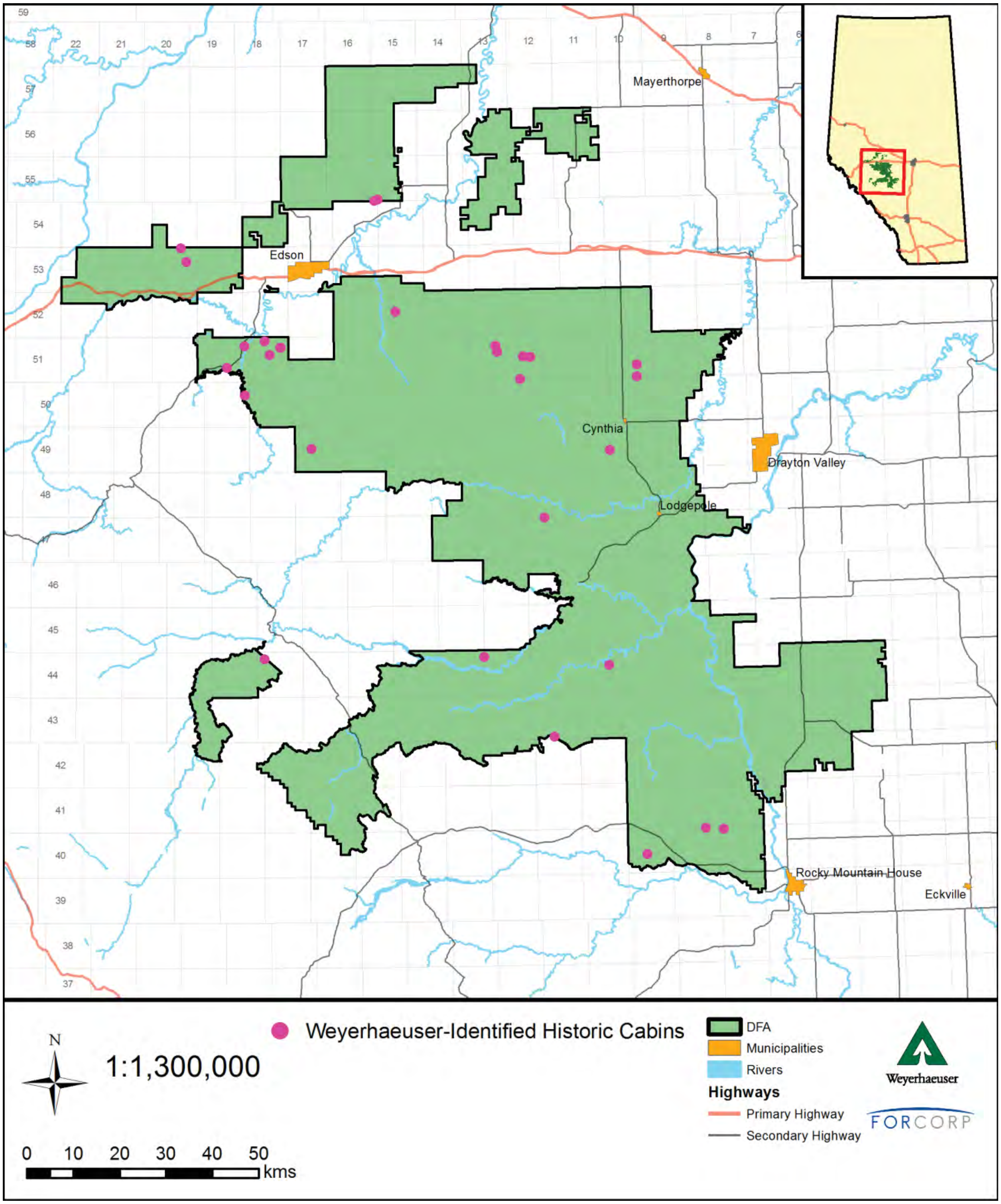

Figure 2.44. Weyerhaeuser identified historic cabins within the DFA.

2.3.45 Temporary Exclusions

Item	Description
Source	Weyerhaeuser
Source Filename	**Exclusion_shs.shp** (Delivered to Forcorp on 2014/08/22)
Description of Source File	Temporary Exclusions
Projection/Datum	Projected, UTM, NAD 1983, UTM Zone 11N
Important Attributes	None
Required Processing	1. Clip source file to R15 FMU boundary 2. Save result as **Exclusions_Clip.shp** 3. Add in the Crimson PNT from the DIDs layer 4. Add in PLS 160001 from the DIDs layer 5. Add field "ex_zone" to the attributes table 6. Assign the polygons in TWP 55, RGE 15 a value of "1" referring to Bear Lake. 7. Assign the polygons in the TWPs 49 and 50 (both RGE 17) a value of "2" referring to Rodney Creek. 8. Assign the PNT polygons south of Crimson Lake with a value of "3" referring to Crimson. 9. Assign the PLS 160001 polygons on the SE border of the O'Chiese First Nation with a value of "4" referring to O'Chiese. 10. Dissolve boundaries to create single polygons based on "ex_zone" field 11. Create new field titled TEMPEXCL and populate with ex_zone values 12. Save result as **Exclusions_Dissolve.shp** 13. Create singlepart shapefile 14. Save result as **Exclusions _Singlepart.shp** 15. Calculate the geometry within attributes table to determine the area (ha) of each polygon. 16. Save result as **TemporaryExclusions.shp**
Assumptions/ Processing Issues	As part of the TSA process (Chapter 6 Section 6.4.16) the Black Mountain working area, Chungo Lookout working area, R12 and E15 grazing leases, and R12 pure deciduous polygons are also identified as temporary exclusions. As these exclusions are generated after the net landbase is created the process to create them is not part of the Required Processing steps above. They are included in this Section and in Figure 2.45 for reference purposes.
Programs	ESRI ArcGIS
Output Filename	**TemporaryExclusions.shp**
Output Description	Single part shapefile showing the temporary exclusions within the Weyerhaeuser Pembina DFA.
Output Attributes	*TEMPEXCL*

Item	Description
Polygon Area/Line Length	Total Area – 77,299 ha Bear Lake – 1,122 ha Crimson – 271 ha O'Chiese – 1,583 ha Rodney Creek – 1,838.36 ha Black Mountain Working Area – 4,551 ha Chungo Lookout Working Area – 5,239 ha E15 and R12 Grazing Leases – 9,027 ha R12 Deciduous Polygons – 53,668 ha
Delivered Theme Name	**Temporary Exclusions**

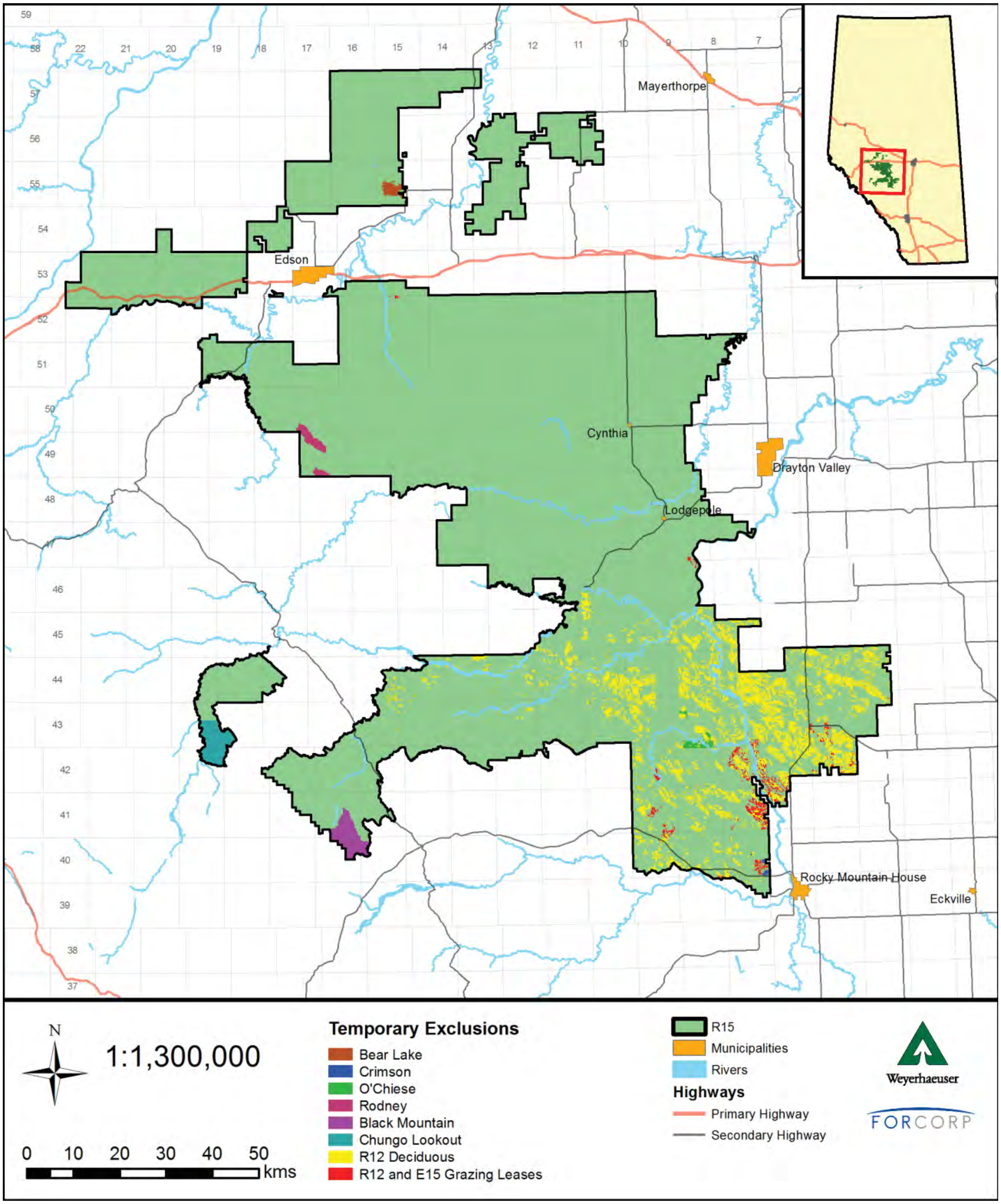

Figure 2.45. Temporary Exclusion Zones within the DFA.

2.3.46 Steep Slopes

Item	Description
Source	Weyerhaeuser
Source Filename	**Slope_deletions.shp**
Description of Source File	Steep slopes within the DFA
Projection/Datum	NAD_1983_UTM_Zone_11N
Important Attributes	SLOPE_CLAS
Required Processing	1. Erase hydrology buffers layer to remove steep slope areas that are due to river banks. 2. Save file as **SteepSlopes_Erase.shp** 3. Clip layer to R15 FMU boundary 4. Save file as **SteepSlopes_Clip.shp** 5. Dissolve layer to remove internal linework 6. Save file as **SteepSlopes_Dissolve.shp** 7. Create singlepart shapefile 8. Save file as **SteepSlopes_Singlepart.shp** 9. Calculate the geometry within attributes table to determine the area (ha) of each polygon. 10. Save result as **SteepSlopes.shp**
Assumptions/ Processing Issues	Steep slopes provided by Weyerhaeuser include all slopes greater than 55% based on LiDAR derived digital elevation models (DEM).
Programs	ESRI ArcGIS
Output Filename	**SteepSlopes.shp**
Output Description	Single part shapefile showing the steep slopes deletions
Output Attributes	*SLOPE*
Polygon Area/Line Length	Total Area – 4,871 ha
Delivered Theme Name	**Operational**

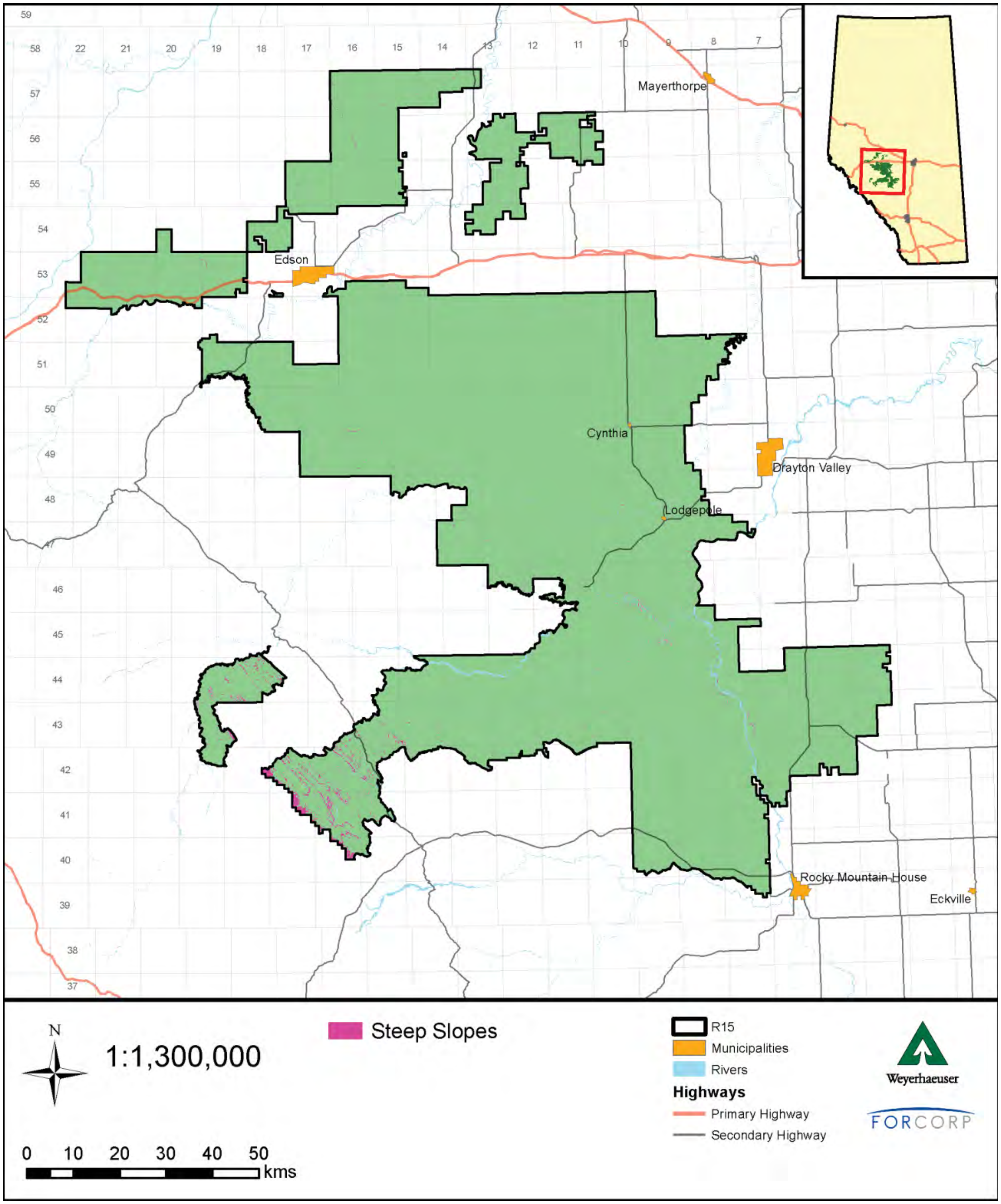

Figure 2.46. Steep Slopes identified by Weyerhaeuser.

2.3.47 Operational and SHS Deletions

Item	Description
Source	Weyerhaeuser
Source Filename	**NorthDeletions_Mar21_16.shp**, OpDeletions_FromARIS, Additional operational deletions provided by Weyerhaeuser in map form. SHS Deletions
Description of Source File	Operational Deletions provided by Weyerhaeuser
Projection/Datum	NAD_1983_UTM_Zone_11N
Important Attributes	None, spatial information is needed but not specific attributes. New field will be generated for output
Required Processing	1. Maps provided by Weyerhaeuser were used to select out polygons that were to be deleted from the Active Landbase. 2. Save result as **OpDeletions_Select.shp** 3. Clip source file to R15 FMU boundary 4. Merge in additional digital Operational and SHS deletions 5. Save result as **OpDeletions_Merge.shp** 6. Dissolve boundaries to remove any potential internal linework 7. Save result as **OpDels_Dissolve.shp** 8. Create singlepart shapefile 9. Save result as **OpDels_Singlepart.shp** 10. Calculate the geometry within attributes table to determine the area (ha) of each polygon. 11. Save result as **OpDels.shp**
Assumptions/ Processing Issues	None
Programs	ESRI ArcGIS
Output Filename	**OpDels.shp**
Output Description	Single part shapefile showing the operational and SHS deletions specified by Weyerhaeuser. SHS deletions were provided by Weyerhaeuser and are taken from the most recent SHS. These deletions include all polygons that are 2 ha or greater in size.
Output Attributes	*OpDel*
Polygon Area/Line Length	Total Area – 3,650 ha
Delivered Theme Name	**Operational**

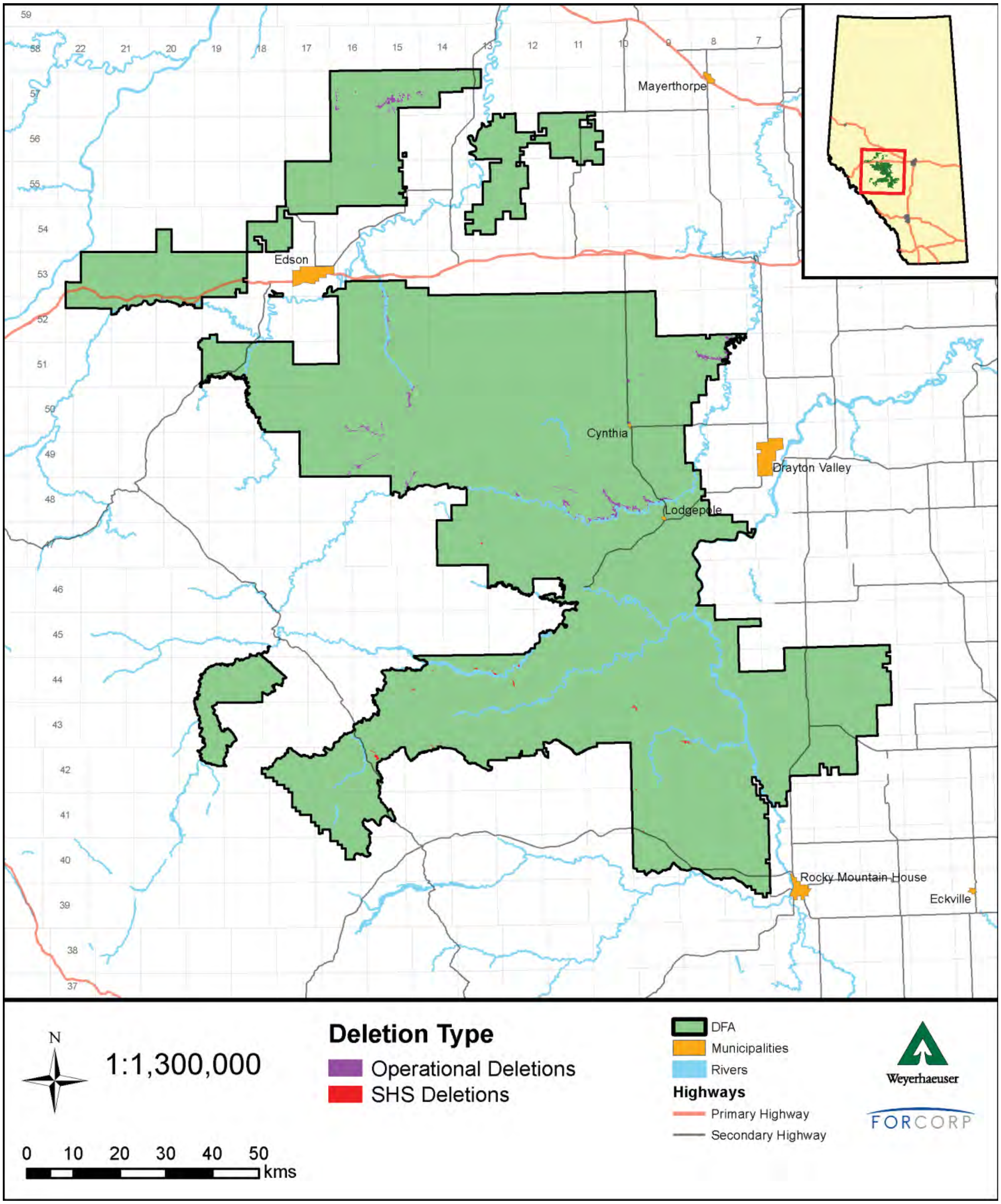

Figure 2.47. Operational Deletions as specified by Weyerhaeuser.

2.3.48 Operational Buffers

Item	Description
Source	Weyerhaeuser
Source Filename	**Buffers**, provided within a geodatabase from Silvacom Online Download (Delivered to Forcorp 2016/02/24)
Description of Source File	Operational Buffers identified by Weyerhaeuser
Projection/Datum	NAD_1983_UTM_Zone_11N
Important Attributes	None, spatial information is needed but not specific attributes. New field will be generated for output
Required Processing	1. Erase the hydrology buffers and steep slopes layers from source layer 2. Save result as **OpBuffers_Erase.shp** 3. Clip source file to R15 FMU boundary 4. Save result as **OpBuffers_Clip.shp** 5. Create singlepart shapefile 6. Save result as **OpBuffers_Singlepart.shp** 7. Calculate the geometry within attributes table to determine the area (ha) of each polygon. 8. Save result as **OpBuffers.shp**
Assumptions/ Processing Issues	None
Programs	**ESRI ArcGIS**
Output Filename	**OpBuffers.shp**
Output Description	Single part shapefile showing the operational planner buffers
Output Attributes	*OPBUFFER*
Polygon Area/Line Length	Total Area – 16,184 ha
Delivered Theme Name	**Operational**

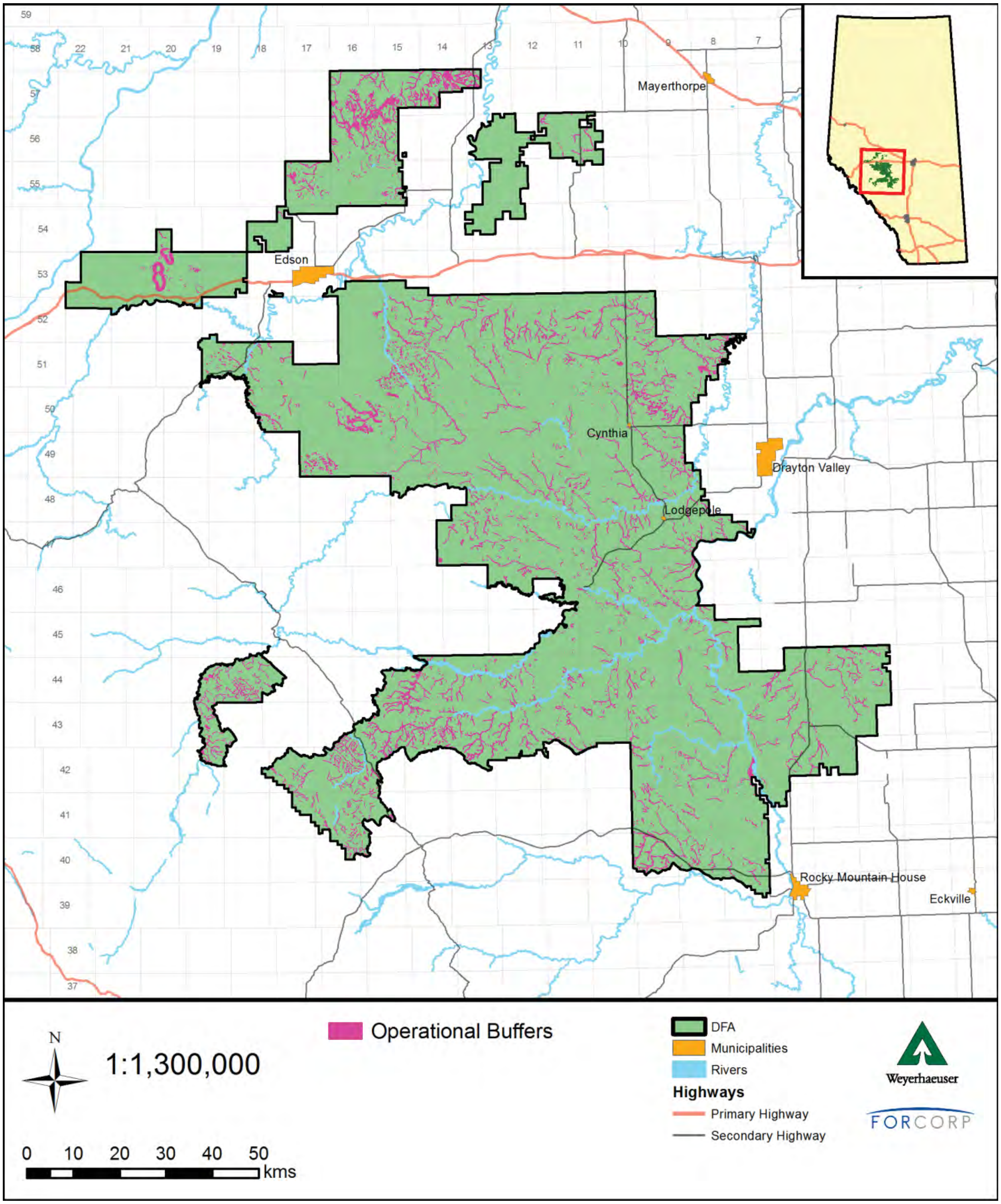

Figure 2.48. Operational Buffers as specified by Weyerhaeuser.

2.3.49 Seismic Lines

Item	Description
Source	Weyerhaeuser
Source Filename	**Weyer_PB_seismic (Delivered on 2015/01/14)** **Seismic lines.shp (Download date: 2014/07/28)**
Description of Source Files	Line features showing the seismic lines found within the Weyerhaeuser DFA
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	None, spatial information is needed but not specific attributes. New field will be generated for output
Required Processing	1. Export Weyer_PB_seismic from geodatabase into shapefile 2. Save result as **Weyer_PB_Seismic.shp** 3. Clip each layer to R15 boundary 4. Save result as **Weyer_PB_Seismic_Clip.shp and SeismicLines_Clip.shp** 5. Merge the line layers 6. Save result as **Seismic_LineFeature.shp** 7. Calculate the geometry for the merged line layer to determine total line length (km) within R15 8. Buffer the merged line layer using a 4 meter buffer, full side type, round line ends and dissolve all intersections 9. Save result as **Seismic_Buffer.shp** 10. Create singlepart shapefile. 11. Save result as **Seismic_Singlepart.shp** 12. Calculate the geometry of the buffer layer to determine the total buffered area (ha) within R15 13. Save result as **Seismic.shp**
Assumptions/ Processing Issues	Seismic lines are assumed to have an average width of 8 meters across the DFA (Weyerhaeuser, 2014a).
Programs	**ESRI ArcGIS**
Output Filenames	**Seismic.shp**
Output Description	Single part shapefiles showing the seismic lines found in the DFA as both line features and as polygons.
Output Attributes	*SEISMIC*
Polygon Area/Line Length	Total Length –83,958 km Total Buffered Area –34,077 ha
Delivered Theme Name	**Seismic**

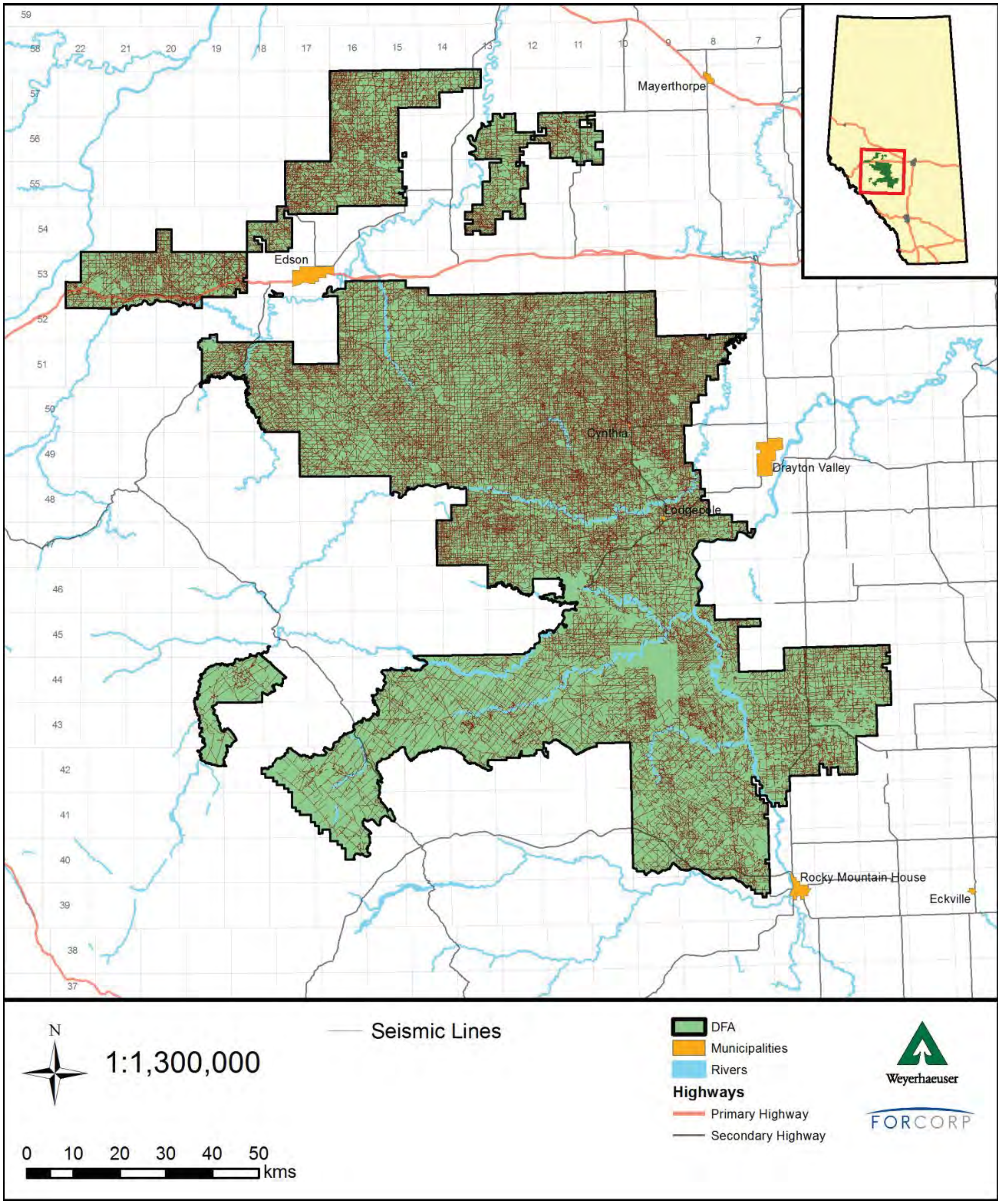

Figure 2.49: Seismic lines within the DFA.

2.3.50 Reforestation Standard of Alberta (RSA)

Item	Description
Source	Weyerhaeuser
Source Filename	**RSA_Merged_Clean_20141127.shp** **RSA_NonWeyer_V2.shp** Additional maps requiring digitization
Description of Source Files	RSA survey polygons from both aerial and non-aerial programs
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	*Unique_ID, Opening, Polygon, Area_ha, NAA, Company*
Required Processing	1. Merge **RSA_Merged_Clean_20141127.shp** with **RSA_NonWeyer_V2.shp** 2. Save result as **RSA_Merge.shp**
Assumptions/ Processing Issues	RSA survey information was added to the pre-landbase AVI by joining it by ARIS number to PLB_ARIS. Many corrections were completed to ensure that the RSA surveys linked to the proper ARIS polygons. Ground surveyed polygons in the RSA database that did not have a map to accompany them were only included if they only had 1 subunit. Any RSA polygons with multiple subunits, but no way to discern the boundaries, are not assigned RSA yield curves.
Programs	**ESRI ArcGIS**
Output Filenames	**RSA_Merge.shp**
Output Description	Shapefile showing RSA polygons
Output Attributes	*UNIQUE_ID, OPENING, POLYGON, AREA_HA, NAA, COMPANY*
Polygon Areas/Line Lengths	Total Area – 15,285 ha
Delivered Theme Name	**RSA**

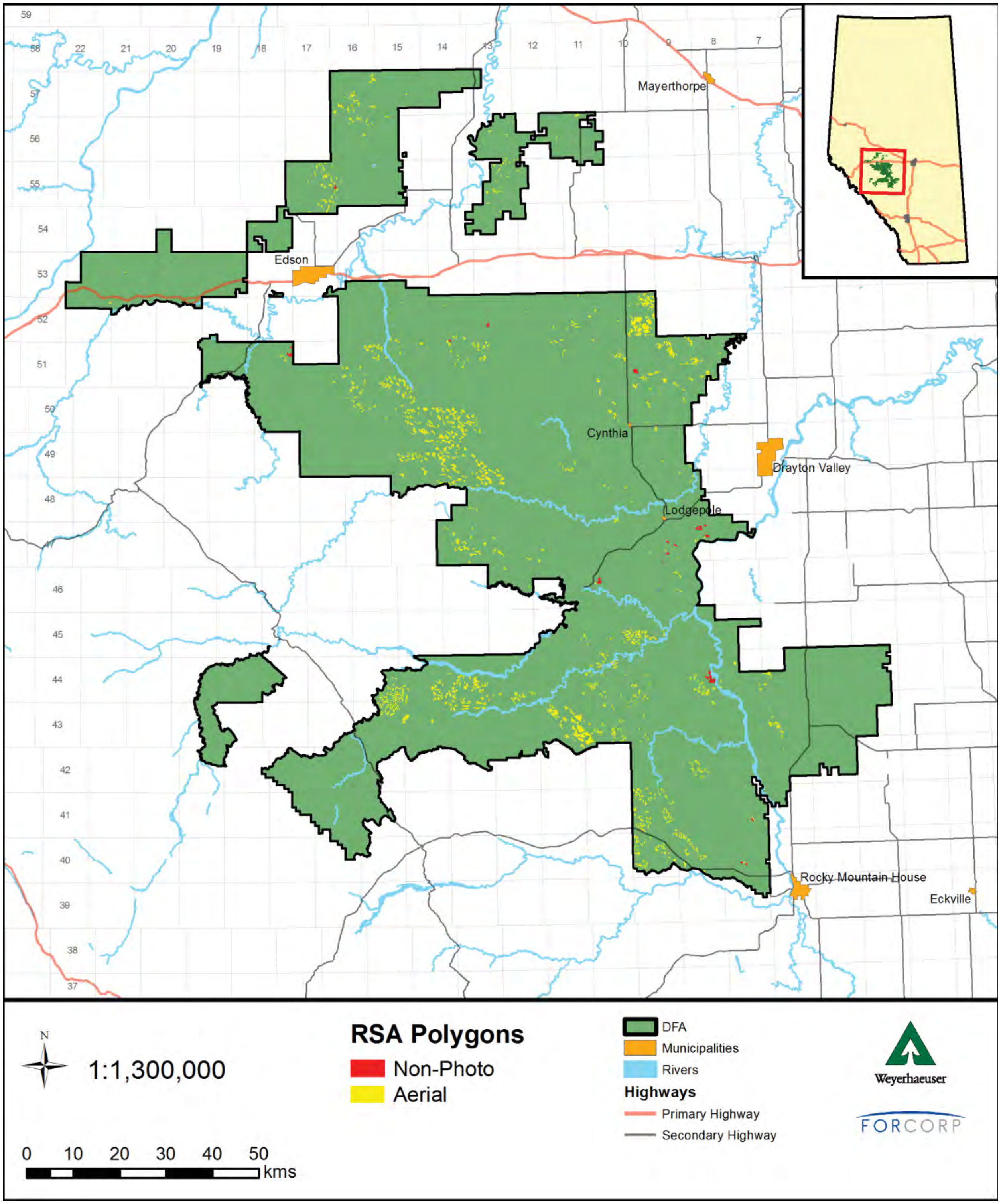

Figure 2.50. RSA polygons within the DFA.

2.3.51 Cutblocks

Item	Description
Source	Weyerhaeuser and all quota holders
Source Filename	Too many files to list, files are provided in accompanying digital files
Description of Source Files	Cutblocks added to the landbase after the AVI photo cutoff date.
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	Field Number, Block Owner, Block Year, Opening Number, Harvest Status (each source file had unique field names for the same data)
Required Processing	1. Merge source files from all companies into single cutblock layer 2. Save result as **Cutblocks_Merge.shp** 3. Edit layer to remove duplicate harvest polygons coming from the same operator 4. Erase all polygons that are present in the pre-landbase AVI that have ARIS numbers. Delete all related slivers remaining after the Erase 5. Save result as **Cutblocks_Erase.shp** 6. Edit layer based on information provided by Weyerhaeuser and quota holders to ensure there are no duplicate ARIS numbers and that all cutblock areas match areas listed in the ARIS database. 7. Create singlepart shapefile. 8. Save result as **Cutblocks_Singlepart.shp** 9. Create CC_FieldNu (block field number), CC_Owner (block owner), CC_BlkYear (timber year), CC_Opening (ARIS number), CC_Source (source file name), CC_Status (harvested), and CC_Strata (declared harvest stratum) fields in the attributes table and populate the fields with the data from each source layer. Populate the CC_Source field with the name of the source file. 10. Calculate the geometry of the buffer layer to determine the total buffered area (ha) within R15 11. Save result as **Cutblocks.shp**
Assumptions/ Processing Issues	Any changes to cutblock linework resulted in the polygon being moved into the pre-landbase AVI and removed from this layer. This allowed for proper adjustments to be made based on neighbouring polygons.
Programs	**ESRI ArcGIS**
Output Filenames	**Cutblock.shp**
Output Description	Cutblocks that were are not part of the pre-landbase AVI.
Output Attributes	*CC_FieldNu, CC_Owner, CC_BlkYear, CC_Opening, CC_Source, CC_Status, CC_Strata*
Polygon Areas/Line Lengths	Total Area – 16,961 ha
Delivered Theme Name	**Operational**

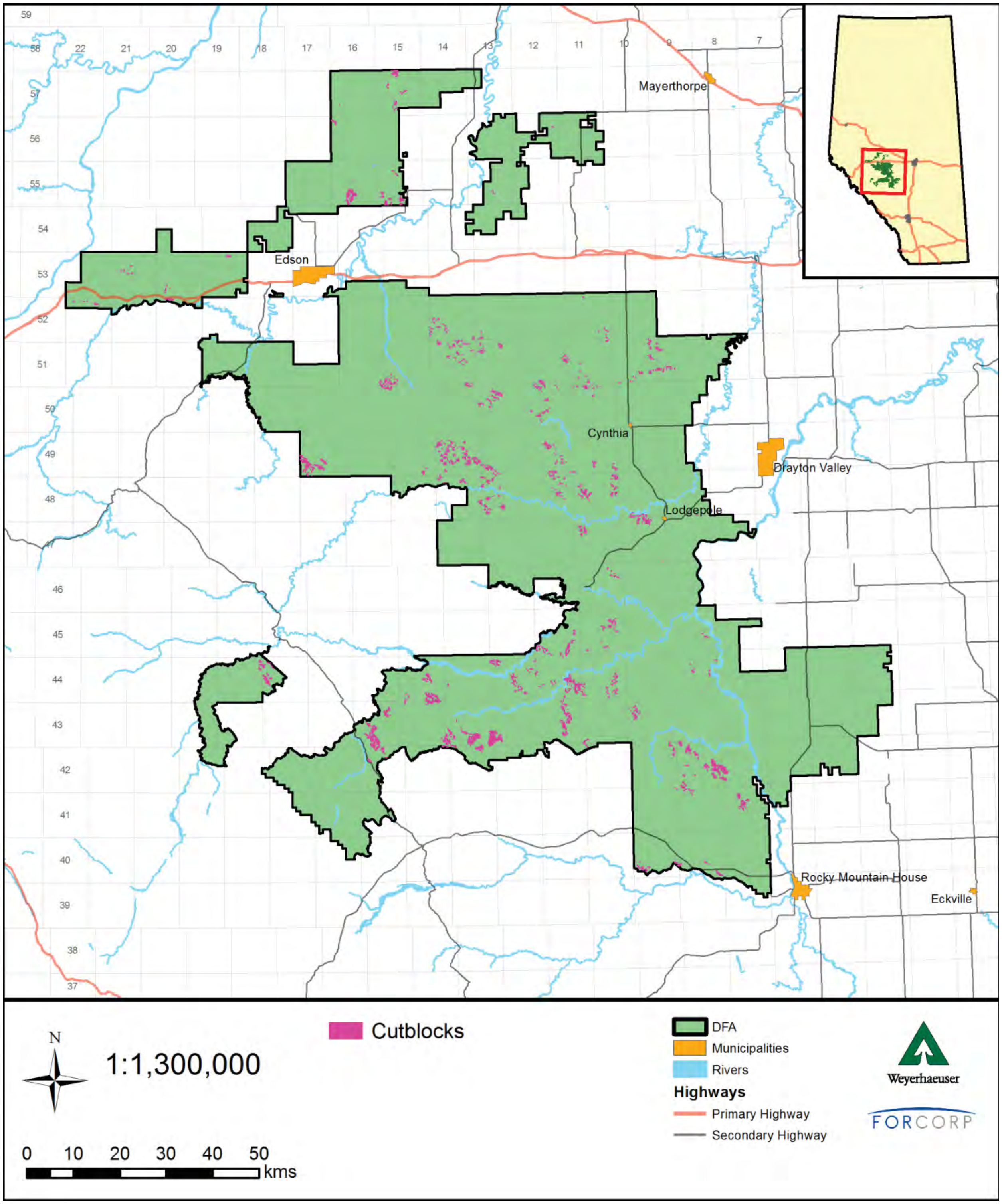

Figure 2.51. Cutblocks harvested within the DFA that are not part of the AVI.

2.3.52 Planned Cutblocks

Item	Description
Source	Weyerhaeuser and Quota holders
Source Filename	Too many to list. Source files are included in digital files
Description of Source Files	Planned Cutblocks that are expected to be harvested after 2015
Projection/Datum	UTM, NAD 1983 UTM Zone 11N
Important Attributes	Opening Numbers, Block Operators, Harvest Status (each source file had unique field names for the same data)
Required Processing	1. Ensure projections of all files is UTM, NAD 1983 UTM Zone 11N 2. Merge all files into a single planned block layer 3. Save result as **PlannedBlocks_Merge.shp** 4. Erase all polygons that are present in the pre-landbase with ARIS numbers, or in the cutblock layer to ensure harvested blocks are removed 5. Save result as **PlannedBlocks_Erase.shp** 6. Edit polygons to ensure linework does not overlap and remove duplicate polygons within the layer 7. Create singlepart shapefile. 8. Save result as **PlannedBlocks_Singlepart.shp** 9. Create PLCC_Open (the planned opening number, if available), PLCC_Owner (cutblock owner), and PLCC_Statu (Plan2, Plan10 or Plan20) fields in the attributes table and populate the fields with the data from each source layer 10. Calculate the geometry of the buffer layer to determine the total buffered area (ha) within R15 11. Save result as **PlannedBlocks.shp**
Assumptions/ Processing Issues	A PLCC_Statu of Plan2 indicates polygons that are harvested or planned to be harvested between 2015 and 2017, between the landbase effective date and the TSA effective date. Plan10 blocks are blocks planned to be harvested after the TSA effective date.
Programs	**ESRI ArcGIS**
Output Filenames	**PlannedBlocks.shp**
Output Description	Planned cutblocks that are expected to be harvested after 2015
Output Attributes	*PLCC_Open, PLCC_Owner, PLCC_Statu*
Polygon Areas/Line Lengths	Total Area – 32,866 ha Plan 2 – 12,542 ha Plan 10 – 19,850 ha Plan20 – 474 ha
Delivered Theme Name	**Operational**

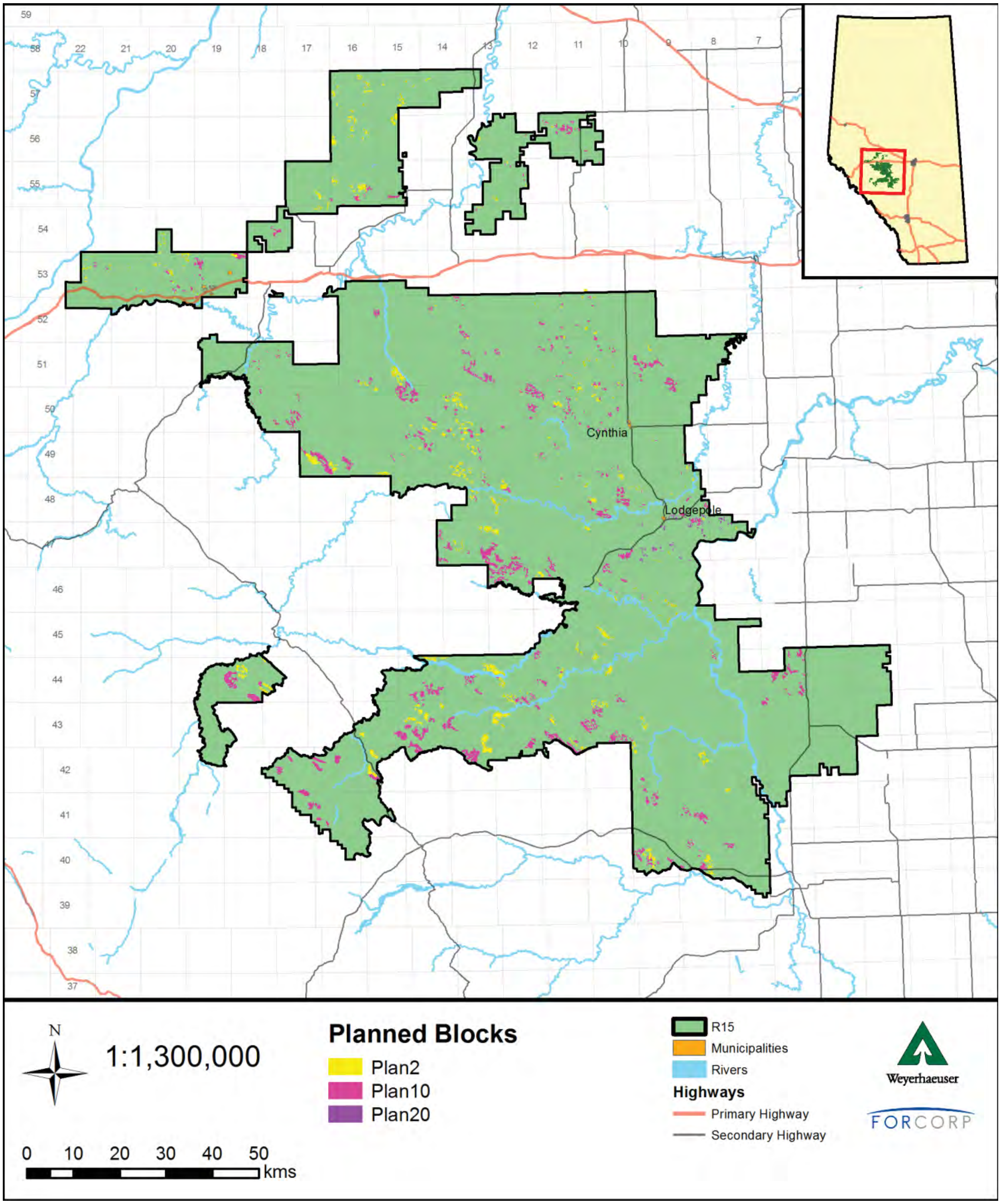

Figure 2.52. Planned Cutblocks that are expected to be harvested after 2015.

3. Development of the Netdown Landbase

3.1 Overview

This section describes the general methods and procedures used to create the final landbase files. Figure 3.1 shows the conceptual process for creating the three landbase datasets previously described (Section 1.4). The process of combining the various datasets in to a single layer is called a '*Multiunion*'. This section describes this process along with the post-processing that cleans this layer and details how the seismic lines are handled in the final landbases.

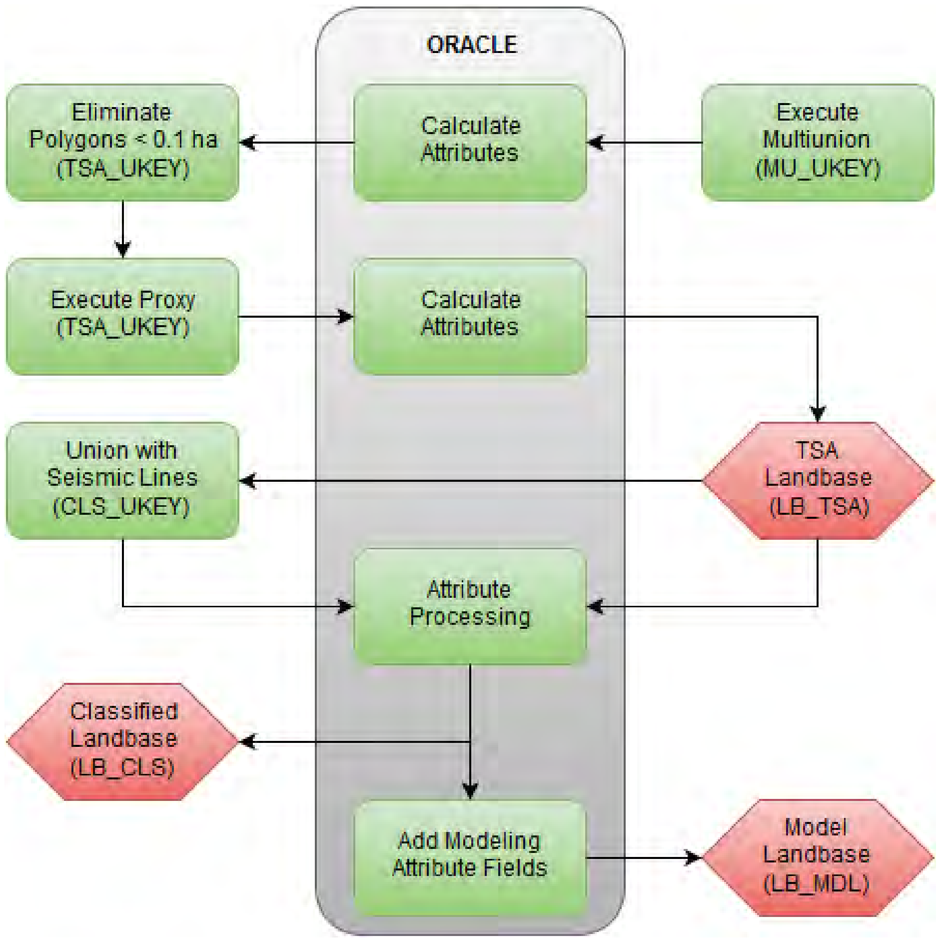

Figure 3.1. Overview of the landbase creation process.

This section also describes how the AVI and the other spatial data layers were used to classify and stratify the landbase for the purpose of determining the active (managed) landbase and the strata within the landbase that will contribute to AAC determination.

This section is divided into parts that will allow the reader to review the specific data and business rules that contribute to the landbase classification. A combination of tables, flow charts and narratives are used to describe the process and the data. The specific scripts used to perform these calculations are provided in the submission package.

The order in which flowcharts and other information is presented in this section represents the order in which they were applied and is thus very important in processing. Values that come first will be at the forefront when conflicts arise between values. For example, spatial resolution of datasets can create results that are not intuitive in the coding world. Slivers and misalignments of datasets will result in the need to place caveats within the code to handle them (*e.g.* RSA blocks on top of rivers). The location as to where these caveats occur affects the end result, and instances of these caveats will be seen in provided figures and scripts.

The general procedure for developing the net landbase is outlined below:

1. Develop the pre-landbase (PLB) (Section 3.2)
2. Multiunion spatial input datasets (Section 3.3)
3. Stratification of the landbase (Section 3.4);
4. Application of landbase deletion rule sets (Section 3.9)
5. Sliver Elimination (Section 3.10.4)
6. Create final landbase classifications (Section 3.12)
7. Create final landbases (Section 3.13).

All input fields in the sections to follow are sourced from the input datasets "important attributes" in Section 2.3.

3.2 Pre-landbase Development

The PLB is essentially a copy of the approved AVI (Appendix II) file where modifications have been applied. All existing AVI attributes were carried forward and remain unchanged; however, the PLB dataset underwent many manual changes (Appendix III). These changes included splitting of features to reconstruct cutblock boundaries, integration of RSA internal linework, updating of AVI attributes (using new field names so that the original attributes are preserved) following close inspection of the data, and reconciliation of opening numbers with ARIS.

Processing of the PLB was performed with the following main objectives:

1. Reconcile with ARIS;
1. Incorporate RSA assignments and linework;
2. Correct obvious attribute errors found in the AVI data; and
3. Provide input into the development of the final net landbase (NLB).

3.2.1 ARIS Reconciliation

Alberta Regeneration Information System (ARIS) is a database that includes information on forest activities submitted by forestry companies as a provincial reporting requirement.

The Alberta Forest Management Planning Standard, Section 3.11 Annex 1 (Alberta, 2006), requires that areas harvested after March 1, 1991 be assigned to a yield stratum as defined in ARIS. It is the responsibility of each operator with harvested areas that will be contributing to the regenerating landbase to ensure that their ARIS records are consistent with the landbase information for each harvested area. Where inconsistencies are found, operators are individually responsible to resolve these to the satisfaction of the AAF (Alberta, 2015).

3.2.1.1 *Processing ARIS Data*

Three separate sets of ARIS data were obtained, as follows:

1. On November 24, 2015 an ARIS extract consisting of 17 separate CSV files for all operators on the DFA was obtained from the AAF (referred to as WY_2016). This extract contained a total of 10,525 openings.
2. On April 7, 2016 an ARIS extract for Sundre Forest Products was obtained from West Fraser. This extract consisted of 21 separate CSV files dated April 7, 2016 (referred to as SFP_2016). This extract contained only 2 openings.
3. On April 25, 2016 an ARIS extract for Edson Forest Products (formerly Sundance Forest Industries) was obtained from West Fraser. This extract consisted of 15 separate CSV files dated May 9, 2014 (referred to as EFP_2014). This extract contained 1,787 openings of which only 133 were on the DFA.

FORCORP's Excel based ARIS processing tool was used to 1) consolidate and 2) process the data in order to determine the final strata assignments, ages, and area for each opening number. The process and final output table (Weyer_2016FMP_ARIS_Extract_Combined) are described in Appendix V.

ARIS Reconciliation

Once the ARIS data processing was complete the final datasets were combined to make one master file. This table was copied into the Oracle database so that the information could be compared to what existed in the AVI or PLB and analysis could begin on completing the first and second phases of the ARIS reconciliation process, *i.e.* one-to-one matching and area variance determination.

One-to-One Matching

The one to one matching is the process for assigning a spatial match for each ARIS record. In summary this process was completed as follows:

- Opening numbers from the pre-landbase dataset and ARIS data were compared to determine which opening numbers matched or did not match between the two tables.
- All openings that did not match were investigated further:
  - Lists on openings were provided to each operator to investigate;
  - Opening numbers were investigated for errors in the number, for example a missing character;
  - The grid, township and range numbers were checked by parsing out the opening numbers to ensure they fell within the DFA boundary.
- Where errors were found in opening numbers regarding alpha characters, the opening numbers were updated in the PLB to create one-to-one matches of opening numbers from ARIS to the landbase.

- Opening numbers in the ARIS table that did not have a match in the landbase were investigated to identify the spatial location. This was also done for cutblocks in the PLB dataset that did not have a matching opening number in the ARIS dataset. Comments were added to the data (ARIS, PLB, etc.) detailing why there was a discrepancy.

Area Variance

The second phase of ARIS reconciliation was to compare the PLB area for each opening to the area reported in ARIS to determine whether or not they were within the allowable variance. For openings greater than or equal to 10 hectares in size, the landbase area must be within 5% of the reported ARIS area; for openings less than 10 hectares in size, the landbase area must be within 0.5 hectares of the reported ARIS area (Alberta, 2015).

There were several steps to complete this phase:

1. Area differences were calculated for each matching PLB and ARIS opening. The area differences were then converted to a percentage (with the ARIS area as denominator), those that had a variance of more than 5% or 0.5 ha, depending on opening size, were flagged;
2. The flagged openings were then individually inspected by the block owner to assess why the areas were outside the allowable variance – comments were made in the dataset to reflect why there was a difference;
3. Where necessary, polygons within the PLB were edited based on information received from each operator to create an area match between the PLB and ARIS. Typical edits included:
   - Splitting cutblocks in the PLB into multiple cutblocks and assigning the correct number to each cutblock;
   - Modifying opening boundaries to match the best available information provided by each operator;
   - Splitting a polygon that had been harvested prior to a disturbance event. In these cases the disturbance boundary crossed the cutblock boundary, making it difficult to identify the original cutblock boundaries. Cutblock boundaries were redrawn to create an area match contributing to the block area, *i.e*. “reconstruction” of the original block;
4. Where PLB and ARIS areas could not be brought within allowable tolerance, a rationale was included in the ARIS table identifying why an area match was not possible. The following rationales were used to identify the reason for the differences:
   - Openings not within the reconciliation population
     - **Pre 1991**- openings harvested on or before March 1, 1991 are not required to be reconciled;
     - **Outside DFA** – openings outside the DFA are not required to be reconciled.
   - Openings within the reconciliation population
     - Openings requiring an area update in ARIS
       - **Update “NHH” - AOP Area Only In ARIS** – the ARIS record does not contain a Net Harvested Hectares (NHH) or valid survey area. As per the ARIS Net Landbase Reconciliation Procedures (Alberta, 2015), the ARIS Annual Operating Plan (AOP) area is not an acceptable value for area reconciliation. All openings with only an AOP area in ARIS should have the NHH updated to reflect the landbase opening area.
       - **Update “NHH” - Update Required Due To New AVI** – the revised PLB cutblock shape is determined to be most accurate representation of the actual cutblock shape and area. The NHH in ARIS should be updated to reflect the current landbase opening area.

  - **Update "NHH" - Update Required Due To Transboundary Issue -** The cutblock is outside tolerance due to a transboundary issue. The NHH area to be updated with the landbase area as it represents what is in the DFA.
  - **Update "Update Area" - Permanent Deletion** – openings which have decreased in size due to a post-harvest anthropogenic disturbance, such as a well site, road, pipeline etc. In these instances the "Update Area" field in ARIS is to be updated with the landbase area.
- Openings NOT requiring an area update in ARIS
  - **ARIS Record to be Deleted** – duplicate openings or openings entirely deleted by another disturbance, *e.g*. a road cannot be reconciled and are to be deleted from ARIS.
  - **New AVI Area Does Not Recognize Retention** – many retention patches do not meet the AVI minimum polygon size limit. This would cause the AVI block area to be slightly larger than the final ARIS area. The cumulative effect of multiple small retention patches may cause some openings to be outside the allowed area tolerance.
  - **No Agreement on Opening Shape or Area** – where an operator does not agree with the AVI opening shape and/or area, the opening will remain outside tolerance and be deleted from the active landbase.
  - **No Area in ARIS – Recent Cutblock** – an ARIS record exists for the opening but no area was recorded at the time of the extract. These records will be updated by the operator in due course.
  - **No Record in ARIS – Recent Cutblock** - no ARIS record existed for the opening at the time of the extract. These records will be captured in ARIS by the operator in due course.
  - **No Record in ARIS – To be Surveyed** - no ARIS record exists for the opening. The openings will be surveyed and ARIS records captured.
  - **No Record in ARIS – ARIS Record to be Created** - no ARIS record exists for the opening. Information exists for these openings but ARIS records were not created, *e.g*. transboundary openings.
  - **No Record in ARIS –** no ARIS record exists for the opening. Some of these are within Provincial Grazing Reserves.
  - **Unknown Location of Opening** – ARIS record exists but location of opening cannot be established.
  - **Within Tolerance** – ARIS and landbase areas are within allowed tolerance.

Openings whose sizes were within the 5.0% or 0.5 ha tolerance did not require investigation or "reconstruction" of the cutblock boundaries. In most cases, however, other ARIS attributes were checked regardless of the area tolerance.

The end result of this process was an ARIS table having either a matching area between it and its spatial record in the PLB, ARIS requiring an area update to match the spatial record, or a rationale indicating the reason why the records do not match. The ARIS table is based on an Excel spreadsheet template provided by the AAF and which is included with the NLB submission (WY_ARIS_SubmissionSpreadsheet_Submitted_20161026.xlsx).

The purpose of this submission is to ensure that data in the raw ARIS dataset is consistent with the processed ARIS data used in the NLB and to ensure that the starting information for the yield curves is consistent with ARIS.

Weyerhaeuser is including the ARIS reconciliation with the NLB submission under RFP validation for both themselves and all embedded operators with post-91 cutblocks on the DFA for the Forest Management Branch (FMB) to review and approve. For openings that required changes in ARIS, sign-off from operators was collected prior to submission. The sign-off demonstrates that each operator agrees with any proposed changes.

3.2.2 RSA Integration

Reforestation Standard of Alberta (RSA) reconciliation was another key component in the data reconciliation process for integration into the final landbase. RSA data plays an important role in yield curve development which is used in the Timber Supply Analysis (TSA) process. With the development of a new AVI dataset for the FMP that is of the similar vintage or newer than that of the RSA data, it changes the process on how RSA is integrated into the landbase. Historically the AVI has been older so the newer RSA linework and data would be cut into the landbase, overriding the AVI linework.

The AAF direction for the completion of the landbase based on new AVI is to use only one representation of a feature (*e.g*. cutblock boundary); the better data source or most up to date representation of the feature is what should be used.

In an effort to reduce the amount of linework cut in for similar features, Weyerhaeuser reviewed and compared every RSA cutblock boundary (aerial program and digitized non-photo blocks where available) to the underlying opening in the PLB. Where the alignment of existing PLB cutblock boundaries were similar to the RSA boundaries, the RSA polygon number was assigned to the existing PLB opening. In cases where there were multiple subunits (SU) present within the RSA that were different from the boundaries found within the PLB, RSA subunits were cut in, and the RSA polygon ID's assigned.

Outlined below are the generalized steps taken to process the RSA data:

Aerial RSA Programs

1. Amalgamate all RSA datasets into one feature class;
2. Spatially compare RSA openings with PLB openings:
   - Where RSA and PLB opening boundaries were similar, the PLB linework was retained;
   - Where RSA and PLB opening boundaries were not similar or where multiple SUs existed in the RSA data and similar internal linework did not exist in the PLB dataset, the RSA interior lines were cut into the PLB dataset.
   - Where the Net Assessment Area (NAA) of an RSA subunit was assigned as 0, all linework was incorporated as this area was surveyed. NAA values of 1 (Anthropogenic Disturbance) or 2 (Retention Patches) did not have RSA surveys conducted and linework was only incorporated if the inclusion of that linework assisted in bringing a cutblock into compliance with ARIS (*e.g.* an in block road may be assigned as NAA 1 if it was not replanted).
3. PLB attributes were updated with the RSA SU number in the PLB attribute column "POLYGON", and the combined ARIS opening number and SU number *(e.g.* 5170592598_1) in the PLB attribute column "RSAUNIQUE".

Non-Aerial RSA Programs

Map of RSA surveyed area available

1. Digitize map;
2. Spatially compare RSA openings from digitized maps with PLB openings:
   - Where RSA and PLB opening boundaries were similar, the PLB linework was retained;
   - Where RSA and PLB opening boundaries were not similar or where multiple SUs existed in the RSA data and similar internal linework did not exist in the PLB dataset, the RSA interior lines were cut into the PLB dataset.
   - Only RSA polygons with a NAA = 0 were integrated into the PLB.
3. PLB attributes were updated with the RSA SU number in the PLB attribute column "POLYGON", and the combined ARIS opening number and SU number (*e.g.* 5170592598_1) in the PLB attribute column "RSAUNIQUE".

Map of RSA surveyed area not available

1. For RSA openings with only a single SU, the RSA information was used to update the PLB attributes where the PLB ARIS number matched the RSA opening number. The RSA SU number was used to update the PLB attribute column "POLYGON", and the combined ARIS opening number and SU number (*e.g.* 5170592598_1) in the PLB attribute column "RSAUNIQUE".
2. RSA openings with multiple SUs were not included in the PLB as there was insufficient information to know how to apply the various SUs to the PLB

The RSAUNIQUE attribute will be used to link the PLB to the original RSA data (Weyer_2016FMP_RSA_InputData_20161019.xlsx) in order to apply the RSA stratum and other attributes to the NLB. A comparison of the original RSA survey area and final landbase area for each subunit (Weyer_2016FMP_RSA_Landbase_Comparison_20161019.xlsx) is also included with the submission package.

3.2.3 Other Changes included in the PLB

As mentioned, the PLB is based on the AVI dataset with updates based on the ARIS reconciliation process, RSA integration, and other changes as required. As the intent is to not change any original AVI attributes, additional fields were added to the dataset to deal with required changes. Changes or inclusions to the original AVI dataset include the following:

1. AVI attributes. To allow for changes to AVI attributes the following new fields were added to the PLB dataset:
   - PLB_ARIS – all entries in the AVI ARIS field were copied to this field. Any changes to ARIS opening numbers were made in the PLB_ARIS field only;
   - PLB_MOD1 - all entries in the AVI MOD1 field were copied to this field. Any changes to MOD1 values were made in the PLB_MOD1 field only;
   - PLB_MOD1YR - all entries in the AVI MOD1YR field were copied to this field. Any changes to MOD1YR values were made in the PLB_MOD1YR field only;
   - PLB_ORIGIN - all entries in the AVI ORIGIN field were copied to this field. Any changes to ORIGIN values were made in the PLB_ORIGIN field only.

   All changes made to the AVI attributes are recorded in Appendix III.

2. RSA fields. To allow for the integration of RSA data into the landbase, the following fields were added to the PLB dataset:
   - POLYGON – RSA subunit number;
   - RSAUNIQUE – combination of the PLB_ARIS and POLYGON fields to enable linking to original RSA data.
3. Ecosite. Ecosite was interpreted for each AVI polygon by Greenlink. The interpretations were added to the PLB by joining the Ecosite layer to the AVI using the POLY_NUM field. Polygons that did not have an ecosite interpreted do not have one assigned in the PLB.
   - ECO1 – the ecosite letter that applies to each polygon.
4. Natural Subregion. As the Natural subregion is required for yield curve assignment, which occurs prior to the inclusion of proxy layers in the NLB process, the Natural Subregion was added to the landbase for all polygons that were assigned an ecosite in the previous step. The assignment of natural subregion was completed manually for all polygons that were not able to have one assigned when ecosite was assigned. Fields added include:
   - NSR – the natural subregion based on edatopic grid
   - NSRCODE – the abbreviated code for each natural subregion

3.3 Multiunion

The underlying structure for the net landbase is the pre-landbase described above. The PLB is simply a modified version of the AVI. Modifications that were required to be made to the AVI were completed in the PLB and included, *inter alia*, updating of ARIS opening numbers, linework updates, and other attribute related updates. All non-proxy or absolute datasets (see Table 2-1 in Section 2.1) were spatially unioned with the PLB which added new linework and attributes to the PLB. The multiunioned dataset was then processed within Oracle SQL to create temporary field values. Once these values were processed, and the link of the table back to the spatial context was made, proxy layers were included and polygon sliver elimination completed.

3.4 Stratification of the Landbase

The final stratification of a stand in the landbase can be based on the AVI, ARIS, harvest stratum assignment (HARVDECL), or RSA information. All natural stands will be stratified based on AVI while cutblock strata can be assigned from any one of the four sources depending on criteria such as age of cutblock (pre- or post-91) and whether or not RSA information exists for a cutblock.

3.4.1 AVI Stratification

All stands in the PLB are stratified based on their AVI attributes. Both the overstorey and understorey are stratified to base 10 and extended strata using the rules outlined in the Planning Standard (Alberta, 2006). The Oracle SQL coding used to achieve the stratifications is included in Appendix IV. The stratification process produces the following fields, which are included in the landbase.

- <sp>_ORD: overstorey species order (ranking), where <sp> represents the various species.
- U<sp>_ORD: understorey species order (ranking), where <sp> represents the various species.

- <sp>_PCT: overstorey species percent (based on crown closure), where <sp> represents the various species.
- U<sp>_PCT: understorey species percent (based on crown closure), where <sp> represents the various species.
- HARDPCT: total overstorey deciduous component expressed as a proportion of 10.
- UHARDPCT: total understorey deciduous component expressed as a proportion of 10.
- SOFTPCT: total overstorey coniferous component expressed as a proportion of 10.
- USOFTPCT: total understorey coniferous component expressed as a proportion of 10.
- LEAD_DEC: leading overstorey deciduous species based on order of deciduous species (<sp>_ORD variables).
- ULEAD_DEC: leading understorey deciduous species based on order of deciduous species (U<sp>_ORD variables).
- LEAD_CON: leading overstorey coniferous species based on order of coniferous species (<sp>_ORD variables).
- ULEAD_CON: leading understorey coniferous species based on order of coniferous species (U<sp>_ORD variables).
- C_CODE: BCG for the stand overstorey (based on sum of <sp>PCT values).
- UC_CODE: BCG for the stand understorey (based on sum of U<sp>PCT values).
- DRULE: the leading overstorey deciduous assignment for the purpose of determining the stratum (function of <sp>_ORD variables).
- UDRULE: the leading understorey deciduous assignment for the purpose of determining the stratum (function of U<sp>_ORD variables).
- CRULE: the leading overstorey coniferous assignment for the purpose of determining the stratum (function of C_CODE and <sp>_PCT variables).
- UCRULE: the leading understorey coniferous assignment for the purpose of determining the stratum (function of UC_CODE and U<sp>_PCT variables).
- B10_STRATA_SRD: the base 10 stratum number for the stand overstorey (derived as a function of the C_CODE, DRULE, CRULE, <sp>_ORD and <sp>_PCT variables).
- B10_USTRATA_SRD: the base 10 stratum number for the stand understorey (derived as a function of the UC_CODE, UDRULE, UCRULE, U<sp>_ORD and U<sp>_PCT variables).
- B10_STRATA_CODE: the overstorey stratum assigned based on the B10_STRATA_SRD code.
- B10_USTRATA_CODE: the understorey stratum assigned based on the B10_USTRATA_SRD code.
- B10_STRATA_NAME: the name of the overstorey stratum assigned based on B10_STRATA_SRD and B10_STRATA_CODE.
- B10_USTRATA_NAME: the name of the understorey stratum assigned based on B10_USTRATA_SRD and B10_USTRATA_CODE.
- STRATA_SRD: The extended stratum code for the overstorey layer.
- USTRATA_SRD: The extended stratum code for the understorey layer.
- AGE: age of the overstorey stand, calculated using the reference year or landbase effective year (2015) minus ORIGIN.
- UAGE: age of the understorey stand, calculated using the reference year or landbase effective year (2015) minus UORIGIN.

Note: All fields are described in further detail in Appendix IV.

3.4.2 ARIS and RSA Stratification

ARIS and RSA stratifications occur outside the landbase netdown process as part of their respective programs. During the landbase process, however, it is required to apply the ARIS and RSA stratifications to the applicable stands in the landbase. In both instances, tables are created from the original ARIS and RSA data and loaded into the Oracle database. Both ARIS and RSA data tables are described in Sections 3.2.1 and 3.2.2, respectively, and are joined to the landbase opening number field (OPENING_ID) in the multiunion table (OPEN_ID in the ARIS table and ARIS_OPENID in the RSA table). The following fields are added to the landbase from the ARIS and RSA tables:

ARIS Fields

- A_OPEN_ID – ARIS opening number
- A_OWNERSHIP- assigned operator
- A_STRATA – ARIS stratum – derived field based on the process outlined in Appendix V
- A_BLOCKYEAR – Clock start year - derived field based on the process outlined in Appendix V
- A_BLOCKERA – Pre- or Post-91 based on A_BLOCKYEAR
- A_AREA – Opening area - derived field based on the process outlined in Appendix V
- A_FIELDNUM – ARIS field number
- A_STRATUMDEC – ARIS stratum declaration
- A_SURVEY – Most recent survey type recorded in ARIS
- A_STOCKING – Stocking status based on survey results
- A_STOCKPER – Total stocking percentage based on survey results
- A_SKIDCLEAR – Skid clear date
- A_LB_DESIG – Landbase designation
- A_NHHAREA – Net harvested hectares from ARIS
- A_RESET_DATE – Date used to determine A_BLOCKYEAR
- A_RESET_SRC – Source of the reset date, ie. either skid clear, reforestation or disturbance date
- A_AREA_SRC – Source of the A_AREA field as described in Appendix V

RSA Fields

- R_POLYGON – RSA subunit number
- R_STRATA – RSA stratum assignment
- R_AGE – Cutblock age based on ARIS (2015 – A_BLOCKYEAR)
- R_OWNER – Operator who owns the RSA data

3.4.3 Harvest Declaration

Section 3.11 (i) (a) of the Planning Standard requires that new harvest areas that have not yet received a stratum declaration should be assigned to a stratum based on their harvest stratum assignment. As this assignment is not in ARIS, this declaration is included in the cutblock layer as CC_STRATA (section 2.3.51).

The rules for applying the final stratum (A_STRATA, R_STRATA, HARVDECL or AVI) to each stand are discussed in Section 3.12.3.

3.5 Assignment of Opening Numbers

On completion of the multiunion process, multiple sources of opening numbers become evident in the multiunioned dataset, including the following fields:

- ARIS: original AVI opening number (Section 2.3.1);
- PLB_ARIS: updated AVI opening number (Section 3.2),
- CC_OPENING: post AVI cutblock opening number (Section 2.3.51),
- PLCC_OPEN: planned cutblock opening number (Section 2.3.52), and
- A_OPEN_ID: ARIS opening number (Section 3.4.2).
- RSAUNIQUE: Combination of opening number and RSA SU number (Section 2.3.50).

In order to clearly identify which opening number to use for each polygon in the landbase, a new field was added, *i.e.*:

OPENING_ID: This field is derived from the PLB_ARIS, CC_OPENING or PLCC_OPEN fields, based on the logic outlined in Figure 3.2.

The A_OPEN_ID and RSAUNIQUE opening numbers are used to join the tabular ARIS and RSA data to the landbase to bring in the required information for those records, including but not limited to strata and age.

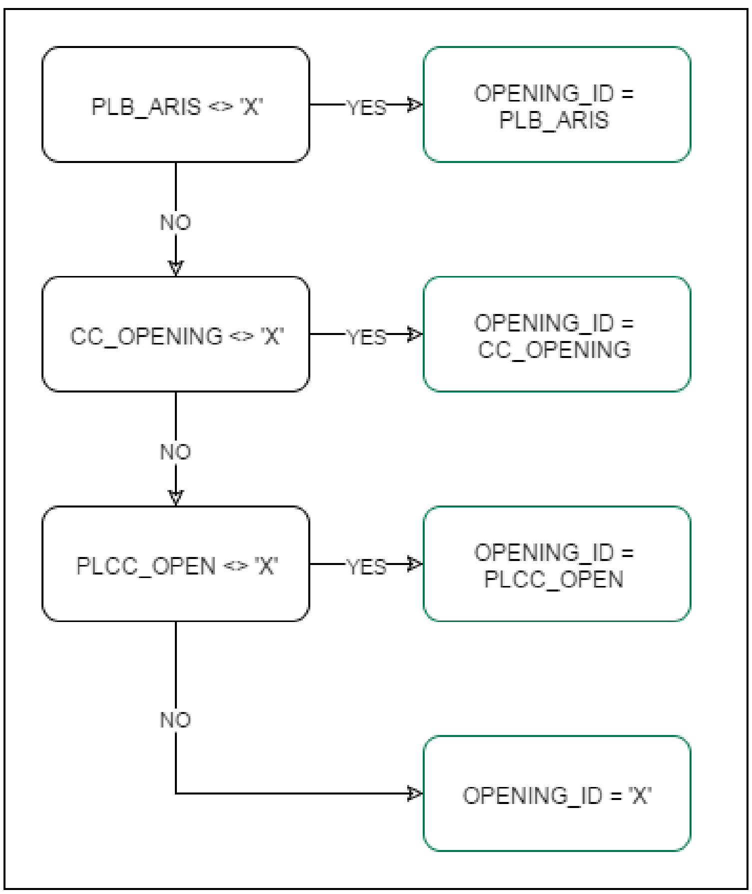

Figure 3.2: Criteria used to assign final opening numbers (OPENING_ID) to the landbase.

3.6 Pine Strategy Stand Ranking

On September 20, 2016 AAF issued an update to section 17 of the *Interpretive Bulletin - Planning Mountain Pine Beetle Response Operations* (Alberta, 2007). This update provides a revised method for the evaluation of stands for pine strategy stand ranking (Alberta, 2016).

The existing Interpretive Bulletin utilizes a climate factor, pine rating (stand susceptibility index) and a compartment risk to assign ranks (1-3) to stands. The revised stand ranking model utilizes a stand level predicted r-value to estimate relative population success for a stand rather than a climate factor.

The following sections describe how the stand ranking system is applied in the landbase.

3.6.1 Stand Susceptibility Index

Stand Susceptibility Index (SSI) is a measure of the physical characteristics of a stand that determine its Mountain Pine Beetle (MPB) habitat suitability, without considering the climate or location of the particular stand. SSI values range from 0 to 100, where higher numbers indicate a higher susceptibility. The SSI is calculated using a formula adapted from Shore, T.L. and Safranyik, L. (1992) that uses AVI attributes to assign a value to each polygon. The formula is as follows:

$$SSI = P\ x\ A\ x\ D$$

where:

P = percentage of susceptible pine basal area;
A = age factor; and
D = density factor.

SSI values for all AVI polygons on the DFA were calculated by AAF and provided in a spatial file that was used to assign the SSI value to the landbase (Section 2.3.27).

3.6.2 Compartment Risk

Compartment risk is an AAF assessment of the probability that a compartment will be attacked based on existing MPB populations, prevalent wind direction, local knowledge, the likely path of spread due to topography (and resulting barriers to movement), and the connectivity of a given compartment to MPB populations via susceptible pine stands. Since the compartment risk is a general assessment of beetle pressure alone, R value, climate, elevation, and the amount of susceptible pine within the compartment are not considered (Alberta, 2016). Risk assessments for the compartments in the Weyerhaeuser DFA (Table 3-1) have been assigned one of the following criteria:

- Very High – compartment contains active MPB populations, or active population is ≤6 km away (i.e. MPB present or expected within three years);
- High - compartment is >6 and ≤12 km from an active MPB population (i.e. MPB expected within >3 and ≤6 years);
- Moderate - compartment is >12 and ≤20 km from an active MPB population (i.e. MPB expected within >6 and ≤10 years); or
- Low – compartment is >20 km from an active MPB population (i.e. MPB expected in >10 years).

Table 3-1. Compartment risk for MPB within the DFA.

Compartment	Compartment Risk
Baptiste	Low
Beaver Meadows	High
Brazeau	High
Edson	Very High
Macmillan	Very High
Medicine Lake	Moderate
Nordegg	Low
South Canal	Moderate
West country	Low
Wolf Lake	Very High

3.6.3 Stand Level Predicted R Value

R value is an estimate of relative female MPB productivity for stands that contain at least 20% pine in both the over- and understorey (with mean tree heights of at least 5 metres) as determined by tree size, location, and weather. Modelling variables include mean stand DBH, elevation, latitude, and minimum temperature experienced during the overwintering period. Mean stand DBH was derived from AVI stand height, and minimum temperature was estimated by averaging results from the Canada_USA 1981-2010 Normals database and BioSIM (the historic lowest temperature between September and May annually). Predicted R values are categorized into Low (0-2), Moderate (2.1 – 4.5), High (4.6 – 5.8), and Very High (5.9 – 9.2) (Alberta, 2016).

3.6.4 Final Pine Stand Ranking

When combined into a matrix, SSI, compartment risk, and R value form a stand ranking system for Pine Strategy FMP planning and implementation (Table 3-2). Much of the DFA is of middle ranking (Rank 2), while the highest priority stands (Rank 1) are generally found in the central and northwest parts of the DFA. The lowest priority stands (Rank 3) are in the south, as well as in the Beaver Meadows compartment (Figure 3.3).

Table 3-2. Pine stand ranking matrix.

Stand Level Predicted R value	Stand Susceptibility Index 1 to 22	Stand Susceptibility Index 23 to 63	Stand Susceptibility Index 64 to 100	Compartment Risk
Low	Rank 3	Rank 3	Rank 3	Low
Low	Rank 3	Rank 3	Rank 3	Moderate
Low	Rank 3	Rank 3	Rank 2	High
Low	Rank 3	Rank 2	Rank 2	Very High
Moderate	Rank 3	Rank 3	Rank 3	Low
Moderate	Rank 3	Rank 3	Rank 2	Moderate
Moderate	Rank 3	Rank 2	Rank 2	High
Moderate	Rank 3	Rank 2	Rank 2	Very High
High	Rank 3	Rank 3	Rank 3	Low
High	Rank 3	Rank 2	Rank 2	Moderate
High	Rank 3	Rank 2	Rank 1	High
High	Rank 2	Rank 1	Rank 1	Very High
Very High	Rank 3	Rank 2	Rank 2	Low
Very High	Rank 3	Rank 2	Rank 1	Moderate
Very High	Rank 2	Rank 1	Rank 1	High
Very High	Rank 2	Rank 1	Rank 1	Very High

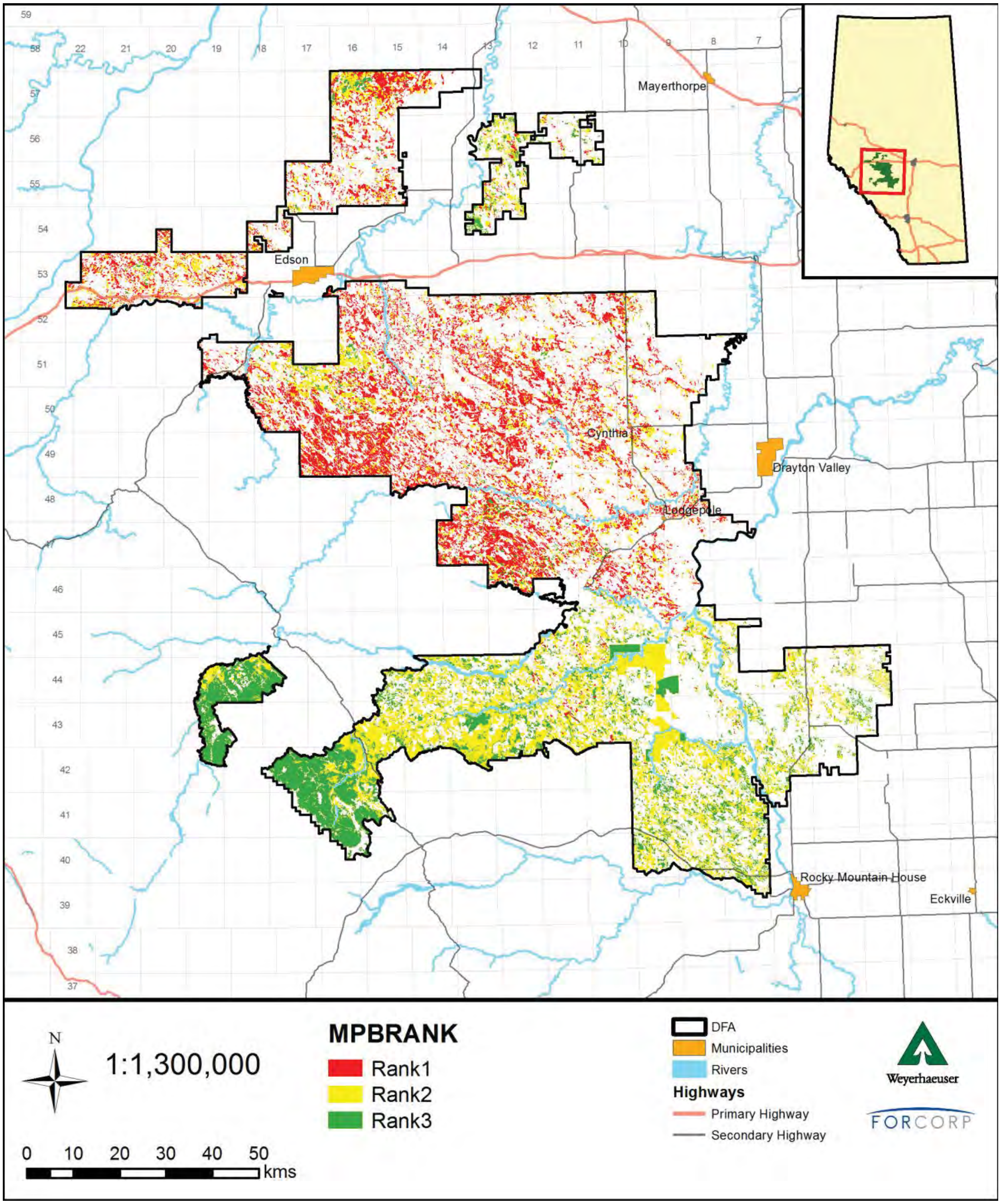

Figure 3.3. Pine Strategy stand ranking within the DFA.

3.7 SHS Deletions and Deferrals from Previous FMPs

Weyerhaeuser tracks and manages their current SHS through Silvacom's SHS Manager Program. All deletions and deferrals from the current SHS were reviewed and addressed as follows in the development of the net landbase:

- Deletions. All stands greater than or equal to 2 hectares and not deleted for another reason are removed from the active landbase (Sections 2.3.47 and 3.10.3.6).
- Deferrals. Stands deferred from the current SHS are neither deferred nor deleted from the active landbase. If necessary, these stands will be dealt with as operators review and validate the new PFMS SHS.

3.8 Defining the Managing Layer

Forested stands on the landbase were interpreted in the AVI to include both overstorey and understorey characteristics. Weyerhaeuser has identified a specific selection of stands where the understorey is to be used as the Storey of Primary Management (SOPM). The following field has been added to the landbase to identify which storey is to be used as the SOPM:

SOPM: This field identifies whether the AVI polygon is to be managed according to the:
- 1 - Overstorey; or
- 2 – Understorey.

Only stands that meet the following criteria are assigned an SOPM = 2:
- Base 10 overstorey stratum = 'Aw' and overstorey density = 'A';
- Understorey density is 'B', 'C' or 'D'; and
- PLB_MOD1 = 'CC', ARIS block era is not Post91 and the understorey age > 24.

All other stands are assigned SOPM = 1. Figure 3.4 shows the process used to assign stands to a SOPM. Table 3-3 summarizes the landbase area by SOPM.

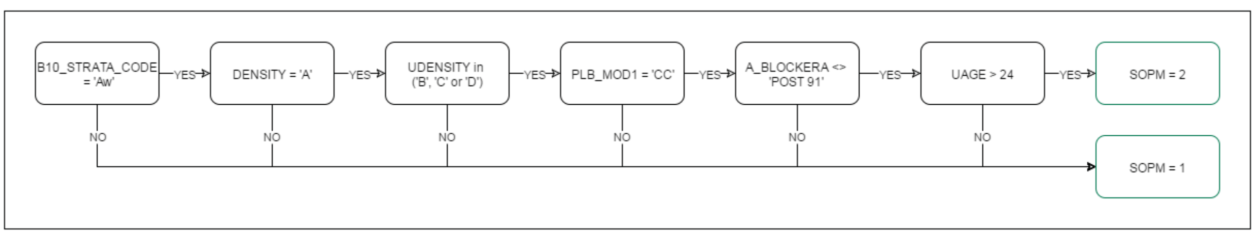

Figure 3.4: Criteria used to assign storey of primary management (SOPM) to the landbase.

Table 3-3. Landbase area by storey of primary management.

	Landbase Area (Ha)		
SOPM	Active	Passive	Total
1	541,165	519,594	1,060,758
2	6,299	358	6,657
Total	**547,464**	**519,951**	**1,067,415**

3.9 Partially Stocked Openings

In accordance with the ARIS Net Landbase Reconciliation Procedures (Alberta, 2015), all openings with a "Not Satisfactorily Restocked" (NSR) condition resultant from a performance survey must be assigned yield curves based on their stocking.

Stands with stocking less than or equal to 50% and which are declared as non-forested by AVI 2.1.1 standards are removed from the productive landbase (Section 3.10.3.5). The remaining NSR stands remain in the active landbase and are assigned to one of the following two categories for yield curve assignment purposes (Weyerhaeuser, 2016b):

Openings with total stocking <= 50%

A weighted average stocking percentage is calculated for all the openings and used to determine an adjustment factor to be applied to the RSA yield curves for all the openings. Table 3-4 shows the eight NSR openings with <= 50% stocking in the landbase.

Table 3-4. Openings in the productive landbase with NSR condition resultant from a performance survey and stocking <= 50%.

OPEN_ID	OWNERSHIP	STRATUM	BLOCKYEAR	LB AREA	STOCKING %
5070440115A	WEYR	AwSx	1994	8.36	42.20
5070441470A	WEYR	AwSx	1994	16.57	46.90
5120561476A	WEYR	SwAw	1996	26.20	41.90
5120561579A	WEYR	Sw	1996	2.17	41.50
5150520080	WEYR	Sw	1991	9.47	50.00
5150520081	WEYR	Sw	1991	5.89	46.90
5150571513	LFS	Pl	1993	3.40	32.60
5160502670	WEYR	Pl	2001	17.29	29.70
Total / Area Weighted Average				**89.35**	**41.32**

The area weighted average stocking percentage for the openings is 41.32%. Based on the assumption that 80% represents a fully stocked status, the adjustment factor to be applied to the yield curves for these openings is calculated as:

*41.32 / 80 * 100 = 51.6%.*

Openings with total stocking > 50% and < 80%

A weighted average stocking percentage is calculated for all the openings and used to determine an adjustment factor to be applied to the RSA yield curves for all the openings. Table 3-5 shows the 33 NSR openings with > 50% but < 80% stocking in the landbase.

The area weighted average stocking percentage for the openings is 71.63%. Based on the assumption that 80% represents a fully stocked status, the adjustment factor to be applied to the yield curves for these openings is calculated as:

*71.63 / 80 * 100 = 89.5%.*

The procedure described above allows for the usage of only two multipliers for all NSR stands *i.e*. a single multiplier for the entire <=50% stocking population and a single multiplier for the entire >50% and <80% stocking population. Minimizing the number of multipliers used is important because of the impracticality of creating and applying additional yield curves for each NSR opening.

Table 3-5. Openings in the productive landbase with NSR condition resultant from a performance survey with stocking >50% and <80%.

OPEN_ID	OWNERSHIP	STRATUM	BLOCKYEAR	LB AREA	STOCKING %
5070432031	WEYR	AwSx	1993	6.82	58.20
5070432038	WEYR	AwSx	1993	10.88	64.70
5070432081	WEYR	AwSx	1993	47.33	69.70
5070433214	WEYR	AwSx	1993	1.80	65.90
5070433255	WEYR	SwAw	1993	3.18	79.10
5070433299	WEYR	AwSx	1993	23.44	77.50
5070433325A	WEYR	AwSx	1993	26.95	77.40
5070440345A	WEYR	Sw	1993	13.96	70.80
5070440998A	WEYR	SwAw	1994	5.42	65.60
5070441296A	WEYR	Sw	1994	9.46	58.50
5080452385A	WEYR	Aw	1996	0.37	71.40
5090412639	WEYR	Sw	1992	4.01	66.70
5090413555	WEYR	Sw	1992	16.76	72.30
5090420228	WEYR	Pl	1992	4.14	72.70
5090463086	WEYR	Sw	1990	14.06	70.80
5100401859A	WEYR	Aw	1997	2.19	63.40
5100413039A	WEYR	Aw	1998	24.73	68.10
5100433454	WEYR	AwSx	1994	10.81	78.50
5100441721A	WEYR	AwSx	1994	5.69	51.60
5110441178A	WEYR	Aw	1994	11.41	68.80
5110480245A	WEYR	Aw	1993	6.12	76.80
5110500496	WEYR	Sw	1992	11.39	73.90
5110502338A	WEYR	SwAw	1995	53.51	69.80
5110560889A	WEYR	Aw	1996	14.34	78.10
5110562938A	WEYR	SwAw	1994	33.52	77.70
5110563130A	WEYR	Aw	1994	24.06	75.00
5120440783	WEYR	AwSx	1991	2.67	68.30
5120441637	WEYR	Pl	1991	15.16	75.00
5120562193A	WEYR	AwSx	1996	22.27	60.60
5120562286A	WEYR	Aw	1996	19.52	76.60
5130470840A	WEYR	Aw	1995	1.87	55.00
5150520083	WEYR	Sw	1991	5.75	60.90
5170511176A	WEYR	Aw	1999	27.01	78.10
Total / Area Weighted Average				**480.61**	**71.63**

3.10 Application of Landbase Deletion Rule Sets

Landbase deletion refers to the process of deleting features from the active landbase and assigning them to the passive landbase. The features are not physically removed from the landbase, but as they cannot, for various reasons, contribute to timber harvesting on the DFA, they are assigned to the passive landbase.

All the parameters required for assigning deletions are contained within the landbase; they are sourced from either the base AVI or from the spatial datasets that have been multiunioned with the AVI. Any one polygon on the landbase could potentially have multiple reasons to be treated as a deletion. Once all potential deletion assignments are made to each polygon, a hierarchical process is used to assign the final deletion (Section 3.12.1).

The landbase deletions are categorized into three categories as follows:

- Administrative;
- Landscape; and,
- Operational.

The following sections discuss the rules used to assign the various deletions within the above categories.

3.10.1 Administrative Deletions

Administrative deletions are sourced from various administrative boundaries that overlap the DFA. Although these areas may contain forested stands, they are removed from the timber harvesting landbase.

3.10.1.1 *D_ADMIN: Administrative deletions*

Administrative deletions are identified in the D_ADMIN field. These are areas identified as First Nations Reservations, parks and protected areas, special land use areas, hamlets, or private land. Figure 3.5 shows the program logic applied to the net landbase table to assign a value to D_ADMIN. Field definitions are presented in Table 3-6.

Table 3-6. D_ADMIN field definitions.

D_ADMIN	Description
FN	First Nations Reservation
PPA	Parks and protected areas
SPECIAL	Special Land Use or Natural Areas
HAMLET	Hamlet (Cynthia/Lodgepole)
PRIVATE	Private land
X	Not a deletion

As it is possible that any one stand in the landbase could potentially be deleted for more than one of the reasons listed in Table 3-6, the D_ADMIN field is populated with the first reason based on the hierarchy shown in Figure 3.5. This same logic applies to each of the deletion categories discussed in the following sections.

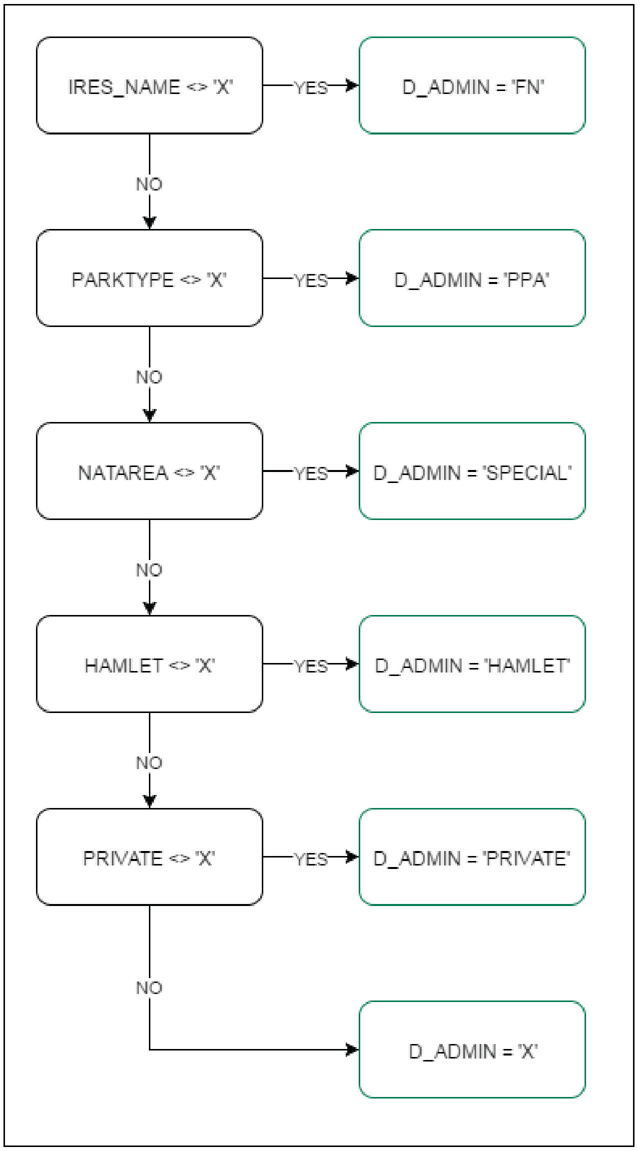

Figure 3.5. Criteria used to assign administrative deletions (D_ADMIN) to the landbase.

3.10.2 Landscape Deletions

Landscape deletions are areas where the land condition is not conducive to timber harvesting or the area forms part of a buffer included to protect a water body or other feature. Typically, this deletion type is comprised of anthropogenic features, non-forested areas, and prescribed buffer areas around hydrology or other features. This section details how landscape deletions are applied in the landbase.

3.10.2.1 *D_ACCESS: Access deletions*

Access deletions are areas that are identified as roads within the Weyerhaeuser DFA. These deletions can come from the AVI dataset or from Alberta's Digital Integrated Disposition System (DIDS). Figure 3.6 shows the program logic applied to the net landbase table to assign a value to D_ACCESS. Field definitions are presented in Table 3-7.

Table 3-7. D_ACCESS field definitions.

D_ACCESS	Description
ROAD	Road feature
X	Not a deletion

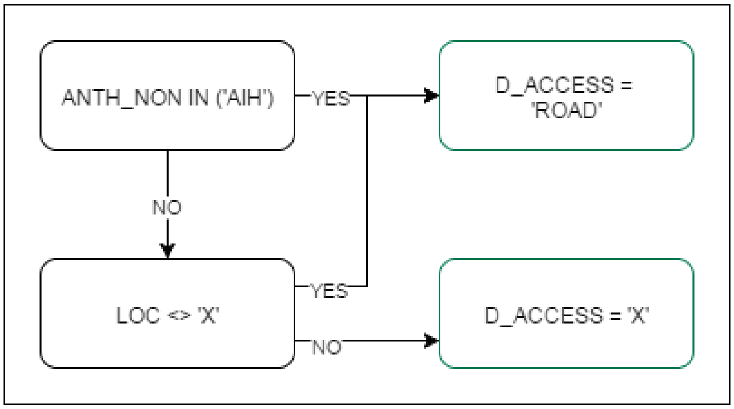

Figure 3.6. Criteria used to assign access deletions (D_ACCESS) to the landbase.

3.10.2.2 *D_ANTHRO: Anthropogenic Deletions*

Anthropogenic features are sourced from either the AVI or from DIDS. Figure 3.7 shows the program logic applied to the net landbase table to assign a value to D_ANTHRO. Field definitions are presented in Table 3-8.

Table 3-8. D_ANTHRO field definitions.

D_ANTHRO	Description
ANTHNON	Anthropogenic Non-vegetated
ANTHVEG	Anthropogenic Vegetated
GRAZING	Provincial Grazing Reserve
PNT	Protected Notation
PSP	Permanent Sample Plot
DIDs	Other landuse dispositions
FIRESMART	FireSmart Treatments
CABIN	Historical Cabin
HRV	Historical Resource Value 1 or 3
X	Not a deletion

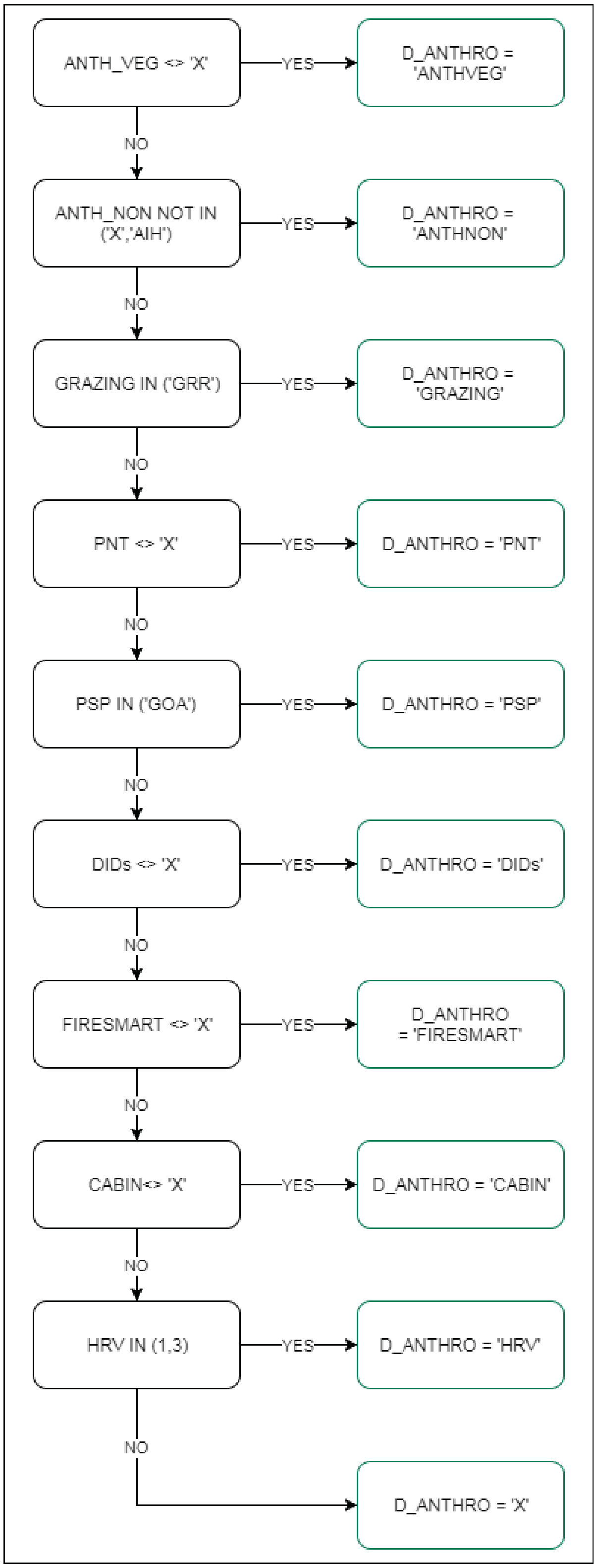

Figure 3.7. Criteria used to assign anthropogenic deletions (D_ANTHRO) to the landbase.

3.10.2.3 *D_HYDRO: Hydrologic Deletions*

Hydrologic deletion types identify hydrological feature types found within the AVI dataset and within the provincial hydrology layer. Figure 3.8 shows the program logic applied to the net landbase table to assign a value to D_HYDRO. Field definitions are presented in Table 3-9.

Table 3-9. D_HYDRO field definitions.

D_HYDRO	Description
WATER	Lakes, rivers and streams
FLOOD	Flooded areas
AQUATIC	Aquatic areas (AVI)
X	Not a deletion

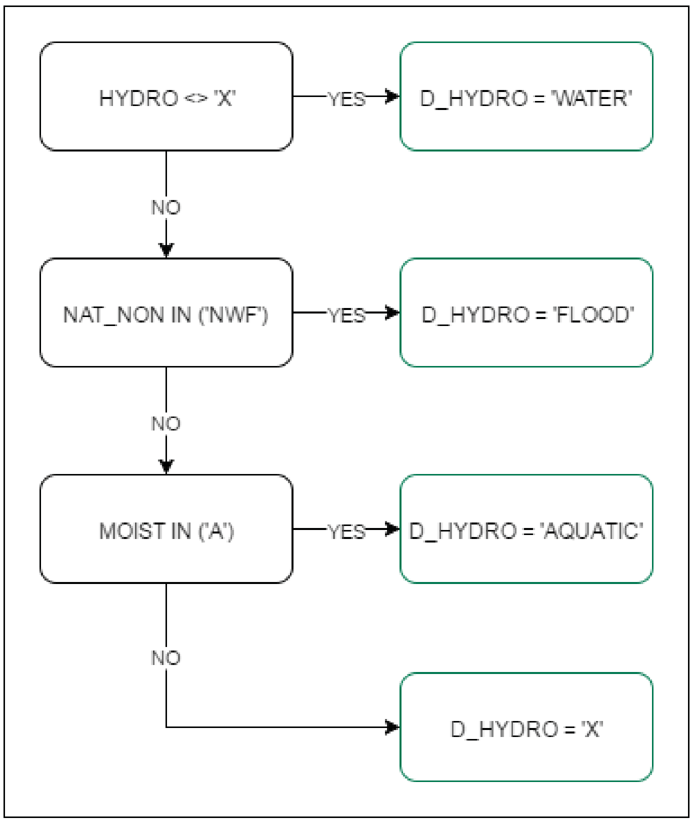

Figure 3.8. Criteria used to assign hydrologic deletions (D_HYDRO) to the landbase.

3.10.2.4 *D_BUF: Buffer Deletions*

Operating ground rules stipulate that water buffers will be removed from the active landbase (Section 2.3.20). For the protection of Nesting Bird habitat, nesting sites are also buffered to limit disturbance (Section 2.3.24). Figure 3.9 indicates the program logic applied to the net landbase table to assign a value to D_BUF. Field definitions are presented in Table 3-10.

Table 3-10. D_BUF field definitions.

D_BUF	Description
WATERBUF	Lake, river and stream buffers
SWAN	Trumpeter swan
COLONIAL	Colonial Nesting Bird
X	Not a deletion

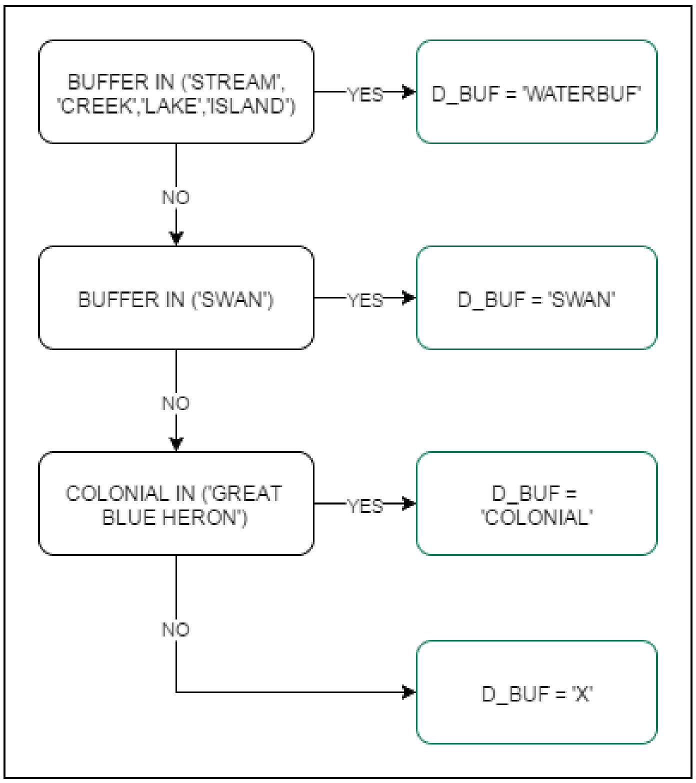

Figure 3.9. Criteria used to assign buffer deletions (D_BUF) to the landbase.

3.10.2.5 *D_NONFOR: Non-forested Deletions*

Non-forested deletions include non-forested or non-vegetated areas such as water, anthropogenic features, and naturally non-treed areas. There are two classes; NNF which is naturally non-forested areas identified by using the AVI non-forest-land codes, and NNV which is naturally non-vegetated areas identified by using the AVI non-vegetated code. Figure 3.10 indicates the program logic applied to the net landbase table to assign a value to D_NONFOR. Field definitions are presented in Table 3-11.

Table 3-11. D_NONFOR field definitions.

D_NONFOR	Description
NNV	Naturally non-vegetated
NNF	Naturally non-forested
X	Not a deletion

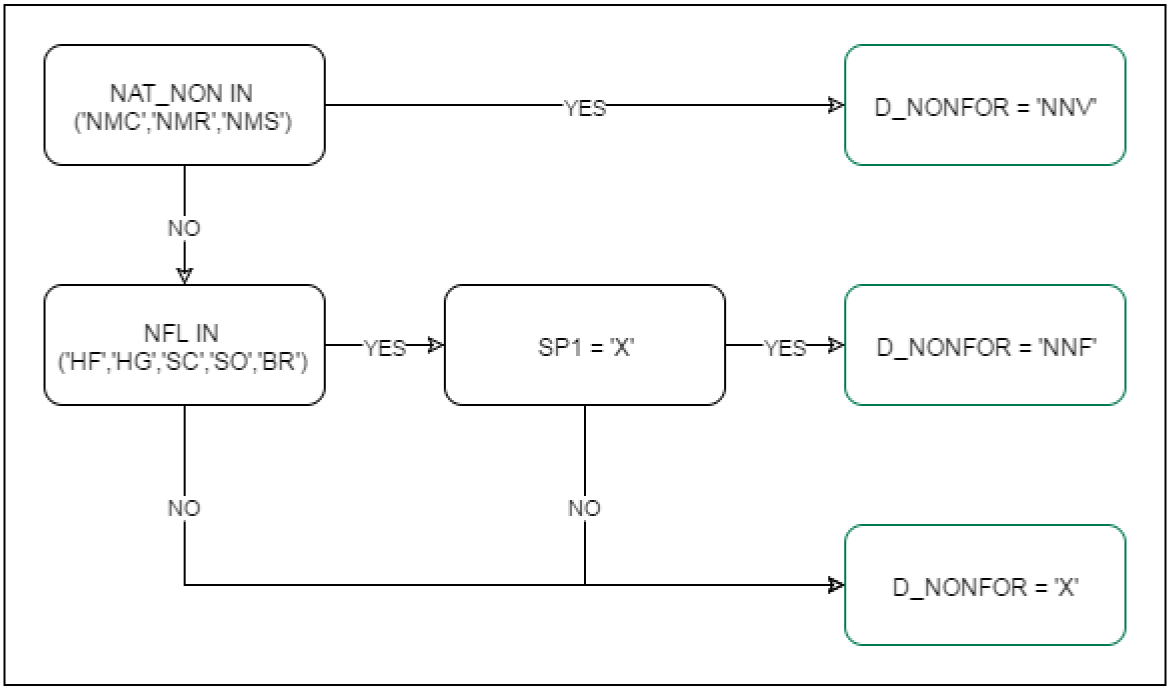

Figure 3.10. Criteria used to assign non-forested deletions (D_NONFOR) to the landbase.

3.10.2.6 *D_AVI: No AVI Deletion.*

On the landbase, some areas do not have AVI information from either the currently approved AVI, or the AVI approved for the most recent FMPs created for Weyerhaeuser Edson and Drayton Valley. These areas are located within the DFA and have coverage from other data layers, but without the AVI are marked for deletion as they cannot be stratified and therefore cannot contribute to harvesting activities. The lack of a valid AVI unique key from either the new AVI (AVI_UKEY) or old AVI (LINK), or a leading species (SP1) are three methods used to identify these deletions. Figure 3.11 indicates the program logic applied to the net landbase table to assign a value to D_AVI. Field definitions are presented in Table 3-12.

Table 3-12. D_AVI field definitions.

D_AVI	Description
AVI	No or missing AVI
X	Not a deletion

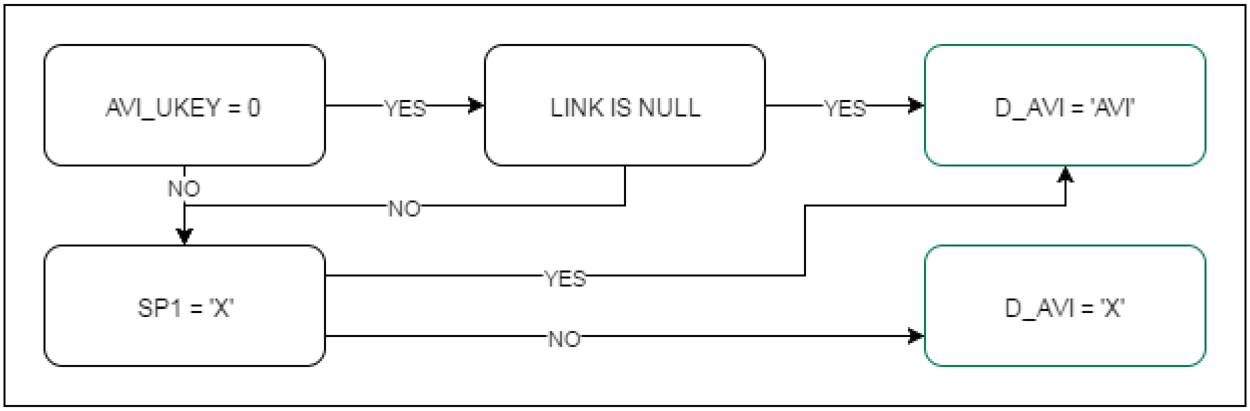

Figure 3.11. Criteria used to assign missing AVI deletions (D_AVI) to the landbase.

3.10.2.7 *D_NATDIST: Natural Disturbance Deletion*

Natural disturbances deletions include recent forest fires (not included in AVI) and other naturally occurring phenomenon (e.g. windfall). Data is sourced from the provincial fire records, from 2010 to May 2015, as described in Section 2.3.30. Natural disturbances identified within the AVI will either be included in the active landbase if a valid strata call is assigned or it will be removed via another deletion such as D_NONFOR. Figure 3.12 indicates the program logic applied to the net landbase table to assign a value to D_NATDIST. Field definitions are presented in Table 3-13.

Table 3-13. D_NATDIST field definitions.

D_NATDIST	Description
BURN	Recent burn
OTHER_DIST	Other disturbance type
X	Not a deletion

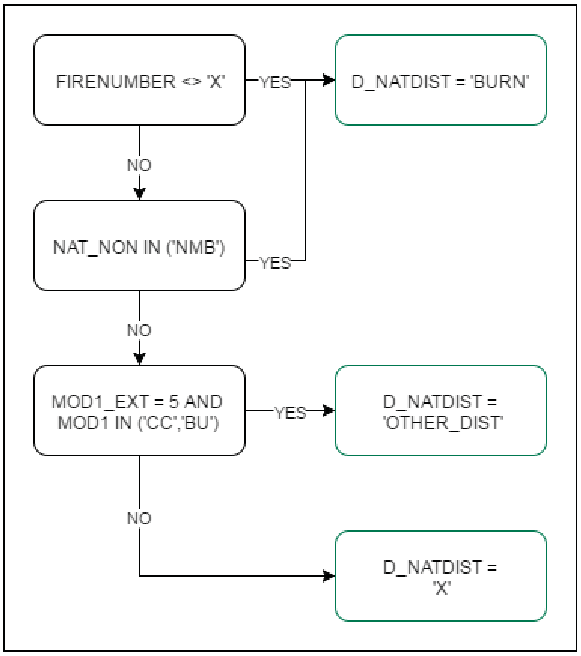

Figure 3.12. Criteria used to assign natural disturbance deletions (D_NATDIST) to the landbase.

3.10.3 Operational Deletions

3.10.3.1 *D_ECOSITE: Unproductive Ecosites Deletion.*

Ecosite information was added to the landbase post AVI (Section 2.3.10). A combination of ecosite and natural subregion (Greenlink, 2016) was used to determine and assign an unproductive ecosite deletion to the landbase (Table 3-14). These areas are considered not productive for commercial timber production based on moisture and nutrient regimes. Figure 3.13 indicates the program logic applied to the net landbase table to assign a value to D_ECOSITE. Field definitions are presented in Table 3-15.

Table 3-14. Ecosite productivity classification by natural subregion.

Class	Central Mixedwood	Dry Mixedwood	Lower Foothills	Upper Foothills	Subalpine	Alpine
Most Productive	e, d	e, d	e, f	f		
Productive	f, b	f, b	c, i	e, j		
Moderately Productive	c, h	c, h	d	c	d	
Least Productive	a, g	a, g	b, j, h	b, d, i, h	b, c, f, g	
Unproductive	**i, j, k, l, m, n, x**	**i, j, k, l, m, n, x**	**a, g, k, l, m, n, x**	**a, g, k, l, m, n, x**	**a, e, h, i, j, x**	**c, d, h, i, j, x**

Table 3-15. D_ECOSITE field definitions.

D_ECOSITE	Description
UNPRODUCTIVE	Unproductive area
X	Not a deletion

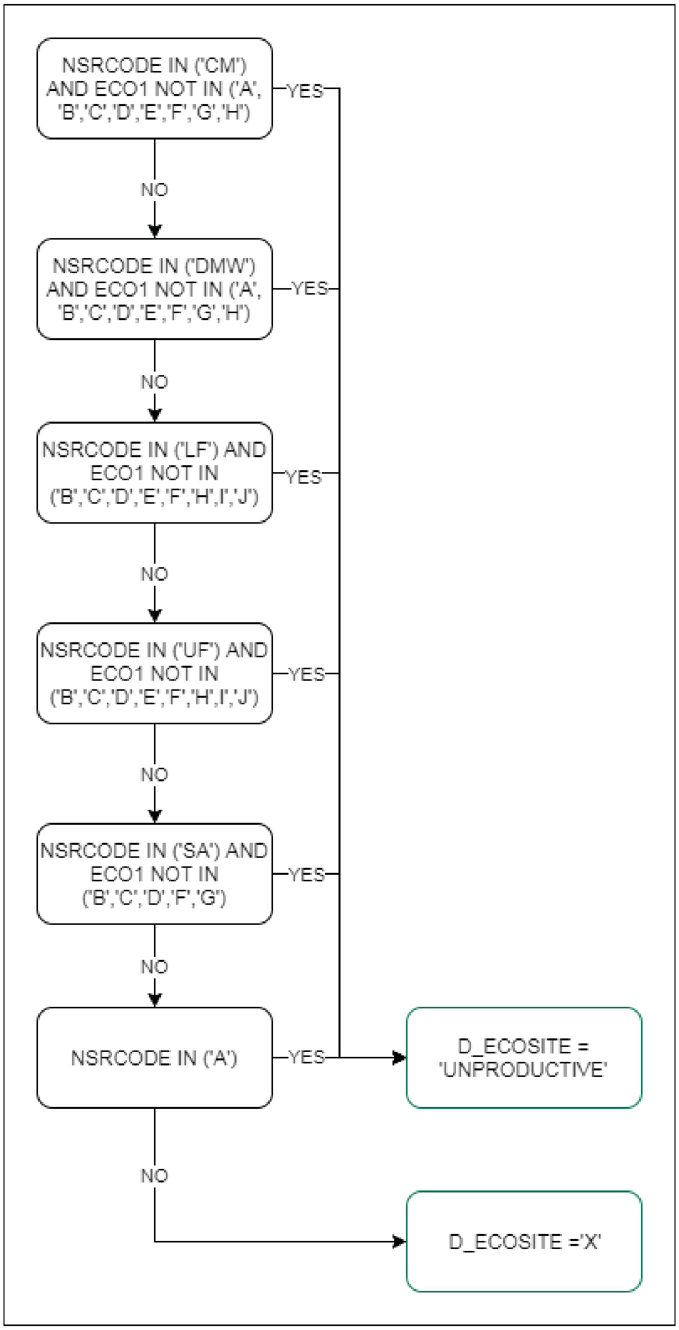

Figure 3.13. Criteria used to assign unproductive area deletions (D_ECOSITE) to the landbase.

3.10.3.2 *D_TPR: Timber Productivity Rating Deletion.*

While most of the unproductive areas on the landbase are deleted based on the above category, Timber Productivity Rating (TPR) deletions were also used to ensure that all unproductive areas are removed from the active landbase. The TPR deletion is applied where a TPR of U (unproductive) was assigned in the AVI. Figure 3.14 indicates the program logic applied to the net landbase table to assign a value to D_TPR. Field definitions are presented in Table 3-16.

Table 3-16. D_TPR field definitions.

D_TPR	Description
TPR	Unproductive TPR (TPR = U)
X	Not a deletion

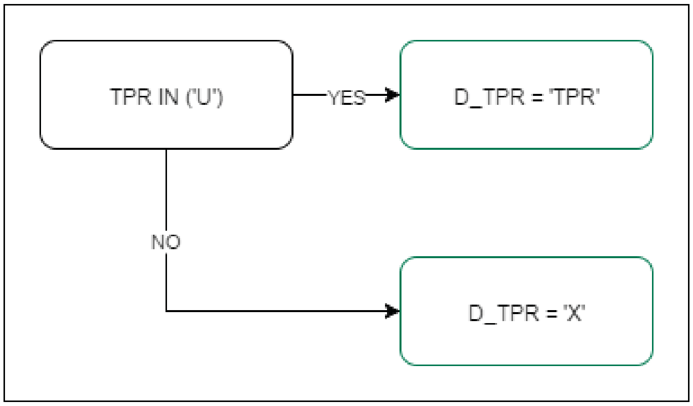

Figure 3.14. Criteria used to assign unproductive TPR deletions (D_TPR) to the landbase.

3.10.3.3 *D_STRUC: Horizontal Structure Deletion.*

Horizontal structure is identified in the AVI. These areas are considered unproductive for timber harvesting activities and are therefore removed from the active landbase. Figure 3.15 indicates the program logic applied to the net landbase table to assign a value to D_STRUC. Field definitions are presented in Table 3-17.

Table 3-17. D_STRUC field definitions.

D_STRUC	Description
HORIZONTAL	Horizontal structure
X	Not a deletion

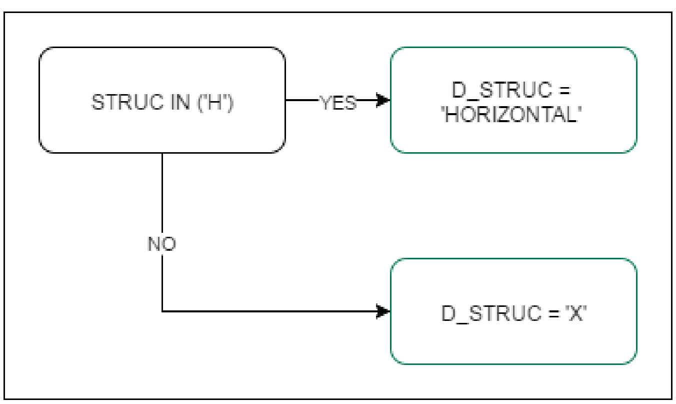

Figure 3.15. Criteria used to assign horizontal structure deletions (D_STRUC) to the landbase.

3.10.3.4 *D_SLOPE: Steep Slope Deletion.*

Areas identified as having slopes that are greater than or equal to 55% (Section 2.3.46), have limited operability and hence are deleted from the active landbase. Figure 3.16 indicates the program logic applied to the net landbase table to assign a value to D_SLOPE. Field definitions are presented in Table 3-18.

Table 3-18. D_SLOPE field definitions.

D_SLOPE	Description
SLOPE	Slope = 55
X	Not a deletion

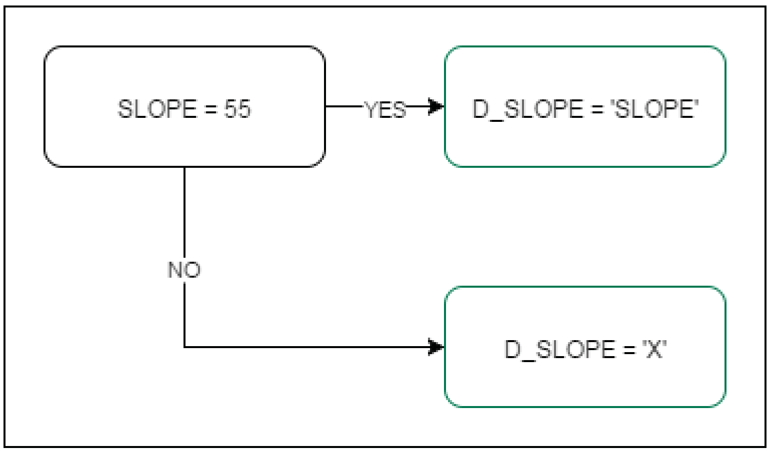

Figure 3.16. Criteria used to assign steep slope deletions (D_SLOPE) to the landbase.

3.10.3.5 *D_BLOCK: Cutblock Deletions.*

Cutblocks, or portions of cutblocks, are removed from the active landbase if they meet one of the following conditions:

- NFCC : Post-91 cutblocks identified in the AVI with a MOD1 = ‘CC’ (PLB_MOD1 in the PLB) but which have no opening number to match to ARIS records to establish a stratum.
- NSR : Cutblocks that have an NSR stocking status and are <= 50% stocked based on a performance survey and non-forested according to AVI.
- ARISRECON : Openings that could not be reconciled, in terms of area, between the landbase and ARIS. Only two openings met this criterion, *i.e*. 5160563410C and 5180548221.

Figure 3.17 indicates the program logic applied to the net landbase table to assign a value to D_BLOCK. Field definitions are presented in Table 3-19.

Table 3-19. D_BLOCK field definitions.

D_BLOCK	Description
NFCC	Non-forested cutblock (cutblock with no ARIS data)
NSR	Non-satisfactorily restocked cutblock with no AVI
ARISRECON	Cutblocks not reconciled in ARIS
X	Not a deletion

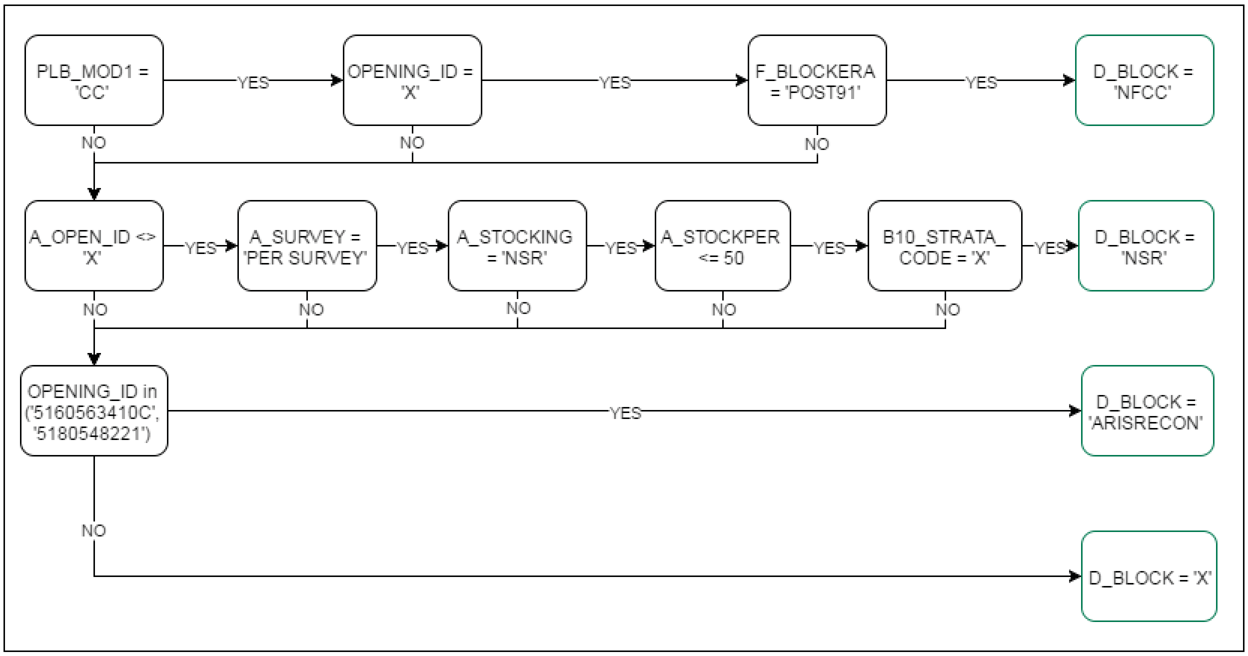

Figure 3.17. Criteria used to assign cutblock deletions (D_BLOCK) to the landbase.

3.10.3.6 *D_OPDEL: Operational Deletions.*

Operational deletions include areas on the landbase identified by Weyerhaeuser as being non operable or required as buffer areas that may not be otherwise buffered by the D_BUF criteria. Spatial Harvest Sequence (SHS) deletions refer to areas that were included in the previous FMP SHS but were not harvested due to being inoperable. These areas are removed from the active landbase to ensure that they are not scheduled again in the TSA process.

Figure 3.18 indicates the program logic applied to the net landbase table to assign a value to D_BLOCK. Field definitions are presented in Table 3-20.

Table 3-20. D_OPDEL field definitions.

D_OPDEL	Description
OPDEL	Areas identified as not operable by Weyerhaeuser
SHS	SHS deletions from the previous FMPs.
OPBUFFER	Operational buffers identified by Weyerhaeuser
X	Not a deletion

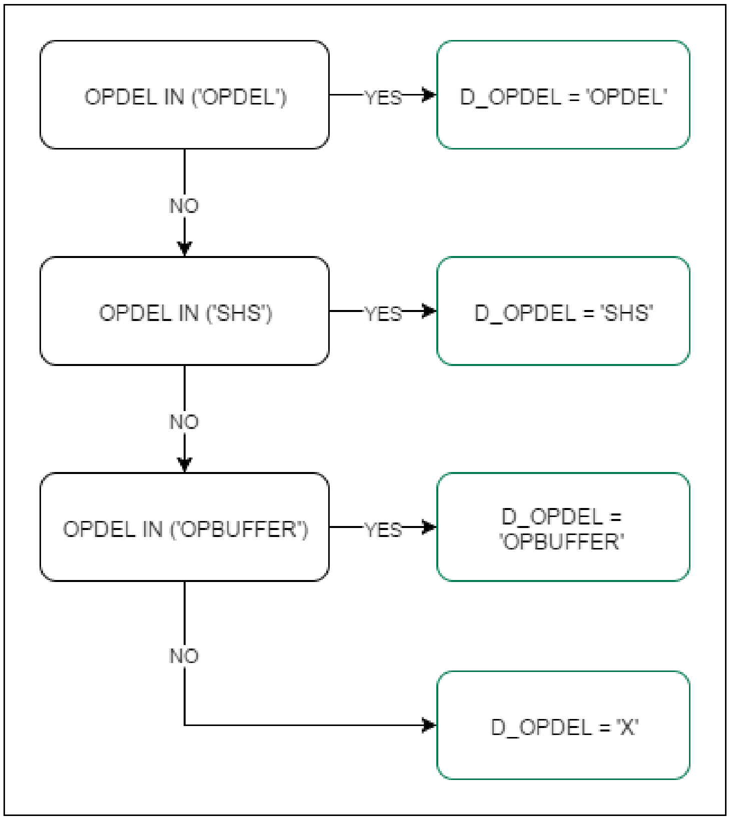

Figure 3.18. Criteria used to assign operational deletions (D_OPDEL) to the landbase.

3.10.3.7 *D_SUBJ: Subjective Deletions*

Subjective deletions apply to forested stands that are not considered to be feasibly operable due to species composition. These include:

- Stands with greater than or equal to 10% larch (Lt) in the overstorey;
- Deciduous stands with birch (Bw) as the leading species;
- 'A' density pine stands (Pl stratum) with a black spruce (Sb) understorey; and
- All Sb stratum stands, with the exception of those where the percentage of Sb is <= 60% and the secondary species (SP2) is Pl.

Figure 3.19 indicates the program logic applied to the net landbase table to assign a value to D_SUBJ. Field definitions are presented in Table 3-21.

Table 3-21. D_SUBJ field definitions.

D_SUBJ	Description
LARCH	Stands with >= 10% larch
BIRCH	Stands where SP1 = Bw and BCG = D
PINE	'A' density Pine stands with Sb understorey
BLKSPRUCE	Sb stratum stands, except where SP2 = Pl and Sb <= 60%
X	Not a deletion

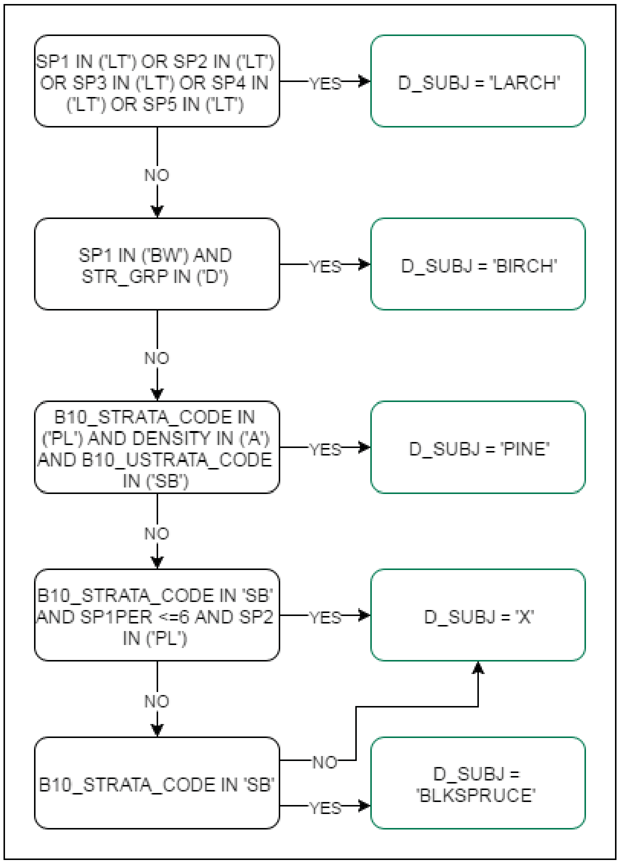

Figure 3.19: Criteria used to assign subjective deletions (D_SUBJ) to the landbase.

3.10.3.8 *D_ISO: Isolated Stands*

Isolated stands are polygons that are isolated in terms of accessibility or feasibility for harvest operations. While the isolated stand determination process is completed after the sliver elimination process (next section) it is included here to keep it together with all the landbase deletions.

There are 2 types of isolated stands identified within the landbase; (i) isolated stand deletions (PAR_DEL and ISO1), and (ii) isolated stand deferrals (PAR_DEF and ISO2).

There are two methods used to identify isolated stands:

1. A perimeter to area ratio (PAR) function is used to identify polygons that are artefacts of the multiunion process, for example resulting from the intersection of harvest blocks. The PAR of the polygon is compared to the PAR of a circle of the same size (area); the larger the difference (PAR_DIFF) the more irregular and elongated the shape of the polygon.

   This method is applied as follows:
   - Polygons with a PAR_DIFF value of > 500 are labelled PAR_DEL and will be deleted from the active landbase;
   - Polygons with a PAR_DIFF value of < 150 with areas <= 2ha are labelled PAR_DEF and become an isolated stand deferral;
   - Polygons with a PAR_DIFF value of >= 200 with areas <= 10ha are labelled PAR_DEF and become an isolated stand deferral.
   - Polygons with a PAR_DIFF value of >= 350 with areas > 10ha are labelled PAR_DEF and become an isolated stand deferral.

2. A set of rules based on isolated stand size and their proximity to roads.

   This method is applied as follows:
   - Polygons are grouped with stands that are within 59m of other harvestable stands:
     - Any group of or single polygons that are < 2ha in size are labelled ISO1 and become an isolated stand deletion;
     - Any group of or single polygons that are >= 2ha but < 4ha in size and are more than 500m from a road are labelled ISO2 and become an isolated stand deferral;

If any of these conditions are not true, the polygon (or group of polygons) are considered operable and are therefore not marked for either deletion or deferral.

Figure 3.20 indicates the program logic applied to the net landbase table to assign a value to D_SUBJ. Field definitions are presented in Table 3-22.

Table 3-22. D_ISO field definitions.

D_ISO	Description
PAR_DEL	Stands to be deleted from the active landbase
PAR_DEF	Stands to be deferred from harvest for a specified period
ISO1	Stands to be deleted from the active landbase
ISO2	Stands to be deferred from harvest for a specified period
X	Neither a deletion or deferral

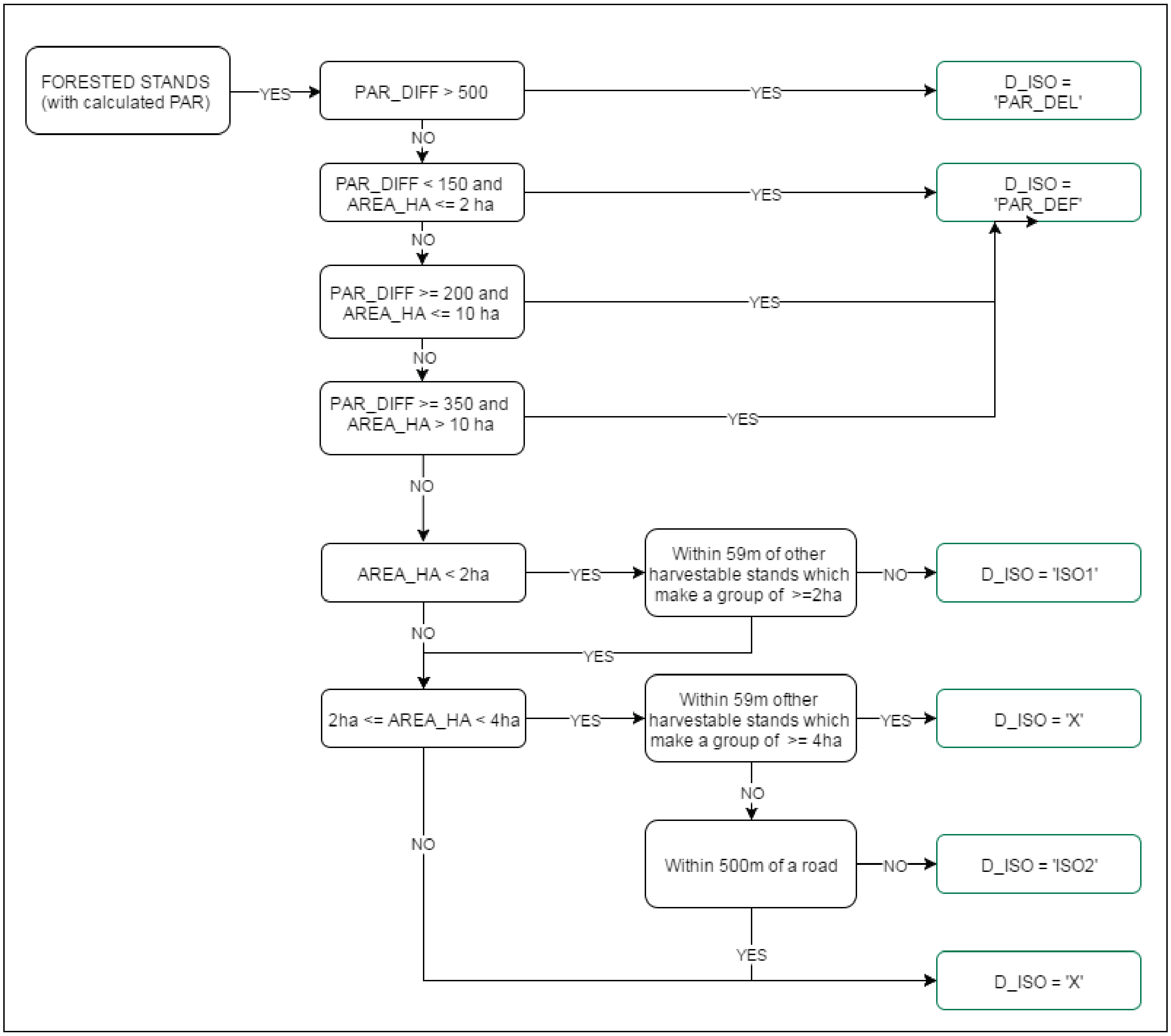

Figure 3.20. Criteria used to assign isolated stand deletions and deferrals (D_ISO) to the landbase.

3.10.4 Sliver Elimination

With the multiunion process amalgamating a large number of spatial datasets from various sources, the product layer contains a large number of sliver polygons that are artefacts of this process. Typically these slivers do not identify any unique characteristic on the landbase and can be eliminated with no significant impact on subsequent analyses.

For the purpose of landbase assessment, slivers were eliminated using the following rule set:

1. Any polygon < 0.01ha is dissolved into the adjacent polygon which it shares the most perimeter with;
2. Polygons > 0.01ha but < 0.1ha are subject to elimination, *i.e.* they will be dissolved into stands with similar deletion codes as explained below;

3. Any boundary identifying a harvested or planned cutblock cannot be eliminated ; and
4. Any boundary between polygons with different landbase deletion code groups cannot be eliminated.

In order for the sliver elimination process to correctly eliminate slivers based on relative importance, deletions were classified into groups based on the deletion similarities. For example, all productivity related deletions, identifying stands that are deemed inoperable, are grouped together.

The grouping of deletion types is shown in Table 3-23 while Figure 3.21 outlines the methods used to assign the attributes.

Table 3-23. Group_Elim deletion group hierarchy.

GROUP_ELIM	Deletion Group
GROUP1	D_ADMIN
GROUP2	D_ACCESS and D_ANTHRO
GROUP3	D_HYDRO, D_BUF, D_NONFOR and D_AVI
GROUP4	D_ECOSITE, D_TPR, D_SLOPE and D_STRUC
GROUP5	D_NATDIST, D_BLOCK, D_OPDEL and D_SUBJ
OPENING#_GROUP#	ARIS # of any harvested cutblock
PLANNED_GROUP#	Planned cutblocks
X	Active landbase

Once the sliver elimination process was completed, the resulting file was checked for topology errors using the topology tool with ESRI's file geodatabase. The file was checked for any gaps or overlaps created in the multiunion process.

The sliver elimination process did not affect the gross landbase area. The pre- and post-elimination areas remain the same. However, the number of polygons was reduced by more than half from 866,385 to 414,439 (Table 3-24 and Table 3-25). Almost 100% of the less than 0.01 hectare polygons and 83% of the less than 0.1 ha polygons were eliminated. The small pre- and post-elimination area shifts between groups are due to the elimination of over 640 ha of less than 0.01 ha polygons, which are dissolved into any neighbouring polygon.

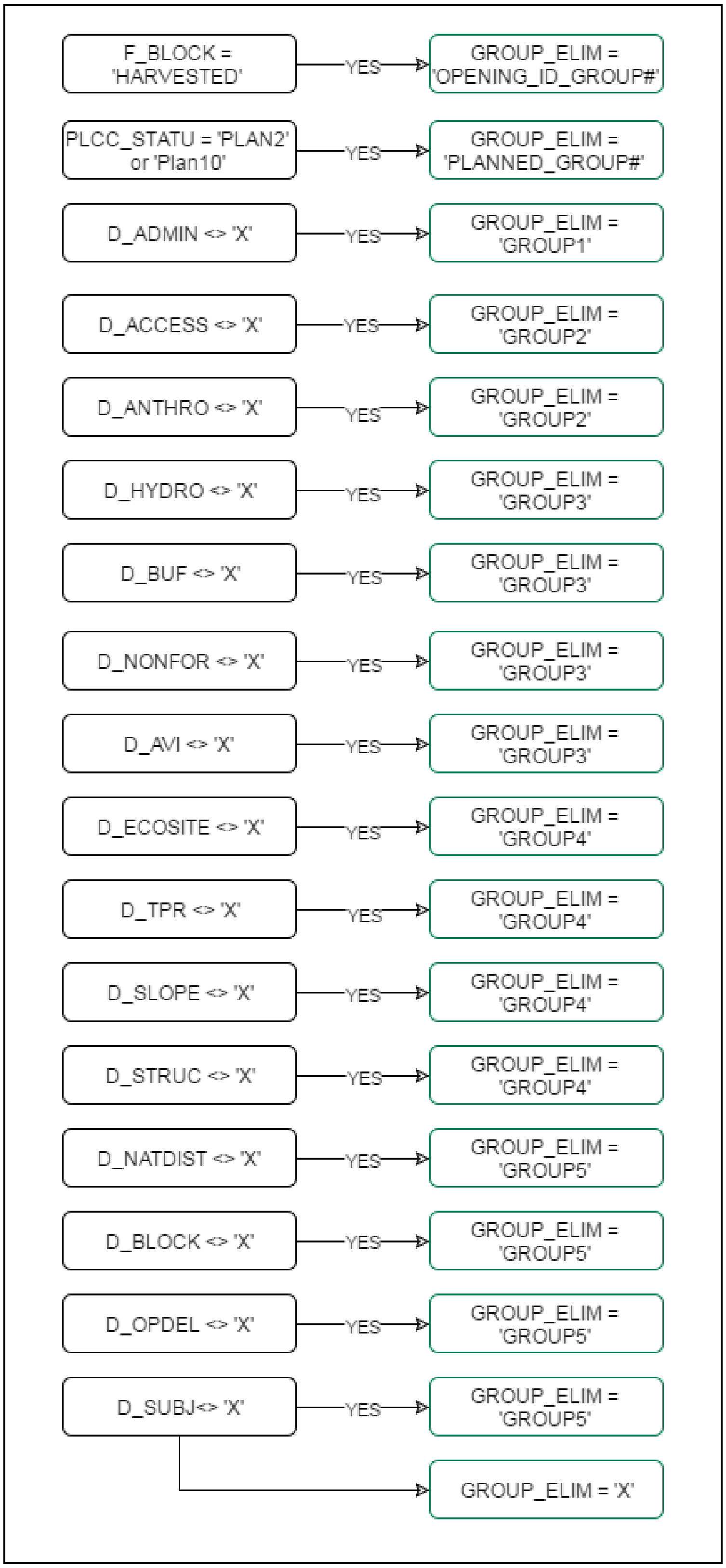

Figure 3.21. Grouping criteria used to determine sliver deletion hierarchy based on deletion criteria.

Table 3-24. Difference in area (ha) and number of polygons between pre- and post-elimination landbases, by group elimination category.

Group	Area (ha)			Number of Polygons		
Elimination	Pre-Elimination	Post-Elimination	Difference	Pre-Elimination	Post-Elimination	Difference
GROUP1	52,448	52,448	0	30,836	12,605	-18,231
GROUP2	96,941	96,967	26	305,528	103,707	-201,821
GROUP3	73,266	73,281	15	99,246	46,907	-52,339
GROUP4	186,902	186,877	-25	74,866	43,294	-31,572
GROUP5	100,521	100,503	-18	81,801	37,592	-44,209
HARVESTED	159,117	159,116	-1	81,790	47,121	-34,669
PLANNED	32,557	32,564	7	35,750	13,387	-22,363
X	365,664	365,658	-5	156,568	108,826	-47,742
Total	**1,067,415**	**1,067,415**	**0**	**866,385**	**413,439**	**-452,946**

Table 3-25. Difference in area (ha) and number of polygons between pre- and post-elimination landbases, by polygon size class.

	Area (ha)			Number of Polygons		
Size Class (ha)	Pre-Elimination	Post-Elimination	Difference	Pre-Elimination	Post-Elimination	Difference
<0.01	646	0	-646	278,994	5	-278,989
>=0.01 and <0.1	8,505	1,357	-7,148	211,130	35,103	-176,027
>=0.1 and <1	72,804	74,639	1,836	195,388	195,622	234
>=1	985,461	991,419	5,958	180,873	182,709	1,836
Total	**1,067,415**	**1,067,415**	**0**	**866,385**	**413,439**	**-452,946**

3.11 Seismic Lines

Seismic lines, when combined with the landbase, increased the polygon count from 413,439 to 1,124,906; a 272% increase. Figure 2.49 illustrates the coverage of seismic lines on the DFA. While seismic lines are included in the classified landbase, in order to reduce model memory and computational overhead, seismic lines are not included in the modelling landbase. Seismic lines are therefore not treated as a deletion in the landbase process, but the area lost to seismic lines on the active landbase will be addressed through strata based yield curve adjustments in the TSA process. Adjustments will be applied to natural and regenerating pre-91 stands only. Post-91 cutblocks are not impacted as the RSA sample program has accounted for seismic area (Weyerhaeuser, 2015). Accordingly, seismic lines falling on post-91 cutblocks are not included in the classified landbase.

Table 3-26 shows the extent of seismic lines by stratum in natural stands and pre-91 cutblocks on the active landbase. Natural stand and pre-91 yield curves will be adjusted by the percentage seismic factor for each stratum in the TSA process.

Table 3-26. Seismic line extent on natural and pre-91 managed stands in the active landbase[1]

Stratum	Gross Area (ha)	Seismic Area (ha)	Net Area (ha)	% Seismic
Aw	147,597	4,493	143,105	3.04
AwPl	16,166	478	15,687	2.96
AwSx	24,631	773	23,858	3.14
SwAw	16,776	513	16,263	3.06
PlAw	16,009	495	15,514	3.09
SbAw	726	32	694	4.46
Sw	64,097	1,525	62,572	2.38
Pl	140,130	3,570	136,560	2.55
Sb	2,388	85	2,302	3.57
Total	**428,519**	**11,964**	**416,555**	**2.79**

3.12 Final Classifications

Assigning initial strata and deletion attributes, as described in the previous sections, paves the way for the determination and assignment of final landbase classifications attributes and those relevant for timber supply analysis. The following sections explain the methodology behind the creation of important fields for landbase classification and timber supply modelling purposes. These derived attributes have an "F_" prefix, which indicates that they are the "final" attributes to be used in the TSA process.

3.12.1 F_DEL: Final Landbase Deletion

F_DEL is an amalgamated field showing the final assigned landbase deletion code for each stand. As many stands may have multiple deletion calls, a deletion hierarchy is used to assign the final deletion. Table 3-27 and Figure 3.22 show the hierarchy and method used to assign the F_DEL attribute.

F_DEL is calculated at two separate points in the process. Following the multiunion process, the deletion attributes e.g. D_ADMIN etc are assigned to the landbase (Appendix VI). F_DEL is then assigned based on the process shown in Figure 3.22, with the exception of D_ISO. The isolated stand process is run after this initial assignment of F_DEL. On completion of the isolated stand process, F_DEL is updated (Appendix VI) to include the D_ISO attribute, but only if a deletion code has not already been assigned.

[1]SQL code used to develop Table 3-26

```
select f_active, f_strata, sum(G_Area) G_Area, sum(S_Area) S_Area, sum(G_Area) - sum(S_Area)
N_Area, sum(S_Area)/sum(G_Area) * 100 S_Pct
from
(select f_active, f_strata,
(case when seismic = 1 then area_ha end) as S_Area, area_ha G_Area
 from CLS_LB_V8_20170824 where f_blockera <> 'POST91' and f_active = 'ACTIVE')
group by f_active, f_strata order by 1,2,3;
```

Table 3-27. Final deletion hierarchy.

Hierarchy	Deletion Type	Deletion Category
1	When D_ADMIN present then D_ADMIN	Administrative
2	When D_ACCESS present then D_ACCESS	Landscape
3	When D_ANTHRO present then D_ANTHRO	Landscape
4	When D_HYDRO present then D_HYDRO	Landscape
5	When D_BUF present then D_BUF	Landscape
6	For a Planned block with a valid stratum then 'X' (no deletion call) [1]	-
7	For a Post-91 cutblock with a valid stratum then 'X' (no deletion call) [2]	-
8	When D_NONFOR present then D_NONFOR	Landscape
9	When D_AVI present then D_AVI	Landscape
10	For a Pre-91 cutblock with a valid stratum then 'X' (no deletion call) [3]	-
11	When D_ECOSITE present then D_ECOSITE	Operational
12	When D_TPR present then D_TPR	Operational
13	When D_STRUC present then D_STRUC	Operational
14	When D_NATDIST present then D_NATDIST	Landscape
15	When D_SLOPE present then D_SLOPE	Operational
16	When D_BLOCK present then D_BLOCK	Operational
17	When D_OPDEL present then D_OPDEL	Landscape
18	When D_SUBJ present then D_SUBJ	Operational
19	When D_ISO present then D_ISO	Operational
20	If no deletion present then 'X'	-

[1] Planned blocks *i.e.* blocks laid out for harvest post the effective date will be deleted from the active landbase if they are assigned a D_ADMIN, D_ACCESS, D_ANTHRO, D_HYDRO or D_BUF deletion type, but not if they are assigned any deletion type below their position on the table.
[2] Post-91 cutblocks are treated similarly to planned blocks, however they will also be deleted if they are assigned a D_BLOCK deletion type.
[3] Pre-91 cutblocks are treated similarly to post-91 cutblocks, however, they will also be deleted if they are assigned a D_NONFOR, D_AVI or D_OPDEL deletion type.

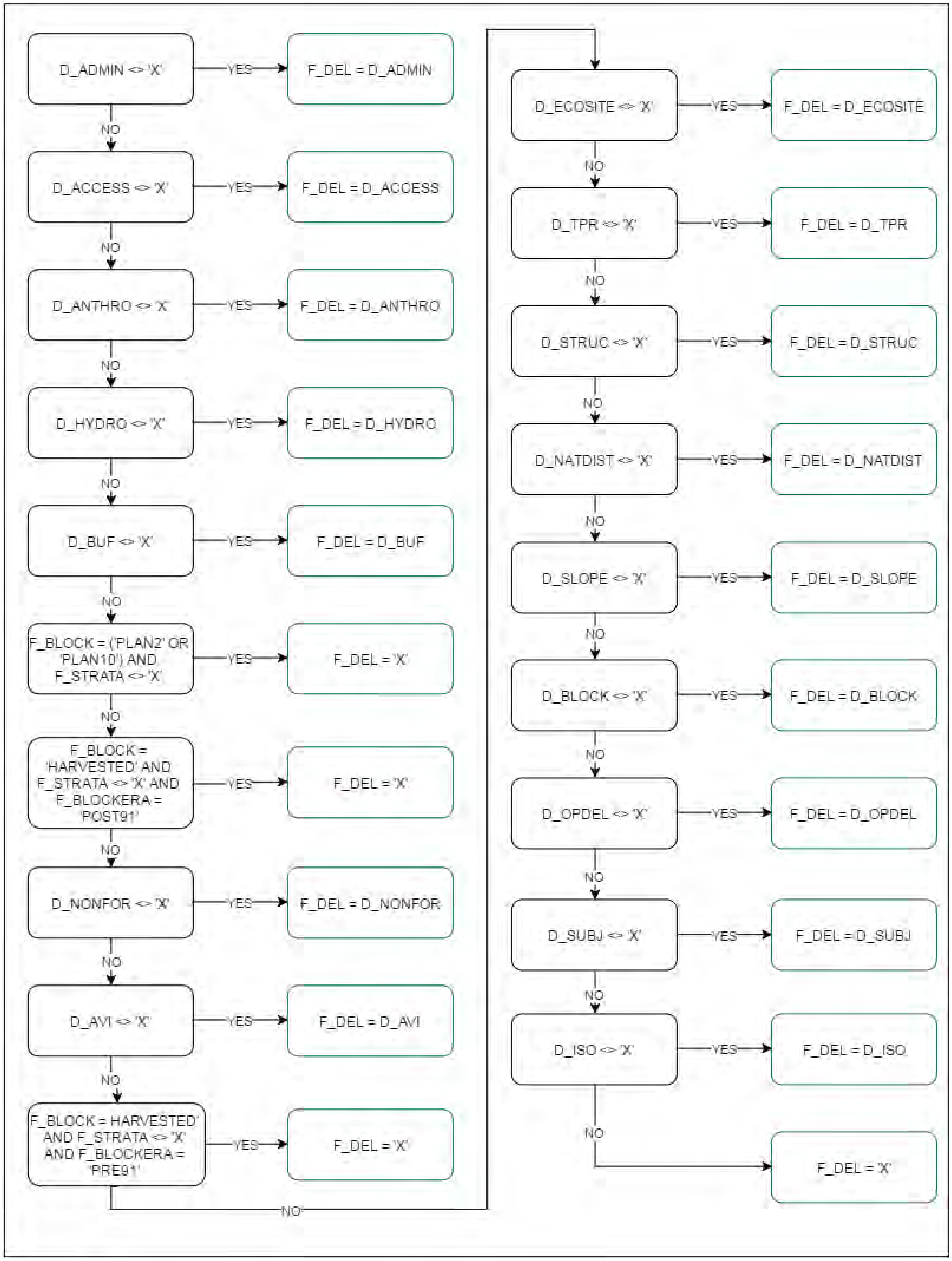

Figure 3.22. Process used to assign the final landbase deletion (F_DEL) in the landbase.

3.12.2 F_BLOCK: Final Block Stage

This attribute indicates stands that are identified as being either harvested, planned for harvest, or a deferral. To be identified as HARVESTED a stand must have a valid opening number and a PLB_MOD1 = CC if the cutblock exists in the AVI, or a CC_STATUS = HARVESTED if the cutblock is from the cutblock layer (Section 2.3.51). Planned blocks from the planned block layer (Section 2.3.52) will be identified as either PLAN2 or PLAN10. PLAN2 blocks are pre-blocks or those that will be harvested post the landbase effective date (May 1, 2015) but prior to the model start date (May 1, 2017) whereas PLAN10 blocks will be scheduled for harvest in the first decade post the model start date.

Stands with a valid OPENING_ID but a PLB_MOD1 that is neither a CC nor CL are identified as being structure retention and will be deferred for 70 years or an entire rotation (DEFERRAL70). Stands identified for deferral in the isolated stands process (Section 3.10.3.8) will be attributed as DEFERRAL20 as it is expected that these will be deferred for 20 years in the TSA process. Table 3-28 presents the final block stage definitions while the process steps to assign the F_BLOCK attribute is shown in Figure 3.23.

Table 3-28. Final block stage definitions.

		Landbase Area (Ha)	
F_BLOCK	Description	Active	Gross
HARVESTED	Stands harvested up to the landbase effective date - May 1, 2015	153,297	159,116
PLAN2	Stands planned for harvest after the effective date but prior to the TSA effective date	12,097	12,343
PLAN10	Stands planned for harvest after the TSA effective date	19,200	19,747
PLAN20	Stands planned for harvest after the TSA effective date but prior to the end of the plan	445	474
DEFERRAL20	Stands identified for deferral in the isolated stands process (D_ISO = PAR_DEF or ISO2)	14,833	14,835
DEFERRAL70	70 year deferral for one rotation length	10	14
X	All other stands	347,582	860,886
Total		**547,464**	**1,067,415**

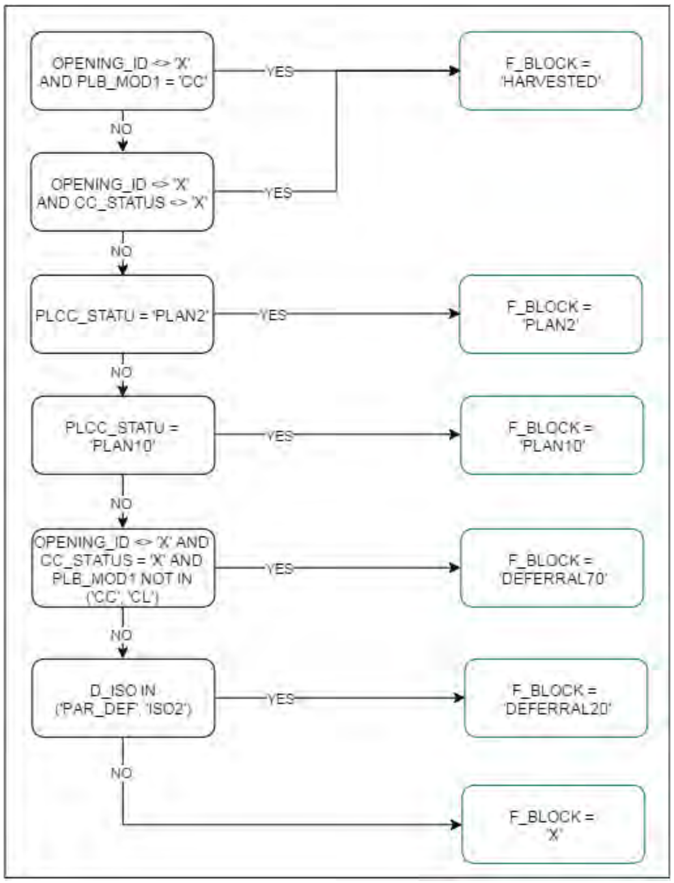

Figure 3.23. Process to assign final block stage (F_BLOCK) in the landbase.

3.12.3 F_DATA_SRC: Final Data Source

The Weyerhaeuser landbase has four potential sources for stratifying each forested stand, *i.e.*, AVI, ARIS, RSA or HARVDECL (section 3.4). The RSA stratum is applied to all managed stands that have had a completed RSA survey. The ARIS stratum is applied to all post-91 harvested stands that do not have an RSA survey completed but have ARIS information available. Recent cutblocks that do not yet have a stratum declaration in ARIS, will receive their harvest stratum assignment (HARVDECL). AVI strata will be applied to all natural stands and pre-91 harvested stands as well as any post-91 harvested stands that do not have RSA or ARIS data. Table 3-29 presents the final data source definitions while Figure 3.24 outlines the process used to assign the F_DATA_SRC attribute.

Table 3-29. Final data source definitions

		Landbase Area (Ha)	
F_DATA_SRC	Description	Active	Gross
RSA	Managed stands with completed RSA survey	19,729	20,130
ARIS	Post-91 harvested stands with a valid ARIS record	96,239	99,250
HARVDECL	Recent cutblock with no stratum declaration in ARIS	2,706	2,763
AVI	All other stands	428,789	945,272
Total		**547,464**	**1,067,415**

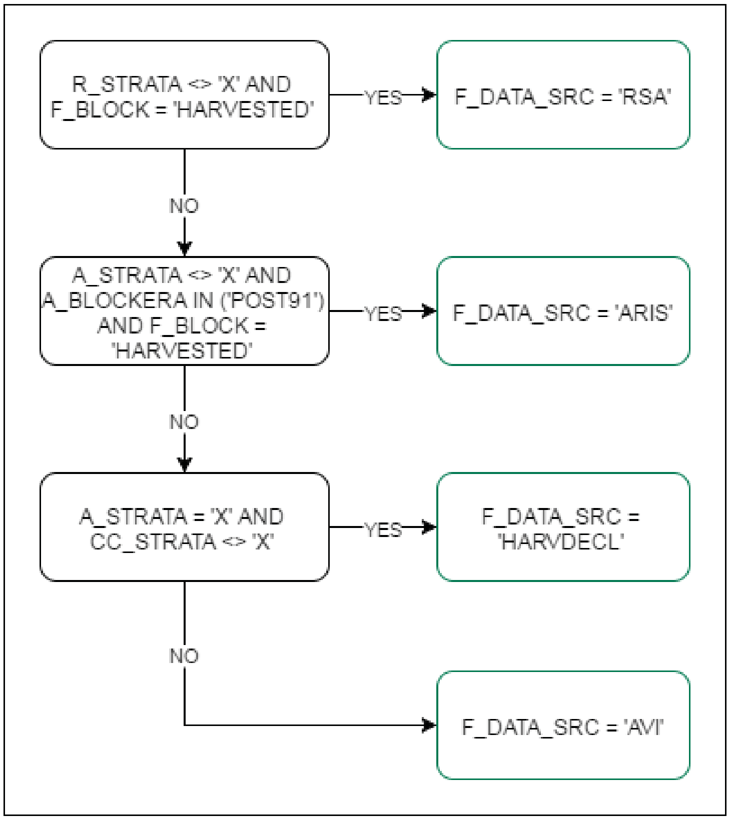

Figure 3.24. Process used to assign the data source (F_DATA_SRC) for stratum assignment.

3.12.4 F_BLOCKERA: Final Harvested Block Era

Block era is an attribute that assigns cutblocks to either pre- or post-91. Pre-91 is defined as blocks harvested on or before March 1, 1991 while post-91 refers to blocks harvest after March 1, 1991. Pre-91 refers to an era when AAF was responsible for reforestation and so ARIS reconciliation is not required to be completed by the tenure holders for cutblocks harvested within this period.

While the fine distinction in dates is possible to make where ARIS data is available, it is not possible from AVI data. For cutblocks without ARIS data, an age of 25 years (2015 – 1990) or less is used to assign a cutblock to the post-91 era as March 1991 falls within the 1990 timber year.

Field definitions are presented in Table 3-30 while Figure 3.25 outlines the methods used to assign the attribute in the landbase.

Table 3-30. Harvest block era definitions

F_BLOCKERA	Description	Landbase Area (Ha) Active	Gross
PRE91	Cutblocks harvested on or before March 1, 1991.	34,353	36,670
POST91	Cutblocks harvested after March 1, 1991.	118,944	122,433
X	All other stands	394,167	908,313
Total		**547,464**	**1,067,415**

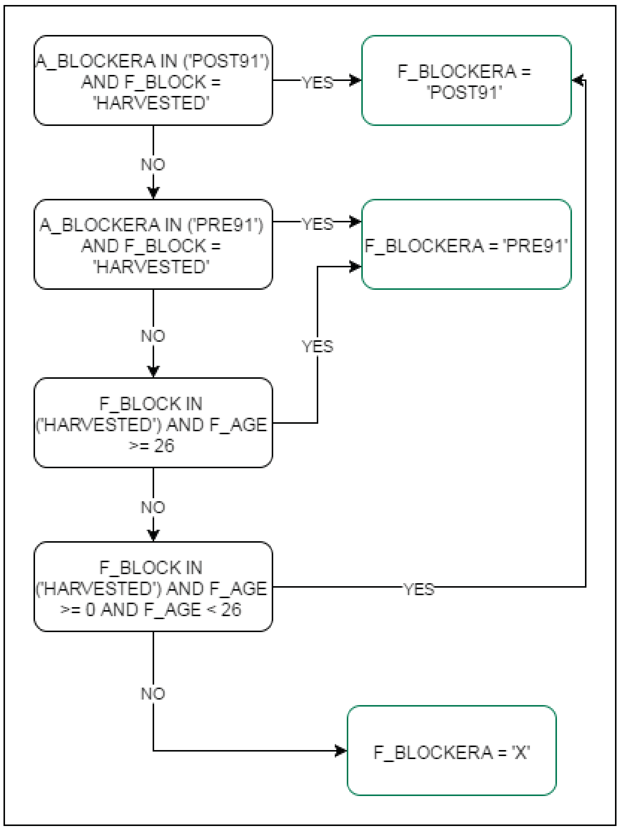

Figure 3.25. Process used to assign the block era (F_BLOCKERA) in the landbase.

3.12.5 F_AGE: Final Stand Age

The source of the F_AGE attribute is determined by the F_DATA_SRC column. Stands with a F_DATA_SRC of 'RSA' reference the R_AGE column. Stands with a F_DATA_SRC of 'ARIS' reference the A_BLOCKYEAR column, where F_AGE = 2015 - A_BLOCKYEAR. An exception to this rule is for pre-91 cutblocks with ARIS data. These cutblocks will also reference the A_BLOCKYEAR column even though the F_DATA_SRC for these cutblocks is 'AVI'.

New cutblocks identified in the cutblock layer (Section 2.3.51) that are not identified in ARIS have their ages set to '0'. Stands assigned a FIRENUMBER where a fire has occurred post AVI also have their ages reset to '0'. Stands that are managed for their understorey (SOPM = 2) are assigned an age based on UMOD1_YR or UORIGIN. The remaining forested stands are assigned age based on the AVI overstorey attributes in the form of either PLB_MOD1_YR or PLB_ORIGIN. The reference year used to calculate age is the effective date of the landbase *i.e*. 2015. An age of -1 is assigned where there is no forest cover. Figure 3.26 shows the process used to assign F_AGE.

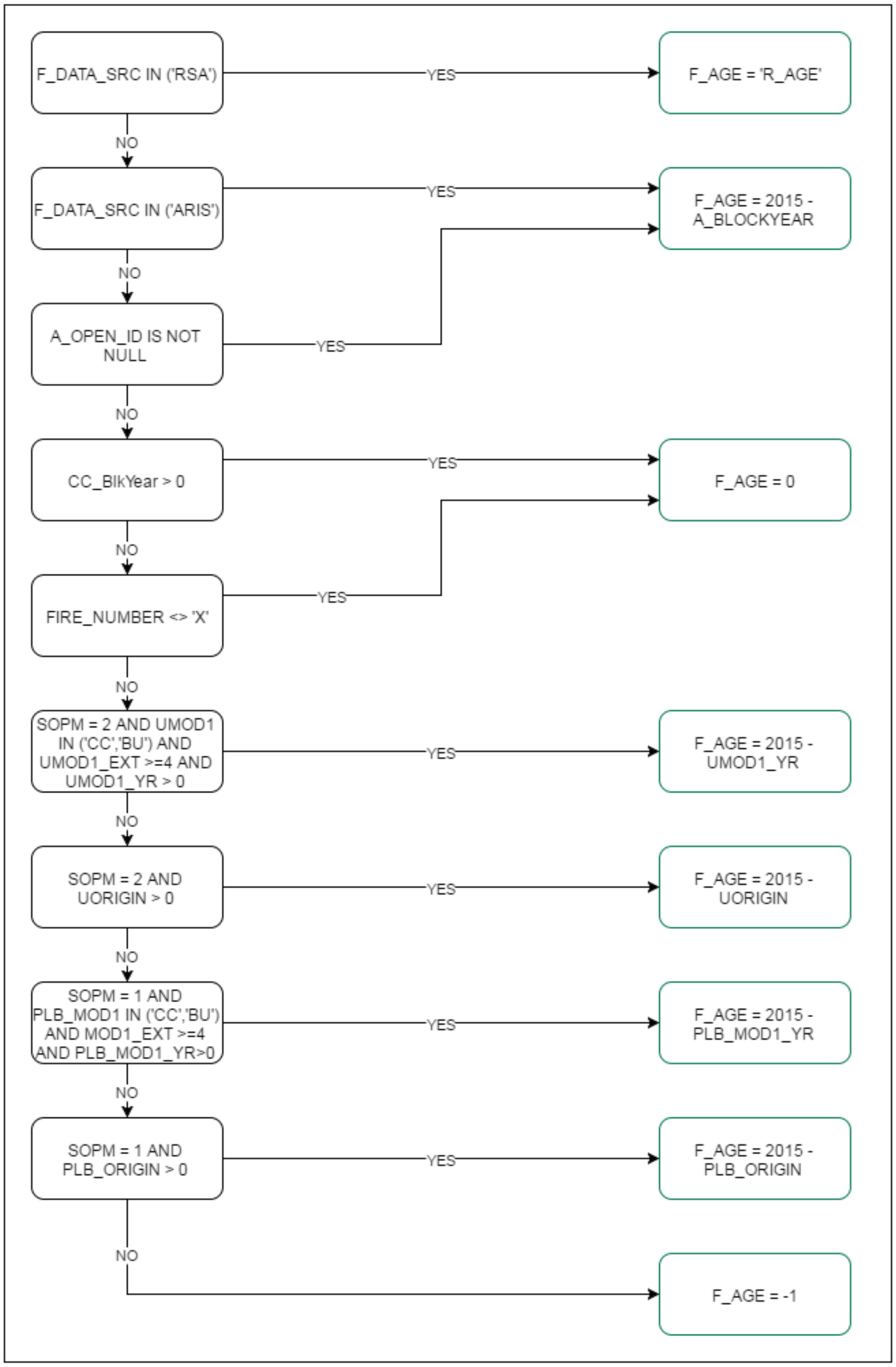

Figure 3.26. Process for assigning the final stand age (F_AGE) in the landbase.

3.12.6 F_HGT: Final Stand Height

F_HGT represents the final stand height assigned to a stand. All recent cutblocks less than 5 years old and stands assigned a FIRENUMBER where a fire has occurred post AVI have their heights reset to '0'. Stands with a SOPM = 2 are assigned a stand height from the AVI understorey height field (UHEIGHT). All other forested stands are assigned a height from the AVI overstorey height field (HEIGHT). Where no height data exists then F_HGT is set as '0'. Figure 3.27 displays the program logic that is applied.

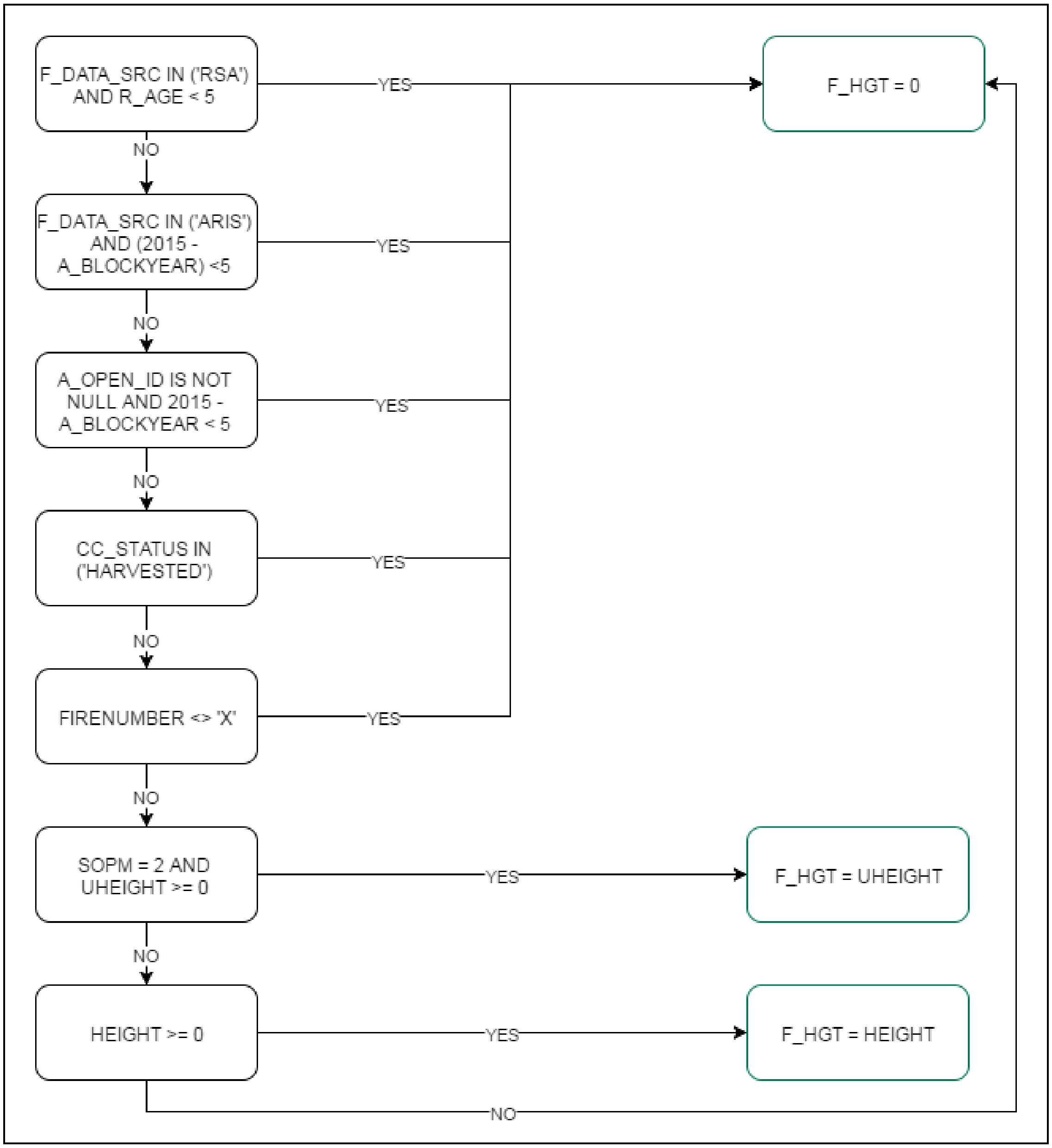

Figure 3.27. Process to assign final stand height (F_HGT) in the landbase.

3.12.7 F_DEN: Final Stand Density

F_DEN represents the overstorey crown closure class assigned to a forested stand. All stands with a F_DATA_SRC of RSA, ARIS or HARVDECL are assigned a stand density of 'C'. Stands that are managed for the understorey (SOPM = 2) are assigned a final stand density from the AVI understorey density field (UDENSITY). All other forested stands assigned a final stand density from the AVI overstorey density field (DENSITY). Non-forested stands are assigned a density of 'X'. Figure 3.28 displays the program logic that is applied and field definitions are presented in (Table 3-31).

Table 3-31. Final stand density definitions.

		Landbase Area (Ha)	
F_DEN	**Description**	**Active**	**Gross**
A	'A' density	89,664	287,834
B	'B' density	107,893	196,310
C	'C' density	286,654	371,727
D	'D' density	63,253	81,838
X	Non-forested	-	129,706
Total		**547,464**	**1,067,415**

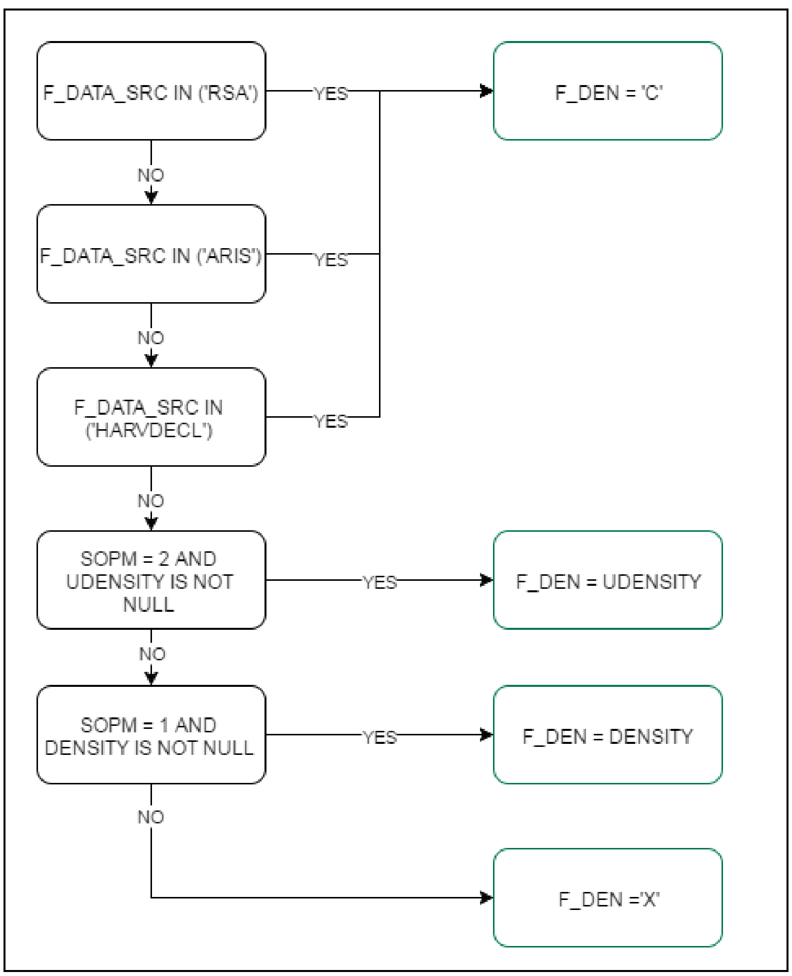

Figure 3.28. Process to assign the final stand density (F_DEN) in the landbase.

3.12.8 F_TPR: Final Timber Productivity Rating

F_TPR represents the final timber productivity rating assigned to a stand. Forested stands are assigned a F_TPR based on the AVI overstorey TPR field (TPR). The exception is stands managed for their understorey (SOPM = 2), where stands are assigned a F_TPR based on the understorey TPR (UTPR). Values of 'X' are assigned if there is no forest cover. Field definitions are presented in Table 3-32 and Figure 3.29 displays the program logic that is applied.

Table 3-32. Final timber productivity rating definitions.

		Landbase Area (Ha)	
F_TPR	**Description**	**Active**	**Gross**
G	Good	205,975	261,574
M	Medium	301,469	481,342
F	Fair	39,679	107,705
U	Unproductive	340	111,837
X	Non-forested stands	-	104,957
Total		**547,464**	**1,067,415**

The unproductive area (TPR=U) in the active landbase is due to areas falling within cutblock and planned block boundaries (Section 3.12.1 and Table 3-27).

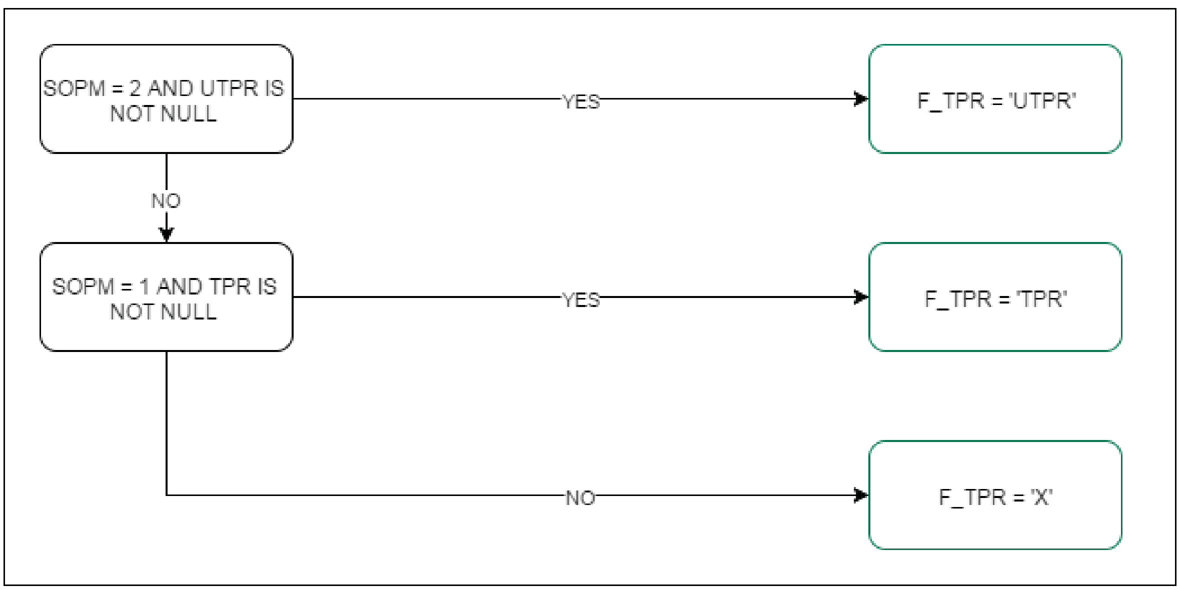

Figure 3.29. Process for assigning the final timber productivity rating (F_TPR) in the landbase.

3.12.9 F_STRATA: Final Stratum Assignment

The final stratum assignment is made according to the final data source (F_DATA_SRC – Section 3.12.2). Figure 3.30 outlines the process for assigning the final stratum in the landbase. While all strata from the various sources are based on the base 10 stratification in the Planning Standard (Alberta, 2006), the labelling of the strata varied between the data sources. For consistency, the strata were renamed where necessary to align with the labels presented in Table 3-33.

Table 3-33. Final stratum assignments.[2]

Stratum			Landbase Area (Ha)	
Label	Number	Name	Active	Gross
Aw	I	Deciduous	183,695	214,036
AwPl	II	Hardwood / Pine	18,614	20,969
AwSx	III	Hardwood / Spruce	33,108	38,696
SwAw	IV	White Spruce / Hardwood	24,233	28,056
PlAw	V	Pine / Hardwood	20,276	22,519
SbAw	VI	Black Spruce / Hardwood	741	2,108
Sw	VII	White Spruce pure or leading	79,804	110,431
Pl	VIII	Pine pure or leading	184,316	241,707
Sb	IX	Black Spruce pure or leading	2,677	259,187
X		No stratum assigned	-	129,706
Total			**547,464**	**1,067,415**

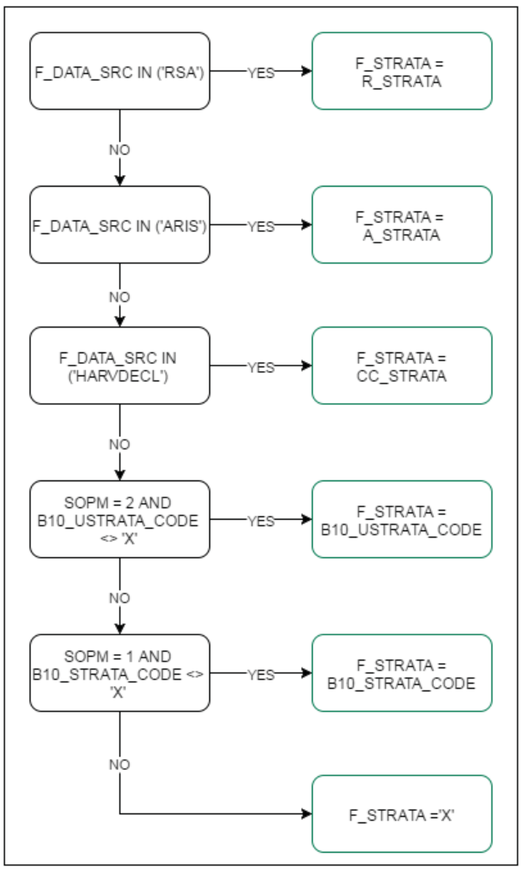

Figure 3.30. Process to assign final strata (F_STRATA) in the landbase.

---

[2] SQL code used to develop Table 3-33

```
SELECT f_strata, sum(ACTIVE) ACTIVE, sum(GROSS) GROSS
from
(select f_active, f_strata,area_ha GROSS,
(case when f_ACTIVE = 'ACTIVE' then area_ha end) as ACTIVE
from CLS_LB_V8_20170824)
group by f_strata order by 1,2,3;
```

3.12.10 F_BCG: Final Broad Cover Group

Broad cover group (BCG) is the classification of forest types based on their coniferous and deciduous components. There are four broad cover groups *i.e.* coniferous (C), coniferous leading mixedwood (CD), deciduous leading mixedwood (DC) and deciduous (D). F_STRATA (Section 3.12.9) is used to assign stands to F_BCG, as shown in Table 3-34. The process is outlined in Figure 3.31.

Table 3-34. Final BCG assignment.

			Landbase Area (Ha)	
F_BCG	**Strata**	**Description**	**Active**	**Gross**
C	Pl, Sw, Sb	Deciduous	266,797	611,325
CD	PlAw, SwAw, SbAw	Coniferous leading mixedwood	45,250	52,682
DC	AwPl, AwSx	Deciduous leading mixedwood	51,722	59,665
D	Aw	Deciduous	183,695	214,036
X	X	Not assigned	-	129,706
Total			**547,464**	**1,067,415**

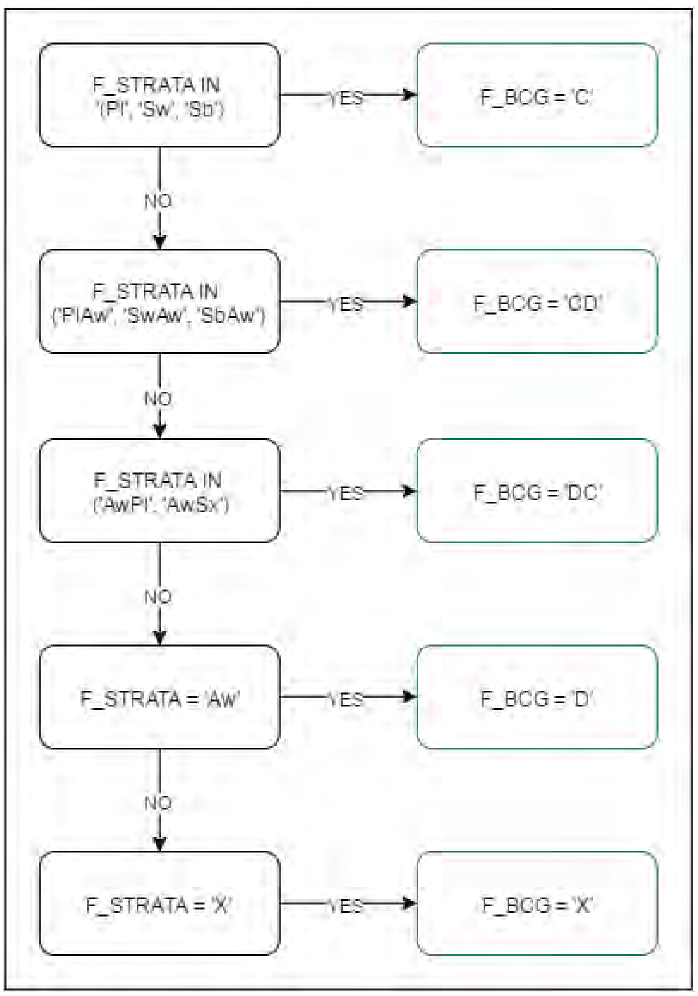

Figure 3.31. Process to assign final BCG (F_BCG) in the landbase.

3.12.11 F_YC: Final Yield Curve Assignment

Each forested stand in the net landbase is assigned to a yield curve to correspond with the yield curves used in the TSA process. The development of the yield curves is described in detail in Annex V: Yield Curve Development.

The assignment of yield curves is a two step process within the development of the landbase:

1. Assign each stand to a yield curve type (YCTYPE), and
2. Assign the final yield curve (F_YC).

3.12.11.1 *Yield Curve Type (YCTYPE) Assignment*

The yield curve development document lists four types or groups of yield curves, as follows:

1. Natural stands (NAT) – for application to all natural fire origin stands;
2. Pre-91 managed stands (M91) - for application to regenerating stands harvested on or before March 1, 1991; and
3. Post-91 managed stands (RSA) – for application to regenerating stands harvested after March 1, 1991, including all future stands harvested in the TSA process.

Figure 3.32 presents the process for assigning the YCTYPE to each stand and Table 3-35 lists the field definitions.

Table 3-35. Yield curve type definitions.

YCTYPE	Description	Landbase Area (Ha) Active	Gross
NAT	Natural stands	394,167	908,313
M91	Pre-91 managed stands	34,622	36,960
RSA	Post-91 managed stands	118,675	122,143
Total		**547,464**	**1,067,415**

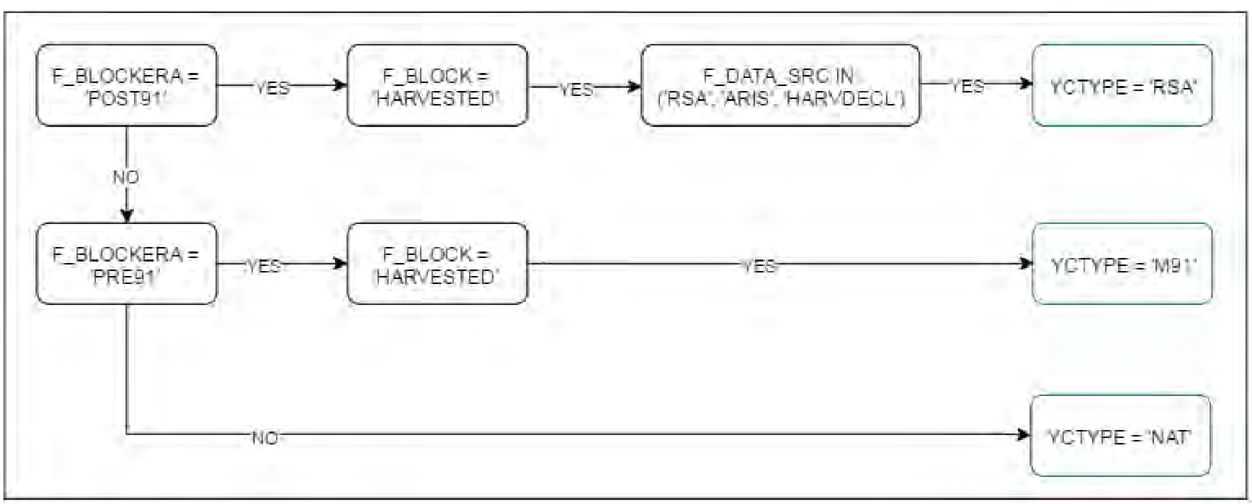

Figure 3.32. Criteria used to assign the yield curve type (YCTYPE) in the landbase.

3.12.11.2 *Final Yield Curve (F_YC) Assignment*

The assignment of final yield curves to each forested stand is based on a number of landbase attributes, including, YCTYPE, F_DATA_SRC, F_STRATA, F_DEN, NSRCODE, ECO1 and OLDFMU. The final yield curves and combination of attributes used to define them are shown in Table 3-36. The area within the active and gross landbases represented by each yield curve is also shown.

The process used to assign the final yield curves for each of the three yield curve types is outlined in Figure 3.33, Figure 3.34 and Figure 3.35.

The distinction between M91 "enhanced" and "basic" curves in Table 3-36 relates to the application of site index estimates from the Regenerated Stand Productivity (RSP) study conducted in 2007/8 (Weyerhaeuser, 2014b). The RSP study population was limited to c, d, e, f, h and j ecosites in the Lower (LF) and Upper (UF) Foothills natural subregions. The enhanced curves incorporate the site index values while the basic curves do not and are the same as the natural yield curves. The basic (_B) suffix was used to keep these yields distinct from the natural curve yield type. Enhanced curves will only be applied to cutblocks harvested on or after May 1, 1966 as prior to this date most timber harvesting was conducted under timber berths, and reforestation activities were most likely rudimentary or non-existent.

The SwG yield curve refers to tree improvement yield curves for white spruce based on the Region I white spruce controlled parentage program (CPP). Twelve openings (5150440720, 5110512011, 5130503654, 5090422098, 5130441559, 5090413179, 5110440217, 5110441042, 5110441448, 5100480322, 5100513580, and 5120432230) have been identified by Weyerhaeuser as being planted with the improved seedstock and are therefore assigned to this yield curve.

In the TSA process, future cutblocks that transition to a Sw stratum within the Region I tree improvement zone will be assigned to the SwG yield curve. As only Weyerhaeuser is expected to utilize the improved Sw seedstock, the assignment to SwG yield curves will be limited to Weyerhaeuser cutblocks.

Table 3-36. Final yield curve definitions and area on the landbase.[3]

F_YC	YCTYPE	F_STRATA	F_DATA_SRC	F_DEN	NSRCODE	ECO1	OLDFMU	Landbase Area (Ha)	
								Active	Gross
Hw	RSA	Aw	RSA					817	833
Pl	RSA	Pl						44,157	45,187
SwG	RSA	Sw						238	239
Sw	RSA	Sw						15,438	15,882
Sb	RSA	Sb						284	292
PlHw	RSA	PlAw						4,153	4,245
SwHw	RSA	SwAw						7,454	7,710
SbHw	RSA	SbAw						15	16
HwPl	RSA	AwPl						2,446	2,519
HwSx	RSA	AwSx						8,469	8,781
Hw_W	RSA	Aw	ARIS, HARVDECL				W5, W6	14,230	14,704
Hw_X	RSA	Aw	ARIS, HARVDECL				E15, E2, R12	20,939	21,701
C-PL_AB_E	M91 (Enhanced)	Pl		A, B	LF, UF	c,d,e,f,h,j		724	781
C-PL_AB_B	M91 (Basic)	Pl		A, B	Not LF, UF	Not c,d,e,f,h,j		297	321
C-PL_CD_E	M91 (Enhanced)	Pl		C, D	LF, UF	c,d,e,f,h,j		5,025	5,316
C-PL_CD_B	M91 (Basic)	Pl		C, D	Not LF, UF	Not c,d,e,f,h,j		312	324
C-SW_E	M91 (Enhanced)	Sw			LF, UF	c,d,e,f,h,j		2,250	2,517
C-SW_B	M91 (Basic)	Sw			Not LF, UF	Not c,d,e,f,h,j		335	362
C-SB_E	M91 (Enhanced)	Sb			LF, UF	c,d,e,f,h,j		156	169
C-SB_B	M91 (Basic)	Sb			Not LF, UF	Not c,d,e,f,h,j		35	36
CD-PL_E	M91 (Enhanced)	PlAw			LF, UF	c,d,e,f,h,j		1,780	1,881
CD-PL_B	M91 (Basic)	PlAw			Not LF, UF	Not c,d,e,f,h,j		16	16
CD-SX_E	M91 (Enhanced)	SwAw, SbAw			LF, UF	c,d,e,f,h,j		811	866
CD-SX_B	M91 (Basic)	SwAw, SbAw			Not LF, UF	Not c,d,e,f,h,j		89	106
DC-PL_E	M91 (Enhanced)	AwPl			LF, UF	c,d,e,f,h,j		1,841	1,952
DC-PL_B	M91 (Basic)	AwPl			Not LF, UF	Not c,d,e,f,h,j		123	134
DC-SX_E	M91 (Enhanced)	AwSx			LF, UF	c,d,e,f,h,j		1,822	1,948
DC-SX_B	M91 (Basic)	AwSx			Not LF, UF	Not c,d,e,f,h,j		57	63
D-HW_W_E	M91 (Enhanced)	Aw			LF, UF	c,d,e,f,h,j	W5, W6	4,459	4,654
D-HW_W_B	M91 (Basic)	Aw			Not LF, UF	Not c,d,e,f,h,j	W5, W6	402	431
D-HW_X_E	M91 (Enhanced)	Aw			LF, UF	c,d,e,f,h,j	E15, E2, R12	13,177	14,007
D-HW_X_B	M91 (Basic)	Aw			Not LF, UF	Not c,d,e,f,h,j	E15, E2, R12	860	953
C-PL_AB	NAT	Pl		A, B				44,589	85,280
C-PL_CD	NAT	Pl		C, D				89,070	103,271
C-SW	NAT	Sw						61,414	87,574
C-SB	NAT	Sb						2,137	169,663
CD-PL	NAT	PlAw						14,327	16,366
CD-SX	NAT	SwAw, SbAw						16,605	21,135
DC-PL	NAT	AwPl						14,203	16,359
DC-SX	NAT	AwSx						22,759	27,685
D-HW_W	NAT	Aw					W5, W6	44,526	53,521
D-HW_X	NAT	Aw					E15, E2, R12	84,284	102,900
X								340	224,714
Total								**547,464**	**1,067,415**

[3] SQL code used to develop Table 3-36

```
SELECT f_yc, yctype, sum(ACTIVE) ACTIVE, sum(GROSS) GROSS
from
(select f_active, f_yc,yctype, area_ha GROSS,
(case when f_ACTIVE = 'ACTIVE' then area_ha end) as ACTIVE
from CLS_LB_V8_20170824)
group by f_yc,yctype order by 2,1;
```

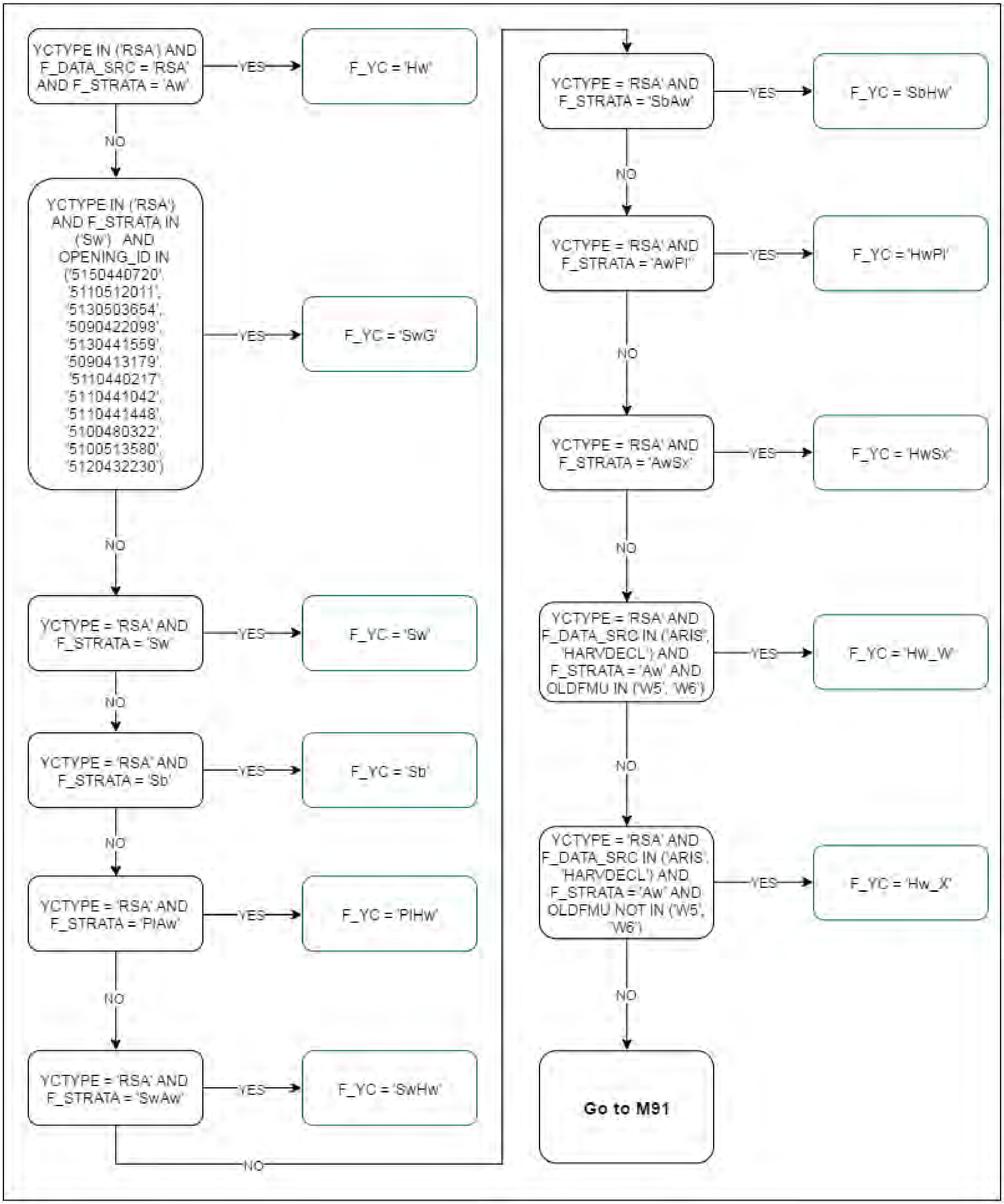

Figure 3.33. Assignment of yield curves (F_YC) for the RSA yield curve type.

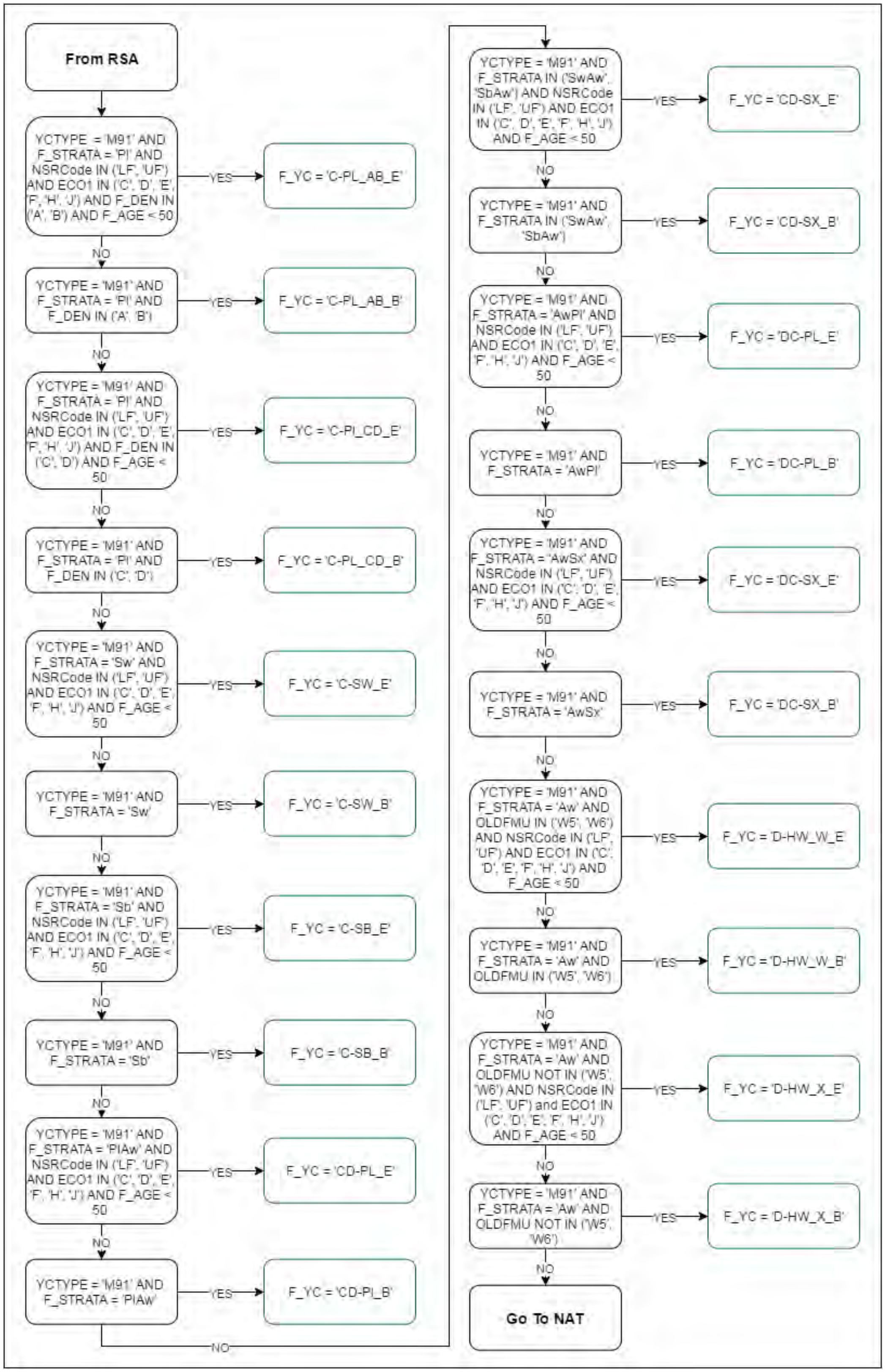

Figure 3.34. Assignment of yield curves (F_YC) for the M91 yield curve type.

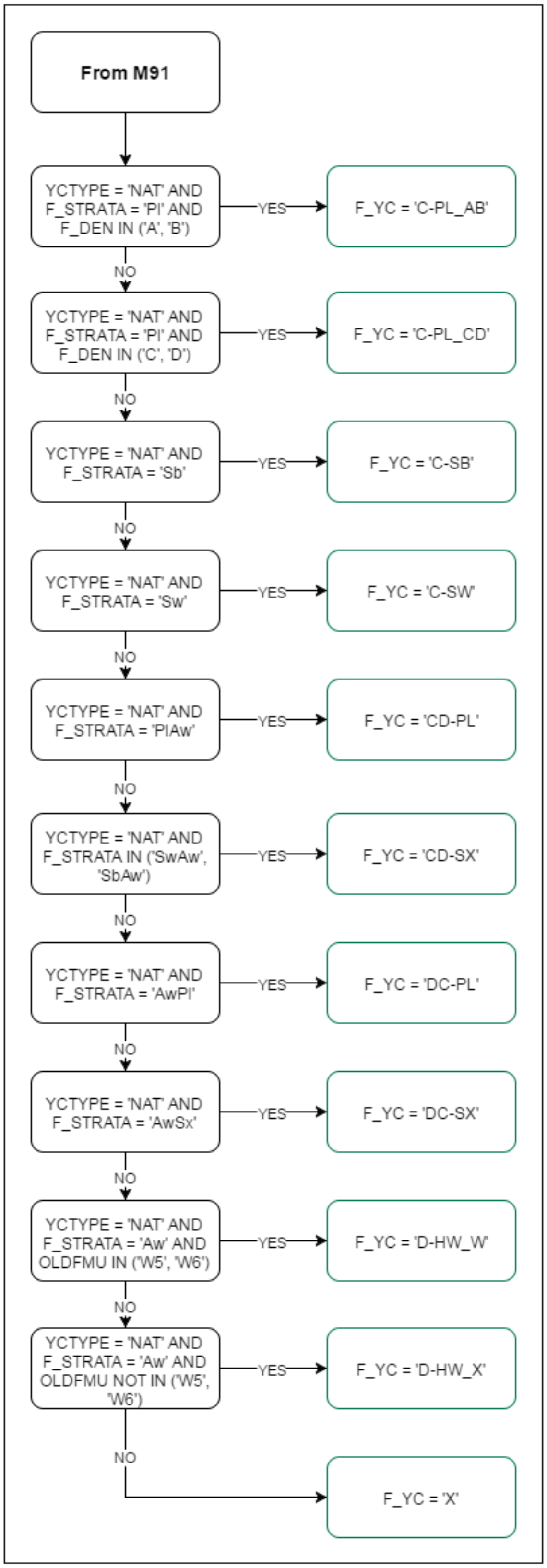

Figure 3.35. Assignment of yield curves (F_YC) for the NAT yield curve type.

3.12.12 F_ACTIVE: Final Active and Passive Landbase Assignment

The final assignment of a stand to either the active or passive landbase is a function of F_DEL. Areas with a deletion code (F_DEL <> 'X') are considered part of the passive landbase. Table 3-37 shows how stands are assigned to either the active or passive landbases.

Table 3-37. Active and passive landbase assignment.

		Landbase Area (Ha)
F_ACTIVE	**Description**	**Gross**
ACTIVE	Stands assigned to the active landbase (F_DEL = 'X')	547,464
PASSIVE	Stands assigned to the passive landbase (F_DEL <> 'X')	519,951
Total		**1,067,415**

3.12.13 F_FMA: Final FMA Assignment

The F_FMA attribute identifies whether a stand is within or external to Weyerhaeuser's FMA boundary. Table 3-38 shows the definitions used to make the final FMA assignment while Figure 3.36 displays the process that is applied to make this determination.

Table 3-38. F_FMA assignment.

		Landbase Area (Ha)	
F_FMA	**Description**	**Active**	**Gross**
FMA	Stands identified as being within Weyerhaeuser's FMA	526,537	955,225
NONFMA	Stands identified as outside the FMA but within the DFA	20,927	112,190
Total		**547,464**	**1,067,415**

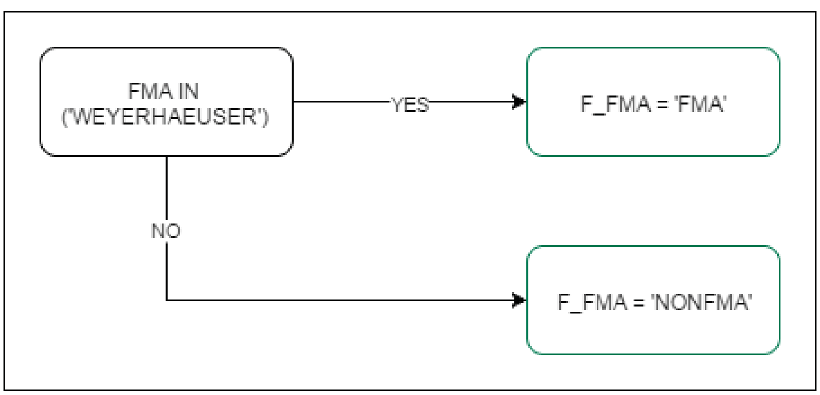

Figure 3.36. Process to assign final FMA (F_FMA) in the landbase.

3.12.14 F_LANDBASE: Final Landbase Assignment

While the TSA modelling process to develop the preferred forest management strategy (PFMS) and final SHS will assume a single landbase, this assignment has been made based on the definitions used in the previous FMP. This is to allow sensitivity analysis to be completed to determine the impacts of changing from a divided to a single landbase in the old Edson FMUs i.e. E15, E2, W5 and W6. Table 3-39 provides these field definitions. Figure 3.37 shows how stands were assigned to either the coniferous or deciduous landbases.

Table 3-39. Final landbase definitions.

		Landbase Area (Ha)	
F_LANDBASE	Description	Active	Gross
CONIFEROUS	Polygon defined as part of the coniferous landbase	329,768	683,855
DECIDUOUS	Polygon defined as part of the deciduous landbase	217,696	253,854
X	Polygon outside the above classification	-	129,706
Total		**547,464**	**1,067,415**

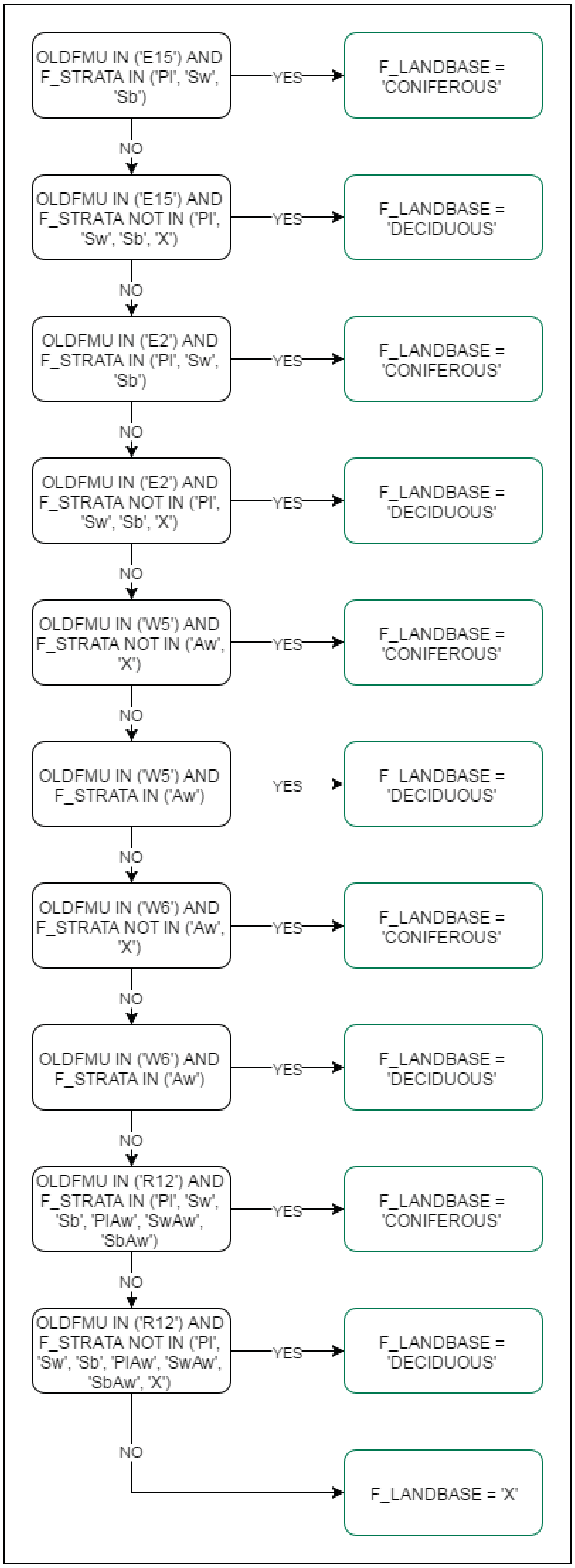

Figure 3.37. Process to assign the final landbase (F_LANDBASE) in the landbase.

3.13 Final Landbase Creation

Final landbase creation and area assignments for the different landbases change with the type of landbase in question.

3.13.1 TSA Landbase

The Timber Supply Analysis (TSA) landbase (TSA_LB_V8_20170824) is a result of linking the eliminated (sliver elimination) landbase to the proxy dataset by MU_UKEY. A new field called TSA_KEY is created as a unique identifier of this landbase. The TSA landbase contains all fields that were present in the pre-landbase. No reference to seismic lines is made in the TSA landbase.

3.13.2 CLS Landbase

The Classified (CLS) landbase (CLS_LB_V8_20170824) is the result of a union of the TSA landbase with the seismic line features as documented in Section 1.3. This landbase contains the most linework and polygon features of all the landbases. In addition to the TSA landbase fields, the fields' SEISMIC and CLS_UKEY are created as part of the union. CLS_UKEY is a unique identifier for this landbase. SEISMIC is a binary attribute (0 or 1) used to identify whether or not a polygon is a seismic line feature on the landbase. The CLS landbase constitutes the final submission landbase as it contains all the features required for submission.

3.13.3 MDL Landbase

The Modelling (MDL) landbase (MDL_LB_V8_20170824) is the landbase that is to be used for TSA modelling. The MDL landbase has the same linework and polygon count as the TSA landbase but has 2 new columns added and only a selection of fields pertinent to TSA modelling from the TSA landbase. The new columns include S_AREA and N_AREA. S_AREA is the seismic line area within the stand, while N_AREA is the net area of the stand, such that N_AREA + S_AREA = AREA_HA.

Additional columns will be added to the modelling landbase throughout the TSA process and will be included in the final landbase and landbase documentation submission with the FMP.

4. Landbase Summary

Following is a summary of the Weyerhaeuser landbase according to the rule-sets applied in previous sections.

4.1 Results

A summary of the landbase netdown, showing the breakdown of the active and passive areas by category, is presented in Table 4-1. While areas covered by seismic lines in the active landbase are shown in Table 4-1, the gross active landbase area (547,464 ha) is considered as contributing landbase for harvest level determination as adjustments for seismic line area is incorporated in the yield curves (section 3.11).

4.2 Changes since the Previous FMPs

Numerous changes have occurred since the development of the landbases for Weyerhaeuser's previous FMPs[4], including:

- The amalgamation of the Edson and Drayton Valley FMAs into a new single FMA, the Weyerhaeuser Pembina Timberlands FMA, in December 2009;
- The amalgamation of the 5 FMUs (E2, E15, W5, W6 and R12) included in the new FMA into a new single FMU, R15. While this amalgamation is awaiting final approval by AAF, the FMP assumes a single FMU;
- With each FMU representing a Sustained Yield Unit (SYU), the previous FMPs included a total of five SYUs. With the amalgamation of the FMUs into a single FMU, the 2016 FMP assumes a single SYU, i.e. FMU R15.
- The boundary for the new R15 FMU was redrawn by AAF and is slightly different to the combined boundaries of the old FMUs;
- New AVI imagery was obtained in 2012 for the majority of the DFA and was interpreted to the 2.1.1 standard;
- Several new requirements have come into effect that impact landbase development, including ARIS reconciliation and the RSA program and integration into the landbase. These new requirements have had a considerable impact on the processing time of the landbase.

Table 4-2 provides a comparison of the 2016 FMP landbase to the combined landbases from the previous Drayton Valley and Edson FMPs. Direct comparison between categories is not possible as the deletion hierarchy utilized in the previous and current net landbase processes are different.

[4] Drayton Valley (FMU R12) effective date November 18, 2000 and Edson (FMUs E15, E2, W5, W6) effective date May 1, 2006.

Table 4-1. Landbase netdown summary[5]

Landbase Category	Gross Area (Ha)	Seismic Area (Ha)	Net Area (Ha)
Passive Landbase			
Administrative Deletions			
First Nations	19,066	124	
Parks and Protected Areas	18,280	272	
Special Land Use Areas	3,065	14	
Hamlets	339	11	
Private Land	11,978	273	
Administrative Subtotal	**52,729**	**694**	
Landscape Deletions			
Roads	25,141	1,553	
Anthropogenic Non-Vegetated	1,639	46	
Anthropogenic Vegetated	33,840	3,086	
Grazing	10,751	254	
PNTs	2,844	42	
PSPs	515	8	
DIDs	26,340	1,381	
FireSmart	409	13	
Cabins	7	0	
HRVs	293	2	
Water	11,772	10	
Flood	1,739	48	
Aquatic	161	0	
Water Buffers	48,056	990	
Trumpeter Swan Buffers	739	35	
Naturally Non Vegetated	310	1	
Naturally Non Forested	11,594	333	
AVI	239	7	
Landscape Subtotal	**176,388**	**7,808**	
Operational Deletions			
Unproductive Areas	177,769	6,407	
TPR	6,316	138	
Horizontal Structure	427	12	
Burn	230	8	
Other Disturbances	488	21	
Slope	2,363	13	
Post91 Openings with no ARIS#	0	0	
Post91 Openings not reconciled	19	0	
Perf Surveyed NSR Openings <50% Stocking	29	0	
Operational Deletions	1,875	24	
SHS Deletions	211	4	
Operational Buffers	9,990	279	
Larch	48,823	1,787	
Birch	1,486	51	
Pine	24,069	719	
Black Spruce	13,506	476	
Isolated Stands	3,233	131	
Operations Subtotal	**290,835**	**10,070**	
Passive Landbase Subtotal	**519,951**	**18,571**	
Active Landbase			
Deciduous (D)	183,695	4,493	179,202
Deciduous/Coniferous (DC)	51,722	1,252	50,471
Coniferous/Deciduous (CD)	45,250	1,040	44,210
Coniferous (C)	266,797	5,180	261,617
Active Landbase Subtotal	**547,464**	**11,964**	**535,499**
Gross Landbase	**1,067,415**	**30,536**	

[5] SQL Code used to develop Table 4-1.

```
SELECT LandbaseCategory, Sum(area_ha) G_Area, Sum(S_AREA) S_Area
from (select Area_ha,
(Case when Seismic = 1 then Area_ha end) as S_Area,
(case when f_ACTIVE = 'ACTIVE' then F_BCG else F_DEL end) as LandbaseCategory
from CLS_LB_V8_20170824)
group by LandbaseCategory;
```

Table 4-2. Comparison of current landbase to previous FMP landbases

Category	2017 FMP	Previous FMPs[1]
Passive Landbase		
Administrative	52,729	30,492
Access	25,155	693
Anthropogenic	76,199	57,897
Seismic Lines	0	21,054
Water Features (excluding buffers)	13,673	0
Water Buffers	48,804	23,237
Non-Forested Areas	12,187	61,122
Natural Disturbances	719	0
Operational Deletions	14,546	10,150
Subjective Deletions	274,254	237,184
Total Deletions	**518,266**	**441,829**
Active Landbase		
Deciduous (D)	183,695	170,327
Deciduous/Coniferous (DC)	51,722	58,206
Coniferous/Deciduous (CD)	45,250	80,256
Coniferous (C)	266,797	279,632
Total Active Landbase	**547,464**	**588,421**
Gross Landbase	**1,065,730**	**1,030,250**

[1] Includes both the Drayton Valley (FMU R12) and Edson (FMUs E15, E2, W5 and W6) net landbases.

While the gross landbase area has increased by 3.6%, the active or contributing landbase available for the 2016 FMP is approximately 7% less than the area available in the previous FMPs. Some of the main reasons for these differences are as follows:

- While the previous DFAs excluded many administrative areas within the DFA, such as parks, private land, and grazing reserves, the new DFA incorporates the entire DFA boundary, resulting in an increase in the gross landbase area;
- Many of the spatial data layers used in the landbase development process have been updated or changed. For example, previous landbase development used Weyerhaeuser's internal hydrology layer while the new landbase utilizes the provincial layer. This has resulted in an increase in buffered area being removed from the active landbase.
- Increased oil and gas activity since the effective dates of the previous landbases has resulted in increased road access and land use dispositions, all of which have been removed from the active landbase;
- A more aggressive approach has been adopted in the 2016 FMP landbase regarding unproductive areas or subjective deletions. Ecosite information was used to determine unproductive areas on the landbase with all areas classified as unproductive being removed from the active landbase. In addition, any stands with a TPR = "U" assignment and which were not classified as an unproductive ecosite, have been assigned to the passive landbase. Subjective deletions in the previous FMPs were mostly species based, *e.g.* larch and black spruce with no removal of TPR = "U" stands.
- Weyerhaeuser has, over time, developed an operational buffer layer for areas deemed to be non-operational for a variety of reasons. This layer was not included in the previous FMPs but results in the removal an additional 10,000 ha from the current active landbase.

- The current landbase process includes an isolated stand procedure which is intended to identify stands that are not likely to be scheduled for harvest over the planning period due to their location or accessibility. This process results in an additional 2,000 ha being removed from the contributing landbase.
- Seismic lines were included as a landbase deletion in the previous FMPs, however they remain part of the active landbase in the 2017 FMP. Yield curve adjustments have been made to account for area loss to seismic lines in the 2017 FMP.

Weyerhaeuser has devoted a large amount of time and effort to accurately process and assess the landbase to ensure that all interests are catered for in the determination of the areas available for future timber harvesting activities (active landbase) and those not available for harvesting (passive landbase). The landbase deletion categories identified in this 2017 FMP landbase cannot be directly compared to the deletions of the previous plan as new information has allowed for a different classification of deletions as well as a different deletion hierarchy.

4.3 Landbase Updates

Updates to the landbase made subsequent to the 1st version submitted on October 26, 2016 include the following:

Section 2.3.4 (Old FMUs), Section 2.3.5 (VSAs), Section 2.3.7 (Compartments) and Section 2.3.8 (Working Areas). Minor boundary adjustments were made to ensure alignment across these administrative areas.

Section 2.3.20 – Updates to Hydrology Buffers. The hydrology buffers were updated, by changing which features in the hydrology polyline layer were classified as small streams (changed from STR_INDEF to STR_RECUR). In addition, the transitional streams were removed from the

Section 2.3.33 – Updates to Natural Areas. The prime protection area of the Eastern Slopes Landuse Zone was added to this layer.

Section 2.3.34 – Updates to Hamlets. The hamlets layer was updated to include the municipal land identified in the “Ownership.shp” layer provided by AAF.

Section 2.3.35 – Updates to Private Land. The private land layer was updated to include the federal land identified in the “Ownership.shp” layer provided by AAF.

Section 2.3.40 – Updates to DIDs layer. The DIDs layer was updated to include all polygons that are not part of the LOCs, PNT, or PSP layers (there is no longer a cut-off age to determine which are included). Additionally, all dispositions that were cancelled prior to May 1, 2015 were removed from the layer.

Section 2.3.43 – Updates to Temporary Exclusions layer. The temporary exclusions layer was updated to include an area adjacent to the O’Chiese First Nation reserve that could potentially be returned to the First Nation at some point in the future.

Section 2.3.46 – Updates to Operational Buffers layer. The operational buffers layer was reprocessed to account for the changes to the hydrology buffers layer.

Section 2.3.49 – Updates to Cutblocks layer. Cutblocks layer was updated to include newly supplied information from operators.

Section 2.3.50 – Updates to Planned Blocks layer. Planned blocks layer was updated to distinguish between pre-blocks i.e. those to be harvested between May 1, 2015 and May 1, 2017 (PLAN2) and planned blocks *i.e.* those to be harvested as part of the first decade of the SHS (PLAN10). Additional blocks were also added based on newly supplied information from operators.

Following AAF review of the ARIS information in the previously submitted landbase, changes were made to specific openings regarding attributes such as standards declarations, landbase designations, final strata assignments and start clock dates to match information provided by the AAF. ARIS reconciliation is ongoing and Weyerhaeuser will continue to work with the GOA to address any outstanding items prior to final landbase submission.

In addition, the following fields were added to the landbase:

- AGECL. 5 year age class based on F_AGE and used for TSA modeling purposes. Age classes are defined as follows: 1 = 1 to 5 years, 2 = 6 to 10 years etc which is consistent with yield curve application.
- STOCKING. Used to identify partially stocked stands that are to be assigned to adjusted yield curves (section 3.9). Stands are assigned one of the following attributes:
  - NSR50 - Performance surveyed stands with stocking status = 'NSR' and a stocking percent <= 50
  - NSR80 - Performance surveyed stands with stocking status = 'NSR' and a stocking percent > 50 but < 80
  - X – All other stands.

Updates to the landbase made subsequent to the 2nd version submitted on February 27, 2017 (A-I-P version) include the following:

Section 2.3.30 – Addition of the FireSmart Deletions section. This section shows the areas that have been cleared as part of the FireSmart program and will likely remain cleared to ensure community safety. As a result they should not be considered part of the active landbase.

Section 2.3.42 – Addition of the Hard Linear Features Section. This section shows the Hard Linear Features layer that is a component of the Songbirds model. This layer is included as a proxy layer so that the model can be integrated into the TSA model. It was included as a proxy to limit the landbase fragmentation that would otherwise occur.

Section 2.3.51 – Updates to the cutblocks layer. Cutblocks were updated to account for ARIS revisions.

Section 2.3.52 – Updates to the planned cutblocks layer. The planned cutblocks layer was updated to account for changes to the planned blocks and additions/deletions requested during the development of the spatial harvest sequence.

Tables and maps in this document were updated based on new information provided by Weyerhaeuser and the quota holders.

4.3.1 Summary of Changes to the Landbase

Table 4-3 summarizes changes to the classified landbase since the version submitted on February 27, 2017 (A-I-P version) while Table 4-4 shows how the area by stratum on the active landbase has changed.

Table 4-3. Summary of changes to the landbase by deletion category

Category	A-I-P Landbase[1] (Ha)	Submitted Landbase[2] (Ha)	Difference (Ha)
Passive Landbase			
Administrative	52,729	52,729	0
Access	25,155	25,141	-14
Anthropogenic	76,199	76,638	439
Seismic Lines	0	0	0
Water Features (excluding buffers)	13,673	13,672	-2
Water Buffers	48,804	48,795	-10
Non-Forested Areas	12,187	12,143	-44
Natural Disturbances	719	718	-2
Operational Deletions	14,546	14,488	-58
Subjective Deletions	274,254	275,629	1,374
Total Deletions	**518,266**	**519,951**	**1,685**
Active Landbase			**0**
Deciduous (D)	184,011	183,695	-316
Deciduous/Coniferous (DC)	51,771	51,722	-49
Coniferous/Deciduous (CD)	45,345	45,250	-95
Coniferous (C)	268,022	266,797	-1,225
Total Active Landbase	**549,149**	**547,464**	**-1,685**
Gross Landbase	**1,067,415**	**1,067,415**	**0**

[1] CLS_LB_V5_20170211

[2] CLS_LB_V8_20170824

Table 4-4. Summary of changes to area by stratum on the active landbase

Stratum	A-I-P Landbase[1] (Ha)	Submitted Landbase[2] (Ha)	Difference (Ha)
Aw	184,011	183,695	-316
AwPl	18,645	18,614	-31
AwSx	33,126	33,108	-18
SwAw	24,266	24,233	-33
PlAw	20,337	20,276	-61
SbAw	742	741	-2
Sw	79,802	79,804	2
Pl	185,265	184,316	-950
Sb	2,955	2,677	-278
Total	**549,149**	**547,464**	**-1,685**

[1] CLS_LB_V5_20170211

[2] CLS_LB_V8_20170824

The active landbase area decreased by 1,685 ha mostly due to the increase in subjective deletions. This was largely caused by changes to plan blocks where subjective deletions within plan blocks are not treated as deletions (see deletion hierarchy in section 3.12.1). With the removal of planned blocks, these areas became subjective deletions in the landbase.

5. References

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Shore, T.L.; Safranyik, L. Susceptibility and risk rating systems for the mountain pine beetle in lodgepole pine stands. 1992. Forestry Canada, Pacific Forestry Centre. Victoria, BC. Information Report BC-X-336. 12 p.

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Weyerhaeuser 2014b. Regenerated Stand Productivity in Central Alberta, Pembina Timberlands. October 2014. Weyerhaeuser Company Ltd. Drayton Valley, AB. 38 p.

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Weyerhaeuser 2016b. LB-021: NSR Performance Surveyed Blocks. September 2016. Weyerhaeuser Company Ltd. Pembina 2016-2026 FMP Development, LB Issue Document. 5p.

Appendix I – Net Landbase Agreement in Principle

Alberta Agriculture and Forestry

Forestry Division
Forest Management Branch
7th floor, Forestry Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Canada
Telephone: 780-427-8474
www.agriculture.alberta.ca

File: 06332-R01-02

March 28, 2017

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Company Ltd. (Pembina Timberlands)
2509 Aspen Drive
Edson, Alberta T7E 1S8

Dear Mr. Scott:

Subject: AGREEMENT-IN-PRINCIPLE – WEYERHAEUSER COMPANY LTD. (PEMBINA TIMBERLANDS 2016 FOREST MANAGEMENT PLAN CLASSIFIED LANDBASE #2

Thank you for the February 27, 2017 second submission of the Weyerhaeuser Company Ltd. Pembina Timberlands (WeyCo PB) Classified Landbase (CLB).

The department has reviewed the submission and agreement-in-principle is granted subject to the following:

1. WeyCo PB has worked closely with the department to understand and complete the ARIS reconciliation process. WeyCo PB shall continue to work with the department to address any issues arising from the ARIS reconciliation portion of the review prior to submission of the forest management plan.

The CLB was audited. WeyCo PB is responsible for identifying and correcting attribute errors found through further review or through the use of the product.

If you have any questions or require further information, please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Director, Forest Resource Management

cc: Kevin Vander Haeghe, Forest Area Manager, Edson Forest Area
Stephen Mills, Area Forester, Edson Forest Area
Trisha Stubbings, Area Forester, Rocky Mountain House Forest Area
Daryl Price, Director, Forest Resource Analysis

Weyerhaeuser

Appendix II – AVI Approval

Alberta Agriculture and Forestry

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7th floor, Great West Life Building
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Telephone: 780-427-8474

File: 06332-F01-04

March 7, 2016

Ms. Kerri Mackay, RPF
Strategic Informatics
Weyerhaeuser Pembina Timberlands
P.O. Box 7739, Hwy 22 South
Drayton Valley, AB T7A 1S8

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: **ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER COMPANY LIMITED (PEMBINA TIMBERLANDS)**

Alberta government staff completed an audit of the western townships within Forest Management Unit R12 in the Weyerhaeuser Company Limited (Pembina Timberlands) Forest Management Agreement (FMA) area (2007 imagery) submitted in February 2016.

The audit conducted indicated that the data are within acceptable ranges of agreement. The audit results are attached.

The data for the Defined Forest Area (FMUs E15, E2, W5, W6 and R12) is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at (780) 422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

Enclosures

cc: Daryl Price, Director, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

Weyerhaeuser Pembina 2007 AVI Audit Results

Company	Weyerhaeuser Pembina
Contractor	Silvacom
FMU	R12 and R13
Date of Submission	February 2016
Imagery Type	ADS 40 4-band 30 cm
Imagery Year	2007
LiDAR Year	2006 - 2007
# Interpreters	1
Auditor	Dean Johnston

Attribute Audit

Warning Summary

Frequency	Description
19	CC or BU modifier should not be contained in understory
25	OVERSTORY A mesic or dry moisture Regime: m found in conjunctions with a Sb species 1
25	OVERSTORY A wet moisture Regime: w found in conjunctions with a Pl species 1
6	OVERSTORY Origin less than 1700
20	OVERSTORY TPR: U found in conjunctions with a Pl species 1
12	OVERSTORY TPR: U found in conjunctions with a Se species 1
59	OVERSTORY TPR: U found in conjunctions with a Sw species 1
1	OVERSTORY Treed layer has a CC or Bu modifier 1 with an associated year but the origin of the stand does not match the modifier year. (mod_yr:2006 origin:1900)
1	OVERSTORY Treed layer has a CC or Bu modifier 1 with an associated year but the origin of the stand does not match the modifier year. (mod_yr:2006 origin:1940)
1	OVERSTORY Treed layer has a CC or Bu modifier 1 with an associated year but the origin of the stand does not match the modifier year. (mod_yr:2013 origin:1890)
1	UNDERSTORY A mesic or dry moisture Regime: d found in conjunctions with a Sb species 1
198	UNDERSTORY A mesic or dry moisture Regime: m found in conjunctions with a Sb species 1
23	Understory data source questionable. (U data: F)
68	Understory data source questionable. (U data: P)
19	Understory modifier 1 questionable. (U mod1: CC)
8	Understory modifier 1 questionable. (U mod1: CL)
3	Understory modifier 1 questionable. (U mod1: ST)
16	Understory modifier 1 questionable. (U mod1: WF)
4	Understory modifier 1 questionable. (U mod1: PL)
1	UNDERSTORY Origin less than 1700
1	UNDERSTORY TPR: U found in conjunctions with a Pl species 1
9	UNDERSTORY TPR: U found in conjunctions with a Se species 1
27	UNDERSTORY TPR: U found in conjunctions with a Sw species 1

Error Summary

Frequency	Description	Results
0	No errors were found in the attribute data	No action required

Spatial Audit

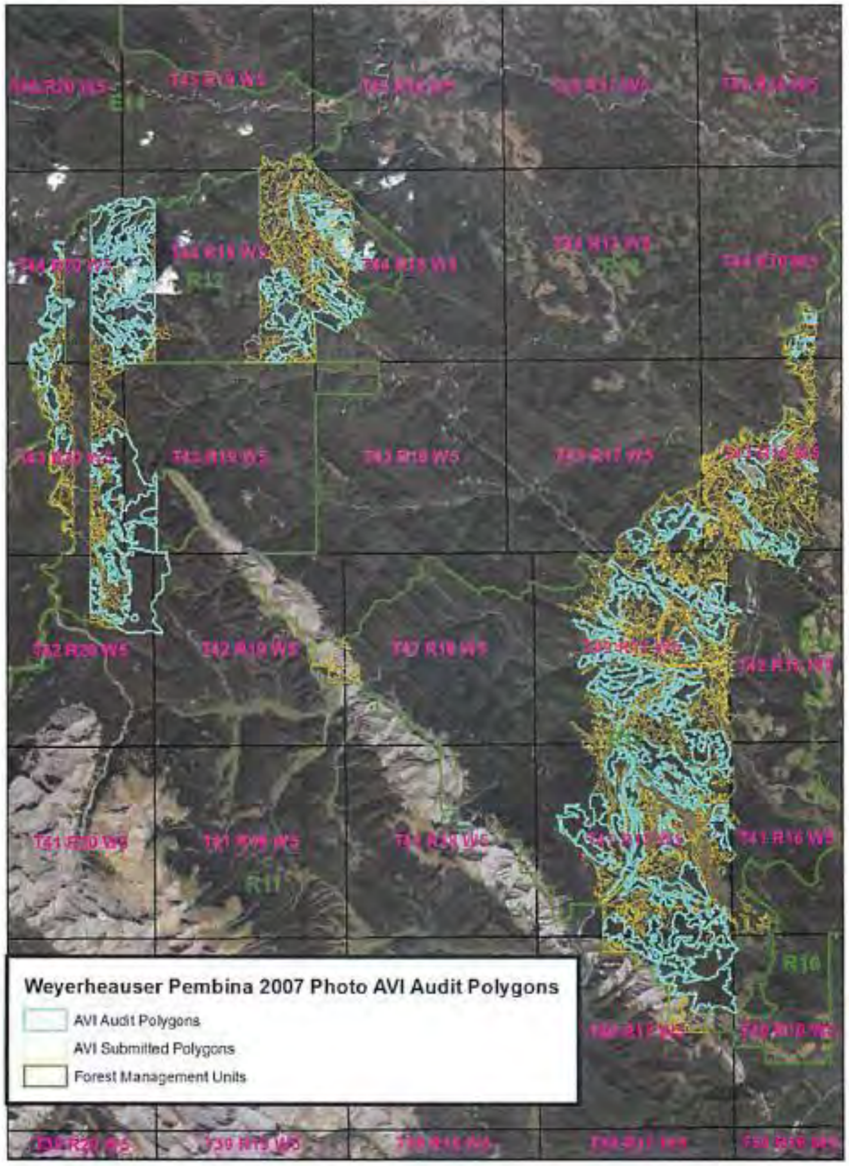
Check	Description	Results
Missing Fields	Required AVI fields are missing.	None
Extra Fields	Invalid AVI feature class fields are present.	None
Overlap	Polygon overlap.	None
Gaps	Gaps in the AVI feature class.	None
Neighbour Attributes	Attributes of neighbouring polygons are the same.	None
Multi-parts	Multi-part polygons.	None
Duplicate POLY_NUM	Each POLY_NUM is not unique.	None
Attribute Structure	AVI fields do not match the proper structure for name, type and length.	None

Interpretation Audit

The interpretation audit process involved creating stratum based on various types deemed to be important indicators in vegetation inventory. The strata are sampled using the strata statistics and random polygons are selected using the POLS (Polygon Sampling) tool for subsequent audit (see Strata Statistics and Sampling Parameters). The variables audited were as follows:

- Moisture regime
- Crown closure (A/B/C/D)
- Crown closure (AB/CD)
- Height
- Non-forested
- Seral Stage
- Species 1
- Modifier 1
- Base 10 Strata
- Cover Group
- Understorey Height
- Understorey Species 1
- Understorey Base 10 Strata
- Understorey Cover Group

The submission contained a total of 2,064 polygons of which 107 were audited. A five meter canopy height model was generated for each polygon to assist in height estimation. The average agreement between the contractor and auditor of the above variables was found to be 98.9% (see Agreement Summary). Based on this level of agreement the inventory was deemed to be acceptable (see also Overall Comments).


Weyerhaeuser Pembina 2007 Photo AVI Audit Polygons
AVI Audit Polygons
AVI Submitted Polygons
Forest Management Units

Polygon Selection (POLS) Information

- Number of polygons in input feature class: 2,064
- Number of selectable polygons : 2,049
- Total area covered by selectable polygons: 31,487.5 ha
- Total number of polygons audited: 107
- Total area covered by audited polygons: 11,082 ha
- 13 polygons of trembling aspen leading and 2 polygons of alpine fir leading were not sampled

Strata Statistics and Sampling Parameters

Strata	# Polygons	Area (ha)	% Area	# Sample Polygons	Sample Area (ha)
White Spruce	584	10051.4	31.9	30	4948.1
Pine	1,065	17,568.3	55.8	49	5369.9
Black Spruce	146	1,852.2	5.9	10	165.5
Non-forested	212	1,426.8	4.5	10	287.4
CC	42	544.8	1.7	8	311.4
Totals	2,049	31,487.5	99.8	107	11082.3

Agreement Summary

Variable	% Agreement
Moisture regime	100.0
Crown closure (A/B/C/D)	95.3
Crown closure (AB/CD)	98.1
Height	96.3
Non-forested	98.1
Seral Stage	100.0
Species 1	99.1
Modifier 1	100.0
Base 10 Strata	99.1
Cover Group	100.0
Average Overstory Agreement	**98.6**
Understorey Height	100.0
Understorey Species 1	99.1
Understorey Base 10 Strata	100.0
Understorey Cover Group	100.0
Average Understory Agreement	**99.8**
Average Total Agreement	**98.9**

Overall Comments

Delineation through this AVI submitted area complied with the AVI 2.1.1 specifications. As well, the anthropogenic footprint was effectively captured.

The use of historic information, such as PSP information and the previous AVI, was found to be referenced through the interpreted area, bringing known information such as species and origin into the newly created AVI.

Overall, the interpreted attributes called by the interpreter was accurate to the AVI 2.1.1 specifications, reflecting the vegetation or feature in which they were describing. There were a just a couple of polygons where Crown Closure and Height were found to be inaccurate, but only appeared locally and not widespread. The interpretation through the area was consistent.

Appendix III – Updates to AVI

Weyerhaeuser Pembina 2016 - 2026 FMP

The following table includes all records that are not identical in the original and updated AVI. Items highlighted in red indicate the field(s) in which the change occurred (ARIS, MOD1, MOD1_YR, and/or ORIGIN).

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
346	34414	X	5140520974	CC	CC	1993	1993	1880	1880
899	36365	X	X	CC	X	0	0	0	0
2594	43419	5140520224A	5140523276A	CC	CC	1995	1995	1940	1940
2940	4616	X	X	CC	CL	0	0	1990	1990
3451	6302	X	X	CC	X	0	0	1890	1890
5285	11329	X	X	CC	CL	1994	1994	1994	1994
5331	11464	X	X	CC	CL	1994	1994	1994	1994
5353	11542	X	X	CC	X	0	0	1980	1980
3963	7731	X	5110462831	CL	CC	0	0	0	0
3977	7769	X	5110462831	CL	CC	0	0	1950	1950
3696	7061	5110461179	X	CC	X	2008	2008	1890	1890
7059	27367	X	5110510468	X	CC	0	2012	1890	1890
5730	12732	X	X	CC	X	1987	1987	1987	1987
6684	4580	X	5110481576A	CC	CC	1994	1994	1994	1994
6870	25966	5100511007A	5110511007A	CC	CC	0	0	1910	1910
6899	26222	X	X	CC	X	0	0	1970	1970
6900	26224	X	X	CC	X	0	0	1980	1980
6905	26241	X	X	CC	X	0	0	1930	1930
6915	26357	X	X	CC	X	0	0	1940	1940
6943	26552	X	X	CC	X	0	0	1930	1930
6952	26599	X	X	CC	X	0	0	1930	1930
6958	26618	5110511020	5110511020	X	CC	0	0	1930	1930
8038	33744	X	5110520163	X	CC	0	1991	1860	1860
8525	453	X	X	CC	X	1941	1941	1940	1940
7634	31254	5110510009	5110510009	X	CC	0	0	1900	1900
7652	31314	X	X	CC	X	0	0	1940	1940
8120	39766	X	X	CC	X	0	0	1970	1970
8253	42105	X	X	CC	X	0	0	1930	1930
8254	33137	X	X	CC	X	0	0	1900	1900
7866	32508	X	X	CC	CC	0	0	1985	1990
7475	30305	X	X	CC	X	0	0	1950	1950
7476	30306	X	X	CC	X	0	0	1950	1950
7490	30389	X	X	CC	X	0	0	1950	1950
7976	42106	X	X	CC	X	0	0	1930	1930
7991	33224	X	X	CC	WT	0	2004	1990	1990
10383	14882	X	X	CC	X	0	0	1970	1970
9459	1318	X	5110502722	X	CC	0	2013	1920	1920
9990	1557	X	5110503223	X	CC	0	2012	1890	1890
10006	1682	X	5110503223	X	CC	0	2012	1930	1930
10045	1039	5110501888	X	CL	CL	0	0	0	0
9766	1647	X	5110503223	X	CC	0	2012	1890	1890
9336	1186	X	X	CC	CL	0	0	1990	1990
9346	1197	X	X	CC	CL	0	0	2000	2000
12705	6651	5100461596	X	CC	X	1992	0	1890	1890
12256	5484	5100451895	5100451895A	CC	CC	1997	1997	1997	1997
11486	17604	5100500111	5100500112	CC	CC	1992	1992	1992	1992
11059	16309	X	5100501046	CC	CC	1993	1993	1993	1993
12562	6379	5100452138	X	CC	X	1991	1991	1910	1910
12161	5095	X	X	CC	X	0	0	1960	1960
13522	8646	X	X	CC	X	0	0	1950	1950
13528	8668	X	X	CC	X	0	0	1950	1950
13557	8750	X	X	CC	X	0	0	1900	1900
13569	8772	X	X	CC	X	0	0	1950	1950
13577	8782	X	X	CC	X	0	0	1950	1950
13599	8854	X	X	CC	X	1986	1986	1986	1986
14114	10115	X	X	CC	X	0	0	1920	1920
13649	9003	X	X	CC	X	0	0	1960	1960
13317	8124	X	X	CC	X	0	0	1930	1930
13372	8254	X	X	CC	X	0	0	1940	1940
14304	10536	5100472687	5100472687	X	CC	0	0	1920	1920
13404	8334	X	X	CC	X	0	0	1980	1980
13422	8378	X	X	CC	X	0	0	1920	1920
13461	8471	X	X	CC	X	0	0	1890	1890
13486	8524	X	X	CC	X	0	0	1890	1890
13487	8540	X	X	CC	X	0	0	1890	1890
13958	9747	5100471688	5100471688	CL	CC	0	0	1970	1970
13507	8571	X	X	CC	X	0	0	1890	1890
13984	9811	5100471688	5100471688	CL	CC	0	0	1970	1970
16450	8342	X	X	CC	X	0	0	1890	1890
16122	12061	X	X	CC	X	1997	1997	0	0

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
16129	12508	5100482085	5100482085	CC	CC	0	2001	2000	1950
15333	12435	5100482085	5100482085	CC	CC	0	2001	2000	1990
15348	12472	5100482085	5100482085	CC	CC	0	2001	2000	1950
15365	12505	5100482085	5100482085	CC	CC	0	2001	2000	2000
16293	8526	X	X	CC	X	0	0	1930	1930
17318	34900	X	X	CC	X	0	0	1930	1930
18267	37929	X	X	CC	X	0	0	1940	1940
16893	33640	X	X	CC	X	0	0	1910	1910
16900	33663	X	X	CC	X	0	0	1950	1950
16901	33666	X	X	CC	X	0	0	1910	1910
18368	38270	X	X	CC	X	0	0	1980	1980
16983	33935	5120520348	5120520349	CC	CC	0	0	1990	1990
17889	36792	X	X	CC	X	0	0	1880	1880
17000	33980	X	5110520395	X	CC	0	2013	1930	1930
17471	35359	5120520968A	5120520968A	CC	CC	2007	2007	2007	1950
17477	35380	X	X	CC	X	0	0	1930	1930
17035	34074	X	5110520395	X	CC	0	2013	1860	1860
17038	34081	X	5110520395	X	CC	0	2013	1860	1860
17094	34259	5120520348	5120520349	CC	CC	0	0	1990	1990
17652	36000	X	X	CC	X	0	0	1860	1860
17695	36139	X	X	CC	X	0	0	1860	1860
17715	36210	X	X	CC	X	0	0	1970	1970
17740	36284	X	X	CC	X	0	0	1890	1890
18819	39970	5110523573	5110523573	CC	CC	0	2002	2002	1960
19339	25567	X	X	CC	X	0	0	1970	1970
18885	40343	X	X	CC	X	0	0	1960	1960
18934	40469	X	X	CC	X	0	0	1930	1930
18955	40529	5110523528	X	CC	X	0	0	1890	1890
18958	40544	5110523528	X	CC	X	0	0	1880	1880
18966	40568	5110523528	X	CC	X	0	0	1880	1880
18536	38874	X	5110522766A	CC	CC	0	1995	1990	1990
19015	40522	X	X	CC	X	0	0	1980	1980
18606	39162	X	5110523330	CC	CC	0	0	1950	1950
20012	28282	X	X	CC	X	0	0	1880	1880
18659	39369	X	X	CC	X	0	0	1950	1950
20967	31668	X	X	CC	X	0	0	1940	1940
21957	2061	X	X	CC	X	0	0	1980	1980
21969	2080	X	X	CC	X	0	0	1890	1890
20567	30336	X	X	CC	X	1988	1988	1988	1988
22002	2124	X	X	CC	X	0	0	1980	1980
22009	2133	X	X	CC	X	0	0	1980	1980
22036	2168	X	X	CC	X	0	0	1980	1980
18456	38622	X	X	CC	X	0	0	1910	1910
22849	3476	X	X	CC	X	0	0	1980	1980
22855	3489	X	X	CC	X	0	0	1980	1980
23312	4265	X	5120443379A	CC	CC	0	1995	1980	1990
22481	2892	X	X	CC	X	0	0	1990	1990
23348	4340	X	5120443379A	CC	CC	0	1995	1995	1990
22513	2936	5110440035	5110441727	CC	CC	1990	1990	1990	1990
22559	3003	5110440034	5110441767	CC	CC	1989	1989	1989	1989
22564	3017	5110440035	5110441727	CC	CC	1990	1990	1990	1990
23450	4523	X	X	CC	X	1995	0	1980	1995
22595	3060	X	X	CC	X	0	0	0	0
23467	4570	X	X	CC	X	1988	1988	1988	1988
22601	3070	5110440034	5110441767	CC	CC	1989	1989	1890	1890
22626	3128	X	X	CC	X	0	0	0	0
23068	3883	5120442638A	5120443525A	CC	CC	1995	1995	1995	1995
23095	3921	5120443379A	5120442638A	CC	CC	1996	1994	1996	1996
23105	3941	5120440114	5120443560A	CC	CC	0	0	1990	1990
23572	4875	5120451171	5120450038	CC	CC	1990	1990	1990	1990
22293	2590	5120432570	X	CC	X	1990	1990	1990	1990
22755	3332	5110441911A	5110441954A	CC	CC	1997	1997	1997	1997
23679	5370	X	X	CC	X	0	0	1890	1890
25624	80815	5080400102	5080400002	CC	CC	1988	1988	1988	1988
25642	80846	5080400102	5080400002	CC	CC	1988	1988	1988	1988
24727	60817	X	5130561279A	X	CC	0	0	1940	1940
25229	63655	5130563692A	5130563689A	CC	CC	1995	1995	1995	1995
22141	2323	X	X	CC	X	1988	1988	1870	1870
23942	3056	X	5120441581	X	CC	0	2013	1870	1870
24429	59364	X	X	CC	X	0	0	1990	1990
23974	3460	X	X	CC	X	0	0	1980	1980
24430	59366	X	X	CC	BU	0	2004	1990	1990
24433	59382	X	X	CC	X	0	0	1950	1950
24435	59394	X	X	CC	BU	0	2004	1990	1990

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
24439	59433	5120553116A	5120553206A	CC	CC	2000	2000	2000	2000
24440	59435	5120553116A	5120553206A	CC	CC	2000	2000	2000	2000
24441	70163	X	5120553116A	CC	CC	0	0	1990	1990
24909	61689	5130562491A	5120561921A	CC	CC	1995	1995	1995	1995
25387	70118	5130561133A	X	CC	X	1993	1993	1940	1940
24466	59574	X	5130560272A	X	X	0	0	1970	1970
24483	59672	5130560272A	5130560282	CC	CC	1993	1993	1940	1940
24020	2320	X	X	CC	X	1988	1988	1988	1988
24027	2355	X	X	CC	X	1988	1988	1988	1988
24047	4518	X	X	CC	X	1988	1988	1988	1988
24965	61944	5130562355A	5130562336A	CC	CC	1995	1995	1995	1995
24579	60126	X	X	CC	X	0	0	1950	1950
25525	80604	5080401133	5080400013	CC	CC	1992	1992	1920	1920
25538	80630	5080401112	5080400012	CC	CC	1991	1991	1991	1991
27456	93323	X	X	CC	X	0	0	1900	1900
26990	90445	X	X	CC	X	0	0	1870	1870
26991	90452	X	X	CC	X	0	0	1960	1960
26995	90591	X	X	CC	X	0	0	1890	1890
26998	90628	X	X	CC	X	0	0	1950	1950
26999	90632	X	X	CC	X	0	0	1960	1960
27025	90885	X	X	CC	X	0	0	1890	1890
27032	90940	X	X	CC	X	0	0	1920	1920
27034	90992	X	X	CC	X	0	0	1900	1900
27037	91006	X	X	CC	X	0	0	1920	1920
27039	91022	X	X	CC	X	0	0	1920	1920
27059	91168	X	X	CC	X	0	0	1920	1920
27076	91276	X	X	CC	X	0	0	1920	1920
27090	91339	X	X	CC	X	0	0	1920	1920
27101	91406	X	X	CC	X	0	0	1910	1910
27107	91461	X	X	CC	X	0	0	1890	1890
27113	91487	X	X	CC	X	0	0	1920	1920
27116	91524	X	5140422977	CC	CC	0	0	1990	1990
27122	91547	X	X	CC	X	0	0	1940	1940
27158	91788	X	X	CC	X	0	0	1970	1970
27169	91851	X	X	CC	X	0	0	1920	1920
27175	91891	X	X	CC	X	1971	1971	1900	1900
27180	91923	X	X	CC	X	0	0	1950	1950
27186	91983	X	X	CC	X	1971	1971	1920	1920
27192	92021	X	X	CC	X	1971	1971	1920	1920
26771	85796	5160412891	5160412891	X	CC	0	0	1890	1890
27196	92047	X	X	CC	X	0	0	1940	1940
27221	92162	X	X	CC	X	0	0	1950	1950
25837	81322	X	5080400105	CC	CC	0	0	1950	1950
27234	92261	X	X	CC	X	0	0	1910	1910
27242	92285	X	X	CC	X	0	0	1910	1910
27245	92298	X	X	CC	X	0	0	1910	1910
27249	92312	X	X	CC	X	0	0	1920	1920
27274	92432	X	X	CC	X	0	0	1910	1910
27280	92460	X	X	CC	X	0	0	1910	1910
27296	92545	X	X	CC	X	0	0	1940	1940
27297	92550	5130423244	5130423244	X	CC	0	0	1890	1890
27300	92565	5130423149	5130423149	X	CC	0	0	1920	1920
26409	98462	5080400103	5080400003	CC	CC	1989	1989	1989	1989
26411	98464	5080400102	5080400002	CC	CC	1988	1988	1988	1988
26413	98466	5080400102	5080400002	CC	CC	1988	1988	1988	1988
27331	92754	X	X	CC	X	0	0	1910	1910
27341	92808	5150423237	5150423237	X	CC	0	0	1860	1860
27344	92821	X	X	CC	X	0	0	1960	1960
27345	92823	X	X	CC	X	0	0	1900	1900
27347	92834	X	X	CC	X	0	0	1960	1960
27349	92845	X	X	CC	X	0	0	1900	1900
27356	92870	X	X	CC	X	0	0	1960	1960
26977	90193	X	X	CC	X	0	0	1910	1910
26984	90355	X	X	CC	X	0	0	1960	1960
27428	93208	X	X	CC	X	1972	1972	1972	1972
26529	100029	5080401133	5080400013	CC	CC	1992	1992	1920	1920
29321	96279	5120432570	5110430005	CC	CC	1990	1990	1990	1990
29025	95978	5130432503	5130430003	CC	CC	1990	1990	1990	1990
28611	95551	X	X	CC	X	0	0	1900	1900
29067	96020	5130432544	5130430002	CC	CC	1990	1990	1990	1990
29120	96074	5130432544	5130430002	CC	CC	1990	1990	1990	1990
29131	96085	5130432503	5130430003	CC	CC	1990	1990	1990	1990
29142	96096	5130432575	5130430001	CC	CC	0	0	1990	1990
27840	94765	5120431253	5120431253	X	CC	0	0	1920	1920

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
29239	96196	5130432558	5130430001	CC	CC	1990	1990	1990	1990
31145	76655	5130432342	5130432342	X	CC	0	0	1890	1890
30763	76297	X	5110431934B	X	CC	0	1997	0	0
30347	98348	5130432544	5130430002	CC	CC	1990	1990	1990	1990
29910	96994	X	X	CC	X	0	0	1860	1860
30144	97613	X	X	CC	X	0	0	1880	1880
30146	97615	X	X	CC	X	0	0	1900	1900
32982	22672	X	X	CC	X	0	0	1910	1910
32783	22376	X	X	CC	X	0	0	1900	1900
32890	22541	X	X	CC	X	0	0	1990	1990
34795	46744	X	X	CC	X	0	0	0	0
33472	23354	X	X	CC	X	0	0	1930	1930
33928	23961	X	X	CC	X	0	0	1900	1900
34023	47493	X	X	CC	X	0	0	1890	1890
34034	24124	X	X	CC	X	0	0	1900	1900
34043	24135	X	X	CC	X	0	0	1910	1910
34476	24829	X	X	CC	X	0	0	1910	1910
33676	23619	X	X	CC	X	0	0	1910	1910
33220	23009	X	X	CC	X	0	0	1890	1890
33298	23125	X	X	CC	X	0	0	1930	1930
33789	23778	5160502104A	5160502087A	CC	CC	1999	1999	1999	1999
33355	23198	X	X	CC	X	0	0	1930	1930
33362	23205	X	X	CC	X	0	0	1890	1890
34707	25238	5150510114	5150500114	CC	CC	1988	1988	1988	1988
34722	25277	5150510114	5150500114	CC	CC	1988	1988	1988	1988
33367	23211	X	X	CC	X	0	0	1930	1930
33851	23867	X	X	CC	X	0	0	1890	1890
34322	24547	X	X	CC	X	0	0	1970	1970
33856	23873	X	X	CC	X	0	0	1890	1890
33906	23936	X	X	CC	X	0	0	1900	1900
36672	59688	5150562026A	5150562026	CC	CC	1993	1993	1950	1950
36205	65739	X	X	CC	CL	0	0	2000	2000
36714	61436	X	X	CC	X	0	0	1920	1920
35773	47630	X	X	CC	X	0	0	1980	1980
36266	65910	5140572513	5140572513	X	CC	0	0	1930	1930
36782	60089	5160560044	5160560044	X	CC	0	0	1980	1980
35380	47254	5160502104A	5160502087A	CC	CC	1999	1999	1999	1999
36311	66074	X	5140573210	X	CC	0	2013	1930	1930
36796	60135	5150560529	X	CC	X	2006	2006	1930	1930
36334	66132	X	X	CC	X	0	0	1930	1930
35895	64270	X	X	CC	CL	0	0	2000	2000
36357	66205	5130573212	5130573212	X	CC	0	0	1910	1910
36860	60367	5160560045	5160560045	X	CC	0	0	1920	1920
36378	66273	5130573105	5130573105	X	CC	0	0	1930	1930
36384	66287	5130570027	5130570027	X	CC	0	0	1970	1970
36394	66315	5130570027	5130570027	X	CC	0	0	1940	1940
36415	66431	5140573648	5140573648	X	CC	0	0	1950	1950
36014	65129	5140570005	5140570005	X	CC	0	0	1980	1980
36015	65131	5140570006	5140570006	X	CC	0	0	1930	1930
36018	65136	5140570005	5140570005	X	CC	0	0	1940	1940
36064	65283	X	X	CC	X	0	0	1910	1910
36066	65291	5140570005	5140570005	X	CC	0	0	1940	1940
35629	24110	X	X	CC	X	0	0	1910	1910
35642	23949	X	X	CC	X	0	0	1900	1900
36089	65362	5130570024	5130570024	X	CC	0	0	1980	1980
35650	23903	X	X	CC	X	0	0	1910	1910
36144	65541	5140572740	5140572740	X	CC	0	0	1910	1910
37148	61443	5160568024	5160568024	X	CC	0	0	1960	1960
37166	61519	5160562026	5150562026A	CC	CC	0	0	1940	1940
37619	63213	5150563039	5150563180	CC	CC	2011	2011	1930	1930
38540	59814	X	X	CC	X	0	0	1910	1910
38542	58258	X	X	CC	X	0	0	1950	1950
38544	67011	X	X	CC	X	0	0	1930	1930
37201	61679	5160562026	5150562026A	CC	CC	0	0	1950	1950
38124	56168	X	X	CC	X	0	0	1930	1930
38596	58081	5160550014	X	CC	CC	1973	1973	1860	1860
38597	57118	5160550014	X	CC	X	1973	0	1920	1920
38601	58392	5160550014	X	X	CC	0	1973	1950	1950
37267	61927	5160568024	5160568024	X	CC	0	0	1930	1930
38146	56434	X	X	CC	X	0	0	1940	1940
38162	56566	X	X	CC	X	0	0	1910	1910
38613	58789	X	X	CC	X	0	0	1910	1910
38202	57065	X	X	CC	X	0	0	1920	1920
38224	57228	X	X	CC	X	0	0	1920	1920

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38247	57813	X	X	CC	X	0	0	1910	1910
38249	57397	X	X	CC	X	0	0	1940	1940
36918	60566	X	X	CC	X	0	0	1940	1940
37357	62260	5160562993	5160562993	X	CC	0	0	1980	1980
38274	57597	X	X	CC	X	0	0	1870	1870
37411	62442	5150560106	5150560106	X	CC	0	0	1950	1950
37870	61668	X	5160563517A	CC	CC	0	0	1990	1990
38285	57687	X	X	CC	X	0	0	1930	1930
38293	57707	X	X	CC	X	0	0	1930	1930
37414	62451	5160562833	5150562833A	CC	CC	0	0	1920	1920
38328	57869	5160550009	5160550009	X	CC	0	0	1940	1940
37465	62648	5160562605	5160562605	X	CC	0	0	1990	1990
38355	58017	X	X	CC	X	0	0	1910	1910
38367	56288	5160550014	X	CC	CC	1973	1973	1900	1900
37016	60916	5160562009	5160562009	X	CC	0	0	1910	1910
37934	61793	X	5160561621	CC	CC	0	0	1920	1920
38370	58097	X	X	CC	X	0	0	1900	1900
38371	58106	X	X	CC	X	0	0	1910	1910
38373	58110	X	X	CC	X	0	0	1910	1910
38385	58213	X	X	CC	X	0	0	1950	1950
38394	67012	X	X	CC	X	0	0	1910	1910
37508	60716	X	X	CC	X	0	0	1920	1920
37514	62841	5160563272	5160563272	X	CC	0	0	1950	1950
37983	59473	5160568024	5160568024	X	CC	0	0	1960	1960
38399	58273	X	X	CC	CL	1999	1999	1960	1960
38401	58278	5160550014	X	CC	X	1973	0	1870	1870
37078	61138	X	5160562010	X	CC	0	0	1940	1940
37564	62998	5150563039	5150563180	CC	CC	2011	2011	1930	1930
37566	63002	5160563272	5160563272	X	CC	0	0	1950	1950
39371	63074	X	X	CC	CL	0	0	1990	1990
39388	63256	X	X	CC	X	0	0	1950	1950
39424	63564	X	X	CC	CL	0	0	1990	1990
39443	63718	X	X	CC	X	0	0	1930	1930
39033	59753	X	X	CC	X	0	0	1930	1930
39046	60036	X	X	CC	X	0	0	1930	1930
39090	60599	X	X	CC	X	0	0	1950	1950
39100	60694	5120560033	5120560023	CC	CC	1985	1985	1985	1985
39562	63107	X	X	CC	X	0	0	0	0
39111	60814	5120560033	5120560023	CC	CC	1985	1985	1940	1940
39200	61435	X	X	CC	X	0	0	1930	1930
39211	61514	X	5120561316A	CC	CC	0	0	1980	1980
39212	61516	5120562361A	5120560030	CC	CC	1996	1996	1890	1890
38861	56942	X	X	CC	X	0	0	1910	1910
38876	57043	X	X	CC	X	0	0	1910	1910
39343	62824	X	X	CC	X	0	0	1970	1970
39348	62881	X	X	CC	X	0	0	1980	1980
39362	63022	X	X	CC	X	0	0	1930	1930
41899	2344	X	X	CC	X	0	0	0	0
41030	16098	X	X	CC	CL	1991	1991	1991	1991
41055	16166	X	X	CC	CL	1991	1991	0	0
41115	16296	X	X	CC	X	0	0	0	0
41147	16363	X	X	CC	X	0	0	0	0
44041	51773	X	X	CC	X	0	0	1980	1980
43084	50567	X	X	CC	X	0	0	1980	1980
43103	50594	5120460015	5120460015	CC	CC	0	1969	1890	1890
43555	51148	5120470007	5120470007	CC	CC	0	1970	1890	1890
43561	51154	X	X	CC	X	0	0	1970	1970
43574	51170	X	X	CC	X	0	0	1970	1970
43108	50600	5120460010	5120460010	CC	CC	0	1971	1890	1890
43114	50606	5120460014	5120460014	CC	CC	0	1969	1920	1920
43132	50626	5120460022	5120460022	CC	CC	0	1970	1920	1920
43135	50630	5120460005	5120460005	CC	CC	0	1971	1880	1880
43597	51202	5120470002	5120470002	CC	CC	0	1971	1920	1920
43610	51215	5120470007	5120470007	CC	CC	0	1970	1970	1970
43140	50635	5120460018	5120460018	CC	CC	0	1971	1960	1960
43161	50657	5120460004	5120460004	CC	CC	0	1971	1920	1920
43163	50659	5120460017	5120460017	CC	CC	0	1971	1880	1880
43618	51223	5120470006	5120470006	CC	CC	0	1970	1970	1970
44115	51861	X	X	CC	X	0	0	0	0
44131	51878	X	X	CC	X	0	0	0	0
42720	50092	5130460107	5130460107	CC	CC	0	1979	1990	1990
43168	50664	5120460013	5120460013	CC	CC	0	1969	1920	1920
43182	50685	X	5140463308A	CC	CC	0	0	1990	1990
43185	50688	5120460002	5120460002	CC	CC	0	1971	1880	1880

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43188	50691	5120460002	5120460002	CC	CC	0	1971	1980	1980
43190	50693	5120460012	5120460012	CC	CC	0	1969	1960	1960
43191	50694	5120460002	5120460002	CC	CC	0	1971	1890	1890
43647	51263	X	X	CC	X	0	0	1970	1970
44142	51889	X	X	CC	X	0	0	1980	1980
43200	50704	5120460023	5120460023	CC	CC	0	1970	1920	1920
42760	50140	5130460104	5130460104	CC	CC	0	1979	1980	1980
42764	50146	5130460106	5130460106	CC	CC	0	1979	1980	1980
42769	50155	5130460041	5130460041	CC	CC	1984	1973	1984	1984
42772	50159	5130460106	5130460106	CC	CC	0	1979	1980	1980
42778	50166	5130460103	5130460103	CC	CC	0	1979	1980	1980
42784	50179	5130460104	5130460104	CC	CC	0	1979	1980	1980
43250	50774	5120460011	5120460011	CC	CC	0	1969	1970	1970
43711	51345	X	X	CC	X	0	0	1970	1970
43720	51357	5130470128	5130470128	CC	CC	0	1984	1900	1900
43722	51359	X	X	CC	X	0	0	1970	1970
43729	51228	5130470131	5130470131	CC	CC	0	1984	1990	1990
44230	51992	5120470008	5120470008	CC	CC	0	1970	1980	1980
42792	50195	5130460027	5130460027	CC	CC	1988	1989	1988	1988
42801	50206	5130460037	5130460037	CC	CC	0	1972	1920	1920
42803	50208	5130460027	5130460027	CC	CC	1988	1989	1988	1988
42808	50216	5130460104	5130460102	CC	CC	1987	1979	1987	1987
42811	50222	5130460027	5130460027	CC	CC	1988	1989	1988	1988
43262	50789	5120470014	5120470014	CC	CC	0	1969	1970	1970
43270	50798	5120470012	5120470012	CC	CC	1988	1971	1988	1988
43271	50799	5120470013	5120470013	CC	CC	0	1970	1980	1980
43273	50803	5120470012	5120470012	CC	CC	1988	1971	1920	1920
43274	50804	5120470012	5120470012	CC	CC	1988	1971	1988	1988
42827	50240	5130460101	5130460101	CC	CC	0	1979	1980	1980
42839	50254	X	X	CC	X	1987	1987	1930	1930
43781	51436	X	X	CC	X	0	0	1900	1900
43784	51440	X	X	CC	X	0	0	1960	1960
43787	51443	X	X	CC	X	0	0	1960	1960
42850	50267	5130460101	5130460101	CC	CC	0	1979	1980	1980
42851	50268	5130460101	5130460101	CC	CC	0	1979	1980	1980
42869	50448	X	X	CC	X	0	0	1960	1960
43330	50872	5120470014	5120470014	CC	CC	0	1969	1970	1970
43333	50875	5120470010	5120470010	CC	CC	0	1971	1920	1920
42421	97335	5110441584	5100441584	CC	CC	1999	1999	1999	1999
42876	50305	5120460044	5120460043	CC	CC	1988	1988	1988	1988
42878	50307	5130460036	5130460036	CC	CC	0	1972	1980	1980
42879	50308	3130460044	X	CC	X	0	0	1990	1990
42884	50318	5130460045	5130460045	CC	CC	0	1972	1960	1960
42901	51337	5130460036	5130460036	CC	CC	0	1972	1960	1960
43349	50892	5120470004	5120470004	CC	CC	0	1969	1980	1980
43830	51498	X	X	CC	X	0	0	1960	1960
42914	50354	5130460045	5130460045	CC	CC	0	1972	1960	1960
43374	50922	5130470125	5130470125	CC	CC	0	1982	1890	1890
43383	50933	5120470003	5120470003	CC	CC	0	1969	1890	1890
43384	75879	5120470005	5120470005	CC	CC	0	1970	1990	1990
43388	50938	X	X	CC	X	0	0	1970	1970
43854	51534	X	X	CC	X	1986	1986	1986	1986
43862	51542	5140471156	5140471156	CC	CC	0	1999	1990	1990
42938	50384	5130460109	5130460109	CC	CC	0	1983	1980	1980
42940	50386	5130460044	X	CC	X	1989	1989	1989	1989
42941	50388	5130460109	5130460109	CC	CC	0	1983	1980	1980
42951	50406	5130460035	5130460035	CC	CC	0	1972	1980	1980
42959	50416	5130460043	5130460043	CC	CC	0	1972	1960	1960
42961	50418	5120460008	5120460008	CC	CC	0	1971	1960	1960
42964	50421	5130460033	5130460033	CC	CC	0	1972	1960	1960
42966	50425	5130460044	5130460044	CC	CC	0	1972	1960	1960
42986	50452	X	X	CC	X	0	0	1960	1960
43438	50996	5130470129	5130470129	CC	CC	0	1984	1990	1990
43451	51012	5130470125	5130470125	CC	CC	0	1982	1890	1890
43457	51020	5130470127	5130470127	CC	CC	0	1982	1900	1900
43462	51237	5120470009	5120470009	CC	CC	0	1970	1880	1880
43927	51628	X	X	CC	X	0	0	0	0
42992	50459	5120460008	5120460008	CC	CC	0	1971	1960	1960
42995	50463	5130460001	5130460001	CC	CC	0	1971	1960	1960
43000	50468	5130463100	5140463683A	CC	CC	0	0	2000	2000
43004	50472	5120460021	5120460021	CC	CC	0	1970	1920	1920
43010	50478	X	X	CC	X	0	0	1890	1890
43011	50480	5130460034	5130460034	CC	CC	0	1972	1890	1890
43013	50482	5130460110	5130460110	CC	CC	0	1983	1980	1980

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43019	50488	5120460020	5120460020	CC	CC	0	1971	1970	1970
43463	51028	X	X	CC	X	0	0	1970	1970
43467	51034	5130470126	5130470126	CC	CC	0	1982	1890	1890
43478	51046	5120470001	5120470001	CC	CC	0	1969	1920	1920
43485	51058	5120470002	5120470002	CC	CC	0	1971	1920	1920
43022	50491	X	X	CC	X	0	0	1920	1920
43038	50510	X	X	CC	X	0	0	1940	1940
43042	50520	5130460111	5130460111	CC	CC	1984	1983	1984	1984
43047	50526	5120460019	5120460019	CC	CC	0	1971	1960	1960
43504	51083	5130470126	5130470126	CC	CC	0	1982	1900	1900
43515	51094	5130470127	5130470127	CC	CC	0	1982	1900	1900
43984	51702	X	X	CC	X	0	0	0	0
43049	50529	5120460007	5120460007	CC	CC	0	1971	1970	1970
43056	50536	5130460034	5130460034	CC	CC	0	1972	1910	1910
43067	50547	5120460006	5120460006	CC	CC	0	1971	1880	1880
43528	51109	5130470130	5130470130	CC	CC	0	1984	1900	1900
43532	51112	5120470008	5120470008	CC	CC	0	1970	1880	1880
43545	51134	5120470001	5120470001	CC	CC	0	1969	1920	1920
43549	75496	5130470129	5130470129	CC	CC	0	1984	1990	1990
45996	75181	X	X	CC	X	1986	1986	1986	1986
46007	75194	5120470002	5120470002	CC	CC	0	1971	1890	1890
45160	53058	X	X	CC	X	0	0	1960	1960
46133	50293	X	X	CC	X	0	0	1890	1890
45224	53128	X	X	CC	X	0	0	1960	1960
45228	53132	X	X	CC	X	0	0	1960	1960
45685	53683	X	X	CC	X	0	0	1890	1890
46155	75285	5120460023	5120460023	CC	CC	0	1970	1960	1960
45322	53235	X	X	CC	X	0	0	1960	1960
45794	51188	5120470007	5120470007	CC	CC	0	1970	1890	1890
45795	51632	5120470007	5120470007	CC	CC	0	1970	1890	1890
45799	51026	5120470009	5120470009	CC	CC	0	1970	1880	1880
45800	51235	5120470009	5120470009	CC	CC	0	1970	1970	1970
45801	51116	5120470008	5120470008	CC	CC	0	1970	1970	1970
45807	51444	5120470006	5120470006	CC	CC	0	1970	1970	1970
45889	50934	5120470005	5120470005	CC	CC	0	1970	1990	1990
47773	28276	X	X	CC	X	0	0	1980	1980
46853	75716	5140471156	5140471156	CC	CC	0	1999	1990	1990
46455	51229	5130470131	5130470131	CC	CC	0	1984	1990	1990
46456	51366	5130470131	5130470131	CC	CC	0	1984	1990	1990
46457	51139	5130470129	5130470129	CC	CC	0	1984	1990	1990
46458	51234	5130470129	5130470129	CC	CC	0	1984	1990	1990
46490	50262	X	5140462592A	CC	CC	0	0	1990	1990
46493	50157	5130460106	5130460106	CC	CC	0	1979	1980	1980
46948	50954	X	X	CC	X	0	0	2000	2000
46495	50170	5130460104	5130460104	CC	CC	0	1979	1980	1980
47451	27046	X	X	CC	X	0	0	1890	1890
46529	50336	5130460036	5130460036	CC	CC	0	1972	1980	1980
46530	51339	5130460035	5130460035	CC	CC	0	1972	1980	1980
46531	51338	5130460035	5130460035	CC	CC	0	1972	1980	1980
46537	50100	5130460110	5130460110	CC	CC	0	1983	1980	1980
46538	50612	5130460110	5130460110	CC	CC	0	1983	1980	1980
47003	25245	5150510114	5150500114	CC	CC	1988	1988	1988	1988
47474	27135	X	X	CC	X	0	0	1890	1890
47974	28973	X	X	CC	X	0	0	1980	1980
46583	75893	5130460106	5130460106	CC	CC	0	1979	1980	1980
46586	50169	5130460041	5130460041	CC	CC	1984	1973	1984	1984
46587	50152	5130460041	5130460041	CC	CC	1984	1973	1984	1984
44298	52067	5140472191	5140472191A	CC	CC	2000	2000	2000	2000
46643	75606	5120460002	5120460002	CC	CC	0	1971	1980	1980
46645	75895	5120460002	5120460002	CC	CC	0	1971	1890	1890
46646	75607	5120460002	5120460002	CC	CC	0	1971	1880	1880
46668	52388	5140472590	5140472590	X	CC	0	0	1880	1880
46204	50792	5130473458	5130473458	X	CC	0	0	1890	1890
47666	27889	X	X	CC	X	0	0	1910	1910
48394	30342	X	5140512429A	X	CC	0	0	1930	1930
49537	34653	X	X	CC	X	0	0	0	0
50564	40729	X	X	CC	X	0	0	1960	1960
50585	40753	X	X	CC	X	0	0	1940	1940
50613	40783	X	X	CC	X	0	0	1940	1940
50714	40910	X	X	CC	X	0	0	0	0
50754	40953	X	X	CC	X	0	0	1940	1940
50756	40955	X	X	CC	X	0	0	1940	1940
49838	36694	X	X	CC	CL	0	0	1990	1990
50342	40292	X	X	CC	X	0	0	1940	1940

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51296	44100	X	X	CC	X	0	0	1950	1950
51297	44101	X	X	CC	X	0	0	1950	1950
49909	44602	X	5150520081	X	CC	0	0	1920	1920
50356	40349	X	X	CC	X	0	0	1940	1940
50401	40474	X	X	CC	X	0	0	1980	1980
50920	43612	X	X	CC	X	0	0	1960	1960
50922	43609	X	X	CC	X	0	0	0	0
50926	43764	X	X	CC	X	0	0	1960	1960
50931	43767	X	X	CC	X	0	0	1960	1960
50935	43765	X	X	CC	X	0	0	0	0
51770	44601	X	5150520081	X	CC	0	0	1920	1920
51840	44704	5120520349	5150521128	CC	CC	0	2010	0	0
55151	28123	X	X	CC	X	0	0	1910	1910
54332	25074	X	X	CC	X	0	0	0	0
55282	28624	X	X	CC	X	0	0	1880	1880
54842	26948	5150510799A	5160510794A	CC	CC	1999	1999	1999	1999
55332	28896	5160510014	5160510013	CC	CC	1985	1985	1985	1985
54849	26966	5150510799A	5160510794A	CC	CC	1999	1999	1999	1999
55338	28907	5160510014	5160510013	CC	CC	1985	1985	1985	1985
54446	25466	X	X	CC	X	0	0	1970	1970
54917	46063	5170511186A	5170511176A	CC	CC	1972	1972	1950	1950
54570	26025	X	5160510318	CC	CC	0	0	0	0
54571	26031	X	X	CC	X	0	0	1890	1890
54591	26082	X	X	CC	X	0	0	1956	1956
54607	26125	X	X	CC	X	0	0	1970	1970
55065	27742	X	X	CC	X	0	0	1930	1930
54628	26229	X	X	CC	X	0	0	1940	1940
54670	26388	X	X	CC	X	0	0	1940	1940
54672	26406	X	X	CC	X	0	0	1890	1890
55128	28009	X	X	CC	X	0	0	1920	1920
55135	28057	X	X	CC	X	0	0	1970	1970
56136	33767	5150520068	5150520628A	CC	CC	1989	1989	1989	1989
56745	38052	X	X	CC	X	0	0	1920	1920
55415	29087	5160510014	5160510013	CC	CC	1985	1985	1985	1985
57963	46135	X	X	CC	X	0	0	0	0
59079	160577	5160430031	5160430031	X	CC	0	0	1860	1860
57685	45870	X	X	CC	X	0	0	1980	1980
58624	160253	X	5160430119	X	CC	0	2013	1840	1840
58625	160254	X	5160430119	X	CC	0	2013	1890	1890
58783	160141	X	5160431754	X	CC	0	2013	1910	1910
58798	160144	X	5160431754	X	CC	0	2013	1870	1870
58800	160146	X	5160731754	X	CC	0	2013	1900	1900
57886	27247	5170511186A	5170511176A	CC	CC	1972	1972	1940	1940
60716	57121	5120560021	5130550001	CC	CC	1984	1984	1890	1890
59401	160925	5160441266	5160441266	X	CC	0	0	1840	1840
59407	160931	5160441266	5160441266	X	CC	0	0	1840	1840
60771	57334	5120560021	5130550001	CC	CC	1984	1984	1984	1984
60323	55645	X	X	CC	CL	0	0	1990	1990
60331	55661	X	X	CC	CL	0	0	1990	1990
60799	57459	5120560022	5130550002	CC	CC	1984	1984	1984	1984
59126	160628	X	5160433504	X	CC	0	2012	1910	1910
59584	160446	X	5160430119	X	CC	0	2013	1900	1900
59585	161097	X	5160430119	X	CC	0	2013	1840	1840
59622	161131	5160430031	5160430031	X	CC	0	0	1860	1860
59720	161082	X	5160433504	X	CC	0	2012	1860	1860
61606	60962	X	X	CC	X	0	0	1950	1950
61610	60983	X	X	CC	X	0	0	1950	1950
61622	61041	X	X	CC	X	0	0	1940	1940
62593	53730	X	X	CC	X	0	0	1980	1980
61195	59031	X	X	CC	X	0	0	1930	1930
61634	61097	X	X	CC	X	0	0	1980	1980
61648	61154	5110561751A	X	CC	X	1996	1996	1996	1996
62626	53775	X	X	CC	X	0	0	1980	1980
62627	53776	X	X	CC	X	0	0	1980	1980
62628	53777	X	X	CC	X	0	0	1930	1930
61671	61243	5110560889A	X	CC	X	1996	1996	1996	1996
61676	61284	X	X	CC	X	0	0	1950	1950
61234	59151	X	X	CC	X	0	0	1980	1990
61702	61429	X	X	CC	ST	0	0	1990	1990
61716	61494	5110561667A	X	CC	X	1994	0	1910	1910
62679	53904	X	X	CC	X	0	0	0	0
61266	59271	X	X	CC	X	0	0	1950	1950
61723	61541	X	X	CC	X	0	0	1950	1950
61728	61628	X	X	CC	X	0	0	1960	1960

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61736	61674	X	X	CC	X	0	0	1950	1950
61310	59428	X	X	CC	X	0	0	1980	1990
61747	61732	X	X	CC	X	0	0	1950	1950
61752	61773	X	X	CC	X	0	0	1950	1950
61754	61792	X	X	CC	X	0	0	1930	1930
61767	61846	X	X	CC	X	0	0	1940	1940
62724	53989	X	X	CC	X	0	0	1900	1900
61323	59502	X	X	CC	X	0	0	1930	1930
61328	59512	X	X	CC	X	0	0	1930	1930
61329	59517	X	X	CC	X	0	0	1920	1920
61330	59519	X	X	CC	X	0	0	1980	1990
61776	61902	X	X	CC	X	0	0	1960	1960
61778	61911	X	X	CC	X	0	0	1950	1950
61782	61967	X	X	CC	X	0	0	1930	1930
61786	61990	X	X	CC	X	0	0	1940	1940
61796	62048	X	X	CC	X	0	0	1970	1970
61800	62065	X	X	CC	X	0	0	1940	1940
61361	59674	X	X	CC	X	0	0	1920	1920
61367	59719	5120560196A	5110560614A	CC	CC	1995	1995	1995	1995
61805	62087	X	X	CC	X	0	0	1930	1930
60937	57988	X	X	CC	X	0	0	1920	1920
61372	59741	X	X	CC	X	0	0	1930	1930
60966	58114	X	X	CC	X	0	0	1980	1980
61419	59998	X	5110560683	CC	CC	0	0	1890	1890
61883	62557	X	X	CC	X	0	0	1940	1940
61434	60069	X	X	CC	X	0	0	1890	1890
62367	62818	X	X	CC	X	0	0	0	0
61922	62809	X	X	CC	X	0	0	1920	1920
61986	63133	X	X	CC	CL	0	0	2000	2000
61990	63175	X	X	CC	X	0	0	0	0
61997	63259	X	X	CC	X	0	0	0	0
62010	63348	X	X	CC	X	0	0	0	0
62014	63363	X	X	CC	X	0	0	0	0
64327	64215	5160570579	5160570579	X	CC	0	0	1890	1890
64338	64249	5160570845	5160570845	X	CC	0	0	1900	1900
64368	64338	5160571157	X	X	X	0	0	1890	1890
63504	56206	X	X	CC	X	0	0	1920	1920
63505	56207	X	X	CC	X	0	0	1920	1920
63512	56237	X	X	CC	X	0	0	1900	1900
63928	58326	5170550020	5170558020	CC	CC	1989	1989	1989	1989
64376	64365	5160571197	5160571197	X	CC	0	0	1860	1860
64383	64383	5160571157	X	X	X	0	0	1890	1890
63070	68570	X	X	CC	X	0	0	1960	1960
63071	54743	X	X	CC	X	0	0	1920	1920
63532	56341	X	X	CC	X	0	0	1910	1910
63552	67976	5170550072	5170550072	X	CC	0	0	1920	1920
63103	54814	X	X	CC	X	0	0	1940	1940
63104	54815	X	X	CC	X	0	0	1920	1920
63121	54843	X	X	CC	X	0	0	1920	1920
63562	56491	5170551139	X	CC	CC	1991	1991	1930	1930
63144	54882	X	X	CC	X	0	0	1940	1940
63613	56768	X	X	CC	X	0	0	1940	1940
63180	54994	X	X	CC	X	0	0	1940	1940
63636	56867	X	X	CC	X	0	0	1930	1930
64046	58859	X	X	CC	X	0	0	1910	1910
64056	58897	5170558025	5170558025	X	CC	0	0	1930	1930
63195	55080	X	X	CC	X	0	0	1980	1980
63199	55162	X	X	CC	X	0	0	1920	1920
63654	56929	X	X	CC	X	0	0	1910	1910
63668	57003	X	X	CC	X	0	0	1920	1920
64080	58974	5170558027	5170558027	X	CC	0	0	1960	1960
64088	59009	5170550031	5170558031	CC	CC	1988	1988	1900	1900
63688	57099	5170551434	X	CC	CC	1991	1991	1910	1910
64099	59054	5170558029	5170550029	CC	CC	1972	1972	1972	1972
62787	54105	X	X	CC	X	0	0	1940	1940
63259	55355	X	X	CC	X	0	0	1980	1980
63712	57253	X	X	CC	X	0	0	1930	1930
63719	57296	X	X	CC	X	0	0	1910	1910
63280	55396	X	X	CC	X	0	0	1980	1980
64171	63589	5160570623	5160570623	X	CC	0	0	1910	1910
64191	67614	5160570623	5160570623	X	CC	0	0	1890	1890
64211	63853	5160570623	5160570623	X	CC	0	0	1890	1890
64237	67593	5160570515	5160570515	X	CC	0	0	1890	1890
64238	63918	5160570579	5160570579	X	CC	0	0	1900	1900

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64239	63919	5160570515	5160570525	X	CC	0	0	1930	1930
64258	63974	5160570318A	5160570318A	X	CC	0	0	1950	1950
63392	68119	X	X	CC	X	0	0	1980	1980
63396	55727	X	X	CC	X	0	0	1930	1930
63397	55730	X	X	CC	X	0	0	1960	1960
63399	55735	X	X	CC	X	0	0	1930	1930
64260	63976	5160570579	5160570579	X	CC	0	0	1900	1900
63424	55864	X	X	CC	X	0	0	1910	1910
64313	64170	5160570579	5160570579	X	CC	0	0	1900	1900
63444	55928	X	X	CC	X	0	0	1980	1980
63451	55968	X	X	CC	X	0	0	1910	1910
63455	55978	X	X	CC	X	0	0	1920	1920
63461	56007	X	X	CC	X	0	0	1980	1980
65232	67259	5160570032	5160570032	X	CC	0	0	1890	1890
65233	67258	5160570034	5160570034	BU	CC	1956	1981	1956	1956
65234	67269	5160570033	5160570033	X	CC	0	0	1910	1910
65718	67958	X	X	CC	X	0	0	1880	1880
65719	67957	X	X	CC	X	0	0	1880	1880
64853	54689	X	X	CC	X	0	0	1980	1980
65313	67326	5160570995	5160570995	X	CC	0	0	1910	1910
65323	67341	5160570515	5160570525	X	CC	0	0	1890	1890
65327	67449	5160570579	5160570579	X	CC	0	0	1910	1910
66301	54978	X	X	CC	X	0	0	1930	1930
65840	67877	5170553308	5170553308	X	CC	0	0	1890	1890
65849	67884	5170553356	X	X	X	0	0	1890	1890
62763	54060	X	X	CC	CL	0	0	2000	2000
65472	67592	5160570515	5160570525	X	CC	0	0	1880	1880
65486	67607	5160570515	5160570525	X	CC	0	0	1890	1890
65489	63806	5160570623	5160570623A	X	CC	0	0	1890	1890
65490	67612	5160570623	5160570623A	X	CC	0	0	1880	1880
65491	67613	5160570623	5160570623	X	CC	0	0	1880	1880
65940	67978	5170550428	5170550428	X	CC	0	0	1910	1910
65059	67206	5160571404	5160571404	X	CC	0	0	1930	1930
65068	67212	5160571523	5160571523	X	CC	0	0	1910	1910
65542	58892	5170558034	5170558034	X	CC	0	0	1890	1890
65108	67243	5160571698	X	X	X	0	0	1890	1890
65151	66357	X	X	CC	X	0	0	1980	1980
65589	67689	X	X	CC	X	0	0	1890	1890
66048	68083	X	X	CC	X	0	0	1980	1980
66053	56983	X	X	CC	X	0	0	1940	1940
66054	68088	X	X	CC	X	0	0	1980	1980
65616	67718	X	X	CC	X	1998	1998	1998	1998
66085	55711	X	X	CC	X	0	0	1940	1940
66098	68132	5170553118	5170553118	X	CC	0	0	1910	1910
65661	67768	5170558022	5170558022	X	CC	0	0	1860	1860
66126	68175	X	X	CC	X	0	0	1980	1980
66671	68687	5180542128A	5180542128A	X	CC	0	0	1930	1930
66674	68690	5180548079	5180548079	X	CC	0	0	1980	1980
68102	80126	X	5080392856A	CC	CC	0	0	2000	2000
66781	68761	X	X	CC	X	0	0	1940	1940
68215	80273	5080397011	5080397011	X	CC	0	0	1970	1970
66433	68441	X	X	CC	X	0	0	1980	1980
66538	68568	X	X	CC	X	0	0	1896	1896
66539	68564	X	X	CC	X	0	0	1960	1960
66540	54628	X	X	CC	X	0	0	1920	1920
66542	68566	X	X	CC	X	0	0	1960	1960
66545	54742	X	X	CC	X	0	0	1930	1930
66590	68707	5180548068	5180548068	X	CC	0	0	1940	1940
66601	68676	X	X	CC	X	0	0	1920	1920
69438	83453	5090403448	5090403448	X	CC	0	0	1920	1920
66391	68439	X	X	CC	X	0	0	1990	1990
66393	68438	X	X	CC	X	0	0	1980	1980
70864	100153	5090403565	5090403565	X	CC	0	0	1930	1930
70865	100152	5090403565	5090403565	X	CC	0	0	1930	1930
70866	100154	5090402549	5090402549	X	CC	0	0	1900	1900
70867	100155	5090402549	5090402549	X	CC	0	0	1900	1900
70868	100156	5090402549	5090402549	X	CC	0	0	1900	1900
70883	98501	X	5090403472	CC	CC	0	0	2004	2004
71306	163030	X	X	CC	X	0	0	1910	1910
70906	100195	5090403385	5090403385	X	CC	0	0	1920	1920
71333	162157	5150423509	5150423509	X	CC	0	0	1880	1880
70978	97991	X	X	CC	CL	0	0	2000	2000
70584	100388	5090413316	5090413316	X	CC	0	0	1991	1991
71122	100407	5090410007	5090410007	X	CC	0	0	1900	1900

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71148	87724	5090411954	5090411954	X	CC	0	0	1900	1900
71265	100434	5090411884	5090411884	X	CC	0	0	1890	1890
71271	100433	5090410012	5090410012	X	CC	0	0	1910	1910
72201	163558	X	X	CC	X	0	0	1910	1910
72212	163566	X	X	CC	X	0	0	1970	1970
72216	163570	X	X	CC	X	0	0	1950	1950
72259	163603	X	X	CC	X	0	0	0	0
72262	163605	X	X	CC	X	0	0	1960	1960
72275	163612	X	X	CC	X	0	0	1960	1960
72290	163625	X	X	CC	X	0	0	1950	1950
72330	162734	5150432786	5150432786	X	CC	0	0	1900	1900
72826	164030	5140440162	5140440162	X	CC	0	0	1890	1890
72009	162549	X	X	CC	X	1958	1958	1910	1910
72011	162550	X	X	CC	X	1958	1958	1920	1920
72030	162559	5150431998A	5150431998A	X	CC	0	0	1920	1920
72037	162564	X	X	CC	X	0	0	1950	1950
72043	162572	5150431998A	5150431998A	X	CC	0	0	1920	1920
72045	162574	X	X	CC	X	1958	1958	1920	1920
73453	164475	5140441826A	5140441826A	X	CC	0	0	1890	1890
72072	162593	X	X	CC	X	1958	1958	1958	1958
72145	162644	5150433001	5150433001	X	CC	0	0	1840	1840
72177	163545	X	X	CC	X	0	0	1950	1950
75439	171346	X	X	CC	X	0	0	1950	1950
75459	171465	X	X	CC	X	0	0	1950	1950
75462	171472	X	X	CC	X	0	0	1950	1950
74590	162674	5150432786	5150432786	X	CC	0	0	1860	1860
75091	169445	X	X	CC	X	0	0	1920	1920
75112	169601	X	X	CC	X	0	0	1960	1960
75119	175267	X	X	CC	X	0	0	1960	1960
74721	163306	X	X	CC	X	0	0	1970	1970
75142	169779	X	X	CC	X	0	0	1960	1960
75147	169793	X	X	CC	X	0	0	1960	1960
74732	163312	X	X	CC	X	0	0	1970	1970
75170	169825	X	5190531037	X	CC	0	0	1880	1880
75223	170201	X	X	CC	X	0	0	1950	1950
74339	162084	X	5150450494A	CC	CC	0	0	1990	1990
75242	175407	X	X	CC	X	0	0	1970	1970
74372	165081	X	5140450531A	CC	CC	0	0	2000	2000
75312	170671	X	5190538046	X	CC	0	0	1940	1940
74939	164486	X	5140441794	CC	CC	0	0	0	0
74020	161923	5150442795	5150442795	X	CC	0	0	1920	1920
74025	161926	5150442795	5150442795	X	CC	0	0	1920	1920
75434	171285	X	X	CC	X	0	0	1950	1950
77287	87427	5090420001	5090420001	X	CC	0	0	1989	1989
76357	83593	5100412964A	5100410172A	CC	CC	1998	1998	1998	1998
77373	87574	X	X	CC	X	0	0	1890	1890
77380	87582	X	X	CC	X	0	0	1890	1890
75993	175221	X	X	CC	X	0	0	1950	1950
76007	171556	X	X	CC	X	0	0	1950	1950
76024	170492	X	X	CC	X	0	0	1920	1920
76945	86107	5100410172A	5100412964A	CC	CC	1999	1999	1999	1999
76033	175235	X	X	CC	X	0	0	1920	1920
76041	169800	X	X	CC	X	0	0	1960	1960
76043	169854	X	X	CC	X	0	0	1960	1960
76044	169784	X	X	CC	X	0	0	1960	1960
76045	169841	5190531037	5190531037	X	CC	0	0	1910	1910
76046	169919	X	5190531037	X	CC	0	0	1910	1910
76084	175326	X	5190538046	X	CC	0	0	1940	1940
76125	175301	X	X	CC	X	0	0	1930	1930
76126	175302	X	X	CC	X	0	0	1930	1930
76179	175368	5190538040	5190538040	X	CC	0	0	1930	1930
76221	175409	X	X	CC	X	0	0	1970	1970
77145	86919	5100413536A	X	CC	CL	1999	1999	0	0
77157	86970	5100413536A	X	CC	CL	1999	1999	0	0
77201	87264	X	X	CC	X	0	0	1890	1890
76300	169901	X	X	CC	X	0	0	1970	1970
76327	83454	5100412964A	5100410172A	CC	CC	1998	1998	1998	1998
77250	87363	X	5090420203	CC	CC	0	0	1990	1990
77887	88815	5090420978	5090420978	X	CC	0	0	1890	1890
79343	100564	X	5100423641	CC	CC	0	0	2000	2000
79366	100587	5100421493	X	CC	X	2007	2007	0	0
78910	93462	X	X	CC	X	0	0	0	0
78520	91538	5100420028	5100420028	X	CC	0	0	1987	1987
78085	89568	5090420025	5090420025	X	CC	0	0	1987	1987

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77677	88149	5090420013	5090420013	X	CC	0	0	1989	1989
78129	89714	5090420025	5090420025	X	CC	0	0	1987	1987
79046	94044	X	X	CC	X	0	0	0	0
79097	98000	5090420927	5090420978	CC	CC	2013	2013	0	0
79595	100807	5100420773	5100420773	X	CC	0	0	1870	1870
80068	101292	5100413536A	X	CC	CL	1999	1999	1999	1999
80627	127822	X	X	CC	X	1988	1988	1988	1988
80630	127827	X	5090440334	X	CC	0	2004	1940	1940
81136	128615	X	5090440216	X	CC	0	0	0	0
79747	100968	5100412923A	5100412924A	CC	CC	1998	1998	1998	1998
79749	100971	5100412915	5100412915	X	CC	0	0	1890	1890
80679	127978	X	5090440334	X	CC	0	2004	0	0
79401	100622	5100420041	5100420041	X	CC	0	0	1987	1987
80387	101614	5080430621	5080430621	CL	CC	0	0	1988	1988
80429	101758	5100412964A	5100410172A	CC	CC	1998	1998	1998	1998
79984	101205	5100410309	5100410309	X	CC	0	0	1930	1930
80954	128414	X	5090440216	CC	CC	0	0	0	0
81507	129012	X	X	CC	X	0	0	0	0
81318	128808	X	X	CC	X	0	0	0	0
83827	131460	X	5090441478A	X	CC	0	0	1930	1930
84431	132130	X	X	CC	X	0	0	1980	1980
81234	128721	X	X	CC	X	0	0	0	0
84146	131797	X	5090441478A	X	CC	0	0	1950	1950
84654	132369	X	X	CC	X	0	0	0	0
84181	131833	X	X	CC	X	0	0	1980	1980
84688	132403	X	X	CC	X	0	0	0	0
85780	133603	X	X	CC	X	0	0	0	0
85924	133755	X	X	CC	CL	0	0	2000	2000
85939	133770	X	X	CC	CL	0	0	2000	2000
85964	133796	X	X	CC	X	0	0	0	0
85605	133409	X	X	CC	X	0	0	1980	1980
85699	133505	X	X	CC	X	0	0	0	0
88189	121391	5080430003	5080430424	CC	CC	1987	1987	1987	1987
90430	124044	X	X	X	CL	0	0	1970	1970
89526	122970	X	X	CC	X	0	0	1980	1980
89576	123029	5080430015	5080430005	CC	CC	1987	1987	1987	1987
89137	122532	X	5070430041	CC	CC	0	0	1990	1990
90117	123646	X	X	CC	X	0	0	1960	1960
90122	123653	5070432166	5070431533	CC	CC	1993	1993	2002	2002
90148	123680	X	X	CC	X	0	0	1980	1980
90620	124285	X	5090432464A	X	CC	0	1993	1990	1990
90203	123760	X	X	CC	X	0	0	1980	1980
89835	123315	5080432981	X	CC	X	1992	1992	1990	1990
89845	123325	5080432981	5080430001	CC	CC	1992	1992	1980	1980
90371	123967	X	5070431446	CC	CC	1991	1991	1991	1991
91479	125379	5070431533	5070432166	CC	CC	2002	2002	2002	2002
91092	124890	5080432415	5090432415	CC	CC	0	0	0	0
91117	124922	5080432415	5090432415	CC	CC	0	0	0	0
90650	124318	5080432415	5090432415	CC	CC	0	0	0	0
90712	124397	X	X	CC	X	0	0	0	0
90726	124415	5070432470	X	CC	X	2000	0	2000	2000
90825	124550	5080432415	5090432415	CC	CC	0	0	1910	1910
94152	181031	5130480041	5130480041	CC	CC	0	1982	1980	1980
94156	181037	X	X	CC	X	0	0	1980	1980
93698	180417	5130480036	5130480036	CC	CC	0	1984	1980	1980
94181	181070	5130480046	5130480046	CC	CC	0	1984	1980	1980
93723	180462	5120480665	5120480665	X	CC	0	0	1880	1880
94201	181098	5130480041	5130480041	CC	CC	0	1982	1980	1980
94203	181101	X	X	CC	X	0	0	1980	1980
94227	181134	5130480169	5130480169	CC	CC	1991	1972	1991	1991
93803	180577	5130480047	5130480047	CC	CC	0	1980	1980	1980
94249	181159	5130480044	5130480044	CC	CC	0	1984	1980	1980
94255	181165	5120480798	5120480798	X	CC	0	0	1890	1890
94268	190507	5130480169	5130480169	CC	CC	1991	1972	1991	1991
93378	124987	5080432889	X	CC	X	1992	0	1990	1990
94277	181189	X	X	CC	X	0	0	1980	1980
94286	181199	5130480151	5130480151	CC	CC	0	1984	1980	1980
94293	181207	5130480041	5130480041	CC	CC	0	1982	1980	1980
94304	190281	X	X	CC	X	0	0	1980	1980
94321	181242	X	X	CC	X	0	0	1970	1970
94333	181258	5130480044	5130480044	CC	CC	0	1984	1980	1980
94348	181276	5130480041	5130480041	CC	CC	0	1982	1980	1980
94352	181280	5130481535	5130481535	CC	CC	1993	1992	1993	1993
94357	181285	X	X	CC	X	0	0	1980	1980

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
94363	181293	X	X	CC	X	0	0	1980	1980
93907	180717	5130480039	5130480039	CC	CC	0	1984	1880	1880
93513	180139	X	X	CC	X	0	0	1920	1920
93514	180141	5130480032	5130480032	CC	CC	0	1972	1980	1980
93931	180750	5130480042	5130480042	CC	CC	0	1984	1980	1980
93933	180752	5130480039	5130480039	CC	CC	0	1984	1880	1880
93935	180754	X	X	CC	X	0	0	1980	1980
93954	180778	5130480039	5130480039	CC	CC	0	1984	1980	1980
92591	126953	X	5070433242A	X	CC	0	1994	1980	1980
93955	180779	5130480042	5130480042	CC	CC	0	1984	1980	1980
93959	180783	5130480039	5130480039	CC	CC	0	1984	1880	1880
93962	180786	5130480042	5130480042	CC	CC	0	1984	1980	1980
93984	180812	5130480043	5130480043	CC	CC	0	1984	1980	1980
93572	180232	5130480031	5130480031	CC	CC	0	1972	1980	1980
93589	180254	5130480038	5130480038	CC	CC	0	1973	1980	1980
94036	180880	5130480042	5130480042	CC	CC	0	1984	1980	1980
94062	180914	X	X	CC	X	0	0	1980	1980
93663	180367	5130480030	5130480030	CC	CC	0	1972	1980	1980
94116	180988	X	X	CC	X	0	0	1980	1980
94598	181581	5130482033	5130482033	CC	CC	1993	1992	1993	1993
96158	184415	X	5130490725B	X	CC	0	1997	1920	1920
94775	181810	5130482033	X	CC	X	1993	0	0	0
95711	183539	X	X	CC	X	0	0	1950	1950
95272	182639	5130483234A	5130483234A	X	CC	0	0	1920	1920
95278	182656	X	5120482769	X	CC	0	0	1900	1900
95282	182667	X	5120482769	X	CC	0	0	1880	1880
95283	190270	X	X	CC	X	0	0	1930	1930
95285	182672	5120482897B	X	X	X	0	0	1860	1860
95769	183639	X	X	CC	X	0	0	1880	1880
95326	182760	X	X	CC	X	0	0	1880	1880
95792	183700	5120490164A	5120490164A	X	CC	0	0	1920	1920
95356	182815	X	X	CL	X	0	0	0	0
94426	181365	X	X	CC	X	0	0	1980	1980
94431	181371	X	X	CC	X	0	0	1980	1980
94437	181379	5130480045	5130480045	CC	CC	1985	1984	1985	1985
94441	181383	X	X	CC	X	0	0	1980	1980
94455	181400	5130480045	5130480174	CC	CC	1985	1985	1985	1985
94473	181422	X	5130480019	CC	CC	1993	1993	1993	1993
95909	183922	5120490407A	5120490583A	CC	CC	2010	2010	0	0
97846	190060	5130493222A	5130493222A	X	CC	0	0	1920	1920
97890	190128	5130481535	5130481535	CC	CC	1993	1992	1993	1993
97891	190129	5130481535	5130481535	CC	CC	1993	1992	1993	1993
98045	190279	X	X	CC	X	0	0	1980	1980
98046	181341	X	X	CC	X	0	0	1980	1980
98047	190280	X	X	CC	X	0	0	1980	1980
98048	181130	X	X	CC	X	0	0	1980	1980
98049	190283	X	X	CC	X	0	0	1980	1980
98050	190284	X	X	CC	X	0	0	1980	1980
98051	190282	X	X	CC	X	0	0	1980	1980
98052	190285	X	X	CC	X	0	0	0	0
96868	185863	5120492093A	5120492093A	X	CC	0	0	1890	1890
98278	181179	5130480169	5130480169	CC	CC	1991	1972	1991	1991
99741	169591	X	X	CC	X	0	0	1950	1950
99869	169763	5210530005	5210530005	X	CC	0	0	1920	1920
98913	168561	5220523213	X	X	X	0	0	1940	1940
99001	168657	5220523447	5220523447	X	CC	0	0	1890	1890
98096	190335	5120483411A	5120483411A	X	CC	0	0	1880	1880
98098	182665	5120482769	5120482749A	CC	CC	2013	2009	1860	1860
98622	177225	5220523481	X	X	X	0	0	1940	1940
99568	169359	X	X	CC	X	0	0	1930	1930
98202	190437	5130480045	5130480045	CC	CC	1985	1984	1985	1985
98213	180867	5130480043	5130480043	CC	CC	0	1984	1980	1980
98657	168268	5220522969	5220522969	X	CC	0	0	1890	1890
98666	177265	5220522969	5220522969	X	CC	0	0	1880	1880
98224	181874	X	X	CC	X	0	0	1880	1880
98695	168310	5220523481	X	X	X	0	0	1940	1940
98697	168312	5220522969	5220522969	X	CC	0	0	1880	1880
98276	190505	5130480169	5130480169	CC	CC	1991	1972	1991	1991
98277	190506	5130480169	5130480169	CC	CC	1991	1972	1991	1991
98721	168339	5220523481	X	X	X	0	0	1940	1940
98731	168349	5220522969	5220522969	X	CC	0	0	1880	1880
100737	171007	X	X	CC	X	0	0	1970	1970
100308	170374	X	X	CC	X	0	0	1950	1950
101693	172368	X	X	CC	X	0	0	1940	1940

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100319	170389	5210530023	5210530023	X	CC	0	0	1970	1970
100326	170398	5210531664	5210531664	X	CC	0	0	1890	1890
100794	171085	X	X	CC	X	0	0	1930	1930
100808	171100	X	X	CC	X	0	0	1970	1970
101729	172425	X	X	CC	X	0	0	1950	1950
101270	176916	5210530029	5210530029	X	CC	0	0	1930	1930
100861	171178	5200532114	5200532114	X	CC	0	0	1910	1910
101795	172522	X	X	CC	X	0	0	1910	1910
100408	170521	5200531544	5200531544	X	CC	0	0	1930	1930
100880	171208	X	5210532164	X	CC	0	2013	1910	1910
100438	170568	X	X	CC	X	0	0	1980	1980
100911	171256	5200532114	5200532114	X	CC	0	0	1890	1890
100945	176074	X	X	CC	X	0	0	1960	1960
101416	171963	X	X	CC	X	0	0	1920	1920
101438	171997	5210530035	5210530035	X	CC	0	0	1930	1930
101037	171410	5210530344A	X	CC	X	1994	1994	1970	1994
101040	176905	5210530344A	X	CC	X	1994	1994	1970	1994
101554	172158	X	X	CC	X	0	0	1960	1960
101135	171559	5210530049	5210530049	X	CC	0	0	1940	1940
101567	172186	5210533471	5210533471	X	CC	0	0	1890	1890
101580	172202	X	X	CC	X	0	0	1970	1970
100200	175887	5200531601	X	X	X	0	0	1940	1940
102008	175688	X	X	CC	X	0	0	1940	1940
102497	172461	X	X	CC	X	0	0	1960	1960
102499	175698	X	X	CC	X	0	0	1960	1960
102500	172286	X	X	CC	X	0	0	1960	1960
102503	175624	X	X	CC	X	0	0	1970	1970
102968	176038	X	X	CC	X	0	0	1940	1940
103530	176555	X	5210523337A	CC	CC	0	0	1990	1990
103534	176563	X	X	CC	X	0	0	1950	1950
102597	175689	X	X	CC	X	0	0	1940	1940
102598	175690	X	X	CC	X	0	0	1940	1940
102624	175706	X	X	CC	X	0	0	1940	1940
102629	175705	X	X	CC	X	0	0	1940	1940
102635	171725	X	X	CC	X	0	0	1950	1950
103654	176678	5210530005	5210530005	X	CC	0	0	1890	1890
99969	169916	X	X	CC	X	0	0	1970	1970
101827	172568	X	X	CC	X	0	0	1930	1930
101841	172587	X	X	CC	X	0	0	1940	1940
102813	175885	5200531601	X	X	X	0	0	1940	1940
102847	176004	5200532114	5200532114	X	CC	0	0	1940	1940
102848	176005	5200532114	5200532114	X	CC	0	0	1880	1880
102849	175997	5200532114	5200532114	X	CC	0	0	1920	1920
102850	176011	5200532114	5200532114	X	CC	0	0	1920	1920
101941	176039	X	X	CC	X	0	0	1940	1940
102875	170230	5200531601	X	X	X	0	0	1890	1890
101958	172759	X	X	CC	X	0	0	1940	1940
102946	175994	5200532114	5200532114	X	CC	0	0	1890	1890
103431	176814	X	X	CC	X	0	0	1930	1930
103933	176938	5210533471	5210533471	X	CC	0	0	1890	1890
103935	176936	5210533471	5210533471	X	CC	0	0	1920	1920
103937	172357	X	5210533471	X	CC	0	0	1880	1880
103941	176922	X	X	CC	X	0	0	1930	1930
104891	198443	X	X	CC	X	0	0	1960	1960
103998	176968	5210530025	5210530025	X	CC	0	0	0	0
105492	198329	X	X	CC	X	0	0	1940	1940
105504	198341	X	5090502816A	CC	CC	0	0	2000	2000
103727	172940	X	X	CC	CL	0	0	2000	2000
103751	176763	5210530027	5210530027	X	CC	0	0	1890	1890
103752	176762	5210530027	5210530027	X	CC	0	0	1940	1940
104223	177184	5220523481	X	X	X	0	0	1940	1940
104224	177183	5220523481	X	X	X	0	0	1940	1940
104680	177554	5220531609	5220531609	X	CC	0	0	1940	1940
104226	177182	5220523481	X	X	X	0	0	1940	1940
104227	177181	5220523481	X	X	X	0	0	1940	1940
104244	177179	5220523481	X	X	X	0	0	1940	1940
105169	204984	5090501893	5090501893	X	CC	0	0	1940	1940
104279	177221	5220523453	5220523453	X	CC	0	0	1940	1940
103834	169560	X	X	CC	X	0	0	1910	1910
103837	176839	X	X	CC	X	0	0	1960	1960
104292	177240	5220523373	X	X	X	0	0	1890	1890
104293	177241	5220523343	X	X	X	0	0	1890	1890
104294	177246	5220523343	X	X	X	0	0	1890	1890
103847	170551	5210530023	5210530023	X	CC	0	0	1970	1970

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103849	176850	5210530057	5210530057	X	CC	0	0	1910	1910
103870	176860	5210530056	5210530056	X	CC	0	0	0	0
104315	177255	5220523373	X	X	X	0	0	1940	1940
104321	177274	5220522969	5220522969	X	CC	0	0	1890	1890
104322	177264	5220522969	5220522969	X	CC	0	0	1940	1940
103893	176890	X	X	CC	X	0	0	1890	1890
103894	176888	X	X	CC	X	0	0	1890	1890
103906	176923	X	X	CC	X	0	0	1930	1930
103908	171413	5210530344A	X	CC	X	1994	1994	1970	1994
103917	176920	5210530344A	X	CC	X	1994	1994	1970	1994
105734	198087	5090502204A	5090502204A	X	CC	0	0	1920	1920
106683	201106	5090512564	5090512564	X	CC	0	0	1920	1920
106735	204873	5090513124A	5090513106A	CC	CC	0	0	1990	1990
106740	201392	5090513243A	5090513205A	CC	CC	0	0	1990	1990
106752	204866	5090513156A	5090513106A	CC	CC	0	0	1990	1990
106774	201557	5090513138A	5090513106A	CC	CC	0	0	1990	1990
106404	200150	5090511923	5090511923	X	CC	0	0	1900	1900
106888	200364	5090512175A	5090511638A	CC	CC	1999	1999	1940	1940
106905	204808	5090510001	X	CL	CL	0	0	2000	2000
106908	204961	5090512107A	5090512107A	BU	CC	1998	1998	1990	1990
106927	204844	5090513243A	5090513205A	CC	CC	0	0	1990	1990
106928	201230	5090513243A	5090513205A	CC	CC	0	0	1990	1990
106931	204848	5090513215A	5090513205A	CC	CC	0	0	1990	1990
106932	201318	5090513215A	5090513205A	CC	CC	0	0	1990	1990
106936	204867	5090513156A	5090513106A	CC	CC	0	0	1990	1990
106937	201504	5090513138A	5090513106A	CC	CC	0	0	1990	1990
106938	204870	5090513126A	5090513106A	CC	CC	0	0	1990	1990
106939	204869	5090513154A	5090513106A	CC	CC	0	0	1990	1990
106941	204868	5090513154A	5090513106A	CC	CC	0	0	1990	1990
106942	201472	5090513174A	5090513106A	CC	CC	0	0	1990	1990
106944	204876	5090513121A	5090513106A	CC	CC	0	0	1990	1990
106945	204877	5090513101A	5090513106A	CC	CC	0	0	1990	1990
106947	204871	5090513126A	5090513106A	CC	CC	0	0	1990	1990
106964	204865	5090513174A	5090513106A	CC	CC	0	0	1990	1990
106965	201361	5090513141A	5090513106A	CC	CC	0	0	1990	1990
107017	195039	5090480670	X	CC	X	2006	0	2006	2006
105705	197138	X	X	CC	CL	0	0	2000	2000
109092	197287	X	X	BU	X	1946	1946	1940	1940
109116	197314	X	X	BU	X	1946	1946	1940	1940
108214	196281	5090483395A	5090483359A	CC	CC	1994	1994	1994	1994
107771	195843	5100481397A	5100481397A	X	CC	0	0	1920	1920
108241	204524	5090483314A	5090483314A	X	CC	0	0	1980	1980
107842	195915	5090481717A	5090481717A	X	CC	0	0	1990	1990
108350	196459	5090483419	X	CC	X	2005	0	1920	1920
107887	195966	X	5090481608	BU	CC	2011	2005	1960	1960
107992	196075	X	X	CC	X	0	0	1960	1960
108476	196593	5090490404	5090490404	BU	CC	2006	2006	2000	2000
108026	196111	X	X	CC	X	0	0	1950	1950
108946	197120	5090490009	5090490009	X	CC	0	0	1990	1990
108996	197179	5090490011	5090490011	BU	CC	1990	1990	1990	1990
108998	197181	5090490011	5090490011	BU	CC	1990	1990	1990	1990
110468	204662	5090490577	5090490577	X	CC	0	0	1920	1920
109616	204361	X	X	CC	X	0	0	1920	1920
111068	66245	X	5150573624	X	CC	0	0	1870	1870
109845	204046	5090481717A	5090481717A	X	CC	0	0	1920	1920
110812	65018	X	X	CC	X	1941	1941	1900	1900
111400	64616	5150571683	5150571683	X	CC	0	0	2000	2000
111442	56016	X	X	CC	X	0	0	1930	1930
111917	215049	X	X	CC	X	0	0	1870	1870
111454	56089	X	X	CC	X	0	0	1950	1950
111458	56109	X	X	CC	X	0	0	1920	1920
111460	56118	X	X	CC	X	0	0	1920	1920
111683	57626	X	X	CC	X	0	0	1860	1860
111688	57668	X	X	CC	X	0	0	1880	1880
111689	57671	X	X	CC	X	0	0	1900	1900
111702	57771	X	X	CC	X	0	0	1880	1880
111707	57800	X	X	CC	X	0	0	1880	1880
111710	57814	X	X	CC	X	0	0	1900	1900
111711	57819	X	X	CC	X	0	0	0	0
111713	57832	X	X	CC	X	0	0	1900	1900
111778	58485	X	X	CC	X	0	0	1920	1920
111790	58610	X	X	CC	X	0	0	1920	1920
111110	66436	X	5150573624	CC	CC	0	0	0	0
111111	66437	X	5150573618A	X	CC	0	0	1890	1890

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113069	57440	5120551764	X	CL	CL	0	0	1970	1970
114113	211193	5170412290	5170412290	X	CC	0	0	1890	1890
113647	211206	5170412478	5170412478	X	CC	0	0	1900	1900
116010	188131	X	X	CC	X	0	0	1890	1890
115648	101689	5100400844	5100400844A	CC	CC	1999	1999	1999	1999
115650	101691	5100400844	5100400844A	CC	CC	1999	1999	1999	1999
115711	101761	5100403688A	5100403677A	CC	CC	1999	1999	1999	1999
115728	101785	5100401363	5100401361	CC	CC	0	0	2000	2000
115337	99014	5100403097A	X	CC	X	1997	1997	1997	1997
115798	187500	5140500145	5140493628A	CC	CC	2000	2000	2000	2000
115883	187903	5140493628A	5140500145	CC	CC	2000	2000	2000	2000
117826	166118	5180518026	5180518026	X	CC	0	0	1910	1910
116974	165113	5180500992	5180500992	X	CC	0	0	1870	1870
116977	165116	5180500882	5180500882	X	CC	0	0	1890	1890
116979	165120	5180500479	5180500479	X	CC	0	0	1870	1870
116995	165138	5180500992	5180500992	X	CC	0	0	1870	1870
117017	165163	5180501040	5180501040	X	CC	0	0	1870	1870
117019	165166	5180500992	5180500992	X	CC	0	0	1870	1870
117038	165186	5180500992	5180500992	X	CC	0	0	1870	1870
117040	165188	5180500992	5180500992	X	CC	0	0	1870	1870
117045	165194	5180500992	5180500992	X	CC	0	0	1870	1870
117048	165198	5180500882	5180500882	X	CC	0	0	1900	1900
117051	165201	5180501045	5180501045	X	CC	0	0	1880	1880
117526	165778	5180500004	5180500004	X	CC	0	0	1974	1974
117057	165208	5180500882	5180500882	X	CC	0	0	1890	1890
117064	165218	5180500882	5180500882	X	CC	0	0	1890	1890
117077	165232	5180500882	5180500882	X	CC	0	0	1880	1880
117078	165233	5180500882	5180500882	X	CC	0	0	1890	1890
117092	165249	5180500882	5180500882	X	CC	0	0	1890	1890
117100	165258	5180501511	5180501511	X	CC	0	0	1940	1940
117103	165262	5180500882	5180500882	X	CC	0	0	1890	1890
117116	165277	5180501511	5180501511	X	CC	0	0	1910	1910
118168	166522	5180510021	5180510021	X	CC	0	0	1984	1984
118190	166551	5190510997	5190510997	X	CC	0	0	1890	1890
117300	165498	5180500056	X	CL	CL	0	0	0	0
119272	167772	5180510102	5180510102	X	CC	0	0	1900	1900
119687	165248	5180501511	5180501511	X	CC	0	0	1890	1890
118821	167264	X	X	CC	X	0	0	1920	1920
118823	167267	X	X	CC	X	0	0	1960	1960
118841	167286	5180510011	5180510011	X	CC	0	0	1880	1880
119278	178319	5180510014	5180510014	X	CC	0	0	1860	1860
120207	178138	5180512618	X	CC	X	0	0	1910	1910
118863	167311	X	X	CC	X	0	0	1910	1910
119323	178148	5180512618	X	CC	X	0	0	1910	1910
119325	178429	5180510102	5180510102	X	CC	0	0	1900	1900
119745	177771	5180501511	5180501511	X	CC	0	0	1900	1900
119746	177802	5180501511	5180501511	X	CC	0	0	1890	1890
120236	178202	5180518046	X	CL	CL	0	0	1960	1960
118878	167333	5180510011	5180510011	X	CC	0	0	1880	1880
119800	177868	X	X	CC	X	0	0	1970	1970
120238	167242	X	X	CC	X	0	0	1910	1910
120262	178192	X	X	CC	X	0	0	1960	1960
118912	167371	5180510012	5180510012	X	CC	0	0	1880	1880
119817	177796	5180500882	5180500882	X	CC	0	0	1870	1870
119827	177803	5180500056	X	CL	CL	0	0	0	0
119828	177804	5180500056	X	CL	CL	0	0	0	0
120273	178194	5180510018	5180510018	X	CC	0	0	1890	1890
120274	178195	5180510018	5180510018	X	CC	0	0	1890	1890
120280	178201	X	X	CC	X	0	0	1910	1910
118955	167421	5180510012	5180510012	X	CC	0	0	1880	1880
118958	178189	5180510009	5180510009	X	CC	0	0	1930	1930
119860	177831	5180510551	5180510551	X	CC	0	0	1890	1890
118983	167451	X	X	CC	X	0	0	1910	1910
119863	177830	5180510551	5180510551	X	CC	0	0	1890	1890
118993	167462	5190512972	5190512972	X	CC	0	0	1940	1940
118997	167467	5180510012	5180510012	X	CC	0	0	1880	1880
118999	167470	5190512972	5190512972	X	CC	0	0	1890	1890
119010	167483	X	X	CC	X	0	0	1950	1950
119908	177863	5180500882	5180500882	X	CC	0	0	1880	1880
119910	177864	5180500882	5180500882	X	CC	0	0	1880	1880
119917	177948	5180501860	5180501860	X	CC	0	0	1890	1890
119042	167515	5190512972	5190512972	X	CC	0	0	1890	1890
119944	177907	5180500882	5180500882	X	CC	0	0	1890	1890
119960	177921	5180500421	5180500421	X	CC	0	0	1890	1890

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119975	177929	5180510551	5180510551	X	CC	0	0	1880	1880
119088	167573	5180510051	5180510051	X	CC	0	0	1860	1860
119567	168098	X	X	CC	X	0	0	1940	1940
119570	168101	5180520321	5180520321	X	CC	0	0	1910	1910
120031	177976	5190502533	5190502533	X	CC	0	0	1890	1890
120060	178092	X	X	CC	X	0	0	1910	1910
119170	167664	5180510014	5180510014	X	CC	0	0	1900	1900
119171	167665	X	X	CC	X	0	0	1920	1920
119650	177665	5180501431	5180501431	X	CC	0	0	1910	1910
119208	167705	5180510014	5180510014	X	CC	0	0	1890	1890
119668	165288	5180500053	5180500053	X	CC	0	0	1900	1900
120100	178029	5180512557	5180512557	X	CC	0	0	1910	1910
120102	178074	5180512634A	5180512634A	X	CC	0	0	1940	1940
120551	178453	5180513173	5180513173	X	CC	0	0	1940	1940
120561	178463	5180513007	5180513007	X	CC	0	0	1910	1910
120562	178465	5180513007	5180513007	X	CC	0	0	1930	1930
120564	178462	5180513007	5180513007	X	CC	0	0	1920	1920
120565	178464	5180513007	5180513007	CL	CC	0	0	1960	1960
121502	120116	5080470019	X	CL	CL	0	0	1970	1970
121535	120149	5080470001	5080470001	X	CC	0	0	1970	1970
120620	178542	5190512562	5190512562	X	CC	0	0	1910	1910
122090	120725	X	X	CC	X	0	0	1960	1960
120637	178543	5190512562	5190512562	X	CC	0	0	1910	1910
121670	120288	5080470002	5080470002	X	CC	0	0	1970	1970
121671	120289	5080470002	5080470002	X	CC	0	0	1970	1970
120377	178338	X	X	CC	X	0	0	1920	1920
120838	178658	5190512789	5190512789	X	CC	0	0	1910	1910
121295	159025	5180500421	5180500421	X	CC	0	0	1890	1890
121300	159045	5180500421	5180500421	X	CC	0	0	1890	1890
121773	120392	5080470020	5080470020	X	CC	0	0	1910	1910
120383	178290	X	X	CC	X	0	0	1960	1960
120385	167472	X	X	CC	X	0	0	1900	1900
120865	178750	5190513385	5190513385	X	CC	0	0	1910	1910
120866	178751	5190513385	5190513385	X	CC	0	0	1910	1910
121320	159004	5180500421	5180500421	X	CC	0	0	1890	1890
121340	159087	5180500479	5180500479	X	CC	0	0	1870	1870
121344	159095	5180500882	5180500882	X	CC	0	0	1890	1890
121800	120419	X	5090470023A	X	CC	0	0	1970	1970
120415	167779	5180510014	5180510014	X	CC	0	0	1890	1890
120416	178320	5180510014	5180510014	X	CC	0	0	1910	1910
120431	178335	5180510009	5180510009	X	CC	0	0	1890	1890
120433	178337	X	X	CC	X	0	0	1960	1960
121872	120493	X	5090470023A	X	CC	0	0	1960	1960
120485	178422	5180510012	5180510012	X	CC	0	0	1930	1930
121896	120526	5080470010	5080470010	X	CC	0	0	1970	1970
120491	178402	5180510010	5180510010	X	CC	0	0	1930	1930
120518	178449	X	X	CC	X	0	0	1960	1960
121456	120070	X	5080472002A	CC	CC	0	0	2000	2000
120523	167875	5180510102	5180510102	X	CC	0	0	1920	1920
120528	178419	5180510012	5180510012	X	CC	0	0	1880	1880
120537	178428	5180510014	5180510014	X	CC	0	0	1900	1900
120540	178436	5180510102	5180510102	X	CC	0	0	1900	1900
120541	178437	5180510102	5180510102	X	CC	0	0	1910	1910
123092	136773	X	X	CC	X	0	0	0	0
123096	136778	X	X	CC	X	0	0	0	0
123098	136781	X	X	CC	X	0	0	0	0
125280	152913	5070490462	5090470462	CC	CC	0	0	0	0
125822	153517	X	X	CC	X	0	0	1960	1960
125375	153025	5070490456	5090470456	CC	CC	0	0	2000	2000
125377	153027	5070490375	5090470375	CC	CC	0	0	0	0
125476	153140	X	5090470854	CC	CC	0	0	1990	1990
125481	153145	5090470885	5090470892A	CC	CC	0	0	2000	2000
125488	153153	X	X	CC	X	0	0	1960	1960
122226	120865	X	X	CC	X	0	0	2000	2000
122229	120868	X	X	CC	CL	0	0	2000	2000
122237	120881	X	X	CC	X	0	0	1990	1990
122241	120885	X	X	CC	X	0	0	1980	1980
125500	153166	X	5090470854	CC	CC	0	0	1990	1990
125504	153171	X	5090470854	CC	CC	0	0	1990	1990
125219	152792	X	5090460114	CC	CC	0	0	2000	2000
124309	151819	X	X	CC	X	0	0	2000	2000
127253	83931	5080410186	5080410195	CC	CC	1996	1996	0	0
127282	84000	5080410013	5080410186	CC	CC	0	0	0	0
126361	154126	5060472775	5090472775	CC	CC	0	0	2000	2000

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127285	84007	5080410013	5080410186	CC	CC	0	0	0	0
126011	153738	X	X	CC	X	0	0	1970	1970
126074	153807	X	X	CC	X	0	0	1960	1960
126551	154340	5070493331	5090473331	CC	CC	0	0	2000	2000
126552	154342	5070493331	5090473331	CC	CC	0	0	2000	2000
126575	154368	5090473282A	X	CC	X	2000	2000	2000	2000
126127	153865	5090472019	X	CC	X	1993	0	1993	1993
126130	153868	X	X	CC	X	0	0	1970	1970
126142	153885	X	X	CC	X	0	0	1970	1970
126182	153930	X	X	CC	X	0	0	1970	1970
126184	153932	X	X	CC	X	0	0	1970	1970
126188	153937	X	X	CC	X	0	0	1970	1970
126687	154490	X	5090473313	X	CC	0	2000	0	0
126690	154493	5070493313	5090473313	CC	CC	0	2000	0	0
128146	86696	X	X	CC	X	0	0	1890	1890
128148	86700	X	X	CC	X	0	0	1930	1930
128198	86827	X	X	CC	X	0	0	1980	1980
125980	153702	X	X	CC	X	0	0	1970	1970
127990	86074	X	5080412920	CL	CC	0	0	1920	1920
130214	105432	5080420013	5080420014	CC	CC	1990	1990	1990	1990
130873	90039	5070421785	5070421785	BU	CC	1941	2001	0	0
132402	90048	X	X	CC	X	0	0	0	0
132443	90279	X	X	CC	X	0	0	0	0
132573	90882	X	X	CC	X	0	0	0	0
132649	91199	X	X	CC	X	0	0	0	0
133729	198837	X	X	CC	X	0	0	1930	1930
134642	200415	5100510036	5100510036	BU	CC	0	1990	1990	1990
134671	200460	5110511918A	5110511918A	X	CC	0	0	1990	1990
134360	199960	5100511867W	5100511867W	X	CC	0	0	1920	1920
135250	201319	5100513524	5100513524	X	CC	0	0	1930	1930
135258	201329	5080513282A	5080513282A	X	CC	0	0	1990	1990
133919	199146	5100510969	X	X	X	0	0	0	0
134407	200057	5100511867W	5100511867W	X	CC	0	0	1930	1930
134521	200247	5100512284	5100512284	X	CC	0	0	1930	1930
134127	199543	5100511531	5100511531	X	CC	0	0	1930	1930
134136	199562	5100511604A	5100511604A	X	CC	0	0	1920	1920
134143	199573	5100511531	5100511531	X	CC	0	0	1910	1910
134147	199578	5100510926A	5100510969	CC	CC	1988	1988	1988	1988
136890	202782	5100523483	5100523483	CC	CC	1991	1998	1991	1991
135982	205182	5100520125A	5100520111A	CC	CC	0	0	1998	1998
135983	205294	5100520246A	5100520246A	CC	CC	1989	1998	1980	1980
136000	201858	5100520296A	5100520296A	CC	CC	1993	1998	1998	1998
136020	201879	5100520010	5100520010	CC	CC	1989	1998	1989	1989
136024	201883	5100521171A	5100521171A	CC	CC	1994	1998	1994	1994
136049	201911	5100520834A	5100520834A	BU	CC	1949	1949	1949	1949
136523	205246	5100522488A	5100522488A	CC	CC	1993	1998	1998	1998
136989	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
136998	202892	5100520001	5100520001	CC	CC	1988	1998	1988	1988
137001	202895	5100520001	5100520001	CC	CC	1988	1998	1988	1988
137004	202899	5100520001	5100520001	CC	CC	1988	1998	1950	1950
137015	205289	5100520272A	5100520201A	CC	CC	0	0	1998	1998
137016	205162	5100520290A	5100520111A	CC	CC	0	0	1990	1990
137018	201757	5100520264A	5100520264A	CC	CC	1989	1998	1989	1989
137019	205514	5100520292A	5100520292A	CC	CC	1988	1998	1998	1998
137020	205173	5100520284A	5100520111A	CC	CC	0	0	1998	1998
137023	205186	5100520296A	5100520296A	CC	CC	1993	1998	1998	1998
137026	201935	5100521171A	5100521171A	CC	CC	1994	1998	1998	1998
137027	205192	5100521171A	5100521171A	CC	CC	1994	1998	1994	1994
137031	205220	5100521414A	5100521414A	CC	CC	1989	1998	1989	1989
135686	205055	X	5100510926A	CC	CC	0	0	1990	1990
137033	205221	5100521571A	5100521571A	CC	CC	1989	1998	1989	1989
137040	205212	5100521534A	5100521534A	CC	CC	1989	1998	1989	1989
137041	205210	5100521401A	5100521541A	CC	CC	1998	1998	1998	1998
137047	205227	X	X	CC	BU	0	0	1998	1998
137052	201821	5100520001	5100520001	CC	CC	1988	1998	1988	1988
136591	205334	5100522863A	X	BU	BU	1949	1989	1998	1998
136604	202486	5100522561A	5100522561A	CC	CC	1988	1998	1998	1998
137077	202473	X	5100522863A	BU	CC	1949	1998	1998	1998
137078	205336	5100522851A	5100522851A	CC	CC	1993	1998	1998	1998
137079	205518	5100520142A	5100520111A	CC	CC	1988	1988	1988	1988
137080	205527	5100520142A	5100520111A	CC	CC	1988	1988	1988	1988
137081	201770	5100520124A	5100520111A	CC	CC	0	0	1998	1998
135740	200478	5110511918A	5110511918A	X	CC	0	0	1930	1930
136170	202036	5100520009	5100520009	CC	CC	1989	1998	0	0

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136183	202049	5100520009	5100520009	CC	CC	1989	1998	1998	1998
136193	202059	5100521571A	5100521571A	CC	CC	1989	1998	1998	1998
136624	202506	5100522851A	5100522851A	CC	CC	1993	1998	1998	1998
135752	205101	5100510017	5100510017	X	CC	0	0	1900	1900
135766	205110	5100510784A	5100510784A	BU	CC	1941	1994	1994	1941
136670	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
135815	205252	5100513629A	5100520111A	CC	CC	0	0	1990	1990
135816	205253	5100513629A	5100520111A	CC	CC	0	0	1990	1990
135820	201512	5100513667A	5100513610A	CC	CC	0	0	1990	1990
136255	202124	5100521575A	5100521575A	CC	CC	1989	1998	1998	1998
136261	205218	5100521534A	5100521534A	CC	CC	1989	1998	1998	1998
136716	202599	5100522619A	5100522619A	CC	CC	1988	1998	1960	1960
136287	205380	5100521414A	5100521414A	CC	CC	1989	1998	1998	1998
135394	201502	5100513629A	5100520111A	CC	CC	0	0	1990	1990
135400	205269	5100513667A	5100513610A	CC	CC	0	0	1950	1950
135862	201610	5100513548	5100513548	X	CC	0	0	0	0
135863	201612	5100520221A	5100520203A	CC	CC	0	0	1998	1998
135865	205161	5100513608A	5100520111A	CC	CC	0	0	1990	1990
135867	201619	5100520131A	5100520111A	CC	CC	0	0	1990	1990
135869	205250	5100513629A	5100520111A	CC	CC	0	0	1990	1990
135878	201676	5100520142A	5100520111A	CC	CC	1988	1988	1988	1988
135881	201686	5100520221A	5100520203A	CC	CC	0	0	1998	1998
136761	202647	5100522677A	5100522677A	CC	CC	1988	1998	1998	1998
135431	201571	5100513679A	5100513616A	CC	CC	0	0	1990	1990
135889	201714	5100520182A	5100520101A	CC	CC	0	0	1998	1998
135893	201726	5100520264A	5100520264A	CC	CC	1989	1998	1989	1989
135894	205516	5100520016	5100520142A	CC	CC	0	1998	1998	1998
135898	205449	5100520264A	5100520264A	CC	CC	1989	1998	1989	1989
135910	201763	5100520394A	5100520394A	CC	CC	1989	1998	1989	1989
136790	202678	5100522619A	5100522619A	CC	CC	1988	1998	1998	1998
135463	201658	5080513129A	5080513129A	X	CC	0	0	1960	1960
135476	201681	5080513129A	5080513129A	X	CC	0	0	1960	1960
135917	205517	5100520016	5100520142A	CC	CC	0	1998	1998	1998
135921	201774	5100520394A	5100520394A	CC	CC	1989	1998	1989	1989
135922	201775	5100520394A	5100520394A	CC	CC	1989	1998	1989	1989
135923	201776	5100520124A	5100520111A	CC	CC	0	0	0	0
135929	205200	5100520344A	5100520344A	CC	CC	1992	1998	1992	1992
135930	201784	5100520443A	5100520443A	CC	CC	1989	1998	1989	1989
135940	205175	5100520272A	5100520201A	CC	CC	0	0	1998	1998
136828	205226	5100522519A	5100522519A	CC	CC	1988	1998	1998	1998
138733	185478	5150492085	5150492085	X	CC	0	0	1890	1890
137474	180706	5140481152	5140481152	X	CC	0	0	1890	1890
137107	205505	5100522449A	5100522449A	CC	CC	1993	1998	0	0
137109	205243	5100522542A	5100522542A	CC	CC	1988	1998	1988	1988
137115	205495	5100520004	5100520004	CC	CC	1988	1998	1988	1988
137119	205501	5100522557A	5100522557A	CC	CC	1988	1998	1988	1988
137127	205290	5100513549A	5100520203A	CC	CC	0	0	1998	1998
137143	205309	5100521534A	5100521534A	CC	CC	1989	1998	1989	1989
137231	205408	5100522651A	5100522651A	BU	CC	1949	1998	1998	1998
137260	201738	5100520264A	5100520264A	BU	CC	1998	1998	1940	1940
137261	201882	5100521171A	5100521171A	CC	CC	1994	1998	1994	1994
137716	182044	5140482630	5140482630	X	CC	0	0	1890	1890
137303	205515	5100520292A	5100520292A	CC	CC	1988	1998	1988	1988
137306	205529	5100520154A	5100520111A	CC	CC	0	0	1998	1998
139598	191264	5150482858A	5150482858A	X	CC	0	0	1990	1990
139706	191334	5150483036	5150483036	X	CC	0	0	1890	1890
139281	190069	5140491248	X	X	X	0	0	1890	1890
139734	191378	5150490710	5150490710	X	CC	0	0	1890	1890
139744	191392	5150490688	5150490688	X	CC	0	0	1890	1890
139320	191013	5140481271	5140481271	X	CC	0	0	1910	1910
139778	191423	5150491883	5150491883	X	CC	0	0	1890	1890
140231	183288	5140490671	5140490511	CC	CC	2000	2000	2000	2000
140239	191893	X	5140490173	CC	CC	1995	1995	1995	1995
140248	183354	X	5140490123	CC	CC	1995	1995	1995	1995
137082	205528	5100520154A	5100520111A	CC	CC	0	0	1998	1998
137085	205531	5100520174A	5100520111A	CC	CC	0	0	1998	1998
137086	205530	5100520162A	5100520111A	CC	CC	0	0	1998	1998
137087	205524	5100520155A	5100520111A	CC	CC	0	0	1998	1998
137089	205183	5100520137A	5100520111A	CC	CC	0	0	1998	1998
137090	201840	5100520124A	5100520111A	CC	CC	0	0	1998	1998
137091	205180	5100520125A	5100520111A	CC	CC	0	0	1998	1998
137092	205177	5100520104A	5100520111A	CC	CC	0	0	1998	1998
137093	205178	5100520124A	5100520111A	CC	CC	0	0	1998	1998
137094	205179	5100520016	5100520142A	CC	CC	0	1998	1998	1998

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
137095	205181	5100520016	5100520142A	CC	CC	0	1998	1998	1998
137096	201727	5100520112A	5100520111A	CC	CC	0	0	1998	1998
137097	201622	5100520131A	5100520111A	CC	CC	0	0	1930	1930
137099	205249	5100520131A	5100520111A	CC	CC	0	0	1990	1990
137100	205251	5100520290A	5100520111A	CC	CC	0	0	1990	1990
137101	205291	5100520264A	5100520264A	CC	CC	1989	1998	1989	1989
137102	205176	5100520112A	5100520111A	CC	CC	0	0	1998	1998
137106	202421	5100522449A	5100522449A	CC	CC	1993	1998	1993	1993
139368	182720	5140483666A	5140483666B	CC	CC	1997	1997	1997	1997
139380	191059	5140481152	5140481152	X	CC	0	0	1900	1900
139382	191064	5140481090	5140481090	X	CC	0	0	1900	1900
139426	191104	5140482360	5140482360	X	CC	0	0	1890	1890
139931	191667	5150491686	5150491686	X	CC	0	0	1900	1900
140450	184240	5140491031B	5140491031B	X	CC	0	0	1890	1890
139546	182410	5140482979A	5140482979B	CC	CC	1996	1996	1996	1996
140009	191714	5150493500	5150493500	X	CC	0	0	1890	1890
140046	191674	5150491585	5150491585	X	CC	0	0	1860	1860
140048	191673	5150491585	5150491585	X	CC	0	0	0	0
140506	184637	5130490725A	5130490725B	CC	CC	1997	1997	1910	1910
141063	190606	X	5140490173	CC	CC	1995	1995	1995	1995
141148	191892	X	5140490173	CC	CC	1995	1995	1995	1860
141149	190605	X	5140490173	CC	CC	1995	1995	1995	1995
141150	191891	X	5140490173	CC	CC	0	1995	1995	1990
141151	191894	X	5140490173	CC	CC	1995	1995	1995	1995
142104	205550	X	X	CC	X	0	0	1940	1940
142110	205547	X	X	CC	X	0	0	1970	1970
142119	205549	X	X	CC	X	0	0	1990	1990
141209	191954	5140490413A	5140490413A	X	CC	0	0	1890	1890
141210	191953	5140490413A	5140490413A	X	CC	0	0	1910	1910
141240	191981	5140490407A	5140490407A	X	CC	0	0	1890	1890
141331	192065	5140491031B	5140491031B	X	CC	0	0	1890	1890
144489	87387	5100423299A	5100413299A	CC	CC	2000	2000	2000	2000
143556	213560	X	X	CC	X	0	0	1890	1890
143658	213663	X	X	CC	X	0	0	1840	1840
144156	205598	X	5180523419	CL	CC	0	0	1990	1990
144159	205591	X	5180528105	CL	CC	0	0	1990	1990
144170	205585	X	5180528108	CL	CC	0	0	1920	1920
144185	199837	5090511348A	5090511369A	CC	CC	1999	1999	1999	1999
144780	0	X	5140450531A	X	CC	0	0	1900	1900
144783	0	X	X	CC	X	0	0	1960	1960
145276	0	X	X	CC	X	0	0	1960	1960
144804	0	X	X	CC	X	0	0	1950	1950
144821	0	X	X	CC	X	1997	1997	0	0
144822	0	X	X	CC	X	1997	1997	0	0
145316	0	X	X	CC	X	0	0	0	0
145317	0	X	X	CC	X	0	0	0	0
145773	0	X	X	CC	X	0	0	1970	1970
145774	0	X	X	CC	X	0	0	1970	1970
145361	0	X	5140450531A	X	CC	0	0	1900	1900
145362	0	X	5140450531A	X	CC	0	0	1900	1900
145372	0	X	X	CC	X	0	0	0	0
146281	0	X	X	CC	X	0	0	1830	1830
146306	0	X	X	CC	X	0	0	1920	1920
146310	0	X	X	CC	X	0	0	1920	1920
146311	0	X	X	CC	X	0	0	1920	1920
144943	0	X	X	CC	X	0	0	0	0
144944	0	X	X	CC	X	0	0	0	0
144945	0	X	X	CC	X	0	0	0	0
144946	0	X	X	CC	X	0	0	0	0
144947	0	X	X	CC	X	0	0	0	0
144948	0	X	X	CC	X	0	0	0	0
145882	0	X	X	CC	X	0	0	1970	1970
145883	0	X	X	CC	X	0	0	1970	1970
145884	0	X	X	CC	X	0	0	1970	1970
145885	0	X	X	CC	X	0	0	1970	1970
145886	0	X	5140450531A	X	CC	0	0	1900	1900
146354	0	X	X	CC	X	0	0	1890	1890
146360	0	X	X	CC	X	0	0	1890	1890
146361	0	X	X	CC	X	0	0	1890	1890
144538	0	X	X	CC	X	0	0	1870	1870
145133	0	X	X	CC	X	0	0	1880	1880
144674	0	X	X	CC	X	0	0	1960	1960
144675	0	X	X	CC	X	0	0	1960	1960
145634	0	X	X	CC	X	0	0	0	0

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
145635	0	X	X	CC	X	0	0	0	0
145636	0	X	X	CC	X	0	0	0	0
145637	0	X	X	CC	X	0	0	0	0
145638	0	X	X	CC	X	0	0	0	0
144705	0	X	X	CC	X	0	0	1970	1970
144706	0	X	X	CC	X	0	0	1970	1970
145642	0	X	X	CC	X	0	0	1890	1890
145651	0	X	X	CC	X	1994	1994	1960	1960
144737	0	X	X	CC	X	0	0	0	0
145243	0	X	X	CC	X	0	0	1880	1880
145244	0	X	X	CC	X	0	0	1880	1880
146625	0	X	X	CC	X	0	0	1960	1960
147105	0	X	X	CC	X	0	0	1950	1950
147106	0	X	X	CC	X	0	0	1950	1950
147113	0	X	X	CC	X	0	0	1950	1950
147131	0	X	X	CC	X	0	0	1960	1960
147592	0	X	X	CC	X	1988	1988	1880	1880
147138	0	X	X	CC	X	0	0	1960	1960
147147	0	X	X	CC	X	0	0	1970	1970
147153	0	X	X	CC	X	0	0	0	0
147159	0	X	X	CC	X	0	0	1910	1910
146681	0	X	X	CC	X	0	0	1920	1920
146695	0	X	X	CC	X	0	0	1890	1890
146696	0	X	X	CC	X	0	0	1890	1890
146706	0	X	X	CC	X	0	0	1950	1950
146707	0	X	X	CC	X	0	0	1950	1950
147180	0	X	X	CC	X	0	0	1920	1920
147181	0	X	X	CC	X	0	0	1920	1920
147633	0	X	X	CC	X	0	0	1890	1890
147193	0	X	X	CC	X	0	0	0	0
147194	0	X	X	CC	X	0	0	1920	1920
147195	0	X	X	CC	X	0	0	1920	1920
147196	0	X	X	CC	X	0	0	1920	1920
147197	0	X	X	CC	X	0	0	1920	1920
147198	0	X	X	CC	X	0	0	1920	1920
147222	0	X	X	CC	X	0	0	1950	1950
147223	0	X	X	CC	X	0	0	1950	1950
147235	0	X	X	CC	X	0	0	1950	1950
147236	0	X	X	CC	X	0	0	1950	1950
147237	0	X	X	CC	X	0	0	1950	1950
147239	0	X	X	CC	X	0	0	1920	1920
147242	0	X	X	CC	X	0	0	0	0
147245	0	X	X	CC	X	0	0	1940	1940
147246	0	X	X	CC	X	0	0	1940	1940
148217	0	X	5140462592A	X	CC	0	0	1900	1900
146786	0	X	X	CC	X	0	0	1890	1890
148234	0	X	X	CC	X	0	0	1890	1890
148235	0	X	X	CC	X	0	0	1890	1890
148236	0	X	X	CC	X	0	0	1890	1890
146801	0	X	X	CC	X	0	0	1950	1950
147754	0	X	X	CC	X	0	0	0	0
147770	0	X	X	CC	X	0	0	1960	1960
147771	0	X	X	CC	X	0	0	1960	1960
146844	0	X	X	CC	X	0	0	0	0
146855	0	X	X	CC	X	0	0	0	0
147364	0	X	X	CC	X	0	0	0	0
146432	0	X	X	CC	X	0	0	1960	1960
146901	0	X	X	CC	X	0	0	1920	1920
146455	0	X	X	CC	X	0	0	0	0
146948	0	X	X	CC	X	0	0	0	0
146485	0	X	X	CC	X	0	0	1960	1960
146486	0	X	X	CC	X	0	0	1960	1960
146962	0	X	X	CC	X	0	0	1930	1930
146967	0	X	X	CC	X	0	0	0	0
146968	0	X	X	CC	X	0	0	0	0
146969	0	X	X	CC	X	0	0	0	0
146970	0	X	X	CC	X	0	0	0	0
146971	0	X	X	CC	X	0	0	0	0
147915	0	X	X	CC	X	0	0	1970	1970
147946	0	X	X	CC	X	0	0	1890	1890
147947	0	X	X	CC	X	0	0	1890	1890
147948	0	X	X	CC	X	0	0	1890	1890
147949	0	X	X	CC	X	0	0	1890	1890
147950	0	X	X	CC	X	0	0	1890	1890

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147951	0	X	X	CC	X	0	0	1890	1890
146554	0	X	X	CC	X	0	0	1960	1960
146570	0	X	X	CC	X	0	0	1920	1920
147053	0	X	X	CC	X	0	0	1920	1920
147985	0	X	X	CC	X	1988	1988	1988	1988
149887	0	X	X	CC	X	0	0	0	0
149894	0	X	X	CC	X	0	0	1960	1960
149895	0	X	X	CC	X	0	0	1960	1960
149896	0	X	X	CC	X	0	0	1960	1960
149917	0	X	X	CC	X	0	0	1900	1900
148546	0	X	X	CC	X	0	0	1970	1970
148554	0	X	X	CC	X	1990	1990	0	0
149040	0	X	X	CC	X	0	0	1940	1940
149045	0	X	X	CC	X	0	0	0	0
149046	0	X	X	CC	X	0	0	0	0
149047	0	X	X	CC	X	0	0	0	0
149048	0	X	X	CC	X	0	0	0	0
149936	0	X	X	CC	X	0	0	1970	1970
149056	0	X	X	CC	X	0	0	1920	1920
149520	0	X	X	CC	X	0	0	0	0
149965	0	X	X	CC	X	0	0	0	0
149981	0	X	X	CC	X	0	0	0	0
148620	0	X	X	CC	X	0	0	1890	1890
149105	0	X	X	CC	X	0	0	1910	1910
149106	0	X	X	CC	X	0	0	0	0
149107	0	X	X	CC	X	0	0	1890	1890
149528	0	X	X	CC	X	0	0	1940	1940
149537	0	X	X	CC	X	0	0	1930	1930
149993	0	X	X	CC	X	0	0	1920	1920
150005	0	X	X	CC	X	0	0	1940	1940
150009	0	X	X	CC	X	0	0	1940	1940
149128	0	X	X	CC	X	0	0	1940	1940
149154	0	X	X	CC	X	0	0	0	0
149578	0	X	X	CC	X	0	0	1950	1950
149579	0	X	X	CC	X	0	0	0	0
149180	0	X	X	CC	X	0	0	0	0
149181	0	X	X	CC	X	0	0	0	0
149186	0	X	X	CC	X	0	0	1930	1930
150100	0	X	X	CC	X	0	0	0	0
150101	0	X	X	CC	X	0	0	0	0
149684	0	X	X	CC	X	0	0	1970	1970
149290	0	X	X	CC	X	0	0	1950	1950
148377	0	X	X	CC	X	0	0	1970	1970
148386	0	X	X	CC	X	0	0	1890	1890
148392	0	X	X	CC	X	0	0	1960	1960
148393	0	X	X	CC	X	0	0	1960	1960
148394	0	X	X	CC	X	0	0	1960	1960
148853	0	X	X	CC	X	0	0	1930	1930
148451	0	X	X	CC	X	1988	1988	1988	1988
149825	0	X	X	CC	X	0	0	1920	1920
149831	0	X	X	CC	X	0	0	0	0
149407	0	X	X	CC	X	0	0	1920	1920
149408	0	X	X	CC	X	0	0	1920	1920
149424	0	X	X	CC	X	0	0	1950	1950
150799	0	X	X	CC	X	0	0	0	0
151251	0	X	X	CC	X	0	0	1970	1970
150350	0	X	X	CC	X	0	0	1930	1930
150351	0	X	X	CC	X	0	0	1930	1930
151277	0	X	X	CC	X	0	0	1980	1980
151790	0	X	X	CC	X	0	0	1980	1980
151791	0	X	X	CC	X	0	0	1970	1970
150373	0	X	X	CC	X	0	0	0	0
150892	0	X	X	CC	X	0	0	1930	1930
151338	0	X	X	CC	X	0	0	1950	1950
151850	0	X	X	CC	X	0	0	1960	1960
150459	0	X	X	CC	X	0	0	1930	1930
150460	0	X	X	CC	X	0	0	1970	1970
150477	0	X	X	CC	X	0	0	1930	1930
150485	0	X	X	CC	X	0	0	0	0
151402	0	X	X	CC	X	0	0	1930	1930
150981	0	X	X	CC	X	0	0	1910	1910
151915	0	X	X	CC	X	0	0	1840	1840
151921	0	X	X	CC	X	0	0	1970	1970
150564	0	X	X	CC	X	0	0	0	0

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150573	0	X	X	CC	X	0	0	1930	1930
150107	0	X	X	CC	X	0	0	0	0
150111	0	X	X	CC	X	0	0	1980	1980
150112	0	X	X	CC	X	0	0	1980	1980
151041	0	X	X	CC	X	0	0	0	0
151042	0	X	X	CC	X	0	0	0	0
151043	0	X	X	CC	X	0	0	0	0
151046	0	X	X	CC	X	0	0	1920	1920
151557	0	X	X	CC	X	0	0	0	0
151566	0	X	X	CC	X	0	0	1910	1910
151567	0	X	X	CC	X	0	0	1910	1910
150657	0	X	X	CC	X	0	0	0	0
151130	0	X	X	CC	X	0	0	1930	1930
151132	0	X	X	CC	X	0	0	1980	1980
151134	0	X	X	CC	X	0	0	0	0
151135	0	X	X	CC	X	0	0	1940	1940
151136	0	X	X	CC	X	0	0	1940	1940
151149	0	X	X	CC	X	0	0	1970	1970
151603	0	X	X	CC	X	0	0	0	0
150742	0	X	X	CC	X	0	0	1920	1920
151204	0	X	X	CC	X	0	0	1910	1910
151205	0	X	X	CC	X	0	0	1910	1910
151668	0	X	X	CC	X	0	0	1840	1840
151669	0	X	X	CC	X	0	0	1890	1890
151671	0	X	X	CC	X	0	0	0	0
151232	0	X	X	CC	X	0	0	1920	1920
151240	0	X	X	CC	X	0	0	0	0
151701	0	X	X	CC	X	0	0	0	0
153427	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153428	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153429	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153430	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153431	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
152210	0	X	X	CC	X	1996	1996	1950	1950
152211	0	X	X	CC	X	1996	1996	1950	1950
152212	0	X	X	CC	X	1996	1996	1950	1950
152213	0	X	X	CC	X	1996	1996	1950	1950
152221	0	X	X	CC	X	1996	1996	1930	1930
152222	0	X	X	CC	X	1996	1996	1930	1930
152223	0	X	X	CC	X	1996	1996	1930	1930
152686	0	X	X	CC	X	0	0	1940	1940
153076	66043	X	5140573210	X	CC	0	2013	1900	1900
153077	66043	X	5140573210	X	CC	0	2013	1900	1900
153078	66043	X	5140573210	X	CC	0	2013	1900	1900
153079	66043	X	5140573210	X	CC	0	2013	1900	1900
153080	66043	X	5140573210	X	CC	0	2013	1900	1900
153081	66190	X	5140573210	X	CC	0	2013	1910	1910
153082	66189	X	5140573210	X	CC	0	2013	1930	1930
153083	66104	X	5140573210	X	CC	0	2013	1910	1910
152251	0	X	X	CC	X	0	0	1950	1950
152257	0	X	X	CC	X	0	0	1940	1940
152714	0	X	X	CC	X	0	0	0	0
153102	171195	X	5210532164	X	CC	0	2013	1940	1940
153103	171271	X	5210532164	X	CC	0	2013	1890	1890
153105	171271	X	5210532164	X	CC	0	2013	1890	1890
153110	153787	X	5090472444	X	CC	0	2013	1900	1900
153111	153821	X	5090472444	X	CC	0	2013	1930	1930
153112	153870	X	5090472444	X	CC	0	2013	1900	1900
153113	153963	5090470021	5090472444	CC	CC	1979	2013	1979	1979
153114	153787	X	5090472444	X	CC	0	2013	1900	1900
153115	153821	X	5090472444	X	CC	0	2013	1930	1930
153116	153760	5090472444	X	CC	X	2013	2013	0	0
153117	153760	5090472444	X	CC	X	2013	2013	0	0
153118	153760	5090472444	X	CC	X	2013	2013	0	0
153119	153760	5090472444	X	CC	X	2013	2013	0	0
152267	0	X	X	CC	X	0	0	1950	1950
152272	0	X	X	CC	X	1997	1997	0	0
152287	0	X	X	CC	X	1997	1997	1950	1950
152288	0	X	X	CC	X	1997	1997	1950	1950
152292	0	X	X	CC	X	0	0	1960	1960
152293	0	X	X	CC	X	0	0	1960	1960
152744	0	X	X	CC	X	0	0	1940	1940
153120	153719	X	5090472444	X	CC	0	2013	0	0
153121	153753	X	5090472444	CL	CC	0	2013	1960	1960

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153122	153787	X	5090472444	X	CC	0	2013	1900	1900
153123	153787	X	5090472444	X	CC	0	2013	1900	1900
153125	195827	5090481865	X	CC	X	2007	0	2007	2007
153126	195827	5090481865	X	CC	X	2007	0	2007	2007
153127	196257	5090482828	X	CC	X	2006	0	1930	1930
153128	196257	5090482828	X	CC	X	2006	0	1930	1930
153129	196257	5090482828	X	CC	X	2006	0	1930	1930
153130	196459	5090483419	X	CC	X	2005	0	1920	1920
153134	196451	X	5090483419	X	CC	0	2005	1900	1900
153135	196451	X	5090483419	X	CC	0	2005	1900	1900
153136	197315	5090493047	X	CC	X	2005	0	1960	1960
153137	197315	5090493047	X	CC	X	2005	0	1960	1960
153138	197287	X	X	BU	X	1946	1946	1940	1940
153139	197287	X	5090493047	BU	CC	1946	2005	1940	1940
153140	197314	X	5090493047	BU	CC	1946	2005	1940	1940
153141	197314	X	5090493047	BU	CC	1946	2005	1940	1940
153142	197314	X	5090493047	BU	CC	1946	2005	1940	1940
152297	0	X	X	CC	X	0	0	1920	1920
152312	0	X	X	CC	X	0	0	1950	1950
152761	0	X	X	CC	X	0	0	1950	1950
152763	0	X	X	CC	X	0	0	1960	1960
152764	0	X	X	CC	X	0	0	1960	1960
152773	0	X	X	CC	X	0	0	1930	1930
152775	0	X	X	CC	X	0	0	1970	1970
152776	0	X	X	CC	X	0	0	1970	1970
152781	0	X	X	CC	X	0	0	1910	1910
153143	197314	X	5090493047	BU	CC	1946	2005	1940	1940
153144	197315	5090493047	X	CC	X	2005	0	1960	1960
153146	200778	5100513054	X	CC	X	2009	0	0	0
153147	200678	5100513054	X	CC	X	2009	0	1990	1990
153148	200678	5100513054	X	CC	X	2009	0	1990	1990
153149	8537	5110463226	X	CC	X	2010	0	2010	2010
153150	8363	5110463226	X	CC	X	2010	0	1880	1880
153151	8266	5110463265	X	CC	X	2007	0	2007	2007
153152	8266	5110463265	X	CC	X	2007	0	2007	2007
153153	8506	5110463309	X	CC	X	2011	2011	0	0
153154	8506	5110463309	X	CC	X	2011	2011	0	0
153155	8506	5110463309	X	CC	X	2011	2011	0	0
153156	8506	5110463309	X	CC	X	2011	2011	0	0
153157	8506	5110463309	X	CC	X	2011	2011	0	0
153158	8506	5110463309	X	CC	X	2011	2011	0	0
153159	8506	5110463309	X	CC	X	2011	2011	0	0
153160	8421	X	5110463309	X	CC	0	0	1880	1880
153161	8565	X	5110463309	X	CC	0	0	1890	1890
153162	8565	X	5110463309	X	CC	0	0	1890	1890
153163	8650	X	5110463309	X	CC	0	0	1900	1900
153164	182554	5130482816A	X	CC	X	2001	0	2001	2001
153165	182554	5130482816A	X	CC	X	2001	0	2001	2001
153166	182554	5130482816A	X	CC	X	2001	0	2001	2001
152331	0	X	X	CC	X	0	0	0	0
152332	0	X	X	CC	X	0	0	0	0
152790	0	X	X	CC	X	1992	1992	1980	1980
152791	0	X	X	CC	X	1992	1992	1980	1980
152808	0	X	X	CC	X	0	0	1930	1930
153167	63469	5160563327A	5160563365A	CC	CC	1998	2001	2001	1998
153169	89403	5100421493	X	CC	X	2007	2007	2007	2007
153170	89403	5100421493	X	CC	X	2007	2007	2007	2007
153171	89403	5100421493	X	CC	X	2007	2007	2007	2007
153172	89403	5100421493	X	CC	X	2007	2007	2007	2007
153176	100587	5100421493	X	CC	X	2007	2007	0	0
153177	52409	5140471988	X	CC	X	2001	0	1920	1920
153179	52409	5140471988	X	CC	X	2001	0	1920	1920
153180	204031	5090480642	X	CC	X	2006	0	2006	2006
153181	204031	5090480642	5090480620	CC	CC	2006	2004	2004	2006
153182	204031	5090480642	X	CC	X	2006	0	2006	2006
153183	131543	5060441583	X	CC	X	2006	0	0	0
153184	131543	5060441583	X	CC	X	2006	0	0	0
153185	195039	5090480670	X	CC	X	2006	0	2006	2006
153188	195039	5090480670	X	CC	X	2006	2006	2006	2006
153189	195818	5090481784	X	CC	X	2005	0	2005	2005
152354	0	X	X	CC	X	0	0	1940	1940
152355	0	X	X	CC	X	0	0	1940	1940
152357	0	X	X	CC	X	0	0	1950	1950
153192	195818	5090481784	X	CC	X	2005	0	2005	2005

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153193	59269	5160553358	X	CC	X	2007	0	1950	1950
153194	6460	5100453495	X	CC	X	2006	0	1960	1960
153199	62419	5160562781	X	CC	X	2010	0	2008	2008
153201	66254	5150573674	5150573624	CC	CC	2006	2013	2013	2006
153202	40444	5110523636A	X	CC	X	2004	0	1940	1940
153203	40508	5110523226	X	CC	X	2011	0	1940	1940
153204	40508	5110523226	X	CC	X	2011	0	1940	1940
153205	89608	5100421456	X	CC	X	2006	0	1920	1920
153206	89608	5100421456	X	CC	X	2006	0	1920	1920
153207	153027	5070490375	X	CC	X	0	0	0	0
153208	153027	5070490375	X	CC	X	0	0	0	0
153209	153027	5070490375	X	CC	X	0	0	0	0
153210	153027	5070490375	X	CC	X	0	0	0	0
153211	153027	5070490375	X	CC	X	0	0	0	0
153212	152984	X	5090470375	X	CC	0	0	1910	1910
152384	0	X	X	CC	X	0	0	1960	1960
152385	0	X	X	CC	X	0	0	1960	1960
152386	0	X	X	CC	X	0	0	1960	1960
152405	0	X	X	CC	CL	1997	1997	1900	1900
153223	154368	5090473282A	5090473313	CC	CC	2000	2000	2000	2000
153224	154493	5070493313	X	CC	X	0	0	0	0
153225	154493	5070493313	X	CC	X	0	0	0	0
153226	154493	5070493313	X	CC	X	0	0	0	0
153227	154493	5070493313	X	CC	X	0	0	0	0
153228	154493	5070493313	X	CC	X	0	0	0	0
153229	154493	5070493313	X	CC	X	0	0	0	0
153230	154493	5070493313	X	CC	X	0	0	0	0
153231	154493	5070493313	X	CC	X	0	0	0	0
153232	154493	5070493313	X	CC	X	0	0	0	0
153233	154493	5070493313	X	CC	X	0	0	0	0
153234	154493	5070493313	X	CC	X	0	0	0	0
153235	154493	5070493313	X	CC	X	0	0	0	0
153236	154410	X	5090473313	X	CC	0	2000	1940	1940
153237	154410	X	5090473313	X	CC	0	2000	1940	1940
153238	154410	X	5090473313	X	CC	0	2000	1940	1940
153611	201879	5100520010	5100520010	CC	CC	1989	1998	1989	1989
153612	201784	5100520443A	5100520443A	CC	CC	1989	1998	1989	1989
153613	205226	5100522519A	5100522519A	CC	CC	1988	1998	1998	1998
153614	205226	5100522519A	5100522519A	CC	CC	1988	1998	1998	1998
152417	0	X	X	CC	X	1996	1996	1950	1950
152421	0	X	X	CC	X	0	0	1950	1950
153239	154410	X	5090473313	X	CC	0	2000	1940	1940
153240	154520	X	5090473313	X	CC	0	2000	1930	1930
153241	154520	X	5090473313	X	CC	0	2000	1930	1930
153242	154520	X	5090473313	X	CC	0	2000	1930	1930
153243	154520	X	5090473313	X	CC	0	2000	1930	1930
153244	154520	X	5090473313	X	CC	0	2000	1930	1930
153245	154520	X	5090473313	X	CC	0	2000	1930	1930
153246	154521	X	5090473313	X	CC	0	2000	1910	1910
153247	154521	X	5090473313	X	CC	0	2000	1910	1910
153248	154461	X	5090473313	X	CC	0	2000	1910	1910
153249	154521	X	5090473313	X	CC	0	2000	1910	1910
153250	154521	X	5090473313	X	CC	0	2000	1910	1910
153251	154521	X	5090473313	X	CC	0	2000	1910	1910
153252	154521	X	5090473313	X	CC	0	2000	1910	1910
153253	154521	X	5090473313	X	CC	0	2000	1910	1910
153254	154521	X	5090473313	X	CC	0	2000	1910	1910
153255	154521	X	5090473313	X	CC	0	2000	1910	1910
153256	154521	X	5090473313	X	CC	0	2000	1910	1910
153257	154521	X	5090473313	X	CC	0	2000	1910	1910
153258	154521	X	5090473313	X	CC	0	2000	1910	1910
153259	154521	X	5090473313	X	CC	0	2000	1910	1910
153261	122410	5080430934	5080430017	CC	CC	1992	1992	1992	1992
152442	0	X	X	CC	X	0	0	1960	1960
152443	0	X	X	CC	X	0	0	1960	1960
152444	0	X	X	CC	X	0	0	1960	1960
152465	0	X	X	CC	X	0	0	1940	1940
152929	201911	5100520834A	X	BU	X	1949	1949	1949	1949
152930	204516	5090482819A	5090482819B	CC	CC	1994	1994	1920	1920
152931	204516	5090482819A	X	CC	X	1994	0	1920	1920
152935	199639	5100511832A	X	CC	X	1994	0	1950	1950
153262	122410	5080430934	X	CC	X	1992	1992	1992	1992
153263	122216	5080430963	X	CC	X	1992	0	1992	1992
153264	122216	5080430963	X	CC	X	1992	0	1992	1992

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153266	125830	5080432995	X	CC	X	1992	1992	1990	1990
153267	125554	X	5080433083	X	CC	0	0	1940	1940
153268	125666	5080433083	X	CC	X	1992	1992	1980	1980
153269	126760	5080433283	X	CC	X	1992	1992	1990	1990
153270	127435	X	5080433283	X	CC	0	0	1940	1940
153271	153423	5090471774	X	CC	X	1993	0	1993	1993
153272	153423	5090471774	X	CC	X	1993	0	1993	1993
153273	153423	5090471774	X	CC	X	1993	0	1993	1993
153274	6939	5100461013	X	CC	X	1991	0	1991	1991
153275	66437	X	5150573618	X	CC	0	0	1890	1890
153276	66437	X	5150573618	X	CC	0	0	1890	1890
153279	205331	X	5100521574A	BU	CC	1949	1998	1998	1998
153280	84317	5080411122	X	CC	X	1992	0	1992	1992
153281	84317	5080411122	X	CC	X	1992	0	1992	1992
153282	105170	5080411121	X	CC	X	1993	0	1993	1993
153283	105170	5080411121	X	CC	X	1993	0	1993	1993
153284	105170	5080411121	X	CC	X	1993	0	1993	1993
153285	105170	5080411121	5080411122	CC	CC	1993	1992	1993	1993
153286	84212	X	5080411121	X	CC	0	1993	1900	1900
152011	0	X	X	CC	X	0	0	1930	1930
152495	0	X	X	CC	X	0	0	1930	1930
152936	199639	5100511832A	X	CC	X	1994	0	1950	1950
152937	200247	5100512284	X	X	X	0	0	1930	1930
152938	200898	5100512771	5100512603	CC	CC	2011	1991	1960	1960
152939	200865	X	5100512728A	X	CC	0	1994	1930	1930
152940	201141	X	5100512728A	X	CC	0	1994	1930	1930
152941	200898	5100512771	5100512728A	CC	CC	2011	1994	1960	1960
152942	32659	5110513393	X	CC	X	1993	0	1993	1993
152944	39841	5110523313	X	CC	X	1992	0	1992	1992
152945	64978	5150572320	5150571469	CC	CC	2010	1993	1950	1950
152946	64978	5150572320	5150571469	CC	CC	2010	1993	1950	1950
152947	64968	5150571659	X	CC	X	1993	0	1993	1993
152948	61225	5160561758	X	CC	X	1993	0	1920	1920
152950	61745	5160562394	X	CC	X	1993	0	1993	1993
152952	61745	5160562394	X	CC	X	1993	0	1993	1993
152953	86323	5080413035	X	CC	X	2003	0	2003	2003
152954	129463	5090441063	X	CC	X	2004	0	2004	2004
152955	129463	5090441063	X	CC	X	2004	0	2004	2004
152956	131255	5090441525	X	CC	X	1999	0	1990	1990
152957	130896	X	5090441663	X	CC	0	1999	1920	1920
153287	84217	X	5080411121	WF	CC	0	1993	1890	1890
153288	84273	X	5080411122	X	CC	0	1992	1890	1890
153289	84321	X	5080411122	X	CC	0	1992	1890	1890
153290	84273	X	5080411121	X	CC	0	1993	1890	1890
153294	9974	X	5090471923A	X	CC	0	1996	1920	1920
153297	153649	5090470010A	5090471923A	CC	CC	1995	1995	1950	1950
153298	153663	X	5090471923A	X	CC	0	0	1920	1920
153299	153664	X	5090471923A	X	CC	0	0	1920	1920
153300	153664	X	5090471923A	X	CC	0	0	1920	1920
153303	204516	5090482819A	X	CC	X	1994	0	1920	1920
153304	196247	5090482819A	5090482819B	CC	CC	1994	1994	1920	1920
152043	0	X	X	CC	X	0	0	1930	1930
152052	0	X	X	CC	X	0	0	1940	1940
152498	0	X	X	CC	X	0	0	0	0
152512	0	X	X	CC	X	0	0	0	0
152958	132246	5090442132	X	CC	X	2011	0	1920	1920
152959	6223	5100452653	X	CC	X	2010	0	1870	1870
152960	7022	5110461217	X	CC	X	2007	0	1890	1890
152961	75039	X	5120472565	X	CC	0	2010	1960	1960
152962	53183	X	5120472565	X	CC	0	2010	0	0
152963	53183	X	5120472565	X	CC	0	2010	0	0
152964	124890	5080432415	5090432435	CC	CC	0	0	0	0
152965	181419	5120481552A	X	CC	X	2007	0	0	0
152966	182782	5120482619A	X	CC	X	2010	0	1970	1970
152967	182359	X	5120482784A	X	CC	0	0	1970	1970
152968	182344	5120482784A	X	CC	X	2010	0	0	0
152969	182344	5120482784A	X	CC	X	2010	0	0	0
152970	190391	5120482817A	X	CC	X	2007	0	0	0
152971	190391	5120482817A	X	CC	X	2007	0	0	0
152972	190391	5120482817A	X	CC	X	2007	0	0	0
152973	182481	5120482814A	X	CC	X	2007	2007	0	0
152974	183162	5120483376A	X	CC	X	2010	0	0	0
152975	183162	5120483376A	X	CC	X	2010	0	0	0
152976	183162	5120483376A	X	CC	X	2010	0	0	0

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152977	183162	5120483376A	X	CC	X	2010	0	0	0
152978	183827	5120490274A	X	CC	X	2008	0	1970	1970
152979	183622	5130490582	5130490526B	CC	CC	1997	1997	1997	1997
152980	183622	5130490582	X	CC	X	1997	0	1997	1997
152981	186917	5130492697A	X	CC	X	2006	0	0	0
152982	186926	5130492697A	X	CC	X	2006	0	0	0
153318	63974	5160570318A	5160570318A	X	CC	0	0	1950	1950
152538	0	X	X	CC	X	0	0	1970	1970
152983	186926	5130492697A	X	CC	X	2006	0	0	0
152984	182232	5140482606A	X	CC	X	2000	0	2000	2000
152985	192105	5140491565	X	CC	X	1996	0	1996	1996
152986	192109	5140491565	X	CC	X	1996	0	1996	1996
152987	188256	5140500865	X	CC	X	2002	0	2002	2002
152988	181735	5150481928A	X	CC	X	2006	0	2006	2006
152990	124550	5080432415	5090432435	CC	CC	0	0	1910	1910
152992	128974	5090440259A	5090440249	CC	CC	2000	2000	2000	2000
152993	128974	5090440259A	5090440249	CC	CC	2000	2000	2000	2000
152995	86074	X	X	CL	X	0	0	1920	1920
152996	86074	X	X	CL	X	0	0	1920	1920
152997	14248	X	5120492460A	X	CC	0	2009	0	0
152998	185775	5120492460A	X	CC	X	2009	0	0	0
152999	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153000	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153001	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153002	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153003	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153004	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153005	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
152097	0	X	X	CC	X	0	0	1910	1910
152108	0	X	X	CC	X	0	0	1940	1940
152114	0	X	X	CC	X	0	0	1950	1950
152115	0	X	X	CC	X	0	0	1950	1950
153006	190067	5130490725A	5130490725B	CC	CC	1997	1997	1997	1997
153007	184190	X	5130490725B	X	CC	0	1997	1870	1870
153008	184410	X	5130490725B	X	CC	0	1997	1900	1900
153009	190603	5130490725A	5130490725B	CC	CC	1997	1997	1940	1940
153010	184766	X	5130490725B	X	CC	0	1997	1890	1890
153012	184415	X	5130490725A	X	CC	0	1997	1920	1920
153013	184415	X	5130490725A	X	CC	0	1997	1920	1920
153014	190601	5130490725B	5130490725A	CC	CC	1997	1997	1997	1997
153015	190601	5130490725B	5130490725A	CC	CC	1997	1997	1997	1997
153016	190601	5130490725B	5130490725A	CC	CC	1997	1997	1997	1997
153017	190601	5130490725B	5130490725A	CC	CC	1997	1997	1997	1997
153020	182720	5140483666A	X	CC	X	1997	0	1997	1997
153021	182720	5140483666A	X	CC	X	1997	0	1997	1997
153022	182720	5140483666A	X	CC	X	1997	0	1997	1997
153023	182791	X	5140483666B	X	CC	0	1997	1880	1880
153024	190564	5130483134A	5140483666B	CC	CC	1997	1997	1997	1997
153025	182822	X	5140483666B	X	CC	0	1997	1860	1860
153026	182822	X	5140483666B	X	CC	0	1997	1860	1860
153027	182876	X	5140483666B	X	CC	0	1997	1930	1930
153028	183003	X	5140483666B	X	CC	0	1997	1890	1890
152145	0	X	X	CC	X	0	0	1930	1930
152146	0	X	X	CC	X	0	0	1930	1930
152151	0	X	X	CC	X	0	0	1950	1950
152587	0	X	X	CC	X	0	0	0	0
152594	0	X	X	CC	X	1997	1997	0	0
152595	0	X	X	CC	X	0	0	1930	1930
152596	0	X	X	CC	X	0	0	1930	1930
152612	0	X	X	CC	X	0	0	1980	1980
153029	183003	X	5140483666B	X	CC	0	1997	1890	1890
153030	191051	5140483666A	5140483666B	CC	CC	1997	1997	1997	1997
153031	191051	5140483666A	5140483666B	CC	CC	1997	1997	1997	1997
153032	182916	5140483666A	5140483666B	CC	CC	1997	1997	1997	1997
153035	191051	5140483666A	X	CC	X	1997	0	1997	1997
153036	191051	5140483666A	X	CC	X	1997	0	1997	1997
153037	191051	5140483666A	X	CC	X	1997	0	1997	1997
153038	182916	5140483666A	X	CC	X	1997	0	1997	1997
153039	182950	5140483666B	X	CC	X	1997	0	1997	1997
153040	183049	X	5140483666A	X	CC	0	1997	1890	1890
153041	183049	X	5140483666A	X	CC	0	1997	1890	1890
153042	183049	X	5140483666A	X	CC	0	1997	1890	1890
153043	183150	X	5140483666A	X	CC	0	1997	1880	1880
153044	183150	X	5140483666A	X	CC	0	1997	1880	1880

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
153045	191052	X	5140483666A	X	CC	0	1997	1900	1900
153046	191052	X	5140483666A	X	CC	0	1997	1900	1900
153047	183003	X	5140483666A	X	CC	0	1997	1890	1890
153048	183003	X	5140483666A	X	CC	0	1997	1890	1890
153049	183003	X	5140483666A	X	CC	0	1997	1890	1890
153391	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153392	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153393	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153394	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153395	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153396	202883	5100520001	5100520001	CC	CC	1988	1998	1998	1998
153397	202036	5100520009	5100520009	CC	CC	1989	1998	0	0
153398	202036	5100520009	5100520009	CC	CC	1989	1998	0	0
153399	205449	5100520264A	5100520264A	CC	CC	1989	1998	1989	1989
153403	201784	5100520443A	5100520443A	CC	CC	1989	1998	1989	1989
152152	0	X	X	CC	X	0	0	1950	1950
152613	0	X	X	CC	X	0	0	1980	1980
152614	0	X	X	CC	X	0	0	1980	1980
152618	0	X	X	CC	X	0	0	1930	1930
152621	0	X	X	CC	X	0	0	1930	1930
152628	0	X	X	CC	CL	1997	1997	1950	1950
152636	0	X	X	CC	X	1996	1996	1950	1950
152637	0	X	X	CC	X	0	0	1950	1950
153052	182950	5140483666B	5140483666A	CC	CC	1997	1997	1997	1997
153053	182950	5140483666B	5140483666A	CC	CC	1997	1997	1997	1997
153054	182950	5140483666B	5140483666A	CC	CC	1997	1997	1997	1997
153055	182950	5140483666B	5140483666A	CC	CC	1997	1997	1997	1997
153056	182950	5140483666B	5140483666A	CC	CC	1997	1997	1997	1997
153057	187117	X	5120492657A	X	CC	0	2010	0	0
153059	185974	5120492093A	X	CC	X	2008	0	0	0
153061	185175	5150492401	5150491318A	CC	CC	2003	2003	2003	2003
153062	186261	5150492814	X	CC	CL	2003	2003	2003	2003
153063	23264	X	5150501644	X	CC	0	2001	1910	1910
153064	23291	X	5150501644	X	CC	0	2001	1910	1910
153065	62859	5160562649	X	CC	X	2009	0	1940	1940
153066	64981	5150571597	X	CC	X	2010	0	1950	1950
153067	64981	5150571597	X	CC	X	2010	0	1950	1950
153068	57730	5160552171	5160552160	CC	CC	2009	2009	0	0
153069	66002	5140573210	X	CC	X	2013	0	1920	1920
153070	66002	5140573210	X	CC	X	2013	2013	1920	1920
153071	66045	5140573210	X	CC	X	2013	0	0	0
153072	66045	5140573210	X	CC	X	2013	0	0	0
153412	205220	5100521414A	5100521414A	CC	CC	1989	1998	1989	1989
153413	205220	5100521414A	5100521414A	CC	CC	1989	1998	1989	1989
153414	205380	5100521414A	5100521414A	CC	CC	1989	1998	1998	1998
153417	205218	5100521534A	5100521534A	CC	CC	1989	1998	1998	1998
153420	205226	5100522519A	5100522519A	CC	CC	1988	1998	1998	1998
153421	205226	5100522519A	5100522519A	CC	CC	1988	1998	1998	1998
153423	205243	5100522542A	5100522542A	CC	CC	1988	1998	1988	1988
153424	205243	5100522542A	5100522542A	CC	CC	1988	1998	1988	1988
153425	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153426	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
152189	0	X	X	CC	X	1997	1997	1970	1970
152197	0	X	X	CC	X	0	0	1970	1970
152200	0	X	X	CC	X	1996	1996	1950	1950
152201	0	X	X	CC	X	1996	1996	1950	1950
152202	0	X	X	CC	X	1996	1996	1950	1950
152203	0	X	X	CC	X	1996	1996	1950	1950
152204	0	X	X	CC	X	1996	1996	1950	1950
152205	0	X	X	CC	X	1996	1996	1950	1950
152206	0	X	X	CC	X	1996	1996	1950	1950
152207	0	X	X	CC	X	1996	1996	1950	1950
152208	0	X	X	CC	X	1996	1996	1950	1950
152209	0	X	X	CC	X	1996	1996	1950	1950
152654	0	X	X	CC	X	0	0	0	0
152655	0	X	X	CC	X	0	0	0	0
152659	0	X	X	CC	X	1997	1997	1960	1960
152660	0	X	X	CC	X	1997	1997	1960	1960
152661	0	X	X	CC	X	1997	1997	1960	1960
151950	0	X	X	CC	X	0	0	1980	1980
151970	0	X	X	CC	X	0	0	1960	1960
153615	205501	5100522557A	5100522557A	CC	CC	1988	1998	1988	1988
153616	205501	5100522557A	5100522557A	CC	CC	1988	1998	1988	1988
153617	202486	5100522561A	5100522561A	CC	CC	1988	1998	1998	1998

Unique Identifier in Pre-Landbase (AVI_UKEY)	Original Polygon Number (POLY_NUM)	Original AVI Opening Number (ARIS)	Updated AVI Opening Number (PLB_ARIS)	Modifier to Land Classification (MOD1)	Updated Modifier to Land Classification (PLB_MOD1)	Year that Modification occurred (MOD1_YR)	Update to the Year that Modification Occurred (PLB_MODYR)	Stand Origin (ORIGIN)	Updated Stand Origin (PLB_ORIGIN)
153618	202647	5100522677A	5100522677A	CC	CC	1988	1998	1998	1998
153619	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153620	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153621	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153623	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153624	205416	5100522795B	5100522795B	CC	CC	1993	1998	1998	1998
153626	202782	5100523483	5100523483	CC	CC	1991	1998	1991	1991
153627	202782	5100523483	5100523483	CC	CC	1991	1998	1991	1991
153645	51842	5140471693A	X	CC	CL	1996	1996	1996	1996
153654	26966	5150510799A	5160510794A	CC	CC	1999	1999	1999	1999
153682	7373	5100461596	X	CC	X	1992	1992	1992	1992
153684	7321	5100461596	X	CC	X	1992	1992	1810	1810
153686	83336	5100403688A	5100403677A	CC	CC	1999	1999	1999	1999
153689	122336	X	5080431242A	X	CC	0	1999	1970	1970
153690	122352	X	5080431242A	X	CC	0	1999	1910	1910
153691	62964	5160563370	5160563392A	CC	CC	2001	2001	1880	1880
153692	128361	5090440284A	5090440263	CC	CC	1999	1999	1998	1998
153693	127972	X	5090440263	X	CC	0	1999	1930	1930
153697	1605	X	5110503223	X	CC	0	2012	1880	1880
153698	1600	X	5110503223	X	CC	0	2012	1920	1920
153699	1543	X	5110503223	X	CC	0	2012	1890	1890
153700	1548	X	5110503223	X	CC	0	2012	1920	1920
153701	202130	5100521523A	X	CC	X	1998	0	1998	1998
153702	202130	5100521523A	X	CC	X	1998	0	1998	1998
153704	90523	5080420013	5080422432	CC	CC	1990	1990	1990	1990
153705	105432	5080420013	5080422432	CC	CC	1990	1990	1990	1990
153706	90530	5080420014	5080422442	CC	CC	1990	1990	1990	1990
153707	90622	5080422432	5080422442	CC	CC	1992	1992	1992	1992
153708	105432	5080420013	5080422442	CC	CC	1990	1990	1990	1990
153709	63351	5160563410C	5160563410A	CC	CC	2000	2000	2000	2000
153711	97977	X	5080393386	X	CC	0	2013	1910	1910
153715	34073	X	5110520395	X	CC	0	2013	1930	1930
153716	33841	X	5110520395	X	CC	0	2013	1860	1860
153719	1357	X	5110502883	X	CC	0	2013	1920	1920
153720	1357	X	5110502883	X	CC	0	2013	1920	1920
153721	1357	X	5110502883	X	CC	0	2013	1920	1920
153722	1378	X	5110502883	X	CC	0	2013	1890	1890
153723	1376	X	5110502723	X	CC	0	2013	1890	1890
153724	1328	X	5110502722	X	CC	0	2013	1940	1940
153725	1333	X	5110502722	X	CC	0	2013	1940	1940
153728	1349	X	5110502722	X	CC	0	2013	1940	1940
153729	1376	X	5110502722	X	CC	0	2013	1890	1890
153731	1319	X	5110502722	X	CC	0	2013	1890	1890
153736	59998	X	X	CC	X	0	0	1890	1890
153737	183825	5120490407A	X	CC	X	2010	0	0	0
153738	183825	5120490407A	X	CC	X	2010	0	0	0
153739	63853	5160570623	5160570623A	X	CC	0	0	1890	1890
153740	67612	5160570623	5160570623	X	CC	0	0	1880	1880
153741	67613	5160570623	5160570623A	X	CC	0	0	1880	1880
153742	66446	X	5150573624	X	CC	0	0	1890	1890
153749	160065	X	5160431754	X	CC	0	2013	1890	1890
153750	192102	5140491412A	X	CC	X	1997	0	1997	1997
153751	189844	5140491412A	X	CC	X	1997	0	1910	1910
153754	8363	5110463226	X	CC	X	2010	0	1880	1880
153755	8537	5110463226	X	CC	X	2010	0	2010	2010
153756	8537	5110463226	X	CC	X	2010	0	2010	2010
153757	8537	5110463226	X	CC	X	2010	0	2010	2010
153758	26025	X	X	CC	X	0	0	0	0
153759	8537	5110463226	X	CC	X	2010	0	2010	2010

Appendix IV – AVI Stratification Process

Overview

This section outlines the process used to stratify the AVI to the Base 10 strata, as per the Alberta Forest Management Planning Standard (Alberta, 2006). Figure A-IV-1 illustrates the order of steps in the process, which are described in the following sections.

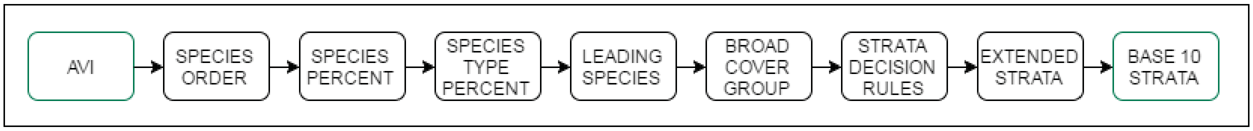

Figure A-IV-1. AVI stratification process.

Species Order

(Output fieldnames: AW_ORD, BW_ORD, PB_ORD, FB_ORD, FD_ORD, LT_ORD, PL_ORD, SB_ORD, SW_ORD and UAW_ORD, UBW_ORD, UPB_ORD, UFB_ORD, UFD_ORD, ULT_ORD, UPL_ORD, USB_ORD, USW_ORD)

The order of species in the species composition code is important for stratification. An example of how species percents are used to calculate species order for aspen is in Table A-IV-5-1. This rule is applied for all species groups in both the overstorey (fields *_ORD) and understorey (fields U*_ORD).

Table A-IV-5-1. Example of species order assignment for under and overstorey.

AW_ORD	Description	Selection Criteria
1	Species 1	SP1 = 'AW'
2	Species 2	SP2 = 'AW'
3	Species 3	SP3 = 'AW'
4	Species 4	SP4 = 'AW'
5	Species 5	SP5 = 'AW'
9	No 'AW' present	

Species Percent

(Output fieldnames: AW_PCT, BW_PCT, PB_PCT, FB_PCT, FD_PCT, LT_PCT, PL_PCT, SB_PCT, SW_PCT and UAW_PCT, UBW_PCT, UPB_PCT, UFB_PCT, UFD_PCT, ULT_PCT, UPL_PCT, USB_PCT, USW_PCT)

AVI species percents were assigned to the appropriate species percent fields. AVI species percents are in 10% classes. An example of how species percents were calculated for aspen is in Table A-IV-5-2. This rule is applied for all species group codes and also for all species groups in both the overstorey (fields *_PCT) and understorey (fields U*_PCT).

Table A-IV-5-2. Example of species percent assignment.

AW_PCT	Description	Selection Criteria
SP1_PER	Species 1 percent class	SP1 = 'AW'
SP2_PER	Species 2 percent class	SP2 = 'AW'
SP3_PER	Species 3 percent class	SP3 = 'AW'
SP4_PER	Species 4 percent class	SP4 = 'AW'
SP5_PER	Species 5 percent class	SP5 = 'AW'
'0'	No 'AW' present	

Species Type Percent

(Output fieldnames: HARDPCT, SOFTPCT, UHARDPCT, USOFTPCT)

The sum of species percents for deciduous and coniferous species was calculated using the following equations. Note that species type percent is calculated for each layer.

HARDPCT = AW_PCT + BW_PCT + PB_PCT

SOFTPCT = FB_PCT + FD_PCT + LT_PCT + PL_PCT + SB_PCT + SW_PCT

UHARDPCT = UAW_PCT + UBW_PCT + UPB_PCT

USOFTPCT = UFB_PCT + UFD_PCT + ULT_PCT + UPL_PCT + USB_PCT + USW_PCT

Leading Species

(Output fieldnames: LEAD_DEC, LEAD_CON, ULEAD_DEC, ULEAD_CON)

The leading deciduous species *(i.e.* the first listed deciduous species in the AVI species composition) was determined using species order (Table A-IV-5-3). The leading coniferous species was also determined (Table A-IV-5-4).

Table A-IV-5-3. Assignment of deciduous leading species.

LEAD_DEC	Description	Selection Criteria
'AW'	Aspen leading deciduous	*AW_ORD < BW_ORD and AW_ORD < PB_ORD*
'BW'	Birch leading deciduous	*BW_ORD < AW_ORD and BW_ORD < PB_ORD*
'PB'	Poplar leading deciduous	*PB_ORD < AW_ORD and PB_ORD < BW_ORD*
'NO'	No deciduous present	*HARDPCT = 0*

Table A-IV-5-4. Assignment of coniferous leading species.

LEAD_CON	Description	Selection Criteria
'FB'	True fir leading conifer	*FB_ORD < FD_ORD and FB_ORD < LT_ORD and FB_ORD < PL_ORD and FB_ORD < SB_ORD and FB_ORD < SW_ORD*
'FD'	Douglas fir leading conifer	*FD_ORD < FB_ORD and FD_ORD < LT_ORD and FD_ORD < PL_ORD and FD_ORD < SB_ORD and FD_ORD < SW_ORD*
'LT'	Larch leading conifer	*LT_ORD < FD_ORD and LT_ORD < FB_ORD and LT_ORD < PL_ORD and LT_ORD < SB_ORD and LT_ORD < SW_ORD*
'PL'	Pine leading conifer	*PL_ORD < FD_ORD and PL_ORD < LT_ORD and PL_ORD < FB_ORD and PL_ORD < SB_ORD and PL_ORD < SW_ORD*
'SB'	Black spruce leading conifer	*SB_ORD < FD_ORD and SB_ORD < LT_ORD and SB_ORD < PL_ORD and SB_ORD < FB_ORD and SB_ORD < SW_ORD*
'SW'	White spruce leading conifer	*SW_ORD < FD_ORD and SW_ORD < LT_ORD and SW_ORD < PL_ORD and SW_ORD < SB_ORD and SW_ORD < FB_ORD*
'NO'	No coniferous present	*SOFTPCT = 0*

Note that the leading *understorey* deciduous (ULEAD_DEC) and *understorey* coniferous (ULEAD_CON) species were also calculated using the appropriate values from the species based U*_ORD variables.

Broad Cover Group

(Output fieldnames: C_CODE, UC_CODE)

The BCG was assigned using the rules outlined in Table A-IV-5-5. Note that the BCG was calculated for the overstorey (C_CODE) and the understorey (UC_CODE) using the appropriate SOFTPCT/HARDPCT/SP1 or USOFTPCT/UHARDPCT/USP1 fields as necessary.

Table A-IV-5-5. BCG assignment.

C_CODE	Label	Description	Selection Criteria
D	Pure Deciduous	Deciduous >= 80%	*HARDPCT >= 8*
DC	Deciduous-Coniferous	Coniferous > 20% and Deciduous >20%	*(HARDPCT > 2 and SOFTPCT > 2) or (HARDPCT = 5 and SP1 is ('AW','PB','BW'))*
CD	Coniferous-Deciduous	Coniferous > 20% and Deciduous >20%	*(HARDPCT > 2 and SOFTPCT > 2) or (SOFTPCT = 5 and SP1 is not ('AW','PB','BW'))*
C	Pure Coniferous	Coniferous >= 80%	*SOFTPCT >= 8*
NULL	No cover group	Not a forested type	*SOFTPCT = 0 and HARDPCT = 0*

Strata Decision Rules

(Output fieldnames: DRULE, CRULE, UDRULE, UCRULE)

Extended strata are defined in the Alberta Forest Management Planning Standard (Alberta, 2006). To assign extended strata, the leading deciduous species and leading coniferous species were required. The leading deciduous species was the species with the lowest order Note that the leading deciduous rule is calculated for both overstorey (DRULE) and understorey (UDRULE) layers of each stand. The rules for DRULE and UDRULE assignment are presented in Table A-IV-5-6.

Table A-IV-5-6. Assignment of leading deciduous strata decision rule.

DRULE	Description	Selection Criteria
'AW_LEAD'	Aspen leading deciduous	*HARDPCT* > 0 and *AW_ORD* < *BW_ORD* and *AW_ORD* < *PB_ORD*
'BW_LEAD'	Birch leading deciduous	*HARDPCT* > 0 and *BW_ORD* < *AW_ORD* and *BW_ORD* < *PB_ORD*
'PB_LEAD'	Popular leading deciduous	*HARDPCT* > 0 and *PB_ORD* < *AW_ORD* and *PB_ORD* < *BW_ORD*
'NO_D'	No deciduous present	*HARDPCT* = 0

Assignment of leading coniferous species was more complex, and based on relative percent composition by species. Note that the leading coniferous rule was calculated for both overstorey (CRULE) and understorey (UCRULE) layers of each stand. The rules for CRULE and UCRULE assignment are presented in Table A-IV-5-7.

Table A-IV-5-7. Assignment of leading coniferous strata decision rule.

CRULE	Description	Selection Criteria
'FB_LEAD'	True fir leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*FB_PCT* > *FD_PCT* and *FB_PCT* > *LT_PCT* and *FB_PCT* > *PL_PCT* and *FB_PCT* > *SB_PCT* and *FB_PCT* > *SW_PCT*) or (*LEAD_CON* = 'FB' and *FB_PCT* >= *FD_PCT* and *FB_PCT* >= *LT_PCT* and *FB_PCT* >= *PL_PCT* and *FB_PCT* >= *SB_PCT* and *FB_PCT* >= *SW_PCT*))
'FD_LEAD'	Douglas fir leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*FD_PCT* > *FB_PCT* and *FD_PCT* > *LT_PCT* and *FD_PCT* > *PL_PCT* and *FD_PCT* > *SB_PCT* and *FD_PCT* > *SW_PCT*) or (*LEAD_CON* = 'FD' and *FD_PCT* >= *FB_PCT* and *FD_PCT* >= *LT_PCT* and *FD_PCT* >= *PL_PCT* and *FD_PCT* >= *SB_PCT* and *FD_PCT* >= *SW_PCT*))
'FBFD_LEAD_MW'	True fir or Douglas fir leading coniferous in mixedwood	*C_CODE* = ('DC', 'CD') and (((*FB_PCT* + *FD_PCT*) > *PL_PCT* and (*FB_PCT* + *FD_PCT*) > (*SB_PCT* + *LT_PCT*) and (*FB_PCT* + *FD_PCT*) > *SW_PCT*) or (*LEAD_CON* = ('FB','FD') and (*FB_PCT* + *FD_PCT*) >= *PL_PCT* and (*FB_PCT* + *FD_PCT*) >= (*SB_PCT* + *LT_PCT*) and (*FB_PCT* + *FD_PCT*) >= *SW_PCT*))
'LT_LEAD'	Larch leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*LT_PCT* > *FB_PCT* and *LT_PCT* > *FD_PCT* and *LT_PCT* > *PL_PCT* and *LT_PCT* > *SB_PCT* and *LT_PCT* > *SW_PCT*) or (*LEAD_CON* = 'LT' and *LT_PCT* >= *FB_PCT* and *LT_PCT* >= *FD_PCT* and *LT_PCT* >= *PL_PCT* and *LT_PCT* >= *SB_PCT* and *LT_PCT* >= *SW_PCT*))
'PL_LEAD'	Pine leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*PL_PCT* > *FB_PCT* and *PL_PCT* > *FD_PCT* and *PL_PCT* > *LT_PCT* and *PL_PCT* > *SB_PCT* and *PL_PCT* > *SW_PCT*) or (*LEAD_CON* = 'PL' and *PL_PCT* >= *FB_PCT* and *PL_PCT* >= *FD_PCT* and *PL_PCT* >= *LT_PCT* and *PL_PCT* >= *SB_PCT* and *PL_PCT* >= *SW_PCT*))
'PL_LEAD_MW'	Pine leading coniferous in mixedwood	*C_CODE* = ('DC', 'CD') and ((*PL_PCT* > (*FB_PCT* + *FD_PCT*) and *PL_PCT* > (*SB_PCT* + *LT_PCT*) and *PL_PCT* > *SW_PCT*) or (*LEAD_CON* = 'PL' and *PL_PCT* >= (*FB_PCT* + *FD_PCT*) and *PL_PCT* >= (*SB_PCT* + *LT_PCT*) and *PL_PCT* >= *SW_PCT*))
'SB_LEAD'	Black spruce leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*SB_PCT* > *FB_PCT* and *SB_PCT* > *FD_PCT* and *SB_PCT* > *LT_PCT* and *SB_PCT* > *PL_PCT* and *SB_PCT* > *SW_PCT*) or (*LEAD_CON* = 'SB' and *SB_PCT* >= *FB_PCT* and *SB_PCT* >= *FD_PCT* and *SB_PCT* >= *LT_PCT* and *SB_PCT* >= *PL_PCT* and *SB_PCT* >= *SW_PCT*))
'SBLT_LEAD_MW'	Black spruce or larch leading coniferous in mixedwood	*C_CODE* = ('DC', 'CD') and (((*SB_PCT* + *LT_PCT*) > (*FB_PCT* + *FD_PCT*) and (*SB_PCT* + *LT_PCT*) > *PL_PCT* and (*SB_PCT* + *LT_PCT*) > *SW_PCT*) or (*LEAD_CON* = ('SB', 'LT') and (*SB_PCT* + *LT_PCT*) >= (*FB_PCT* + *FD_PCT*) and (*SB_PCT* + *LT_PCT*) >= *PL_PCT* and (*SB_PCT* + *LT_PCT*) >= *SW_PCT*))
'SW_LEAD'	White spruce leading coniferous in pure stand	*C_CODE* = ('C', 'D') and ((*SW_PCT* > *FB_PCT* and *SW_PCT* > *FD_PCT* and *SW_PCT* > *LT_PCT* and *SW_PCT* > *PL_PCT* and *SW_PCT* > *SB_PCT*) or (*LEAD_CON* = 'SW' and *SW_PCT* >= *FB_PCT* and *SW_PCT* >= *FD_PCT* and *SW_PCT* >= *LT_PCT* and *SW_PCT* >= PL_PCT and *SW_PCT* >= *SB_PCT*))

CRULE	Description	Selection Criteria
'SW_LEAD_MW'	White spruce leading coniferous in mixedwood	*C_CODE* = ('DC', 'CD') and ((*SW_PCT* > (*FB_PCT*+*FD_PCT*) and *SW_PCT* > *PL_PCT* and *SW_PCT* > (*SB_PCT* + *LT_PCT*)) or (*LEAD_CON* = 'SW' and *SW_PCT* >= (*FB_PCT*+*FD_PCT*) and *SW_PCT* >= *PL_PCT* and *SW_PCT* >= (*SB_PCT* + *LT_PCT*)))
'NO_C'	No coniferous present	*SOFTPCT* = 0

Extended Strata

(Output fieldnames : STRATA_SRD, USTRATA_SRD)

Based on the leading species, BCG and species composition, polygons were then assigned to an extended stratum as defined in the Planning Standard (see Table A-IV-5-8). Note that the extended strata were calculated for both the overstorey and understorey layers using the appropriate input variables representing the layer.

Table A-IV-5-8. Assignment of extended strata.

STRATA_SRD	Description	Selection Criteria
'D1'	Pure aspen	*C_CODE* = 'D' and *AW_PCT* >= 9
'D2'	Aspen leading with poplar	*C_CODE* = 'D' and *DRULE* = 'AW_LEAD' and *AW_PCT* < 9 and *PB_PCT* > 1
'D3'	Aspen leading without poplar	*C_CODE* = 'D' and *DRULE* = 'AW_LEAD' and *AW_PCT* < 9 and *PB_PCT* <= 1
'D4'	Poplar leading	*C_CODE* = 'D' and *DRULE* = 'PB_LEAD'
'D5'	Birch leading	*C_CODE* = 'D' and *DRULE* = 'BW_LEAD'
'DC1'	Aspen/white spruce	*C_CODE* = 'DC' and *DRULE* = 'AW_LEAD' and *CRULE* = 'SW_LEAD_MW'
'DC2'	Aspen/pine	*C_CODE* = 'DC' and *DRULE* = 'AW_LEAD' and *CRULE* = 'PL_LEAD_MW'
'DC3'	Aspen/black spruce	*C_CODE* = 'DC' and *DRULE* = 'AW_LEAD' and *CRULE* = 'SBLT_LEAD_MW'
'DC4'	Aspen/fir	*C_CODE* = 'DC' and *DRULE* = 'AW_LEAD' and *CRULE* = 'FBFD_LEAD_MW'
'DC5'	Poplar/white spruce	*C_CODE* = 'DC' and *DRULE* = 'PB_LEAD' and *CRULE* = 'SW_LEAD_MW'
'DC6'	Poplar/pine	*C_CODE* = 'DC' and *DRULE* = 'PB_LEAD' and *CRULE* = 'PL_LEAD_MW'
'DC7'	Poplar/black spruce	*C_CODE* = 'DC' and *DRULE* = 'PB_LEAD' and *CRULE* = 'SBLT_LEAD_MW'

STRATA_SRD	Description	Selection Criteria
'DC8'	Poplar/fir	*C_CODE* = 'DC' and *DRULE* = 'PB_LEAD' and *CRULE* = 'FBFD_LEAD_MW'
'DC9'	Birch/white spruce	*C_CODE* = 'DC' and *DRULE* = 'BW_LEAD' and *CRULE* = 'SW_LEAD_MW'
'DC10'	Birch/pine	*C_CODE* = 'DC' and *DRULE* = 'BW_LEAD' and *CRULE* = 'PL_LEAD_MW'
'DC11'	Birch/black spruce	*C_CODE* = 'DC' and *DRULE* = 'BW_LEAD' and *CRULE* = 'SBLT_LEAD_MW'
'DC12'	Birch/fir	*C_CODE* = 'DC' and *DRULE* = 'BW_LEAD' and *CRULE* = 'FBFD_LEAD_MW'
'CD1'	White spruce/aspen	*C_CODE* = 'CD' and *CRULE* = 'SW_LEAD_MW' and *DRULE* = 'AW_LEAD'
'CD2'	White spruce/poplar	*C_CODE* = 'CD' and *CRULE* = 'SW_LEAD_MW' and *DRULE* = 'PB_LEAD'
'CD3'	White spruce/birch	*C_CODE* = 'CD' and *CRULE* = 'SW_LEAD_MW' and *DRULE* = 'BW_LEAD'
'CD4'	Pine/aspen	*C_CODE* = 'CD' and *CRULE* = 'PL_LEAD_MW' and *DRULE* = 'AW_LEAD'
'CD5'	Pine/poplar	*C_CODE* = 'CD' and *CRULE* = 'PL_LEAD_MW' and *DRULE* = 'PB_LEAD'
'CD6'	Pine/birch	*C_CODE* = 'CD' and *CRULE* = 'PL_LEAD_MW' and *DRULE* = 'BW_LEAD'
'CD7'	Black spruce/aspen	*C_CODE* = 'CD' and *CRULE* = 'SBLT_LEAD_MW' and *DRULE* = 'AW_LEAD'
'CD8'	Black spruce/poplar	*C_CODE* = 'CD' and *CRULE* = 'SBLT_LEAD_MW' and *DRULE* = 'PB_LEAD'
'CD9'	Black spruce/birch	*C_CODE* = 'CD' and *CRULE* = 'SBLT_LEAD_MW' and *DRULE* = 'BW_LEAD'
'CD10'	Fir/aspen	*C_CODE* = 'CD' and *CRULE* = 'FBFD_LEAD_MW' and *DRULE* = 'AW_LEAD'
'CD11'	Fir/poplar	*C_CODE* = 'CD' and *CRULE* = 'FBFD_LEAD_MW' and *DRULE* = 'PB_LEAD'
'CD12'	Fir/birch	*C_CODE* = 'CD' and *CRULE* = 'FBFD_LEAD_MW' and *DRULE* = 'BW_LEAD'
'C1'	Pure white spruce	*C_CODE* = 'C' and *SW_PCT* >= 9
'C2'	White spruce leading with pine	*C_CODE* = 'C' and *CRULE* = 'SW_LEAD' and *SW_PCT* < 9 and *PL_PCT* > 1
'C3'	White spruce leading without pine	*C_CODE* = 'C' and *CRULE* = 'SW_LEAD' and *SW_PCT* < 9 and *PL_PCT* <= 1
'C4'	Pure pine	*C_CODE* = 'C' and *PL_PCT* >= 9
'C5'	Pine leading with white spruce	*C_CODE* = 'C' and *CRULE* = 'PL_LEAD' and *PL_PCT* < 9 and *SW_PCT* > 1 and *SW_ORD* < *FB_ORD* and *SW_ORD* < *SB_ORD*
'C6'	Pine leading with black spruce	*C_CODE* = 'C' and *CRULE* = 'PL_LEAD' and *PL_PCT* < 9 and *SB_PCT* > 1 and *SB_ORD* < *FB_ORD* and *SB_ORD* < *SW_ORD*
'C7'	Pine leading with fir	*C_CODE* = 'C' and *CRULE* = 'PL_LEAD' and *PL_PCT* < 9 and *FB_PCT* > 1 and *FB_ORD* < *SB_ORD* and *FB_ORD* < *SW_ORD*

STRATA_SRD	Description	Selection Criteria
'C8'	Pine leading without spruce and fir	*C_CODE* = 'C' and *CRULE* = 'PL_LEAD' and *PL_PCT* < 9 and *FB_PCT* <= 1 and *SB_PCT* <=1 and *SW_PCT* <= 1
'C9'	Pure black spruce	*C_CODE* = 'C' and *SB_PCT* >= 9
'C10'	Black spruce leading with pine	*C_CODE* = 'C' and *CRULE* = 'SB_LEAD' and *SB_PCT* < 9 and *PL_PCT* > 1
'C11'	Black spruce leading without pine	*C_CODE* = 'C' and *CRULE* = 'SB_LEAD' and *SB_PCT* < 9 and *PL_PCT* <= 1
'C12'	Larch leading	*C_CODE* = 'C' and *CRULE* = 'LT_LEAD'
'C13'	Pure Douglas fir	*C_CODE* = 'C' and *FD_PCT* >= 9
'C14'	Douglas fir leading	*C_CODE* = 'C' and *CRULE* = 'FD_LEAD' and *FD_PCT* < 9
'C15'	Pure balsam fir	*C_CODE* = 'C' and *FB_PCT* >= 9
'C16'	Balsam fir leading with pine	*C_CODE* = 'C' and *CRULE* = 'FB_LEAD' and *FB_PCT* < 9 and *PL_PCT* > 1
'C17'	Balsam fir leading without pine	*C_CODE* = 'C' and *CRULE* = 'FB_LEAD' and *FB_PCT* < 9 and *PL_PCT* <= 1
'XX0'	Non-forested	*C_CODE* = NULL

Base 10 Strata

(Output fieldnames: B10_STRATA_SRD, B10_STRATA_CODE, B10_STRATA_NAME, B10_USTRATA_SRD, B10_USTRATA_CODE, B10_USTRATA_NAME)

Polygons are assigned a final base 10 stratum dependent on the extended strata. Base 10 strata are comprised of groups of extended strata (Table A-IV-5-9). Note that the extended strata were calculated for both the overstorey and understorey layers using the appropriate input variables.

Table A-IV-5-9. Assignment of base 10 strata.

B10_STRATA_SRD	B10_STRATA_CODE	Selection Criteria
I	Aw	*STRATA_SRD in ('D1', 'D2', 'D3', 'D4', 'D5')*
II	AwPl	*STRATA_SRD in ('DC2', 'DC6', 'DC10')*
III	AwSx	*STRATA_SRD in ('DC1', 'DC3', 'DC4', 'DC5', 'DC7', 'DC8', 'DC9', 'DC11', 'DC12')*
IV	SwAw	*STRATA_SRD in ('CD1', 'CD2', 'CD3', 'CD10', 'CD11', 'CD12')*
V	PlAw	*STRATA_SRD in ('CD4', 'CD5', 'CD6')*
VI	SbAw	*STRATA_SRD in ('CD7', 'CD8', 'CD9')*
VII	Sw	*STRATA_SRD in ('C1', 'C2', 'C3', 'C15', 'C16', 'C17')*
VIII	Pl	*STRATA_SRD in ('C4', 'C5', 'C6', 'C7', 'C8')*
IX	Sb	*STRATA_SRD in ('C9', 'C10', 'C11', 'C12')*
X	Fd	*STRATA_SRD in ('C13', 'C14')*
Null	X	*None*

As no Douglas fir exists on the DFA, only the first nine base 10 strata are utilized in the landbase

Appendix V – Processing ARIS Extract Data

FORCORP's Excel based ARIS processing tool was used to consolidate and process the ARIS extract data in order to determine the final strata assignments, ages and area for each opening number. The following sections describes the process

Assigning Strata

The final stratum (F_STRATA) is determined based on fields populated within the ARIS dataset. Newer cutblocks (generally with a skid clearance of May 1, 2008 or later) were assigned yield stratum-specific declarations in ARIS, simplifying the stratum assignment. Older cutblocks, however were declared to a broad cover group-based stratum, which was comprised of a two-letter code. The first letter represents the initial broad cover group (BCG) declaration, and the second letter represents the re-declaration after establishment survey (if any). In cases where an establishment survey has not yet been completed or re-declaration was not required, the first and second letters are the same. For the purposes of stratum assignment, declarations were extracted from the second character of this code since this represents the most up-to-date representation available for the opening. However, broad cover group is of insufficient resolution for assigning strata. The leading conifer species (F_CON) was therefore also assigned using one of five sources of information extracted from the ARIS data, as follows:

1. Assess timber declaration match according to the strata table loaded in as a second input (Table A-IV-I) to the ARIS processing tool (STRATA).
   - If timber declaration (TIMB_SUP_LD_BS_DESIG_CODE) is Aw then F_CON = "X"
   - If timber declaration is Sx, Sw, Se then F_CON = "Sx"
   - If timber declaration is Pl, Pj then F_CON = "Pl"
   - If timber declaration is Sb then F_CON = "Sb"
   - If timber declaration is Lt then F_CON = "Lt"
2. Assess planted stems according to summed planting events.
   - If Sw total planted stems >= Px, Sb, Lt planted stems then F_CON = "Sw"
   - If Px total planted stems >= Sb, Lt planted stems then F_CON = "Pl"
   - If Sb total planted stems >= Lt planted stems then F_CON = "Sb"
   - If Lt total planted stems > 0 then F_CON = "Lt"
3. Assess Leave for Natural calls.
   - If LFN_METHOD_CODE (LFN_METHOD) = "B" then F_CON = "Pl"
   - If LFN_METHOD_CODE is "C" then F_CON = "Sw"
   - If LFN_METHOD_CODE is "D" then F_CON = "Sw"
4. Assess Direct Seeding Events.
   - If SPECIES_CODE = "SW" then F_CON = "Sw"
   - If SPECIES_CODE = "Px" then F_CON = "Pl"
5. Assess original stand type (pre-harvest).
   - If SPECIES_GROUP is "PN" then F_CON = "Pl"
   - If SPECIES_GROUP is "DE" and timber declaration = "HH" then F_CON = "XXXX"
   - If SPECIES_GROUP is "MX" then F_CON = "Sw"
   - If SPECIES_GROUP is "FA" then F_CON = "Fa"

Timber declaration and the leading coniferous species (F_CON) were then used to assign yield stratum (F_STRATA), which is defined from the following hierarchal rule-set:

6. Assess timber declaration match according to the strata table loaded in as a second input (Table A-IV-I) to the ARIS processing tool (STRATA).
   - If the length of the timber declaration is > 2 THEN F_STRATA = STRATA
   - If the timber declaration = "AwC" then F_STRATA = "Aw" & F_CON
   - If F_CON = "Sw" then F_STRATA = "AwSw"
   - If F_CON = "Sb" then F_STRATA = "AwSb"
   - If the timber declaration = "CAw" then F_STRATA = F_CON & "AW"
   - If F_CON = "Sw" then F_STRATA = "SwAw"
   - If F_CON = "Sb" then F_STRATA = "SbAw"
7. Assess timber declaration match as it relates to the loaded strata table as the second input (Table A-IV-I) to the ARIS processing tool (BCG)
   - If BCG is "D" then F_STRATA = "Aw"
   - If BCG is "CD" and F_CON = "Pl" then F_STRATA = "PlAw"
   - If BCG is "CD" and F_CON = "Sw" or "Sb" then F_STRATA = "SxAw"
   - If BCG is "DC" and F_CON = "Pl" then F_STRATA = "AwPl"
   - If BCG is "DC" and F_CON = "Sw" or "Sb" then F_STRATA = "AwSx"
   - If BCG is "C" and F_CON = "Pl" then F_STRATA = "Pl"
   - If BCG is "C" and F_CON = "Sw" then F_STRATA = "Sw"
   - If BCG is "C" and F_CON = "Sb" then F_STRATA = "Sb"
   - If BCG is "C" and F_CON = "Lt" then F_STRATA = "Lt"

Assigning Block Year

To assign an age to an opening, the block year (BLOCK_YEAR) needs to be assigned. This is a calculation that considers the skid clearance date, disturbance date and reforestation start clock date.

1. If the skid clearance date is within 1 year of the reforestation start clock date then the block year is based on the skid clearance date;
2. If the skid clearance date has a difference greater than 1 year from the reforestation start clock date then the block year is determined as follows:
   - If the date of disturbance is greater than the year 1900:
     - and the date of disturbance is within 1 year of the reforestation start clock date then the date of disturbance is used to assign block year;
     - and the date of disturbance is more than 1 year from the reforestation start clock date then the reforestation start clock date is used to assign block year;
   - If the date of disturbance is before the year 1900 then the reforestation start clock date is used to assign block year.

Timber year is assigned based on the date assigned in steps 1 or 2 above. If the month is less than 5 (May) then the year minus one is assigned, otherwise the year is assigned as BLOCK_YEAR.

Block year is the value that will be subtracted from the reference year or landbase effective date (as a timber year) to determine stand age.

Table A-IV-5. ARIS Designation for Strata Assignment.

ARIS Landbase Designation	STRATA	BCG
CC	CAw	CD
CD	AwC	DC
CH	Aw	D
CS	C	C
DC	CAw	CD
DD	AwC	DC
DH	Aw	D
DS	C	C
HC	CAw	CD
HD	AwC	DC
HH	Aw	D
HS	C	C
MH	Aw	D
MS	C	C
MW	AwC	DC
SC	CAw	CD
SD	AwC	DC
SH	Aw	D
SS	C	C
WEYD0001	Aw	D
WEYD0002	AwPl	DC
WEYD0003	AwSw	DC
WEYD0004	SwAw	CD
WEYD0005	PlAw	CD
WEYD0007	Sw	C
WEYD0008	Pl	C
WEYD0009	Sb	C
WEYE0601	Aw	D
WEYE0602	AwPl	DC
WEYE0603	AwSw	DC
WEYE0604	SwAw	CD
WEYE0605	PlAw	CD
WEYE0607	Sw	C
WEYE0608	Pl	C
WEYE0609	Sb	C

The landbase effective date is May 1, 2015, which equates to an effective year of 2015. The block year derived from the ARIS data was used to determine block age rather than skid clearance year as it was found that in the instances where they were different the openings either had a reforestation or disturbance event more than one year after the skid clearance date that should have caused clock start to be reset.

An exception to the above block year assignment procedure was made for 29 cutblocks burnt in the 1998 Chip Lake fire. These cutblocks have skid clearance and reforestation dates ranging between 1987 and 1992, however they were all reforested following the 1998 fire. All 29 openings have performance surveys completed in 2012. The block year for these cutblocks was manually changed to match the disturbance year, *i.e*. 1998. The 29 openings modified are as follows:

5100520001	5100520246A	5100520394A	5100521571A	5100522542A	5100522795B
5100520004	5100520264A	5100520443A	5100521575A	5100522557A	5100522851A
5100520009	5100520292A	5100521171A	5100522449A	5100522561A	5100522863A
5100520010	5100520296A	5100521414A	5100522488A	5100522619A	5100523483
5100520142A	5100520344A	5100521534A	5100522519A	5100522677A	

Out of a total of 10,661 ARIS openings only 83 (0.8%) used a date other than skid clearance to determine the block year. This includes the 29 Chip Lake fire openings updated to reflect the disturbance year.

Assigning Area

The assignment of the area (A_AREA) from the ARIS dataset to be used for area reconciliation purposes was completed as follows:

1. If a performance survey has been completed and the survey area is not null, then A_AREA = SURVEY_AREA; else
2. If the update area is > 0, then A_AREA = UPDATE_AREA; else
3. If NHH area > 0, then A_AREA = NHH; else
4. If an establishment survey has been completed and the survey area is not null, then A_AREA = SURVEY_AREA; else
5. Zero.

The AOP area was not used in the determination of the opening area.

Output Table

The outcome of the above process is a single spreadsheet (Weyer_2016FMP_ARIS_Output_Combined.xlsx) that contains all the relevant information extracted from the consolidated tables and derived fields including block year, area and stratum. The following fields are included in the resulting table for all operators:

- A_AREA: Derived opening area to be used for reconciliation purposes.
- AOP_AREA: Annual Operating Plan area recorded in ARIS
- AREA_CODE: The area district code for each opening number.
- ARIS_STATUS: Pre- or Post 91 based on the date used to determine the BLOCK_YEAR.
- BLOCK_YEAR: Derived field identifying the year of cut based on timber year.
- DATE_OF_DISTURBANCE: The date a disturbance occurred.
- DISTURBANCE_TYPE_CODE: Event type that has occurred and substantially affected the opening after harvest.
- F_CON: Is the leading conifer species, calculated by following hierarchal rule-set outlined below.
- F_STRATA: Derived field which identifies the strata call for the opening based on the below information.
- FIELD_NUMBER: Derived from the AOP cutover map or operators may provide their own numbers.
- FMU: The Forest Management Unit to which the ARIS record is spatially located.
- HARVESTED_HECTARES: The number of hectares harvested.

- LAST_PLANT: Derived field identifying the timber year of plant.
- LFN_METHOD_CODE: A unique code to identify the reason LFN was chosen as a reforestation strategy for an opening.
- NET_HARVESTED_HECTARES: Net Harvested Hectares is the actual harvested area of an opening.
- OPEN_TYPE: Type of opening as well as the reason for the initial creation of the opening.
- OPENING_NUMBER: This is the unique AAF opening number and represents the location of the centre of the Opening on the ground.
- OPERATOR: Derived field identifying owner of ARIS data being processed.
- PLANTED_LT: Planted LT stems.
- PLANTED_PJ: Planted PJ stems.
- PLANTED_SB: Planted SB stems.
- PLANTED_STEMS: Total planted stems.
- PLANTED_SW: Planted SW stems.
- PRIMARY_DISPOSITION: Multiple dispositions may exist for an opening, but the primary disposition is the disposition number to which the reforestation responsibility is attached.
- REFOREST_START_CL_DATE: The Reforestation Start Clock Date is the date when regulated reforestation begins for an opening.
- REGENERATION_STANDARD_CODE: For openings still using the two digit code, the Stratum Declaration must match the last digit of the Landbase Designation. Companies under the RSA standard are required to supply a Stratum Declaration that corresponds to the RSA Landbase Designation Code as per Appendix C in the ARIS Manual.
- SEED_METHOD_TYPE_CODE: Method of seeding used.
- SITE_PREP_METHOD_CODE: Refers to the site preparation method used.
- SKID_CLEARANCE_DATE: Skid clearance refers to the date when timber skidding was completed in the opening.
- SOURCE: Source of the ARIS data
- SPECIES_CODE: Species Code indicates the type of tree species planted in the treatment area.
- SPECIES_GROUP_CODE: Species Group Code is a code indicating a declared species group within the survey.
- STAND_TEND_TYPE_CODE: Stand Tend Type Code is a code that identifies the stand tending or chemical site prep type.
- STOCKING_STATUS_CODE: Stocking Status Code refers to the reforestation status of the opening as a result of the survey.
- SURVEY_AREA: Refers to the survey area of the regeneration survey.
- SURVEY_DATE: The date the survey was performed.
- SURVEY_TYPE_CODE: Survey Type Code indicates the type of survey and must be 'Est Survey' for establishment survey or 'Per Survey' for performance survey.
- TIMB_SUP_LD_BS_DESIG_CODE: Non RSA Landbase Designations are two letter codes. With the introduction of RSA, companies will be required to submit the new RSA Landbase codes.
- TOTAL_STOCKING_PERCENT: Total Stocking Percent is the total allowable percent stocking for the regeneration survey.
- TREATMENT_DATE_SEED: Date of seeding treatment.
- TREATMENT_DATE_SITE_PREP: Date of site preparation treatment.
- TREATMENT_DATE_TEND: Date of stand tending treatment.
- UPDATE_AREA: Update Area is an area measure that is only to be used in the case of a deviation from the net harvested hectares.

Appendix VI – Processing Scripts

The following processing scripts are included in the submission package:

LB_Code_20170628.py

> Directs the spatial processing steps including the multiunion, proxy assignments, sliver elimination, isolated stands analysis, and seismic inclusion and simplification.

Weyer_RunSRDStrata_v8_20170824.sql

> Stratifies the AVI into Base 10 strata for the Overstorey and Understorey and generates the Strata table for use in the PreLandbase process.

Weyer_RunPreLandbase_v8_20170824.sql

> Initial processing of the multiunion and AVI to assign D_ and F_ assignments prior to the inclusion of proxies, removal of slivers, and the isolated stand analysis.

Run_Final_Landbase_v8_20170830.sql

> Assigns the final D_ and F_Codes to the landbase based on the changes from the proxy, removal of slivers, and isolated stand processes

Appendix VII – Data Dictionary

The data dictionary for the three final landbases (combined) is presented here. Data dictionaries for the following list of spatial input data layers are included in the submission package (DataDictionaries_20170227.pdf).

1. Classified, TSA and Modelling Landbases
2. AVI_Combined and AVI_20160930 (Alberta Vegetation Inventory)
3. Cabins (Historic Cabins)
4. Colonial Nesting Birds (Colonial Nesting Bird Buffers)
5. Compartments
6. Cutblocks
7. DIDs (Digital Integrated Dispositions)
8. Ecosite
9. FireSmart (FireSmart Community Zones)
10. FireSmart Deletions
11. First Nations (First Nations Reserves)
12. Fish Management Zones
13. FMA (Forest Management Agreement Area Boundary)
14. FMU (Previous Forest Management Units)
15. Culture and Tourism Historic Resources (Historic Resource Values)
16. Grazing Dispositions
17. Grizzly Bear Watersheds
18. Grizzly Bear Habitat Zones
19. Hamlets
20. Hard Linear Features
21. HUC Watersheds (Hydrologic Unit Code 8 Watersheds)
22. Hydrology Buffers
23. Hydrology Features
24. Land Use Framework
25. LOC (Post AVI Road Dispositions)
26. MPB R Value (Mountain Pine Beetle R value)
27. MPB SSI (Mountain Pine Beetle Stand Susceptibility Index)
28. Municipalities (Hamlets)
29. Natural Areas
30. Natural Subregions
31. Op Buffers (Operational Buffers)
32. Op Dels (Operational and SHS Deletions)
33. Parks (Parks and Recreation Areas)
34. Planned Cutblocks
35. PNT (Protective Notations)
36. Private Land
37. PSP (Permanent Sample Plots)
38. R15 (Defined Forest Area Boundary)
39. Rainbow Trout Streams
40. RFMA (Registered Fur Management Areas)

41. RSA_Merge (Reforestation Standard of Alberta)
42. Seismic Lines
43. Steep Slopes
44. Temporary Exclusions
45. Townships
46. Tree Improvement Zones
47. Tree Seed Zones
48. VSA (Volume Supply Areas)
49. Watersheds
50. Wildfire Management Zones
51. Wildfires
52. Wildlife Management Units
53. Woodsheds
54. Working Areas

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
CLS, TSA, MDL	AGE	Double	8	38	Age of overstory	-1 - 365	Variable values
						<Null>	
CLS, TSA, MDL	AGECL	Double	8	38	Age class in 5 year increments (based on F_Age)	0-73	Variable values
CLS, TSA, MDL	ANTH_NON	Text	5	0	Anthropogenic Non Vegetated Code	AIF	Farmstead
						AIG	Gravel Pit
						AIH	Permanent Right-of-Way
						AII	Industrial Plant Sites
						ASC	
						ASR	Ribbon Development
						<Null>	
CLS, TSA, MDL	ANTH_VEG	Text	5	0	Anthropogenic Vegetated Code	CA	Annual Crops
						CIP	Industrial - seeded
						CIW	Geophysical Features Seeded
						CP	Crop Plan
						CPR	Rough pasture
						<Null>	
CLS, TSA, MDL	AREA_HA	Double	8	38	Gross Polygon Area (ha)	0 - X	Variable values
CLS, TSA, MDL	ARIS	Text	13	0	ARIS Opening Number	0 - X	Variable values
						<Null>	
CLS, TSA, MDL	AVI_UKEY	Long	4	0	Combined AVI Unique Key	0 - X	Variable values
CLS, TSA	AW_ORD	Double	8	38	Aspen order in species assignment	0 - X	Variable values
						<Null>	
CLS, TSA, MDL	AW_PCT	Double	8	38	Aspen percent in species distribution	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	A_AREA	Double	8	38	ARIS Opening Area	0 - X	Variable values
						<Null>	
CLS, TSA	A_AREA_SRC	Text	12	0	Source of the A_AREA field from ARIS	AOPArea	Annual Operating Plan
						EstSurvey	Establishment Survey
						NHHArea	Net Harvested Hectares
						PerSurvey	Performance Survey
						UpdateArea	Update Area
						X	
						<Null>	
CLS, TSA, MDL	A_BLOCKERA	Text	8	0	ARIS Block Era	POST91	Cutblock harvested after March 1, 1991
						PRE91	Cutblock harvested on or before March 1, 1991
						<Null>	
CLS, TSA, MDL	A_BLOCKYEAR	Long	4	0	ARIS Block Year - derived	1962 - 2014	Variable values
						<Null>	
CLS, TSA	A_FIELDNUM	Text	14	0	ARIS Operator Field Number	0 - X	Variable values
						<Null>	
CLS, TSA	A_LB_DESIG	Text	10	0	ARIS Landbase Designation	CC	Coniferous Mixedwood to Coniferous Mixedwood (C to C)
						CD	Coniferous Mixedwood to Deciduous Mixedwood (C to D)
						CH	Coniferous Mixedwood to Deciduous Harwood (C to H)
						CS	Coniferous Mixedwood to Coniferous Softwood (C to S)
						DC	Deciduous Mixedwood to Coniferous Mixedwood (D to C)
						DD	Deciduous Mixedwood to Deciduous Mixedwood (D to D)
						DH	Deciduous Mixedwood to Deciduous Hardwood (D to H)
						DS	Deciduous Mixedwood to Coniferous Softwood (D to S)
						HC	Deciduous Hardwood to Coniferous Mixedwood (H to C)
						HD	Deciduous Hardwood to Deciduous Mixedwood (H to D)
						HH	Deciduous Hardwood to Deciduous Hardwood
						HS	Deciduous Hardwood to Coniferous Softwood
						MH	Mixedwood to Hardwood (Historical Code)
						MS	Mixedwood to Coniferous Softwood (Historical)
						SC	S/W to Conf M/W - C to CD
						SD	S/W to Dec M/W - C to DC
						SH	Coniferous Softwood to Deciduous Hardwood (S to H)
						SS	Coniferous Softwood to Coniferous Softwood (S to S)
						WEYD0001	WEYD 2000 Deciduous
						WEYD0002	WEYD 2000 Hwd/Px
						WEYD0003	WEYD 2000 Hwd/Sx
						WEYD0004	WEYD 2000 Sw/Hwd
						WEYD0005	WEYD 2000 Px/Hwd
						WEYD0007	WEYD 2000 Sw
						WEYD0008	WEYD 2000 Px
						WEYD0009	WEYD 2000 Sb
						WEYE0601	WEYE 2006 Deciduous
						WEYE0602	WEYE 2006 Hwd/Px
						WEYE0603	WEYE 2006 Hwd/Sx

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						WEYE0604	WEYE 2006 Sw/Hwd
						WEYE0605	WEYE 2006 Px/Hwd
						WEYE0607	WEYE 2006 Sw
						WEYE0608	WEYE 2006 Px
						WEYE0609	WEYE 2006 Sb
						<Null>	
CLS, TSA, MDL	A_NHHAREA	Double	38	8	ARIS Net Harvested Hectares	0-999	Variable values
CLS, TSA, MDL	A_OPEN_ID	Text	13	0	ARIS Opening Number	0 - X	Variable values
						<Null>	
CLS, TSA, MDL	A_OWNERSHIP	Text	6	0	ARIS Block Ownership	ANC	Alberta Newsprint Company
						AVLG	A & V Logging Ltd.
						BLUE	Blue Ridge Lumber Ltd.
						BRIS	Brisco
						CENT	Centenial Lumber Ltd.
						CORS	Corser, Clyde A
						EDFR	Edfor Cooperative Ltd.
						ETPL	Edson Timber Products Ltd.
						FRIA	Forest Resource Improvement
						HANS	Hansen, Dale H
						LFS	Land and Forest Service
						LREN	Rehn, L. Harold
						MWWC	Millar Western Whitecourt Division
						SFPI	Sundre Forest Products Inc.
						SUND	Sundance
						TALL	Tall Pine Timber Co. Ltd.
						WEYR	Weyerhaeuser Canada Ltd.
						<Null>	
CLS, TSA	A_RESET_DATE	Date			ARIS disturbance reset date - determines A_BLOCKYEAR	0 - X	Variable values
						<Null>	
CLS, TSA	A_RESET_SRC	Text	10	0	Source of the reset date from ARIS	Disturb	Disturbance date
						Refor	Reforestation date
						SkidClear	Skid Clearance date
						<Null>	
CLS, TSA	A_SKIDCLEAR	Date			ARIS Skid Clearance Date	0 - X	Variable values
						<Null>	
CLS, TSA	A_STOCKING	Text	5	0	ARIS Stocking Status	CSR	Conditionally restocked (not valid on or after May 1, 2010)
						FTG	Free To Grow
						NSR	Not-Satisfactorily-Restocked
						PSC	Performance Survey Complete
						RTD	Re-treatment-Complete
						SR	Satisfactorily-Restocked
						<Null>	
CLS, TSA	A_STOCKPER	Double	38	8	ARIS Total Stocking Percentage	0 - 100	Variable values
						<Null>	
CLS, TSA, MDL	A_STRATA	Text	6	0	ARIS Strata Call	Aw	Aspen
						AwPl	Aspen leading lodgepole pine mixedwood
						AwSw	Aspen leading white spruce mixedwood
						Lt	Larch
						Pl	Lodgepole pine
						PlAw	Lodgepole pine leading aspen mixedwood
						Sb	Black spruce
						SbAw	Black spruce leading aspen mixedwood
						Sw	White spruce
						SwAw	White spruce leading aspen mixedwood
						<Null>	
CLS, TSA	A_STRATUMDEC	Text	9	0	ARIS Declared Stratum	C-2000	Coniferous 2000
						CD-2000	Coniferous - Deciduous 2000
						CONF	Coniferous (Historical Record)
						D-2000	Deciduous 2000
						DC-2000	Deciduous - Coniferous 2000
						DECD	Deciduous (Historical Record)
						MIXD	Mixedwood (Historical Record)
						PR91	Pre 1991 Blocks (Historical)
						<Null>	
CLS, TSA	A_SURVEY	Text	12	0	ARIS Survey Type	Est Survey	Establishment survey
						Per Survey	Performance survey
						<Null>	
CLS, TSA, MDL	B10_STRATA_CODE	Text	6	0	Base 10 Overstorey Stratum Code	Aw	Aspen
						AwPl	Aspen leading lodgepole pine mixedwood
						AwSw	Aspen leading white spruce mixedwood

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						Pl	Lodgepole pine
						PlAw	Pine leading aspen mixedwood
						Sb	Black spruce
						SbAw	Black spruce leading aspen mixedwood
						Sw	White spruce
						SwAw	White spruce leading aspen mixedwood
						X	No call
						<Null>	
CLS, TSA, MDL	B10_STRATA_NAME	Text	30	0	Base 10 strata name (Overstory)	Black Spruce pure or leading	
						Black Spruce/Hardwood	
						Deciduous	
						Hardwood/Pine	
						Hardwood/Spruce	
						Pine pure or leading	
						Pine/Hardwood	
						White Spruce pure or leading	
						White Spruce/Hardwood	
						No ESRD Strata	
						<Null>	
CLS, TSA, MDL	B10_STRATA_SRD	Text	6	0	Base 10 strata type (Overstory)	I	Deciduous
						II	Hardwood/Pine
						III	Hardwood/Spruce
						IV	Spruce/Hardwood
						V	Pine/Hardwood
						VI	Black Spruce/Hardwood
						VII	White Spruce pure or leading
						VIII	Pine pure or leading
						IX	Black Spruce pure or leading
						<Null>	
CLS, TSA, MDL	B10_USTRATA_CODE	Text	6	0	Base 10 Understorey Stratum Code	Aw	Aspen
						AwPl	Aspen leading lodgepole pine mixedwood
						AwSw	Aspen leading white spruce mixedwood
						Pl	Lodgepole pine
						PlAw	Lodgepole pine leading aspen mixedwood
						Sb	Black Spruce
						SbAw	Black spruce leading aspen mixedwood
						Sw	White spruce
						SwAw	White spruce leading aspen mixedwood
						X	No call
						<Null>	
CLS, TSA, MDL	B10_USTRATA_NAME	Text	30	0	Base 10 strata name (Understory)	Black Spruce pure or leading	
						Black Spruce/Hardwood	
						Deciduous	
						Hardwood/Pine	
						Hardwood/Spruce	
						Pine pure or leading	
						Pine/Hardwood	
						White Spruce pure or leading	
						White Spruce/Hardwood	
						No ESRD Strata	
						<Null>	
CLS, TSA, MDL	B10_USTRATA_SRD	Text	6	0	Base 10 strata type (Understory)	I	Deciduous
						II	Hardwood/Pine
						III	Hardwood/Spruce
						IV	Spruce/Hardwood
						V	Pine/Hardwood
						VI	Black Spruce/Hardwood
						VII	White Spruce pure or leading
						VIII	Pine pure or leading
						IX	Black Spruce pure or leading
						<Null>	
CLS, TSA, MDL	BEARWATERSHED	Text	5	0	Grizzly Bear Watersheds	16 - 148	Grizzly bear watershed number
						<Null>	
CLS, TSA, MDL	BUFFER	Text	14	0	Buffer Type	CREEK	Creek buffers (60 meters)
						ISLAND	Feature is an isolated island less than 10 ha surrounded by hydrology buffers
						LAKE	Lake and River buffers (100 meters)
						STREAM	Stream buffer (30 meters)
						SWAN	Trumpeter Swan buffer (200 meters)
						<Null>	
CLS, TSA	BW_ORD	Double	8	38	White birch order in species assignment	0 - 9	Variable values
						<Null>	
CLS, TSA, MDL	BW_PCT	Double	8	38	White birch percent in species	0 - 10	Variable values

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					distribution	<Null>	
CLS, TSA, MDL	C_CODE	Text	4	0	Broad cover group	C	Conifer
						CD	Conifer leading mixedwood
						D	Deciduous
						DC	Deciduous leading mixedwood
						<Null>	
CLS, TSA, MDL	CABIN	Text	7	0	Historic Cabin Buffer	CABIN	Historic Cabin
						<Null>	
CLS, TSA, MDL	CC_BLKYEAR	Text	6	0	Cutblock Timber Year	2010 - 2015	Timber year
						<Null>	
CLS, TSA, MDL	CC_OPENING	Text	13	0	Cutblock ARIS Opening Number	Variable values	
CLS, TSA, MDL	CC_OWNER	Text	6	0	Cutblock Owner	ANC	Alberta Newsprint Company
						BLUE	Blue Ridge Lumber Ltd.
						EDFR	Edfor Cooperative Ltd.
						FRIA	Forest Resource Improvement
						MWWC	Millar Western Whitecourt Division
						TALL	Tall Pine Timber Co. Ltd.
						WEYR	Weyerhaeuser Canada Ltd.
						<Null>	
CLS, TSA, MDL	CC_STATUS	Text	11	0	Cutblock Harvest Status	HARVESTED	Block has been harvested
						<Null>	
CLS, TSA, MDL	CC_STRATA	Text	8	0	Cutblock Strata	CD-P	Coniferous mixedwood with pine
						CD-SW	Coniferous mixedwood with white spruce
						C-P	Coniferous pine
						C-SW	Coniferous white spruce
						D	Deciduous
						DC-P	Deciduous mixedwood with pine
						DC-S	Deciduous mixedwood with spruce
						<Null>	
CLS, TSA	CLS_KEY	Long	4	10	Classified landbase unique key	1 - 1,121,622	Variable values
CLS, TSA, MDL	COLONIAL	Text	16	0	Colonial Nesting Bird Buffers	GREAT BLUE HERON	Great blue heron nesting site
						<Null>	
CLS, TSA, MDL	COMPARTMEN	Text	16	0	Compartment	BAPTISTE	
						BEAVER MEADOWS	
						BRAZEAU	
						EDSON	
						MACMILLAN	
						MEDICINE LAKE	
						NORDEGG	
						SOUTH CANAL	
						WEST COUNTRY	
						WOLF LAKE	
CLS, TSA, MDL	COMPCODE	Text	14	0	Compartment Code	BAP	Baptiste
						BEA	Beaver Meadows
						BRA	Brazeau
						EDS	Edson
						MAC	Macmillan
						MED	Medicine Lake
						NOR	Nordegg
						SOU	South Canal
						WES	West Country
						WOL	Wolf Lake
CLS, TSA	COMPRISK	Text	7	0	Compartment Risk - MPB	LOW	Low risk
						MOD	Moderate risk
						HIGH	High Risk
						VHIGH	Very High risk
CLS, TSA	CRULE	Text	14	0	Conifer strata decision rule (overstory)	FB_LEAD	Fir leading coniferous
						FBFD_LEAD_MW	Fir leading mixedwood
						LT_LEAD	Larch leading coniferous
						NO_C	No coniferous species
						PL_LEAD	Pine leading coniferous
						PL_LEAD_MW	Pine leading mixedwood
						SB_LEAD	Black spruce leading coniferous
						SBLT_LEAD_MW	Black spruce larch leading mixedwood
						SW_LEAD	White spruce leading coniferous
						SW_LEAD_MW	White spruce leading mixedwood
						<Null>	
CLS, TSA, MDL	D_ACCESS	Text	6	0	Access deletion type	ROAD	Roadway
						X	No call
CLS, TSA, MDL	D_ADMIN	Text	9	0	Administrative Deletion	FN	First Nations

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						HAMLET	Hamlet
						PPA	Park and Protected Area
						PRIVATE	Private Land
						SPECIAL	Provincial Natural Areas
						X	No call
CLS, TSA, MDL	D_ANTHRO	Text	9	0	Anthropogenic deletion	ANTHNON	Anthropogenic non-vegetated
						ANTHVEG	Anthropogenic vegetated
						CABIN	Historic Cabin
						DIDs	Digital Integrated Dispositions
						FIRESMART	FireSmart Treatment Areas
						GRAZING	Grazing Lease
						HRV	Historic Resource Value
						PNT	Protective Notation
						PSP	Permanent Sample Plot
						X	No call
CLS, TSA, MDL	D_AVI	Text	5	0	No AVI Deletion	AVI	No AVI information available
						X	No call
CLS, TSA, MDL	D_BLOCK	Text	10	0	Cutblock deletion	ARISRECON	Unreconciled openings
						NSR	Performance surveyed with NSR <=50% stocking and no AVI
						X	No call
CLS, TSA, MDL	D_BUF	Text	10	0	Buffer deletion type	COLONIAL	Colonial Nesting Bird Buffer
						SWAN	Swan buffers
						WATERBUF	Water Buffer
						X	No call
CLS, TSA, MDL	D_ECOSITE	Text	14	0	Unproductive Ecosites Deletion	UNPRODUCTIVE	Unproductive ecosite deletion
						X	No call
CLS, TSA, MDL	D_HYDRO	Text	9	0	Hydrological deletion	AQUATIC	Aquatic polygon
						FLOOD	Flooded areas
						WATER	Water polygon
						X	No call
CLS, TSA, MDL	D_ISO	Text	9	0	Deletion for isolated/inaccessible stands	ISO1	Isolated stand deletions
						ISO2	Isolated stand deferrals
						PAR_DEF	Perimeter Area Relationship Deferral
						PAR_DEL	Perimeter Area Relationship Deletion
						X	No call
CLS, TSA, MDL	D_NATDIST	Text	12	0	Natural disturbance deletions	BURN	Fire affected polygon
						OTHER_DIST	Other Disturbance
						X	No call
CLS, TSA, MDL	D_NONFOR	Text	5	0	Deletion for nonforest lands	NNF	Naturally non-forested
						NNV	Naturally non-vegetated
						X	No call
CLS, TSA, MDL	D_OPDEL	Text	10	0	Operational Deletions	OPBUFFER	Operational Buffer Deletion
						OPDEL	Operational Deletion
						SHS	Spatial Harvest Sequence Deletion
						X	No call
CLS, TSA, MDL	D_SLOPE	Text	7	0	Slope deletion	SLOPE	Areas with a slope > 55%
						X	No call
CLS, TSA, MDL	D_STRUC	Text	12	0	Horizontal Structure Deletion	HORIZONTAL	Horizontal Structure
						X	No call
CLS, TSA, MDL	D_SUBJ	Text	11	0	Subjective deletion	BIRCH	Birch Subjective Deletion
						BLKSPRUCE	Black Spruce Subjective Deletion
						LARCH	Larch Subjective Deletion
						PINE	Pine Subjective Deletion
						X	No call
CLS, TSA, MDL	D_TPR	Text	5	0	Deletion for unproductive areas	TPR	Unproductive timber productivity
						X	No call
CLS, TSA, MDL	DENSITY	Text	3	0	Density	A	A Density stands
						B	B Density stands
						C	C Density stands
						D	D Density stands
						<Null>	
CLS, TSA, MDL	DIDS	Text	5	0	Digital Integrated Disposition Type	DHR	Designated Historic Resource
						DML	Miscellaneous Lease
						DPI	Pipeline Installation Lease
						DPL	Pipeline Agreement
						DRS	Disposition Reservation
						EZE	Easement
						FDL	Farm Development Lease

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						MLL	Miscellaneous Lease
						MLP	Miscellaneous Permit
						MSL	Mineral Surface Lease
						PEZ	Easement
						PIL	Pipeline Installation Lease
						PLA	Pipeline Agreement
						PLC	License of Occupation
						PLS	Private Land Sale
						PML	Miscellaneous Lease
						PMS	Mineral Surface Lease
						PPA	Pipeline Agreement
						PRL	Recreation Lease
						PSM	Surface Material License
						REA	Rural Electric Association Easement
						REC	Recreation Lease
						ROE	Right-Of-Entry Agreement
						RVC	Vegetation Control Easement
						SMC	Surface Material License
						SME	Surface Material Exploration
						SML	Surface Material Lease
						VCE	Vegetation Control Easement
						<Null>	
CLS, TSA	DRULE	Text	9	0	Deciduous strata decision rule (overstory)	AW_LEAD	Aspen leading deciduous
						BW_LEAD	Birch leading deciduous
						PB_LEAD	Balsam poplar leading deciduous
						NO_D	No deciduous species
						<Null>	
CLS, TSA, MDL	ECO1	Text	3	0	Ecosite Classification	A	
						B	
						C	
						D	
						E	
						F	
						G	
						H	
						I	
						J	
						K	
						L	
						M	
						N	
						X	
						<null>	
CLS, TSA, MDL	ECOUNIT	Text	2	0	Ecological Unit	CD	Coniferous dominated mixedwood
						CX	Pure coniferous - Sb or Lt leading
						DC	Deciduous dominated mixedwood
						DX	Pure deciduous
						PL	Pure coniferous - Pl leading
						SW	Pure coniferous - Sw leading
						X	No call
CLS, TSA, MDL	F_ACTIVE	Text	9	0	Final Landbase Assignment	ACTIVE	Active Landbase
						PASSIVE	Passive Landbase
CLS, TSA, MDL	F_AGE	Double	8	38	Final Age of the stand	-1 - 365	Variable values
CLS, TSA, MDL	F_BCG	Text	4	0	Final Broad Cover Group	C	Coniferous
						CD	Coniferous leading mixedwood
						D	Deciduous
						DC	Deciduous leading mixedwood
						X	No call
CLS, TSA, MDL	F_BLOCK	Text	11	0	Final block type assignment	DEFERRAL20	20 Year Deferral
						DEFERRAL70	70 Year Deferral
						HARVESTED	Block has been harvested
						PLAN10	Planned blocks to be harvested in the first ten years of the SHS
						PLAN2	Planned blocks to be harvested prior to the model start date (2015 - 2017)
						PLAN20	Planned blocks to be harvested in the first twenty years of the SHS
						X	No call
CLS, TSA, MDL	F_BLOCKERA	Text	8	0	Final Landbase Harvested Block Era	POST91	Cutblock harvested after March 1, 1991
						PRE91	Cutblock harvested on or before March 1, 1991
						X	No call
CLS, TSA, MDL	F_DATA_SRC	Text	8	0	Final Data Source	ARIS	Alberta Regeneration Information System.
						AVI	Alberta Vegetaion Inventory.

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						HARVDECL	Harvest Declaration
						RSA	Regeneration Standard of Alberta
CLS, TSA, MDL	F_DEL	Text	14	0	Final stand deletion classification	ANTHNON	Anthropogenic non-vegetated
						ANTHVEG	Anthropogenic vegetated
						AQUATIC	Aquatic polygon
						ARISRECON	Unreconciled cutblock
						AVI	Alberta Vegetaion Inventory.
						BIRCH	Birch Subjective Deletion
						BLKSPRUCE	Black Spruce Subjective Deletion
						BURN	Fire Disturbance
						CABIN	Historic Cabin
						DIDs	Digital Integrated Dispositions
						FIRESMART	FireSmart Deletions
						FLOOD	Flooded areas
						FN	First Nations
						GRAZING	Grazing Lease
						HAMLET	Hamlet
						HORIZONTAL	Horizontal Structure
						HRV	Historic Resource Value
						ISO	Isolated stands
						LARCH	Larch Subjective Deletion
						NNF	Naturally non-forested
						NNV	Naturally non-vegetated
						NSR	Not Sufficiently Restocked
						OPBUFFER	Operational Buffer Deletion
						OPDEL	Operational Deletion
						OTHER_DIST	Other Disturbance
						PINE	Pine Subjective Deletion
						PNT	Protective Notation
						PPA	Park and Protected Area
						PRIVATE	Private land
						PSP	Permanent Sample Plot
						ROAD	Roadway
						SHS	Spatial Harvest Sequence Deletion
						SLOPE	Sloped Areas
						SPECIAL	Provincial Natural Area
						SWAN	Swan buffers
						TPR	Unproductive timber productivity
						UNPRODUCTIVE	Unproductive ecosite deletion
						WATER	Water polygon
						WATERBUF	Water Buffer
						X	No call
CLS, TSA, MDL	F_DEN	Text	3	0	Final stand density assignment	A	A Density stands
						B	B Density stands
						C	C Density stands
						D	D Density stands
						X	No call
CLS, TSA, MDL	F_FMA	Text	8	0	Final FMA call	FMA	Forest Management Agreement Area
						NONFMA	Non-FMA area
CLS, TSA, MDL	F_HGT	Double	8	38	Final stand height assignment	0 - 36	Variable values
CLS, TSA, MDL	F_LANDBASE	Text	12	0	Final landbase assignment	CONIFEROUS	Coniferous polygon
						DECIDUOUS	Deciduous polygon
						X	No call
CLS, TSA, MDL	F_STRATA	Text	6	0	Final Stratum Assignment	Aw	Aspen
						AwPl	Aspen leading lodgepole pine mixedwood
						AwSx	Aspen leading spruce mixedwood
						Pl	Lodgepole pine
						PlAw	Lodgepole pine leading aspen mixedwood
						Sb	Black Spruce
						SbAw	Black spruce leading aspen mixedwood
						Sw	White spruce
						SwAw	White spruce leading aspen mixedwood
						X	No call
CLS, TSA, MDL	F_TPR	Text	3	0	Final stand timber productivity	F	Fair
						G	Good
						M	Mediun
						U	Unproductive
						X	No call
CLS, TSA, MDL	F_YC	Text	11	0	Final yield curve assignment	C-PL_AB	Pl stratum A/B density natural stand (NAT) yield curve
						C-PL_AB_B	Pl stratum A/B density pre-91 cutblock (M91) yield curve (basic)
						C-PL_AB_E	Pl stratum A/B density pre-91 cutblock (M91) yield curve (enhanced)

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						C-PL_CD	Pl stratum C/D density natural stand (NAT) yield curve
						C-PL_CD_B	Pl stratum C/D density pre-91 cutblock (M91) yield curve (basic)
						C-PL_CD_E	Pl stratum C/D density pre-91 cutblock (M91) yield curve (enhanced)
						C-SB	Sb stratum natural stand (NAT) yield curve
						C-SB_B	Sb stratum pre-91 cutblock (M91) yield curve (basic)
						C-SB_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
						C-SW	Sw stratum natural stand (NAT) yield curve
						C-SW_B	Sw stratum pre-91 cutblock (M91) yield curve (basic)
						C-SW_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
						CD-PL	PlAw stratum natural stand (NAT) yield curve
						CD-PL_B	PlAw stratum pre-91 cutblock (M91) yield curve (basic)
						CD-PL_E	PlAw stratum pre-91 cutblock (M91) yield curve (enhanced)
						CD-SX	SwAw & SbAw stratum natural stand (NAT) yield curve
						CD-SX_B	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (basic)
						CD-SX_E	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (enhanced)
						D-HW_W	Aw stratum natural stand (NAT) yield curve in W5 or W6
						D-HW_W_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in W5 or w6
						D-HW_W_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in W5 or w6
						D-HW_X	Aw stratum natural stand (NAT) yield curve in E15, E2 or R12
						D-HW_X_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in E15, E2 or R12
						D-HW_X_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in E15, E2 or R12
						DC-PL	AwPl stratum natural stand (NAT) yield curve
						DC-PL_B	AwPl stratum pre-91 cutblock (M91) yield curve (basic)
						DC-PL_E	AwPl stratum pre-91 cutblock (M91) yield curve (enhanced)
						DC-SX	AwSx stratum natural stand (NAT) yield curve
						DC-SX_B	AwSx stratum pre-91 cutblock (M91) yield curve (basic)
						DC-SX_E	AwSx stratum pre-91 cutblock (M91) yield curve (enhanced)
						Hw	Aw stratum in D declared openings (RSA)
						HwPl	AwPl stratum post-91 cutblock (RSA)
						HwSx	AwSx post-91 cutblock stratum (RSA)
						Hw_W	Aw stratum post-91 cutblock (RSA) yield curve in W5 or W6
						Hw_X	Aw stratum post-91 cutblock (RSA) yield curve in E15, E2 or R12
						Pl	Pl stratum post-91 cutblock (RSA)
						PlHw	PlAw stratum post-91 cutblock (RSA)
						Sb	Sb stratum post-91 cutblock (RSA)
						SbHw	SbAw stratum post-91 cutblock (RSA)
						Sw	Sw stratum post-91 cutblock (RSA)
						SwG	Sw stratum post-91 cutblock (RSA) genetic gain yield curve
						SwHw	SwAw stratum post-91 cutblock (RSA)
						TPR_U	Unproductive
						X	No call
CLS, TSA	FB_ORD	Double	8	38	Balsam fir order in species assignment	1 - 9 <Null>	Variable values
CLS, TSA, MDL	FB_PCT	Double	8	38	Balsam fir percent in species distribution	0 - 10 <Null>	Variable values
CLS, TSA	FD_ORD	Double	8	38	Douglas fir order in species assignment	9 <Null>	
CLS, TSA, MDL	FD_PCT	Double	8	38	Douglas fir percent in species distribution	0 <Null>	
CLS, TSA, MDL	FIRENUMBER	Text	14	0	PFFC Fire number	RWF-020-2013 RWF-042-2013 <Null>	Rocky Wildfire Zone - Fire 20 - 2013 Rocky Wildfire Zone - Fire 42 - 2013
CLS, TSA, MDL	FIRESMART	Text	23	0	FireSmart Community Zone Name	ALDER FLATS BIGHORN RESERVE CRIMSON LAKE CYNTHIA ECHO CANYON EDSON AREA GOLDEYE	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						HINTON/CARLSDALE	
						HOBURG	
						LOBSTICK/HANSONVILLE	
						LODGEPOLE	
						MARLBORO/WAPITI RIDGE	
						NORDEGG	
						ROCKY CORRIDOR	
						SUNCHILD-O'CHIESE	
						<Null>	
CLS, TSA, MDL	FISHMGMT_C	Text	7	0	Fish Management Zone Code	00001	Eastern slopes zone
						00002	Parkland-Prairie zone
						00003	Northern boreal zone
						<Null>	
CLS, TSA, MDL	FISHMGMT_N	Text	23	0	Fish Management Zone Name	EASTERN SLOPES ZONE	
						NORTHERN BOREAL ZONE	
						PARKLAND-PRAIRIE ZONE	
						<Null>	
CLS, TSA, MDL	FMA	Text	14	0	Forest management agreement	WEYERHAEUSER	
						<Null>	
CLS, TSA, MDL	FMU_NAME	Text	5	0	Forest Management Unit name	R15	
CLS, TSA, MDL	FSMART_DEL	Text	14	0	FireSmart Deletions	FIRESMART_DELETION	FireSmart Treatment Areas
						<Null>	
CLS, TSA, MDL	GB_POPTYPE	Text	11	0	Grizzly Bear Population Type	CORE	Core Grizzly Bear Habitat
						SECONDARY	Secondary Grizzly Bear Habitat
						<Null>	
CLS, TSA, MDL	GB_POPUNIT	Text	14	0	Grizzly Bear Population Unit	CLEARWATER	Clearwater
						GRANDE CACHE	Grande Cache
						YELLOWHEAD	Yellowhead
						<Null>	
CLS, TSA, MDL	GRAZING	Text	5	0	Grazing Disposition Type	FGL	Forest Grazing License
						GRL	Grazing Lease
						GRP	Grazing Permit
						GRR	Provincial Grazing Reserve
						<Null>	
CLS, TSA, MDL	GROUP_ELIM	Text	8	0	Group Elimination	GROUP1	Administrative Deletions
						GROUP2	Anthropogenic Deletions
						GROUP3	Landscape Deletions
						GROUP4	Operational Deletions
						GROUP5	Subjective Deletions
						OPENING#_GROUP#	Deletion groups within harvested blocks
						PLANNED_GROUP#	Deletion groups within planned blocks
						X	No call
CLS, TSA, MDL	HAMLET	Text	11	0	Hamlets	CYNTHIA	
						LODGEPOLE	
						BRAZEAU COUNTY	
						CLEARWATER COUNTY	
						YELLOWHEAD COUNTY	
						<Null>	
CLS, TSA, MDL	HARDPCT	Double	8	38	Deciduous species percent (overstorey)	0 - 10	Variable values
						<null>	
CLS, TSA, MDL	HEIGHT	Double	8	38	Stand Overstorey Height (m)	0 - 36	Variable values
						<null>	
CLS, TSA, MDL	HRV	Text	3	0	Historical Resource Values	0	Does not contain a historical resource
						1	Provincial historic resource
						3	Contains a significant historical resource that will likely require avoidance
						4	Contains a historic resource that may require avoidance
						5	Believed to contain a historic resource
CLS, TSA, MDL	HUC	Text	10	0	Hydrologic Unit Code 8 Watershed	11010201	
						11010203	
						11010401	
						11010403	
						11010404	
						11010405	
						11010406	
						11020101	
						11020102	
						11020103	
						17010401	
						17010501	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						17020101	
						17020102	
						17020201	
						17020202	
						17020203	
						17020204	
						17030101	
						17030102	
						17030201	
						17030202	
						17030203	
						8010302	
CLS, TSA, MDL	HYDRO	Text	7	0	Hydrology Features	HYDRO	Hydrologic feature
						<Null>	
CLS, TSA, MDL	IRES_NAME	Text	18	0	First Nations Reserve Name	O'CHIESE NO. 203	
						SUNCHILD NO. 202	
						<Null>	
CLS, TSA, MDL	ISOSTAND	Text	9	0	Isolated Stand	ISO1	Isolated stand deletions
						ISO2	Isolated stand deferrals
						PAR_DEF	Perimeter Area Relationship Deferral
						PAR_DEL	Perimeter Area Relationship Deletion
						<Null>	
CLS, TSA, MDL	LABEL	Text	50	0	AVI label	Variable values	
CLS, TSA, MDL	LEAD_CON	Text	4	0	Leading conifer	FB	Balsam Fir
						LT	Larch
						NO	No Species
						PL	Lodgepole Pine
						SB	Black Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	LEAD_DEC	Text	4	0	Leading deciduous	AW	Aspen
						BW	Birch
						NO	No Deciduous
						PB	Balsam Poplar
						<Null>	
CLS, TSA, MDL	LINK	Text	14	0	AVI Unique Identifier (old version)	Variable values	
CLS, TSA, MDL	LOC	Text	5	0	License of Occupation (roadway)	DLO	License of Occupation
						LOC	Polygon is an LOC
						RDS	Provisional Roadway
						RRD	Registered Roadway
						<Null>	
CLS, TSA	LT_ORD	Double	8	38	Larch order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	LT_PCT	Double	8	38	Larch percent in species distribution	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	LUFCODE	Text	4	0	Land Use Framework Code	04	Upper Athabasca
						05	North Saskatchewan
CLS, TSA, MDL	LUFNAME	Text	20	0	Land Use Framework Name	NORTH SASKATCHEWAN	
						UPPER ATHABASCA	
CLS, TSA, MDL	MAPCODE	Text	4	0	Ecosite Mapcode	2B	
						3B	
						3C	
						5B	
						5C	
						5D	
						6E	
						7B	
						7C	
						7D	
						9B	
						9C	
						9D	
						9E	
						XX	
						<Null>	
CLS, TSA, MDL	MER	Long	4	5	Meridian	5	The 5th Meridian
CLS, TSA, MDL	MOD1	Text	4	0	AVI stand modifier	BT	Broken Tops
						BU	Burn
						CC	Clear Cut
						CL	Clearing

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						DI	Disease
						DT	Discolored/ dead tops
						GR	Developed for grazing domestic livestock
						IK	Insect Kill
						PL	Planted
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
CLS, TSA, MDL	MOD1_EXT	Double	8	38	AVI stand extent 1	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	MOD1_YR	Double	8	38	AVI stand modifier year	0 - 2015	Variable values
						<Null>	
CLS, TSA, MDL	MOD2	Text	4	0	AVI stand modifier 2	BU	Burn
						CL	Clearing
						GR	Developed for grazing domestic livestock
						PL	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned
						UK	Unknown Kill
						WF	Windfall
						<Null>	
CLS, TSA, MDL	MOD2_EXT	Double	8	38	AVI stand extent 2	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	MOD2_YR	Double	8	38	AVI stand modifier year	0 - 2012	Variable values
						<Null>	
CLS, TSA, MDL	MOIST	Text	3	0	AVI moisture classification	A	Aquatic
						D	Dry
						M	Mesic
						U	Unknown
						W	Wet
						<Null>	
CLS, TSA, MDL	MPBRANK	Text	5	0	MPB Stand Risk Rank	Rank1	
						Rank2	
						Rank3	
						X	No Call
CLS, TSA, MDL	MU_UKEY	Long	4	10	Multi Union Unique Key	0 - X	Variable values
MDL	N_AREA	Double	8	38	Net polygon area after seismic removal	0 - X	Variable values
CLS, TSA, MDL	NAT_NON	Text	5	0	Naturally NonForest Code	NMB	Mineral - Recent Burn
						NMC	Cutbank
						NMR	Mineral - Rock
						NMS	Mineral - Sand
						NWF	Flooded
						NWL	Lakes
						NWR	River
						<Null>	
CLS, TSA, MDL	NATAREA	Text	10	0	Natural Areas	AURORA	Aurora
						O'CHIESE	O'Chiese
						PRIMEPROTECTION	Eastern Slopes Prime Protection Zone
						<Null>	
CLS, TSA, MDL	NFL	Text	4	0	Non Forest Land Code	HF	Herbaceous Forbs
						HG	Herbaceous Grasses
						SC	Closed Shrub
						SO	Open shrub
						<Null>	
CLS, TSA, MDL	NFL_PER	Double	8	38	Non Forest Land Crown Percent	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	NRNAME	Text	16	0	Natural region name	BOREAL	Boreal forest
						FOOTHILLS	Foothills forest
						ROCKY MOUNTAIN	
						<Null>	
CLS, TSA, MDL	NSRCODE	Text	5	0	Natural subregion code	A	Alpine
						CM	Central Mixedwood

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						DMW	Dry Mixedwood
						LF	Lower Foothills
						SA	Subalpine
						UF	Upper Foothills
						<Null>	
CLS, TSA, MDL	NSRNAME	Text	19	0	Natural subregion name	ALPINE	Alpine
						CENTRAL MIXEDWOOD	Central Mixedwood
						DRY MIXEDWOOD	Dry Mixedwood
						LOWER FOOTHILLS	Lower Foothills
						SUBALPINE	Subalpine
						UPPER FOOTHILLS	Upper Foothills
						<Null>	
CLS, TSA, MDL	OLDFMU	Text	5	0	Previous Forest Management Unit	E15	
						E2	
						R12	
						W5	
						W6	
CLS, TSA, MDL	OPBUFFER	Text	10	0	Operational Buffers	OPBUFFER	Operational Buffer Deletion
						<Null>	
CLS, TSA, MDL	OPDEL	Text	7	0	Operational and SHS Deletions	OPDEL	Operational Deletion
						SHS	Spatial Harvest Sequence Deletion
						<Null>	
CLS, TSA, MDL	OPENING_ID	Text	13	0	Final Opening Number Assignment	Variable values	
CLS, TSA, MDL	ORIGIN	Double	8	38	Stand origin	0 - 2014	Variable values
						<Null>	
CLS, TSA, MDL	PARKTYPE	Text	7	0	Park Type	ER	Ecological Reserve
						PLREC	Public land recreation area
						PP	Provincial park
						PRA	Provincial recreation area
						WPP	Wildland Provincial Park
						<Null>	
CLS, TSA	PB_ORD	Double	8	38	Balsam poplar order in species assigment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	PB_PCT	Double	8	38	Balsam poplar percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	PHOTO_YR	Double	8	38	AVI Photo Year	1982 - 2013	Variable values
						2016	Linework was interpolated by Forcorp
						<Null>	
CLS, TSA	PL_ORD	Double	8	38	Lodgepole pine order in species	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	PL_PCT	Double	8	38	Lodgepole pine order in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	PLB_ARIS	Text	13	0	Pre-landbase ARIS Opening Number	Variable values	
						<Null>	
CLS, TSA, MDL	PLB_MOD1	Text	4	0	Pre-landbase Mod1 Assignment	BT	Broken Tops
						BU	Burn
						CC	Clear Cut
						CL	Clearing
						DI	Disease
						DT	Discolored/ dead tops
						GR	Developed for grazing domestic livestock
						IK	Insect Kill
						PL	Planted
						SI	Site improved
						SN	Snag
						ST	Scattered Timber
						TH	Thinned
						UK	Unknown Kill
						WF	Windfall
						WT	Weather
						X	No call
						<Null>	
CLS, TSA, MDL	PLB_MOD1_YR	Double	8	38	Pre-landbase Mod1 Year	0 - 2015	Variable values
						<Null>	
CLS, TSA, MDL	PLB_ORIGIN	Double	8	38	Pre-Landbase Origin Year	0 - 2014	Variable values
						<Null>	
CLS, TSA, MDL	PLCC_OPEN	Text	13	0	Planned Cutblock Opening Number	Variable values	
						<Null>	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
CLS, TSA, MDL	PLCC_OWNER	Text	6	0	Planned Cutblock Owner	ANC	Alberta Newsprint Company
						BLUE	Blue Ridge Lumber Ltd.
						CTP	Community Timber Permit
						EDFR	Edfor Cooperative Ltd.
						ETP	Edson Timber Products
						MWWC	Millar Western Whitecourt Division
						TALL	Tall Pine Timber Co. Ltd.
						WEYR	Weyerhaeuser Canada Ltd.
						<Null>	
CLS, TSA, MDL	PLCC_STATU	Text	9	0	Planned Cutblock Harvest Status	PLAN10	Planned blocks to be harvested in the first ten years of the SHS
						PLAN2	Planned blocks to be harvested prior to the model start date (2015 - 2017)
						PLAN20	Planned blocks to be harvested in the first twenty years of the SHS
						<Null>	
CLS, TSA, MDL	PNT	Text	5	0	Protective notations	PNT	Protective Notation
						<Null>	
CLS, TSA, MDL	POLY_NUM	Double	8	38	AVI 2.1 polygon number	0 - X	Variable values
						<Null>	
CLS, TSA, MDL	PRIVATE	Text	9	0	Private Land	PRIVATE	Private land
						FEDERAL	Federal private land
						<Null>	
CLS, TSA, MDL	PSP	Text	7	0	Permanent Sample Plot	GOA	Provincial PSP
						WEYER	Weyerhaeuser PSP
						<Null>	
CLS, TSA, MDL	R_AGE	Double	8	38	RSA Block Age	14 - 28	Variable values
						<Null>	
CLS, TSA, MDL	R_OWNER	Text	6	0	RSA Cutblock Owner	ANC	Alberta Newsprint Company
						BLUE	Blue Ridge Lumber Inc.
						ETPL	Edson Timber Products Ltd.
						FRIA	Forest Resource Improvement
						HANS	Hansen, Dale H
						LFS	Land and Forest Service
						MWWC	Millar Western Whitecourt Division
						SFPI	Sundre Forest Products Inc.
						TALL	Tall Pine Timber Co. Ltd.
						WEYR	Weyerhaeuser Canada Ltd.
						<Null>	
CLS, TSA, MDL	R_POLYGON	Long	4	10	RSA Subunit Number	0 - X	Variable values
						<Null>	
CLS, TSA, MDL	R_STRATA	Text	6	0	RSA stratum assigment	HW	Aspen leading
						HWPL	Aspen leading Pine
						HWSX	Aspen leading Spruce
						PL	Lodgepole Pine
						PLHW	Pine leading Mixedwood
						SB	Black Spruce
						SBHW	Black spruce leading mixedwood
						SW	White Spruce leading
						SWHW	White Spruce leading Aspen
						<Null>	
CLS, TSA, MDL	RFMA	Text	7	0	Registered Fur Management Area	00001 - 01658	RFMA Number
						<Null>	
CLS, TSA, MDL	RGE	Long	4	5	Range	5 - 22	Variable values
CLS, TSA, MDL	RSAPOLYGON	Double	8	38	RSA Subunit Number	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	RSAUNIQUE	Text	15	0	RSA Unique Key	0 - X	Variable values
CLS, TSA	RVALUE	Text	10	0	MPB R Value	High	
						Low	
						Mod	
						Vhigh	
MDL	S_AREA	Double	8	38	Seismic Area within polygon	0 - X	Variable values
CLS, TSA	SB_ORD	Double	8	38	Black spruce order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	SB_PCT	Double	8	38	Black spruce percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	SEEDZONE	Text	8	0	Seed zone code	A 1.2	Alpine Zone 1.2 - Athabasca-Kootenay Alpine

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						CM 3.5	Central Mixedwood Zone 3.5 - Drayton Central Mixedwood Plains
						DM 2.3	Dry Mixedwood Zone 2.3 - Red Deer Dry Mixedwood Plains
						LF 1.5	Lower Foothills Zone 1.5 - McLeod-North Saskatchewan Lower Foothills
						LF 2.1	Lower Foothills Zone 2.1 - Athabasca-McLeod Lower Foothills
						LF 2.2	Lower Foothills Zone 2.2 - Brazeau-Clearwater Lower Foothills
						SA 1.2	Subalpine Zone 1.2 - Athabasca-Kootenay Lower Subalpine
						SA 2.2	Subalpine Zone 2.2 - Athabasca-Kootenay Upper Subalpine
						UF 1.2	Upper Foothills Zone 1.2 - Mayberne Upper Foothills
						UF 1.4	Upper Foothills Zone 1.4 - Athabasca-North Saskatchewan Upper Foothills
						UF 2.4	Upper Foothills Zone 2.4 - Brazeau Upper Foothills
CLS	SEISMIC	Double	8	38	Seismic polygon identifier	1	Seismic Line
						0	No Seismic Activity
CLS, TSA, MDL	SLOPE	Integer	4	5	Sloped area identifier	55	Area has a slope greater than 55%
						0	Area has a slope less than 55%
CLS, TSA, MDL	SOFTPCT	Double	8	38	Coniferous species percent (overstory)	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	SOPM	Double	8	38	Storey of Primary Management	1	Overstorey
						2	Understorey
CLS, TSA, MDL	SP1	Text	4	0	AVI species 1	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	SP1PER	Double	8	38	Species 1 Percent	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	SP2	Text	4	0	AVI species assignment	A	Aspen
						AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam FIr
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PF	Limber pine
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	SP2PER	Double	8	38	Species 2 Percent	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	SP3	Text	4	0	AVI species assignment	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	SP3PER	Double	8	38	Species 3 Percent	0 - 3	Variable values

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						<Null>	
CLS, TSA, MDL	SP4	Text	4	0	AVI species assignment	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir
						LT	Larch
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	SP4PER	Double	8	38	Species 4 Percent	0 - 2	Variable values
						<Null>	
CLS, TSA, MDL	SP5	Text	4	0	AVI species assignment	AW	Aspen
						BW	Birch
						FB	Balsam Fir
						LT	Larch
						PB	Balsam Poplar
						PL	Lodgepole Pine
						SB	Black Spruce
						SW	White Spruce leading
						<Null>	
CLS, TSA, MDL	SP5PER	Double	8	38	Species 5 Percent	0 - 2	Variable values
						<Null>	
CLS, TSA, MDL	SSI	Long	4	10	MPB Stand Susceptibility Index	1-83	Variable values
CLS, TSA, MDL	SSI_CAT	Text	7	0	MPB SSI Category	1 - 22	
						23 - 63	
						64 - 100	
						X	No call
						<Null>	
CLS, TSA, MDL	STOCKING	Text	5	0	Not Sufficiently Restocked polygon identifer	NSR50	NSR and <=50% stocked
						NSR80	NSR and >50% and <80% stocked
						X	
CLS, TSA, MDL	STR_GRP	Text	4	0	AVI Broad Cover Group (Overstorey)	C	Coniferous
						CD	Coniferous leading mixedwood
						D	Deciduous
						DC	Deciduous leading mixedwood
						<Null>	
CLS, TSA, MDL	STRATA_SRD	Text	6	0	AVI extended strata (Overstory)	C1	Pure White Spruce
						C10	Black Spruce leading with Pine
						C11	Black Spruce leading without Pine
						C12	Larch leading
						C15	Pure Balsam Fir
						C16	Balsam Fir leading with Pine
						C17	Balsam Fir leading without Pine
						C2	White Spruce leading with Pine
						C3	White Spruce leading without Pine
						C4	Pure Pine
						C5	Pine leading with White Spruce
						C6	Pine leading with Black Spruce
						C7	Pine leading with Fir
						C8	Pine leading without Spruce and Fir
						C9	Pure Black Spruce
						CD1	White Spruce/Aspen
						CD10	Fir/Aspen
						CD11	Fir/Poplar
						CD12	Fir/Birch
						CD2	White Spruce/Poplar
						CD3	White Spruce/Birch
						CD4	Pine/Aspen
						CD5	Pine/Poplar
						CD6	Pine/Birch
						CD7	Black Spruce/Aspen
						CD8	Black Spruce/Poplar
						CD9	Black Spruce/Birch
						D1	Pure Aspen
						D2	Aspen leading with Poplar
						D3	Aspen leading without Poplar
						D4	Balsam poplar leading
						D5	Birch leading
						DC1	Aspen/White Spruce
						DC10	Birch/Pine

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						DC11	Birch/Black Spruce
						DC12	Birch/Fir
						DC2	Aspen/Pine
						DC3	Aspen/Black Spruce
						DC4	Aspen/Fir
						DC5	Poplar/ White Spruce
						DC6	Poplar/Pine
						DC7	Poplar/Black Spruce
						DC8	Poplar/Fir
						DC9	Birch/White Spruce
						X	No call
						<Null>	
CLS, TSA, MDL	STRUC	Text	3	0	Stand structure	C	Complex
						H	Horizontal
						M	Multi-storeyed structure
						<Null>	
CLS, TSA, MDL	STRUC_VAL	Text	3	0	Stand structure value	0 - 9	10% extent classes
						<Null>	
CLS, TSA	SW_ORD	Double	8	38	White spruce order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	SW_PCT	Double	8	38	White spruce percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	TEMPEXCL	Text	10	0	Temporary Exclusion	BEARLAKE	Bear Lake
						CRIMSON	Crimson
						OCHIESE	O'Chiese
						RODNEY	Rodney Creek
						<Null>	
CLS, TSA, MDL	TPR	Text	3	0	Overstorey Productivity assignment	F	Fair
						G	Good
						M	Medium
						U	Unproductive
						<Null>	
CLS, TSA, MDL	TREEIMP	Text	9	0	Tree Improvement Zones	TREEIMP	Tree Improvement Zones
						<Null>	
CLS, TSA, MDL	TROUTMGMT	Text	15	0	Rainbow Trout Streams	TROUT	Rainbow trout steam
						<Null>	
CLS, TSA, MDL	TSA_KEY	Long	4	10	TSA Landbase Unique Key	0 - X	Variable values
CLS, TSA, MDL	TWP	Long	4	5	Township	39 - 57	Variable values
CLS, TSA, MDL	UAGE	Double	8	38	Age of understory	-1 - 335	Variable values
						<Null>	
CLS, TSA, MDL	UANTH_NON	Text	5	0	Non-vegetated land influenced by man (Understory)	AIF	Farmstead
						AIG	Gravel Pit
						AIH	Permanent Right-of-Way
						AII	Industrial Plant Sites
						ASR	Ribbon Development
						<Null>	
CLS, TSA, MDL	UANTH_VEG	Text	5	0	Anthropogenic Vegetated (Understory)	CA	Annual Crops
						CIP	Industrial - seeded
						CIW	Geophysical Features Seeded
						CP	Crop Plan
						CPR	Rough pasture
						<Null>	
CLS, TSA	UAW_ORD	Double	8	38	Aspen order in species assignment (Understory)	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	UAW_PCT	Double	8	38	Aspen percent in species distribution (Understory)	0 - 10	Variable values
						<Null>	
CLS, TSA	UBW_ORD	Double	8	38	White birch order in species assignment (Understory)	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	UBW_PCT	Double	8	38	White birch percent in species distribution	0 - 10	Variable values
CLS, TSA, MDL	UC_CODE	Text	4	0	Broad cover group (understory)	C	Coniferous
						CD	Coniferous leading mixedwood
						D	Deciduous
						DC	Deciduous leading mixedwood
						<Null>	
CLS, TSA	UCRULE	Text	14	0	Conifer strata decision rule (understory)	FB_LEAD	Fir leading coniferous
						FBFD_LEAD_MW	Fir leading mixedwood
						LT_LEAD	Larch leading coniferous

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						NO_C	No coniferous species
						PL_LEAD	Pine leading coniferous
						PL_LEAD_MW	Pine leading mixedwood
						SB_LEAD	Black spruce leading coniferous
						SBLT_LEAD_MW	Black spruce larch leading mixedwood
						SW_LEAD	White spruce leading coniferous
						SW_LEAD_MW	White spruce leading mixedwood
						<Null>	
CLS, TSA, MDL	UDENSITY	Text	3	0	Stand density (understory)	A	A Density stands
						B	B Density stands
						C	C Density stands
						D	D Density stands
						<Null>	
CLS, TSA	UDRULE	Text	9	0	Deciduous strata decision rule	AW_LEAD	Aspen leading deciduous
						BW_LEAD	Birch leading deciduous
						PB_LEAD	Poplar leading deciduous
						NO_D	No deciduous species
						<Null>	
CLS, TSA	UFB_ORD	Double	8	38	Balsam fir order in species assignment (Understory)	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	UFB_PCT	Double	8	38	Balsam fir percent in species distribution (Understory)	0 - 10	Variable values
						<Null>	
CLS, TSA	UFD_ORD	Double	8	38	Douglas fir order in species assignment (Understory)	9	Variable values
						<Null>	
CLS, TSA, MDL	UFD_PCT	Double	8	38	Douglas fir percent in species distribution (Understory)	0	
						<Null>	
CLS, TSA, MDL	UHARDPCT	Double	8	38	Deciduous species percent (understory)	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	UHEIGHT	Double	8	38	Stand height (understory)	0 - 30	Variable values
						<Null>	
CLS, TSA, MDL	ULEAD_CON	Text	4	0	Leading conifer (understory)	FB	Balsam Fir
						LT	Larch
						NO	No Species
						PL	Lodgepole Pine
						SB	Black Spruce
						SW	White Spruce leading
						<Null>	
CLS, TSA, MDL	ULEAD_DEC	Text	4	0	Leading deciduous (understory)	AW	Aspen
						BW	Birch
						NO	No Species
						PB	Balsam Poplar
						<Null>	
CLS, TSA	ULT_ORD	Double	8	38	Larch order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	ULT_PCT	Double	8	38	Larch percent in species distribution	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	UMOD1	Text	4	0	Stand modifier (understory)	BT	Broken Tops
						BU	Burn
						CC	Clear Cut
						CL	Clearing
						DI	Disease
						DT	Discolored/ dead tops
						GR	Developed for grazing domestic livestock
						IK	Insect Kill
						PL	Planted
						SI	Site improved
						SN	Snag
						ST	Scattered Timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
CLS, TSA, MDL	UMOD1_EXT	Double	8	38	Stand modifier extent (understory)	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	UMOD1_YR	Double	8	38	Stand modifier year (understory)	0 - 2015	Variable values
						<Null>	
CLS, TSA, MDL	UMOD2	Text	4	0	Stand modifier (understory)	BU	Burn
						CL	Clearing
						GR	Developed for grazing domestic livestock

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_American_1983   Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						PL	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered Timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
CLS, TSA, MDL	UMOD2_EXT	Double	8	38	Stand modifier extent (understory)	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	UMOD2_YR	Double	8	38	Stand modifier year (understory)	0 - 2012	Variable values
						<Null>	
CLS, TSA, MDL	UMOIST	Text	3	0	Stand moisture regime (understory)	A	Aquatic
						D	Dry
						M	Mesic
						U	Unknown
						W	Wet
						<Null>	
CLS, TSA, MDL	UNAT_NON	Text	5	0	Natural non-vegetated land	NMC	Cutbank
						NMR	Mineral - Rock
						NMS	Mineral - Sand
						NWF	Flooded
						NWL	Lakes
						NWR	River
						<Null>	
CLS, TSA, MDL	UNFL	Text	4	0	Non-forested land	BR	Bare Root.
						HF	Herbaceous Forbs
						HG	Herbaceous Grasses
						SC	Closed Shrub
						SO	Open shrub
						<Null>	
CLS, TSA, MDL	UNFL_PER	Double	8	38	Non-forested land percent	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	UORIGIN	Double	8	38	Stand origin (understory)	0 - 2013	Variable values
						<Null>	
CLS, TSA	UPB_ORD	Double	8	38	Balsam poplar order in species	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	UPB_PCT	Double	8	38	Balsam poplar percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA	UPL_ORD	Double	8	38	Lodgepole pine order in species	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	UPL_PCT	Double	8	38	Lodgepole pine percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA	USB_ORD	Double	8	38	Black spruce order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	USB_PCT	Double	8	38	Black spruce percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	USOFTPCT	Double	8	38	Coniferous species percent (understory)	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	USP1	Text	4	0	AVI species 1 code	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	USP1PER	Double	8	38	Understorey Species 1 Percent	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	USP2	Text	4	0	AVI species 2 code	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	USP2PER	Double	8	38	Understorey Species 2 Percent	0 - 5	Variable values
						<Null>	
CLS, TSA, MDL	USP3	Text	4	0	AVI species 3 code	AW	Aspen
						BW	Birch
						FA	Alpine fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	USP3PER	Double	8	38	Understorey Species 3 Percent	0 - 3	Variable values
						<Null>	
CLS, TSA, MDL	USP4	Text	4	0	AVI species 4 code	AW	Aspen
						BW	Birch
						FB	Balsam Fir
						LT	Larch
						PB	Balsam Poplar
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	USP4PER	Double	8	38	Understorey Species 4 Percent	0 - 2	Variable values
						<Null>	
CLS, TSA, MDL	USP5	Text	4	0	AVI species 5 code	AW	Aspen
						BW	Birch
						FB	Balsam FIr
						LT	Larch
						PB	Balsam Poplar
						PL	Lodgepole Pine
						SB	Black Spruce
						SW	White Spruce
						<Null>	
CLS, TSA, MDL	USP5PER	Double	8	38	Understorey Species 5 Percent	0 - 1	Variable values
						<Null>	
CLS, TSA, MDL	USTR_GRP	Text	4	0	Understorey Strata Group	C	Coniferous
						CD	Coniferous leading mixed
						D	Deciduous
						DC	Deciduous leading mixed
						<Null>	
CLS, TSA, MDL	USTRATA_SRD	Text	6	0	AVI extended strata (Understory)	C1	Pure White Spruce
						C10	Black Spruce leading with Pine
						C11	Black Spruce leading without Pine
						C12	Larch leading
						C15	Pure Balsam Fir
						C16	Balsam Fir leading with Pine
						C17	Balsam Fir leading without Pine
						C2	White Spruce leading with Pine
						C3	White Spruce leading without Pine
						C4	Pure pine
						C5	Pine leading with White Spruce
						C6	Pine leading with Black Spruce
						C7	Pine leading with Fir
						C8	Pine leading without Spruce and Fir
						C9	Pure Black Spruce
						CD1	White Spruce/Aspen
						CD10	Fir/Aspen
						CD11	Fir/Poplar
						CD12	Fir/Birch

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						CD2	White Spruce/Poplar
						CD3	White Spruce/Birch
						CD4	Pine/Aspen
						CD5	Pine/Poplar
						CD6	Pine/Birch
						CD7	Black Spruce/Aspen
						CD8	Black Spruce/Poplar
						CD9	Black Spruce/Birch
						D1	Pure aspen
						D2	Aspen leading with Poplar
						D3	Aspen leading without Poplar
						D4	Poplar leading
						D5	Birch leading
						DC1	Aspen/White Spruce
						DC10	Birch/Pine
						DC11	Birch/Black Spruce
						DC12	Birch/Fir
						DC2	Aspen/Pine
						DC3	Aspen/Black Spruce
						DC4	Aspen/Fir
						DC5	Poplar/White Spruce
						DC6	Poplar/Pine
						DC7	Poplar/Black Spruce
						DC8	Poplar/fir
						DC9	Birch/White Spruce
						X	No call
						<Null>	
CLS, TSA, MDL	USTRUC	Text	3	0	Stand structure code	H	Horizontal
						<Null>	
CLS, TSA, MDL	USTRUC_VAL	Text	3	0	Stand structure value	0 - 9	10% extent percentages
						<Null>	
CLS, TSA	USW_ORD	Double	8	38	White spruce order in species assignment	1 - 9	Variable values
						<Null>	
CLS, TSA, MDL	USW_PCT	Double	8	38	White spruce percent in species	0 - 10	Variable values
						<Null>	
CLS, TSA, MDL	UTPR	Text	3	0	Understorey Timber productivity rating	F	Fair
						G	Good
						M	Mediun
						U	Unproductive
						<Null>	
CLS, TSA, MDL	VSA	Text	3	0	Volume Supply Area	1 - 4	Volume Supply Area number
						<Null>	
CLS, TSA, MDL	WATERSHEDS	Text	23	0	Landbase Watershed Assignment	Athabasca	
						Baker	
						Baptiste	
						Bear	
						Big Beaver	
						Bigoray	
						Brazeau	
						Brewster	
						Broken Arm	
						Bruce	
						Cairn	
						Chiefs	
						Chip	
						Chungo	
						Corser	
						Coyote	
						Crimson	
						Cynthia	
						Deer	
						Dismal	
						Dzida	
						East Baptiste	
						East Bear	
						East Carrot	
						East Chambers	
						East Eta	
						East Fickle	
						East Lobstick	
						East Nordegg	
						East Poison	
						East Rundell	
						East Sturrock	

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						East Zeta	
						Edson	
						Embarras	
						Erith	
						Fairless	
						Garden	
						Graham	
						Granada	
						Grey Owl	
						Groat	
						Half Moon	
						Hanlan	
						Hansen	
						Hardluck	
						Highway	
						Hoke	
						Horseshoe	
						House	
						Jerry	
						Kathy	
						Keyera	
						Little Grey Owl	
						Lobstick	
						Lookout	
						Lower Blackstone	
						Lower Carrot	
						Lower Chambers	
						Lower Moose	
						Lower North Rat	
						Lower Pembina	
						Lower Sang	
						Lower Saskatchewan	
						Lower Wapiabi	
						Lower Wolf	
						Macmillan	
						Marsh	
						Marshybank Fringe	
						Marshybank Fringe2	
						Mason	
						Mcleod	
						Middle Blackstone	
						Middle Marshybank	
						Middle Open	
						Middle Poison	
						Middle Wolf	
						Miiddle Pembina	
						Mink	
						Minnow	
						Negraiff	
						Niton	
						Nojack	
						Noname	
						Nordegg	
						Norht Athabasca	
						North Brewster	
						North Colt	
						North Corser	
						North Elk	
						North Marshybank	
						North O'Chiese	
						North Open	
						North Rapid	
						North Saskatchewan	
						Obed	
						O'chiese	
						Oldman	
						Owl	
						Paddle	
						Paddy	
						Peco	
						Penti	
						Plateau	
						Prarie	
						Rapid	
						Raven	
						Rehn	
						Reservoir	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						Rocky Rockyview Rodney Sand Shinningbank Sinkhole South Baptiste South Bear South Elk South Lobstick South Lookout South Marshybank South Mcloed South Open South Rat Stephens Stephens Fringe Sturrock Sunchild Sundance East Sundance West Sundre Sutherland Svedberg Swartz Tall Pine Tom Trout Upper Blackstone Upper Brown Upper Chambers Upper Chambers Fringe Upper Moose Upper North Rat Upper Pembina Upper Sang Upper Saskatchwan Upper Wapiabi Upper Wolf Varty Wawa Welch West Baptiste West Carrot West Chambers West Chungo West Eta West Fickle West Lobstick West Lower Blackstone West Moose West Negraiff West Poison West Zeta Whitefish Wilson <Null>	
CLS, TSA, MDL	WATSHDCODE	Text	5	0	Watershed Code	0 - 169 <Null>	Watershed number
CLS, TSA, MDL	WILDFIRE	Text	22	0	Wildfire Management Zone	EDSON ROCKY MOUNTAIN HOUSE <Null>	
CLS, TSA, MDL	WILDLIFE	Text	14	0	Wildlife Management Units	ALDER FLATS BIGHORN BIGORAY BLACKSTONE CARDINAL CARROT CREEK CHIP LAKE ELK RIVER MCLEOD RIVER OCHIESE SCHUNDA SHININGBANK WOLF RIVER <Null>	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
CLS, TSA, MDL	WOODSHED	Text	12	0	Woodshed Name	001-WLFW	
						002-WLFW	
						003-WLFW	
						004-WLFW	
						005-WLFW	
						006-WLFE	
						007-WLFE	
						008-SDIS	
						009-POCH	
						010-POCH	
						011-WLFE	
						012-BARM	
						013-LGPL	
						014-JACK	
						015-BRAZ	
						016-CATH	
						017-POWR	
						018-NBRA	
						019-PEMB	
						020-DOMN	
						021-CRMS	
						022-STRW	
						023-SDER	
						024-NORM	
						025-ALDR	
						026-WLFC	
						027-MEDI	
						028-SASK	
						029-GOSL	
						030-BEND	
						031-OPEN	
						032-BREW	
						033-OMNI	
						034-BREW	
						035-CHAM	
						036-GRAC	
						037-CHAM	
						038-LUIS	
						039-PRNT	
						040-SUNC	
						041-OBEDLK	
						042-OBEDLK	
						043-MEDICI	
						044-MEDICI	
						045-SUNDAN	
						046-EASYFD	
						047-EASYFD	
						048-BIGORY	
						049-BIGORY	
						050-BIGORY	
						051-CHIPLK	
						052-LOBSTK	
						053-WAWA	
						054-STVN	
						055-GREY	
						056-RAPD	
						057-RAPD	
						058-STVN	
						059-GREY	
						060-DOCS	
						061-DOCS	
						062-SBRA	
						063-ERUN	
						064-SBRA	
						065-SRES	
						066-SRES	
						067-SRES	
						068-SBRA	
						069-CHUN	
						070-RACE	
						071-CNYN	
						072-GAP	
						073-NFLS	
						074-BMNT	
						075-TRNK	
						076-BEVR	
						077-ELKE	

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_American_1983   Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						078-NCNL	
						079-SCNL	
						080-BDRY	
						081-BDRY	
						082-WRUN	
						083-ERUN	
						084-NDIS	
						085-NDIS	
						086-NDIS	
						087-WLFW	
						088-NDIS	
						089-NOJACK	
						090-NOJACK	
						091-SINKHL	
						092-CHIPLK	
						093-ETALAK	
						094-ETALAK	
						095-ETALAK	
						096-ETALAK	
						097-ETALAK	
						098-PADDYC	
						099-PADDYC	
						100-SRATCK	
						101-SRATCK	
						102-PEMBIN	
						103-PEMBIN	
						104-BIGROK	
						105-BIGROK	
						106-BIGROK	
						107-PEMBIN	
						108-ZETALK	
						109-SRATCK	
						110-ZETALK	
						111-ZETALK	
						112-MINNWL	
						113-NRATCK	
						114-SRATCK	
						115-NRATCK	
						116-NRATCK	
						117-NRATCK	
						118-NRATCK	
						119-GRANAD	
						120-GRANAD	
						121-SANGLK	
						122-TOWERX	
						123-LOSTER	
						124-TOWERX	
						125-NINEML	
						126-MINNWL	
						127-MINNWL	
						128-COYOTE	
						129-RODNEY	
						130-RODNEY	
						131-RODNEY	
						132-SANGLK	
						133-BROCAB	
						134-SANGLK	
						135-BROCAB	
						136-SWANSN	
						137-SUNDAN	
						138-SWANSN	
						139-MEDICI	
						140-SUNDAN	
						141-SUNDAN	
						142-GRANDE	
						143-DEERHL	
						144-DEERHL	
						145-TROUTC	
						146-TROUTC	
						147-TROUTC	
						148-PIONER	
						149-TOMHIL	
						150-OLDMAN	
						151-TOMHIL	
						152-TOMHIL	
						153-CRICKS	
						154-CRICKS	

Data Dictionary
Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)
Description: Classified, TSA and Modelling Landbases
Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						155-OLDMAN	
						156-SHININ	
						157-SHININ	
						158-EASTBK	
						159-MCLEOD	
						160-MCLEOD	
						161-MCLEOD	
						162-HATTON	
						163-HATTON	
						164-HATTON	
						165-MACKAY	
						166-HATTON	
						167-MACKAY	
						168-MACKAY	
						169-SWANSN	
						170-FICKLE	
						171-FICKLE	
						172-ERITHX	
						173-ERITHX	
						174-ERITHX	
						175-SVEDBG	
						176-SVEDBG	
						177-SVEDBG	
						178-SVEDBG	
						179-RODNEY	
						<Null>	
CLS, TSA, MDL	WORKAREA	Text	22	0	Working area.	BEAVER FLATS	
						BIG BEND	
						BIG ROCK	
						BIGORAY	
						BLACK MOUNTAIN	
						BOUNDARY	
						BRAZEAU TOWER	
						BREWSTER CREEK	
						BROKEN ARM	
						BROKEN CABIN	
						CANAL	
						CANYON CREEK	
						CATHEDRAL GROVE	
						CHAMBERS CREEK	
						CHIP LAKE	
						CHUNGO LOOKOUT	
						COYOTE CREEK	
						CRICKS CREEK	
						CRIMSON	
						DEER HILL	
						DOCS LAKE	
						DOMINION LAKE	
						EAST BANK	
						EASYFORD	
						ELKE SUMMERS	
						ERITH	
						ETA LAKE	
						FICKLE LAKE	
						GRACE CREEK	
						GRANADA	
						GRAND TRUNK	
						GRANDE PRAIRIE TRAIL	
						HATTONFORD	
						JACK KNIFE	
						KEY HOLE	
						LOBSTICK	
						LODGEPOLE	
						LODGEPOLE DV	
						LOOKOUT CREEK	
						LOST ELK RIDGE	
						LOUIS LAKE	
						MACKAY	
						MCLEOD CROSSING	
						MEDICINE CREEK	
						MEDICINE LODGE	
						MINNOW LAKE	
						NINE MILE	
						NO NAME CREEK	
						NOJACK SOUTH	
						NORMS THROW	
						NORTH BRAZEAU	

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						NORTH DISMAL CREEK	
						NORTH FALSE GAP	
						NORTH PEMBINA	
						NORTH RAT CREEK	
						OBED LAKE	
						OLDMAN CREEK	
						PADDY CREEK	
						PEMBINA	
						PIONEER	
						POACHERS CREEK	
						POWER HOUSE	
						RACE CREEK	
						RAPID CREEK	
						RODNEY CREEK	
						RUNDELL	
						SANG LAKE NORTH	
						SANG LAKE SOUTH	
						SASKATCHEWAN	
						SHININGBANK EAST	
						SINKHOLE LAKE	
						SOUTH BRAZEAU	
						SOUTH DISMAL CREEK	
						SOUTH FALSE GAP	
						SOUTH RAT CREEK	
						SOUTH RESERVOIR	
						STEVENS CREEK	
						STRAWBERRY MOUNTAIN	
						SUNDANCE CREEK	
						SURPRISE LAKE	
						SVEDBERG	
						SWANSON	
						THE GAP	
						TOM HILL	
						TOWER	
						TROUT CREEK	
						TRUNK ROAD	
						WAWA	
						WOLF LAKE EAST	
						WOLF LAKE WEST	
						ZETA LAKE	
						<Null>	
CLS, TSA, MDL	WORKCODE	Text	14	0	Working Areas Code	BEVRFL	Beaver Flats
						BIGBND	Big Bend
						BIGORY	Bigoray
						BIGROK	Big Rock
						BLKMNT	Black Mountain
						BOUDRY	Boundary
						BRAZEU	Brazeau Tower
						BREWST	Brewster Creek
						BROARM	Broken Arm
						BROCAB	Broken Cabin
						CANALS	Canal
						CANYON	Canyon Creek
						CATHED	Cathedral Grove
						CHAMBR	Chambers Creek
						CHIPLK	Chip Lake
						CHUNGO	Chungo Lookout
						COYOTE	Coyote Creek
						CRICKS	Cricks Creek
						CRIMSN	Crimson
						DEERHL	Deer Hill
						DOCSLK	Docs Lake
						DOMNLK	Dominion Lake
						EASTBK	East Bank
						EASYFD	Easyford
						ELKESU	Elke Summers
						ERITHX	Erith
						ETALAK	Eta Lake
						FICKLE	Fickle Creek
						FICKLE	Fickle Lake
						GRACEC	Grace Creek
						GRANAD	Granada
						GRANDE	Grande Prairie Trail
						GRANDT	Grand Trunk
						HATTON	Hattonford
						JACKNI	Jack Knife
						KEYHOL	Key Hole

Data Dictionary

Dataset Nan CLS_LB_V8_20170824 (CLS), TSA_LB_V8_20170824 (TSA), MDL_LB_V8_20170824 (MDL)

Description: Classified, TSA and Modelling Landbases

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Landbase	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						LGPLDV	Lodgepole DV
						LOBSTK	Lobstick
						LODGEP	Lodgepole
						LOOKOU	Lookout Creek
						LOSTER	Lost Elk Ridge
						LOUISL	Louis Lake
						MACKAY	Mackay
						MCLEOD	McLeod
						MEDICI	Medicine Lodge
						MEDICR	Medicine Creek
						MINNWL	Minnow Lake
						NBRAZU	North Brazeau
						NDISML	North Dismal Creek
						NFLSGP	North False Gap
						NINEML	Nine Mile
						NOJACK	Nojack South
						NONAME	No Name Creek
						NORMTH	Norms Throw
						NRATCK	North Rat Creek
						OBEDLK	Obed Lake
						OLDMAN	Oldman Creek
						PADDYC	Paddy Creek
						PEMBIN	Pembina
						PEMBNT	North Pembina
						PIONER	Pioneer
						POACHC	Poachers Creek
						POWERH	Power House
						RACECK	Race Creek
						RAPDCK	Rapid Creek
						RODNEY	Rodney Creek
						RUNDEL	Rundell
						SANGLN	Sang Lake North
						SANGLS	Sang Lake South
						SASKAT	Saskatchewan
						SBRAZU	South Brazeau
						SDISML	South Dismal Creek
						SFLSGP	South False Gap
						SHININ	Shiningbank East
						SINKHL	Sinkhole Lake
						SRATCK	South Rat Creek
						SRESER	South Reservoir
						STRWMN	Strawberry Mountain
						STVNCK	Stevens Creek
						SUNDAN	Sundance Creek
						SURPRI	Surprise Lake
						SVEDBG	Svedberg
						SWANSN	Swanson
						THEGAP	The Gap
						TOMHIL	Tom Hill
						TOWERX	Tower
						TRNKRD	Trunk Road
						TROUTC	Trout Creek
						WAWAWC	Wawa
						WOLFLE	Wolf Lake East
						WOLFLW	Wolf Lake West
						ZETALK	Zeta Lake
						<Null>	
CLS, TSA, MDL	YCTYPE	Text	3	0	Yield Curve Type	M91	Yield curve applied to a pre-91 cutblock
						NAT	Natural Stands
						RSA	Yield curve applied to a post-91 cutblock
						<Null>	

Data Dictionary

Dataset Name: AVI_Combined (AVI) and AVI_20170822 (PLB_AVI)

Description: AVI attributes from approved AVI dataset and Pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Dataset	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
AVI and PLB_AVI	ANTH_NON	Text	3	0	Anthropogenic Non Vegetated Code	AIF	Farmstead
						AIG	Gravel Pit
						AIH	Permanent Right-of-Way
						AII	Industrial Plant Sites
						ASC	Cities, Towns, Villages, Hamlets
						ASR	Ribbon Development
						<Null>	
AVI and PLB_AVI	ANTH_VEG	Text	3	0	Anthropogenic Vegetated Code	CA	Annual Crops
						CIP	Industrial - seeded
						CIW	Geophysical Features Seeded
						CP	Crop Plan
						CPR	Rough pasture
						<Null>	
AVI and PLB_AVI	AREA_HA	Double	8	0	Area (ha)	0 - X	Variable values
AVI and PLB_AVI	ARIS	Text	13	0	ARIS Opening Number	0 - X	Variable values
						<Null>	
AVI and PLB_AVI	AVI_UKEY	Integer	4	0	Combined AVI Unique Key	0 - X	Variable values
AVI and PLB_AVI	DATA	Text	1	0	Data source for AVI classification	A	
						F	
						I	
						P	
						<Null>	
AVI and PLB_AVI	DATA_YR	Integer	4	0	Data Reference Year	0 - 2015	Variable values
AVI and PLB_AVI	DENSITY	Text	1	0	Overstorey Density	A	A Density stands
						B	B Density stands
						C	C Density stands
						D	D Density stands
						<Null>	
AVI and PLB_AVI	DIST_PTRN	SmallInteger	2	0	Disturbance Pattern	0	
PLB_AVI	ECO1	Text	3	0	Ecosite Classification	a	
						b	
						c	
						d	
						e	
						f	
						g	
						h	
						i	
						j	
						k	
						l	
						m	
						n	
						X	No call
						<Null>	
AVI and PLB_AVI	HEIGHT	SmallInteger	2	0	Overstorey Height (m)	0 - 36	Stand Height
AVI and PLB_AVI	INITIALS	Text	2	0	AVI interpreter initials	Variable Values	
						<Null>	
AVI and PLB_AVI	LABEL	Text	55	0	AVI label	Variable values	
						<Null>	
AVI and PLB_AVI	LINK	Text	12	0	AVI Attribute	Variable values	
						<Null>	
PLB_AVI	MAPCODE	Text	3	0	Ecosite Mapcode	2B	
						3B	
						3C	
						5B	
						5C	
						5D	
						6E	
						7B	
						7C	
						7D	
						9B	
						9C	
						9D	
						9E	
						XX	
						<Null>	
AVI and PLB_AVI	MOD1	Text	2	0	AVI stand modifier	BT	Broken Tops
						BU	Burn
						CC	Clear Cut
						CL	Clearing
						DI	Disease
						DT	Discolored/ dead tops

Data Dictionary

Dataset Name: AVI_Combined (AVI) and AVI_20170822 (PLB_AVI)

Description: AVI attributes from approved AVI dataset and Pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_American_1983   Units: Meters

Dataset	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						GR	Developed for grazing domestic livestock
						IK	Insect Kill
						PI	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
AVI and PLB_AVI	MOD1_EXT	SmallInteger	2	0	AVI stand extent 1	0 - 5	20% extent percentages
AVI and PLB_AVI	MOD2	Text	2	0	AVI stand modifier 2	BU	Burn
						CL	Clearing
						GR	Developed for grazing domestic livestock
						PL	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered Timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
AVI and PLB_AVI	MOD2_EXT	SmallInteger	2	0	AVI stand extent 2	0 -5	20% extent percentages
AVI and PLB_AVI	NAT_NON	Text	3	0	Naturally NonForest Code	NMB	Mineral - Recent Burn
						NMC	Cutbank
						NMR	Mineral - Rock
						NMS	Mineral - Sand
						NWF	Flooded
						NWL	Lakes
						NWR	River
						<Null>	
AVI and PLB_AVI	NFL	Text	2	0	Non Forest Land Code	BR	Bare Root.
						HF	Herbaceous Forbs
						HG	Herbaceous Grasses
						SC	Closed Shrub
						SO	Open shrub
						<Null>	
AVI and PLB_AVI	NFL_PER	SmallInteger	2	0	Non Forest Land Crown Percent	0 - 10	10% cover classes
PLB_AVI	NRNAME	Text	20	0	Natural region	Boreal	
						Foothills	
						Rocky Mountain	
PLB_AVI	NSRCODE	Text	3	0	Natural subregion code	A	Alpine
						CM	Central Mixedwood
						DMW	Dry Mixedwood
						LF	Lower Foothills
						SA	Subalpine
						UF	Upper Foothills
PLB_AVI	NSRNAME	Text	25	0	Natural subregion	Alpine	
						Central Mixedwood	
						Dry Mixedwood	
						Lower Foothills	
						Subalpine	
						Upper Foothills	
AVI and PLB_AVI	OBJECTID	SmallInteger	4	0	ArcGIS Object Id	0 - X	Variable values
AVI and PLB_AVI	ORIGIN	SmallInteger	2	0	Stand origin	1650 - 2014	Year of stand origin
AVI and PLB_AVI	PHOTO_YR	SmallInteger	2	0	AVI Photo Year	1982 - 2013	Photo year
						2016	Linework was interpolated by Forcorp
PLB_AVI	PLB_ARIS	Text	15	0	Pre-landbase Opening number	0 - X	Variable values
PLB_AVI	PLB_MOD1	Text	15	0	Pre-landbase Stand Modifier 1	BT	Broken Tops
						BU	Burn
						CC	Clear Cut
						CL	Clearing
						DI	Disease
						DT	Discolored/ dead tops
						GR	Developed for grazing domestic livestock
						IK	Insect Kill
						PI	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned

Data Dictionary

Dataset Name: AVI_Combined (AVI) and AVI_20170822 (PLB_AVI)

Description: AVI attributes from approved AVI dataset and Pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_American_1983   Units: Meters

Dataset	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
						UK	Unknown Kill
						WF	Wind Fall
						X	No Call
PLB_AVI	PLB_MODYR	SmallInteger	2	0	Pre-landbase Mod Year	0 - 2015	Mod Year
PLB_AVI	PLB_ORIGIN	SmallInteger	2	0	Pre-Landbase Polygon Origin Year	0 - 2014	Origin Year
PLB_AVI	RATIONALE	Text	60	0	ARIS Area Adjustment Rationale	Variable values	
						<Null>	
PLB_AVI	REVCOMMENT	Text	60	0	Reviewers Comment Regarding ARIS Polygon Status	Variable values	
PLB_AVI	RSACOMMENT	Text	50	0	RSA Comment	Variable values	
						<Null>	
PLB_AVI	RSAPOLYGON	SmallInteger	2	0	RSA Polygon Number	0 - 5	RSA subunit polygon number
PLB_AVI	RSAUNIQUE	Text	50	0	RSA Unique Key	Variable values	
AVI and PLB_AVI	SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values
AVI and PLB_AVI	SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
AVI and PLB_AVI	SP1	Text	2	0	AVI species 1 assignment	Aw	Aspen
						Bw	Birch
						Fa	Alpine Fir
						Fb	Balsam FIr
						Lt	Larch
						P	AVI Generalized Code for Pine
						Pb	Balsam Poplar
						Pl	Lodgepole Pine
						Sb	Black Spruce
						Sw	White Spruce
						<Null>	
AVI and PLB_AVI	SP1_PER	SmallInteger	2	0	AVI species 1 percent	0 - 10	10% percentage classes
AVI and PLB_AVI	SP2	Text	2	0	AVI species 2 assignment	Aw	Aspen
						Bw	Birch
						Fa	Alpine Fir
						Fb	Balsam FIr
						Lt	Larch
						P	AVI Generalized Code for Pine
						Pb	Balsam Poplar
						Pl	Lodgepole Pine
						Sb	Black Spruce
						Sw	White Spruce
						<Null>	
AVI and PLB_AVI	SP2_PER	SmallInteger	2	0	AVI species 2 percent	0 - 10	10% percentage classes
AVI and PLB_AVI	SP3	Text	2	0	AVI species 3 assignment	Aw	Aspen
						Bw	Birch
						Fa	Alpine Fir
						Fb	Balsam FIr
						Lt	Larch
						P	AVI Generalized Code for Pine
						Pb	Balsam Poplar
						Pl	Lodgepole Pine
						Sb	Black Spruce
						Sw	White Spruce
						<Null>	
AVI and PLB_AVI	SP3_PER	SmallInteger	2	0	AVI species 3 percent	0 - 10	10% percentage classes
AVI and PLB_AVI	SP4	Text	2	0	AVI species 4 assignment	Aw	Aspen
						Bw	Birch
						Fa	Alpine Fir
						Fb	Balsam FIr
						Lt	Larch
						P	AVI Generalized Code for Pine
						Pb	Balsam Poplar
						Pl	Lodgepole Pine
						Sb	Black Spruce
						Sw	White Spruce
						<Null>	
AVI and PLB_AVI	SP4_PER	SmallInteger	2	0	AVI species 4 percent	0 - 10	10% percentage classes
AVI and PLB_AVI	SP5	Text	2	0	AVI species assignment	Aw	Aspen
						Bw	Birch
						Fb	Balsam FIr
						Lt	Larch
						Pb	Balsam Poplar
						Pl	Lodgepole Pine
						Sb	Black Spruce
						Sw	White Spruce
						<Null>	
AVI and PLB_AVI	SP5_PER	SmallInteger	2	0	AVI species percent	0 -2	10% percentage classes

Data Dictionary

Dataset Name: AVI_Combined (AVI) and AVI_20170822 (PLB_AVI)

Description: AVI attributes from approved AVI dataset and Pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Dataset	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
AVI and PLB_AVI	STRUC	Text	1	0	Stand structure	C	Complex structure
						H	Horizontal structure
						M	Multi-storeyed strucutre
						<Null>	
AVI and PLB_AVI	STRUC_VAL	SmallInteger	2	0	Stand structure value	0 - 9	10% extent classes
AVI and PLB_AVI	TPR	Text	3	0	Overstorey Timber Productivity assignment	F	Fair
						G	Good
						M	Mediun
						U	Unproductive
						<Null>	
AVI and PLB_AVI	UANTH_NON	Text	3	0	Non-vegetated land influenced by man (Understory)	AIF	Farmstead
						AIG	Gravel Pit
						AIH	Permanent Right-of-Way
						AII	Industrial Plant Sites
						ASR	Ribbon Development
						<Null>	
AVI and PLB_AVI	UDATA	Text	1	0	Data source for AVI classification	A	
						F	
						I	
						P	
						<Null>	
AVI and PLB_AVI	UDATA_YR	SmallInteger	2	0	US - Data Reference Year	0 - 2015	Understory data reference year
AVI and PLB_AVI	UDENSITY	Text	1	0	Stand density (understory)	A	A Density stands
						B	B Density stands
						C	C Density stands
						D	D Density stands
						<Null>	
AVI and PLB_AVI	UHEIGHT	SmallInteger	2	0	Stand height (understory)	1 - 30	height in meters
AVI and PLB_AVI	UINITIALS	Text	2	0	Interpreter initials (Understory)	Variable Values	
AVI and PLB_AVI	UMOD1	Text	2	0	AVI stand modifier	BT	Broken Tops
						BU	Burn
						CL	Clearing
						GR	Developed for grazing domestic livestock
						PL	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
AVI and PLB_AVI	UMOD1_EXT	SmallInteger	2	0	Stand modifier extent (understory)	0 - 5	20% extent classes
AVI and PLB_AVI	UMOD2	Text	2	0	Stand modifier (understory)	BU	Burn
						CL	Clearing
						GR	Developed for grazing domestic livestock
						PL	Planted
						SC	Closed Shrub
						SI	Site improved
						SN	Snag
						ST	Scattered timber
						TH	Thinned
						UK	Unknown Kill
						WF	Wind Fall
						<Null>	
AVI and PLB_AVI	UMOD2_YR	SmallInteger	2	0	Stand modifier year (understory)	1941 - 2012	understorey modifier year
AVI and PLB_AVI	UMOIST_REG	Text	1	0	Stand moisture regime	A	Aquatic
						D	Dry
						M	Mesic
						W	Wet
AVI and PLB_AVI	UNAT_NON	Text	3	0	Natural non-vegetated land	NMC	Cutbank
						NMR	Mineral - Rock
						NMS	Mineral - Sand
						NWF	Flooded
						NWL	Lakes
						NWR	River
						<Null>	
AVI and PLB_AVI	UNFL	Text	2	0	Non-forested land	BR	Bare Root.
						HF	Herbaceous Forbs
						HG	Herbaceous Grasses
						SC	Closed Shrub
						SO	Open shrub
						<Null>	

Data Dictionary

Dataset Name: AVI_Combined (AVI) and AVI_20170822 (PLB_AVI)

Description: AVI attributes from approved AVI dataset and Pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Dataset	Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
AVI and PLB_AVI	UNFL_PER	SmallInteger	2	0	Non-forested land percent	0 - 10	10% extent classes
AVI and PLB_AVI	UORIGIN	SmallInteger	2	0	Stand origin (understory)	0 - 2013	None
AVI and PLB_AVI	USP1	Text	2	0	AVI species code	AW	Aspen
						BW	Birch
						FA	Alpine Fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
AVI and PLB_AVI	USP1_PER	SmallInteger	2	0	AVI species percent	0 - 10	10% extent classes
AVI and PLB_AVI	USP2	Text	2	0	AVI species code	AW	Aspen
						BW	Birch
						FA	Alpine Fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
AVI and PLB_AVI	USP2_PER	SmallInteger	2	0	AVI species percent	0 -5	10% extent classes
AVI and PLB_AVI	USP3	Text	2	0	AVI species code	AW	Aspen
						BW	Birch
						FA	Alpine Fir
						FB	Balsam Fir
						LT	Larch
						P	AVI Generalized Code for Pine
						PB	Balsam Poplar
						PJ	Jack Pine
						PL	Lodgepole Pine
						SB	Black Spruce
						SE	Engelmann Spruce
						SW	White Spruce
						<Null>	
AVI and PLB_AVI	USP4_PER	SmallInteger	2	0	AVI species percent	0 - 2	10% extent classes
AVI and PLB_AVI	USP5_PER	SmallInteger	2	0	AVI species percent	0 - 1	10% extent classes
AVI and PLB_AVI	USTRUC	Text	1	0	Stand structure code	H	Horizontal
						M	Mediun
AVI and PLB_AVI	USTRUC_VAL	SmallInteger	2	0	Stand structure value	0 - 9	10% extent classes
AVI and PLB_AVI	UTPR	Text	1	0	Timber productivity rating	F	Fair
						G	Good
						M	Medium
						U	Unproductive

Data Dictionary

Dataset Name: **Cabins**

Description: Historical Cabins Identified by Weyerhaeuser

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
CABIN	Text	5	0	Historic Cabin Buffer	CABIN	Historic Cabin
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: ColonialNestingBirds

Description: Colonial nesting bird sites located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
COLONIAL	Text	20	0	Colonial Nesting Bird Sites	Great Blue Heron	Great Blue Heron Nest
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Compartments

Description: Compartments

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
COMPARTMEN	Text	50	0	Compartment	Baptiste Beaver Meadows Brazeau Edson Macmillan Medicine Lake Nordegg South Canal West Country Wolf Lake	
COMPCODE	Text	5	0	Compartment Code	BAP BEA BRA EDS MAC MED NOR SOU WES WOL	Baptiste Beaver Creek Brazeau Edson Macmillan Medicine Lake Nordegg South Canal West Country Wolf Lake
COMPRISK	Text	10	0	Mountain Pine Beetle Compartment Risk	HIGH LOW MOD VHIGH	High risk compartment Low risk compartment Moderate risk compartment Very high risk compartment
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Cutblock

Description: Cutblocks that are not part of the pre-landbase AVI

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
CC_FIELDNU	Text	50	0	Cutblock Operator Field Number	Variable values	The field number used by the cutblock operator
CC_OWNER	Text	50	0	Cutblock Owner	ANC BLUE EDFR FRIA MWWC TALL WEYR	Alberta Newsprint Company Blue Ridge Lumber Ltd. Edfor Cooperative Ltd. Forest Resource Improvement Millar Western Whitecourt Division Tall Pine Timber Co. Ltd. Weyerhaeuser Canada Ltd.
CC_BLKYEAR	Text	50	0	Cutblock Timber Year	Variable values	The timber year in which the cutblock was harvested (2011 through 2015)
CC_OPENING	Text	50	0	Cutblock ARIS Opening Number	Variable values	The ARIS opening number assigned to the cutblock
CC_SOURCE	Text	50	0	Cutblock Source File Name	Variable values	Name of the source file in which the polygon was taken from
CC_STATUS	Text	50	0	Cutblock Harvest Status	Harvested	Confirmation that the block is harvested and not still a planned block
CC_STRATA	Text	10	0	Cutblock Strata	CD-P CD-SW C-P C-SW C-SW D D DC-P DC-S	Coniferous mixedwood with pine Coniferous mixedwood with white spruce Coniferous pine Sw stratum natural stand (NAT) yield curve Coniferous white spruce Deciduous >= 80% D Density stands Deciduous mixedwood with pine Deciduous mixedwood with spruce
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **DIDS**

Description: Post-AVI DIDs dispositions located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
DIDS	Text	5	0	Digital Integrated Disposition Type	DHR	Designated Historic Resource
					DML	Miscellaneous Lease
					DPI	Pipeline Installation Lease
					DPL	Pipeline Agreement
					DRS	Disposition Reservation
					EZE	Easement
					FDL	Farm Development Lease
					MLL	Miscellaneous Lease
					MLP	Miscellaneous Permit
					MSL	Mineral Surface Lease
					PEZ	Easement
					PIL	Pipeline Installation Lease
					PLA	Pipeline Agreement
					PLC	License of Occupation
					PLS	Private Land Sale
					PML	Miscellaneous Lease
					PMS	Mineral Surface Lease
					PPA	Pipeline Agreement
					PRL	Recreation Lease
					PSM	Surface Material License
					REA	Rural Electric Association Easement
					REC	Recreation Lease
					ROE	Right-Of-Entry Agreement
					RVC	Vegetation Control Easement
					SMC	Surface Material License
					SME	Surface Material Exploration
					SML	Surface Material Lease
					VCE	Vegetation Control Easement
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Ecosite**

Description: Ecosites within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
POLY_NUM	Double	8	38	AVI 2.1 polygon number	0 - X <Null>	Variable values
NSRCODE	Text	5	0	Natural subregion code	A CM DMW LF SA UF ' '	Alpine Central Mixedwood Dry Mixedwood Lower Foothills Subalpine Upper Foothills No Value
ECO1	Text	3	0	Ecosite Classification	a b c d e f g h i j k l m n X ' '	 No Value
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **FireSmart**

Description: FireSmart Community Zones that are found within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
FIRESMART	Text	30	0	FireSmart Community Zone Name	Alder Flats Bighorn Reserve Crimson Lake Cynthia Echo Canyon Edson Area Goldeye Hinton/Carlsdale Hoburg Lobstick/Hansonville Lodgepole Marlboro/Wapiti Ridge Nordegg Rocky Corridor Sunchild-O'Chiese	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **FireSmart Deletions**

Description: FireSmart Treatment Areas

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
Fsmart_Del	Text	20	0	FireSmart Deletions	FireSmart_Deletion	Polygon was a FireSmart Treatment
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq. m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Fish_Management_Zones**

Description: Fish Management Zones located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
FISHMGMT_N	Text	80	0	Fish Management Zone Name	Eastern Slopes Zone Northern Boreal Zone Parkland-Prairie Zone	
FISHMGMT_C	Text	5	0	Fish Management Zone Code	00001 00002 00003	Eastern Slopes Zone Parkland-Prairie Zone Northern Boreal Zone
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: FMA

Description: Forest management agreement area boundary

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
FMA	Text	15	0	Forest management agreement	Weyerhaeuser	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: FMU

Description: Old FMUs located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
OLDFMU	Text	5	0	Previous Forest Management Unit	E15 E2 R12 W5 W6	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: GoAHistoricResources

Description: Government of Alberta Identified Historic resources located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HRV	Long	4	0	Historical Resource Values	1	Provincial historic resource
					3	Significant historic resources likely requiring avoidance
					4	Historic Resources that may require avoidance
					5	Believed to contain a historic resource
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Grazing

Description: Grazing reserves located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
DISP_NUM	Text	15	0	Grazing Disposition Number		Variable values
GRAZING	Text	3	0	Grazing Disposition Type	FGL	Forest Grazing License
					GRL	Grazing Lease
					GRP	Grazing Permit
					GRR	Provincial Grazing Reserve
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Grizzly_Bear_Watersheds**

Description: Grizzly Bear Watersheds within the DFA, identified by number

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
BEARSHED	Long	2	0	Grizzly Bear Watershed Number	16 - 148	Grizzly bear watershed number
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values

Data Dictionary

Dataset Name: Grizzly_Bear_Zones

Description: Grizzly Bear Zones located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
GB_POPUNIT	Text	50	0	Grizzly Bear Population Unit	Clearwater Grande Cache Yellowhead	
TYPE	Text	10	0	Grizzly Bear Population Type	Core Secondary	Core Grizzly Bear Habitat Secondary Grizzly Bear Habitat
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Hamlets

Description: Hamlets located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HAMLET	Text	50	0	Hamlets	Cynthia Lodgepole Brazeau County Clearwater County Yellowhead County	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Hard Linear Features

Description: Hard Linear Features as designated by the Songbirds Model

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HLIN	Text	5	0	Hard Linear Features	HLIN	Hard Linear Feature according to the songbirds model
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: HUCWatershed

Description: Hydrologic Unit Code 8 (HUC8) Watersheds located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HUC	Text	50	0	Hydrologic Unit Code 8 Watershed Number	11010201 11010203 11010401 11010403 11010404 11010405 11010406 11020101 11020102 11020103 17010401 17010501 17020101 17020102 17020201 17020202 17020203 17020204 17030101 17030102 17030201 17030202 17030203 8010302	HUC 8 watershed number
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **HydroBuffers**

Description: Hydrology Buffers

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
TROUTMGMT	Text	10	0	Rainbow Trout Streams	Trout	Rainbow trout steam
BUFFER	Text	20	0	Buffer Type	Creek	Creek buffer (60 meters)
					Island	Feature is an isolated island less than 10 ha surrounded by hydrology buffers
					Lake	Lake and river buffers (100 meters)
					Stream	Stream buffer (30 meters)
					Swan	Trumpeter swan buffer (200 meters)
AREA_HA	Double	8	0	Area (ha)	0 - X	Variable values
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: HydroFeatures

Description: Hydrology Features

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HYDRO	Text	10	0	Hydrology Features	Hydro	Hydrologic feature
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable Values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable Values

Data Dictionary

Dataset Name: **Land_Use_Framework**

Description: Land Use Framework regions within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
LUF_NAME	Text	80	0	Land Use Framework Name	North Saskatchewan Upper Athabasca Red Deer	
LUF_CODE	Text	5	0	Land Use Framework Code	04 05 06	Upper Athabasca North Saskatchewan Red Deer
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: LOC

Description: Post AVI road dispositions within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
LOC	Text	5	0	LOC	DLO	License of Occupation
					LOC	Polygon is an LOC
					RDS	Provisional Roadway
					RRD	Registered Roadway
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **MPB_Rvalue**

Description: Mountain Pine Beetle R value within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
RVALUE	Text	10	0	MPB R value	High Low Mod VHigh	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **MPB_SSI**

Description: Stand Susceptibility Index within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
MPB_SSI	Long	4	10	MPB Stand Susceptibility Index	1-83	Variable values

Data Dictionary

Dataset Name: **Municipalities**

Description: Municipalities within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
HAMLET	Text	50	0	Hamlets	Cynthia	
					Lodgepole	
TOWN_NAME	Text	80	0	Towns	Calmar	
					Canmore	
					Cochrane	
					Vermilion	
					Smoky Lake	
					Spirit River	
					St. Paul	
					Stavely	
					Stettler	
					Stony Plain	
					Milk River	
					Millet	
					Morinville	
					Mundare	
					Nanton	
					Okotoks	
					Olds	
					Onoway	
					Oyen	
					Peace River	
					Penhold	
					Picture Butte	
					Pincher Creek	
					Ponoka	
					Provost	
					Rainbow Lake	
					Raymond	
					Redcliff	
					Redwater	
					Rimbey	
					Rocky Mountain House	
					Sedgewick	
					Sexsmith	
					Slave Lake	
					Bruderheim	
					Viking	
					Vulcan	
					Wainwright	
					Wembley	
					Edson	
					High River	
					Hinton	
					Innisfail	
					Irricana	
					Killam	
					Lamont	
					Legal	
					Magrath	
					Manning	

					Westlock	
					Whitecourt	
					Chestermere	
					Banff	
					Drumheller	
					Cardston	
					Carstairs	
					Strathmore	
					Sundre	
					Swan Hills	
					Sylvan Lake	
					Trochu	
					Athabasca	
					Barrhead	
					Bashaw	
					Bassano	
					Taber	
					Three Hills	
					Tofield	
					Beaumont	
					Beaverlodge	
					Bentley	
					Black Diamond	
					Blackfalds	
					Bon Accord	
					Turner Valley	
					Two Hills	
					Valleyview	
					Vauxhall	
					Vegreville	
					Bonnyville	
					Bow Island	
					Bowden	
					Daysland	
					Devon	
					Didsbury	
					Drayton Valley	
					Eckville	
					Claresholm	
					Coalhurst	
					Coaldale	
					Coronation	
					Crossfield	
					Mayerthorpe	
					McLennan	
					Elk Point	
					Fairview	
					Falher	
					Fort Macleod	
					Fox Creek	
					Gibbons	
					Grande Cache	
					Granum	
					Grimshaw	
					Hanna	
					Hardisty	
					High Level	
					High Prairie	
					Castor	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **NaturalAreas**

Description: Natural Areas within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
NATAREA	Text	10	0	Natural Areas	Aurora	
					O'Chiese	
					Prime Protection	Eastern Slopes Prime Protection Zone
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: NaturalSubregions

Description: Natural Subregions that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
NSRNAME	Text	19	0	Natural subregion name	ALPINE CENTRAL MIXEDWOOD DRY MIXEDWOOD LOWER FOOTHILLS SUBALPINE UPPER FOOTHILLS	
NSRCODE	Text	5	0	Natural subregion code	A CM DMW LF SA UF	Alpine Central Mixedwood Dry Mixedwood Lower Foothills Subalpine Upper Foothills
NRNAME	Text	16	0	Natural region name	BOREAL FOOTHILLS ROCKY MOUNTAIN	Boreal forest Foothills forest Rocky Mountain
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: OpBuffers

Description: Operational Buffers identified by Weyerhaeuser

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
OPBUFFER	Text	50	0	Operational Buffers	OpBuffer	Operational Buffer Deletion
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **OpDels**

Description: Operational Deletions identified by Weyerhaeuser

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
OPDEL	Text	50	0	Operational and SHS Deletions	OpDel SHS	Operational Deletion Spatial Harvest Sequence Deletion
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Parks**

Description: Parks and recreational areas located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
PARKTYPE	Text	10	0	Park Type	ER	Ecological reserve
					PLREC	Public lands recreation area
					PP	Provincial park
					PRA	Provincial recreation area
					WPP	Wildland provincial park
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **PlannedBlocks**

Description: Blocks planned for harvest after the landbase effective date (May 1, 2015)

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_12	OID	4	0	ArcGIS Object ID	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
PLCC_OPEN	Text	50	0	Planned Cutblock Opening Number	Variable values	ARIS number assigned to planned cutblock
PLCC_OWNER	Text	50	0	Cutblock Owner based on Planned Cutblocks Layer	ANC	Alberta Newsprint Company
					BLUE	Blue Ridge Lumber Ltd.
					CTP	Community Timber Permit
					EDFR	Edfor Cooperative Ltd.
					ETP	Edson Timber Products
					MWWC	Millar Western Whitecourt Division
					TALL	Tall Pine Timber Co. Ltd.
					WEYR	Weyerhaeuser Canada Ltd.
PLCC_STATU	Text	50	0	Planned Cutblock Harvest Status	PLAN10	Planned blocks for the first ten years of the SHS
					PLAN2	Planned blocks to be harvested between 2015 and 2017
					PLAN20	Planned blocks for the first twenty years of the SHS
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: PNT

Description: Protective Notations (PNTs) that are deleted from the landbase

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
PNT	Text	5	0	Protective notations	PNT	Protective notation deletion
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **PrivateLand**

Description: Private land located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_12	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
PRIVATE	Text	10	0	Private Land	PRIVATE FEDERAL	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: PSP

Description: Permanent sample plots located within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
PSP	Text	10	0	Permanent Sample Plot	GOA Weyer	Provincial PSP Weyerhaeuser PSP
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: R15

Description: R15 FMU Boundary

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
FMU_NAME	Text	80	0	Forest Management Unit name	R15	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **RainbowTroutStreams**

Description: Rainbow trout occupied streams within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
TroutMgmt	Text	50	0	Rainbow trout streams	Rainbow Trout	Rainbow trout stream
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **RFMA**

Description: Registered Fur Management Area boundaries

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
RFMA_CODE	Text	5	0	Registered Fur Management Area Code	00001 - 01658 ' '	RFMA Identifier Not an RFMA
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **RSA_Merge**

Description: RSA survey polygons within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
UNIQUE_ID	Text	16	0	RSA Polygon Unique ID	0 - X	Variable Values
OPENING	Text	12	0	ARIS Opening Number	0 - X	Variable Values
POLYGON	Text	3	0	RSA Subunit Number	1 - 5	
AREA_HA	Double	8	0	Area (ha)	0 - X	Variable Values
NAA	Short	4	0	Net Assessement Area	0 1 2	Net Assessment Area Anthropogenic deletions Natural Deletions
COMPANY	Text	50	0	Harvest Operator	ANC EDFOR <Null>	Alberta Newsprint Company Edfor Cooperative Ltd. Operator Not Listed
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Seismic**

Description: Seismic lines within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
SEISMIC	Long	2	0	Seismic polygon identifier	1	Seismic line
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: SteepSlopes

Description: Steep slope deletions within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
SLOPE	Long	2	0	Sloped area identifier	55	Slope of 55% or greater
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **TemporaryExclusions**

Description: Temporary Exclusions within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
TEMPEXCL	Text	20	0	Temporary Exclusion	BEARLAKE	Bear Lake
					CRIMSON	Crimson Lake
					OCHIESE	O'Chiese Natural Area
					RODNEY	Rodney Creek
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Townships

Description: Townships that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
M	Long	2	0	Meridian	5	The 5th meridian
RGE	Long	2	0	Range	5 - 23	Variable values
TWP	Long	2	0	Township	39 - 58	Variable values
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Tree_Improvement_Zones

Description: Region I White Spruce Tree Improvement Zone boundary within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
TREEIMP	Text	10	0	Tree Improvement Zones	TREEIMP	Tree Improvement Zones
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Tree_Seed_Zones**

Description: Tree seed zones within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
SEEDZONE	Text	40	0	Seed zone code	A 1.2	Alpine Zone 1.2 - Athabasca-Kootenay Alpine
					CM 3.5	Central Mixedwood Zone 3.4 - Drayton Central Mixedwood Plains
					DM 2.3	Dry Mixedwood Zone 2.3 - Redd Deer Dry Mixedwood Plains
					LF 1.5	Lower Foothills Zone 1.5 - McLeod-North Saskatchewan Lower Foothills
					LF 2.1	Lower Foothills Zone 2.1 - Athabasca-McLeod Lower Foothills
					LF 2.2	Lower Foothills Zone 2.2 - Brazeau-Clearwater Lower Foothills
					SA 1.2	Subalpine Zone 1.1 - Athabasca-Kootenay Lower Subalpine
					SA 2.2	Subalpine Zone 2.2 - Athabasca-Kootenay Upper Subalpine
					UF 1.2	Upper Foothills Zone 1.2 - Mayberne Upper Foothills
					UF 1.4	Upper Foothills Zone 1.4 - Athabasca-North Saskatchewan Upper Foothills
					UF 2.4	Upper Foothills Zone 2.4 - Brazeau Upper Foothills
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: VSA

Description: Volume Supply Areas

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
VSA	Long	2	0	Volume Supply Area	1 - 4	VSA number
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Watersheds**

Description: Watershed that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
WATERSHEDS	Text	50	0	Landbase Watershed Assignment	Athabasca	
					Baker	
					Baptiste	
					Bear	
					Big Beaver	
					Bigoray	
					Brazeau	
					Brewster	
					Broken Arm	
					Bruce	
					Cairn	
					Chiefs	
					Chip	
					Chungo	
					Corser	
					Coyote	
					Crimson	
					Cynthia	
					Deer	
					Dismal	
					Dzida	
					East Baptiste	
					East Bear	
					East Carrot	
					East Chambers	
					East Eta	
					East Fickle	
					East Lobstick	
					East Nordegg	
					East Poison	
					East Rundell	
					East Sturrock	
					East Zeta	
					Edson	
					Embarras	
					Erith	
					Fairless	
					Garden	
					Graham	
					Granada	
					Grey Owl	
					Groat	
					Half Moon	
					Hanlan	
					Hansen	
					Hardluck	
					Highway	
					Hoke	
					Horseshoe	
					House	
					Jerry	
					Kathy	
					Keyera	

Data Dictionary

Dataset Name: **Watersheds**

Description: Watershed that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Little Grey Owl	
					Lobstick	
					Lookout	
					Lower Blackstone	
					Lower Carrot	
					Lower Chambers	
					Lower Moose	
					Lower North Rat	
					Lower Pembina	
					Lower Sang	
					Lower Saskatchewan	
					Lower Wapiabi	
					Lower Wolf	
					Macmillan	
					Marsh	
					Marshybank Fringe	
					Marshybank Fringe2	
					Marshybank Fringe3	
					Mason	
					Mcleod	
					Middle Blackstone	
					Middle Marshybank	
					Middle Open	
					Middle Pembina	
					Middle Poison	
					Middle Wolf	
					Mink	
					Minnow	
					Negraiff	
					Niton	
					Nojack	
					Noname	
					Nordegg	
					North Athabasca	
					North Brewster	
					North Colt	
					North Corser	
					North Elk	
					North Marshybank	
					North O'Chiese	
					North Open	
					North Rapid	
					North Saskatchewan	
					Obed	
					O'chiese	
					Oldman	
					Owl	
					Paddle	
					Paddy	
					Peco	
					Penti	
					Plateau	
					Prarie	
					Rapid	
					Raven	
					Rehn	

Data Dictionary

Dataset Name: **Watersheds**

Description: Watershed that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Reservoir	
					Rocky	
					Rockyview	
					Rodney	
					Sand	
					Shinningbank	
					Sinkhole	
					South Baptiste	
					South Bear	
					South Elk	
					South Lobstick	
					South Lookout	
					South Marshybank	
					South Mcleod	
					South Open	
					South Rat	
					Stephens	
					Stephens Fringe	
					Sturrock	
					Sunchild	
					Sundance East	
					Sundance West	
					Sundre	
					Sutherland	
					Svedberg	
					Swartz	
					Tall Pine	
					Tom	
					Trout	
					Upper Blackstone	
					Upper Brown	
					Upper Chambers	
					Upper Chambers Fringe	
					Upper Moose	
					Upper North Rat	
					Upper Pembina	
					Upper Sang	
					Upper Saskatchwan	
					Upper Wapiabi	
					Upper Wolf	
					Varty	
					Wawa	
					Welch	
					West Baptiste	
					West Carrot	
					West Chambers	
					West Chungo	
					West Eta	
					West Fickle	
					West Lobstick	
					West Lower Blackstone	
					West Moose	
					West Negraiff	
					West Poison	
					West Zeta	
					Whitefish	

Data Dictionary

Dataset Name: **Watersheds**

Description: Watershed that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Wilson None	
WATSHDCODE	Long	2	0	Watershed Code	1 - 168	Watershed number
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Wildfire_ Mgmt_Zones

Description: Wildfire management zones that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
WILDFIRE	Text	80	0	Wildfire Management Area Name	Edson Rocky Mountain House Whitecourt	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Wildfires

Description: Wildfires within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
FIRENUMBER	Text	12	0	PFFC Fire number	RWF-020-2013 RWF-042-2013	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **Wildlife_Mgmt_Units**

Description: Wildlife Management Units that intersect the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID_1	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
Wildlife	Text	20	0	Wildlife Management Unit Name	Alder Flats Bighorn Bigoray Blackstone Cardinal Carrot Creek Chip Lake Elk River McLeod River OChiese Red Cap Schunda Shiningbank Wolf River	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: Woodsheds

Description: Woodsheds found within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
WOODSHED	Text	254	0	Woodshed Identifier	001-WLFW	
					002-WLFW	
					003-WLFW	
					004-WLFW	
					005-WLFW	
					006-WLFE	
					007-WLFE	
					008-SDIS	
					009-POCH	
					010-POCH	
					011-WLFE	
					012-BARM	
					013-LGPL	
					014-JACK	
					015-BRAZ	
					016-CATH	
					017-POWR	
					018-NBRA	
					019-PEMB	
					020-DOMN	
					021-CRMS	
					022-STRW	
					023-SDER	
					024-NORM	
					025-ALDR	
					026-WLFC	
					027-MEDI	
					028-SASK	
					029-GOSL	
					030-BEND	
					031-OPEN	
					032-BREW	
					033-OMNI	
					034-BREW	
					035-CHAM	
					036-GRAC	
					037-CHAM	
					038-LUIS	
					039-PRNT	
					040-SUNC	
					041-OBEDLK	
					042-OBEDLK	
					043-MEDICI	
					044-MEDICI	
					045-SUNDAN	
					046-EASYFD	
					047-EASYFD	
					048-BIGORY	
					049-BIGORY	
					050-BIGORY	
					051-CHIPLK	
					052-LOBSTK	
					053-WAWA	
					054-STVN	

Data Dictionary

Dataset Name: Woodsheds

Description: Woodsheds found within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					055-GREY	
					056-RAPD	
					057-RAPD	
					058-STVN	
					059-GREY	
					060-DOCS	
					061-DOCS	
					062-SBRA	
					063-ERUN	
					064-SBRA	
					065-SRES	
					066-SRES	
					067-SRES	
					068-SBRA	
					069-CHUN	
					070-RACE	
					071-CNYN	
					072-GAP	
					073-NFLS	
					074-BMNT	
					075-TRNK	
					076-BEVR	
					077-ELKE	
					078-NCNL	
					079-SCNL	
					080-BDRY	
					081-BDRY	
					082-WRUN	
					083-ERUN	
					084-NDIS	
					085-NDIS	
					086-NDIS	
					087-WLFW	
					088-NDIS	
					089-NOJACK	
					090-NOJACK	
					091-SINKHL	
					092-CHIPLK	
					093-ETALAK	
					094-ETALAK	
					095-ETALAK	
					096-ETALAK	
					097-ETALAK	
					098-PADDYC	
					099-PADDYC	
					100-SRATCK	
					101-SRATCK	
					102-PEMBIN	
					103-PEMBIN	
					104-BIGROK	
					105-BIGROK	
					106-BIGROK	
					107-PEMBIN	
					108-ZETALK	
					109-SRATCK	
					110-ZETALK	
					111-ZETALK	
					112-MINNWL	

Data Dictionary

Dataset Name: Woodsheds

Description: Woodsheds found within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					113-NRATCK	
					114-SRATCK	
					115-NRATCK	
					116-NRATCK	
					117-NRATCK	
					118-NRATCK	
					119-GRANAD	
					120-GRANAD	
					121-SANGLK	
					122-TOWERX	
					123-LOSTER	
					124-TOWERX	
					125-NINEML	
					126-MINNWL	
					127-MINNWL	
					128-COYOTE	
					129-RODNEY	
					130-RODNEY	
					131-RODNEY	
					132-SANGLK	
					133-BROCAB	
					134-SANGLK	
					135-BROCAB	
					136-SWANSN	
					137-SUNDAN	
					138-SWANSN	
					139-MEDICI	
					140-SUNDAN	
					141-SUNDAN	
					142-GRANDE	
					143-DEERHL	
					144-DEERHL	
					145-TROUTC	
					146-TROUTC	
					147-TROUTC	
					148-PIONER	
					149-TOMHIL	
					150-OLDMAN	
					151-TOMHIL	
					152-TOMHIL	
					153-CRICKS	
					154-CRICKS	
					155-OLDMAN	
					156-SHININ	
					157-SHININ	
					158-EASTBK	
					159-MCLEOD	
					160-MCLEOD	
					161-MCLEOD	
					162-HATTON	
					163-HATTON	
					164-HATTON	
					165-MACKAY	
					166-HATTON	
					167-MACKAY	
					168-MACKAY	
					169-SWANSN	
					170-FICKLE	

Data Dictionary

Dataset Name: **Woodsheds**

Description: Woodsheds found within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					171-FICKLE	
					172-ERITHX	
					173-ERITHX	
					174-ERITHX	
					175-SVEDBG	
					176-SVEDBG	
					177-SVEDBG	
					178-SVEDBG	
					179-RODNEY	
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Data Dictionary

Dataset Name: **WorkingAreas**

Description: Working Areas within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
OBJECTID	OID	4	0	ArcGIS Object Id	0 - X	Variable values
SHAPE	Geometry	0	0	Feature Geometry	Polygon	Feature is a polygon
WORKAREA	Text	200	0	Working area	Beaver Flats	
					Big Bend	
					Big Rock	
					Bigoray	
					Black Mountain	
					Boundary	
					Brazeau Tower	
					Brewster Creek	
					Broken Arm	
					Broken Cabin	
					Canal	
					Canyon Creek	
					Cathedral Grove	
					Chambers Creek	
					Chip Lake	
					Chungo Lookout	
					Coyote Creek	
					Cricks Creek	
					Crimson	
					Deer Hill	
					Docs Lake	
					Dominion Lake	
					East Bank	
					Easyford	
					Elke Summers	
					Erith	
					Eta Lake	
					Fickle Lake	
					Grace Creek	
					Granada	
					Grand Trunk	
					Grande Prairie Trail	
					Hattonford	
					Jack Knife	
					Key Hole	
					Lobstick	
					Lodgepole	
					Lodgepole DV	
					Lookout Creek	
					Lost Elk Ridge	
					Louis Lake	
					MacKay	
					McLeod Crossing	
					Medicine Creek	
					Medicine Lodge	
					Minnow Lake	
					Nine Mile	
					No Name Creek	
					Nojack South	
					Norms Throw	

Data Dictionary

Dataset Name: **WorkingAreas**

Description: Working Areas within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					North Brazeau	
					North Dismal Creek	
					North False Gap	
					North Pembina	
					North Rat Creek	
					Obed Lake	
					Oldman Creek	
					Paddy Creek	
					Pembina	
					Pioneer	
					Poachers Creek	
					Power House	
					Race Creek	
					Rapid Creek	
					Rodney Creek	
					Rundell	
					Sang Lake North	
					Sang Lake South	
					Saskatchewan	
					Shiningbank East	
					Sinkhole Lake	
					South Brazeau	
					South Dismal Creek	
					South False Gap	
					South Rat Creek	
					South Reservoir	
					Stevens Creek	
					Strawberry Mountain	
					Sundance Creek	
					Surprise Lake	
					Svedberg	
					Swanson	
					The GAP	
					Tom Hill	
					Tower	
					Trout Creek	
					Trunk Road	
					Wawa	
					Wolf Lake East	
					Wolf Lake West	
					Zeta Lake	
WORKCODE	Text	8	0	Working Areas Code	BEVRFL	Beaver Flats
					BIGBND	Big Bend
					BIGORY	Bigoray
					BIGROK	Big Rock
					BLKMNT	Black Mountain
					BOUDRY	Boundary
					BRAZEU	Brazeau Tower
					BREWST	Brewster Creek
					BROARM	Broken Arm
					BROCAB	Broken Cabin
					CANALS	Canal
					CANYON	Canyon Creek

Data Dictionary

Dataset Name: WorkingAreas

Description: Working Areas within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					CATHED	Cathedral Grove
					CHAMBR	Chambers Creek
					CHIPLK	Chip Lake
					CHUNGO	Chungo Lookout
					COYOTE	Coyote Creek
					CRICKS	Cricks Creek
					CRIMSN	Crimson
					DEERHL	Deer Hill
					DOCSLK	Docs Lake
					DOMNLK	Dominion Lake
					EASTBK	East Bank
					EASYFD	Easyford
					ELKESU	Elke Summers
					ERITHX	Erith
					ETALAK	Eta Lake
					FICKLE	Fickle Lake
					GRACEC	Grace Creek
					GRANAD	Granada
					GRANDE	Grande Prairie Trail
					GRANDT	Grand Trunk
					HATTON	Hattonford
					JACKNI	Jack Knife
					KEYHOL	Key Hole
					LGPLDV	Lodgepole DV
					LOBSTK	Lobstick
					LODGEP	Lodgepole
					LOOKOU	Lookout Creek
					LOSTER	Lost Elk Ridge
					LOUISL	Louis Lake
					MACKAY	Mackay
					MCLEOD	McLeod
					MEDICI	Medicine Lodge
					MEDICR	Medicine Creek
					MINNWL	Minnow Lake
					NBRAZU	North Brazeau
					NDISML	North Dismal Creek
					NFLSGP	North False Gap
					NINEML	Nine Mile
					NOJACK	Nojack South
					NONAME	No Name Creek
					NORMTH	Norms Throw
					NRATCK	North Rat Creek
					OBEDLK	Obed Lake
					OLDMAN	Oldman Creek
					PADDYC	Paddy Creek
					PEMBIN	Pembina
					PEMBNT	North Pembina
					PIONER	Pioneer
					POACHC	Poachers Creek
					POWERH	Power House
					RACECK	Race Creek
					RAPDCK	Rapid Creek
					RODNEY	Rodney Creek
					RUNDEL	Rundell

Data Dictionary

Dataset Name: **WorkingAreas**

Description: Working Areas within the DFA

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_American_1983 Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					SANGLN	Sang Lake North
					SANGLS	Sang Lake South
					SASKAT	Saskatchewan
					SBRAZU	South Brazeau
					SDISML	South Dismal Creek
					SFLSGP	South False Gap
					SHININ	Shiningbank East
					SINKHL	Sinkhole Lake
					SRATCK	South Rat Creek
					SRESER	South Reservoir
					STRWMN	Strawberry Mountain
					STVNCK	Stevens Creek
					SUNDAN	Sundance Creek
					SURPRI	Surprise Lake
					SVEDBG	Svedberg
					SWANSN	Swanson
					THEGAP	The Gap
					TOMHIL	Tom Hill
					TOWERX	Tower
					TRNKRD	Trunk Road
					TROUTC	Trout Creek
					WAWAWC	Wawa
					WOLFLE	Wolf Lake East
					WOLFLW	Wolf Lake West
					ZETALK	Zeta Lake
SHAPE_LENGTH	Double	8	0	Polygon Perimeter in Meters	0 - X	Variable values
SHAPE_AREA	Double	8	0	Area (sq.m)	0 - X	Variable values

Appendix VIII – AVI Final Report

Weyerhaeuser Pembina FMA

Alberta Vegetation Inventory

Final Wrap-up Report

Submitted To:
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February 25, 2016

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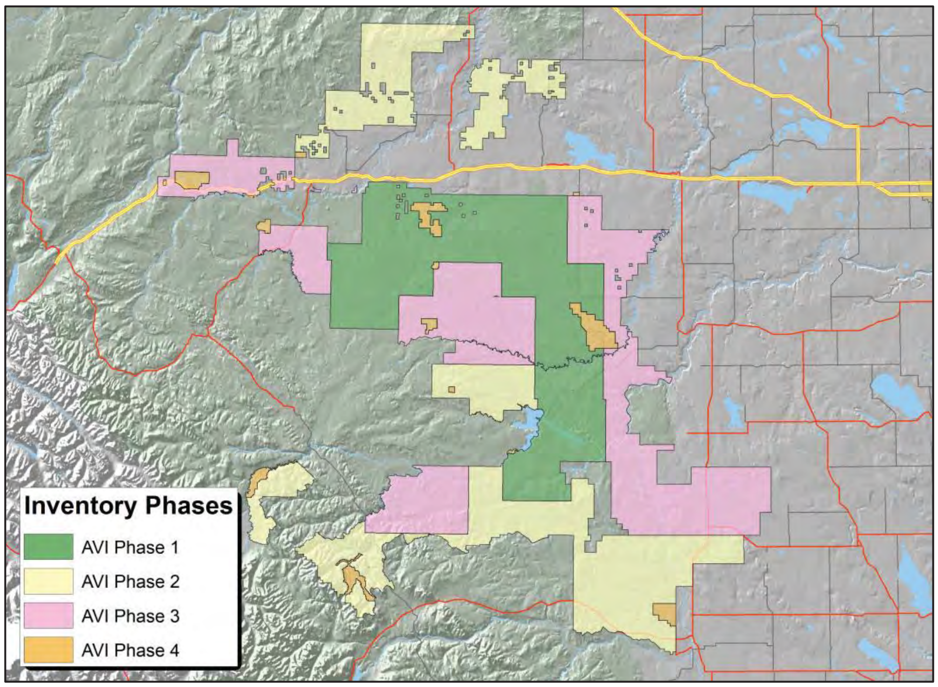
1.0 INTRODUCTION

In 2012 Weyerhaeuser Company Ltd. (Pembina Timberlands) acquired 4 band 30cm stereo imagery to complete an Alberta Vegetation Inventory (AVI) for approximately 1,000,000 ha of area. This inventory will serve as the foundation for the upcoming Detailed Forest Management Plan. As a means of initiating the process, Weyerhaeuser met with Agriculture and Forestry (AF) on January 27, 2012 to discuss plans for implementing the land base inventory. As a follow up to that meeting, AF provided a number of items for Weyerhaeuser to answer prior to initiating the inventory project. The following document outlines the details of the inventory process, methods/imagery used, and addresses the items AF requested.

2.0 AREA OF INTEREST

The Weyerhaeuser AVI was originally split into 3 phases, with a 4th phase added to cover inventory inside the FMU but outside the FMA area. The 4th phase was added after the initial inventory phases had commenced.

Figure 2-1: AVI Phases for the FMA Inventory Program

PHASE	AREA (ha)	AVI PHASE MAP
Phase 1	301,628	
Phase 2	347,150	
Phase 3	356,380	
Phase 4	30,769	
Total	**1,035,927**	

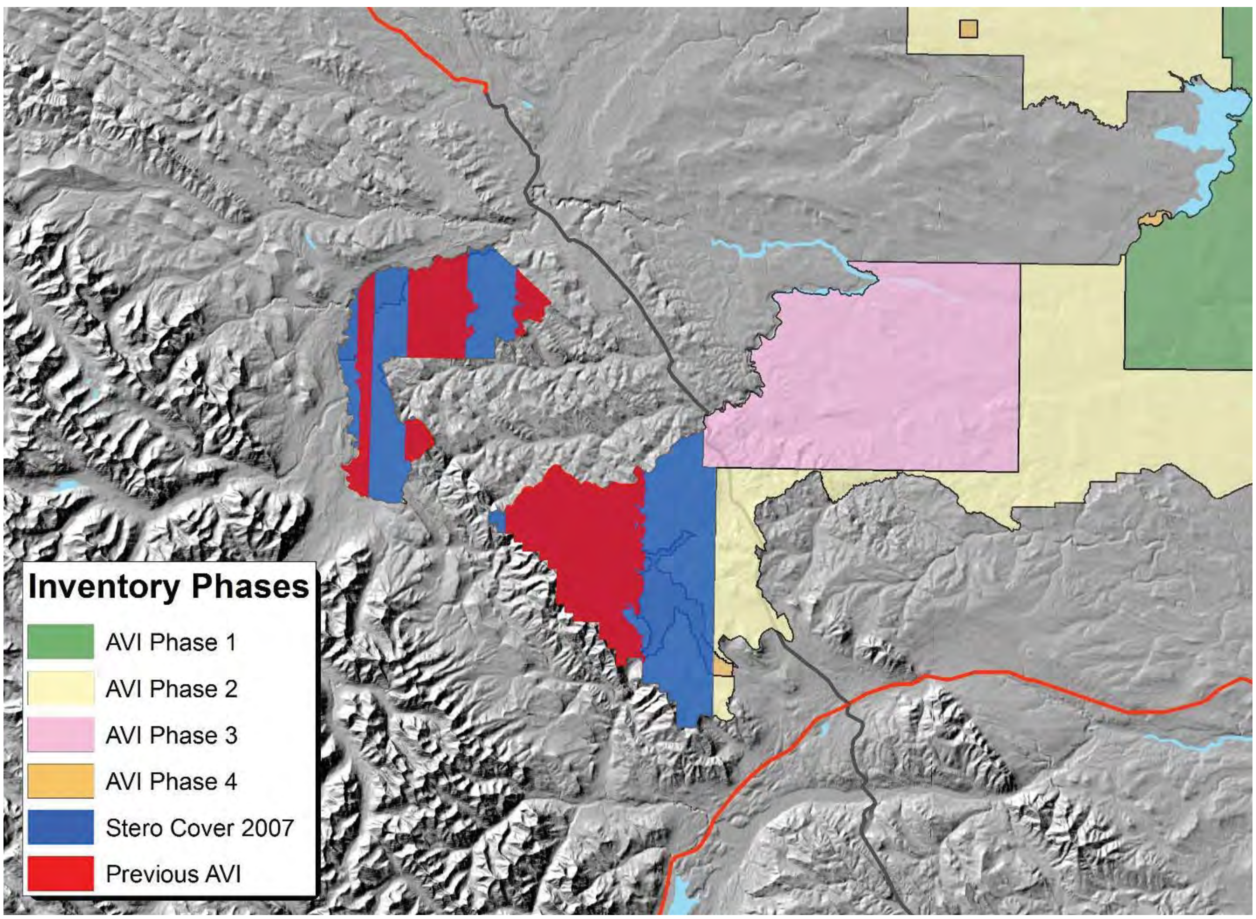
3.0 IMAGERY/SPATIAL/TABULAR DATA LAYERS

3.1 Imagery Specifications

For the completion of the forest inventory, Weyerhaeuser utilized leaf-on 4-band digital imagery collected during the summer of 2012 by North West Geomatics. The imagery was gathered with the use of a state-of-the-art Leica ADS80 sensor at a resolution of 30 cm. Alternative imagery and existing inventory was necessary to use for a western portion of the FMA not captured during the 2012 flight program.

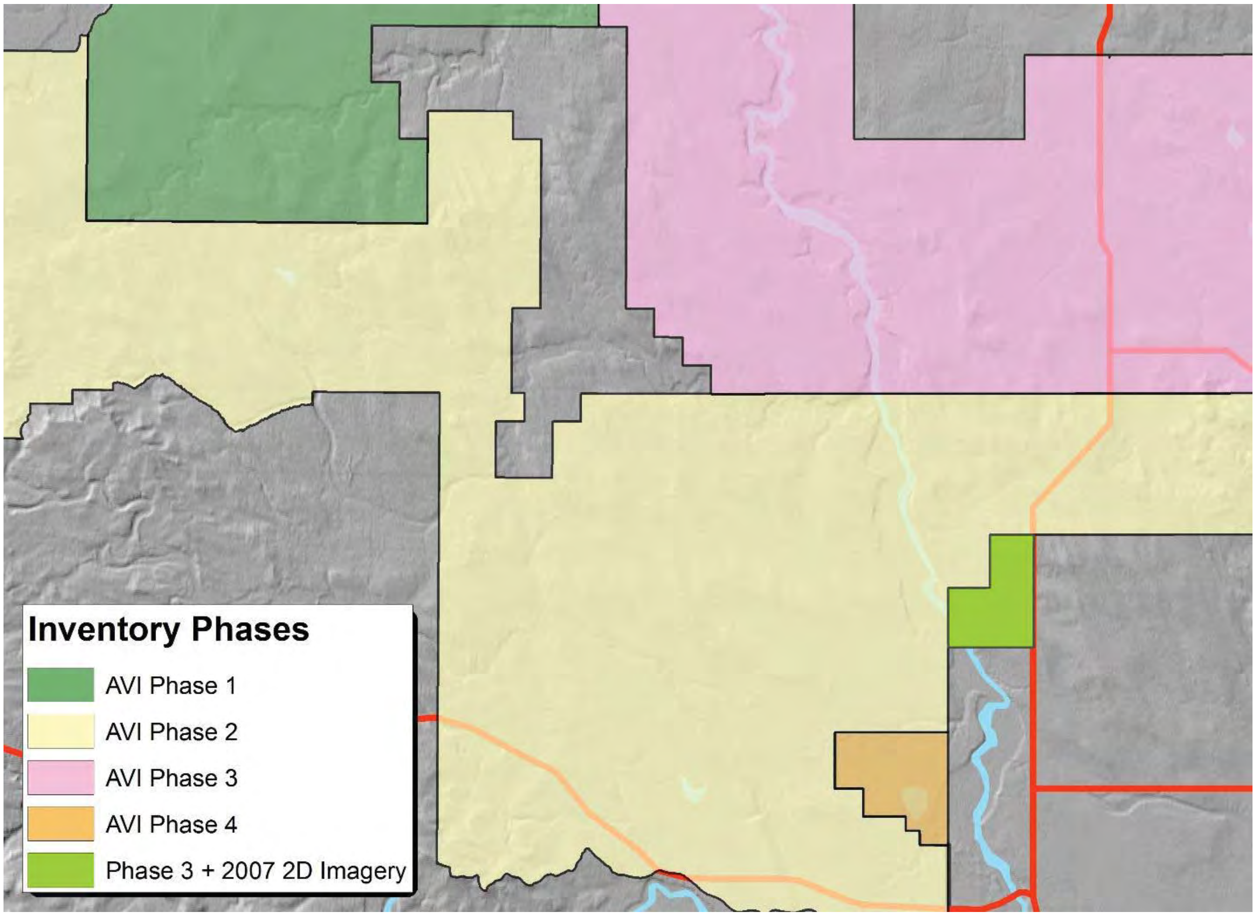
In the figure below, areas highlighted in blue and red represents the portion of FMA that was not originally captured during the 2012 flight program. Additional attempts have been made to acquire this area, however, due to weather conditions and other timing constraints recent imagery was not available to use in the process of the forest inventory update. The most recent imagery (highlighted in blue) with stereo coverage available from 2007 was used for completion of the inventory in this area of the FMA. The inventory generated with this imagery was completed up to the closest section line with full coverage. For the remaining area (highlighted in red) the previous AVI was used to fill the gap. Once imagery becomes available the inventory will be updated.

Figure 3-1: Alternative Imagery Utilized in the FMA Inventory



In figure 3-2 below, part of township 41-7 (bright green) was another portion of FMA that was not originally captured during the 2012 flight program. The inventory was completed through the use of the old phase 3 inventory combined with 2007 2D imagery from North West Geomatics.

Figure 3-2: Alternative Imagery Utilized in the FMA Inventory for Township 41-7.



3.2 Data Layers

Table 3-1: Data layers used for completing the AVI

DATA LAYER	SOURCE	DATA LAYER USE
4-Band 30cm digital imagery	North West Geomatics	AVI 2.1.1 delineation and interpretation
LiDAR	AF	Canopy height reference layer
Fire boundaries	AF	Fire year, boundary reference
Previous AVI	Weyerhaeuser	AVI 2.1.1 origin and interpretation reference
2007 2D Imagery	North West Geomatics	Interpretation of township 41-7
2007 TARIN Imagery	Weyerhaeuser	Interpretation of the western FLUS area
Phase 3 Inventory	AF	Interpretation of township 41-7, reference for origins/general use for interpreters to reference
Cutblock boundaries	Weyerhaeuser	Cutblock origin, boundary reference
DIDs	AF	Reference for interpretation
TSP/PSP	Weyerhaeuser	Species and origin reference

4.0 ASSUMPTIONS AND DECISIONS ASSOCIATED WITH THE WORK COMPLETED

The following subsections outline various assumptions made in the project and decisions executed to complete the inventory, subject to desired outcomes and specifications. These assumptions and decisions are important for the proper application and use of the final inventory results developed from the project.

4.1 Softcopy Software

Silvacom was required to utilize softcopy software to complete the interpretation of the forest vegetation inventory, as contracted by Weyerhaeuser Pembina. To carry out the interpretation, Silvacom employed Summit Evolution softcopy software by DAT/EM.

4.2 Inventory Specification

The vegetation inventory was completed according to AVI 2.1.1 specifications. The understorey was captured to meet the same specifications.

4.3 Interpretation Within Area Missing 2012 4-Band Imagery

As indicated in Section 3.1, the delineation and interpretation for a small portion of the AVI was completed using 2007 imagery and previous inventory (see Figure 3-1). Since this area is primarily composed of mature stand types, experienced photo interpreters used the previous inventory's cutblock information and available LiDAR to help guide the interpretation. This portion of the FMA was augmented with additional interpretation validation. Two days of flying in this area was completed, followed by ground validation plots.

4.4 Polygon Delineation

The following are AVI 2.1.1 minimum polygon size variances that Weyerhaeuser has incorporated in their AVI:

- Linear features 15 meters in width and greater were captured in the AVI delineation process.
- Retention patches greater than 2 ha within cutblocks were delineated and attributed with the cutblock opening number.

4.4.1 Cutblock Boundaries

The delineation of cutblock boundaries was a process that changed after commencing the inventory project. Initially, cutblock boundaries were maintained from pre-disturbance stand boundaries. This method was discovered to be problematic for retaining the level of accuracy and precision targeted for the delineation of the land base. The process was adjusted so that photo interpreters would delineate cutblock boundaries based on what was seen in the photographic imagery.

4.5 Stand Origins and Modification Year

Origins were assigned to polygons based on a number of reference sources, including:

- Phase 3 inventory map sheets
- Previous inventory
- Data collected in the field (TSPs, PSPs, interpreter ground truthing data)
- Other reference layers (ARIS records, cutblocks and fire)

4.5.1 Cutblock Modification Year

An important variable related to the stand origin field is the cutblock modification year. This field represents the year that the stand was harvested and transferred into a regenerating stand. To ensure consistency in definition across the land base, the cutblock modification year was determined to be equal to the skid clearance date.

5.0 PROJECT COMMUNICATIONS/MEETINGS

Communication between various parties involved was important to ensure project expectations were understood and to deal with any issues that arose during the process. Table 5-1 summaries meetings held regarding the project.

Table 5-1: Summary of Project Communications/Meetings

COMMUNICATION/MEETING ATTENDEE(S)	DATE	PURPOSE OF MEETING
Kerri MacKay & Paul Scott	January 28, 2013	To review existing cutblock boundaries in relation to new imagery and what is the best way to handle boundary adjustments.
Chris Lommerse	January 29, 2013	To review early stages of polygon delineation.
Kerri MacKay & Paul Scott	March 22, 2013	
Weyerhaeuser/AF/Silvacom	July 4, 2013	Meeting with AF to discuss cutblock delineation issues.
Weyerhaeuser/AF/Silvacom	July 24, 2013	Field trip
AF	October 2, 2013	AF delivered the results of the preliminary audit of 2 test townships.
Weyerhaeuser/AF	October 22, 2013	To discuss results of the preliminary audit.
Weyerhaeuser/AF/Silvacom	November 15, 2013	To further discuss the preliminary audit results with Silvacom staff.
Liana Luard	December 13, 2013	Weyerhaeuser provided a project scoping document for approval-in-principle.
Liana Luard	December 17, 2013	Approval-in-principle was provided.
Kerri MacKay	December 9, 2014	To discuss gaps in image coverage.
Kerri MacKay	December 11, 2014	To discuss gaps in image coverage and use of 2007 Tarin Imagery.
Paul Scott	January 9, 2014	To further discuss cutblock delineation.
Kerri MacKay & Paul Scott	January 22, 2015	To discuss gaps in image coverage, and further discuss cutblocks in AVI.

Kerri MacKay	February 26, 2015	To discuss gaps in image coverage and work completed
Kerri MacKay	April 15, 2015	To discuss gap in image cover and the area using 2D image.
Weyerhaeuser/AF/Silvacom	June 18, 2015	To discuss the outages with TWP 55-13-5

6.0 QUALITY CONTROL/AF AUDITS

Silvacom follows a strict internal audit procedure for completing AVI which includes internal independent interpreter review, following internal ISO process and completing internal attribute and spatial quality control checks.

In addition to Silvacom's internal quality control procedures, the following processes were conducted through the completion of the forest inventory:

≠ Field visit(s) by Weyerhaeuser, Contractor and AF
≠ Test townships for each interpreter submitted to FMB for an early "unofficial audit"
≠ FMB and/or Informatics Branch visits to complete on-screen assessments of the delineation
≠ FMB and/or Informatics Branch visits to complete on-screen assessments of the interpretation
≠ Packages of approximately 10 townships submitted to FMB as they were completed for a final audit
≠ Running of AF-supplied spatial and attribute audit tools on the AVI prior to submission
≠ Final AVI submitted to FMB for a spatial review (the interpretation audits, with the associated final approvals, will already be completed for each township package)

Table 6-1 below shows the details of the test township submissions and their associated results. The details and results of the audit package submissions are displayed in Table 6-2.

Table 6-1: Test Township Submissions

SUBMISSION DATE	APPROVAL DATE	INTERPRETER	TOWNSHIP SUBMITTED	PASS/ FAIL
August 16, 2014	September 26, 2013	Elisha Cahoon	Twp 50 R 11 W5M	Pass
August 16, 2014	September 26, 2013	Mark Hemstock	Twp 51 R 11 W5M	Pass
March 20, 2014	June 2, 2014	David Taylor	Twp 56 R 13 W5M	Pass
March 20, 2014	June 2, 2014	Jesse Nebo	Twp 40 R 8 W5M	Pass
January 27, 2014	January 27, 2014	Karlie Higgins	Twp 57 R 15 W5M	Pass
March 18, 2015	June 2014	Chris Lommerse	Twp 43 R 5 W5M	Pass

Table 6-2: Audit Package Submissions

SUBMISSION DATE	APPROVAL DATE	# OF TOWNSHIPS SUBMITTED	TOWNSHIPS SELECTED FOR AUDIT	PASS %	PASS/ FAIL
January 17, 2014	April 11, 2014	8	TWP47R10W5M	93.0%	Pass
			TWP52R12W5M	83.3%	Pass
			TWP44R11W5M	82.5%	Pass
February 27, 2014	April 11, 2014	10	TWP51R12W5M	81.0%	Pass
			TWP56R16W5M	80.0%	Pass
April 22, 2014	July 18, 2014	6	TWP46R11W5M	92.3%	Pass
			TWP56R13W5M	86.0%	Pass
July 29, 2014	November 19, 2014	8	TWP49R11W5M	80.1%	Pass
			TWP50R12W5M	80.5%	Pass
			TWP51R14W5M	87.0%	Pass
			TWP51R15W5M	88.5%	Pass
			TWP52R15W5M	88.0%	Pass
			TWP56R12W5M	85.8%	Pass
October 2, 2014	December 10, 2014	18	TWP40R8W5M	95.5%	Pass
			TWP47R14W5M	84.0%	Pass
			TWP50R17W5M	89.1%	Pass
			TWP56R13W5M	82.7%	Pass
			TWP57R15W5M	81.1%	Pass
December 17, 2014	February 9, 2015	16	TWP43R13W5M	92.2%	Pass
			TWP50R15W5M	85.7%	Pass
February 19, 2015	May 26, 2015	13	TWP56R11W5M	85%	Pass
			TWP55R13W5M	71.1%	Fail/Resubmitted
			TWP55R17W5M	87.2%	Pass
March 25, & June 25, 2015	September 15, 2015	32	TWP41R10W5M	89.8%	Pass
			TWP43R8W5M	88.3%	Pass
			TWP48R9W5M	87.3%	Pass
			TWP49R13W5M	89.3%	Pass
			TWP53R21W5M	89.5%	Pass
September 23,	November 16,	37	TWP40R10W5M	88.3%	Pass

SUBMISSION DATE	APPROVAL DATE	# OF TOWNSHIPS SUBMITTED	TOWNSHIPS SELECTED FOR AUDIT	PASS %	PASS/ FAIL
2015	2015		TWP42R7W5M	93.6%	Pass
			TWP45R9W5M	85.9%	Pass
			TWP51R18W5M	86.0%	Pass
			TWP55R15W5M	84.2%	Pass
November 27, 2015	January 14, 2016	Entire FMA AVI			Pass (See App. 3)

7.0 FIELD ASSESSMENTS

AVI ground verification plots were completed through the project according to AVI 2.1.1 specifications. Field plots were located within the stand, minimum of two co-dominate trees were choose for measurement. Measurements include tree height, DBH and a tree core is taken to establish an origin for the stand. In addition, if an understory is present, then understory trees will be sampled. The following table outlines the field measurements that were completed throughout the project. In addition, a field visit with Weyerhaeuser, Silvacom and AF staff was conducted at the beginning of the inventory process.

Table 7-1: Field Assessments for Ground "Truthing" Plots

FIELD CREW	DATE	# PLOTS
Jesse Nebo/Karlie Higgins/Elisha Cahoon	May 7-8, 2013	39
Elisha Cahoon/Kendel Hunt	July 29-August 4, 2013 August 13-19, 2013	229
Mark Hemstock/Craig Cruikshank	July 29-August 2, 2013 August 13-19, 2013	229
Craig Cruikshank/Kendel Hunt	August 20-22, 2013	54
Elisha Cahoon/Karlie Higgins	September 16-17, 2013 September 22-24, 2013	76
Jesse Nebo	September 23-26, 2013	57
Elisha Cahoon	September 29-October 5, 2013	65
Jesse Nebo/Kostner Soderstrom	April 30-May 2, 2014	31
Jesse Nebo/Kendel Hunt	October 2-4, 2013 October 9-11, 2013	66
Jesse Nebo/Noah Delwel	October 6-9, 2014	59
Jesse Nebo/Nicole Smith	October 20-23, 2014	61

Mark Hemstock/Kostner Soderstrom	October 6-10, 2014 October 27-31, 2014	192
Noah Delwel/Kostner Soderstrom	November 17-21, 2014	55
Kostner Soderstrom/Nicole Smith	November 24-26, 2014	59
Jesse Nebo/Elisha Cahoon	November 24-25, 2014	25
Mark Hemstock/Nicole Smith	December 8-11, 2014	55
Elisha Cahoon/Nicole Smith	February 18-19, 2015	29
Kostner Soderstrom/Nicole Smith	February 23-24, 2015	14

8.0 PROJECT SCOPE CHANGES

Some changes were made to the project scope once the project had already commenced. A 4th phase of an additional 30,769 ha was added to the project. Phase 4 inventory consisted of grazing leases, park land and other land use outside the FMA area. An additional area of two small portions of crown land outside the FMA area were added to phase 4 on February 11, 2014. These are areas that are within the greater FMU area but outside the FMA.

On December 9, 2014 small changes were made to phase boundary, as the FMA boundary had been unknowingly changed in the past prior to project commencement and receiving the AVI phase map. Thus, project boundaries were updated to reflect the current FMA boundaries.

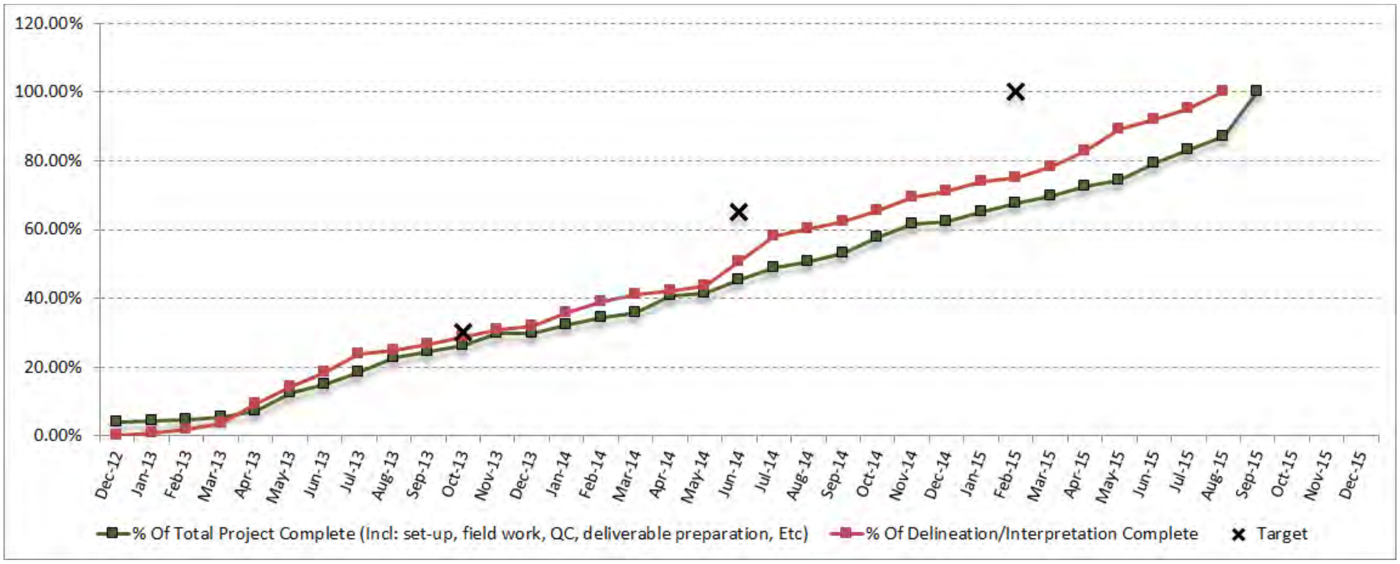
The delineation of cutblock boundaries was a process that changed after commencing the inventory project. Initially, cutblock boundaries were maintained from pre-disturbance stand boundaries. This method was discovered to be problematic for retaining the level of accuracy and precision targeted for the delineation of the land base. The process was adjusted so that photo interpreters would delineate cutblock boundaries based on what was seen in the photographic imagery.

9.0 DELIVERABLES

A single Geodatabase of AVI for the FMA Area, consistent with AVI 2.1.1 specifications was finalized and delivered to AF for spatial/attribute audits on November 27, 2015. This data was assembled in Informatics Branch "final audit format", including assembly of required metadata. Cutblock boundary updates are included in the AVI Geodatabase. The final AVI Geodatabase that had interpretation audits done by AF was delivered on September 23, 2015. In addition to the AVI Geodatabase, an updated seismic line layer for the FMA Area was produced.

All original ground truthing data was assembled and stored digitally, with a corresponding plot location shapefile. The ground validation plot locations were stored in a single geodatabase and delivered with the final package.

10.0 APPENDIX 1: PROJECT PROGRESSION SUMMARY



11.0 APPENDIX 2: AF APPROVAL/AUDIT LETTERS

Alberta Environment and Sustainable Resource Development

Forestry and Emergency Response Division
Forest Management Branch
7th floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Canada
Telephone: 780-427-8474
www.alberta.ca

File: 06332-F02-04
06332-F01-04
06332-010

December 17, 2013

Mr. Paul Scott
Strategic Planning Co-ordinator
Weyerhaeuser Company Ltd.
2509 Aspen Drive
Edson, Alberta T7E 1S8

Subject: **AGREEMENT-IN-PRINCIPLE – WEYERHAEUSER COMPANY LTD. (PEMBINA TIMBERLANDS) ALBERTA VEGETATION INVENTORY PLAN**

Dear Mr. Scott:

Thank you for the Weyerhaeuser Pembina Forest Management Agreement – Alberta Vegetation Inventory Plan dated December 12, 2013.

The department has completed its review and the document is granted agreement-in-principle.

Regular communication with Forest Management Branch staff is encouraged throughout the inventory process to ensure continued agreement and timely approvals.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager, Forest Resource Management Section

cc: Dave Hugelschaffer, Acting Approvals Manager, Upper Athabasca Region
Phil Mackenzie, Section Head, Data Management, Informatics Branch
Daryl Price, Senior Manager, Resource Analysis, Forest Management Branch

Alberta Agriculture and Forestry

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File: 06332-F02-04
06332-F01-04
06332-010

June 3, 2015

Mr. Paul Scott
Strategic Planning Co-ordinator
Weyerhaeuser Company Ltd.
2509 Aspen Drive
Edson, Alberta T7E 1S8

Dear Mr. Scott:

Subject: AGREEMENT-IN-PRINCIPLE - WEYERHAEUSER COMPANY LTD. (PEMBINA TIMBERLANDS) ALBERTA VEGETATION INVENTORY PLAN AMENDMENT #1

Thank you for the amended Weyerhaeuser Pembina Forest Management Agreement – Alberta Vegetation Inventory Plan dated April 22, 2015.

The department has reviewed the amendment addressing the area not captured during the 2012 flight. The process is granted agreement-in-principle.

Please continue with regular communication with Forest Management Branch staff to ensure continued agreement and timely approvals.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager

cc: Dave Hugelschaffer, Approvals Manager, Upper Athabasca Region
Phil Mackenzie, Director, Information and Data Provisioning Services
Daryl Price, Senior Manager, Forest Resource Analysis Section

Alberta Agriculture and Forestry

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File: 06332-F01-04

November 16, 2015

Ms. Kerri Mackay, RPF
Strategic Informatics
Weyerhaeuser Pembina Timberlands
P.O. Box 7739, Hwy 22 South
Drayton Valley, AB T7A 1S8

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta government staff completed a review of the Alberta Vegetation Inventory (AVI) submitted by Weyerhaeuser Pembina.

Five townships were selected for auditing with the following results:

- Twp 40 R 10 W5M - 88.3%
- Twp 42 R 7 W5M - 93.6
- Twp 45 R 9 W5M - 85.9%
- Twp 51 R 18 W5M - 86.0%
- Twp 55 R 15 W5M - 84.2%

It appears that the data was not run through the AVI Spatial Audit Tools prior to submission, as there were 129 self-intersection errors as well as 142 multipart polygons. The intersection errors were corrected and the multipart polygons were converted to single part polygons and assigned unique polygon IDs prior to the interpretation audit.

The vegetation interpretation audit conducted in the five townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards. The data for the five townships is approved for use in forest management and operational planning.

The interpretation audit is now complete. We request a final submission of the entire inventoried area for a final spatial and attribute audit prior to approving the AVI.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Director, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

Alberta Agriculture and Forestry

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File: 06332-F01-04

September 17, 2015

Ms. Kerri Mackay, RPF
Strategic Informatics
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Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Government staff have completed a review of the Alberta Vegetation Inventory (AVI) submitted by Weyerhaeuser Pembina.

Two submissions (March 25, 2015 and June 25, 2015) were treated as one block. Five townships were selected for auditing with the following results:

Twp 41 R 10 W5M	89.9%
Twp 43 R 8 W5M	88.3%
Twp 48 R 9 W5M	87.3%
Twp 49 R 13 W5M	89.3%
Twp 53 R 21 W5M	89.5%

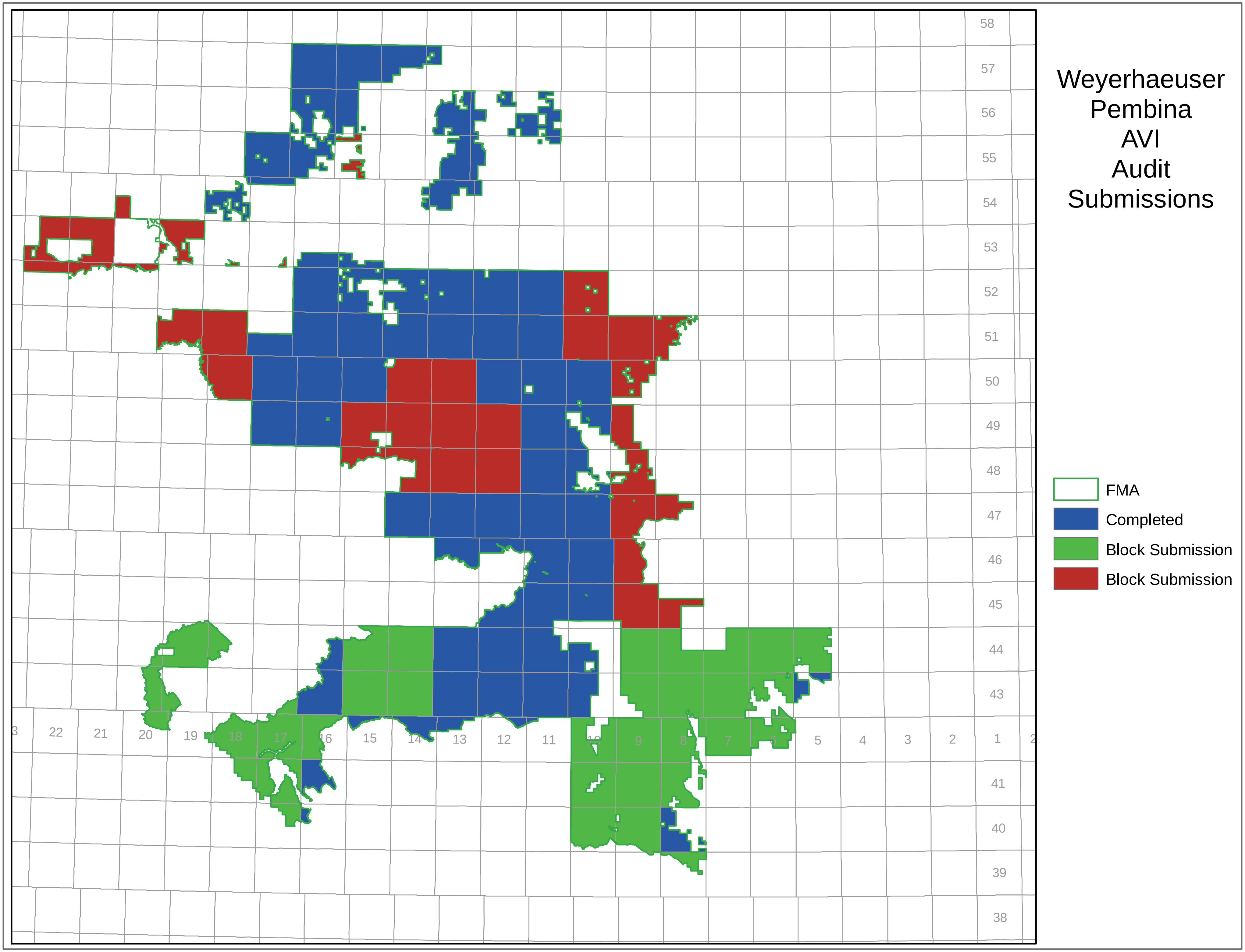
The vegetation interpretation audit conducted in the five townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards. The data is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Director, Resource Analysis, FBM
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring, FBM


Weyerhaeuser
Pembina
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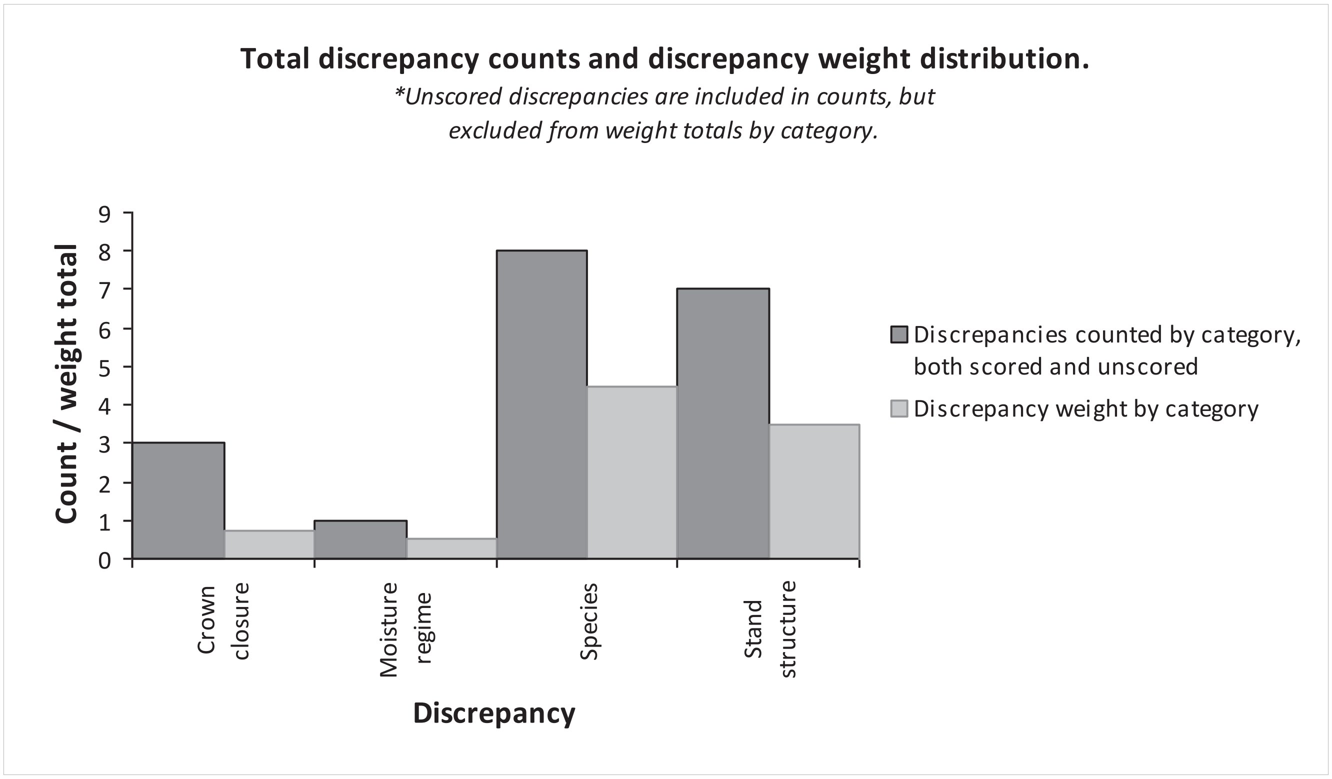
Audit Results

Sum of discrepancy weights: 9.25 **Polygons Audited:** 32 **Project Accuracy:** <u>**71.1%**</u>



Project Title	Audit Date	Township Code	Forest Management Unit	Forest Management Area
Twp 55 13 5_03/05	3/5/2015	T55-R13-W5	W5	Weyerhaeuser Company Limited (Pembina Timberland) FMA

Polygon number: **56689** Discrepancy weight: 0.5 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Moisture regime Comments: Is a mB21Pl6Sw2Sb1Lt1/B10Sb8Sw2.The seam of Sb,Lt along AIH cheat along CIW to similar Sb poly

Polygon number: **57930** Discrepancy weight: 0.75 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Crown closure Comments: C density altogether.Only a B density understory.

Polygon number: **56666** Discrepancy weight: 0.75 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Species Comments: Marginal A density with a Sw lead.West side along drainage could have typed out a mB20Sw7Pl1Pb1Aw1/B12Sb8Sw2. The bal.of Sb has scattered Sw throughout.

Project Title	Audit Date	Township Code	Forest Management Unit	Forest Management Area
Twp 55 13 5_03/05	3/5/2015	T55-R13-W5	W5	Weyerhaeuser Company Limited (Pembina Timberland) FMA

Polygon number: **58903** Discrepancy weight: 0.75 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Species Comments: Looks like a mA16Sw8Sb1Pb1/B10Bw4Sw4Sb1Pb1

Polygon number: **59104** Discrepancy weight: 0.75 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Species Comments: No A density at 26m. 4 different hts. In this poly. Looks like on avg. mA20Pb4Sw4Aw1/C12Bw6Sw3Pb1.

Polygon number: **58816** Discrepancy weight: 0.75 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Species Comments: Looks like a wA18Lt10/C11Lt7Sb3

Polygon number: **56848** Discrepancy weight: 0.75 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Species Comments: Looks like a C-B21Pl8Aw1Sw1/B10Sb8Sw2

Polygon number: **56346** Discrepancy weight: 0.75 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Species Comments: As delineated, is mB18Pl3Sb2Sw2Aw1Bw1Lt1/B-C12Sb9Sw1. The C12Sb10 within this polygon should be typed to the adj. smaller Sb polygon. W vs M sites

Polygon number: **56521** Discrepancy weight: 0.5 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Stand structure Comments: With the drainage and the NWF included in this polygon, it is a C density altogether. Stand structure was levied was rather than crown closure, not delineated properly.

Polygon number: **56364** Discrepancy weight: 0.5 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Stand structure Comments: The 3 pockets of 15Sb4Lt3Pl3 typed out or added to poly # 56352 only consumes about 2% of poly. The 5 or 6 pockets of 3-4m Sb holes within has a greater % of the polygon.

Polygon number: **57623** Discrepancy weight: 0.5 Interpreter Initials: EC
Score: Discrepancy Auditor ID: Robert
Attribute: Stand structure Comments: M vs W sites. The 6 ha. mB-B-C14Sw4Pl4Sb1Pb1/B9SbSw1 typed out from the wD7Sb8Lt2 which is 50% of polygon.

Project Title	Audit Date	Township Code	Forest Management Unit	Forest Management Area
Twp 55 13 5_03/05	3/5/2015	T55-R13-W5	W5	Weyerhaeuser Company Limited (Pembina Timberland) FMA

Polygon number: **56342** Discrepancy weight: 0.5 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Stand structure Comments: It is a C density altogether. Looks like A12SW5Aw4Pb1/A8Aw3Sw3Bw2Pb1Pl1/B2Sw4Pl4Bw2 structure.The old CIW or plant site at 2 ha.within should be typed out.

Polygon number: **57595** Discrepancy weight: 0.5 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Stand structure Comments: A density overall.Looks like a A20Pl9Sb1/B13Pl7Sb3/B8Sb9Pl1-A1Pl9Sb1/C11Sb7Pl3. The Sb content should be typed to adj. Sb poly's and the immature Pl in the middle typed out separately.

Polygon number: **56175** Discrepancy weight: 0.5 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Stand structure Comments: This is a visible multistory story polygon. A C15Sw8Bw2/A10Sw10 would be a better call.Considerably shorter than the adjacent 23Aw and 24mSw.

Polygon number: **58024** Discrepancy weight: 0.5 Interpreter Initials: EC

Score: Discrepancy Auditor ID: Robert

Attribute: Stand structure Comments: M vs W sites. The Sw in the west and east portions of polygon should have been added to adj. Sw polygon.No Pl at 24m. The bal. Is wA19Sw10/C10Sb9Pl1.

Polygon number: **56973** Discrepancy weight: Interpreter Initials: EC

Score: Noted (not scored) Auditor ID: Robert

Attribute: Comments: Looks like wA13Sb7Lt2Pl1/C4Sb7Lt3.70% of this polygon is unproductive.

Polygon number: **55989** Discrepancy weight: Interpreter Initials: EC

Score: Noted (not scored) Auditor ID: Robert

Attribute: Comments: Marginal A density,and a mostly unproductive site overall. Also an wA16Pl5Sb5 overstory to encompass the taller Sb under sitting under the pockets of Pl. The north half of the unproductive Sb with no Pl could have been typed out.

Polygon number: **57555** Discrepancy weight: Interpreter Initials: EC

Score: Noted (not scored) Auditor ID: Robert

Attribute: Comments: D density overstory

Polygon number: **56326** Discrepancy weight: Interpreter Initials: EC
Score: Noted (not scored) Auditor ID: Robert
Attribute: Comments: Looks like a A26Sw10/B20Aw7Sw3/B13Sw10 structure as delineated. The seam of Sw along drainage should have been typed to poly # 56521, then it would be a B density overstory. and the Aw to # 56235.

Polygon number: **59470** Discrepancy weight: 0 Interpreter Initials: EC
Score: Noted (not scored) Auditor ID: Robert
Attribute: Crown closure Comments: D density overstory

Polygon number: **57326** Discrepancy weight: 0 Interpreter Initials: EC
Score: Noted (not scored) Auditor ID: Robert
Attribute: Crown closure Comments: Altogether a B density.An A5Lt10/B-A2Lt10

Polygon number: **57289** Discrepancy weight: 0 Interpreter Initials: EC
Score: Noted (not scored) Auditor ID: Robert
Attribute: Species Comments: The Lt in both stories missed. Looks like a wB16Sb8Lt1Pl1/B8Sb8Lt2

Polygon number: **56877** Discrepancy weight: 0 Interpreter Initials: EC
Score: Noted (not scored) Auditor ID: Robert
Attribute: Species Comments: There is 20% Sw missed in this polygon. Is a C20Pl6Sw2Sb1Pb1/A12Sb9Sw1

Polygon number: **57220** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **56064** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **56732** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **57112** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **58770** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Project Title	Audit Date	Township Code	Forest Management Unit	Forest Management Area
Twp 55 13 5_03/05	3/5/2015	T55-R13-W5	W5	Weyerhaeuser Company Limited (Pembina Timberland) FMA

Polygon number: **58455** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **57122** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **59458** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Polygon number: **57040** Discrepancy weight: Interpreter Initials: EC
Score: Pass Auditor ID: Robert
Attribute: Comments:

Alberta Environment and Sustainable Resource Development

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File: 06332-F01-04

February 9, 2015

Ms. Kerri Mackay, RPF
Strategic Informatics
Weyerhaeuser Pembina Timberlands
P.O. Box 7739, Hwy 22 South
Drayton Valley, AB T7A 1S8

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Environment and Sustainable Resource Development staff have completed a review of the Alberta Vegetation Inventory (AVI) completed by Weyerhaeuser Pembina.

Approximately 16 townships (some full townships and some partial townships) were submitted for AVI audit on December 17, 2014. Two townships were selected for auditing with the following results:

Twp 43 R 13 W5M	92.2%
Twp 50 R 15 W5M	85.7%

The vegetation interpretation audit conducted in the five townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards. The data is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Senior Manager, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

Alberta Environment and Sustainable Resource Development

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File: 06332-F01-04

December 10, 2014

Ms. Kerri Mackay, RPF
Strategic Informatics
Weyerhaeuser Pembina Timberlands
P.O. Box 7739, Hwy 22 South
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Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Environment and Sustainable Resource Development staff have completed a review of the Alberta Vegetation Inventory (AVI) completed by Weyerhaeuser Pembina.

Approximately 18 townships (some full townships and some partial townships) were submitted for AVI audit on October 2, 2014. Five townships were selected for auditing with the following results:

Twp 40 R 8 W5M	95.5%
Twp 47 R 14 W5M	84.0%
Twp 50 R 17 W5M	89.1%
Twp 56 R 13 W5M	82.7%
Twp 57 R 15 W5M	81.1%

The vegetation interpretation audit conducted in the five townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards. The data is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Senior Manager, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

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File: 06332-F01-04

November 19, 2014

Ms. Kerri Mackay, RPF
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Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Environment and Sustainable Resource Development staff have completed a review of the Alberta Vegetation Inventory (AVI) completed by Weyerhaeuser Pembina.

Approximately 8 townships were submitted for AVI audit on July 29, 2014. Six townships were selected for auditing with the following results:

Twp 49 R 11 W5M	80.1%
Twp 50 R 12 W5M	80.5%
Twp 51 R 14 W5M	87.0%
Twp 51 R 15 W5M	88.5%
Twp 52 R 15 W5M	88.0%
Twp 56 R 12 W5M	85.8%

The vegetation interpretation audit conducted in the six townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards. The data is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Senior Manager, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

Alberta Environment and Sustainable Resource Development

Forestry and Emergency Response Division
Forest Management Branch
7th floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Canada
Telephone: 780-427-8474
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File: 06332-F01-04

July 18, 2014

Ms. Kerri Mackay, RPF
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Drayton Valley, AB T7A 1S8

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Environment and Sustainable Resource Development staff have completed a review of the Alberta Vegetation Inventory (AVI) completed by Weyerhaeuser Pembina Timberlands for Phases 1 and 2.

Six townships were submitted for AVI audit on April 22, 2014. Two townships were selected for auditing with the following results:

Twp 46 R 11 W5M	92.3%
Twp 56 R 13 W5M	86.0%

The vegetation interpretation audit conducted in the two townships indicated that the audited townships are within acceptable range of accuracy as stated in the AVI ver 2.1.1 standards.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Senior Manager, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services

Alberta Environment and Sustainable Resource Development

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File: 06332-F01-04

April 11, 2014

Ms. Kerri Mackay, RPF
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Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Pembina Timberlands
2509 Aspen Drive
Edson, AB T7E 1S8

Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta Environment and Sustainable Resource Development staff have completed a review of the Alberta Vegetation Inventory (AVI) completed by Weyerhaeuser Pembina Timberlands for Phases 1 and 2. I am pleased to inform you that the two phases of your inventory have successfully passed the audit. Your inventory is approved for use in forest management and operational planning.

Eight townships were submitted for the Phase 1 AVI audit. Two townships were selected for auditing with the following results:

Twp 47 R 10 W5M	93.0%
Twp 52 R 12 W5M	83.3%

Ten townships were submitted for the Phase 2 AVI audit. Three townships were selected for auditing with the following results:

Twp 44 R 11 W5M	82.5%
Twp 51 R 12 W5M	81.0%
Twp 56 R 16 W5M	80.0%

The Phase 1 and Phase 2 audit reports are attached.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

cc: Daryl Price, Senior Manager, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

AUDIT OF THE ALBERTA VEGETATION INVENTORY

Weyerhaeuser Pembina Timberlands FMA

Phases 1 and 2

Alberta
Environment and Sustainable
Resource Development

April 2014

SUMMARY

The Alberta Vegetation Inventory (AVI) is the primary information used for completing strategic level planning within the province. Forest industry companies, who operate under a Forest Management Agreement (FMA), are required to complete Forest Management Plans for their area of responsibility. Part of this agreement requires the completion and maintenance of a current AVI for planning purposes.

To ensure that the AVI information meets the Alberta Vegetation Inventory Standards version 2.1.1, an audit process has been developed. This process provides an indication of the accuracy of the inventory information by reviewing the interpretation and digital integrity. This audit is an assessment of the inventory to determine conformance to AVI specifications, as adopted by the Alberta Environmental Protection (now Alberta Environment and Sustainable Resource Development) / Forest Industry Steering Committee.

The inventory completed to date by Weyerhaeuser Pembina Timberlands within its FMA, encompassing Forest Management Units (FMUs) W6, E1, E2 and R12, was submitted to the Department for audit purposes.

As agreed upon, the AVI is being submitted in stages. The Phase 1 submission consisted of eight townships (45-10-5 to 50-10-5 and 52-11-5 & 52-12-5). Two townships were selected for audit (Twp 47 R 10 W5M and Twp 52 R 12 W5M). The Phase 2 submission consisted of ten townships (51-12 and 13-5, 44-11 and 12-5, 45-12-5, 55-16-5, 56-15 and 16-5 and 57-13 and 14-5). Three townships were selected for audit (Twp 44 R 11 W5M, Twp 51 R 12 W5M, Twp 56 R 16 W5M).

The data was checked according to the tolerance limits established in the AVI Audit Process standards.

Audit Component	Results
Imagery	**Accepted**
Vegetation Interpretation	**Accepted**
Digital Data Integrity (polygon attribute verification)	**Accepted**
Digital Data Integrity (topological integrity)	**Accepted**

The results indicate that all components of the vegetation inventory completed by Weyerhaeuser Pembina Timberlands in FMUs W6, E1, E2 and R12 to date met the AVI standards version 2.1.1.

1. INTRODUCTION

The Alberta Vegetation Inventory is the primary information used for completing strategic level planning within the province. Forest industry companies, who operate under a Forest Management Agreement, are required to complete the Detailed Forest Management Plans for their area of responsibility. Part of this agreement requires the completion and maintenance of a current AVI for planning purposes.

To ensure that the AVI information meets the *Alberta Vegetation Inventory Standards v2.1.1*, an audit process has been developed. This process provides an indication of the accuracy of the inventory information by reviewing the interpretation and digital integrity. This audit is an assessment of the inventory to determine conformance to AVI specifications, as adopted by the Alberta Environmental Protection (now Alberta Environment and Sustainable Resource Development) /Forest Industry Steering Committee.

Weyerhaeuser Pembina Timberlands has initiated a vegetation inventory of its Forest Management Agreement area, to Alberta Vegetation Inventory, version 2.1.1 specifications. The company has contracted Silvacom Ltd. to complete the inventory.

The audit process includes the examination of the imagery, the vegetation interpretation, and the digital data integrity audit.

2. RESULTS

2.1 Imagery

The stereo imagery used for the audit was acquired with an ADS80 sensor during the late summer/early fall of 2012. The imagery is 4-band RGB, leaf-on, with pixel resolution of 30 cm. There were multiple dates associated with the imagery: August 17; August 28; September 4, September 7, September 13 and September 20, 2012. There are some tonal issues with the imagery that resulted in some difficulties in determining species composition.

The imagery met the required specifications and is an adequate product for vegetation interpretation.

2.2 Air Photo Vegetation Interpretation

The vegetation interpretation audit conducted in the FMA area indicated that the audited townships are within acceptable range of accuracy as stated in the AVI standards.

A summary of the vegetation interpretation agreement for the audited townships is presented on Table 1.

Table 1. Summary of the vegetation interpretation agreement audit.

Project Area Block	Township (Twp-Rge-M)	Vegetation Interpretation Agreement (%)
Phase 1	Twp 47 R 10 W5M	93.0
Phase 1	Twp 52 R 12 W5M	83.3
Phase 2	Twp 44 R 11 W5M	82.5
Phase 2	Twp 51 R 12 W5M	81.0
Phase 2	Twp 56 R 16 W5M	80.0
Mean Agreement (%)		84.0

As shown in Table 1, all audited townships had the percentage for vegetation interpretation agreement above the minimum of 80% required for acceptance. On average, the vegetation interpretation agreement was acceptable. Comments specific to each phase are noted below.

Phase 1

- The overall quality of the inventory was acceptable. The total number of polygons audited was 100.
- The clear-cut history appeared correct and ARIS numbers were included in the polygon attributes, though some polygons were without a clearcut origin or an ARIS number.
- Species composition for the most part appeared good with the interpreter recognizing species that are hard to identify.
- The remaining polygon attributes were examined for "D" density polygons with understories, "A" and "B" density polygons without understories, "SC" and "SO" polygons under 60% without understories as well as "NFL" and accompanying horizontal modifiers. These polygons meet standards.
- The quality and completeness of the inventory could be improved upon by:
    - Cut block data corrected where needed;
    - Refining the delineation in some cases.

Phase 2

- The overall quality of the inventory was acceptable. The total number of polygons audited was 150.
- The quality and completeness of the inventory could be improved upon by:
    - Addressing missing attribution (ages and ARIS opening numbers) and residual polygons in cut blocks;
    - Documented use of PSP data as reference for field plot information;

- Review and confirmation regarding use of moisture classes for those polygons identified in the warnings report.

2.3 Digital Data Integrity

The digital data integrity audit consists of two parts: polygon attribute verification as well as a check on the topological integrity of the data. A set of ArcGIS tools, supplied to the contractor, performs an audit of AVI attributes generating table containing list of errors and warnings.

The following table indicates the types of audit checks that are performed on the selected AVI feature class.

Check	Description
Missing Fields	Checks the AVI feature class to ensure that all the required AVI fields are present.
Extra Fields	Checks to ensure that only valid AVI feature class fields are present.
Overlap	Checks for polygon overlap. Any overlaps that are detected are written as polygons to the Overlap feature class in the audit FGDB.
Gaps	Checks for potential gaps in the AVI feature class. Note that in some cases gaps are legitimate if they represent excluded regions within the project area. These gaps must be manually reviewed to determine if they are in fact errors. Any potential gaps are written to the Gaps feature class in the audit FGDB.
Neighbour Attributes	Checks the attributes of neighbouring polygons to ensure they are not the same. If any errors are detected the offending polygons are written to the att_neighbor feature class in the audit FGDB. The log file will list the OBJECTID values for the offending polygons.
Multi-parts	Makes sure there are no multi-part polygons. Will list the OBJECTID of features that are multi-part.
Duplicate POLY_NUM	Makes sure that each POLY_NUM is unique. Note that if you had multi-part polygons and converted them into single part polygons you will probably have duplicate POLY_NUM values. Calculate these to the OBJECTID field to make them unique.
Attribute Structure	Checks to make sure that the AVI fields match the proper structure for name, type and length.
Minimum Area	Checks to see if stand area falls below a minimum value.

Phase 1

- No errors or feature classes were generated by the spatial audit
- Warnings for 200 polygons containing pine in a wet site were generated by the attribute audit.
- All warnings should be reviewed to ensure that they are valid.

Phase 2

- No errors or feature classes were generated by the spatial audit.
- In the attribute audit, there were 4 exceptions identified in the report, though these identified errors were in compliance with the AVI specifications.
- In the attribute audit there were 138 polygons were identified as having a mesic or dry moisture regime with black spruce as the leading species. 313 polygons were identified as having a wet moisture regime with lodgepole pine as the leading species.
- All warnings should be reviewed to ensure that they are valid.

3. CONCLUSION

To date, all components of the vegetation inventory completed by Weyerhaeuser Pembina Timberlands in FMUs W6, E1, E2 and R12 met the AVI standards version 2.1.1.

12.0 APPENDIX 3: AF FINAL APPROVAL LETTER

Alberta Agriculture and Forestry

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January 14, 2016

Ms. Kerri Mackay, RPF
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Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
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2509 Aspen Drive
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Dear Ms. MacKay/Mr. Scott:

Subject: ALBERTA VEGETATION INVENTORY AUDIT FOR WEYERHAEUSER PEMBINA TIMBERLANDS

Alberta government staff completed a final review of the Alberta Vegetation Inventory (AVI) submitted by Weyerhaeuser Pembina.

The audit conducted over the FMA indicated that the data are within acceptable ranges of agreement. The final audit results are attached. The data is approved for use in forest management and operational planning.

If you have any questions regarding this process please contact Daryl Price at 780-422-0329.

Yours truly,

Darren Tapp, MBA, MF, RPF
Executive Director

Enclosure

cc: Daryl Price, Director, Forest Resource Analysis
Phil Mackenzie, Director, Information & Data Provisioning Services
Liana Luard, Lead, Forest Planning & Performance Monitoring

AUDIT OF THE ALBERTA VEGETATION INVENTORY

Weyerhaeuser Pembina Timberlands FMA

January 2016

Alberta Agriculture and Forestry

SUMMARY

The Alberta Vegetation Inventory (AVI) is the primary information used for completing strategic level planning within the province. Forest industry companies, who operate under a Forest Management Agreement (FMA), are required to complete Forest Management Plans for their area of responsibility. Part of this agreement requires the completion and maintenance of a current AVI for planning purposes.

To ensure that the AVI information meets the Alberta Vegetation Inventory Standards version 2.1.1, an audit process has been developed. This process provides an indication of the accuracy of the inventory information by reviewing the interpretation and digital integrity. This audit is an assessment of the inventory to determine conformance to AVI specifications, as adopted by the Alberta Environmental Protection (now Alberta Environment and Sustainable Resource Development) / Forest Industry Steering Committee.

The inventory completed to date by Weyerhaeuser Pembina Timberlands within its FMA, encompassing Forest Management Units (FMUs) W5, W6, E1, E2 and R12, was submitted to the Department for audit purposes.

As agreed upon, the AVI was submitted in stages. The data was checked according to the tolerance limits established in the AVI Audit Process standards.

Audit Component	Results
Imagery	**Accepted**
Vegetation Interpretation	**Accepted**
Digital Data Integrity (polygon attribute verification)	**Accepted**
Digital Data Integrity (topological integrity)	**Accepted**

The results indicate that all components of the vegetation inventory completed by Weyerhaeuser Pembina Timberlands in FMUs W5, W6, E15, E2 and R12 to date met the AVI standards version 2.1.1.

1. INTRODUCTION

The Alberta Vegetation Inventory is the primary information used for completing strategic level planning within the province. Forest industry companies, who operate under a Forest Management Agreement, are required to complete the Detailed Forest Management Plans for their area of responsibility. Part of this agreement requires the completion and maintenance of a current AVI for planning purposes.

To ensure that the AVI information meets the *Alberta Vegetation Inventory Standards v2.1.1*, an audit process was been developed. This process provides an indication of the accuracy of the inventory information by reviewing the interpretation and digital integrity. This audit is an assessment of the inventory to determine conformance to AVI specifications, as adopted by the Alberta Environmental Protection (now Alberta Environment and Sustainable Resource Development) /Forest Industry Steering Committee.

Weyerhaeuser Pembina Timberlands has initiated a vegetation inventory of its Forest Management Agreement area, to Alberta Vegetation Inventory, version 2.1.1 specifications. The company has contracted Silvacom Ltd. to complete the inventory.

The audit process includes the examination of the imagery, the vegetation interpretation, and the digital data integrity audit.

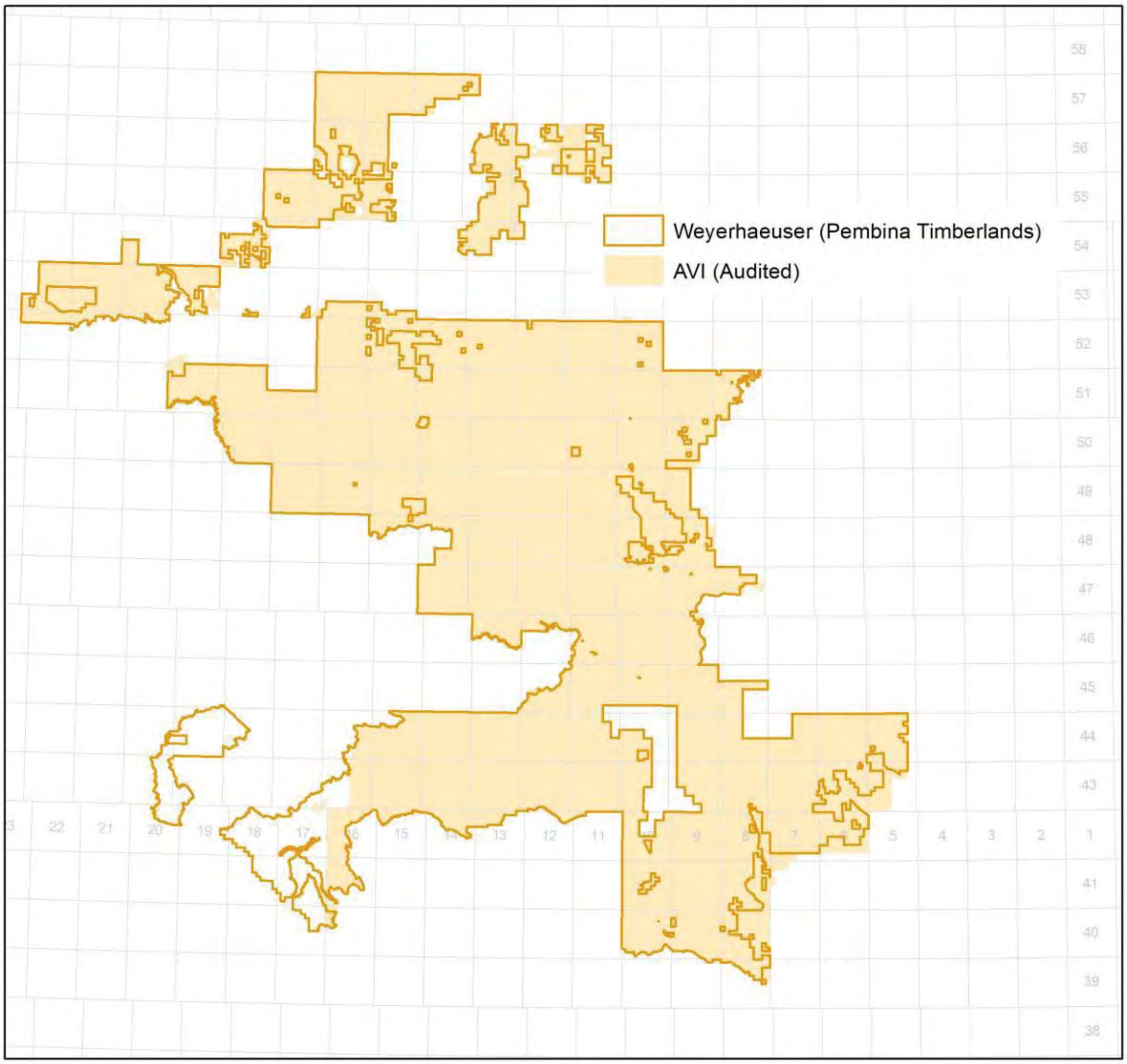
2. RESULTS

2.1 Imagery

The stereo imagery used for the audit was acquired with an ADS80 sensor during the late summer/early fall of 2012. The imagery is 4-band RGB, leaf-on, with pixel resolution of 30 cm. There were multiple dates associated with the imagery: August 17; August 28; September 4, September 7, September 13 and September 20, 2012. There are some tonal issues with the imagery that resulted in some difficulties in determining species composition.

The imagery met the required specifications and is an adequate product for vegetation interpretation.

New imagery was not acquired for a portion of the FMA in the western part of the FMA (see map), so the total area submitted for audit is 981,820.8 ha.



2.2 Vegetation Interpretation

The vegetation interpretation audit conducted in the FMA area indicated that the audited townships are within acceptable range of accuracy as stated in the AVI standards.

A summary of the vegetation interpretation agreement for the audited townships is presented on Table 1.

Table 1. Summary of the vegetation interpretation agreement audit.

#	Submission Date	Twps Audited	Photo-interpretation audit %
1	August 28, 2013	50-11-5	pilot
2	January 7, 2014	57-15-5	informal
3	January 23, 2014	47-10-5	93.0
		52-12-5	83.3
4	March 3, 2014	44-11-5	82.5
		51-12-5	81.0
		56-16-5	80.0
5	March 31, 2014	40-8-5	informal
		56-13-5	informal
6	April 22, 2014	46-11-5	92.3
		52-13-5	86.0
7	July 28, 2014	51-15-5	88.5
		52-15-5	88.0
		56-12-5	85.8
		49-11-5	80.1
		50-12-5	80.5
		51-14-5	87.0
8	October 2, 2014	57-15-5	81.1
		50-17-5	89.1
		40-8-5	95.5
		47-14-5	84.0
		56-13-5	82.7
9	December 17, 2014	43-13-5	92.2
		50-15-5	85.7
10	February 20, 2015	55-13-5	71.1
		55-17-5	87.2
		56-11-5	85.0
11	March 19, 2015	43-5-5	informal
12	March 17, 2015	41-10-5	89.9
	June 30, 2015	43-8-5	88.3
		48-9-5	87.3
		49-13-5	89.3
		53-21-5	89.5
13	September 24, 2015	40-10-5	88.3
		42-7-5	93.6
		45-9-5	85.9
		51-18-5	86.0
		55-15-5	84.2
14	November 27, 2015	complete submission	
15	December 3, 2015	complete submission	

As shown in Table 1, all audited townships had the percentage for vegetation interpretation agreement above the minimum of 80% required for acceptance except for one township. On average, the vegetation interpretation agreement was acceptable. Comments are noted below:

- ≠ The overall quality of the inventory was acceptable;
- ≠ The harvest history appeared correct and most ARIS numbers were included in the polygon attributes, though some polygons were without a clearcut origin or an ARIS opening number;
- ≠ Species composition for the most part appeared good with the interpreter recognizing species that are hard to identify.

2.3 Digital Data Integrity

The digital data integrity audit consists of two parts: polygon attribute verification as well as a check on the topological integrity of the data. A set of ArcGIS tools, supplied to the contractor, performs an audit of AVI attributes generating table containing list of errors and warnings.

The following table indicates the types of audit checks that are performed on the selected AVI feature class.

Check	Description
Missing Fields	Checks the AVI feature class to ensure that all the required AVI fields are present.
Extra Fields	Checks to ensure that only valid AVI feature class fields are present.
Overlap	Checks for polygon overlap. Any overlaps that are detected are written as polygons to the Overlap feature class in the audit FGDB.
Gaps	Checks for potential gaps in the AVI feature class. Note that in some cases gaps are legitimate if they represent excluded regions within the project area. These gaps must be manually reviewed to determine if they are in fact errors. Any potential gaps are written to the Gaps feature class in the audit FGDB.
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Multi-parts	Makes sure there are no multi-part polygons. Will list the OBJECTID of features that are multi-part.
Duplicate POLY_NUM	Makes sure that each POLY_NUM is unique. Note that if you had multi-part polygons and converted them into single part polygons you will probably have duplicate POLY_NUM values. Calculate these to the OBJECTID field to make them unique.
Attribute Structure	Checks to make sure that the AVI fields match the proper structure for name, type and length.
Minimum Area	Checks to see if stand area falls below a minimum value.

- ≠ No errors or feature classes were generated by the spatial audit
- ≠ There were 4 exceptions identified in the attribute audit report, though these identified errors were in compliance with the AVI specifications.

3. CONCLUSION

All components of the vegetation inventory completed by Weyerhaeuser Pembina Timberlands in FMUs W5, W6, E15, E2 and R12 met the AVI standards version 2.1.1.

Appendix IX – LB-001: Conversion of the Patchworks SHS Validated Polygons (Scenario P10005) to the new AVI

Issue Number: LB-001

Conversion of the Patchworks SHS Validated Polygons (Scenario P10005) to the new AVI

Type: □ Requires Resolution √ Discussion Item

1 Description

Weyerhaeuser has undertaken a number of scenario developments using Patchworks for spatial modeling of the currently approved cut levels based on the approved 2007 MPB amendments for both the Drayton Valley and Edson Detailed Forest Management Plans. After a number of scenarios, Weyerhaeuser planning staff found that scenario P10005 appeared to be sufficiently robust, and this scenario was chosen as the spatial harvest sequence (SHS) to be validated by timber operators on the Defined Forest Area (DFA). The validated SHS would then be used as an input into the upcoming 2016 Pembina Forest Management Plan (FMP) Timber Supply Analysis (TSA) to be developed upon completion of the new AVI, net land base determination, and yield curve development.

Scenario P10005 years 1-20 was validated by operational planners using the new 3-D model output of the 2012 imagery that was also used to develop the new AVI, and some ground truthing. Reviewers reviewed the polygons suggested by patchworks, and accepted (Yes) the polygon as being valid for operational purposes or rejected (No) the polygon as a deferral and available for future periods. Acceptance and deferrals were subjective but utilized current practices consistent with the operating ground rules. Deletions were not captured, as it can be anticipated that the new net land base determination will capture those polygons as subjective deletions more readily. The reviewer's initials were recorded and reviewers were able to designate an appropriate five-year period(s) that they would like the polygon to be scheduled in.

The resulting validated SHS created an issue regarding the validation of Patchworks output P10005 that used the current (pre-1999) AVI within the Weyerhaeuser Pembina DFA, and how changes to the Alberta Vegetation Inventory (2012 new AVI) might affect these validated polygons. With the creation of the new AVI, a preliminary analysis of one township was completed to assess how much this AVI update conflicts with the Patchworks spatial harvest sequence (SHS).

2 Methodology

2.1 Shapefile Conditioning

To complete this analysis the raw shapefiles were clipped and conditioned:

1. A single township that had complete AVI coverage and a large percentage of SHS blocks was selected (TWP 50, RGE 11).

2. The SHS and AVI layers were clipped to the township boundaries. The SHS layer included a “Map_Revi_1” field which identifies polygons to be carried forward into the new TSA as “Yes” polygons and polygons that should be deferred in the new TSA as “No” polygons.
3. Within the attributes tables of both layers, a unique key was created.
4. The two layers were combined using a Union, and the geometry of the layer was updated.
5. The attributes table of this Union was exported to Oracle.

From this exported table, the areas of the AVI polygons that overlap with “Yes” polygons and “No” polygons are calculated independently.

2.2 Estimation of AVI polygon areas that overlap “Yes” and “No” Blocks from Patchworks Scenario P10005.

1. For each forested AVI polygon (ANTH_NON and ANTH_VEG both = “null”), a count of the number of SHS polygons and a sum of the corresponding area that overlaps each polygon is calculated. This is done for:
    a. All instances where a “Yes” polygons identified in the “Map_Revi_1” field overlaps an AVI polygon, and
    b. All instances where a “No” polygon identified in the “Map_Revi_1” field overlaps an AVI polygon.
2. The results table created was then joined to the original AVI layer by the AVI unique key.

These calculations will occur within a single Oracle script so that counts and areas can be joined to a single AVI unique key number. There are instances where no overlap will be present, or where overlap from both “Yes” and “No” polygons will occur over the same AVI polygon.

2.3 Assigning Decision Variables based on % Carried Forward and % Deferred.

After the areas of overlap have been calculated, a decision was set for each polygon based on the percentage of “Yes” and “No” overlap

1. For both the “Yes” and “No” areas calculated in Oracle, a percentage of overlap was be calculated by creating “Percent_Y” and “Percent_N” fields and dividing the overlap areas by the AVI polygon areas
2. A “Decision” field was added to the attributes table and based on the percent calculations the following decisions can be assigned.
    a. A percentage of 0% “Yes” and 0% “No” was assigned a Decision of 0. These polygons remain as part of the open landbase and may be selected in the next TSA model
    b. A percentage of 0% < x <30% “Yes” and 0% “No” was be assigned a Decision of 1. These polygons are no longer considered “Yes” polygons but may still be selected in the next TSA model.

c. A percentage of 30% ≤ x < 50% "Yes" and 0% "No" was assigned a Decision of 2. These polygons are to be reviewed as to whether they remain as "Yes" polygons to be carried forward in the next TSA. If they are not carried forward then they return to the open landbase and may still be selected in the next TSA model. After review each polygon will be assigned to either Decision 1 or Decision 3 at the reviewer's discretion. For any polygons that get reassigned as a Decision 3, the cut period assigned will also be carried forward.
d. A percentage of x ≥ 50% "Yes" and 0% "No" was assigned a Decision of 3. These polygons are carried forward into the next TSA model as is the cut period that was assigned during the initial review of the SHS blocks.
e. A percentage of 0% "Yes" and x ≤ 50% "No" was assigned a Decision of 4. These polygons are no longer considered "No" polygons. These polygons return to the open landbase and may be selected in the next TSA model.
f. A percentage of 0% "Yes" and x > 50% "No" was assigned a Decision of 5. These polygons are to be deferred in the next TSA model for the first 20 years.
g. A combination x > 0% for both "Yes" and "No" was assigned as Decision 6. These polygons are to be reviewed on a case by case basis as to whether they are deferred for the first 20 years, carried forward, or returned to the open landbase. A set of rules will be assigned for these polygons and from there each can be reassigned to one of the other decisions.

3. An additional "Map Review" field was added to the attributes table. This field held a final decision as to whether a polygon was to be carried forward, returned to the open landbase or deferred. Regardless of the decision assigned based on overlap of the SHS blocks, a polygon could be reassigned to any of the three final decisions. In cases where polygons get assigned to be carried forward, the initial cut period assigned will also be carried forward if one was given.

3 Results

The township contained 1,796 polygons, and of these polygons 27% (38.3% by area) had some level of coverage by the "Yes" or "No" SHS blocks (Figure 1). AVI polygons covered solely by "Yes" blocks consisted of 21% of the total count (31% by area), and blocks covered solely by "No" blocks consisted of 5% of the total count (6% by area). AVI polygons covered by some combination of both "Yes" and "No" blocks consisted of 1% of the polygons by both count and area. These values are tabulated in Table 1 and shown in Figure 2.

Table 1: The percentage of each AVI polygons covered by "yes" or "no" SHS polygons from Patchworks scenario 10005.

Decision	Range of SHS Coverage within an AVI Polygon		Average % of AVI/SHS Overlap within an AVI Polygon		Count of Polygons	% of Total Polygons	Total Area (ha)	% of Total Area
	% Yes	% No	% Yes	% No				
0	0%	0%	0%	0%	1,300	72.4%	6,030	61.5%
1	0% < x < 30%	0%	5%	0%	206	11.5%	1,730	17.7%
2	30% ≤ x < 50%	0%	40%	0%	34	1.9%	375	3.8%
3	x ≥ 50%	0%	78%	0%	141	7.9%	886	9.0%
4	0%	x ≤ 50%	0%	9%	75	4.2%	551	5.6%
5	0%	x > 50%	0%	80%	22	1.2%	93	0.9%
6	x > 0%	x > 0%	18%	24%	18	1.0%	132	1.3%
Totals					1,796		9,797	

After the initial classification into the seven decision classes, the results were reviewed to determine what the final decisions were for the polygons classified under decisions 2 and 6. In addition, any polygons could be reclassified as seen fit. The administrative review resulted in 88% of the polygons (86% by area) being classified as open landbase, 11% being carried forward into the TSA (13% by area) and the remaining 1% being deferred. These results are tabulated in Table 2 and shown in Figure 3.

Table 2: The count and area of polygons for TWP 50, RGE 11 after administrative review of polygons in Table 1.

Decision	Count of Polygons	% of Total Polygons	Total Area (ha)	% of Total Area	% of AVI/SHS Overlap	
					% Yes	% No
Return to Open Landbase	1,576	87.8%	8,411	85.9%	2%	1%
Defer	16	0.9%	77	0.8%	0%	81%
Carry Forward	204	11.4%	1,309	13.4%	61%	2%
Total	1,796		9,797		9.7%	2%

The polygons that were part of the original SHS "Yes" and "No" polygons consisted of 1,148 ha. Of this, the original plan had 974 ha being carried forward, and 174 ha being deferred. After the selections and final administrative revisions 826 ha of this area were carried forward, 62 ha were deferred and 260 ha were returned to the open landbase (Table 3)

Table 3: The areas of the original SHS "Yes" and "No" polygons and the assignments of these areas after assessing the polygons against the AVI and the polygons being reviewed.

Original Assignment	New Assignment			Total Area (ha)
	Area Carried Forward (ha)	Area Deferred (ha)	Area Returned to Open Landbase (ha)	
Yes	803	0	171	974
No	89	62	22	173
Totals	892	62	193	1,147

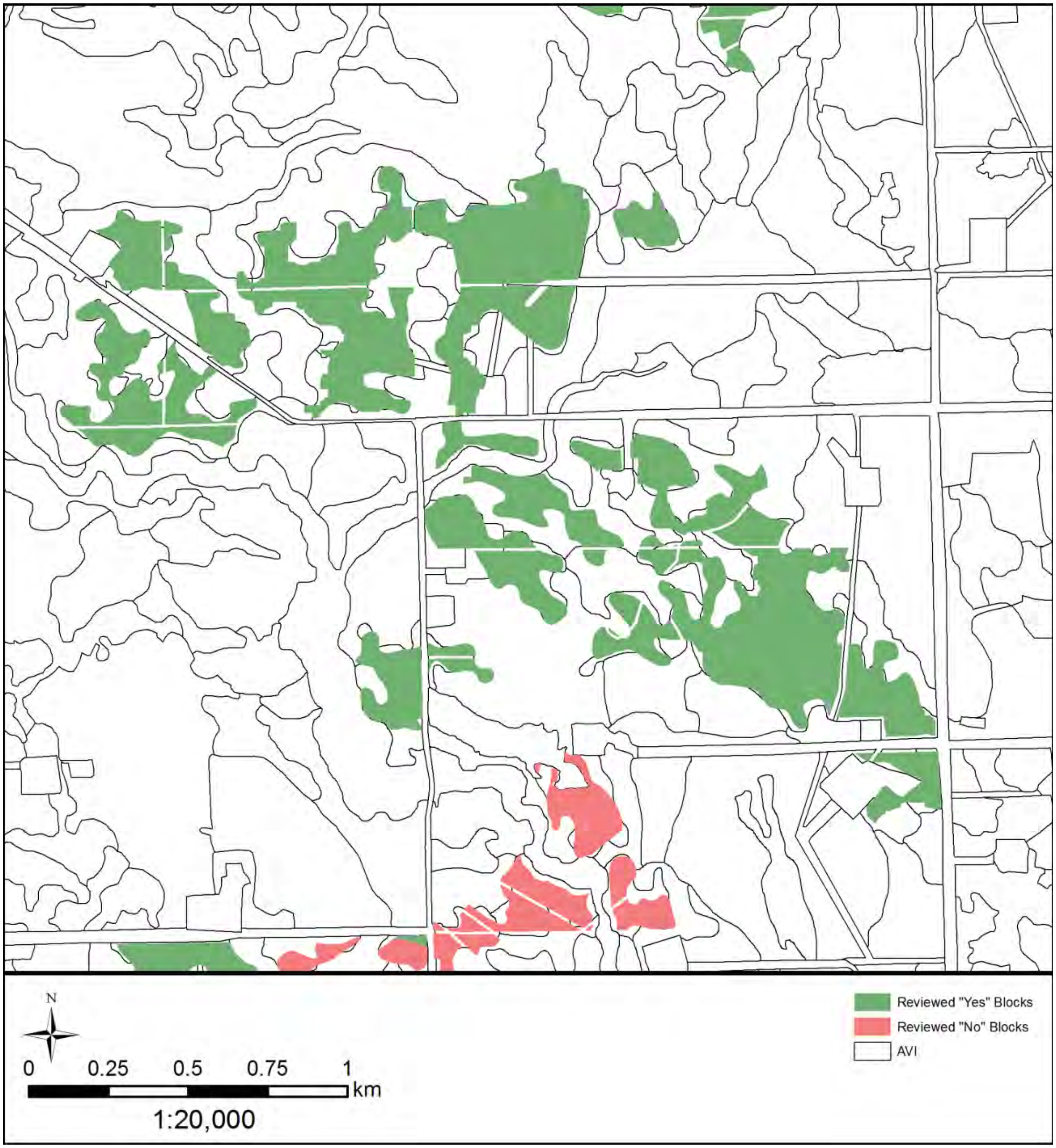

Figure 1: View of polygons selected as part of patchworks scenario 10005 that have been marked to either be carried forward or deferred in next TSA.

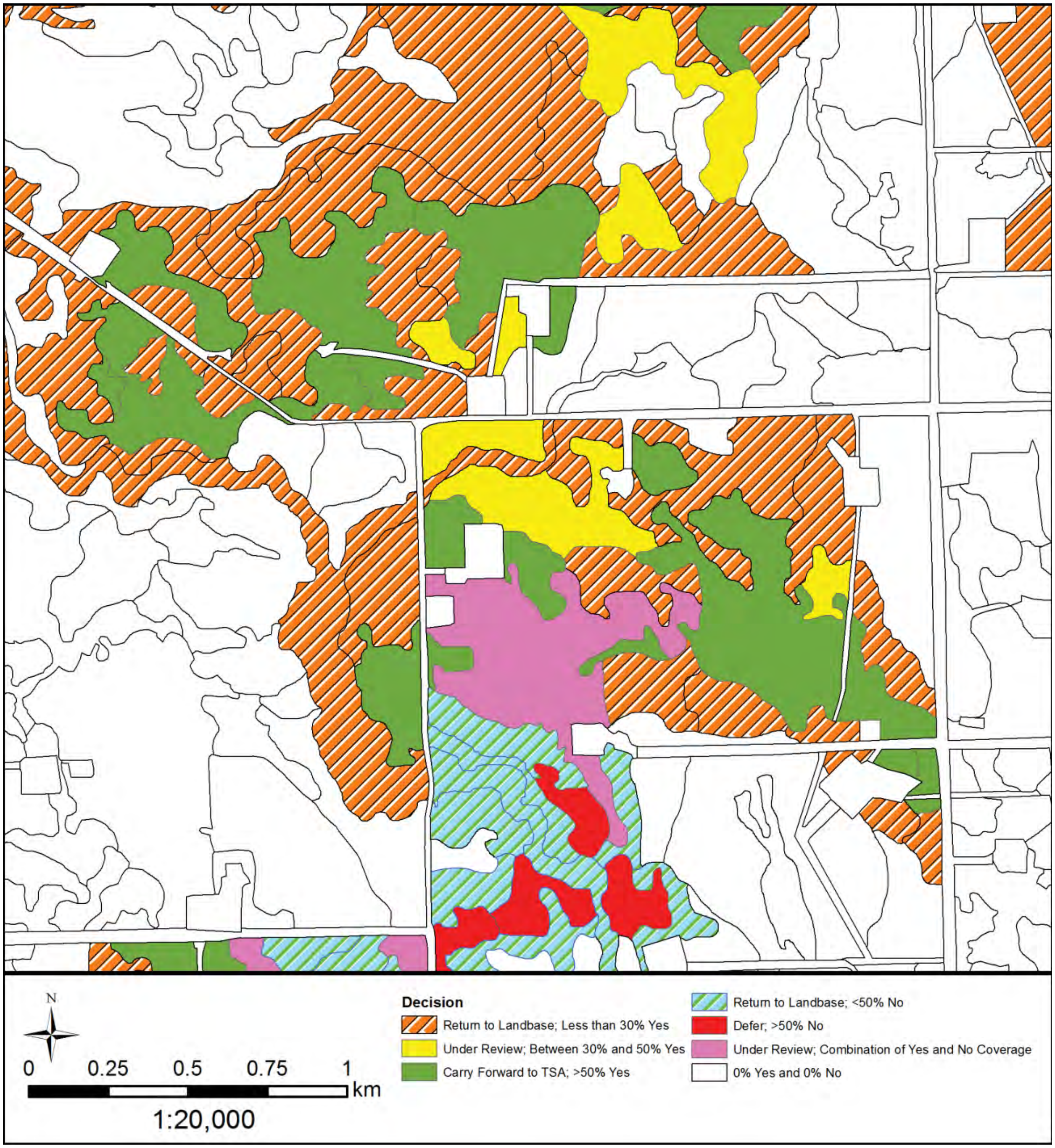

Figure 2: AVI polygons selected to be carried forward, deferred, returned to the open landbase or reviewed based on the "Yes" and "No" polygons seen in Figure 1.

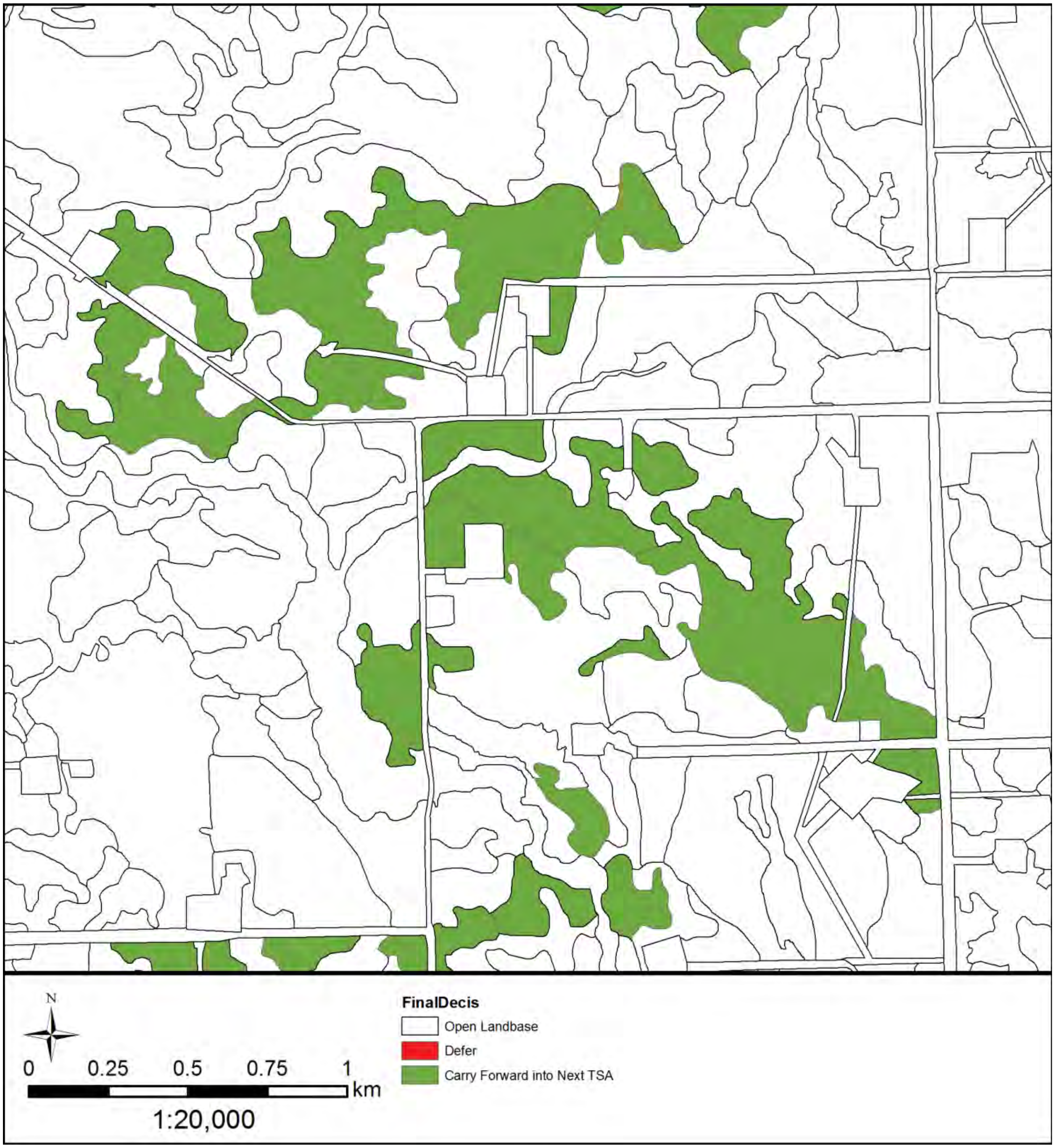

Figure 3: Final decisions based on the selection rules and final administrative reviews.

4 Final Resolution

Based on this procedure created for a single township, this selection process appears to provide an effective approach of selecting new AVI polygons to be carried forward into the TSA Patchworks model that align closely with the polygons selected for harvest by the operational patchworks model (scenario P10005). The process will include the initial analysis based on polygons in the Patchworks model, an administrative review of the polygons selected where changes can be made to any of the polygons, and a final assignment of the polygons (carry forward, defer, or remaining part of the open landbase) after the review. The deferred polygons will not be considered in the first 20 years of the new Patchworks model, and the polygons carried forward into the new TSA will also have the recommended cut period carried forward as well. The results of these selections may be further altered by other landbase deletions (e.g. grazing leases not part of the FMA) once the final landbase is created.

This selection process can be conducted for the entire DFA once:

- The final approved AVI is available
- The reviewed SHS polygons for all the FMUs are available.

Response from ESRD to PDT in email dated June 25th, 2015

Hi everyone,

I just spoke with Paul Scott and Greg Greidanus about this document. You may read the information to be informed if you wish, but it's not necessary for us to provide agreement on the process. This preliminary planning process is something that WeyCo PB has chosen to do above and beyond the requirements of the Planning Standard. We do not have any policy or guidelines to reference and provide direction on a process such as this. There is no reason why they can't take this type of an approach to preliminary planning process. Ultimately, the end results identified in the chosen Preferred Forest Management Strategy will be assessed to ensure the Planning Standard is met. Liana Luard

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Appendix X – LB-002: Seismic Line Width

Issue Number: LB-002

Seismic Line Width

Type: √ Requires Resolution ☐ Discussion Item

1 Description

Seismic lines are typically not retained as polygon features in either forest inventory or land use datasets. They are generally treated as lineal features only as the width is normally less than the minimum that can be captured digitally as a polygon. However, for forest planning purposes, seismic lines are considered non-vegetated and must be deleted from the planning landbase. To that end, seismic lines need to be polygon features. Rarely do companies have the width of individual lines as an attribute on the features themselves. For the purposes of strategic or tactical forest planning the application of an average width (for lines where width is unknown) is appropriate.

In the previous FMPs for both Edson and Drayton Valley, seismic lines were buffered to a total width of 8m (4m either side) and applied as a deletion to the landbase.

Note that the FMP will NOT include the avoidance lines if they exist, as these linear disturbances typically have not removed timber to any significant degree, and are difficult to interpret for inclusion in a land use layer. The recommendation below will only apply to identifiable and interpreted seismic lines available in Weyerhaeuser's seismic line layer.

2 Data

The existing seismic lines layer (downloaded from Silvacom Online) has the most up to date information on seismic lines across the FMA area. Figure 1 shows the seismic lines in and around the FMA area. The dataset is based on linear features only, *i.e*. zero width is assigned to all the cutlines.

The seismic layer is in the process of being updated by Silvacom using the latest imagery to the fall of 2012. This is expected to be completed by November 2014.

3 Recommendation

As the linear features in the dataset have no width assigned to them, they will have to be buffered. While the previous FMP used a 4m buffer on either side, consideration should be given to the fact that many of these lines were created a number of years ago and will already be forested to varying extents. In order to recognize that the extent of landbase loss will be reduced, it is recommended that a buffer of 2.5 meters each side of all seismic lines (for a total width of 5 meters) is used for this FMP.

4 Resolution

The intention to change the seismic line width from the current 8m to 5m was discussed at a meeting with the Quota Holders and ESRD on September 15, 2014. ESRD stated that any change would require justification, possibly a field study. Weyerhaeuser felt that a field study was not warranted at this time and made the decision to stay with an 8m buffer for the 2016 FMP. (AIP by PDT on December 2, 2014).

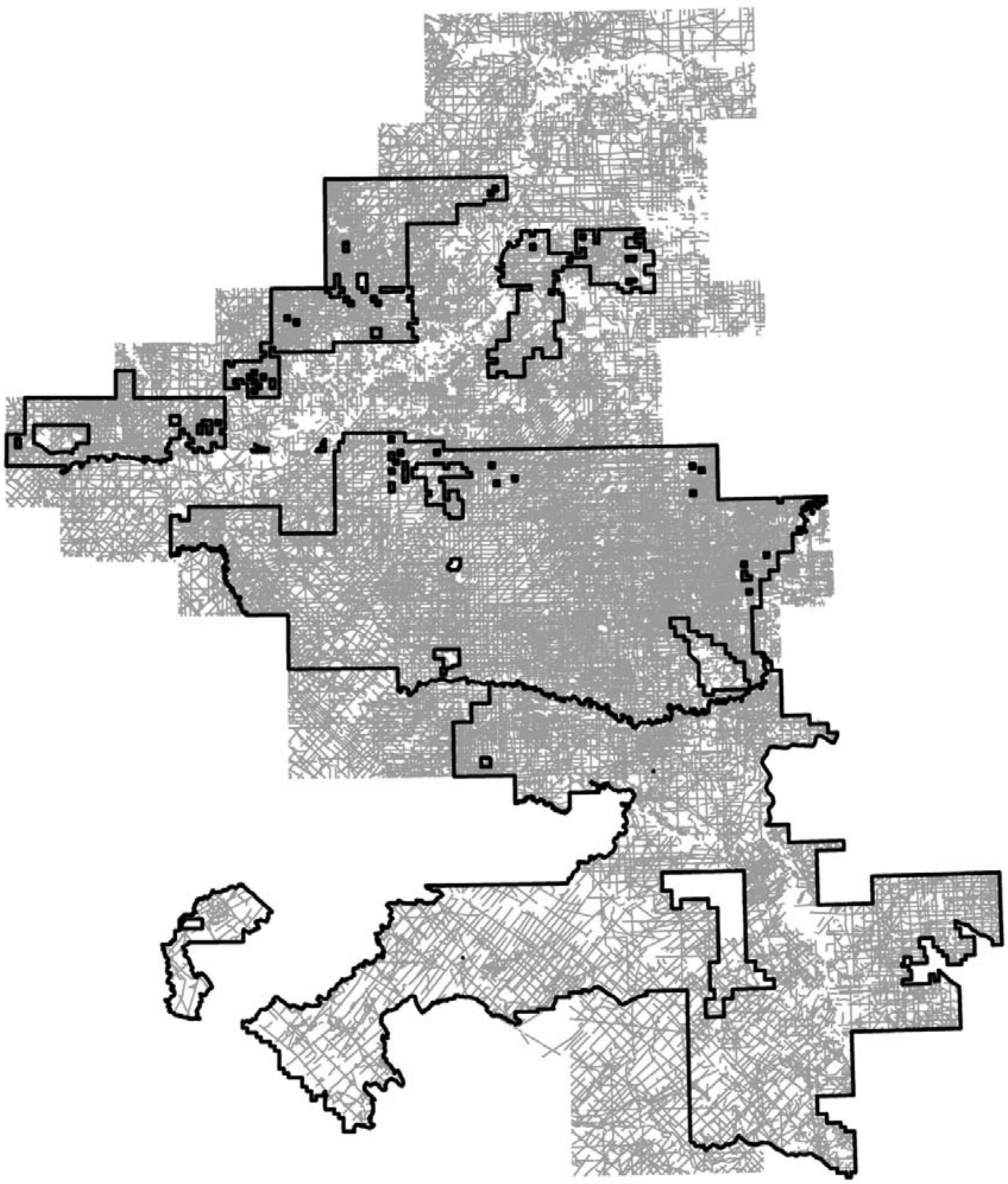

Figure 1. Seismic lines in and around the FMA area (data to 2000 for DV and 2004 for Edson FMAs).

Appendix XI – LB-005: RSA/AVI Update Process

Issue Number: LB-005

RSA/AVI Update Process

Type: √ Requires Resolution ☐ Discussion Item

1 Description

With the new Alberta Vegetation Inventory (AVI) coming into effect for the Weyerhaeuser Pembina DFA, an issue has been raised regarding the alignment of the new AVI linework with the linework from Reforestation Standards of Alberta (RSA) performance surveys. A number of RSA block boundaries differ somewhat from the new AVI polygon(s) due to a variety of factors including, but not limited to: differences in data capture (i.e. imagery, GPS, etc.); the addition of landuse dispositions since the RSA surveys were conducted; and differences in boundary interpretation. These differences result in the creation of slivers and polygon fragments that remain when RSA block boundaries are reconciled against AVI polygons. To resolve this issue, methods need to be developed that identify polygon fragments and slivers that are created when RSA and AVI layers are overlaid and resolutions need to be created to determine how to resolve the presence of these fragments and slivers that is acceptable to stakeholders.

2 Identified Issues with the RSA Dataset

1. Boundary Differences

   In most cases, the AVI polygon boundaries do not match the RSA survey boundaries exactly. Generally, however the net area gain/loss between the boundaries is negligible. Cutting in the RSA boundaries will, however result in slivers which will complicate the resulting landbase.

2. Internal Linework

   Several RSA blocks have internal linework to differentiate different sampling units. The inclusion of these sampling units is important as they will affect volume projections. A method to Identify and include these sampling units in the landbase when the linework is not present in the AVI will be required.

3. Retention Patches

   For the RSA surveys that involved aerial sampling, there is inconsistency regarding the delineation of retention patches within the survey area and the degree to which they are delineated. In some cases all retention patches within a single RSA block were delineated and in some cases no retention patches were delineated. With patch delineation affecting RSA block area, some consistency is required.

3 Methodology

3.1 Identifying Slivers between the Two Layers

In order to understand the change between the RSA blocks and the new AVI, a single township was processed to demonstrate the process (TWP 51, RGE 16). The AVI and RSA block layers were overlaid and the slivers of AVI polygons created from this union were identified. This was done using the following process:

1. The RSA data and AVI data were clipped to the same extents.
2. Geometry was updated for both layers and unique keys were added to the attributes table.
3. The two layers were combined using a Union
4. Geometry of the union layer was updated and joined by AVI key to the original AVI data

After the join, the following selections were completed

1. Select all blocks with an RSAKey = 0 (identifies polygons that were not part of the RSA blocks)
2. Select blocks that do not have an Anth_Non or Anth_Veg code (removes non-forested blocks)
3. Select block where the (Union Area/AVI Area) < 100%. (This indicates a change in the area due to the union of the RSA and AVI, most commonly a sliver that remains).

This creates a visual that shows fragments and slivers of AVI polygons that have been created due to the presence of RSA blocks.

4 Results

In Township 51 - Range 16, there are 34 unique RSA blocks, when sub units within RSA blocks are combined. One block was a sliver on the edge of the township tile, so it was removed from the analysis. Of the remaining 33 RSA blocks the average area was 12.33 ha with a range of 0.27 ha to 25.74 ha. When these RSA blocks were overlaid with the new AVI an average of 90% of the area was common between the two sets of boundaries with a range between 16% and 100%, with 22 of the 33 polygons having averages greater than 90%.

When comparing RSA polygons to AVI polygons, on average there was 0.25 ha of area associated with each RSA block that was classified as standing timber by the AVI. Additionally, 0.74 ha was the average area outside of the RSA block area that was classified as part of a clearcut in the AVI. When considering the differences in area alone between RSA blocks and the new AVI in terms of net area and not spatial boundaries, by excluding area that was classified as standing timber in the AVI and including area that was classified as clearcut, the amount of area classified as part of a clearcut averages about 98%.

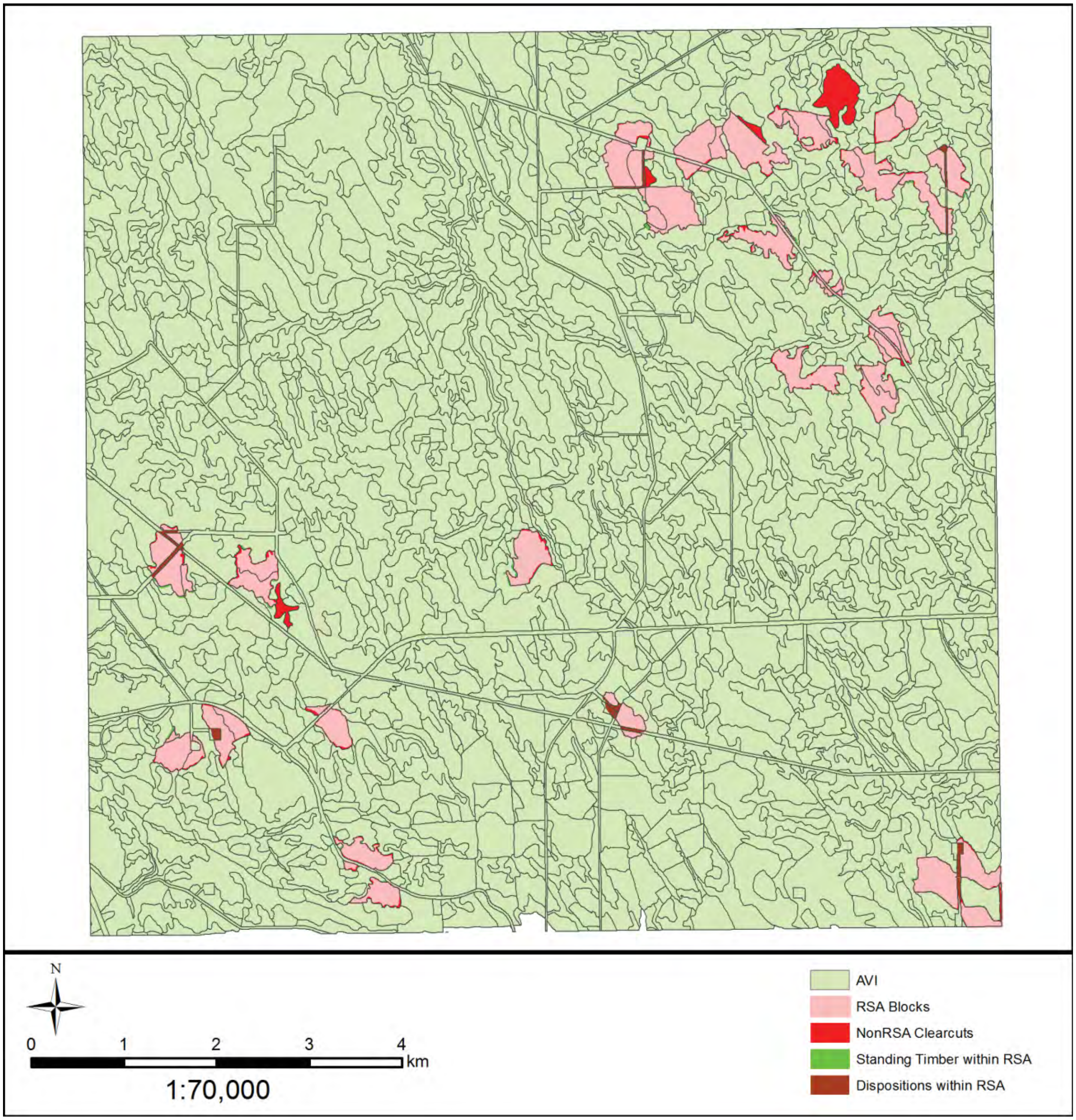

Figure 1: Township 51, Range 16 with RSA blocks and slivers created due to differences in alignment of the two layers.

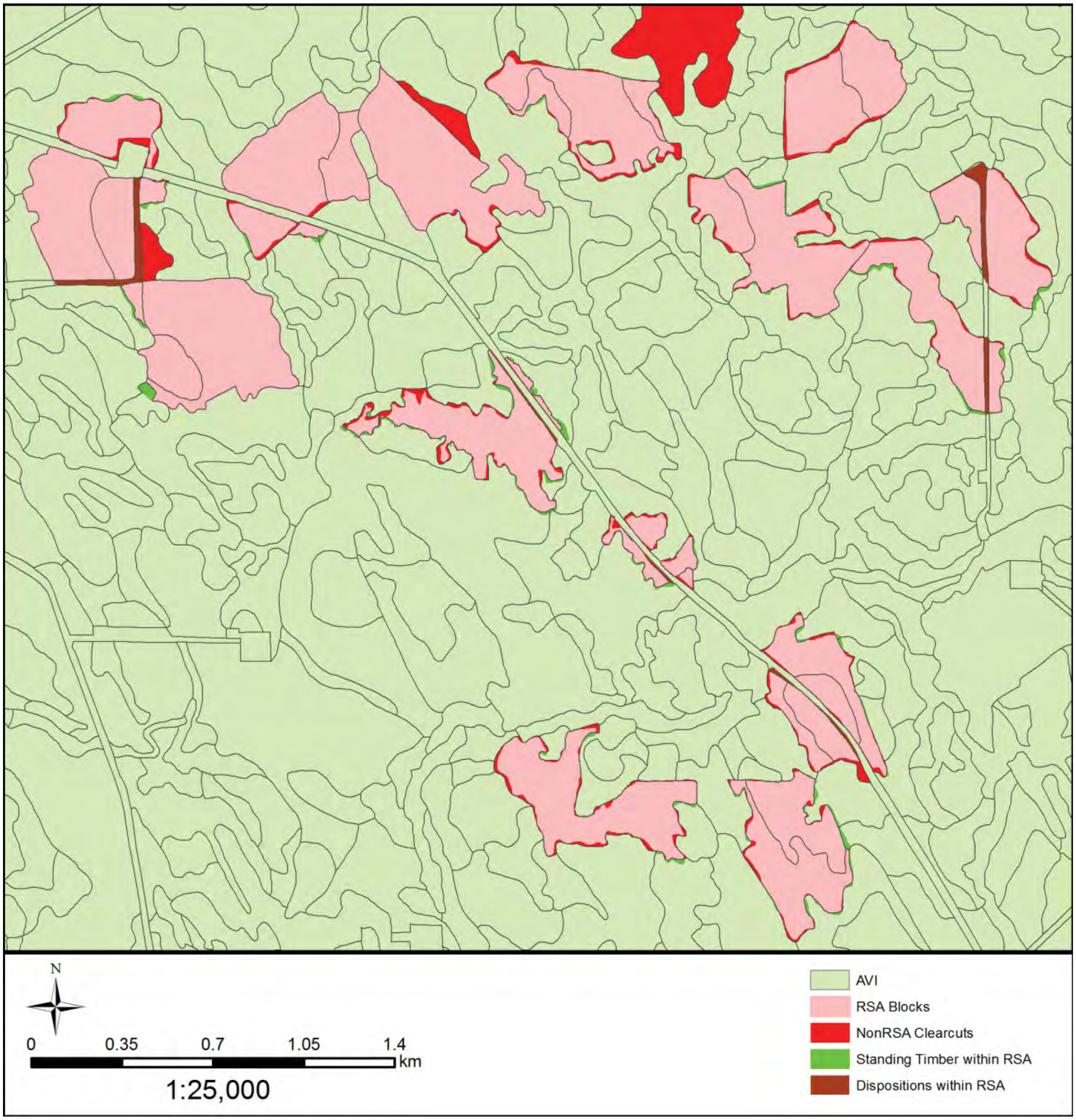

Figure 2: Larger scale view of RSA blocks in the northeast corner of TWP 51, RGE 16 showing AVI slivers with a maximum size of 2 ha.

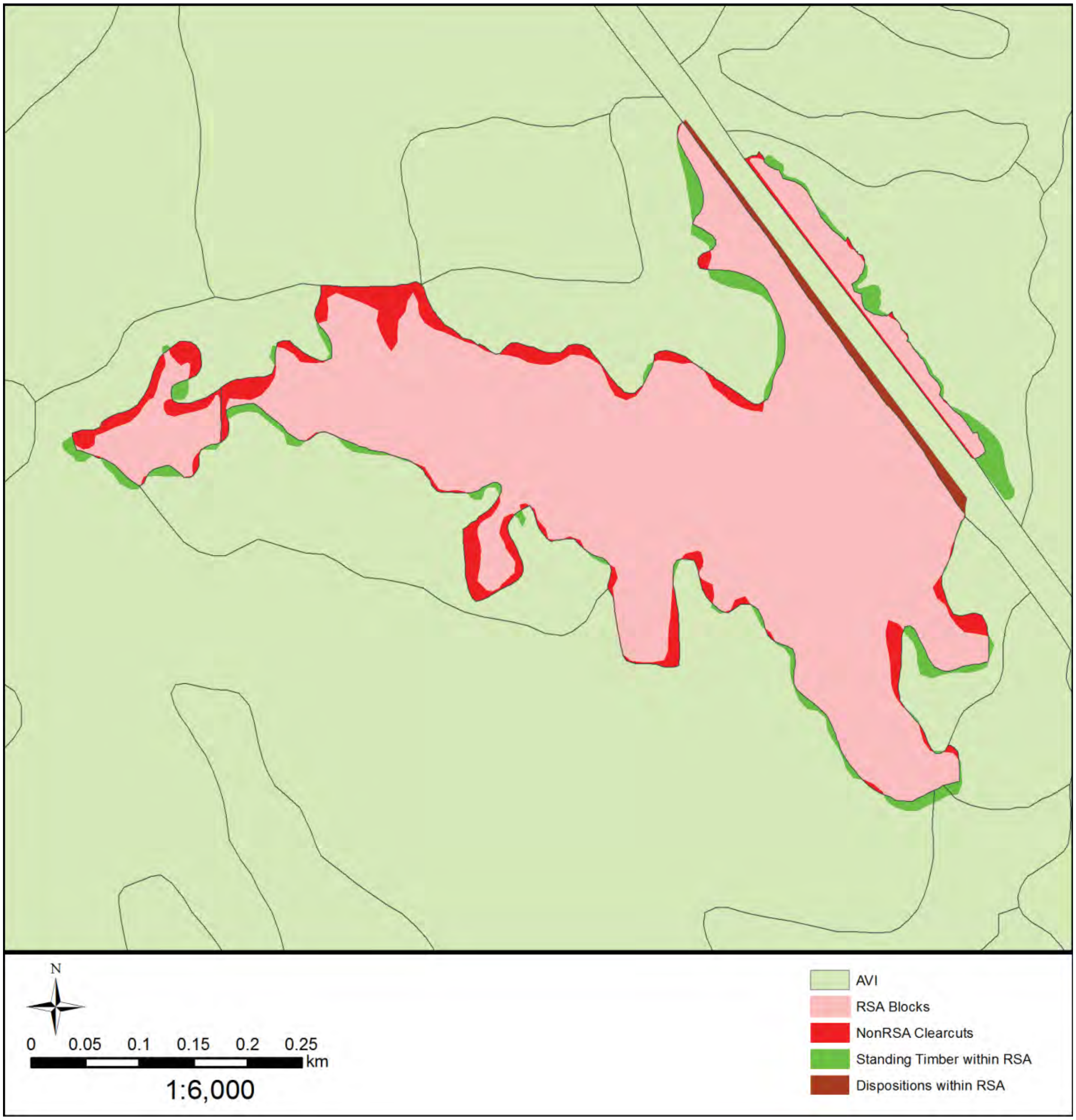

Figure 3: Larger scale view of ARIS opening 5160512656A in the northeast corner of TWP 51, RGE 16 showing the types of slivers created in by the AVI/RSA overlay.

5 Recommendations

The landbase for this DFMP will be created using new AVI, the boundaries for forest and cutblock polygons having been interpreted using recent photography (2012). In line with recent direction from the GoA to use a single representation of a cutblock opening, the following recommendations are proposed to resolve the issues between the two datasets:

1. For all RSA surveyed openings, AVI polygon boundaries will be used to represent the RSA boundaries. This will ensure that the harvest blocks fit in with the surrounding stands and sliver generation will be minimized.
2. For RSA openings with internal linework, the linework will be added only if it is not already present in the AVI. If the linework is present in the AVI then no additional changes will occur. Internal linework will be inspected on a block by block basis to ensure that no unnecessary linework is introduced into the landbase.
3. For all RSA openings with delineated retention patches, the patches will not be carried forward unless it is present in the AVI, i.e. only retention patches captured in the AVI will be carried forward to the landbase.

6 Resolution

1. Only where the AVI is considered newer and more accurate than the RSA boundary. Only one boundary can be selected. Where the RSA Boundary isn't selected, it will be a requirement to compare it to the AVI boundary in a separate document and/or table with a rationale. Block yields and projections will still be based off survey results.
    a. Table will have the following information: opening number, area surveyed (RSA), area applied (AVI) and rationale (optional map).
2. Where there is existing RSA internal linework (e.g. Sampling units). The linework needs to be carried forward. WeyCo PB can propose a method. Should be wall to wall coverage. Everything in the block should be 100% coverage. Even if it's not present in the RSA boundary.
3. GoA acknowledges retention may not be captured in the AVI. As long as they can meet their reporting requirements in another manner it will be acceptable.

AIP January 14, 2016

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Appendix XII – LB-007: Hydrography Buffer Sources

Issue Number: LB-007

Hydrography Buffer Sources

Type: √ Requires Resolution ☐ Discussion Item

1 Description

A part of the landbase netdown process is to identify all water bodies and linear features and buffer them according to a predetermined set of rules. The task of capturing and categorizing hydrography features is a complex one and will require some discussion and further investigation.

2 Sources of Hydrography data

2.1 Silvacom

The buffer layer downloaded from the silvacom website contains multiple features which overlap. This will require clean up as this overlap introduces issues such as redundancy, slivers, and donut holes into the data which, in turn, creates unwanted artifacts in the netdown process.

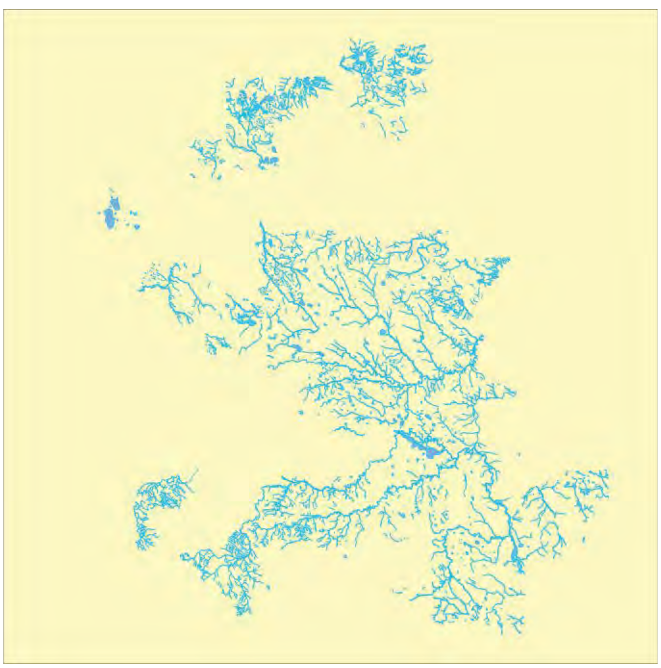

Figure 2-1: Hydro Buffers as downloaded from Silvacom

2.2 Albera Base Layers – Altalis

This Alberta wide 1:20K scale hydrography layer can be used to derive the buffers required for the netdown input. The dataset is made up of a polygon layer and a linear layer.

The polygon layer will provide the source data for the Trumpeter Swan lakes and major lakes and rivers while the linear layer will be used to derive buffers for smaller streams and creeks.

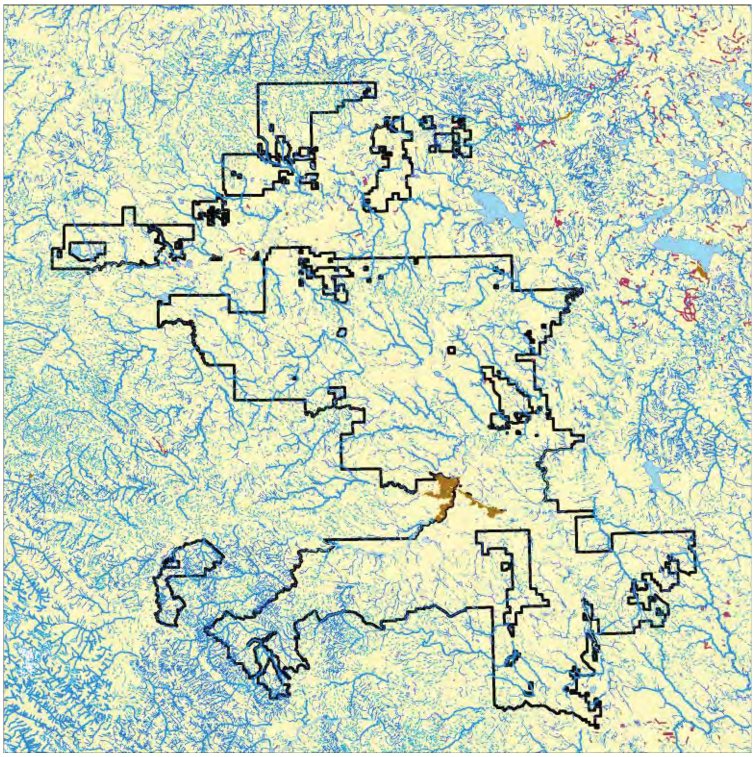

Figure 2-2: 1:20K Alberta hydrography layers

2.2.1 Polygons

- Lakes which intersect Trumpeter Swan areas as designated by ESRD are categorized as Trumpeter Swan Lakes
- Other polygon Lakes are considered major lakes
- Polygon river features are used as major rivers

2.2.2 Line Features

FEATURE_TY field is used to determine the category:

- Large creeks (STR-PER, Permanent Streams)
- Small streams (STR-IND, indefinite stream)
- Transitional streams (STR-REC, Recurring streams)

These categories were cross referenced with the buffer layer downloaded from the silvacom site.

2.3 Previous LB

Another way of identifying buffers is to use previous landbase data and use any features with a "DEL" attribute which contains a riparian buffer. The main issue with this method is that deletion criteria have a certain hierarchy which means that some buffer polygons can have a different deletion attribute based on a non hydro related criteria.

2.4 LiDAR

Lidar data have not yet been received by FORCORP.

3 Objective

The purpose of this issue document is to reach a resolution regarding the source of the hydrography data and the standards of which to buffer them prior to using the data as input for the landbase netdown process.

4 Resolution

PDT agreement Feb. 25, 2015

Appendix XIII – LB-008: Road Buffer Identification

Issue Number: LB-008

Road Buffer Identification

Type: √ Requires Resolution ☐ Discussion Item

1 Description

A part of the landbase netdown process is to identify all access roads and buffer them according to a predetermined set of rules. The task of capturing and categorizing road features is a complex one and will require some discussion and further investigation.

2 Sources of access road data

2.1 Albera Base Layers – Altalis

This Alberta wide 1:20K scale roads layer can be used to derive the buffers required for the netdown input. The dataset is made up of line work attributed based on road class.

Criteria will need to be set in order to assign buffer sizes based on road classes for this layer as width attribute is deemed unreliable.

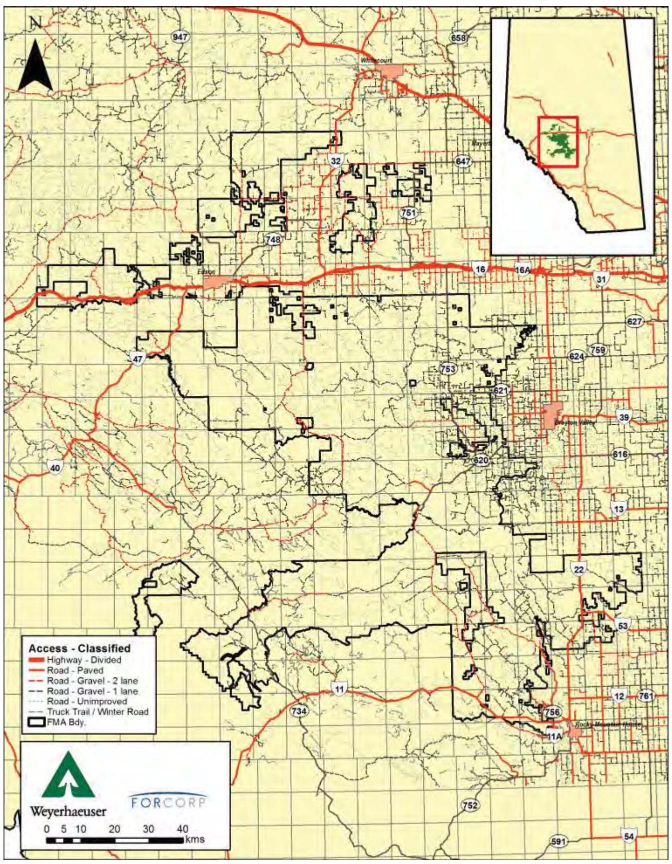

Figure 2-1: 1:20K Alberta road network (Altalis)

2.2 DIDS

Another way of identifying buffers is to use access disposition within the Alberta DIDS Plus data where DIDS denotes an access road allowance. The main problem with this approach is that data maybe lost when access roads go through road allowances as shown in the figure below.

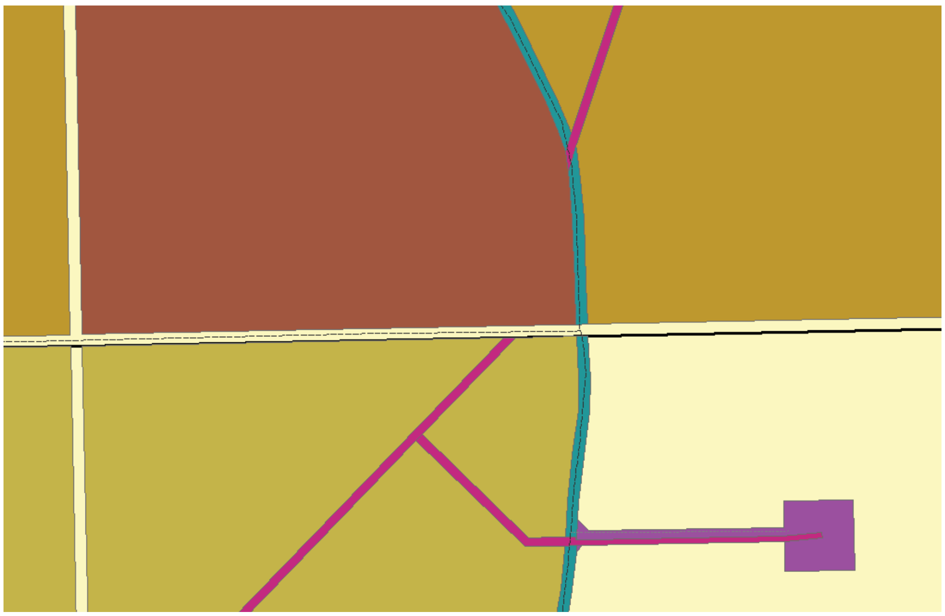

Figure 2-2: Access road allowance as denoted by DIDS

3 Objective

The purpose of this issue document is to reach a resolution regarding the source of the access data and the standards of which to buffer them prior to using the data as input for the landbase netdown process.

4 Resolution

It was decided at a technical team meeting on September 10, 2014 to use the new AVI updated with DLOs for the net landbase (post Aug 1, 2012). For the Patchworks model Weyerhaeuser's latest road network will be used.

On Dec 18, 2014, ESRD specified that access information should also include disposition types ("DISP_TYPE") - 'EZE', 'LOC', 'ROE', 'FRD', 'ROW', 'REA' and 'BCE'.

PDT agreement, Feb. 25, 2015

Appendix XIV – LB-009: Combine Watersheds

Issue Number: LB-009

Combine Watersheds

Type: √Requires Resolution ☐ Discussion Item

1 Description

The watershed layer is one of the inputs that go into the netdown landbase creation process. The current layer supplied by ESRD contains watersheds that are < 500ha in size. The objective of this exercise is to generalize this layer and absorb smaller watershed polygons (< 500 ha) into larger, adjacent polygons.

2 Original Data

As Table 1 shows, there are 25 watershed polygons which have areas that are under 500 ha in size. Figure 1, shows the original state of the fourth order watersheds layers as downloaded from AESRD (January 2015).

Table 1: Number of watershed polygons within area categories

Area (ha)	Count of Watersheds
0 - 500	25
500 +	143
	168

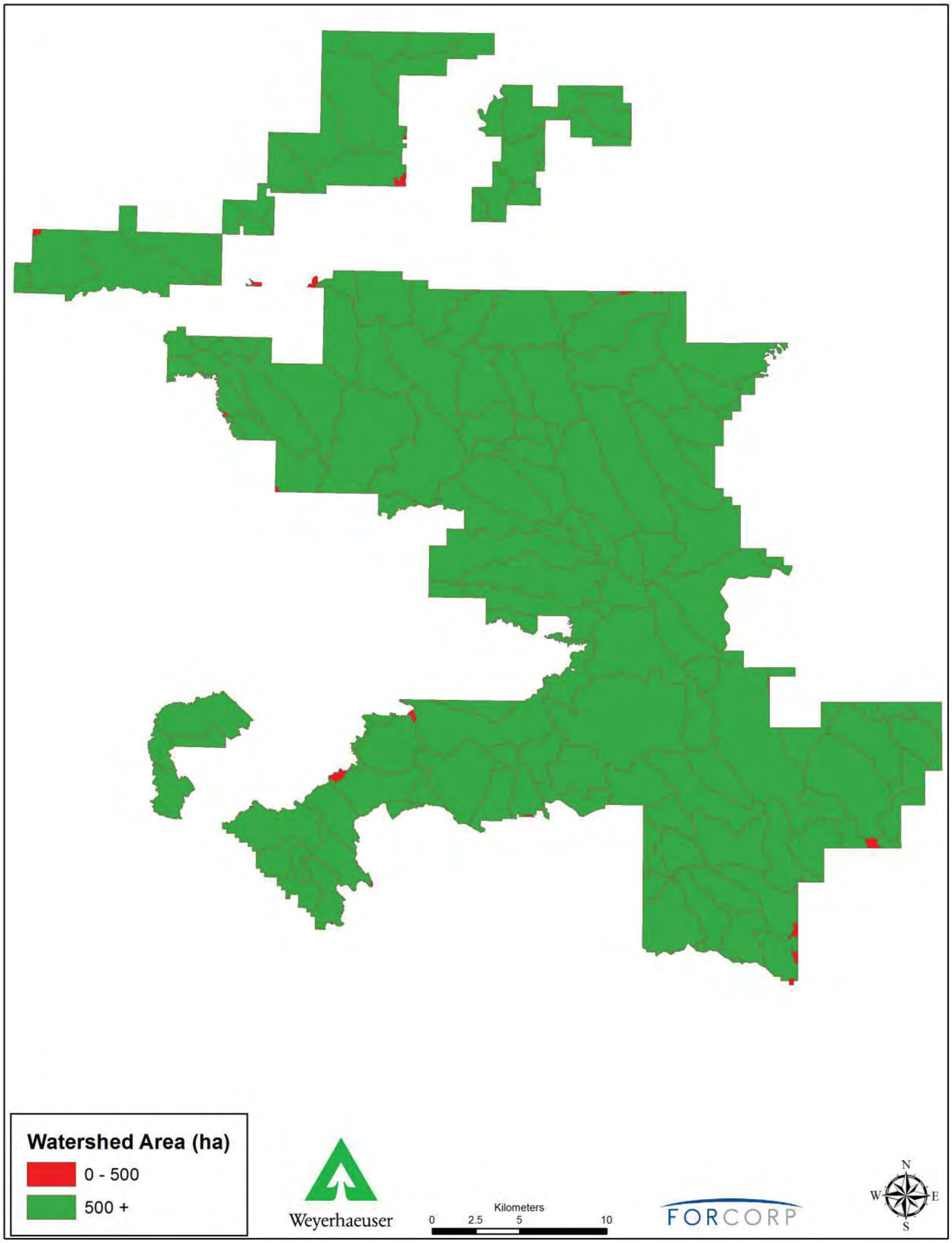

Figure 1: Fourth order watersheds as received by FORCORP.

3 Watershed Polygon Generalization

The watersheds that have < 500 ha of area inside the Weyerhaeuser boundaries were generalized through a process which merged them with their largest (by area) adjacent neighbor. To show the result of generalizing these 25 watersheds, Figure 2 was created. This figure depicts both the finalized version of the watershed layer as proposed and a before and after snapshot of where 1 watershed dissolved.

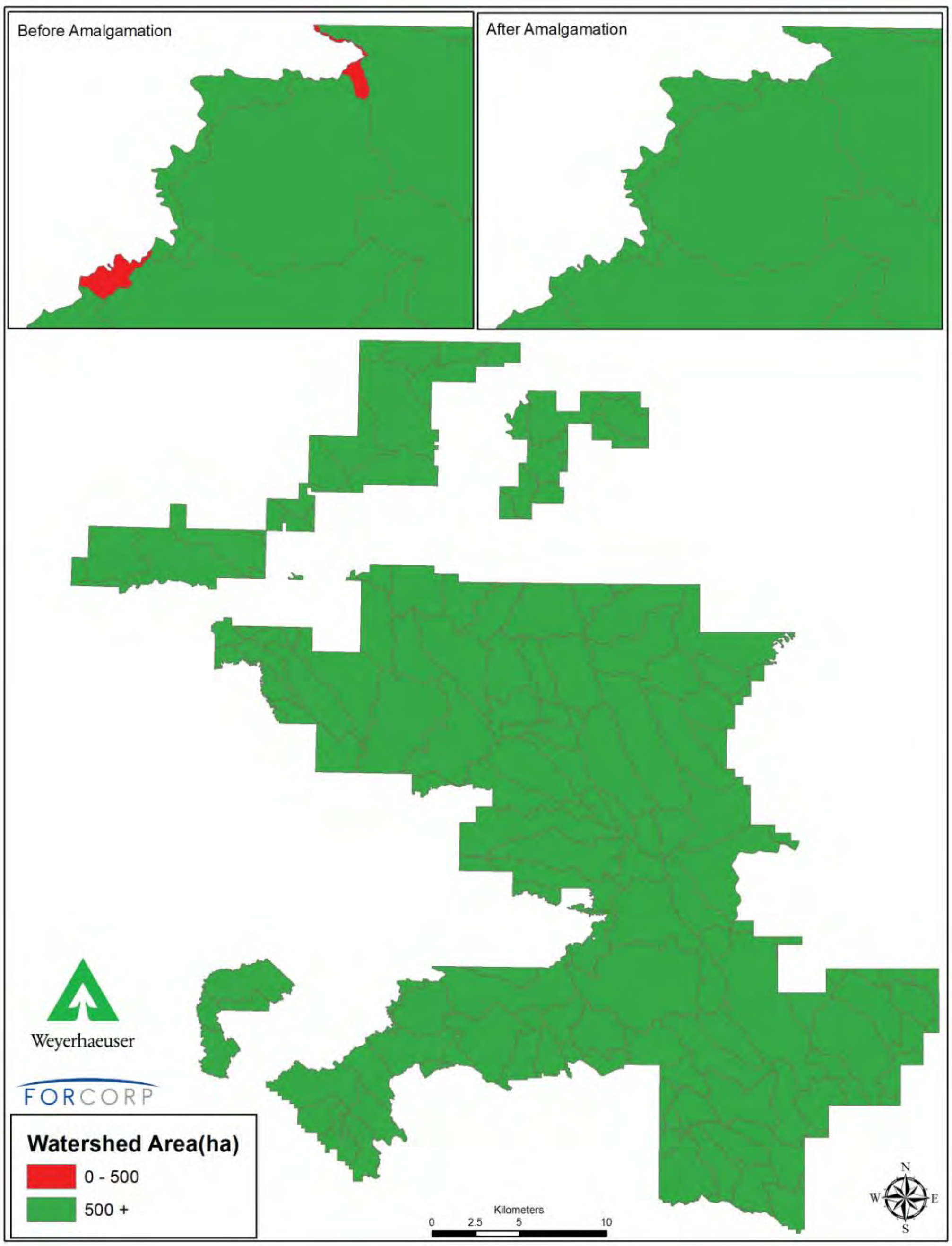

Figure 3-1. An overview of the process to remove small watersheds.

4 Thresholds for Watershed Impacts

The following email was received by Paul Scott from Liana Luard on February that reads:

Thresholds for Watershed Impacts

The following thresholds of impacts are being used:

ECA< 30%: Low impacts

30% <ECA<50%: Medium impacts

ECA> 50%: High impacts

Those watersheds for which high impacts have been identified by this method, it is recommended to define some mitigation strategies which may be applied to protect watershed values in the identified watersheds. Some recommended mitigation measures include, but are not limited to:

- timely removal of temporary roads,
- extra retention of trees,
- closure of roads to public (active roads have more erosion than inactive)
- focusing harvest on areas that are not expected to contribute to spring freshets.
- Timing of proposed operations (winter / summer)
- Site disturbance associated with skidding and site prep, etc

5 Resolution

Email received from Liana Luard by Paul Scott on February 23, 2015 read:

"We met on Friday, February 20, 2015 to discuss what to do with boundary watersheds. Here's the verdict:

1. **As identified originally (e-mail attached), all watersheds will remain intact.**
2. **Boundary watersheds less than 500 hectares will not have an assessment completed on them. It has been decided that there is no value in completing an assessment on these because the entire watershed (outside the FMA) is not being assessed.**
3. **Absorbing the watersheds as presented due to the FMA boundary is not recommended. Making any adjustments defies all principles of hydrology and therefore does not make sense."**

PDT agreement, February 25, 2015

Appendix XV – LB-010: Process to Reconcile New 2012 AVI to Current ARIS Records

Issue Number: LB-010

Process to Reconcile New 2012 AVI to Current ARIS Records

Type: √ Requires Resolution ☐ Discussion Item

1 Background

This document describes the reconciliation process between the new Weyerhaeuser 2012 Alberta Vegetation Inventory (AVI) and the corresponding areas recognized in the Alberta Regeneration Information System (ARIS). It covers the Weyerhaeuser Pembina Defined Forest Area (FMUs E15, E2, W5 ,W6 and R12).

This process is expected to expedite the validation of ARIS to the net land base determination, as described in the Alberta Forest Management Planning Standard (V4.1 – April 2006, section 3.11 of Annex 1). It will be the responsibility of each timber operator to ensure that their ARIS records are consistent with all harvest areas from the defined forest area created as of March 1, 1991. This includes all harvested/reforested areas contributing to the regenerating landbase but not areas under non-forestry dispositions and/or areas that have been withdrawn from the productive landbase (mines, pipelines, well sites etc.).

In general, the following rules will be applied during the development of the net land base:

I. Any AVI polygon identified with a modifier of 'CC Clearcut' that does not have an ARIS opening number but ***has*** a valid AVI forest label - natural stand yield curves will be used to represent their contribution to the timber producing landbase based on their AVI stratum.

II. Any AVI polygon that has a modifier of 'CC Clearcut' that does not have an ARIS opening number but ***does not*** have a valid AVI forest label (i.e.clg) will not form part of the timber productive landbase unless Weyerhaeuser can supply additional information to ESRD in support of inclusion into the timber productive landbase (i.e. a ground survey).

III. Any AVI polygon identified with a modifier of 'CC Clearcut' that has an ARIS opening number - regenerating yield curves will be used to represent their contribution to the timber producing landbase based on their ARIS stratum.

The process defined by this document will deal with those AVI polygons identified in iii) above. The new AVI has included all known ARIS opening numbers. There are a number of AVI polygons identified with a modifier of 'CC' where the ARIS opening number is unknown. Weyerhaeuser, ESRD and the Quota Holders have all supplied information to minimize the extent of this deficiency.

2 Validation Process

2.1 Comparing new AVI polygons to ARIS records

Silvacom has created an automated GIS process that identifies discrepancies between recently approved AVI polygon areas and their associated ARIS areas. In general, the following occurs:

- Select polygons with a modifier of 'CC Clearcut" and an ARIS opening number from the AVI and aggregate areas based on the ARIS Opening Number
- Match the AVI polygons to ARIS records[1]
- If matches are not found, attempts are made to gather the correct ARIS information; if the ARIS opening number applied to the AVI polygon is correct, then either ESRD or another timber operator can provide the information for this process; if there is not corresponding ARIS information, then it may be determined that the ARIS opening number associated with the AVI polygon has been labeled incorrectly.
- Where matches are found, identify if there are any area discrepancies based on the following:
    - Each AVI polygon opening area shall be within the allowable error of+/- 5% for those opening greater than or equal to 10 hectares, or +/- 0.5 hectares where an opening is less than 10 hectares, of the ARIS area
- Identify potential sources for area discrepancies, such as:
    - small retention patches not interpreted in the AVI
    - permanent deletions/disturbances that have occurred since harvesting and not updated in the ARIS data
    - incorrect, or outdated, boundaries in the cutblock layer

[1] Includes Weyerhaeuser and all authorized timber disposition holders operating within the Defined Forest Area.

2.2 Rationale for Area Differences

Match the outputs created in section 2.1 to the raw ARIS data and produce a table similar to the example below. This will be used to identify all area discrepancies and indicate if they are due to small retention patches, permanent deletions, cutblock boundary issues, or any combination of the three.

Table 1. ARIS-AVI Area Discrepancies

Weyerhaeuser Pembina FMA Twp. 50 Rge. 10 W5M - New AVI ARIS Area Reconciliation (March 1, 1991 to April 30, 2014)																
ARIS DATA								AVI Opening & Area						Difference (ha) (ARIS - AVI)	Changes Required in ARIS (Y/N) (5% or 0.5 ha rule)	Rationale
Opening Number	Field Number	Operator	Primary Disposition	Net Harvested Hectares	Skid Clearance Date (yyyy-mm-dd)	Stratum Declaration	Landbase Designation	OPEN_NUM	FIELD_NUM	OWNER	AREA_HA (AVI)	SKID CLEAR DATE	DATA SOURCE			
5100500205A	214	FRIA	CTPW060254	7.91	2/7/2001	C-2000	SS	5100500205A		xxx	7.91		Non-Liability Blocks	0.00	N	
5100500228	M15	WEYR	CTLW060052	17.62	2/20/1992	C-2000	MS	5100500228		WEYR	18.03	20-Feb-92	Historical Blocks	-0.41	N	
5100500304A	492	FRIA	CTPW060254	1.69	2/7/2001	C-2000	SS	5100500304A		xxx	1.02		Non-Liability Blocks	0.67	Y	Cutblock Layer Update
5100500335	M14	WEYR	CTLW060052	17.2	2/20/1992	C-2000	MS	5100500335		WEYR	16.73	20-Feb-92	Historical Blocks	0.47	N	
5100500711	711	WEYR	FMA9700035	43.05	11/2/2006	D-2000	HH	5100500711	711	WEYR	43.05	2-Nov-06	FMS Blocks	0.00	N	

3 Documentation of Results

It is intended that this analysis will occur approximately three times during the interpretation and submission stages of the new AVI. The first analysis will occur on Submissions 1 through 6, or approximately 64 full or partial townships.

Results will be shared with timber operators. It will be the responsibility of all operators to ensure that the following information from the approved AVI polygon(s) with a modifier of 'CC Clearcut' and an ARIS identifier (opening numbers) are consistent with their ARIS records. This will hasten the process for reconciliation of ARIS to the net land base.

Based on direction from ESRD in an email dated March 6th from Liana Luard to Paul Scott, the following should occur:

- *Timing (for submission of discrepancies) to ESRD will be once the AVI is approved for the entire Defined Forest Area.*

- *There will be 1 submission. This submission will ideally be complete with all openings for all operators within the DFA. ESRD will address all LFS/FRIAA openings.*
    - *With 1 submission complete with all operators there will need to be RFP sign off (per Annex 2 of the Planning Standard) from each quota holder that the information WeyCo PB submits is complete and accurate. The sign off also gives permission to update ARIS with the new areas. Make sure there is a clear link between what the QH is agreeing to in their sign off and the information submitted.*

June 4, 2015: PDT Agreement-In-Principle

Appendix XVI – LB-014: Reconciliation of the Original DFA Boundary (FMUs E2, E15, R12, W5, and W6) and the new R15 FMU Boundary

Issue Number: LB-014

Reconciliation of the Original DFA Boundary (FMUs E2, E15, R12, W5, and W6) and the new R15 FMU Boundary.

Type: √ Requires Resolution ☐ Discussion Item

1 Description

The new R15 FMU boundary recently released by the GoA is designed to amalgamate the five FMUs in the Weyerhaeuser Pembina DFA (FMUs E2, E15, R12, W5 and W6). The outer boundaries were compared to determine if there were any differences between the new boundary and the individual FMU boundaries currently hosted on AltaLIS.

The initial assessment showed a net loss of 1.76 ha of area when changing from the original DFA boundary to the new FMU boundary. Further analysis showed that 4.75 ha of area were deleted from the original DFA, and 2.99 ha of area were added to the new FMU.

While the extent of the differences is small and for most spatial layers can be dealt with by simply cutting in the new boundary, there are a few instances where existing boundaries, *e.g.* the FMA boundary cannot be easily changed and the application of the new FMU boundary will result in slivers of potentially unclassified land being part of the landbase.

2 Methodology

Figure 1 shows that there are no visible differences between the original DFA and new R15 FMU boundaries when overlaid on a map. To compare the boundaries, a symmetrical difference between the two layers was conducted. The layer created from the process identifies all area that corresponds to one data layer and not the other by deleting any polygons that were common to both. Following this process, a multipart to single part process was run so that individual slivers could be identified and the dimensions of each sliver could be calculated.

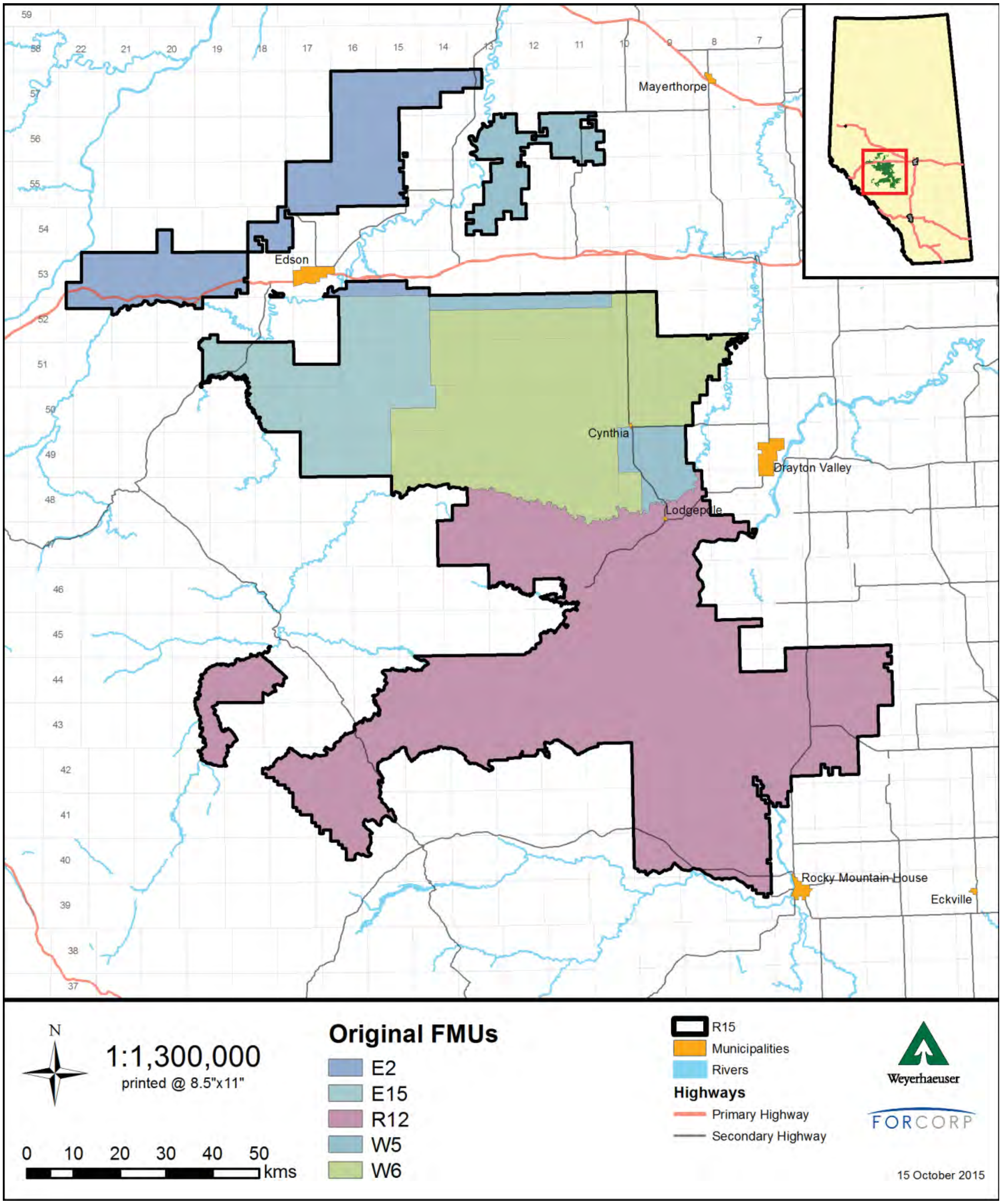

Figure 1. Original FMUs found within the new R15 boundary.

3 Results

The process described above resulted in the creation of 74 individual slivers, with 38 slivers being part of the original DFA and not R15, and 36 slivers being part of R15 but not part of the original DFA. The location of these slivers is shown in Figure 2. Descriptive statistics of the slivers are presented in Table 1.

Table 1. Descriptive statistics of slivers created from the symmetrical difference between the original Weyerhaeuser Pembina DFA and the new R15 FMU boundary. The smallest slivers are smaller than 10 square meters.

	Part of Old DFA, not part of R15	Part of R15, Not part of Old DFA
Number of slivers	38	36
Average sliver size (ha)	0.13	0.08
Minimum sliver size (ha)	<0.001	<0.001
Maximum sliver size (ha)	3.28	1.61
Total sliver area (ha)	4.75	2.99

The 3.28 ha polygon indicated in Table 1 as being the largest sliver part of the old DFA but not in R15 is located in the south east of FMU R12 and appears to be the only polygon that has been intentionally removed from the new FMU. This polygon falls outside the FMA, as shown in Figure 3. All other slivers appear to be due to slight misalignments between the old and new boundaries. Many of these slivers (± 45%) are less than 0.001 ha in size.

As the FMA and VSA boundaries align with the old FMU boundaries, the same misalignment issues exist when these boundaries are compared to the new R15 FMU boundary.

4 Discussion

For most of the spatial layers to be used in the 2016 FMP, the small differences highlighted above do not pose much of an issue as the layers can be redrawn by simply clipping the original source layer to the new boundary. Operational boundaries, such as compartments and working areas can also be modified to match the new boundary.

However, for existing pre-determined boundaries, such as FMA and VSA area boundaries, a method to resolve these differences will be required as the boundaries are defined in the FMA agreement and may require an Order in Council to change.

In order to resolve this issue, the following options should be considered:

Option 1:

Request the GoA to review the new R15 boundary and amend it to match the outer boundaries of the old FMUs, with the possible exception of the 3.28 ha polygon in R12 (Figure 3). No further sliver reconciliation would be required as the DFA/FMU/FMA boundaries will align.

Option 2:

Keep the new R15 boundary as provided, but request permission from the GoA to fit the FMA and VSA boundaries to align with the new R15 FMU boundary for the FMP. Official approval for these changes may have to be obtained at a later date.

5 Final Resolution

Use the R15 Draft boundary. Use option 2 as described above.

AIP – January 14, 2016

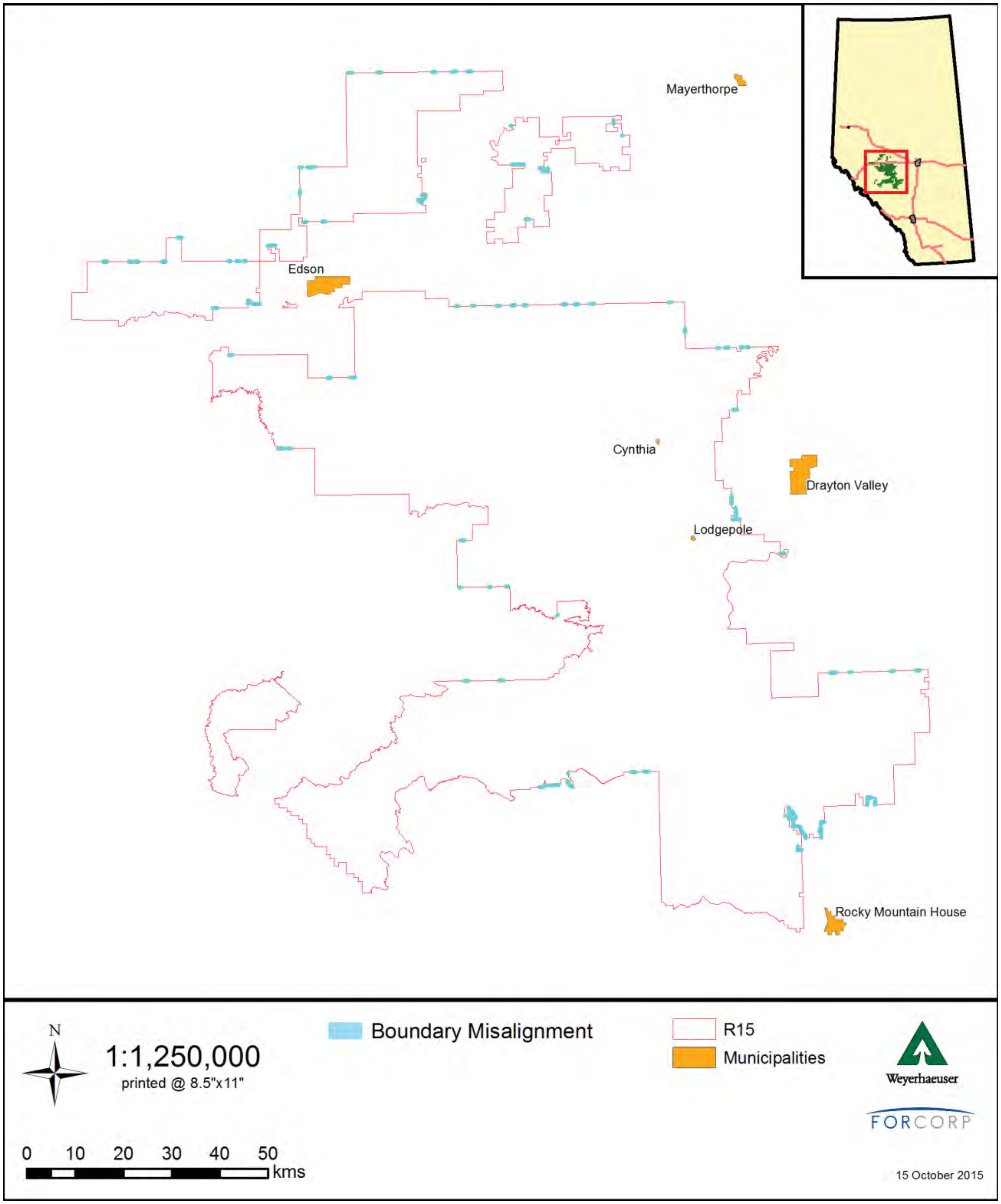

Figure 2. Slivers created from the difference between the original DFA boundary and the new R15 boundary.

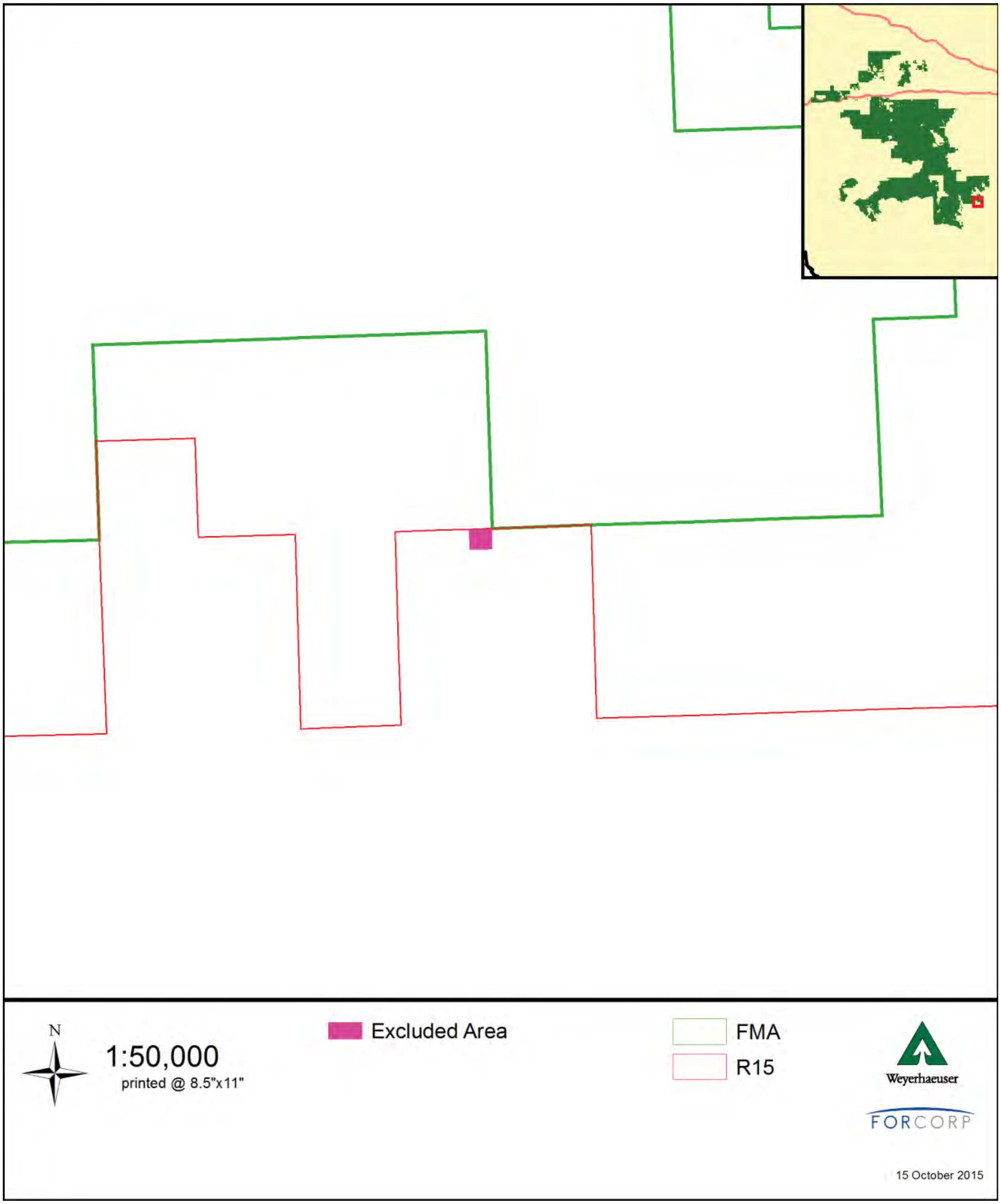

Figure 3. Polygon excluded from the new R15 FMU.

Appendix XVII – LB-015: Determination of Absolute or Proxy Status for Layers used in the Landbase Netdown Process

Issue Number: LB-015

Determination of Absolute or Proxy Status for Layers used in the Landbase Netdown Process

Type: √ Requires Resolution ☐ Discussion Item

1 Description

In the landbase netdown process, one of the initial steps is combining the Alberta Vegetation Inventory (AVI) with the numerous boundary layers and land use layers into a single landbase file. This is done through a multi-union process. Within the file produced from the multi-union, each AVI polygon is assigned attributes based on the additional layers. In cases where the AVI boundaries do not match the boundaries of the other layers, AVI polygons are subdivided and parts of individual AVI polygons can have different attributes. The subdividing of AVI polygons can result in a large number of new polygons being created, which can be difficult to manage and can increase processing time.

To reduce the potential number of polygons within the landbase, assigning different resolutions to some boundaries may be appropriate. For example, with natural subregions having gradual boundaries that change over long distances, subdividing individual polygons based on the natural subregions layer may not be required. In other cases the subdivision may be required due to administrative or reporting requirements (*e.g.* FMA boundaries). In these cases, narrower, absolute boundaries are required.

Assigning the layers with broad boundaries as "proxy layers" will reduce the number of potential polygons that will be created in the final landbase. In these cases, polygons intersected(majority or centroid) by proxy layer boundaries are assigned a single classification. This results in fewer polygons being created without it affecting the integrity of the final landbase.

The goal of this document is to examine the landbase layers that will be used in landbase netdown and determine the layers that have absolute boundaries and the layers for which proxy status will be sufficient.

2 Layers

The list of layers to be used in the landbase netdown process is presented in Table 2.1. This list was created based on the spatial layers listed in the Spatial Data Document. Each layer is to be reviewed to determine whether the boundary assignments will be absolute, or if proxy status will be sufficient for the netdown process. Layers can be added, or deleted from this list as appropriate.

Table 2.1: List of layers and boundary status.

Layer Name	Comments	Status (Absolute/Proxy)
Forest Management Unit	R15 Boundary	Absolute
Previous FMUs	E2, E15, R12, W5 and W6 FMU boundaries	Absolute
Volume Supply Areas	Volume Supply Area Boundaries	Absolute
Land Use Framework		Proxy
Forest Management Agreement Area	FMA Boundary	Absolute
Townships	If not in the AVI (Currently not) then added[1].	Proxy
Compartment Boundaries		Absolute
Working Area Boundaries		Absolute
Woodshed Boundaries	Operational boundary	Proxy
HUC Watersheds	Hydrologic Unit Code Watershed Boundaries	Proxy
Watersheds	Forest Management Watershed Boundaries	Absolute
Seismic Lines	Seismic lines and buffers within the FMU (Classified landbase - will not be included in the TSA landbase)	Absolute
Roads	Roads within the DFA not recognized in the new AVI	Absolute
FireSmart Zones	FireSmart Zones bordering and within the FMU	Absolute
Historical Wildfires	Fires that occurred after the imagery that was used to create the new AVI	Absolute
Digitial Integrated Dispositions (DIDs)	Provincial dispositions not recognized in the new AVI	Absolute
Culture Points	Areas of cultural importance (Alberta Culture and Tourism)	Absolute
Natural Subregions		Proxy
Tree Seed Zones		Proxy
Grizzly Bear Zones		Absolute
Grizzly Bear Watersheds		Proxy
Temporary Exclusions		Absolute
Hydrology Buffers		Absolute
Special Land Use Areas		Absolute
Parks and Recreation Areas		Absolute
Municipalities		Absolute
Private Land		Absolute
First Nations Reserves		Absolute
Grazing Dispositions		Absolute
Permanent Sample Plots		Absolute
Cutblocks		Absolute
Planned Cutblocks		Absolute
Operational Planner Deferrals and Deletions		Absolute

[1]Inclusion of townships may not be required. It is part of the planning standard; however the inclusion of the linework may needlessly divide the landbase if township level reporting is not going to be done.

3 Final Resolution

AIP January 14, 2016

\\silver\clients\Weyerhauser\Projects\P744_FMP\3_Landbase\Issues\LB_015\LB_015_AbsoluteLayersVsProxies_20151204v2.docx

Appendix XVIII – LB-017: Landbase Assignments for Protective Notations (PNTs)

LB-017: Landbase Assignments for Protective Notations (PNTs)

Type: □ Requires Resolution √ Discussion Item

1. Background

Within DIDs, protective notations (PNTs) are dispositions that may or may not be assigned to the active landbase based on direction by Alberta Agriculture and Forestry. To determine the assignment ("In" or "Out"), the status of each PNT is reviewed. The decisions based on these reviews are then incorporated into the final landbase by assigning each PNT to either the active or passive landbase.

In the landbase development process, PNT boundaries are classified as "Out" if the area is to be kept out of the active landbase for the life of the management plan. Each of these "Out" PNTs is to be cut into the landbase as a PNT deletion (D_PNT). In some cases, a PNT deletion may fall into several deletion categories (*e.g.* it may correspond to a grazing lease, or have a buffered stream running through it). In these cases, the PNT deletion may not be the final assigned deletion, as the PNT deletion may fall lower in the deletion hierarchy than other deletions assigned to the same tract of land. If a PNT is classified as "In", the linework is not cut into the landbase as this would needlessly complicate the landbase.

2. Landbase Assignments

The initial assessment of PNTs involved the review of 711 individual polygons across 226 PNTs. The list of PNTs was taken from a DIDs layer generated on 6 May 2015. This date was used to ensure that all PNTs would be accounted for after the landbase cutoff date of 1 May 2015. To generate the PNT layer, the DIDs layer was clipped to the R15 FMU boundary provided by Alberta Agriculture and Forestry, and from that product the PNTs were selected based on the Disposition Type attribute. The list of PNTs was then submitted to Alberta Agriculture and Forestry to determine which PNTs should be included or excluded from the landbase.

3. Results

The assessment resulted in 575 polygons being assigned to the active landbase, 93 polygons being assigned to the passive landbase, and 10 PNTs being assigned to be split into parts that would assigned to the active landbase and parts that would be assigned to the passive landbase. One reason for splitting a polygon included the presence of a buffered PSP within a larger tract of land. With the PSP buffer being sufficient for protecting the PSP, all PNT area outside of that buffer could be included in the active landbase, and the area within the buffer would be assigned to the passive landbase. For the polygons that were to be split, screen captured images were provided that showed the boundaries of the protected areas. These images were georeferenced to the DIDs layer, the protected areas were traced to split the polygons, and appropriate landbase assignments were then given. Of the 10 PNTs that were to be split, 27 new polygons were created. PNT locations are presented in Figure 1. Two examples of PNTs that were split into "In" and "Out" portions are presented in Figures 2 and 3. The disposition number for each PNT along with the associated landbase assignment and polygon area are presented in Appendix 1.

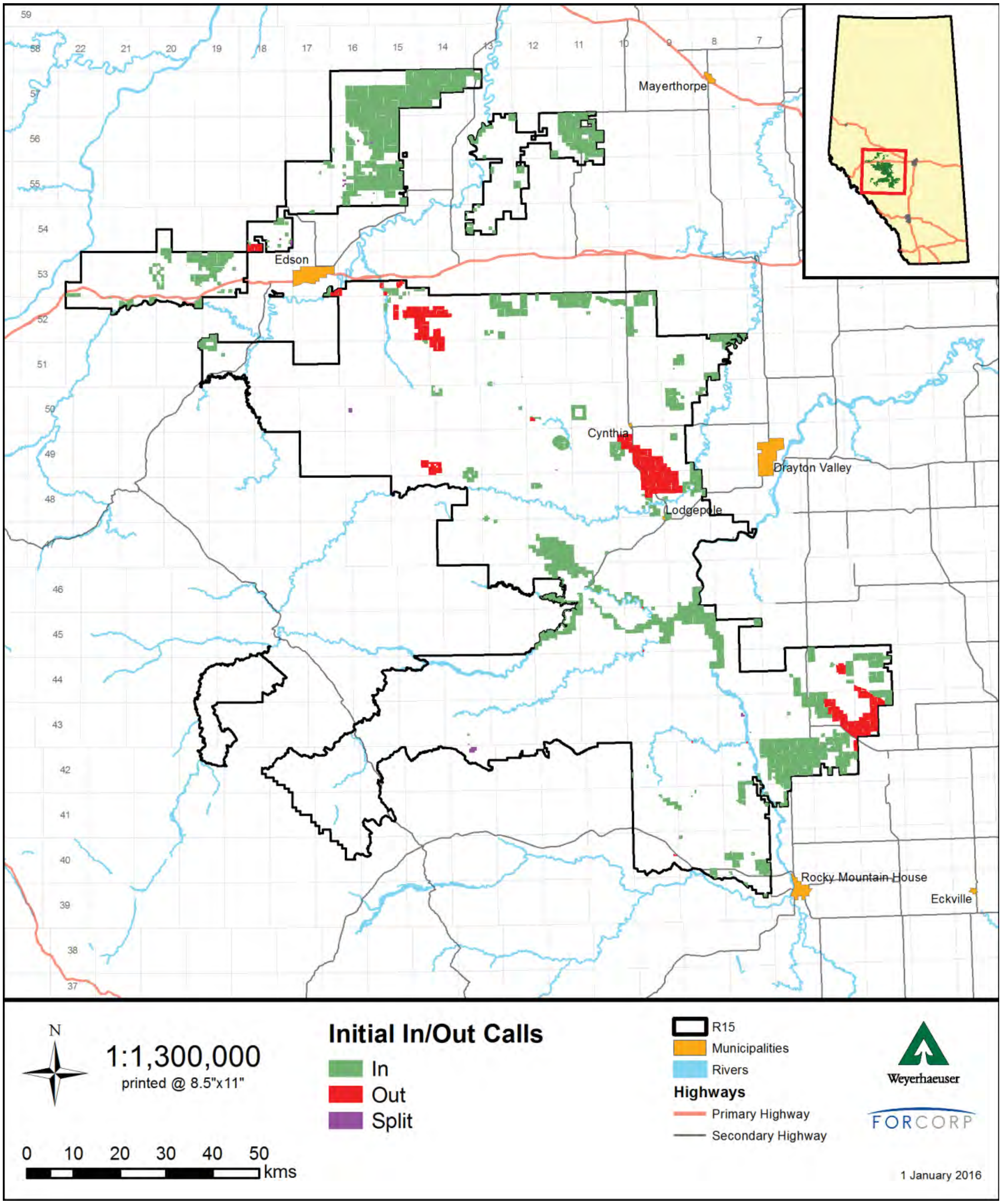

Figure 1. Location of PNTs within the R15 FMU

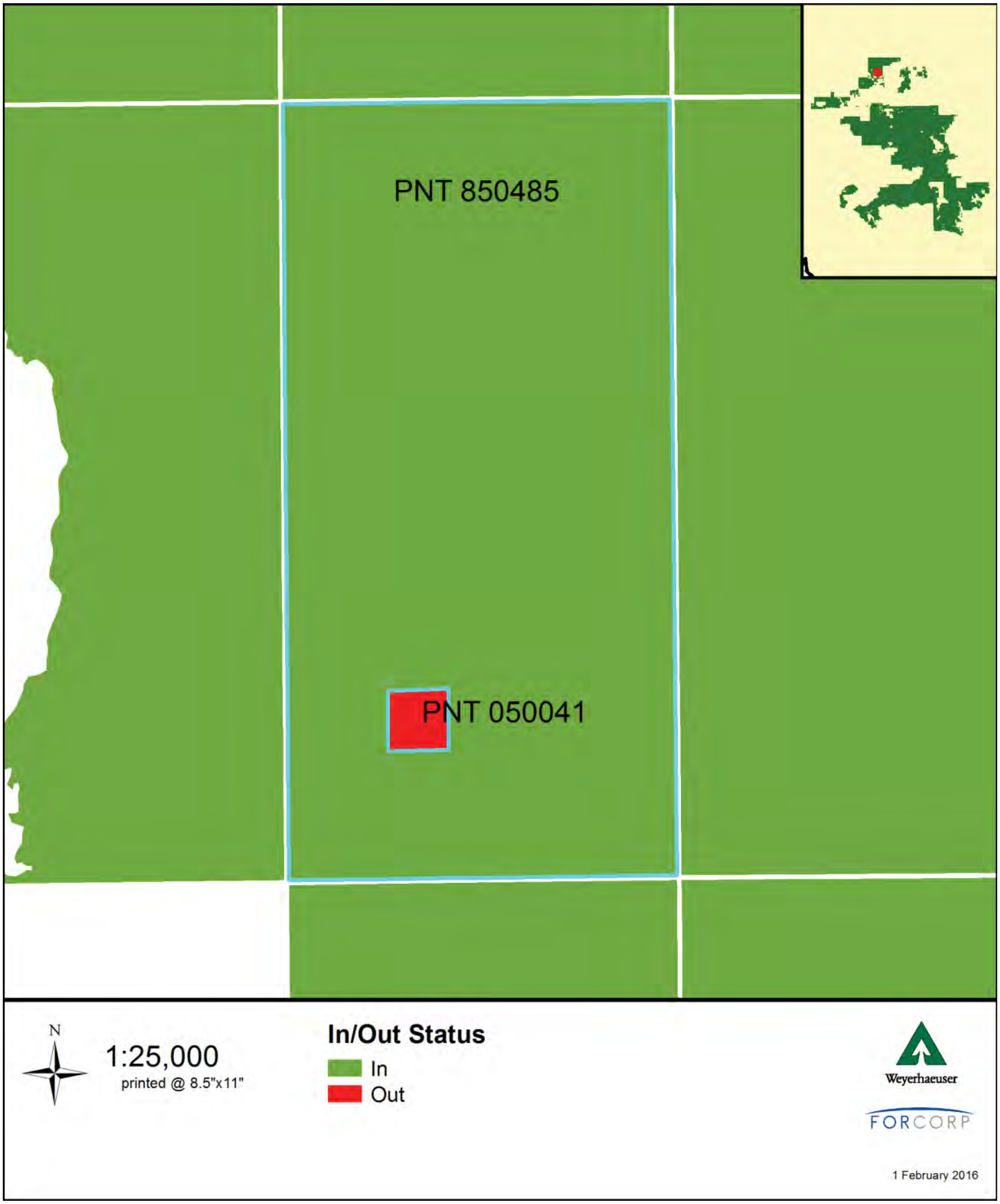

Figure 2. Overlapping PNTs – Example 1

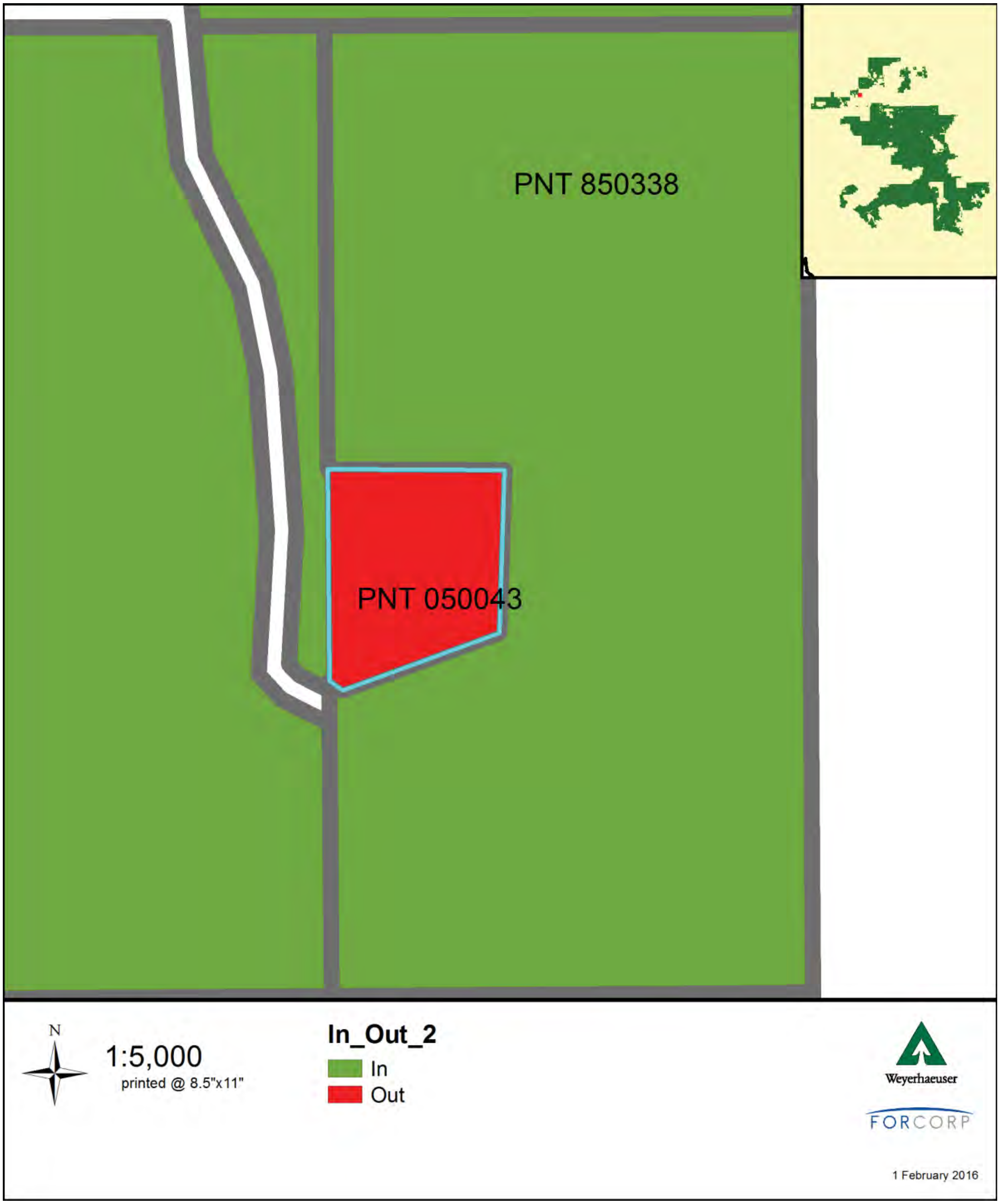

Figure 3. Overlapping PNTs – Example 2

Appendix. Landbase Assignments for PNTs within the R15 FMU.

Disposition Number	VER_DATE	EDIT_DATE	PRO_DATE	Original In/Out Call	In/Out Call after Polygon Splitting	Area after Polygon Splitting
PNT000027	1/2/1900	2/6/2008	5/5/2015	In	In	0.00
PNT000028	1/2/1900	2/6/2008	5/5/2015	In	In	0.00
PNT000038	1/2/1900	7/12/2012	5/5/2015	In	In	1936.19
PNT000070	2/17/2010	3/9/2010	5/5/2015	In	In	97.03
PNT000150	1/2/1900	9/9/2008	5/5/2015	In	In	258.75
PNT000153	1/2/1900	4/28/2008	5/5/2015	Out	Out	435.79
PNT000248	1/2/1900	7/29/2010	5/5/2015	In	In	33.48
PNT000249	1/2/1900	9/9/2008	5/5/2015	In	In	48.41
PNT010162	6/17/2009	9/24/2010	5/5/2015	In	In	59.00
PNT010214	1/2/1900	2/14/2007	5/5/2015	In	In	31.11
PNT010215	1/2/1900	2/14/2007	5/5/2015	In	In	31.77
PNT010257	1/2/1900	1/23/2008	5/5/2015	In	In	516.50
PNT010262	1/2/1900	2/5/2007	5/5/2015	In	In	579.65
PNT010263	1/2/1900	1/18/2007	5/5/2015	In	In	885.59
PNT010273	1/2/1900	2/7/2007	5/5/2015	In	In	390.08
PNT010274	1/2/1900	2/7/2007	5/5/2015	In	In	130.24
PNT020323	1/2/1900	8/11/2008	5/5/2015	In	In	16.21
PNT020361	1/2/1900	1/12/2007	5/5/2015	In	In	64.55
PNT030033	1/2/1900	1/9/2007	5/5/2015	In	In	64.71
PNT030196	1/2/1900	7/3/2008	5/5/2015	In	In	175.75
PNT030201	1/2/1900	6/2/2008	5/5/2015	In	In	221.37
PNT030277	1/2/1900	8/5/2008	5/5/2015	In	In	31.44
PNT040002	1/2/1900	1/10/2007	5/5/2015	In	In	19.78
PNT040004	1/2/1900	1/10/2007	5/5/2015	In	In	19.78
PNT040272	1/2/1900	6/17/2008	5/5/2015	In	In	174.10
PNT040273	1/2/1900	3/12/2010	5/5/2015	In	In	593.98
PNT040277	1/2/1900	4/29/2008	5/5/2015	In	In	194.85
PNT040311	1/2/1900	2/6/2008	5/5/2015	In	In	259.09
PNT040312	1/2/1900	4/8/2015	5/5/2015	In	In	222.75
PNT040356	1/2/1900	2/14/2007	5/5/2015	Out	Out	4843.98
PNT040375	1/2/1900	6/18/2008	5/5/2015	Out	Out	5556.86
PNT040376	1/2/1900	5/2/2008	5/5/2015	Out	Out	7949.42
PNT050032	1/2/1900	2/22/2007	5/5/2015	Split	In	13.74
PNT050032	1/2/1900	2/22/2007	5/5/2015	Split	Out	2.45
PNT050040	1/2/1900	2/12/2007	5/5/2015	Split	In	13.20
PNT050040	1/2/1900	2/12/2007	5/5/2015	Split	Out	2.97
PNT050041	1/2/1900	2/12/2007	5/5/2015	Split	In	9.83
PNT050041	1/2/1900	2/12/2007	5/5/2015	Split	Out	6.33
PNT050042	1/2/1900	1/4/2007	5/5/2015	Split	In	24.54
PNT050042	1/2/1900	1/4/2007	5/5/2015	Split	Out	7.61
PNT050043	1/2/1900	1/4/2007	5/5/2015	Split	In	29.79
PNT050043	1/2/1900	1/4/2007	5/5/2015	Split	Out	2.31
PNT050058	1/2/1900	4/28/2008	5/5/2015	In	In	84.99
PNT050178	6/6/2005	9/12/2008	5/5/2015	Split	Out	31.93
PNT050178	6/6/2005	9/12/2008	5/5/2015	Split	In	16.14
PNT050186	1/2/1900	8/21/2008	5/5/2015	Out	Out	15.76

Disposition Number	VER_DATE	EDIT_DATE	PRO_DATE	Original In/Out Call	In/Out Call after Polygon Splitting	Area after Polygon Splitting
PNT060013	7/27/2006	5/17/2007	5/5/2015	In	In	519.44
PNT060014	3/6/2006	7/19/2007	5/5/2015	In	In	32.31
PNT060022	5/12/2006	7/28/2010	5/5/2015	In	In	63.32
PNT060080	7/27/2006	5/17/2007	5/5/2015	In	In	237.10
PNT060082	1/3/2007	5/17/2010	5/5/2015	Out	Out	3.58
PNT060130	8/23/2006	7/19/2007	5/5/2015	In	In	129.76
PNT070012	2/5/2007	5/29/2007	5/5/2015	In	In	63.72
PNT070054	11/1/2007	3/31/2008	5/5/2015	In	In	30.12
PNT070259	10/15/2007	11/30/2007	5/5/2015	In	In	1345.93
PNT070311	2/4/2008	9/22/2009	5/5/2015	In	In	1001.51
PNT090018	5/5/2009	5/20/2009	5/5/2015	In	In	645.33
PNT090019	5/5/2009	5/20/2009	5/5/2015	In	In	1325.73
PNT090024	6/17/2009	6/23/2009	5/5/2015	In	In	516.46
PNT090033	2/5/2010	2/26/2010	5/5/2015	In	In	753.03
PNT090038	7/7/2009	7/24/2009	5/5/2015	In	In	1181.29
PNT090059	8/31/2009	9/18/2009	5/5/2015	In	In	32.87
PNT100007	1/18/2010	1/26/2010	5/5/2015	In	In	405.73
PNT100010	1/20/2010	1/26/2010	5/5/2015	In	In	96.45
PNT100019	2/1/2010	2/8/2010	5/5/2015	In	In	15.24
PNT100046	3/1/2010	3/9/2010	5/5/2015	In	In	1770.20
PNT100281	1/28/2011	4/6/2011	5/5/2015	In	In	2573.15
PNT120022	4/3/2012	8/9/2012	5/5/2015	In	In	85.83
PNT130020	3/4/2013	3/8/2013	5/5/2015	In	In	740.47
PNT130102	12/13/2013	12/17/2013	5/5/2015	In	In	13.11
PNT130157	1/15/2014	1/21/2014	5/5/2015	In	In	170.51
PNT130168	1/24/2014	1/29/2014	5/5/2015	In	In	62.03
PNT130240	12/13/2013	12/16/2013	5/5/2015	In	In	128.47
PNT140010	3/12/2014	3/14/2014	5/5/2015	In	In	281.16
PNT150037	3/2/2015	3/4/2015	5/5/2015	Out	Out	31.18
PNT150039	4/20/2015	4/24/2015	5/5/2015	In	In	270.38
PNT680006	1/2/1900	1/9/2007	5/5/2015	Out	Out	64.71
PNT710637	1/2/1900	2/21/2008	5/5/2015	In	In	128.59
PNT720005	1/2/1900	6/27/2010	5/5/2015	In	In	775.42
PNT720025	1/2/1900	1/12/2007	5/5/2015	In	In	16.15
PNT721782	1/2/1900	5/18/2007	5/5/2015	In	In	64.75
PNT742890	1/2/1900	5/18/2007	5/5/2015	In	In	64.70
PNT753588	1/2/1900	1/10/2007	5/5/2015	In	In	0.00
PNT753606	1/2/1900	2/20/2007	5/5/2015	Out	Out	77.97
PNT753739	1/2/1900	3/25/2008	5/5/2015	In	In	437.06
PNT753973	1/2/1900	2/7/2008	5/5/2015	In	In	424.35
PNT754024	1/2/1900	2/2/2007	5/5/2015	In	In	22.05
PNT760075	1/2/1900	6/25/2008	5/5/2015	Out	Out	20.90
PNT763833	1/2/1900	1/10/2007	5/5/2015	In	In	151.62
PNT764916	1/2/1900	2/15/2008	5/5/2015	In	In	520.08
PNT765019	1/2/1900	1/9/2007	5/5/2015	Out	Out	169.88
PNT770026	1/2/1900	6/13/2008	5/5/2015	In	In	128.67
PNT774629	1/2/1900	6/23/2008	5/5/2015	In	In	15.92
PNT775502	1/2/1900	1/30/2008	5/5/2015	In	In	388.92
PNT775522	1/2/1900	6/18/2008	5/5/2015	In	In	683.98
PNT775530	1/2/1900	3/12/2010	5/5/2015	In	In	3189.61
PNT775603	1/2/1900	5/8/2008	5/5/2015	In	In	194.00
PNT775604	1/2/1900	5/12/2008	5/5/2015	In	In	518.17

Disposition Number	VER_DATE	EDIT_DATE	PRO_DATE	Original In/Out Call	In/Out Call after Polygon Splitting	Area after Polygon Splitting
PNT775616	1/2/1900	5/18/2007	5/5/2015	In	In	64.52
PNT775764	1/2/1900	3/24/2008	5/5/2015	In	In	2846.05
PNT775850	1/2/1900	3/31/2008	5/5/2015	In	In	451.93
PNT775918	1/2/1900	6/17/2008	5/5/2015	In	In	25.69
PNT775973	1/2/1900	1/27/2015	5/5/2015	In	In	1938.38
PNT776084	1/2/1900	6/19/2008	5/5/2015	In	In	1551.95
PNT776123	1/2/1900	5/23/2008	5/5/2015	In	In	451.44
PNT776167	1/2/1900	3/5/2010	5/5/2015	In	In	213.85
PNT776188	1/2/1900	3/31/2008	5/5/2015	In	In	131.72
PNT776217	1/2/1900	5/3/2008	5/5/2015	In	In	2085.50
PNT776272	1/2/1900	7/8/2008	5/5/2015	In	In	7416.63
PNT780191	1/2/1900	3/26/2007	5/5/2015	Out	Out	864.01
PNT780208	1/2/1900	2/7/2008	5/5/2015	In	In	224.77
PNT780312	1/2/1900	7/16/2008	5/5/2015	In	In	995.97
PNT780417	1/2/1900	5/18/2007	5/5/2015	In	In	64.47
PNT780430	1/2/1900	1/10/2007	5/5/2015	Out	Out	14.11
PNT780883	1/2/1900	8/9/2010	5/5/2015	In	In	275.18
PNT780896	1/2/1900	1/10/2007	5/5/2015	Out	Out	295.48
PNT780945	1/2/1900	10/10/2007	5/5/2015	In	In	7.41
PNT785094	1/2/1900	2/26/2007	5/5/2015	In	In	166.07
PNT790074	1/2/1900	3/8/2007	5/5/2015	Split	In	53.35
PNT790074	1/2/1900	3/8/2007	5/5/2015	Split	Out	11.13
PNT790302	1/2/1900	6/10/2008	5/5/2015	Out	Out	193.64
PNT790373	1/2/1900	5/18/2007	5/5/2015	In	In	64.75
PNT790382	1/2/1900	2/5/2008	5/5/2015	In	In	5122.20
PNT790518	1/2/1900	6/2/2008	5/5/2015	In	In	128.55
PNT790914	1/2/1900	2/14/2007	5/5/2015	Out	Out	388.87
PNT790932	1/2/1900	5/11/2007	5/5/2015	In	In	64.96
PNT790979	1/2/1900	2/5/2008	5/5/2015	In	In	1375.68
PNT794747	1/2/1900	1/26/2007	5/5/2015	In	In	387.31
PNT800038	1/2/1900	8/25/2009	5/5/2015	Split	In	2801.71
PNT800038	1/2/1900	8/25/2009	5/5/2015	Split	Out	6.64
PNT800573	1/2/1900	6/2/2008	5/5/2015	In	In	8063.45
PNT800942	1/2/1900	9/12/2008	5/5/2015	In	In	9601.77
PNT801048	1/2/1900	2/12/2007	5/5/2015	In	In	183.63
PNT801170	1/2/1900	12/21/2006	5/5/2015	Out	Out	514.76
PNT801204	1/2/1900	9/10/2008	5/5/2015	In	In	254.76
PNT810051	1/2/1900	6/13/2008	5/5/2015	In	In	129.18
PNT810257	1/2/1900	5/18/2007	5/5/2015	In	In	64.53
PNT810258	1/2/1900	5/18/2007	5/5/2015	Out	Out	64.63
PNT810510	1/2/1900	6/5/2008	5/5/2015	In	In	0.00
PNT810618	1/2/1900	1/12/2007	5/5/2015	In	In	189.67
PNT810638	1/2/1900	9/5/2008	5/5/2015	In	In	128.92
PNT810693	1/2/1900	4/28/2008	5/5/2015	In	In	1165.19
PNT810758	1/2/1900	5/18/2007	5/5/2015	In	In	64.53
PNT820001	1/2/1900	8/15/2008	5/5/2015	In	In	48.05
PNT820023	1/2/1900	3/12/2007	5/5/2015	In	In	352.23
PNT820312	1/2/1900	1/8/2007	5/5/2015	In	In	81.76

Disposition Number	VER_DATE	EDIT_DATE	PRO_DATE	Original In/Out Call	In/Out Call after Polygon Splitting	Area after Polygon Splitting
PNT820574	1/2/1900	2/21/2008	5/5/2015	In	In	0.00
PNT820620	1/2/1900	1/5/2007	5/5/2015	In	In	0.00
PNT820699	1/2/1900	6/19/2008	5/5/2015	In	In	389.40
PNT820852	1/2/1900	5/11/2007	5/5/2015	In	In	323.15
PNT830078	1/2/1900	6/19/2008	5/5/2015	In	In	388.94
PNT830185	1/2/1900	6/18/2008	5/5/2015	In	In	261.79
PNT830996	1/2/1900	6/10/2008	5/5/2015	In	In	256.47
PNT831025	1/2/1900	6/12/2008	5/5/2015	In	In	49.59
PNT840070	1/2/1900	1/4/2007	5/5/2015	In	In	64.29
PNT840168	1/2/1900	3/25/2008	5/5/2015	In	In	646.15
PNT840202	1/2/1900	3/28/2008	5/5/2015	In	In	129.42
PNT840385	1/2/1900	1/9/2007	5/5/2015	In	In	97.20
PNT840401	1/2/1900	3/28/2008	5/5/2015	In	In	64.65
PNT840536	1/2/1900	1/12/2007	5/5/2015	In	In	64.32
PNT840539	7/9/2009	7/24/2009	5/5/2015	In	In	121.01
PNT840579	1/2/1900	1/9/2007	5/5/2015	In	In	64.85
PNT840580	1/2/1900	2/2/2007	5/5/2015	In	In	37.82
PNT840690	1/2/1900	1/6/2009	5/5/2015	In	In	64.24
PNT850028	1/2/1900	8/27/2008	5/5/2015	In	In	925.06
PNT850029	1/2/1900	8/15/2008	5/5/2015	In	In	346.19
PNT850184	1/2/1900	2/12/2007	5/5/2015	In	In	65.46
PNT850338	2/8/2010	2/19/2010	5/5/2015	In	In	28.85
PNT850485	2/5/2010	5/18/2012	5/5/2015	In	In	23388.65
PNT850544	1/2/1900	8/18/2008	5/5/2015	In	In	258.22
PNT850565	1/2/1900	12/11/2006	5/5/2015	In	In	257.48
PNT850573	1/2/1900	3/31/2008	5/5/2015	In	In	701.78
PNT850581	1/2/1900	3/28/2008	5/5/2015	In	In	48.16
PNT850593	1/2/1900	3/31/2008	5/5/2015	In	In	624.25
PNT860083	1/2/1900	2/6/2007	5/5/2015	In	In	515.72
PNT860209	1/2/1900	8/15/2008	5/5/2015	In	In	193.78
PNT860357	1/2/1900	8/22/2008	5/5/2015	In	In	72.76
PNT860391	1/2/1900	2/6/2008	5/5/2015	In	In	259.20
PNT860615	1/2/1900	6/19/2008	5/5/2015	In	In	129.08
PNT860618	1/2/1900	2/26/2007	5/5/2015	In	In	300.41
PNT870116	1/2/1900	8/22/2008	5/5/2015	Out	Out	27.59
PNT870255	1/2/1900	1/12/2007	5/5/2015	In	In	193.87
PNT870284	1/2/1900	2/14/2007	5/5/2015	In	In	199.94
PNT870285	1/2/1900	1/9/2007	5/5/2015	In	In	371.87
PNT870561	1/2/1900	3/17/2008	5/5/2015	In	In	64.58
PNT870615	1/2/1900	2/23/2007	5/5/2015	In	In	173.86
PNT870634	1/2/1900	2/23/2007	5/5/2015	In	In	231.77
PNT870817	1/2/1900	1/8/2007	5/5/2015	In	In	64.25
PNT880004	1/2/1900	5/18/2007	5/5/2015	In	In	64.36
PNT880320	9/4/2009	2/25/2015	5/5/2015	In	In	106.11
PNT880428	1/2/1900	3/23/2007	5/5/2015	In	In	16.04
PNT880493	1/2/1900	6/18/2008	5/5/2015	Out	Out	520.19
PNT880495	1/2/1900	2/16/2007	5/5/2015	In	In	128.17
PNT880552	1/2/1900	2/14/2007	5/5/2015	Out	Out	63.44
PNT880606	1/2/1900	6/19/2014	5/5/2015	In	In	31.64

Disposition Number	VER_DATE	EDIT_DATE	PRO_DATE	Original In/Out Call	In/Out Call after Polygon Splitting	Area after Polygon Splitting
PNT890211	1/2/1900	2/15/2007	5/5/2015	In	In	346.26
PNT890501	1/2/1900	5/18/2007	5/5/2015	In	In	64.73
PNT890660	1/2/1900	2/15/2007	5/5/2015	In	In	129.69
PNT900030	1/2/1900	2/15/2007	5/5/2015	Split	In	63.13
PNT900030	1/2/1900	2/15/2007	5/5/2015	Split	Out	1.40
PNT900454	1/2/1900	5/11/2007	5/5/2015	In	In	20.23
PNT910020	1/2/1900	2/22/2007	5/5/2015	In	In	194.34
PNT910171	1/2/1900	9/6/2008	5/5/2015	In	In	8.16
PNT910238	1/2/1900	9/8/2008	5/5/2015	In	In	16.01
PNT910276	1/2/1900	4/17/2008	5/5/2015	In	In	80.40
PNT910382	1/2/1900	2/28/2007	5/5/2015	In	In	80.75
PNT920079	1/2/1900	1/21/2015	5/5/2015	In	In	229.72
PNT920109	1/2/1900	8/15/2008	5/5/2015	In	In	695.70
PNT920151	1/2/1900	8/13/2008	5/5/2015	In	In	0.00
PNT920155	1/2/1900	8/13/2008	5/5/2015	In	In	0.00
PNT920177	1/2/1900	9/8/2008	5/5/2015	In	In	4.06
PNT920178	1/2/1900	9/8/2008	5/5/2015	In	In	15.82
PNT920180	1/2/1900	5/22/2007	5/5/2015	In	In	0.00
PNT920189	4/27/1992	6/23/2008	5/5/2015	Split	In	44.57
PNT920189	4/27/1992	6/23/2008	5/5/2015	Split	Out	3.46
PNT920229	1/2/1900	2/13/2007	5/5/2015	In	In	64.81
PNT920243	1/2/1900	1/9/2007	5/5/2015	In	In	64.70
PNT920339	8/4/1992	5/22/2008	5/5/2015	In	In	249.91
PNT920436	1/2/1900	1/5/2007	5/5/2015	In	In	88.48
PNT920464	1/2/1900	3/23/2011	5/5/2015	In	In	0.29
PNT930036	1/2/1900	6/5/2008	5/5/2015	In	In	164.06
PNT930137	1/2/1900	2/7/2007	5/5/2015	In	In	258.24
PNT930141	1/2/1900	5/26/2008	5/5/2015	In	In	158.92
PNT930408	1/2/1900	1/12/2007	5/5/2015	In	In	842.10
PNT930443	1/2/1900	6/12/2008	5/5/2015	In	In	462.69
PNT940035	1/2/1900	1/9/2007	5/5/2015	In	In	64.70
PNT940051	1/2/1900	1/26/2007	5/5/2015	In	In	259.00
PNT940293	1/2/1900	5/22/2007	5/5/2015	In	In	59.61
PNT940350	1/2/1900	2/15/2007	5/5/2015	In	In	16.27
PNT940351	1/2/1900	2/15/2007	5/5/2015	In	In	16.86
PNT950091	10/23/2008	11/27/2008	5/5/2015	In	In	36.24
PNT950123	1/2/1900	3/26/2007	5/5/2015	Out	Out	177.98
PNT950134	12/19/2001	7/15/2008	5/5/2015	Out	Out	16.92
PNT950135	1/8/2008	2/2/2008	5/5/2015	In	In	876.18
PNT950177	1/2/1900	6/2/2008	5/5/2015	In	In	128.56
PNT950188	1/2/1900	6/2/2008	5/5/2015	In	In	128.56
PNT950198	1/2/1900	5/8/2008	5/5/2015	In	In	850.44
PNT960099	1/2/1900	3/17/2008	5/5/2015	In	In	24.65
PNT960157	1/2/1900	9/5/2008	5/5/2015	In	In	129.01
PNT970283	1/2/1900	8/1/2008	5/5/2015	Split	In	8.09
PNT970283	1/2/1900	8/1/2008	5/5/2015	Split	Out	8.09
PNT980102	1/2/1900	7/19/2008	5/5/2015	In	In	774.66
PNT990020	1/2/1900	1/30/2008	5/5/2015	In	In	95.13
PNT990069	1/2/1900	4/7/2008	5/5/2015	In	In	521.48
PNT990084	1/2/1900	1/30/2008	5/5/2015	In	In	259.27
PNT990085	6/18/2009	6/24/2009	5/5/2015	In	In	1618.40
PNT990173	1/2/1900	4/7/2008	5/5/2015	In	In	16.33
PNT990181	1/2/1900	2/5/2008	5/5/2015	In	In	258.41
PNT990220	1/2/1900	2/7/2007	5/5/2015	In	In	5900.16

Please note that there was a discrepancy involving PNTs 050178 and 800038 which involved splitting out a research plot area. This area was not accounted for in Version 4 of the landbase which was presented to the GoA during the landbase walkthrough on 26 October 2016. These changes will be shown in Version 5 and any subsequent versions and the change will be presented with the final landbase delivery.

AIP – November 25th, 2016 – Paul Scott and Stephen Mills – endorsed by PDT at the December 13, 2016 meeting

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Appendix XIX – LB-021: NSR Performance Surveyed Blocks

LB-021: NSR Performance Surveyed Blocks

Type: ✓ Requires Resolution ☐ Discussion Item

1. Background

Section 10 under "Procedures" in the ARIS Net Landbase Reconciliation Procedures[1] document states that:

All openings with an "NSR" condition resultant from a performance survey shall be assigned to one of two classes based upon ARIS performance survey data:

a) Openings with total stocking equal to or less than 50% shall be removed from the productive landbase. These areas, once meeting minimum AVI 2.1.1 standards for classification as being a forested type, may be returned to the productive landbase.

b) Openings with total stocking greater than 50% but less than 80% shall be assigned to a regenerating yield stratum based upon the reported component D and C stocking as reported in ARIS, and be assigned to a yield assumption scaled proportionately to the total reported stocking.

*i. For example, an opening with 21% D and 50% C reported stocking, may be deemed contributing to the regenerating landbase (total stocking exceeds 50%), would be assigned to a conifer leading mixedwood stratum, and assumed to yield 89% (71/80*100) of the conifer leading mixedwood regenerated yield assumption.*

Where approved yield stratum in a Forest Management Plan contain strata based upon less than fully stocked condition (i.e. A/B density), amended stocking thresholds must be selected (a or b above), documented and approved by Alberta.

2. Current Situation

Openings with total stocking <= 50%

In the most recent version of the landbase there are a total of eight cutblocks with a NSR condition from a performance survey that meet this criterion. Table 1 shows the 8 openings within the landbase as well as an additional three that are in the ARIS data but are outside the DFA boundary.

Table 2 shows that of the 89.51 ha of performance surveyed NSR cutblocks 60.25 ha is classified as forested by the new AVI.

[1] ARIS Net Landbase Reconciliation Procedures. Feb 10, 2015. Environment and Sustainable Resource Development. Government of Alberta.

Table 1. Performance surveyed NSR cutblocks with total stocking <= 50%

OPEN_ID	OWNERSHIP	STRATA	BLOCKYEAR	LB AREA	
5070440115A	WEYR	AwSw	1994	8.36	
5070441470A	WEYR	AwSw	1994	16.57	
5120421717A	WEYR	Aw	1995		Outside DFA
5120421881A	WEYR	Aw	1995		Outside DFA
5120422106A	WEYR	SwAw	1995		Outside DFA
5120561476A	WEYR	SwAw	1996	26.20	
5120561579A	WEYR	Sw	1996	2.17	
5150520080	WEYR	Sw	1991	9.47	
5150520081	WEYR	Sw	1991	5.89	
5150571513	LFS	Pl	1993	3.55	
5160502670	WEYR	Pl	2001	17.29	
				89.51	

Table 2. AVI B10 Strata for performance surveyed NSR cutblocks with total stocking <= 50%

OPENING_ID	B10_STRATA_CODE	AREA
5070440115A	X	8.36
5070441470A	Aw	12.16
	X	4.41
5120561476A	Aw	3.91
5120561476A	Sw	5.81
	X	16.48
5120561579A	Sw	2.17
5150520080	Aw	1.24
5150520080	AwPl	8.23
5150520081	Aw	0.36
5150520081	AwSw	5.54
5150571513	Pl	3.55
5160502670	Sw	17.29
Total Forested		**60.25**
Total non-forested		**29.26**
		89.51

Openings with total stocking > 50% but < 80%

In the most recent version of the landbase there are a total of 33 cutblocks with a NSR condition from a performance survey that meet this criterion. Table 3 shows the 33 openings within the landbase as well as an additional 6 that are in the ARIS data but are outside the DFA boundary.

Table 3. Performance surveyed NSR cutblocks with total stocking > 50% but < 80%

OPEN_ID	OWNERSHIP	STRATA	BLOCKYEAR	LB AREA	
5070432031	WEYR	AwSw	1993	6.82	
5070432038	WEYR	AwSw	1993	10.80	
5070432081	WEYR	AwSw	1993	47.32	
5070433214	WEYR	AwSw	1993	1.80	
5070433255	WEYR	SwAw	1993	3.19	
5070433299	WEYR	AwSw	1993	23.32	
5070433325A	WEYR	AwSw	1993	26.92	
5070440345A	WEYR	Sw	1993	13.87	
5070440998A	WEYR	SwAw	1994	5.44	
5070441296A	WEYR	Sw	1994	9.46	
5080452385A	WEYR	Aw	1996	0.37	
5080452639A	FRIA	Aw	1997		Outside DFA
5090412639	WEYR	Sw	1992	4.01	
5090413555	WEYR	Sw	1992	16.76	
5090420228	WEYR	Pl	1992	4.14	
5090463086	WEYR	Sw	1990	14.03	
5100401859A	WEYR	Aw	1997	2.19	
5100413039A	WEYR	Aw	1998	24.82	
5100433454	WEYR	AwSw	1994	10.81	
5100441721A	WEYR	AwSw	1994	5.69	
5110441178A	WEYR	Aw	1994	11.41	
5110480245A	WEYR	Aw	1993	6.09	
5110500496	WEYR	Sw	1992	11.39	
5110502338A	WEYR	SwAw	1995	53.50	
5110560889A	WEYR	Aw	1996	14.27	
5110562938A	WEYR	SwAw	1994	33.52	
5110563130A	WEYR	Aw	1994	24.06	
5120440783	WEYR	AwSw	1991	2.66	
5120441637	WEYR	Pl	1991	15.06	
5120461849A	WEYR	AwSw	1995		Outside DFA
5120562193A	WEYR	AwSw	1996	22.27	
5120562286A	WEYR	Aw	1996	19.55	
5130470840A	WEYR	Aw	1995	1.87	
5150463597A	WEYR	Aw	1993		Outside DFA
5150520083	WEYR	Sw	1991	5.75	
5150562548A	WEYR	AwSw	1995		Outside DFA
5150562608A	WEYR	SwAw	1995		Outside DFA
5150562645A	WEYR	AwSw	1995		Outside DFA
5170511176A	WEYR	Aw	1999	26.94	
				480.09	

3. Recommendation

Openings with total stocking <= 50%

Point a) in section 10 of the ARIS reconciliation directive is clear that performance surveyed NSR openings with <= 50% stocking should be removed from the productive landbase. However, it does allow these stands to be returned to the active landbase if they are classified as forested under the AVI 2.1.1. standard.

It is recommended that the stands making up 60.25 ha of performance surveyed NSR openings with <= 50% stocking remain in the active landbase. These stands will be stratified based on their AVI information and M91 yield curves will be applied. The stands making up the remaining 29.26 ha will be removed from the active landbase.

Openings with total stocking > 50% but < 80%

Point b) in section 10 of the ARIS reconciliation directive requires that these openings be assigned to a yield curve scaled proportionately to the total reported stocking. As the stocking proportions will be different in each case, this suggests that 33 additional yield curves will be required to address only 480 ha of the regenerating landbase. Due to the impracticality of creating and applying so many additional yield curves for so little area, it is recommended that, either:

1. These openings receive the same yield curves as they would if they were stocked > 80% (preferred option), or
2. The openings are assigned to M91 yield curves, or
3. A single blended curve be developed specifically for these openings.

4. Resolution

Email from Cosmin Tansanu to Liana Luard on September 28, 206:

I have reviewed the LB-021 document submitted by Weyerhaeuser Pembina and these are my thoughts:

1. *Blocks <50% and declared non-forested by AVI – are not included in the net lb.*
2. *Blocks <50% and declared forested by AVI*
    a. *Create an adjustment factor for each block using the formula on page 1, b) i.*
    b. *Average the adjustment factor, area weighted, across all blocks <50% and declared forested by AVI*
    c. *Apply the average adjustment factor to the post91 yield curve corresponding to the block – e.g average adjustment is 40% and block 50704414700A is on an Aw yield curve (RSA YC). The yield for this block is 40% of the post 91 yield curve (RSA curve).*
3. *Blocks not fully stocked, with stocking levels between 50 and 80%.*
    a. *Create an adjustment factor for each block using formula on page 1, b) i.*
    b. *Average the adjustment factor, area weighted, across all blocks 50-80%*

c. Apply the average adjustment factor to the post91 yield curve (RSA curve) corresponding to the block. For example: block 507032031 is on AsSw yield curve, the average adjustment factor is 70%. The yield for this block is 70% of the post 91 yield curve (RSA Curve).

In this way we only deal with a single multiplier for the entire population <50% and a single multiplier for 50-80.

AIP on December 13, 2016.

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Weyerhaeuser

Pembina 2017-2026

Forest Management Plan

Annex VII: Yield Curve Development

March 19, 2018

Executive Summary

Weyerhaeuser Company Ltd. developed 32 new yield curves for the Pembina Timberlands Forest Management Area (FMA #0900046). The curves will be used to facilitate the timber supply analysis being completed in support of the 2017-2026 Forest Management Plan. This document describes the data, methods, assumptions and processes used to develop yield estimates for natural and managed stands in the net landbase (NLB).

The yield curve development process was based on permanent sample plots, site productivity data from pre-1991 managed stands and RSA performance survey data collected across the defined forest area. Additional growth and yield monitoring plots were used to validate managed stand yields.

Stratification was based on Weyerhaeuser's base yield strata using either Alberta Vegetation Inventory (AVI) attributes in natural stands and pre-1991 managed stands or a combination RSA stratification, silviculture declaration plus treatment information in managed stands. The strata are a modification of the Alberta Planning Standard base 10 yield strata, minus the Douglas-fir (Fd) stratum.

Gross merchantable volumes were compiled to 10 cm (deciduous) and 11 cm (conifer) top diameter inside bark and 15 cm stump diameter at 15 cm stump height for the FMA baseline utilization. Additional utilization standards were also developed using volume adjustment equations. Adjustment for stand decline for the deciduous stand component was implemented in the D and DC stand types. Cull and stand retention were not accounted for during the yield curve development.

Weyerhaeuser identified three main groups of stands within the NLB for yield curve development:

Natural stands (NAT): include all fire-origin stands. Modeling was based on GYPSY in semi-empirical fashion whereby observed top height and basal area were used to constrain model projections. Strata were based on the AVI polygon.

Pre-1991 managed stands (M91): include all openings that were harvested prior to March 1, 1991. Modeling was based on the natural stand yield curves with additional site index adjustments using results from the Regenerated Site Productivity study conducted in 2007. Strata were based on the AVI polygon.

Post-1991 managed stands (RSA): represent all exiting openings that were harvested on or after March 1, 1991. Modeling was based on GYPSY projection of RSA performance survey data. The projections were averaged by yield strata using the proper sample weights by RSA program year and population areas as per RSA protocols. Strata were based on the RSA strata at the sampling unit (SU) level for all surveyed openings. Silviculture declaration and treatment information from ARIS were used to stratify the rest of the blocks at the opening-level.

Weyerhaeuser also developed tree improvement (genetic) yield curves for Region I white spruce (I1) to reflect yield increases resulting from the deployment of genetically improved stock from the controlled parentage program (CPP).

This document replaces the document dated October 21, 2016 submitted for Agreement-in-Principle on October 26, 2016.

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1 Overview

Weyerhaeuser Company Ltd. (Weyerhaeuser) is required to complete a Forest Management Plan (FMP) for the Pembina Timberlands (FMA # 0900046) by December 1, 2017. This document describes the data, methods, assumptions and processes used to develop yield estimates for natural and managed stands in support of the 2017 FMP. The yield curve development methods intend to follow the procedures published in the Alberta Forest Management Planning Standard (Planning Standard) version 4.1 (ASRD 2006) and additional supporting documentation released over the past 10 years[1].

Some of the information contained in this document is a simplification of the work completed within the landbase netdown process. This information is provided solely as context for the yield curve document. Please refer to Annex IV for the full detailed documentation of the landbase netdown process and description of associated attributes.

1.1 Landbase Classification and Base Yield Strata

The landbase is initially defined based on Alberta Vegetation Inventory (AVI) polygons (AFLW 1991). Alterations to the clearcut and landbase polygon set occur through the cutblock reconciliation process or as an outcome of aerial or non-photo stratification as part of performance surveys. Additional modifications occur through overlays of other relevant spatial information such as land use layers and disposition boundaries. Through this process, the timber harvesting landbase (polygons eligible for forest management activities - ‘the active landbase’) is defined.

Polygons within the timber harvesting landbase are then assigned into yield strata using either AVI attributes (fire-origin stands and openings harvested prior to March 1, 1991) or, in the case of managed stands harvested after March 1, 1991, a combination of silviculture declaration plus treatment information (e.g., planting, seeding and/or leave for natural treatments). In stands which have undergone a Regeneration Standard of Alberta (RSA) performance survey, yield strata are defined based on either new photo-interpreted aerial attributes or ground survey data for stands where aerial photos are not available.

All stand groups are differentiated into the same base set of yield strata, regardless of differences in rule sets used to assign the strata; Weyerhaeuser’s 8 base yield strata are described in Table 1-1. The strata are a modification of the Planning Standard base 10 yield strata, minus the Douglas-fir (Fd) stratum. Natural stand yield groups were developed by splitting Weyerhaeuser’s base yield strata based on AVI attributes as discussed in Section 2.2.2.

[1] This document attempts to follow the structure and wording of other yield curve documents that have been produced in Alberta in recent years to help speed up the review process.

Table 1-1. Description of Weyerhaeuser base yield strata.

Weyerhaeuser Base Yield Stratum	GoA Yield Stratum	Broad Cover Group	Description
C-PL	Pl	C	Pure conifer stand - pine leading
C-SW	Sw	C	Pure conifer stand - white spruce leading
C-SB	Sb	C	Pure conifer stand - black spruce leading
CD-PL	PlHw	CD	Conifer mixedwood stand - pine leading
CD-SX	SwHw	CD	Conifer mixedwood stand - white spruce leading
	SbHw	CD	Conifer mixedwood stand - black spruce leading
DC-PL	HwPl	DC	Deciduous mixedwood stand - leading conifer pine
DC-SX	HwSx	DC	Deciduous mixedwood stand - leading conifer spruce
D-HW	Hw	D	Pure deciduous stand

1.2 Groups of Stands

Weyerhaeuser has identified four groups of stands within their timber harvesting landbase for purposes of yield curve development:

A. Natural Stands

Natural stands are defined as all fire-origin stands in the Pembina Timberlands defined forest area (DFA) that are within the net landbase. Growth and yield projections will be developed using natural stand yield curves.

B. Managed Stands

Managed stands are defined as any post-harvest regenerated (PHR) stands that are identified with an Alberta Regeneration Information System (ARIS) record and have been reconciled with ARIS either during the preparation of the inventory and/or through the development of the net landbase.

There are three major types of managed stands that are required to project growth and yield for in the net landbase:

B.1. Existing managed stands harvested before March 1, 1991

B.2. Existing managed stands harvested on or after March 1, 1991

B.3. Future managed stands harvested after the effective date[2] of the FMP

1.3 Growth Models

There are only two growth models available for use in Alberta; the Growth and Yield Projection System (GYPSY) and the Mixedwood Growth Model (MGM). An alternative option for yield curve development is to use empirical (regression-based) yield curve approaches; however, this option is only available for natural, not managed stands. Weyerhaeuser decided to use GYPSY for yield curve development in all stand types in the 2017 FMP. A brief description of GYPSY is provided here for context.

[2] The 2017 FMP landbase effective date is set at May 1, 2015.

The GYPSY model is a stand-level growth model developed by the Province of Alberta (Huang *et al*. 2009a, 2009b). Model inputs include stand age plus species group[3]-specific inputs: top height or site index (SI), age, density, stocking (optional) and basal area (optional). Spatial patterning is modelled via an (optional) stocking input, which modifies both the density and basal area increment functions within the GYPSY model. If stocking is not provided to the model, a non-spatial version of GYPSY is used. Huang *et al.* (2009a) recommend using the non-spatial version of GYSPY for fire origin stands, and wherever possible, the spatial version for post-harvest stands.

Basal area inputs are used to localize predicted basal area increment curves to observed plot data. Where basal area inputs are not available, basal area increment is predicted by the model. Competition between species is built into the model's structure in two manners: via a species composition function as well as through interactions within several of the model functions. Aspen and black spruce species groups are unaffected by the presence of other species except via species composition equations embedded in the model. White spruce and pine species groups are affected by the presence of other species groups via modifiers to the density, basal area increment and percent stocking models.

General direction from AAF is to use GYPSY without any change or model coefficient re-calibration. However, plot data from the FMA must be used thus localizing the GYPSY model for FMA conditions.

1.4 Modelling Approach

A different modelling approach was used for yield curve development for each type of stand based on the input datasets, type of stand and other constraints. Each approach is described briefly here, and in more detail in each relevant chapter. All relevant data compilation and analysis steps were undertaken using the Statistical Analysis System (SAS) version 9.4 on Windows 7[4].

1.4.1 Natural Stands (NAT)

All natural fire-origin stands were projected using NAT yield curves. Yield curve development in natural stands involved the projection of local plot data using the GYPSY growth model. GYPSY was developed primarily from natural stand data and it is considered a suitable model for natural stand growth projections. The Planning Standard requires that standing timber (e.g. natural stand) yield curves be validated against plot data using AVI-based age as the basis for assigning stand age thus providing a direct link to the inventory. Weyerhaeuser natural stand yield strata assignments were based on AVI attributes at the AVI polygon level (Table 1-1).

1.4.2 Pre-1991 Managed Stands (M91)

PHR stands that were harvested prior to March 1, 1991 were projected using M91 yield curves. The Planning Standard, Section 3.11ii, Annex 1, requires that "…areas harvested prior to March 1, 1991 shall be assigned to a yield stratum based on the vegetation inventory in place on the effective date of the inventory...". The stratification therefore was based on the AVI and followed the same stratification rules applied to the natural stands. Weyerhaeuser was using the same methodology, model and data used for the natural stand yield curves; however site index estimates were obtained from the Regenerated Stand Productivity (RSP) study conducted in 2007 for aspen, poplar, lodgepole pine and

[3] Species groups: AW (aspen, birch +and poplar), PL (pines + larch), SB (black spruce), SW (white spruce + fir).
[4] We also used Python 2.7 scripting for the matrix algebra portion of height-dbh mixed effect modelling.

white spruce (Weyerhaeuser 2014a, 2014b, AAF 2015a). Any strata without RSP site index adjustment defaulted to the natural stand yield curve.

1.4.3 Post-1991 Managed Stands (RSA)

All existing PHR stands that were harvested on or after March 1, 1991 were projected using RSA yield curves. The Planning Standard, Section 3.11i, Annex 1, requires that areas harvested on or after March 1, 1991 be assigned to a yield stratum as defined in ARIS and the most current information on the harvest area and its associated regeneration stratum in ARIS. Stratification was based on the AAF base 10 strata (Table 1-1).

Weyerhaeuser used all RSA survey data that had been submitted to the Forest Management Branch by May 15, 2015. These data sets included all Weyerhaeuser and Quota Holder cutblocks where aerial or non-photo RSA programs have been completed since 2009. Managed stand yield curves were developed using the RSA data projected by the GYPSY model. The GYPSY projections were averaged by yield strata using the proper sample weights by RSA program year and population areas by strata across program year as per RSA protocols.

Weyerhaeuser also developed tree improvement (genetic) yield curves for Region I white spruce (I1) to reflect yield increases resulting from the deployment of genetically improved stock from the controlled parentage program (CPP). Genetic yields were applied in pure conifer cutblocks where at least 70% of seedlings were from seedlots deemed improved seed.

1.4.4 Future Managed Stands

All existing PHR stands that are harvested after the effective date of the landbase will be projected using RSA yield curves. Stratum assignment will use the transition rules as defined in the silviculture matrix developed for the 2017 FMP. Stratification will be based on the AAF base 10 strata (Table 1-1).

White spruce genetic curves will be applied to future harvested stands that are located in the I1 breeding region in the Sw regeneration stratum.

1.5 Technical Specifications

1.5.1 Yield Curve Summary

A summary of all stand types, including the growth model used for yield curve development, scale of application and method of stratum assignment, is provided in Table 1-2.

Table 1-2. Model, scale and stratum assignment methods by stand type.

Groups of Stands	Model	Scale	Stratum Assignment
Natural	GYPSY	AVI Polygon	AVI attributes
Pre-1991 Managed	GYPSY	Opening	AVI attributes
Post-1991 Managed	GYPSY	RSA sampling unit*	RSA attributes
		Opening	Declaration+silviculture
Future Managed	GYPSY	Opening	Silviculture Matrix

** if an RSA survey is available for the opening.*

1.5.2 Eligible Species and Species Groups

Table 1-3 lists the species present in Weyerhaeuser's FMA area. All species are acceptable for the purposes of yield curve development with the exception of larch, which is considered a non-merchantable species. For GYPSY modelling purposes, species groups are used rather than individual species; species groupings are as shown in Table 1-3, as well as the corresponding species type (conifer vs. deciduous).

Table 1-3. Species types and groups and their eligibility for yield curve development in the 2017 FMP.

Species Type	GYPSY Species Group	Species Code	Common Name	Latin Name	Acceptable Species
Deciduous	AW	Aw	Aspen	*Populus tremuloides*	Yes
		Pb	Poplar	*Populus balsamifera*	Yes
		Bw	Birch	*Betula papyrifera*	Yes
Conifer	PL	Pl	Lodgepole pine	*Pinus contorta*	Yes
		Lt	Tamarack	*Larix laricina*	No
	SB	Sb	Black spruce	*Picea mariana*	Yes
	SW	Sw	White spruce	*Picea glauca*	Yes
		Se	Engelmann spruce	*Picea engelmannii*	Yes
		Fb	Balsam fir	*Abies balsamea*	Yes

For GYPSY modelling purposes, larch is included in the PL species group. Larch was not dropped during the plot-level compilations before the GYPSY projections because these trees take up growing space in the plot and ignoring them would not be correct from the modelling standpoint. However, all stands that contained larch in the AVI were removed from the net landbase. There was less than 0.2% of larch in the final modelling plot data set, so the impact of larch trees on the compilations and GYPSY projections was negligible.

1.5.3 Utilization Standards

The GYPSY model was used for yield curve development in the FMP that is capable of predicting gross merchantable[5] volumes from plot data. The modeler needs to provide the following utilization parameters:

- minimum stump diameter outside bark (STUMPDOB);
- top diameter inside bark (TOPDIB); and
- stump height from the ground (STUMPHT).

GYPSY gross merchantable volumes are compiled and projected based on a 3.66 m usable length (also known as minimum merchantable length - MML - measured from the stump) using the tree-length (TL) system where the volume is fully utilized to the specified merchantable TOPDIB.

[5] No allowances for form (e.g. sweep or crook), breakage or decay were included in the merchandizing process. Net volumes were derived based on an analysis of cull based on bush bucking from production studies and the analysis of scale data discussed in Section 1.5.4.

Weyerhaeuser developed FMP baseline yield curves using the following utilization limits:

Conifer:

STUMPDOB=15 cm, TOPDIB=11 cm, STUMPHT=15 cm, MML=3.66 m, SYSTEM=TL

Short notation: 15/11/15/366/TL

Deciduous:

STUMPDOB=15 cm, TOPDIB=10 cm, STUMPHT=15 cm, MML=3.66 m, SYSTEM=TL

Short notation: 15/10/15/366/TL

All FMP baseline yield curve volumes were projected to the baseline utilization limits. The short notation of the utilization limit will be used in the rest of this document.

The Weyerhaeuser Pembina Timberlands FMA operating ground rules (Weyerhaeuser 2011) and embedded quota holders require the projection of both conifer and deciduous gross merchantable volumes to various utilization limits and systems (Table 1-4).

Table 1-4. Utilization matrix by company/operator for the 2017 FMP.

Company/Operators	Old Forest Management Units	Conifer Utilization	Deciduous Utilization
FMP Baseline		*15/11/15/366**	*15/10/15/366*
Weyerhaeuser	R12, E15, E2, W5, W6	15/11/15/366	15/10/15/488
Blue Ridge Lumber	W6	15/11/15/366	NA
Alberta Newsprint	W6	15/11/15/366	NA
Millar Western	W6	15/11/15/366	NA
EDFOR Cooperatives	E2	15/11/15/366	NA
Brisco Wood	E15	15/11/15/366	NA
CTPP	R12, E2, W5, W6	15/11/15/366	15/10/15/488
LTP (Misc. Timber Users)	R12, E15, E2, W5, W6	15/11/15/366	15/10/15/488
Dale Hansen	R12	15/11/15/366	NA
Tall Pine Timber	R12	15/11/15/366	NA
*RSA***	*ALL*	*15/10/30/366*	*15/10/30/366*

** Annual Allowable Cut (AAC) will be established based on tree-length (TL) processing. Cut-to-length (CTL) and other processing systems will not be considered in the context of FMP yield curves and AAC calculations.*

*** Regeneration Standard of Alberta yield curves can be used to calculate the target MAIs for ARIS.*

In GYPSY, the modeller cannot specify alternate usable lengths, minimum log length, short logs, a mixture of different log sizes, trim allowance or other parameters. Development of adjustment factors to allow for different MML's and/or top diameter was done outside of GYPSY as discussed in Section 5.1.

1.5.4 Cull

There are two sources of cull that must be quantified:

Field operational cull: includes waste left in the bush as result of processor operator decisions based on individual tree rot, butt flare, poor form (sweep/crook) or forks.

Mill scale cull: includes waste that is deducted at the scaling deck to determine the proportion of sound wood in bolts.

In 2013/2014 Weyerhaeuser collected field operational cull information as part of their on-going processor production study on the FMA. Estimates of mill scale cull were based on the latest volume scaling data collected from timber years 2004 to 2012 for the Pembina FMA scaling population.

Weyerhaeuser submitted a consolidated cull proposal to AAF (Weyerhaeuser 2015a) quantifying the estimates of field cull and mill scale cull by stand type and species group that subsequently received agreement in principle from the department (AAF 2015c). Total field cull deductions by species and stand type are presented in Table 1-5 and total mill scale cull deductions by species and stand type are presented in Table 1-6.

Table 1-5. Total field cull deductions by species and stand type.

Species Group	Stand Type	
	Natural Stands	Managed Stands
All Deciduous	1.9%	1.9%
All Conifer	1.2%	1.2%

Table 1-6. Total scale cull deductions by species and stand type.

<table>
<tr><th rowspan="2">Species Group</th><th rowspan="2">Species</th><th colspan="2">Natural Stands</th><th rowspan="2">Managed Stands</th></tr>
<tr><th>≤ 130 years</th><th>> 130 years</th></tr>
<tr><td rowspan="3">Deciduous</td><td>Aw</td><td>10.0%</td><td>17.4%*</td><td rowspan="3">7.0%</td></tr>
<tr><td>Pb</td><td colspan="2">5.3%</td></tr>
<tr><td>Bw</td><td colspan="2">4.6%</td></tr>
<tr><td>Conifer</td><td>All</td><td colspan="2">1.2%</td><td>1.2%</td></tr>
</table>

** implemented as part of the deciduous stand decline function*

Net volumes are calculated by deducting cull from the gross merchantable volumes in the order the cull was derived. 1. Cull deductions need to apply directly to yield projections not post-hoc AAC as defined in Section 4.2.7(d) of the Planning Standard. Cull is included here for reference only; application of yield reductions to account for cull is applied within the FMP timber supply analysis.

1.5.5 Mortality

In 2006, the FMP yield curves used an age-based mortality constant (Huang 1999) that was applied to the deciduous volumes in an attempt to more fully capture volume loss. Deciduous volumes were reduced by an estimated percentage volume loss due to mortality.

Due to the strategic nature of the FMP timber supply analysis, yield curves represent average stand conditions and volume projections by AVI-based strata in natural stands. The accuracy of volume predictions will vary stand by stand; however it is important to identify the groups of stands that may be at risk of higher levels of mortality and volume loss so that the timber supply model can address priority setting and harvest scheduling not only based on age (oldest first) but also by minimizing growth loss, where applicable.

Weyerhaeuser submitted an analysis in May 2016 regarding deciduous stand decline in the Pembina FMA using Fisher's exact test on deciduous periodic annual increment (PAI) and several AVI attributes in pure deciduous and deciduous-dominated mixedwood stands (Weyerhaeuser 2016b). The analysis indicated that deciduous mortality is more prevalent in Drayton Valley (Old FMU=R12) and in the northern part of Edson (Old FMUs E15 and E2). Significant stand decline starts around 90-100 years as shown in Figure 1.

Deciduous yield estimates could be adjusted for mortality by reducing the yields by the predicted deciduous PAI average until yield predictions reach zero. Volume declines were implemented only after the PAI growth rates turn negative (the prediction line crosses the X axis). There is minimal volume loss observed in deciduous stands in the old W5 and W6 FMUs. AAF provided an agreement in principle regarding the proposed methods and results (AAF 2016b).

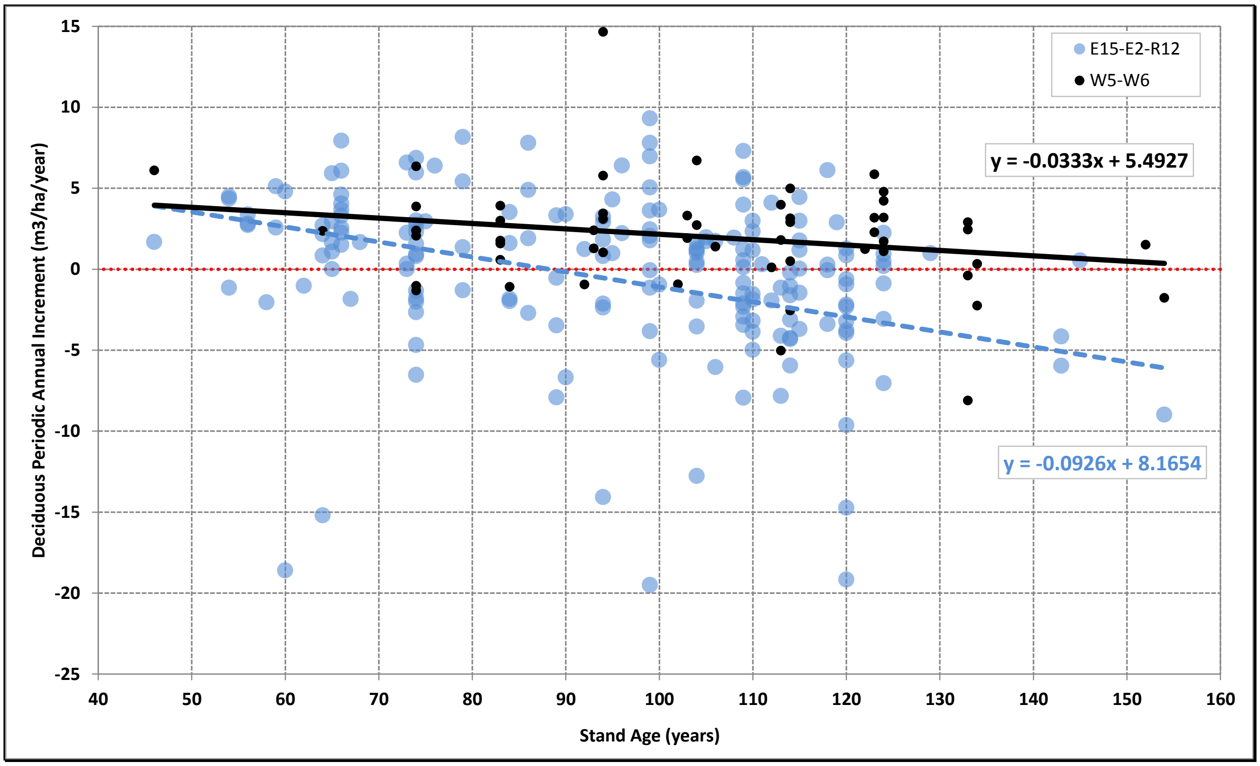

Figure 1. Deciduous volume loss by old FMU area.

Deciduous stand decline was implemented as follows:

Natural Stands

D and DC strata - old E2/E15/R12 FMUs: Implement a deciduous volume stand decline function starting at 100 years stand age using a linear adjustment of predicted PAI (Figure 1 - blue equation).

D and DC strata - Rest of the DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.

C and CD strata - Entire DFA: No deciduous stand decline was implemented due to lack of evidence and the small amount of deciduous volumes.

Managed Stands

D and DC strata - Entire DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.

C and CD strata - Entire DFA: No deciduous stand decline was implemented due to lack of evidence and the small amount of deciduous volumes.

We did not find any evidence of significant decline in conifer volumes and therefore conifer volumes were not adjusted for additional mortality beyond the GYPSY model projections in any of the yield curves developed for the 2017 FMP.

1.5.6 Regeneration Lag

In managed stands, regeneration lag is incorporated into the yield curve development process by using skid clearance to determine stand age, while using plot-based species ages to initiate growth functions.

1.6 Available Data

Essential features of sample selection and data collection procedures used for yield curve development are briefly summarized here. For specific details on each sampling program, please refer to the documents referenced in each section. Data dictionaries are provided as separate digital documents with the yield curve submission.

1.6.1 Permanent Sample Plots in Natural Stands

Weyerhaeuser began establishing permanent sample plots (PSPs) in natural stands on their FMA areas in 1994 in Drayton Valley and in 1998 in Edson. The PSP field procedures were based, to some extent, on the Land and Forest Services PSP program (LFS 1994). The plot configuration was changed to simplify establishment and re-measurement. Additional changes to the procedure were also necessary to facilitate measurement of primarily hardwood and/or mixedwood stands. The majority of Weyerhaeuser's natural stand PSPs were established between 1995 and 2001 in Drayton Valley and between 1999 and 2003 in Edson.

The sampling frame for natural stand PSP establishment included all natural stands in the timber harvesting landbase at the time. The intent of the PSP design was to ensure that the plots established were representative of stands being sampled.

The plots were established using stratified sampling. The objective for sample selection was to obtain a good distribution of samples by broad cover group, species composition and age class. Within each stratum, a list of randomly selected stands was produced. Selection was weighted by stand area, thus stands with more area had a higher probability of being selected. This random stand list was reviewed to ensure that the stand selected was suitable for establishing a PSP. Stands were eliminated from consideration if the stand was to be sequenced for harvest within the next 15 to 20 years or if accessibility constraints were severe.

Once a stand has been selected as being suitable for PSP establishment, a plot location was randomly chosen. A numbered grid (75mx75m) was laid over a map of the stand and a random number chosen. The corresponding grid intersection was chosen as the plot location. The entire plot and buffer had to be contained within the stand. Plots which fell on seismic lines or roads which were not mapped as polygons were moved[6]. The procedures for moving the plot are described in the document *Permanent*

[6] The potential bias due to seismic line avoidance will be addressed by the stratum-based seismic % area reduction in the 2017 FMP timber supply analysis.

Sample Plot Field Procedures (Weyerhaeuser 1998). Other disturbances such as partial cutting were to be noted but were not justification for re-locating plots.

The distribution of plots by the original FMA areas is shown in Table 1-7.

Table 1-7. Distribution of PSPs by last measurement year and original FMA.

Last Measurement Year	Number of Plots					
	Location*			Measurement		
	Drayton	Edson	*Total*	Drayton	Edson	*Total*
1999	1		*1*	1		*1*
2000	3	1	*4*	3	1	*4*
2001	3	1	*4*	3	1	*4*
2004	1		*1*	2		*2*
2005	5		*5*	11		*11*
2006	8		*8*	16		*16*
2008	27		*27*	54		*54*
2009	29		*29*	58		*58*
2010	66		*66*	184		*184*
2012	18	17	*35*	36	34	*70*
2013	4	67	*71*	8	134	*142*
2014	75	92	*167*	202	188	*390*
2015		3	*3*		6	*6*
Grand Total	**240**	**181**	**421**	**578**	**364**	**942**

** Plots 66 and 210 in Drayton Valley fall outside the FMA area*

PSPs established by Weyerhaeuser area are 1000 m^2 (0.1 ha) circular plots contained within a 2.25 ha buffer (150 m by 150 m). The main plot, which is used to record the tagged tree information, was established using a radius of 17.84 m. Height and height to live crown were measured on a subsample of the trees within the main plot. All trees with a diameter at breast height (DBH) of 7.1 cm or greater were considered part of the tree strata and were numbered and tagged.

Nested within the main plot, four 10 m^2 subplots were established to record information regarding the saplings (untagged, tallied 1 to 7 cm DBH) and regenerating stems (<1cm DBH to 30 cm height dot tallied by species and height class) within the subplots. These subplots were established in each of the four cardinal directions (north, east, south and west). The subplots are circular, with a radius of 1.78 m.

A 10 m radius zone is established around the main plot to facilitate any destructive sampling that was done in conjunction with the PSP program to record tree age. For example, any sectioning of stems could not be conducted within the PSP and would be done outside the main plot, from within the buffer. Eight age trees were sampled for each species with a substantial presence in the main plot (i.e., which account for at least 30% of the overstorey crown closure, based on the AVI field type within the plot). Age trees had to be dominant or codominant trees with no restriction to exclude veteran trees.

In addition, two trees of the dominant species on a PSP were to be selected and measured as site trees. If the plot was located in a mixedwood stand, then two of the dominant conifer and two of the dominant deciduous stems had to be selected. All site trees were selected from the same area as the aged trees (i.e., 10 m radius around the outside of the main plot). The site trees had to be dominant or codominant stems that did not show signs of suppressed height growth and any major stem form defects. For each tree, height, DBH, breast height age and stump height age were collected (where not impacted by rot). The increment cores were also examined for any signs of serious suppression.

Further details can be found in the *Permanent Sample Plot Field Procedures Manual* (Weyerhaeuser 1998).

1.6.2 Growth and Yield Monitoring Plots in Managed Stands

As part of the approved FMP in 2006, Weyerhaeuser was committed to developing a Growth and Yield Monitoring (GYM) Program to validate projected regenerated yields and associated assumptions (J.S. Thrower & Associates 2005a). As part of this program, Weyerhaeuser were to initially establish 86 new GYM plots on a 3.33 km grid in PHR stands. This grid was created by dividing the National Forest Inventory (NFI) 20-km grid by six[7]. This allowed each GYM plot established on the 20 km grid to also serve as a PSP in the provincial and federal inventory and monitoring programs.

Initial establishment included cut blocks from 1960 onwards. New GYM plots will be established over time as the target population of PHR stands expands. GYM plots will be established 2 years after reforestation of the block and re-measured at a 5-year interval. There are currently 90 GYM plots established in the FMA area (Table 1-8).

Table 1-8. Distribution of GYM plots by measurement year and number.

Measurement Year	Measurement*		
	1	2	*Total*
2005	6		*6*
2006	29		*29*
2007	20		*20*
2008	19		*19*
2009	9		*9*
2010			*0*
2011	7	33	*40*
2012		2	*2*
2013		33	*33*
2014			*0*
2015		21	*21*
Grand Total	**90**	**89**	**179**

** Plot 50511536 was destroyed by the expansion of the Wolf Lake Road ROW.*

Weyerhaeuser's GYM Program will monitor critical G&Y indicators to track progress towards meeting FMP G&Y targets and validating timber supply assumptions. The GYM Program objectives that apply to PHR stands are:

- Monitor change in volume, species composition, stand top height, site height, and site index (growth intercept) in PHR stands in the Drayton Valley and Edson FMA areas. This data will be

[7] https://nfi.nfis.org/en/

compared with predicted values of the same attributes and regeneration assumptions used in the FMP timber supply analysis to check that predictions are accurate and precise.

- Provide data on competition and succession that can be used to link early stand performance to late stand conditions, especially in succession-based mixedwood stands.
- Provide data on stand height, volume growth, seedling mortality, and ingress that can be used as a subset of the data to develop new or calibrate existing G&Y models for PHR stands.

GYM plots consist of a 0.04 ha large 20x20 m square tree plot (>=5 cm DBH), a 0.01 ha 10x10 m nested square sapling plot (>=1.3 m in height to 4.99 cm DBH) and a 0.005 ha 7.07x7.07 m nested square regeneration plot (10 cm to 1.3 m height). The sapling and regeneration plots are located in the NW corner of the main tree plot. DBH and height measurements are recorded for all trees and saplings. All trees are tagged once they reach 1.3 m height.

Site tree data are collected on the 0.04 ha main plot. Site index estimates are derived from the four largest diameter suitable trees of each species in the 0.04 ha main plot. This conforms to the recommendation of selecting the equivalent of the 100 largest diameter trees per ha on a plot at least 0.03 ha in size (Huang *et al*. 2004).

Existing oil and gas cutlines crossing the PHR stands are included in the target population for sampling. If a cutline crosses a portion of the GYM plot, it is included in the plot; however the cutline is to be mapped by placing posts along the edges and recording sufficient distances and bearings so that the area of the cutline can be calculated.

A detailed description of Weyerhaeuser's GYM plot program and field protocols can be found in the *Edson & Drayton Valley GYM Field Manual* (J.S. Thrower & Associates 2005b).

1.6.3 Regeneration Standard of Alberta Performance Surveys

Regeneration Standard of Alberta (RSA) performance surveys collect detailed plot information within sampling units which can be at the opening or sub-opening level (AESRD 2015). The sampling frame for performance surveys in a given year was defined as all openings between 12 and 14 years of age belonging to a specific sustained yield unit.

Openings were subdivided into sampling units (SUs) either via aerial photography (for larger programs) or field reconnaissance (for smaller programs, also called non-photo programs). Before 2014, aerial programs employed a subsampling method in which a smaller subset of SUs were selected for ground sampling, whereas non-photo programs require a full ground sample (census) of SUs. Up to and including the 2013-14 timber year, the method for selecting aerial samples involved a slightly biased sample selection, which then required a complicated determination of a composite weight needed to account for this bias during the calculation of averaged results (described in detail in AESRD 2013). Simple stratified random sampling was introduced in the 2014-15 timber year thus equal sample weights were assigned to each ground sampled SU.

Within SUs selected for ground sampling, 10 m^2 plots were established using a grid-based method, with the number of plots varying depending on SU size and type of program. The number in aerial programs ranged from 32-64 plots, and in non-photo programs generally ranged from 41 plots up to 2.77 plots/ha in larger SUs.

Data were collected on conifer ≥0.3 m in height and deciduous ≥1.3 m in height. The following information was collected:

- Every plot: tally trees by species and type (seedling vs. advanced), with a separate tally for pine with western gall rust.
- Every 4th plot: within a 100 m^2 plot centered around the 10 m^2 plot, select the largest DBH tree by species group and record height, DBH (optional) and total age.
- Every 4th plot (optional): within the 10 m^2 plot, measure DBH and height (optional) of the 1st three trees by species group and type (seedling or advanced) and tally the number of seedling conifers above and below 1.3 m by species (to allow for calculation of basal area).

RSA data were available from Weyerhaeuser as well as all quota holders. The number of ground-sampled SUs available for yield curve development is presented in Table 1-9.

Table 1-9. Distribution of RSA performance surveys by company, program year and type.

Company	Program Year	Program Type	Total # of Openings	Total # of SUs	Sampled SUs
Weyerhaeuser	2009	Aerial	93	105	47
	2010	Aerial	446	559	148
	2011	Non-Photo	6	6	6
	2012	Aerial	165	221	121
	2013	Aerial	180	259	124
	2013	Non-Photo	4	6	6
	2014	Non-Photo	1	1	1
ANC	2010	Aerial	46	69	37
	2012	Aerial	63	92	46
	2014	Aerial	77	93	30
Blue Ridge	2014	Aerial	36	49	32
ETPL	2009	Non-Photo	2	2	2
FRIAA	2009	Non-Photo	3	3	3
	2010	Non-Photo	85	112	112
	2011	Aerial	77	99	43
	2011	Non-Photo	16	20	20
	2012	Non-Photo	22	29	29
	2014	Non-Photo	5	5	5
Hansen	2012	Non-Photo	3	3	3
	2013	Non-Photo	8	8	8
	2014	Non-Photo	6	6	6
Millar Western	2010	Non-Photo	6	7	7
SFPI	2013	Aerial	4	4	4
Tall Pine	2013	Non-Photo	24	24	24
	2014	Non-Photo	9	11	11
Total			**1387**	**1793**	**875**

For more details on RSA performance survey programs and protocols, please refer to the *Reforestation Standard of Alberta* (AESRD 2015).

2 Natural Stand Yield Curves (NAT)

Standing timber yield curves (NAT) representing all fire-origin (natural) stands within the Weyerhaeuser Pembina FMA area will be used in the 2017 FMP.

2.1 Approach

Weyerhaeuser's preference for yield curve development was to use growth models for creating yield projections, rather than pursue a regression-based approach. The approach for natural stand yield curve development was constrained by availability of growth models: GYPSY is currently the only approved growth model for the Province of Alberta.

A second constraint was the Planning Standard requirement to use (or at least validate yields against) inventory-based ages. The GYPSY model was thus used in a semi-empirical fashion whereby top height and basal area were used to constrain model projections; this is described in further detail in Section 2.4. Weyerhaeuser submitted a proposal for the general approach to developing yield curves for natural stands (Weyerhaeuser 2016a). AAF provided an agreement in principle on March 31, 2016.

2.2 Input Datasets

2.2.1 Source Data

All PSPs defined as natural origin in the Weyerhaeuser plot database were included in the preliminary set of plot data. A description of the PSP data collection protocols is provided in Section 1.6.1.

2.2.2 Yield Stratum Assignment

For their last FMP, Weyerhaeuser developed a series of yield strata that took into account broad cover group, AVI conifer percent, crown closure class and timber productivity rating (TPR). Species or major species groups were not part of the stratification scheme.

The 2017 FMP natural stand stratification was based on the latest AVI attributes applied at the polygon-level and was also based on the following guiding principles:

- Use the latest AVI for natural stand stratification.
- Use broad cover group (BCG) and major species-group as part of the strata.
- Use the AAF extended strata as building blocks for the FMP yield strata (ASRD 2006).
- Ensure that the strata "can be collapsed on different scales" with considerations given to the size of the resulting strata. Do not combine strata across BCG.
- Assign strata based on the overstorey (O/S) or understorey (U/S). Management intent must be clearly stated based on the storey of primary management (SoPM).
- Have a clearly documented, transparent and repeatable process.

In the 2017 FMP Weyerhaeuser used the AAF "minimum 10" strata as outlined in the Planning Standard, as the basis for the stratification of natural stands (Table 1-1) using the overstorey layer as the SoPM. There are not enough plots (and landbase area) to justify a separate SbHw stratum in the DFA therefore it will be aggregated with SwHw to create a CD-SX yield stratum The strata were further divided into yield groups based on inventory attributes where the distribution and number of PSPs allowed for it as shown in Table 2-1.

Table 2-1. Criteria for assigning yield groups to natural stands within the timber harvesting landbase.

O/S BCG	O/S Base 10	Description	O/S Density	Old FMU	Yield Group Label
C	Pl	Pure Conifer - Pine leading	AB	ALL	C-PL-AB
			CD		C-PL-CD
	Sw	Pure Conifer -White Spruce leading	ALL	ALL	C-SW
	Sb	Pure Conifer - Black Spruce leading	ALL	ALL	C-SB
CD	PlHw	Conifer Mixedwood - Pine leading	ALL	ALL	CD-PL
	SwHw	Conifer Mixedwood - White Spruce leading	ALL	ALL	CD-SX
	SbHw	Conifer Mixedwood - Black Spruce leading			
DC	HwPl	Deciduous Mixedwood - Pine leading	ALL	ALL	DC-PL
	HwSx	Deciduous Mixedwood - Spruce leading	ALL	ALL	DC-SX
D	Hw	Pure Deciduous	ALL	W5 & W6	D-HW-W
				REST	D-HW-X

As per the Planning Standard Section 4.2.4.a, the calibration of yield projections for natural stands must be based on plot data from the defined forest area (DFA). Attributes for the Weyerhaeuser natural stand PSPs were obtained via a spatial linkage to the landbase (**Version 4: October 3, 2016**). Weyerhaeuser opted to utilize plots within the DFA active landbase for natural stand yield curve development, with the exception of the C-SB yield group where 22 plots from the passive landbase were added to the modelling data set. Most areas of the Sb yield stratum were netted out as a subjective deletion. As a result, only 1,978 ha represented by 2 PSPs in Sb-leading stands with <=60% Sb where the secondary conifer is Pl remained in the active landbase which was not enough to develop yield estimates. Given the very low amount of C-SB yield group in the active landbase and the low volumes generally present in this stand type, using plots from the passive landbase was a reasonable proxy for model calibration.

The validation of natural stand yield curves were based on the last measurement of the plots that are within the net harvestable landbase (standing timber).

2.2.3 Data Exclusions and Inclusions

The following deletions/inclusions from the initial PSP dataset were applied to build the modelling data set for the natural stand yield curve development (also see Table 2-2):

- All plots outside the timber harvesting landbase (in the passive landbase) were deleted.
- All plots that have been harvested prior to the AVI photo year were deleted.
- All plots burned after plot establishment were deleted.

- Eight plots with potential data issues (large atypical volumes or high volumes at a young stand age) were removed from the data set.
- Plot DV110 was retained as it was in a mature stand with intact buffer located in a cutblock.
- Plots in the Sb stratum were all included regardless of their location.

Table 2-2. Plot netdown in natural stands.

Plot Deletions		Number of Plots Location	Measure
Initial number of plots		**421**	**942**
Outside the DFA	Plots located outside the current DFA boundary	2	3
Outside Active Landbase*	NNF: Non-forested stands	2	6
	BIRCH: Birch leading pure deciduous stands	1	2
	LARCH: Any stand with larch in the overstorey	6	12
	PINE: 'A' density pine stand with Sb understorey	14	30
	OPDEL: Operational deletions	1	2
	SLOPE: Polygons with slope > 55 percent	3	7
	TPR: Unproductive stands	3	5
	SHS: Polygons identified as SHS deletions	1	2
	ISO: Isolated polygons as per GIS processing	1	2
	OPBUFFER: Operational buffers	2	4
	WATERBUF: Water buffers	19	43
Inventory/Landbase	Harvested	7	11
	Burned	1	1
Plot Data Issues	Outlier/Suspect	8	19
Total observations used for natural yield curves		**350**	**793**

** Netdown deletion codes are described in more detail in Annex IV - Landbase document.*

The final number of observations by yield stratum is shown in Table 2-3. Outliers and influential points that were removed are listed in Appendix IX.

Table 2-3. Number of observations by yield group.

Yield Group	Number of Plots Location	Measure
C-PL_AB	41	84
C-PL_CD	66	138
C-SW	42	94
C-SB*	24	52
CD-PL	7	15
CD-SX	21	45
DC-PL	16	36
DC-SX	16	37
D-HW_W	36	73
D-HW_X	81	219
Total	**350**	**793**

** includes 22 plots from the passive landbase.*

2.2.4 Landbase Representation

The representation of the net landbase by the PSP data is shown by height class in Table 2-4 and by age class in Table 2-5.

Table 2-4. Distribution of natural stand PSPs and landbase area by AVI height class.

Yield		Actual by Height Class (m)						Percentage by Height Class (m)					
Group	Metric	1-5	6-10	11-15	16-20	21-25	26+	1-5	6-10	11-15	16-20	21-25	26+
C-PL_AB	Area (ha)	100	598	4,668	17,442	17,563	4,022	0%	0%	1%	4%	4%	1%
	# Plots			4	16	14	7			1%	5%	4%	2%
C-PL_CD	Area (ha)	162	1,629	11,809	35,680	34,540	5,798	0%	0%	3%	9%	9%	1%
	# Plots			7	28	23	8			2%	9%	7%	2%
C-SW	Area (ha)	169	1,266	4,336	18,136	27,630	9,400	0%	0%	1%	5%	7%	2%
	# Plots			2	11	26	3			1%	3%	8%	1%
C-SB	Area (ha)	12	215	572	1,106	66	6	0%	0%	0%	0%	0%	0%
	# Plots			1	1					0%	0%		
CD-PL	Area (ha)	67	263	1,031	3,667	6,914	2,574	0%	0%	0%	1%	2%	1%
	# Plots				1	5	1				0%	2%	0%
CD-SX	Area (ha)	66	615	1,036	3,702	8,483	2,782	0%	0%	0%	1%	2%	1%
	# Plots			1	1	15	4			0%	0%	5%	1%
DC-PL	Area (ha)	120	127	658	3,203	7,183	3,124	0%	0%	0%	1%	2%	1%
	# Plots				4	9	3				1%	3%	1%
DC-SX	Area (ha)	46	238	766	4,886	12,800	4,250	0%	0%	0%	1%	3%	1%
	# Plots			1		12	3			0%		4%	1%
D-HW_W	Area (ha)	204	667	1,193	11,929	24,577	6,906	0%	0%	0%	3%	6%	2%
	# Plots				8	20	8				2%	6%	2%
D-HW_X	Area (ha)	285	1,305	3,763	20,893	38,155	21,499	0%	0%	1%	5%	10%	5%
	# Plots			3	22	35	21			1%	7%	11%	6%

Table 2-5. Distribution of natural stand PSPs and landbase area by age class.

Yield		Actual by Age Class					Percentage by Age Class					Total	
Group	Metric	1-50	51-100	101-150	151-200	200+	1-50	51-100	101-150	151-200	200+	Area/#	%
C-PL_AB	Area (ha)	369	10,119	31,317	2,068	521	0%	3%	8%	1%	0%	44,394	11%
	# Plots		11	27	3			3%	8%	1%		41	13%
C-PL_CD	Area (ha)	1,383	22,690	60,835	3,847	863	0%	6%	15%	1%	0%	89,618	23%
	# Plots		19	41	3	3		6%	13%	1%	1%	66	20%
C-SW	Area (ha)	761	17,505	32,847	7,288	2,537	0%	4%	8%	2%	1%	60,937	15%
	# Plots		17	17	4	4		5%	5%	1%	1%	42	13%
C-SB	Area (ha)	10	529	1,066	359	14	0%	0%	0%	0%	0%	1,978	0%
	# Plots		2					1%				2	1%
CD-PL	Area (ha)	364	3,752	9,705	680	14	0%	1%	2%	0%	0%	14,515	4%
	# Plots		1	5	1			0%	2%	0%		7	2%
CD-SX	Area (ha)	414	6,032	9,483	747	9	0%	2%	2%	0%	0%	16,684	4%
	# Plots		6	15				2%	5%			21	6%
DC-PL	Area (ha)	304	5,442	8,496	172		0%	1%	2%	0%		14,414	4%
	# Plots		4	11	1			1%	3%	0%		16	5%
DC-SX	Area (ha)	422	9,936	12,467	162		0%	3%	3%	0%		22,986	6%
	# Plots		3	13				1%	4%			16	5%
D-HW_W	Area (ha)	1,572	26,560	17,075	270		0%	7%	4%	0%		45,477	11%
	# Plots	1	18	17			0%	5%	5%			36	11%
D-HW_X	Area (ha)	3,019	39,900	42,127	837	17	1%	10%	11%	0%	0%	85,900	22%
	# Plots	1	37	43			0%	11%	13%			81	25%

Overall, there is reasonably close representation of the landbase by height class; although the taller height class (21-25m) in the C-PL_CD yield group is underrepresented while the CD-SX yield group is slightly overrepresented in the same height class. There is also reasonably close representation of the landbase by age class. There is an underrepresentation of the 101-150 years age class in the C-SW yield group and overrepresentation occurs in the 101-150 years age class in the CD-SX yield group.

2.3 Data Preparation

In preparation for the 2017 FMP, Weyerhaeuser spent a considerable amount of time reviewing and, where possible, correcting their PSP data using validation code which provided checks within and between measurements for each plot. In the last 5-6 years in preparation of the FMP, Weyerhaeuser also thrived to re-measure most PSPs thus ensuring that a new measurement is available within 5-10 years of the AVI photo year. Additional plot-level age data was also collected by the main species groups wherever it was feasible.

In addition, all plots selected for the Provincial Growth and Yield Initiative (PGYI) were further cleaned to meet rigorous PGYI standards (AESRD 2014). All findings from the PGYI conversion process were incorporated into the FMP data preparation phase to ensure the best quality data possible.

2.3.1 Deletions

All trees with “dead” or “missing” condition codes were removed from the PSP dataset. Age trees (which were sampled within the plot buffer) were removed from the PSP dataset and reserved for site index and age calculations. If the DBH and height along with the species code were all missing, the tree was presumed dead and removed. However, if there was evidence that the tree was alive based on the subsequent measurements of the tree, we recovered DBH/height and species information where possible.

There were 13 tree records with no species, DBH or height with the comment “NO TREE” were also deleted from the PSP dataset. All live trees in the main tree plot were retained for all further tree- and plot-level compilations.

2.3.2 Missing Diameters

Missing diameters from trees ≥ 1.3 m tall were filled in using the DBH from the previous measurement where it was possible; if this was not available, the DBH from the subsequent measurement was used.

2.3.3 Missing Heights

As per PSP field protocols, only every 5th tree was measured for height. Measured height data were first screened to remove trees with unusual height-diameter relationships using scatter plots (Figure 2). There were only 13 trees in the data set where the measured height was set to missing as a result of the data screening process.

Missing heights were predicted using Huang *et al*.’s *Population and Plot-Specific Individual Tree Height-Diameter Models for Major Alberta Tree Species* (Huang *et al*. 2013). The ratio of means approach as described in Huang *et al*. was used to adjust (localize) predicted heights based on available trees with measured heights.

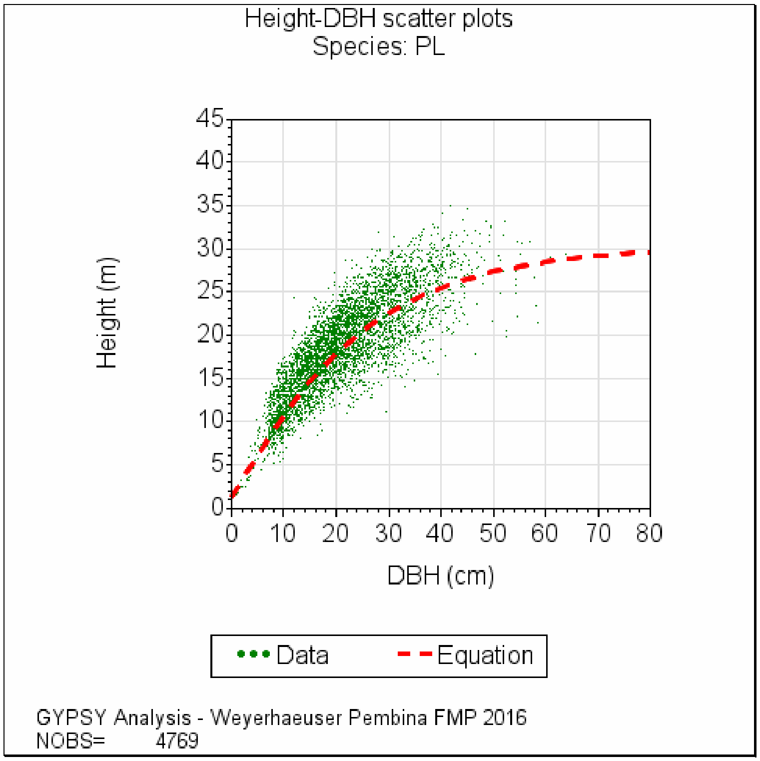

Figure 2. Height-DBH scatter plot for lodgepole pine for all live trees with measured height.

All trees with measured heights were given a predicted height using Huang *et al.*'s equations. An average ratio of predicted to actual height was calculated by species, which was used to adjust the predicted heights of trees without an actual measurement. Ratios were calculated using the following rules: use ratio of means by species, plot and measurement; if no trees for that species are available, then use a ratio of means by species and plot (across measurements of the plot). Any remaining trees without a valid ratio were assigned an unadjusted predicted height (did not occur in our data sets).

2.4 Data Compilation

Data were compiled to create species group-level inputs for the GYPSY model; these inputs could then be combined to create volume estimates by species type (coniferous vs. deciduous) for yield validation. Average density, basal area, volume were calculated on a unit-area (per hectare) basis by measurement and species group. Top height, site index and age were calculated by measurement and species group. Note that all compilation was done by plot measurement for the Weyerhaeuser PSPs[8].

2.4.1 Density

Tree factors (number of stems represented by each sampled tree) were assigned to each live tree in the tree list based on the inverse of plot size. Tree factors were then summed by species group for each PSP measurement. The sum of the tree factors represents density (stems/ha) by species group for each plot measurement.

[8] PSPs have a roughly even number of measurements (2-3) and can be treated as independent observations for the development of natural stand yield curves. (Cosmin Tansanu, AAF 2015 pers. comm.)

Saplings[9] and regeneration was not included for PSPs since high densities of small shade tolerant ingress in mature stands could impact GYPSY model simulations in a non-meaningful manner.

2.4.2 Basal Area

Basal area (cross-sectional area of each tree at 1.3 m above point of germination, represented in m^2) was calculated for each tree from measured DBH. Basal area values were then multiplied by each tree factor. Resulting values were summed by species group for each PSP by measurement.

As per GYPSY protocols, basal area must be used in the GYPSY forecasts (projections are adjusted to the observed basal area in the plot).

2.4.3 Volume Compilation

Both gross and merchantable volumes were determined for each tree in the dataset. Volume compilation followed a standardized process developed based on equations and coefficients provided in Huang's (1994b) *Ecologically Based Individual Tree Volume Estimation for Major Alberta Tree Species*.

Weyerhaeuser assigned the Alberta Township System (ATS) based natural subregion codes for proper linkage of the taper coefficients. Trees with zero merchantable volume were assigned a value of 0. Merchantable tree volumes were compiled to the FMP baseline utilization limits (Section 1.5.3).

Gross and merchantable volumes were then multiplied by each tree factor. Resulting values were summed by species group for each PSP by measurement.

2.4.4 Top Height

Top height was calculated by selecting the 10 largest DBH trees, by species group, from within the main plot (1000 m^2) as the target sample size for top height was 1 tree per 100 m^2 of plot size whenever possible[10]. Trees marked as dead/dying, or with a broken or damaged top, sign of suppression or severe lean were excluded from top height tree selection. Saplings were also excluded to avoid the selection of multiple cohorts. All trees were included for top height selection regardless of whether heights were measured or predicted (recall that predicted heights were localized using measured plot data).

Average top height was then calculated for each PSP measurement by species group.

2.4.5 Stand Age

Stand age was calculated for each plot measurement using the difference between AVI stand origin and measurement year. No correction for growing season was done due to the resolution and accuracy of the origin calls for mature natural stands in the inventory.

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[9] Untagged saplings were sometimes inconsistently recorded in 4x10m^2 subplots, especially in older PSP measurements. Given the low amount of saplings recorded and their low impact on basal area (DBH<=7 cm) they were not included in the projections of mature natural stand PSPs.

[10] Top height was calculated in some instances from a minimum of 2-4 trees/plot where there were not enough eligible top height trees in the plot.

2.4.6 Species Group Age

In the Weyerhaeuser PSPs, site trees were sampled within the plot buffer, with a target of 2 trees per dominant species. If the plot was located in a mixedwood stand, then two of the dominant conifer and two of the dominant deciduous stems were selected. The site trees had to be dominant or codominant stems that did not show signs of suppressed height growth and any major stem form defects. For each tree, height, DBH, breast height age and stump height age were collected (where not impacted by rot).

Site tree age data was compiled by the following steps:

1. Review site tree information and remove duplicates or correct the age data.

2. Calculate site index, years to breast height/stump height and total age for each site tree using GYPSY site index equations (Huang *et al*. 2009a). Use breast height age over stump height age, if available.

3. Calculate origin from total age and measurement year for all site trees.

4. Calculate average origin by species group and plot[11]. Median origins were also calculated[12].

5. Append average origin year back onto to each plot/measurement by species group.

Site tree based origins were the main source of species group ages for the plot measurements.

In addition, eight age trees were sampled for each species with a substantial presence in the main plot (i.e., which account for at least 30% of the overstorey crown closure, based on the AVI field type within the plot). Breast height or stump height ages were collected for the age trees in the plot buffer.

Age trees were not measured for height therefore breast height and stump height ages were converted to total age using years to breast/stump height assumptions listed on page 5 of Huang *et al*. (2009a).

Calculation of species group based origins from age trees followed the steps outlined above from step #3. Age tree based origins were only used as supplemental information in cases where species group based plot age was not available from the site tree data.

2.4.7 Site Index

Site index was calculated using the same dataset used for species group age calculations using GYPSY site index equations (Huang *et al*. 2009a). Plot level species group age and top height was used as input.

Plot level top height by species group was based on the *topht_w* variable (minor tree defect were allowed in the calculations, but no defect were allowed that would cause height growth impediment such as suppressed, dead or broken top, dying, for or severe lean). For some stand components (plot measurement and species group) where top height was not available, dominant-codominant height was used (6%) and for very minor stand components (basal area<0.25m^2/ha) we used average height as a proxy in modeling (2.5%). Plot level species ages were based on site tree based origins or age tree based origins as a secondary option.

[11] Because ages were sometimes re-evaluated at PSP re-measurement, but not every re-measurement necessarily had an age, data were 'normalized' and then used to create an observation for each plot measurement.
[12] Any larger difference between the median and average origin was noted as by definition median is less sensitive to extreme values.

Maximum site index values were set by species group as follows: AW-30 m, PL/SW-25 m, SB-18 m. Only 2 SW/PL and 1 SB stand component were slightly above the maxima and their site index values were set to missing.

Where site index was not available due to missing species group age for a plot measurement, the average site index by plot (all measurements)/species group was used. If the site index was still not available then the average site index by yield stratum/species group was used to fill in missing values; if a SI value was still not available for a specified species group within that yield stratum, an overall average was used.

2.5 Modelling

2.5.1 Growth Modelling Approach

The GYPSY growth model (Huang *et al*. 2009a, 2009b) was selected for model projections. Additional constraints governed how the model was used. The Planning Standard requires use of inventory age for characterizing plots for yield validation and direct linkage to the inventory and FMP timber supply analysis.

The modelling approach followed the methodology outlined for natural (unmanaged stands) in the document titled *Use of GYPSY for Natural Yield Curve Development* (AAF 2015f).

As per the suggested methods, the 2 guiding principles were:

1. Use GYPSY to project the observed plot conditions by species group - “biological projection”.

2. Adjust the average of the biological projections by yield strata to reflect the age difference between observed plot ages and the AVI stand ages.

The following sections describe the model inputs and outputs along with additional adjustments that were made to the natural stand yield curves.

2.5.2 Model Inputs

Inputs were provided as follows (for each PSP measurement) based on the compilation methods described in Section 2.4:

- Observed plot total age by species group. Stand age was left blank and the maximum total age for the plot was calculated by the GYPSY model.
- Site index was only provided (Section 2.4.7) if the plot total age was not available for a species group so that species total age can be calculated from site index and observed top height. Site index was capped based on maxima defined by species group in Section 2.4.7.
- Observed plot top height by species group.
- Observed basal area by species group.
- Percent stocking was left blank, as recommended by Huang *et al*. (2009a) for use in natural stands.

- Observed density by species group. Because GYPSY cannot project growth for low densities (≤ 30 stems/ha), any species groups present in densities under 31 stems/ha were deleted and their projection was replaced by 0 merchantable volume[13].

2.5.3 Model Outputs

The GYPSY model was run for each PSP measurement until age 300. GYPSY grows the stand both backwards and forwards from the input condition, producing a yield output from age 0 to 300 for each observation. GYPSY model projections were averaged by yield group using the plot maximum observed total age - this ensured that projections would have the same origin. Because plots were established with preference towards establishment in larger openings, weighting by polygon size (area) was not required[14].

Next the average difference between stand age (AVI-based) and the maximum total age observed in the plot was calculated by yield group (Table 2-6). The average yield projections (plot maximum total age based) were shifted by this age differential to account for differences between the AVI and plot ages and generate the finalized natural stand yield estimates by yield group.

Table 2-6. Average age offset by yield group.

Yield Group	Age Offset
C-PL_AB	2.7
C-PL_CD	-3.6
C-SB	-13.0
C-SW	-5.3
CD-PL	-8.1
CD-SX	-4.0
D-HW_W	13.4
D-HW_X	-2.9
DC-PL	-2.2
DC-SX	-8.2

2.5.4 Yield Adjustments

Decline due to deciduous stand breakup and mortality was underestimated in GYPSY, with yields showing insufficient reduction after maximum yield is expected. Weyerhaeuser chose to modify the resulting natural stand yield curves as discussed in Section 1.5.5:

[13] There were 3 plot measurements that were completely eliminated by the deletion of low density species groups. It was ensured that these plot measurements were accounted for with 0 volume projections in the average yield curve calculations in subsequent steps. There were 2 plot measurements, where the SB component of 40 stems per hectare was also replaced by 0 volume projections to avoid the model picking the small SB component for maximum species total age.

[14] If initial sample selection includes probability of selection proportional to polygon size (as in Weyerhaeuser's PSP protocols), simple averaging of the results is sufficient. In cases where a completely random selection is undertaken, results should be averaged using polygon-based area weighting.

- D and DC strata - E2/E15/R12 FMUs: Implement a deciduous volume stand decline function starting at 100 years stand age using a linear adjustment of predicted PAI (Figure 1 - blue equation).
- D and DC strata - Rest of the DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.
- C and CD strata - Entire DFA: No deciduous stand decline was implemented due to lack of evidence and the small amount of deciduous volumes.

Based on our PSP data, there was no evidence of significant stand decline in conifer volumes and therefore conifer volumes were not adjusted for additional mortality beyond the GYPSY model projections in any of the natural stand yield curves developed for the 2017 FMP.

2.5.5 Validation Statistics

Validation statistics were calculated using the most recent observation from each PSP[15]. Percent bias, root mean squared error (RMSE) and the goodness of fit index (GOFI) were calculated for 1) the original unadjusted yield curves and 2) yield curves adjusted to account for mortality. Formulae are provided in Table 2-7.

Table 2-7. Validation statistics formulae.

$Bias = \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)}{n}$	$Bias\% = \frac{Bias}{\bar{y}} \times 100$
$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n}}$	$GoFI = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$

2.6 Results

2.6.1 Natural Stand Yield Curves

Preliminary (uncapped) yield curves are presented in Figure 3. Final (capped/adjusted) yield curves are presented in Figure 4. Adjustments for deciduous mortality had a positive impact on the predicted final yields in the deciduous volumes at the older stand ages.

2.6.2 Validation Against Plot Data

Figure 5 presents the total merchantable yield for natural stands by yield stratum (uncapped). Yields are compared against the most recent observation from PSPs grouped into 20-year intervals. Only plots in the net landbase are used for yield validation. Grey boxes represent the 95% confidence interval for the plot data, with the middle bar representing the mean. Green columns represent the number of

[15] We used the last measurement of all plots in the C-SB yield group due to the insufficient number of observations in the net landbase, the very small area associated with the strata and the low importance and small projected volumes.

observations in the validation dataset. There is generally a good fit relative to validation data except at older ages in the pure deciduous and deciduous mixedwood stand types.

Figure 6 presents the total merchantable yield for natural stands by yield stratum after deciduous mortality assumptions were applied (capped). Yields are validated against the most recent observation from PSPs, grouped into 20-year intervals. Grey boxes represent the 95% confidence interval for the data, with the middle bar representing the mean. Green columns represent the number of observations in the validation dataset. Older deciduous stand breakup is now better reflected, although in some cases conifer yields are under-predicted relative to the validation dataset.

Uncapped and capped conifer and deciduous volume projections were also compared against the most recent observation from PSPs grouped into 20-year intervals. The resulting graphs are included in Appendix I.

2.6.3 Individual Growth Trajectories

Plot measurement trajectories were graphed against the natural stand yield curves; results are presented in Figure 7 for total volumes. Data show the expected range of variability for this type of exercise. Capped conifer and deciduous volume projections were also compared against PSP measurement trajectories.

2.6.4 Validation Statistics

Results are presented in Table 2-8. Percent bias is generally low, much less than 10% for most yield curves. The D-HW yield curves show a moderate level of underprediction for conifer volume; however conifer volumes are generally low in these yield groups. The DC-SX and DC-PL yield curves also show some underprediction of conifer volumes; however, since these yield curves are only supported by a modest number of plots and represent little area in the net landbase, no upwards adjustment was made for these curves.

When adjusted for mortality, the fit was improved for deciduous volumes for the D-HW_X, D-HW_W, and DC-PL yield groups. The C-SB yield curve has only two plots available for validation as most PSPs are located outside the net harvestable landbase therefore for this exercise we show the statistics based on the last measurements of all plots used for model development.

The overall percent volume bias for the conifer, deciduous and total merchantable volumes are well below 5%.

Table 2-8. Fit statistics for original and final natural yield curves.

Yield Group	# of Obs.	Area (ha)	Area (%)	Curve Type[1]	Deciduous[2] %Bias	Deciduous[2] RMSE	Conifer[2] %Bias	Conifer[2] RMSE	Total %Bias	Total RMSE
C-PL_AB	41	44,394	11.2	*Original*	*6.5*	*34*	*-5.6*	*83*	*-4.4*	*89*
				Final	**6.5**	**34**	**-5.6**	**83**	**-4.4**	**89**
C-PL_CD	65	89,618	22.6	*Original*	*6.5*	*56*	*-2.4*	*102*	*-1.5*	*105*
				Final	**6.5**	**56**	**-2.4**	**102**	**-1.5**	**105**
C-SB[3]	24	1,978	0.5	*Original*	*14.8*	*21*	*-7.6*	*82*	*-6.3*	*96*
				Final	**14.8**	**21**	**-7.6**	**82**	**-6.3**	**96**
C-SW	42	60,937	15.4	*Original*	*8.5*	*71*	*2.8*	*83*	*4.2*	*106*
				Final	**8.5**	**71**	**2.8**	**83**	**4.2**	**106**
CD-PL	7	14,515	3.7	*Original*	*16.4*	*98*	*-1.0*	*84*	*3.5*	*110*
				Final	**16.4**	**98**	**-1.0**	**84**	**3.5**	**110**
CD-SX	21	16,684	4.2	*Original*	*0.9*	*68*	*-0.1*	*113*	*0.2*	*123*
				Final	**0.9**	**68**	**-0.1**	**113**	**0.2**	**123**
DC-PL	16	14,414	3.6	*Original*	*-11.1*	*76*	*13.8*	*65*	*-2.5*	*68*
				Final	**-7.6**	**76**	**13.8**	**65**	**0.0**	**76**
DC-SX	16	22,986	5.8	*Original*	*-8.7*	*72*	*32.4*	*87*	*5.0*	*56*
				Final	**-8.4**	**72**	**32.4**	**87**	**5.3**	**57**
D-HW_W	36	45,477	11.5	*Original*	*-9.2*	*113*	*29.7*	*74*	*-0.9*	*107*
				Final	**-8.5**	**112**	**29.7**	**74**	**-0.3**	**108**
D-HW_X	81	85,900	21.6	*Original*	*-16.9*	*102*	*22.7*	*61*	*-10.1*	*92*
				Final	**-8.9**	**95**	**22.7**	**61**	**-2.9**	**86**
ALL[4]	349	396,902	100.0	*Original*	*-8.9*		*2.8*		*-2.2*	
				Final	**-4.9**		**2.8**		**-0.4**	

[1] Original = original unadjusted yield curves; Final = curves adjusted for mortality assumptions.

[2] Primary volume of interest shaded in light green.

[3] C-SB includes 22 plots from the passive landbase.

[4] One plot was older than 300 years and was beyond the yield curve age range.

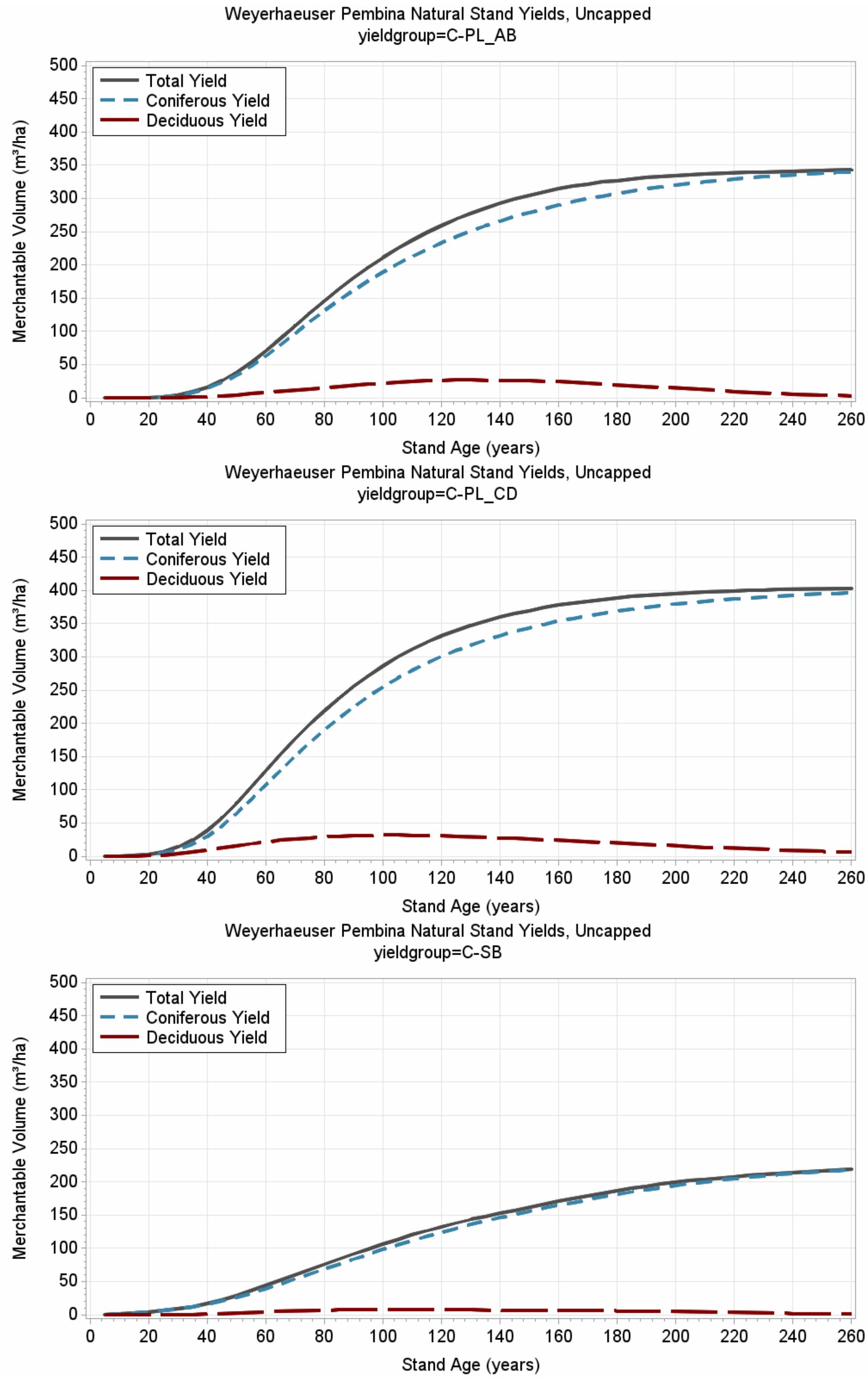


Figure 3. Natural stand yield curves (uncapped).

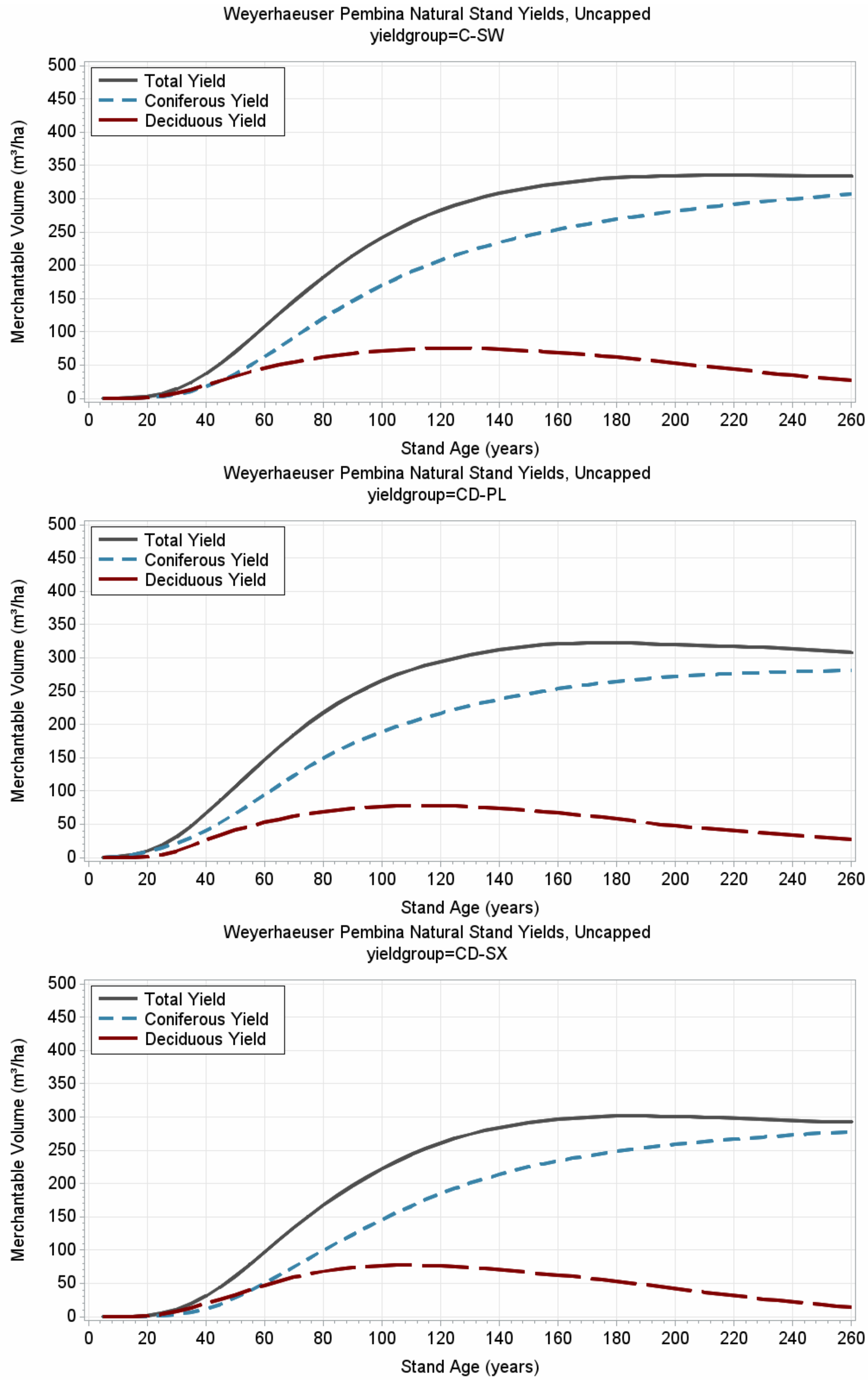


Figure 3. Natural stand yield curves (uncapped).

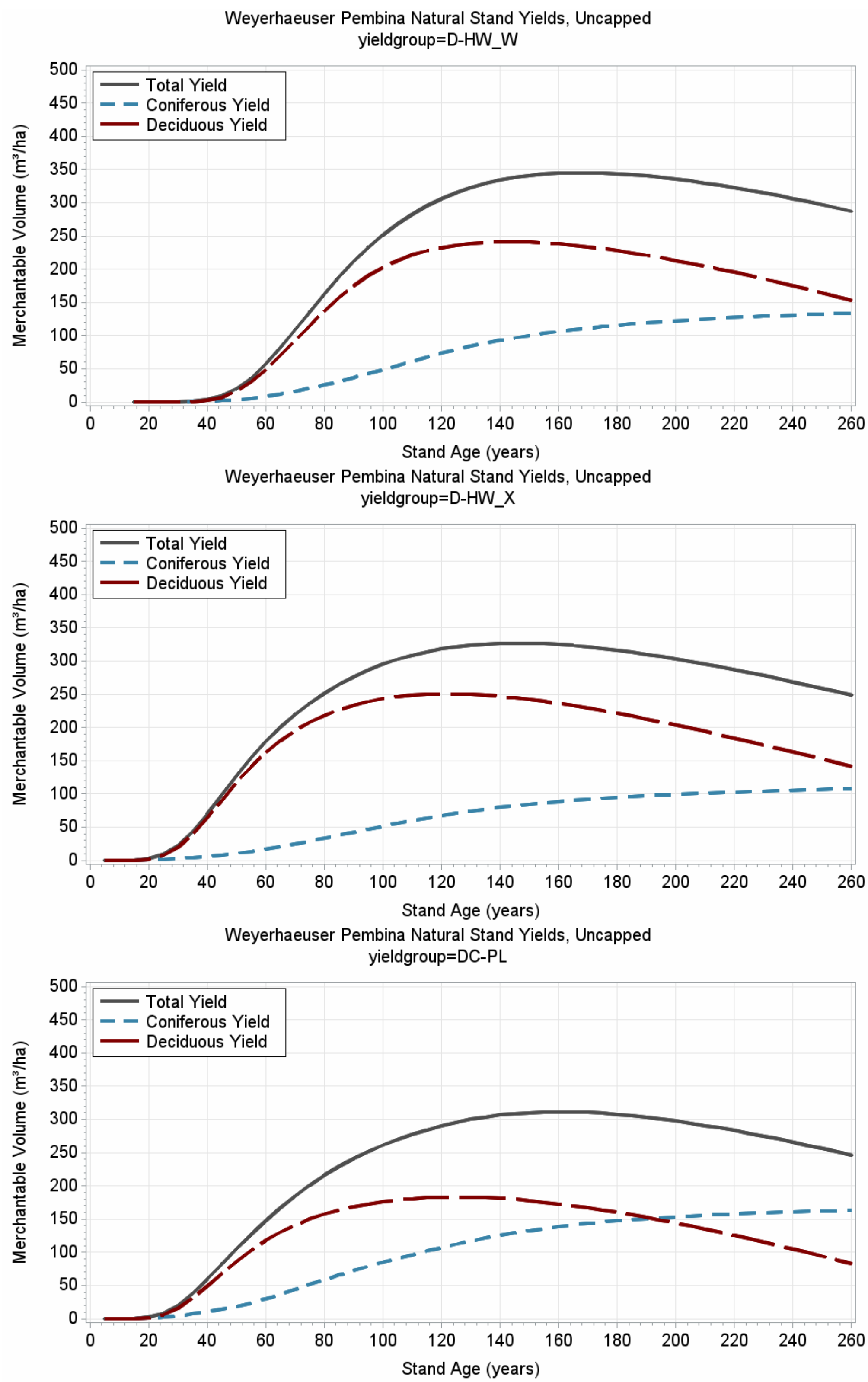


Figure 3. Natural stand yield curves (uncapped).

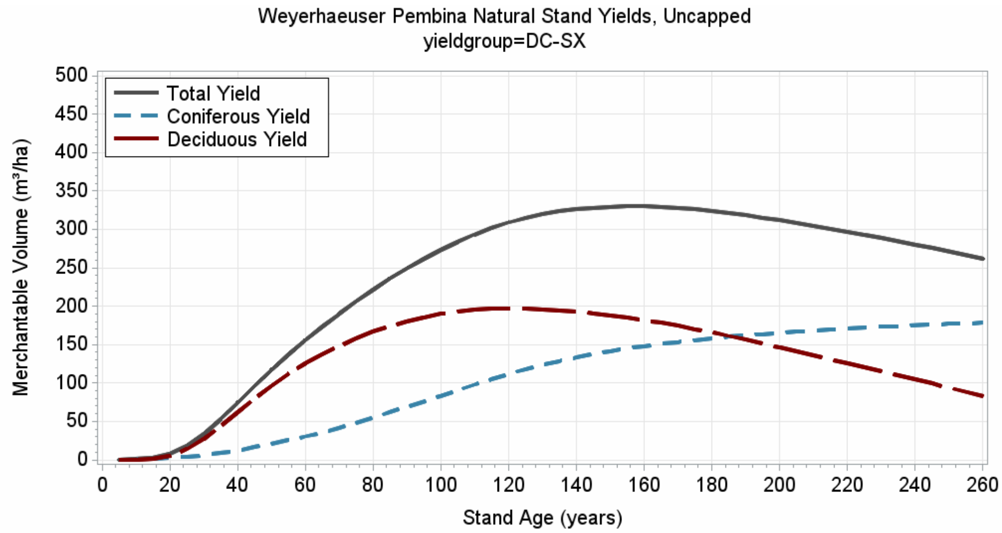


Figure 3. Natural stand yield curves (uncapped).

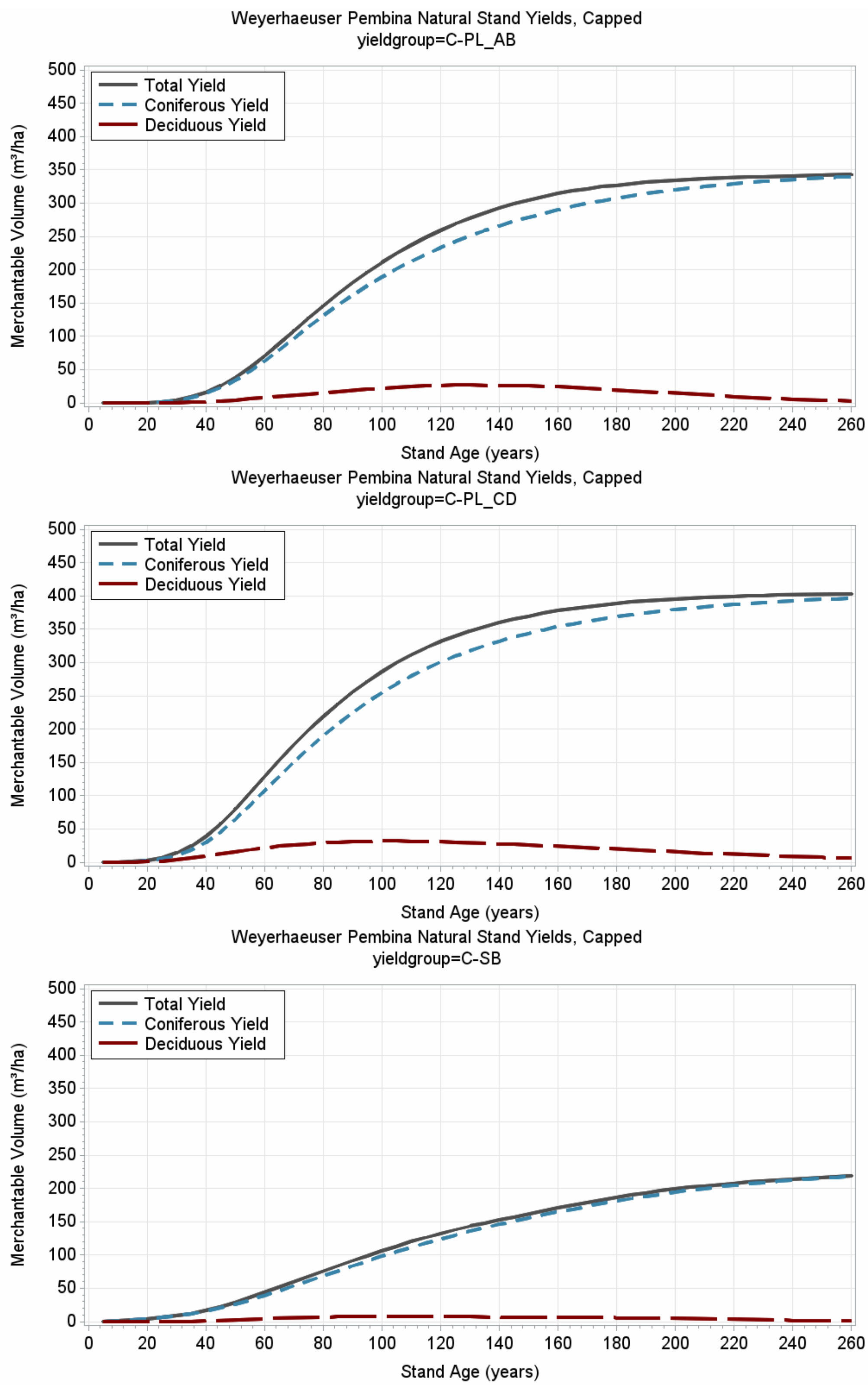


Figure 4. Final natural stand yield curves.

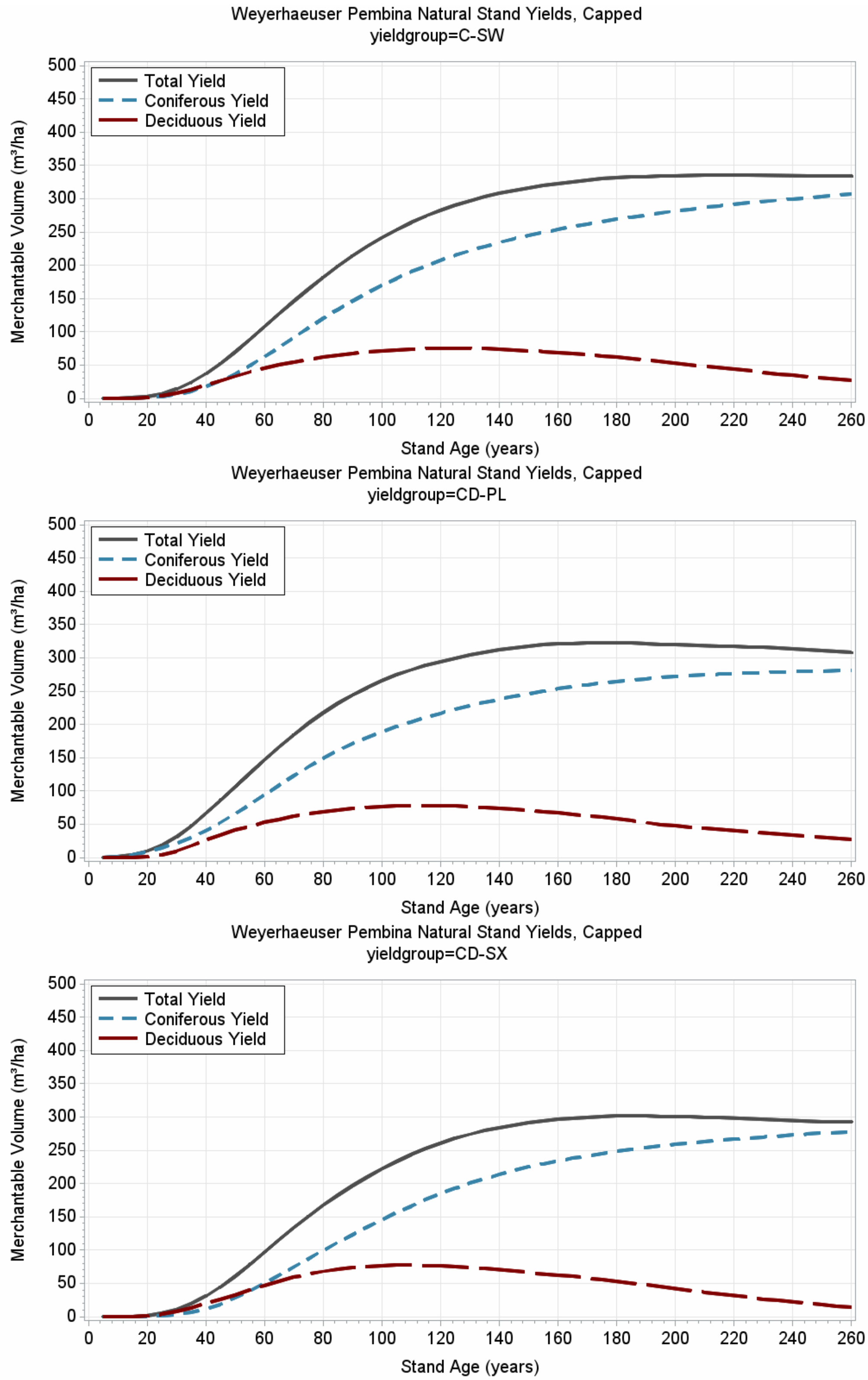


Figure 4. Final natural stand yield curves.

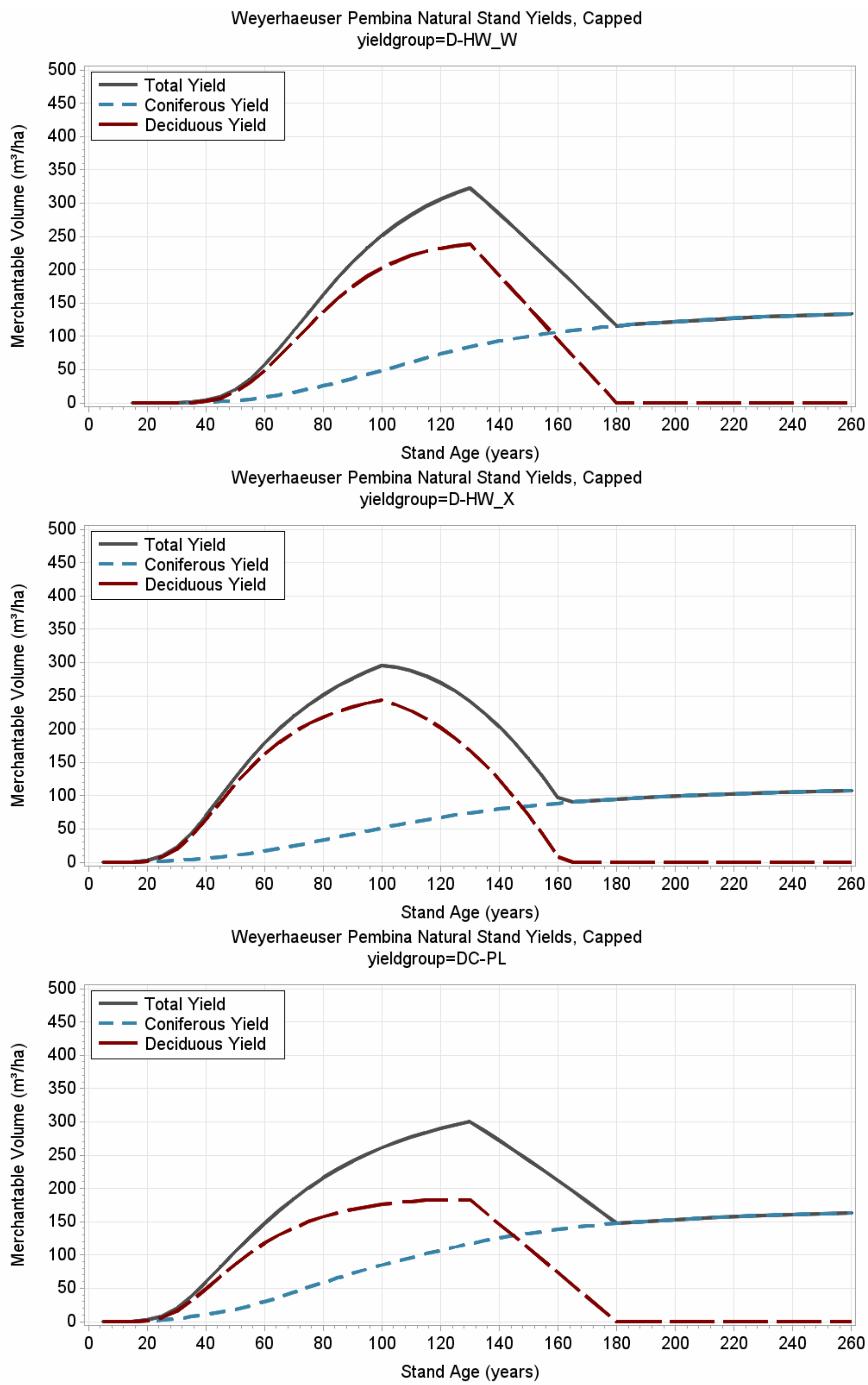


Figure 4. Final natural stand yield curves.

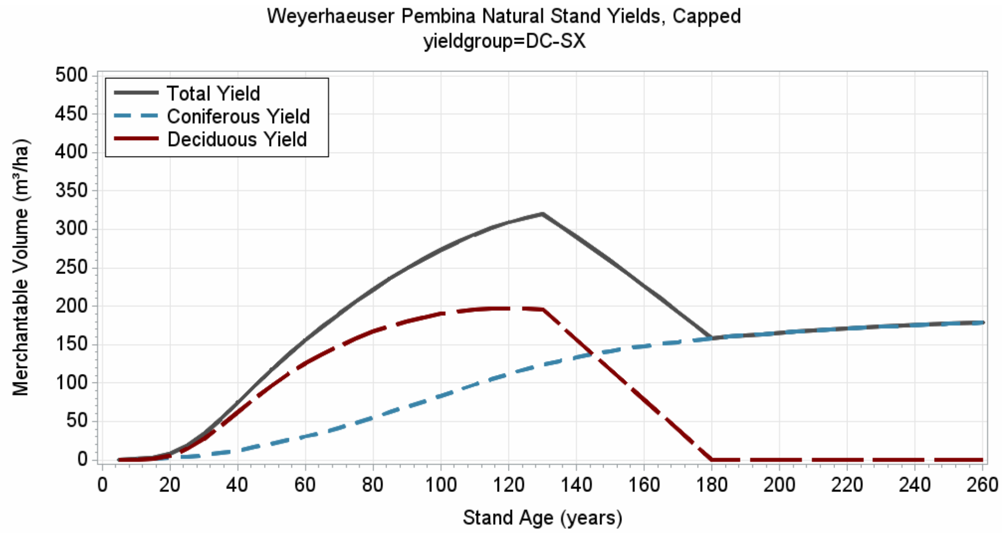


Figure 4. Final natural stand yield curves.

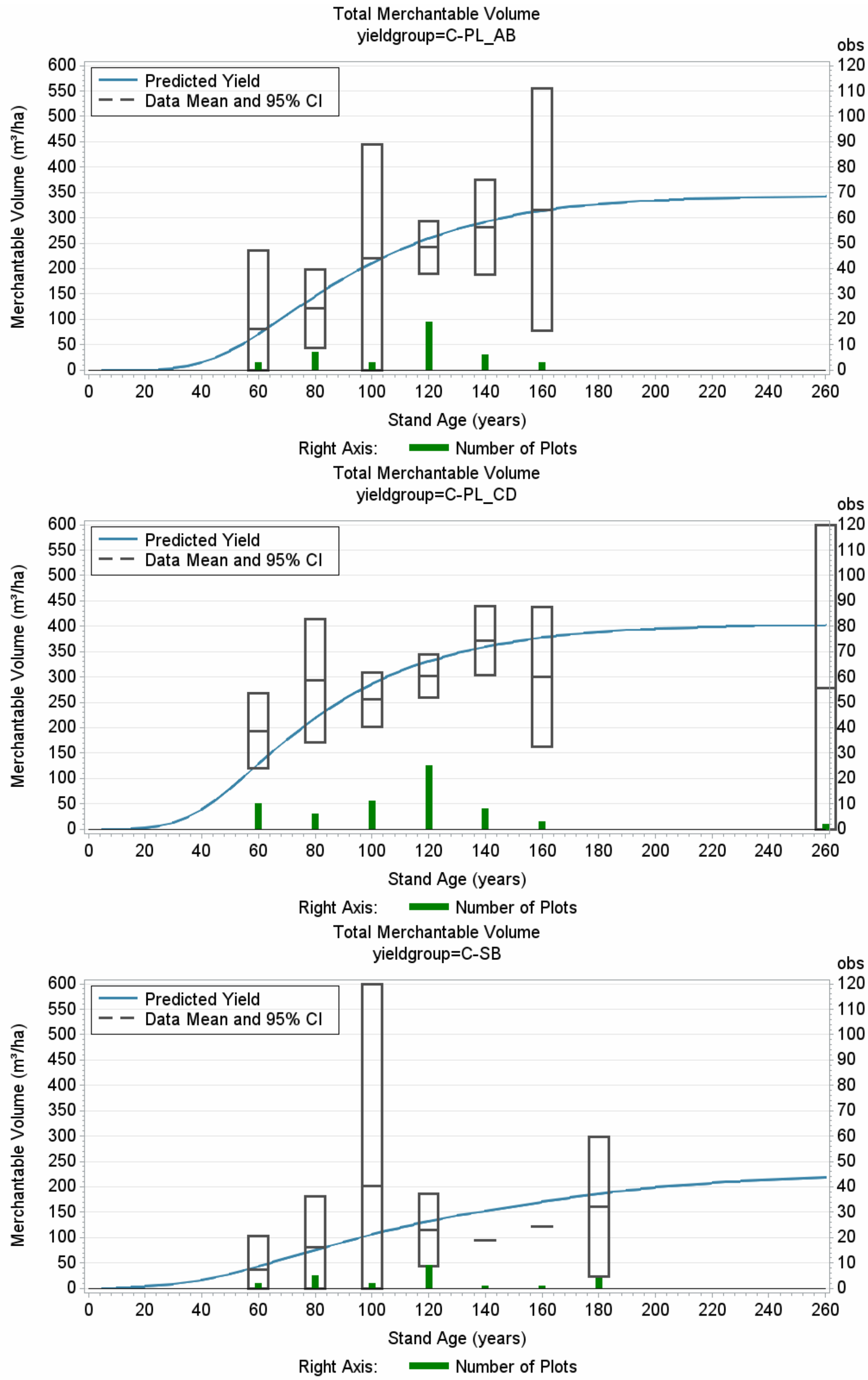


Figure 5. Natural stand total yield curves (uncapped) against 20-year plot averages.

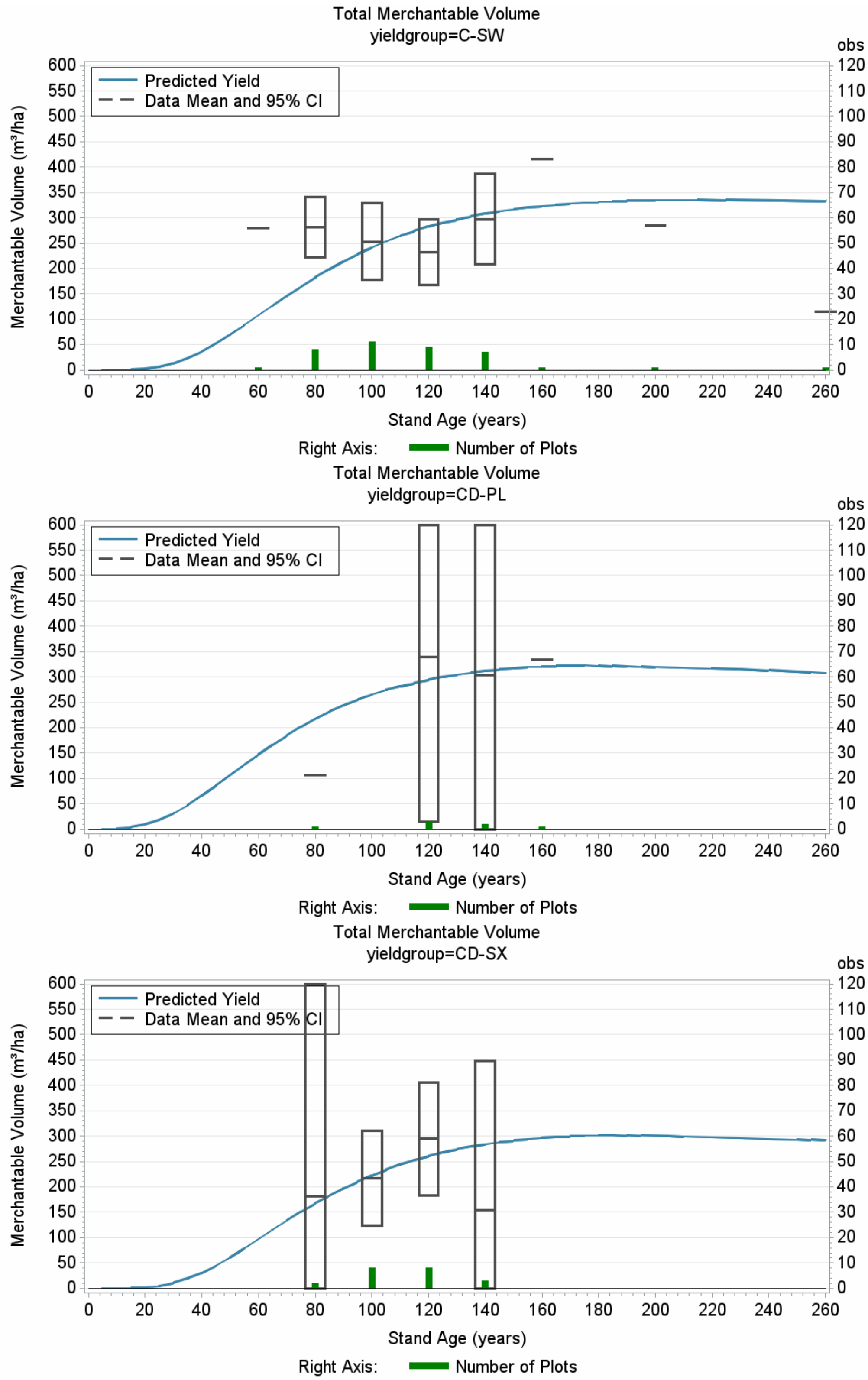


Figure 5. Natural stand total yield curves (uncapped) against 20-year plot averages.

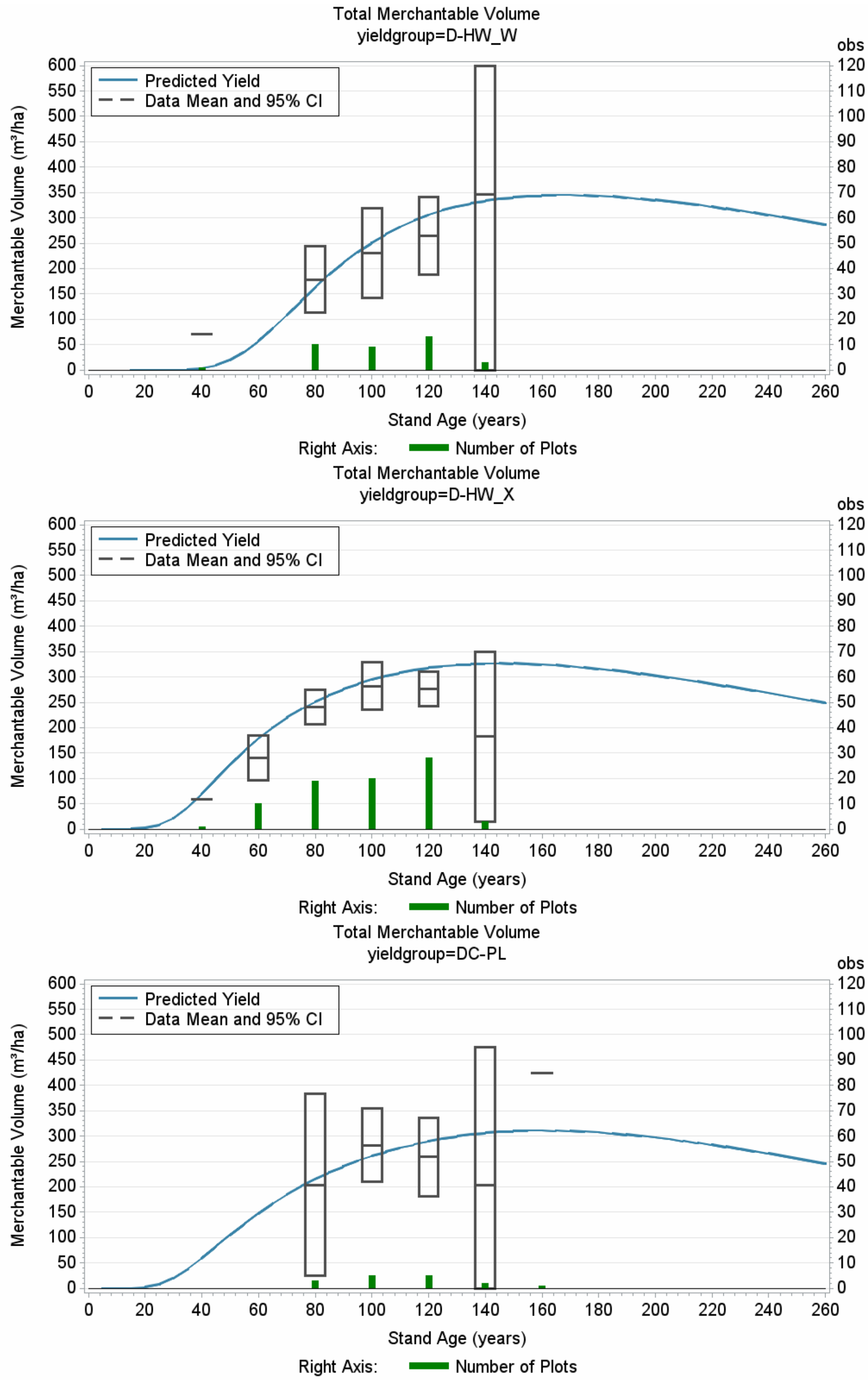


Figure 5. Natural stand total yield curves (uncapped) against 20-year plot averages.

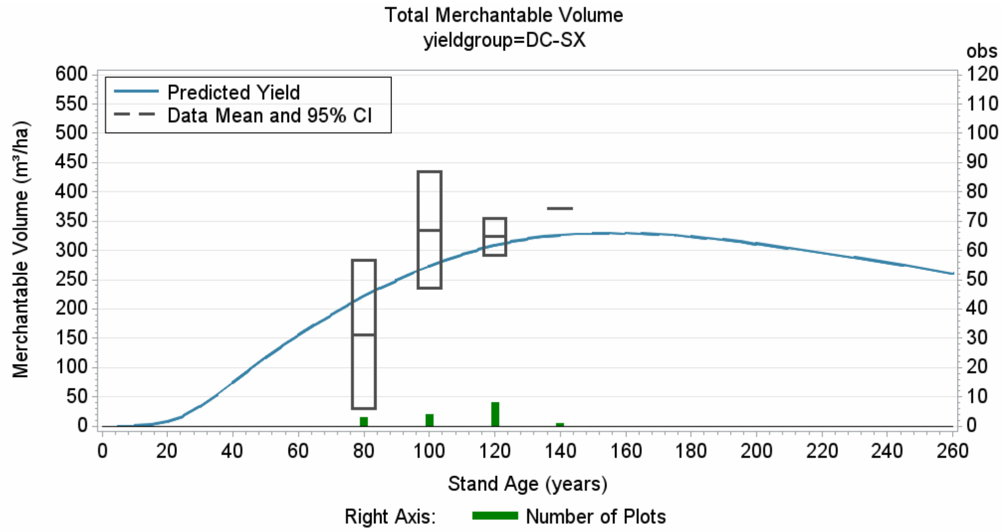


Figure 5. Natural stand total yield curves (uncapped) against 20-year plot averages.

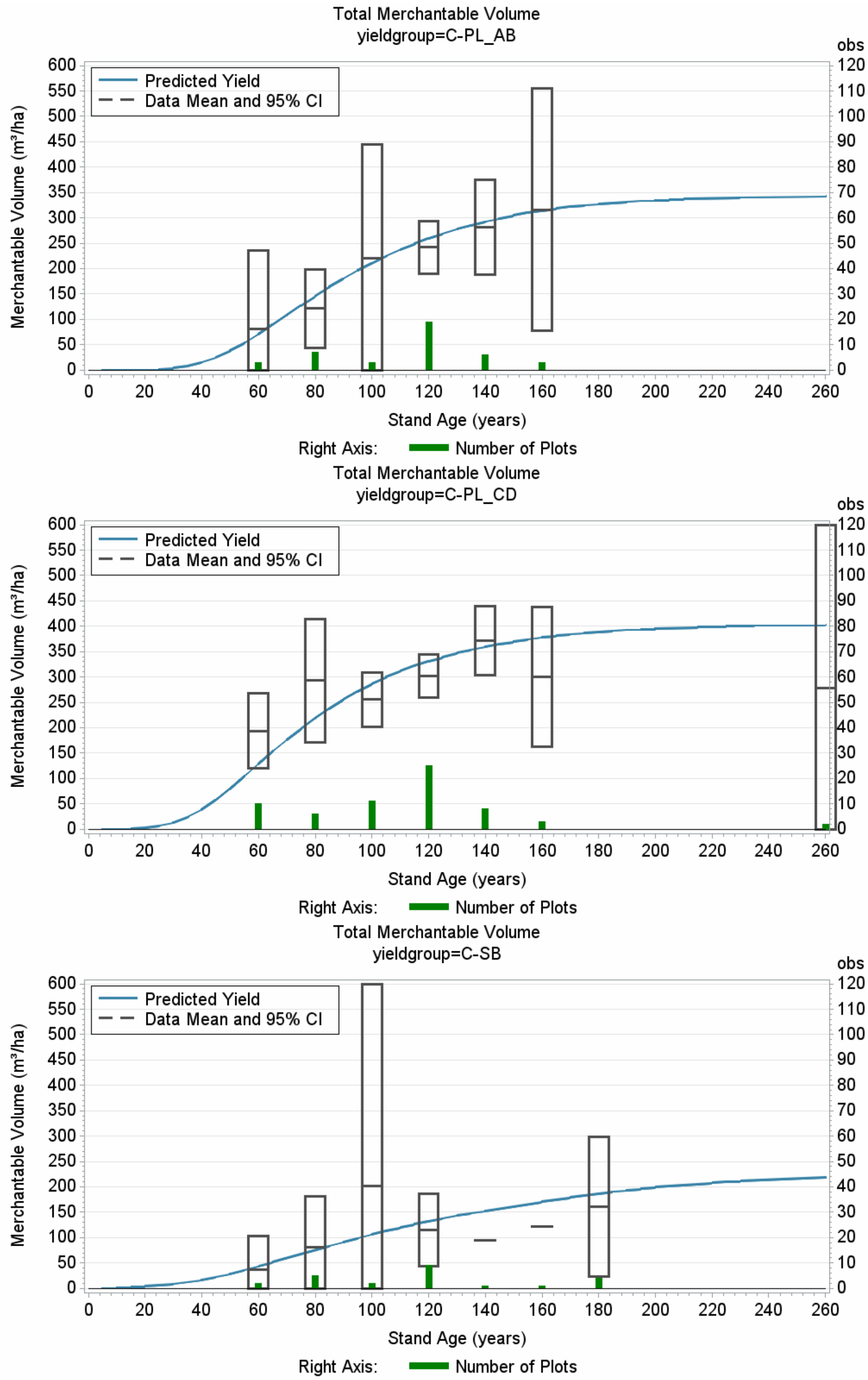


Figure 6. Final natural stand total yield curves against 20-year plot averages.

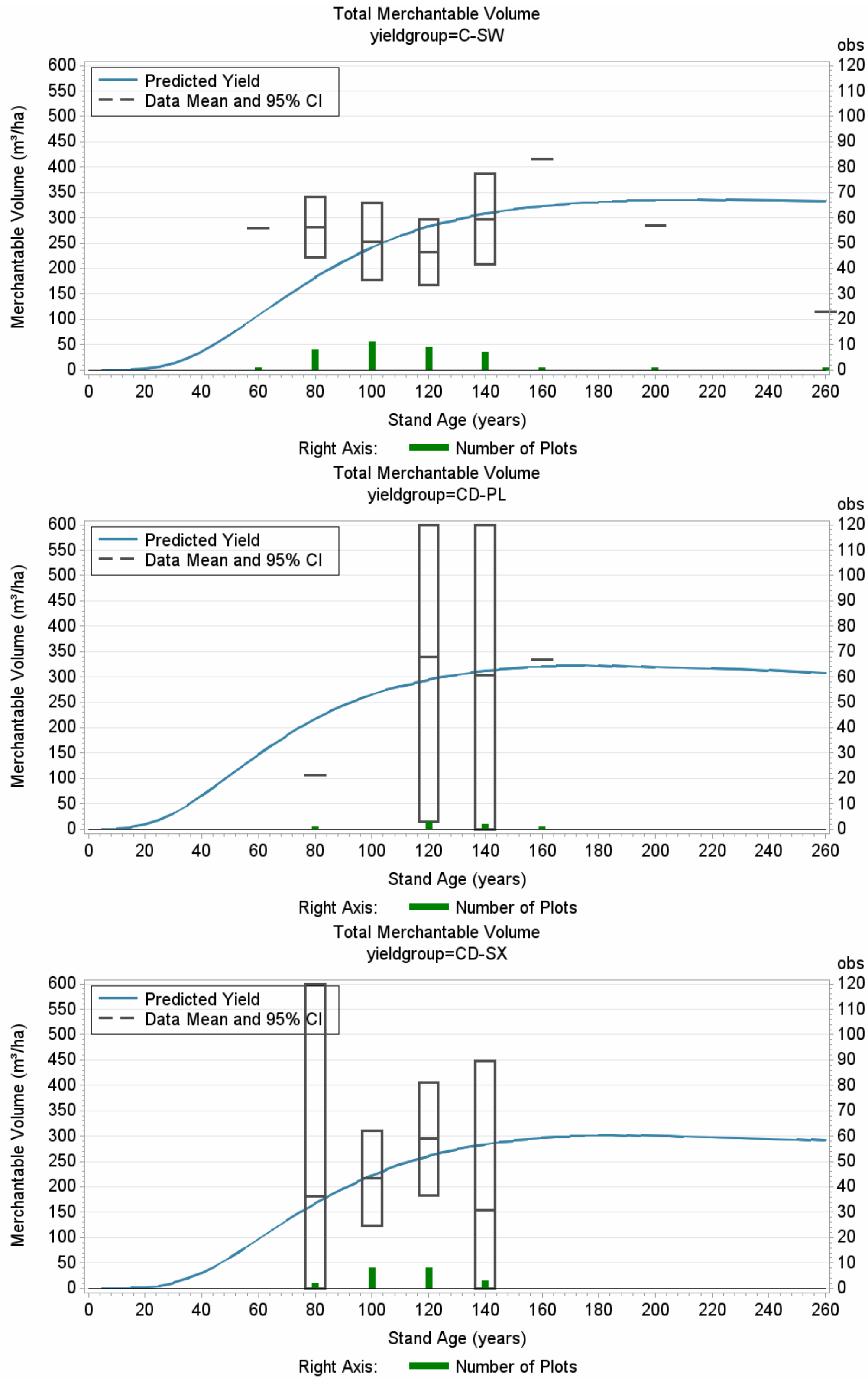


Figure 6. Final natural stand total yield curves against 20-year plot averages.

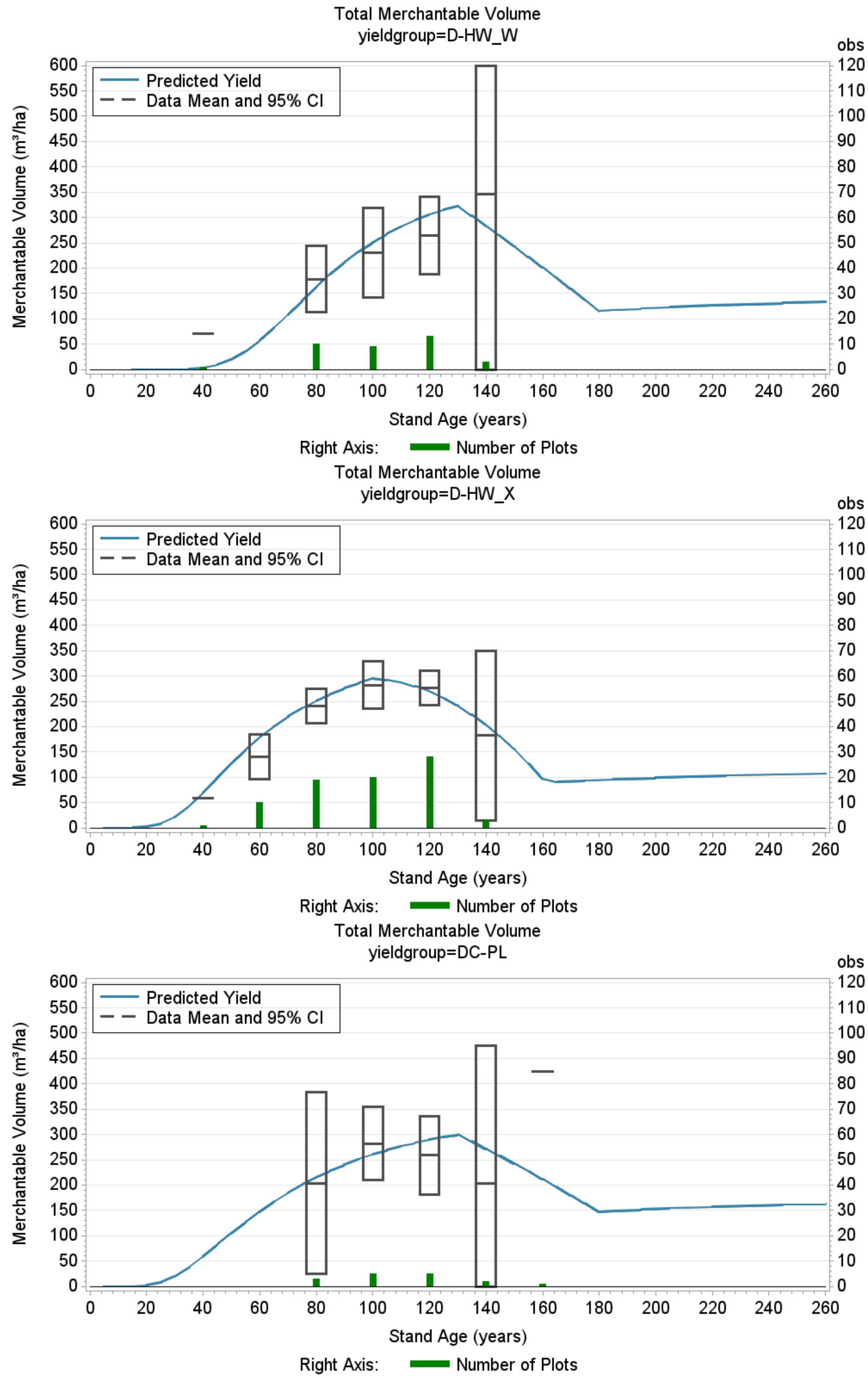


Figure 6. Final natural stand total yield curves against 20-year plot averages.

Figure 6. Final natural stand total yield curves against 20-year plot averages.

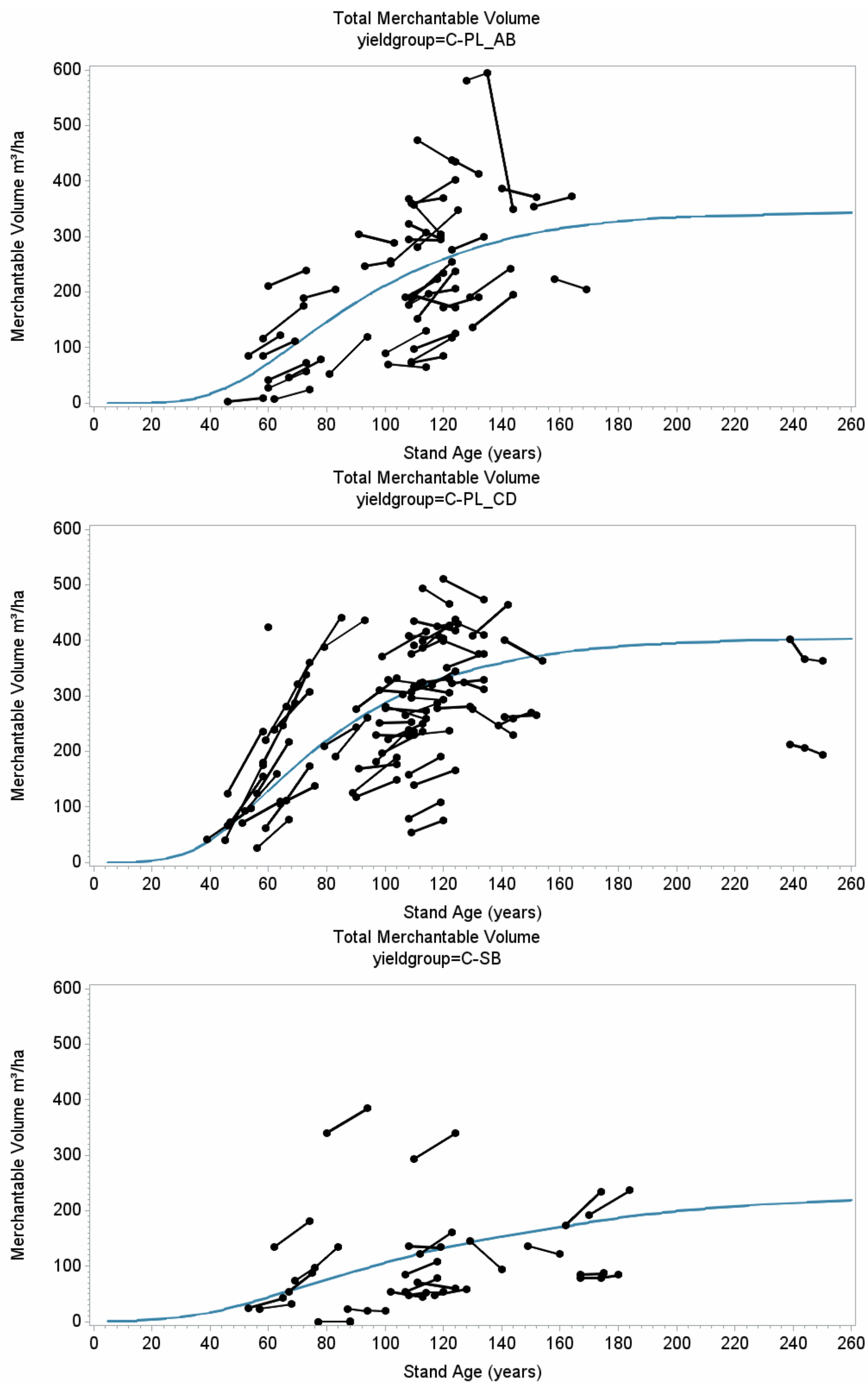


Figure 7. Natural stand total plot data against final natural stand yield curves.

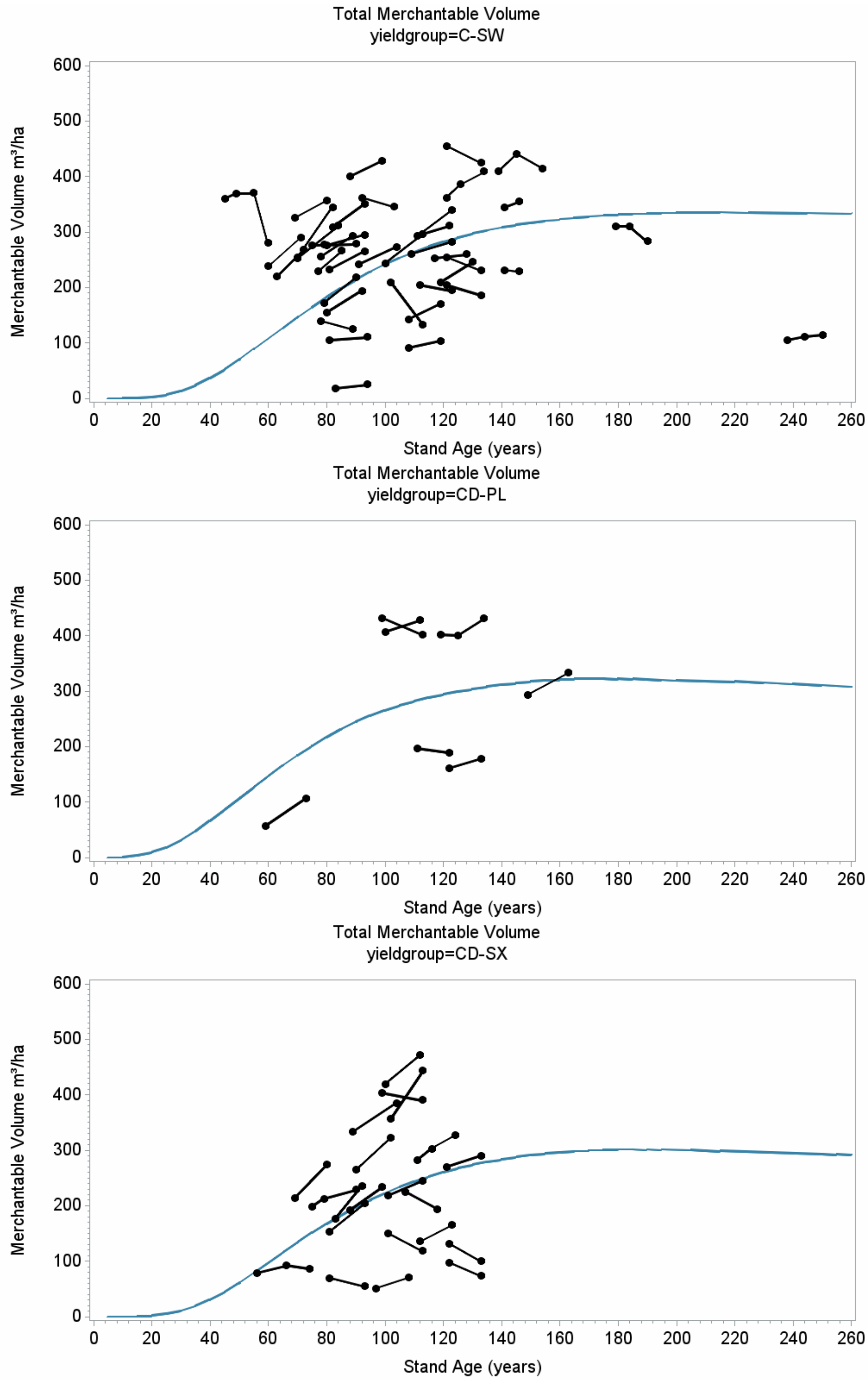


Figure 7. Natural stand total plot data against final natural stand yield curves.

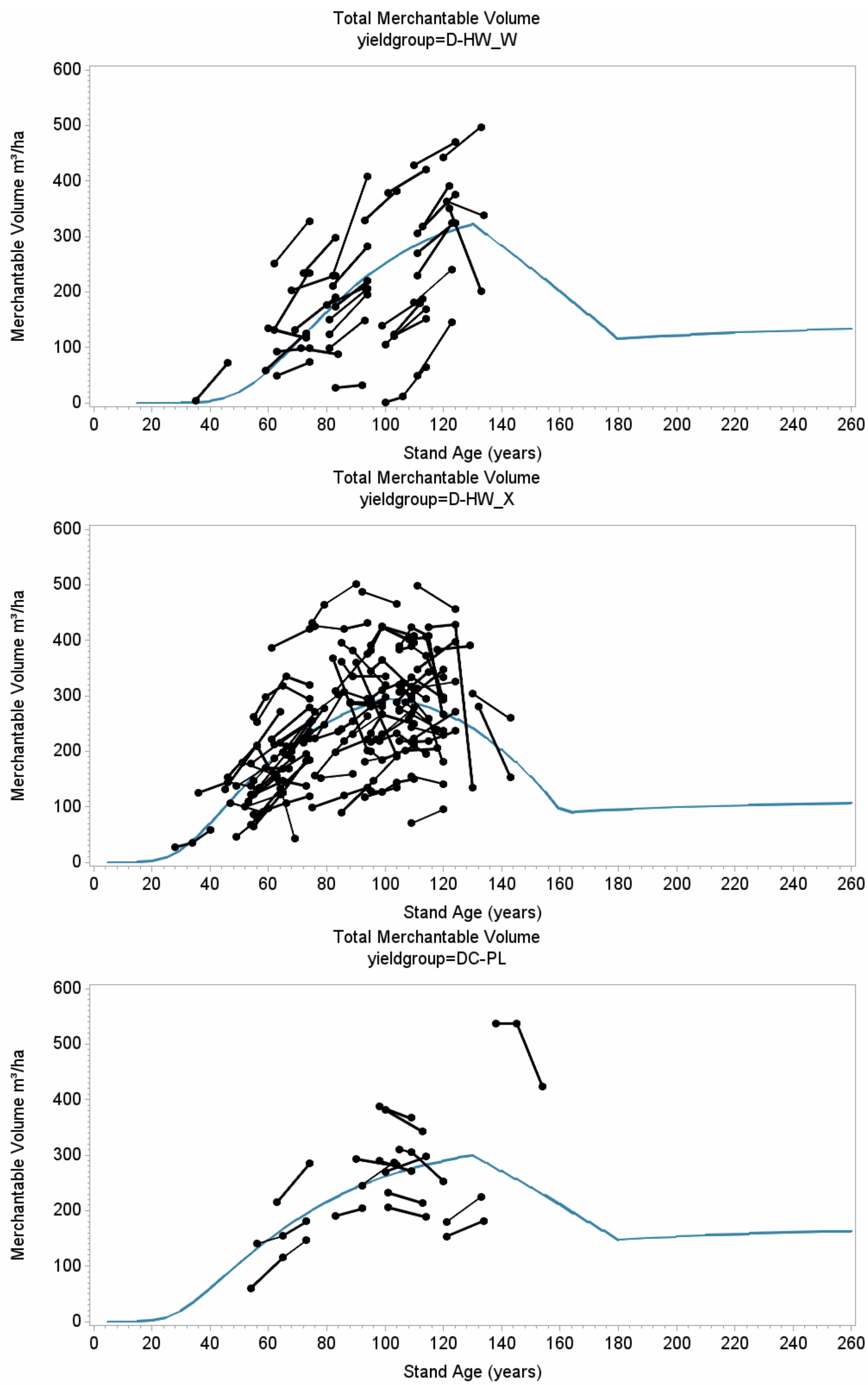


Figure 7. Natural stand total plot data against final natural stand yield curves.

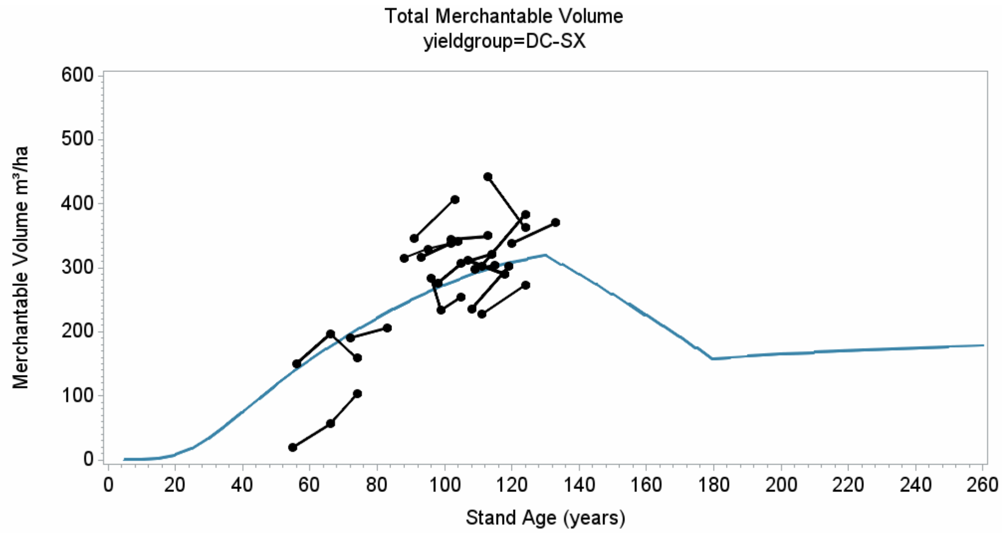


Figure 7. Natural stand total plot data against final natural stand yield curves.

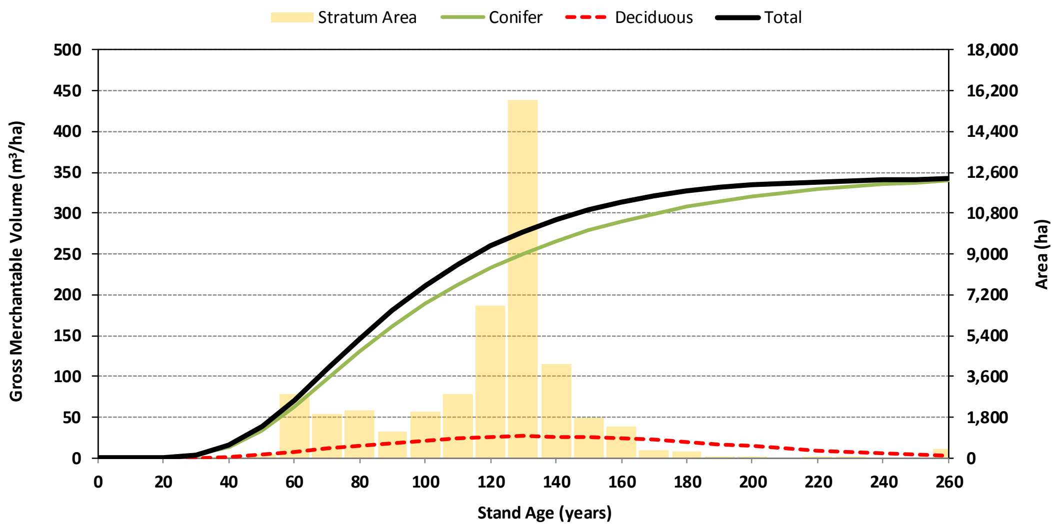
2.6.5 Final Yields

Final natural stand yield tables are provided in Appendix II an example is presented in Figure 8.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

STRATUM: C-PL_AB

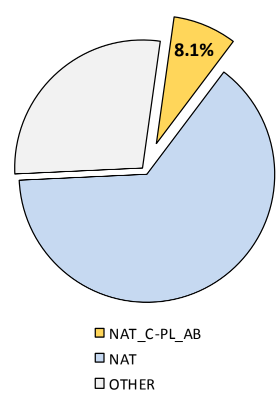


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.3	0.0	0.3	0.01	0.00	0.01
30	3.7	0.3	4.0	0.12	0.01	0.13
40	14.2	1.6	15.7	0.35	0.04	0.39
50	33.9	4.2	38.1	0.68	0.08	0.76
60	62.9	7.7	70.6	1.05	0.13	1.18
70	96.9	11.6	108.6	1.38	0.17	1.55
80	130.9	15.2	146.1	1.64	0.19	1.83
90	161.8	18.6	180.4	1.80	0.21	2.00
100	189.0	21.8	210.9	1.89	0.22	2.11
110	212.7	24.6	237.3	1.93	0.22	2.16
120	233.1	26.4	259.4	1.94	0.22	2.16
130	250.7	26.7	277.5	1.93	0.21	2.13
140	265.9	26.5	292.4	1.90	0.19	2.09
150	278.9	25.7	304.6	1.86	0.17	2.03
160	290.1	24.2	314.3	1.81	0.15	1.96
170	299.6	22.1	321.7	1.76	0.13	1.89
180	307.6	19.5	327.1	1.71	0.11	1.82
190	314.4	16.9	331.3	1.65	0.09	1.74
200	320.2	14.4	334.5	1.60	0.07	1.67
210	325.0	11.9	336.9	1.55	0.06	1.60
220	329.1	9.4	338.5	1.50	0.04	1.54
230	332.5	7.3	339.8	1.45	0.03	1.48
240	335.5	5.3	340.7	1.40	0.02	1.42
250	337.9	3.9	341.8	1.35	0.02	1.37
260	339.9	3.0	342.9	1.31	0.01	1.32

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	NAT_C-PL_AB	44,394	8.1%

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	9,745,004	220
Deciduous	15/10/15/366/TL	1,018,474	23
Total		10,763,720	242

Figure 8. Final natural yield table summary for yield group: C-PL_AB.Pre-1991 Managed Yield Curves (M91)

3 Pre-1991 Managed Yield Curves (M91)

Pre-1991 managed stand yield curves (M91) representing PHR stands that were harvested prior to March 1, 1991 within the Weyerhaeuser Pembina FMA area will be used in the 2017 FMP.

3.1 Approach

Weyerhaeuser used the same methodology, model and data that was used in the development of the natural stand yield curves (NAT) with the following notable changes:

- Managed stand site index estimates were obtained from the Regenerated Stand Productivity (RSP) study conducted in 2007-2008 for aspen, poplar, lodgepole pine and white spruce.
- The proposed site index values were submitted in the RSP study project report Appendix III, Table 6.6 (Weyerhaeuser 2014a).
- Methodology on how to incorporate the RSP study site index values was submitted to AAF in December 2014 (Weyerhaeuser 2014b).

The RSP study report, site index values and the proposed methods of application received AAF agreement-in-principle in January 2015 (AAF 2015a).

3.2 Input Datasets

3.2.1 Source Data

All PSPs that were used in the natural yield curve modelling data set were retained for the pre-1991 managed stand yield curve development. The average site index values for pre-1991 managed stands from the RSP study are presented in Table 3-1.

Table 3-1. Average site index by FMA, species, natural subregion and ecosite.

FMA	Ecosite	Aw		Pb		Pl		Sw	
		LF	UF	LF	UF	LF	UF	LF	UF
Drayton Valley	c	17.5	19.3			19.3	17.9	15.6	15.7
	d					18.6	16.8	14.9	
	e	19.5	18.5	18.6	17.8	20.4	19.2	17.7	16.7
	f	20.4	20.7	23.2		19.9	18.9	17.3	17.4
	h	14.8				17.7	16.0		
	j					15.2	16.0	15.5	16.1
Edson	c	17.5	19.3			19.5	18.1	15.9	16.0
	d					18.8	17.0	15.2	
	e	19.5	18.6	17.8	17.1	20.6	19.4	18.1	17.0
	f	20.5	20.8	22.2		20.1	19.1	17.6	17.7
	h	14.8				17.9	16.2		
	j					15.4	16.2	15.9	16.4

Source: RSP Study Report Appendix III - Table 6.6.

3.2.2 Yield Stratum Assignment

Yield stratification followed the same methodology and guiding principles as presented for natural stands in Section 2.2.2. The source of the strata was the AVI overstorey attributes, with the exception of A density aspen-leading stands with an understorey layer of B, C or D density where the understorey AVI attributes were used to assign the yield stratum. Further details on the stratum assignment can be found in Annex IV - Landbase document.

The RSP study sampling frame/target population included areas only in the Lower Foothills (LF) and Upper Foothills (UF) natural subregions in c, d, e, f, h and j ecosites, therefore two separate sets of M91 strata were created.

The enhanced M91 strata included areas in the RSP target population and were labelled by same stratum labels used for natural stands by adding the '_E' suffix to the stratum name. Areas outside the target population but within the pre-1991 managed stand landbase were assigned with natural yield curves. For distinction from the natural stand strata, we added the suffix '_B' (basic) to the stratum name.

A summary of areas in the net harvestable landbase by M91 strata is presented in Table 3-2. Almost 55% of the pre-1991 managed stand yield strata are pure deciduous stands.

Table 3-2. Area summary by yield stratum in the pre-1991 managed stands.

Stratum Type	Yield Group	Area (ha)	Percent(%)
Enhanced	C-PL_AB_E	721.3	2.1%
	C-PL_CD_E	5,108.8	14.6%
	C-SB_E	156.6	0.4%
	C-SW_E	2,300.3	6.6%
	CD-PL_E	1,711.7	4.9%
	CD-SX_E	822.9	2.3%
	D-HW_W_E	4,494.1	12.8%
	D-HW_X_E	13,405.9	38.2%
	DC-PL_E	1,855.6	5.3%
	DC-SX_E	1,845.3	5.3%
Enhanced Total		**32,422.7**	**92.4%**
Basic	C-PL_AB_B	346.4	1.0%
	C-PL_CD_B	343.2	1.0%
	C-SB_B	36.6	0.1%
	C-SW_B	335.6	1.0%
	CD-PL_B	15.8	0.0%
	CD-SX_B	97.6	0.3%
	D-HW_W_B	418.0	1.2%
	D-HW_X_B	919.3	2.6%
	DC-PL_B	123.9	0.4%
	DC-SX_B	43.6	0.1%
Basic Total		**2,680.2**	**7.6%**
Overall Total		**35,102.9**	**100.0%**

3.2.3 Data Exclusions

All PSPs that were used in the natural yield curve modelling data set were retained for the pre-1991 managed stand yield curve development. No further exclusions were implemented.

3.3 Data Preparation

The natural stand yield curve PSP modelling data set GYPY input was used as the basis for the analysis. No further data preparation on the PSP data was required.

3.4 Data Compilation

3.4.1 Managed Stand Site Index Values

In the RSP study sampling was undertaken by FMA, natural subregion and ecosite and the number of samples was not established proportionally to area. The average managed stand site index values (MSI) by yield group and natural subregion were therefore calculated using the area of the target population (Table 3-3).

Table 3-3. Area summary of the target population by FMA, natural subregion and ecosite.

FMA	Ecosite	Natural Subregion		
		LF	UF	Grand Total
Drayton Valley	c	13.9		13.9
	d	31.6	26.8	58.3
	e	3,724.9	319.0	4,043.9
	f	10,950.9	595.2	11,546.1
	h	3.6		3.6
	j	17.7	23.7	41.4
Edson	c	2.0		2.0
	d	78.8		78.8
	e	6,597.2	2.5	6,599.6
	f	9,952.5	5.1	9,957.6
	h	0.5		0.5
	j	76.7		76.7
Grand Total		**31,450.4**	**972.2**	**32,422.7**

Any FMA/natural subregion/ecosite combination with an area in the target population but without a site index estimate defaulted to the minimum site index within the FMA, natural subregion and species (Table 3-1).

Finalized MSI values by species group were calculated for each yield group and natural subregion combination weighted by the net harvestable areas (Table 3-4).

Table 3-4. Managed stand site index values by yield group and natural subregion.

Natural Subregion	Yield Group	Area (ha)	Site index at BH (m) AW	PL	SW
Lower Foothills	C-PL_AB_E	618.6	20.4	20.1	17.5
	C-PL_CD_E	4,704.0	21.1	20.1	17.5
	C-SB_E	151.1	17.5	17.9	16.3
	C-SW_E	2,181.2	20.1	20.3	17.7
	CD-PL_E	1,655.3	21.1	20.0	17.5
	CD-SX_E	820.9	19.6	20.3	17.8
	D-HW_W_E	4,494.1	20.5	20.2	17.7
	D-HW_X_E	13,192.0	20.9	20.1	17.5
	DC-PL_E	1,797.9	20.4	20.2	17.6
	DC-SX_E	1,835.3	19.4	20.4	17.9
Upper Foothills	C-PL_AB_E	102.7	18.2	19.1	16.7
	C-PL_CD_E	404.8	18.8	18.9	17.1
	C-SB_E	5.6	18.2	19.2	16.7
	C-SW_E	119.1	19.1	18.9	17.3
	CD-PL_E	56.3	18.7	19.1	17.0
	CD-SX_E	2.0	19.3	18.9	17.4
	D-HW_X_E	214.0	19.0	18.6	17.2
	DC-PL_E	57.7	18.7	19.0	17.1
	DC-SX_E	10.0	19.3	18.9	17.4
Overall*		**32,422.7**	**20.6**	**20.1**	**17.6**

** area-weighted overall site index values are for information only.*

3.4.2 Natural Stand Site Index Values

Natural stand site index values (NSI) were calculated by yield group, natural subregion and species group from the PSP modelling data set using plots in the target population. Any plots with significant birch content[16] were not used for the calculation of NSI for the AW species group.

Finalized NSI values by species group were calculated for each yield group and natural subregion from the eligible PSP measurements of the natural yield curve modelling data set (Table 3-5).

[16] Plot measurements where over 50% of the deciduous top height trees were white birch were not used in the calculation of the NSI for the AW species group. However, these plots were still used to calculate the NSI for PL and SW in the target population.

Table 3-5. Natural stand site index values by yield group and natural subregion.

Natural Subregion	Yield Group	Number of Plots	Site index at BH (m)		
			AW	PL	SW
Lower Foothills	C-PL_AB_E	72	17.0	16.7	13.9
	C-PL_CD_E	97	18.0	18.6	13.8
	C-SB_E	18	17.8	14.7	10.8
	C-SW_E	61	18.2	17.6	17.0
	CD-PL_E	15	20.8	16.9	13.9
	CD-SX_E	35	15.8	17.0	17.7
	D-HW_W_E	67	20.2	18.9	16.9
	D-HW_X_E	193	19.3	19.2	16.0
	DC-PL_E	36	18.7	15.9	18.1
	DC-SX_E	26	20.1	19.5	17.5
Upper Foothills	C-PL_AB_E	11		14.9	18.0
	C-PL_CD_E	23	17.7	13.8	13.7
	C-SB_E	2			7.4
	C-SW_E	4		13.6	10.5
	D-HW_X_E	2	15.3	17.7	22.2
Overall*		**662**	**18.1**	**17.9**	**15.6**

** weighted overall site index values are for information only.*

3.5 Modelling

3.5.1 Growth Modelling Approach

The natural stand yield curve development modelling data set and methodology were used to develop enhanced M91 yield curves for the pre-1991 managed stand target population. Areas outside the target population but identified as pre-1991 managed stands were assigned with natural stand yield curves.

First, the site index ratio was calculated based on the formula: MSI/NSI by natural subregion and yield group for each species group (Table 3-6). Any missing ratio was set to 1.00, including the entire SB species group which was not part of the RSP study sampling frame.

Secondly, natural stand site index values for all PSPs in the modelling data set were adjusted by the ratios. Any PSPs outside the target population were left unadjusted (using the ratio of 1) and any plots within the target population but having a significant birch component were not adjusted for the AW species group.

Note that the site index ratio was not guaranteed to be greater than 1 but it was expected that the MSI would be generally higher than the NSI.

Thirdly, the natural yield curve process was rerun on the PSP data (adjusted for site index only).

Table 3-6. Site index ratios by natural subregion and yield group for the target population.

Natural Subregion	Yield Group	Area (%)	Site index Ratio AW	PL	SW
Lower Foothills	C-PL_AB_E	1.9%	1.20	1.20	1.26
	C-PL_CD_E	14.6%	1.17	1.08	1.27
	C-SB_E	0.5%	0.98	1.22	1.51
	C-SW_E	6.8%	1.10	1.15	1.04
	CD-PL_E	5.1%	1.02	1.19	1.26
	CD-SX_E	2.5%	1.24	1.19	1.01
	D-HW_W_E	13.9%	1.01	1.07	1.05
	D-HW_X_E	40.8%	1.08	1.05	1.10
	DC-PL_E	5.6%	1.09	1.27	0.97
	DC-SX_E	5.7%	0.96	1.05	1.02
Upper Foothills	C-PL_AB_E	0.3%	1.00	1.28	0.93
	C-PL_CD_E	1.3%	1.06	1.37	1.25
	C-SB_E	0.0%	1.00	1.00	2.26
	C-SW_E	0.4%	1.00	1.39	1.64
	D-HW_X_E	0.7%	1.24	1.05	0.77

3.5.2 Yield Adjustments

Pre-1991 managed stand yield curves were adjusted for deciduous decline and stand breakup exactly the same way as natural stand yield curves described in Section 2.5.4.

3.6 Results

3.6.1 Pre-1991 Managed Stand Yield Curves

The final (capped/adjusted) yield curves for pre-1991 managed stands in the target population are shown in Figure 9.

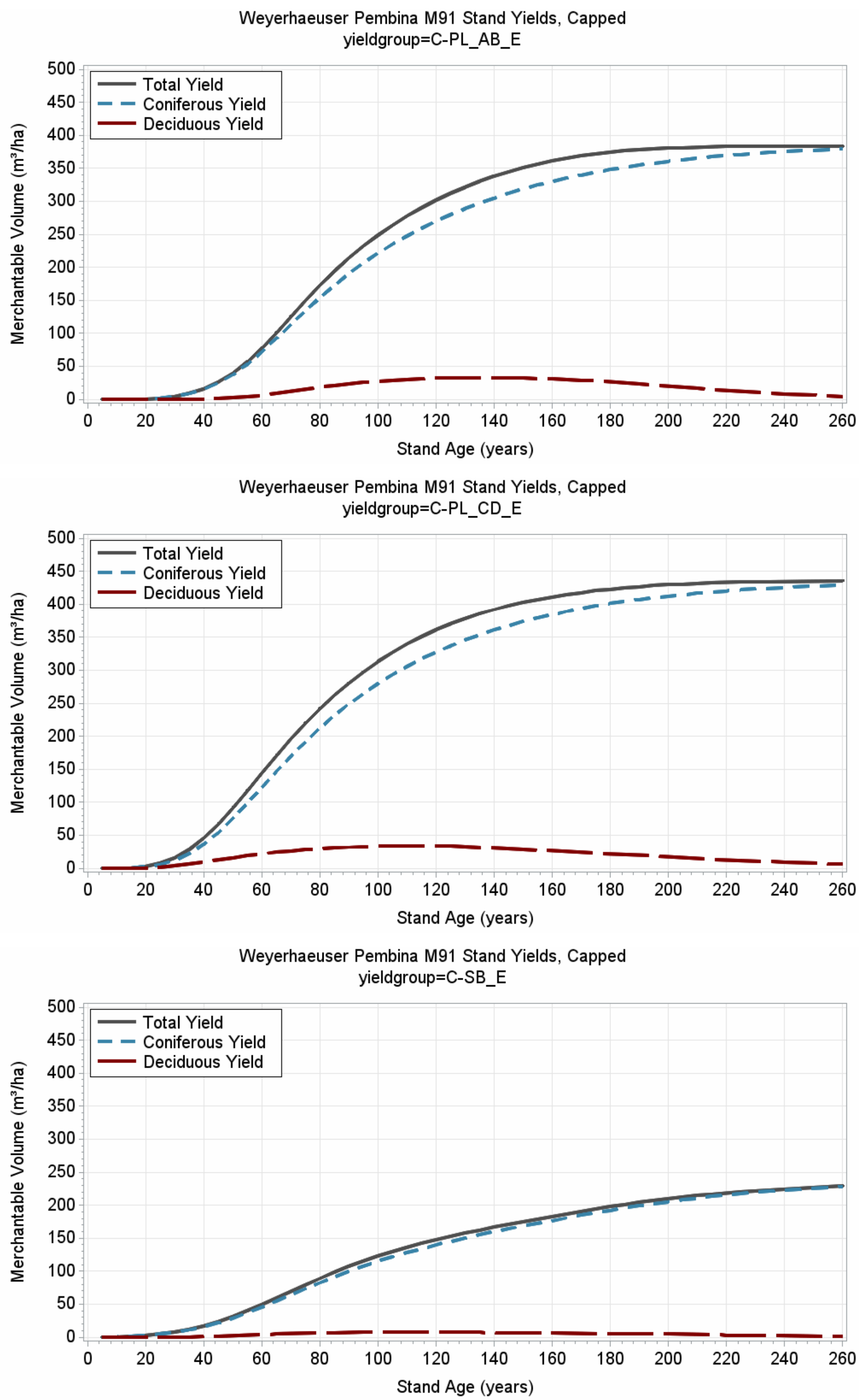


Figure 9. Final pre-1991 managed stand yield curves (M91).

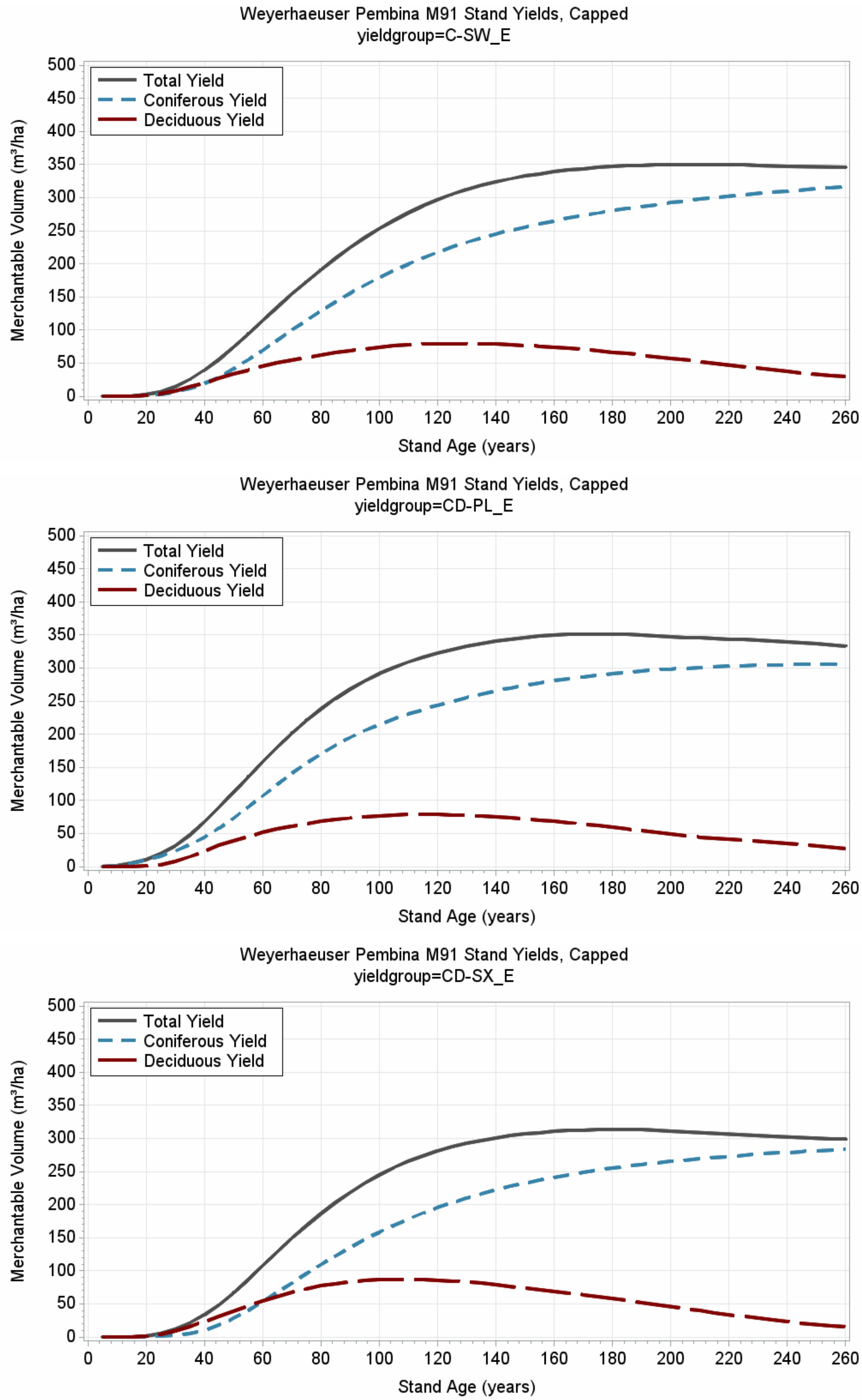
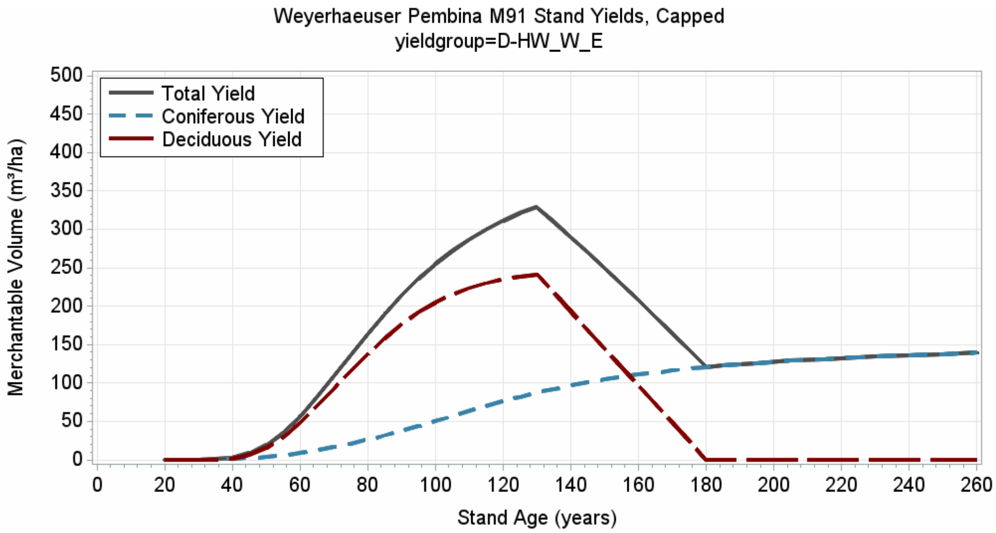
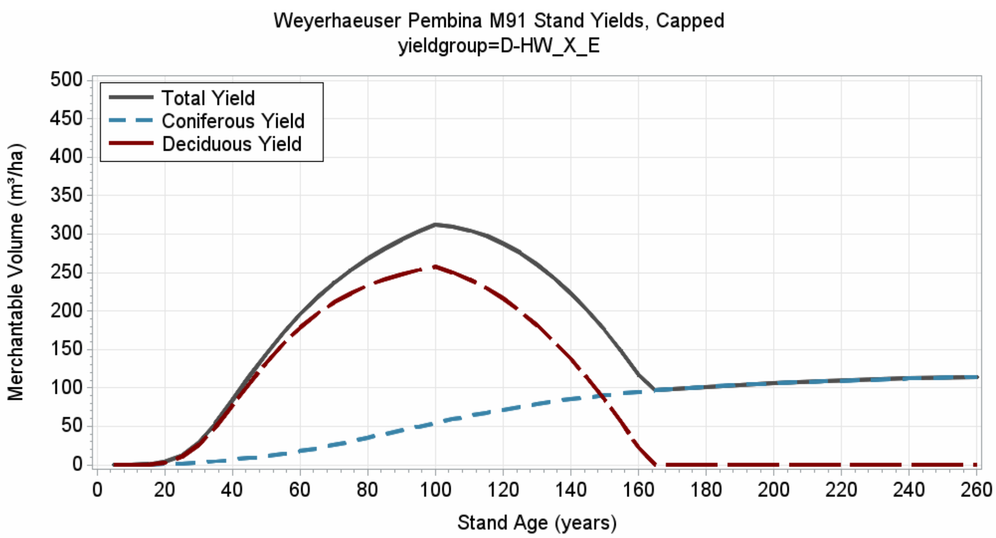


Figure 9. Final pre-1991 managed stand yield curves (M91).





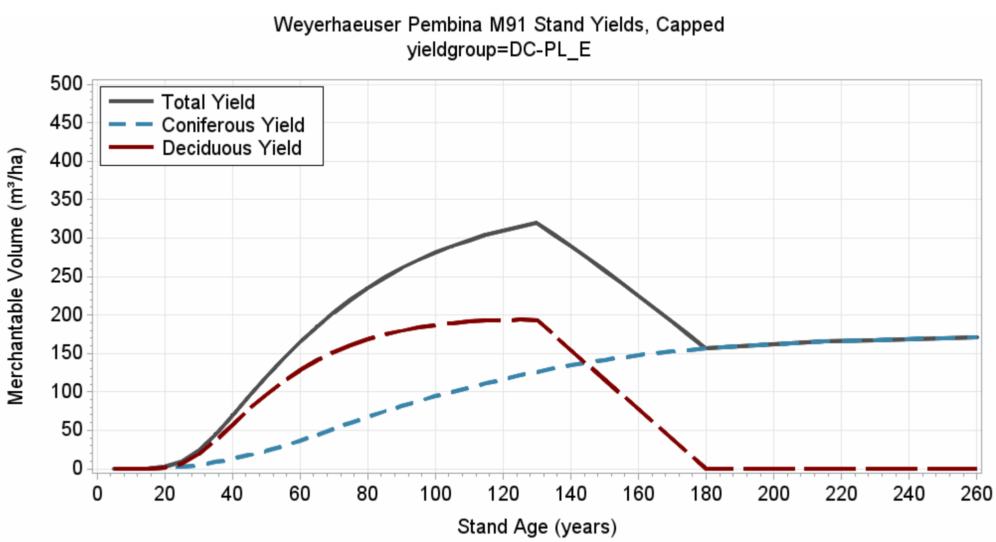


Figure 9. Final pre-1991 managed stand yield curves (M91).

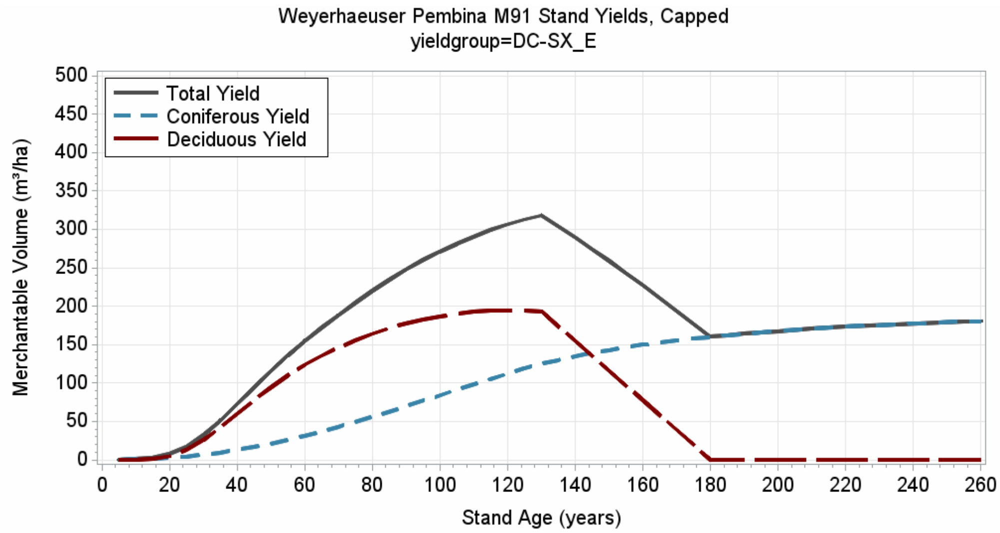


Figure 9. Final pre-1991 managed stand yield curves (M91).

3.6.2 Validation Against Managed Stand GYM Plot Data

The GYM plot data (Section 1.6.2) was compiled following the same protocols used for the natural stand PSP data. Significant data cleaning took place as part of the PGYI data preparation exercise in March 2016 which was incorporated into the FMP data preparation process. Gross merchantable volumes were compiled to FMA baseline utilization for the 29 GYM plots that were located in pre-1991 openings as per the landbase intersect[17].

The number of GYM plots is not sufficient to draw any statistical conclusions from the data and the stands are still in the early development phase where merchantable volume starts to accumulate. However, volume accumulation will need to be continually monitored to ensure that yield projections are on track.

Total merchantable volumes were compared to the last measurement of the GYM plots as shown in Figure 10 and volume growth trajectories are presented in Figure 11. All M91 yield curves are presented in the charts to also show the amount of plots available (or lacking) by age class.

Additional charts for conifer and deciduous merchantable volumes are included in Appendix V.

[17] Four GYM plots fell into the natural landbase due to potential location issues (50400917, 50491401, 50551704 and 50561111) and one plot (50511536) was destroyed by road construction.

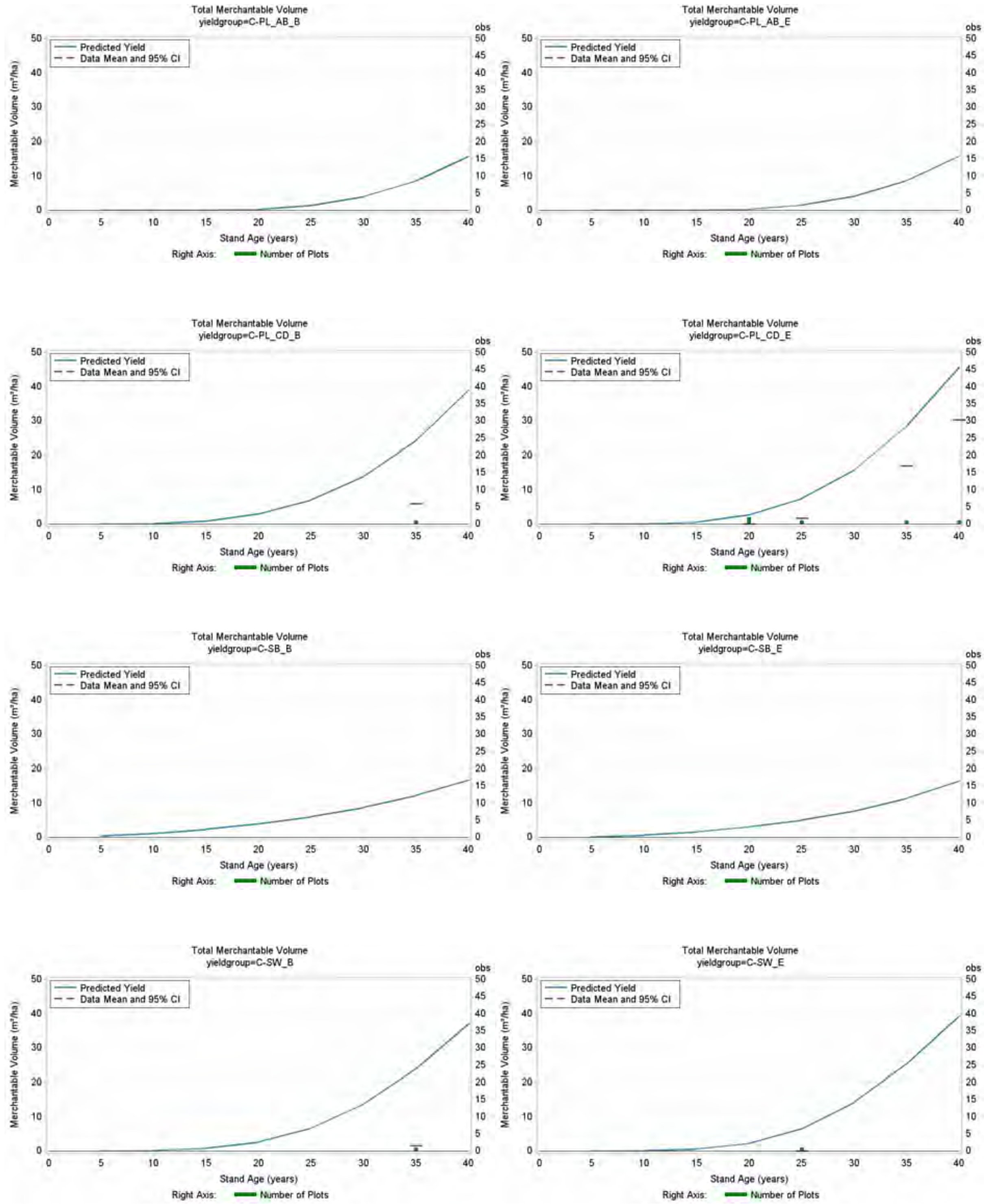


Figure 10. Average total merchantable volume by age class against the M91 yield curves.

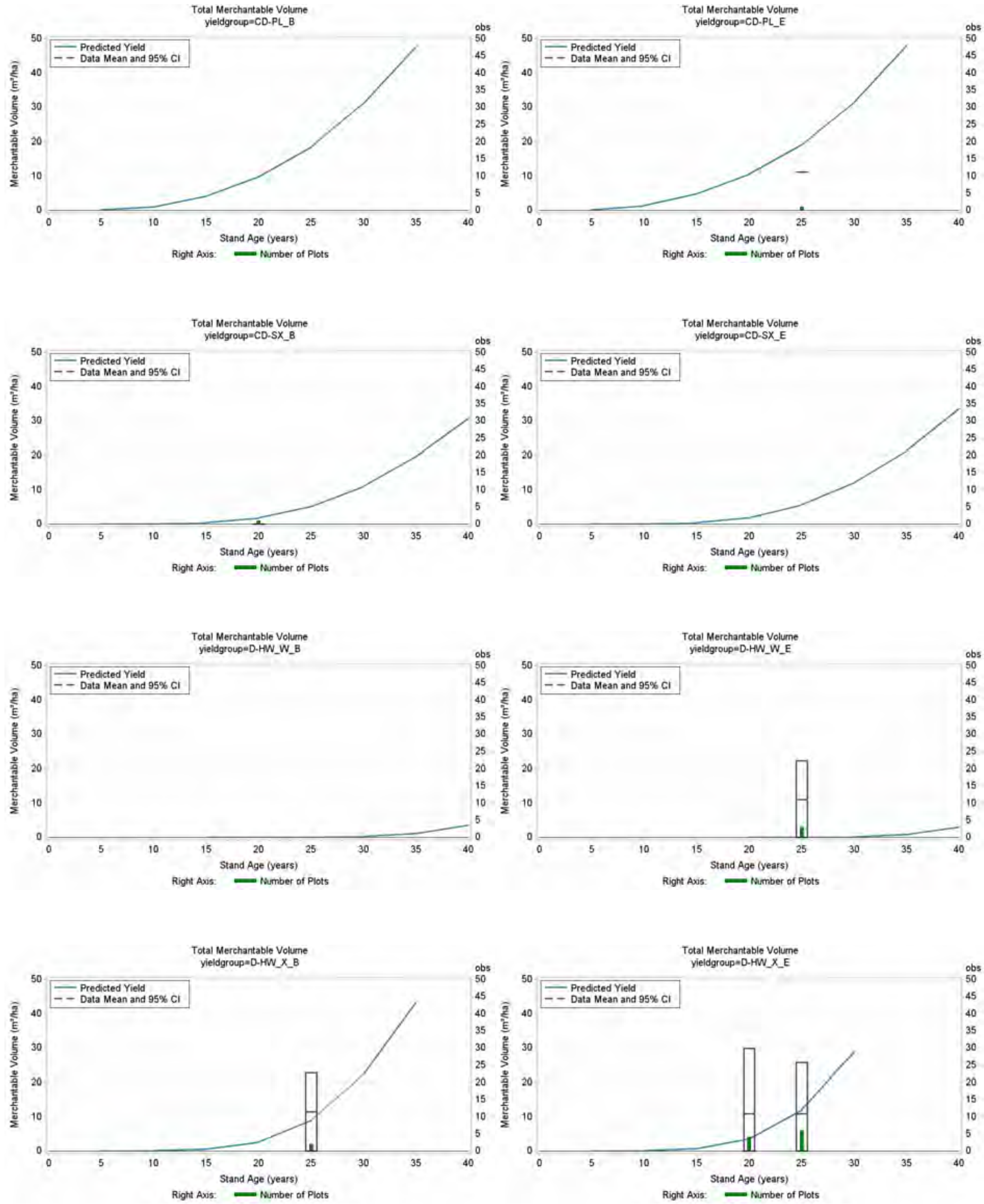


Figure 10. Average total merchantable volume by age class against the M91 yield curves.

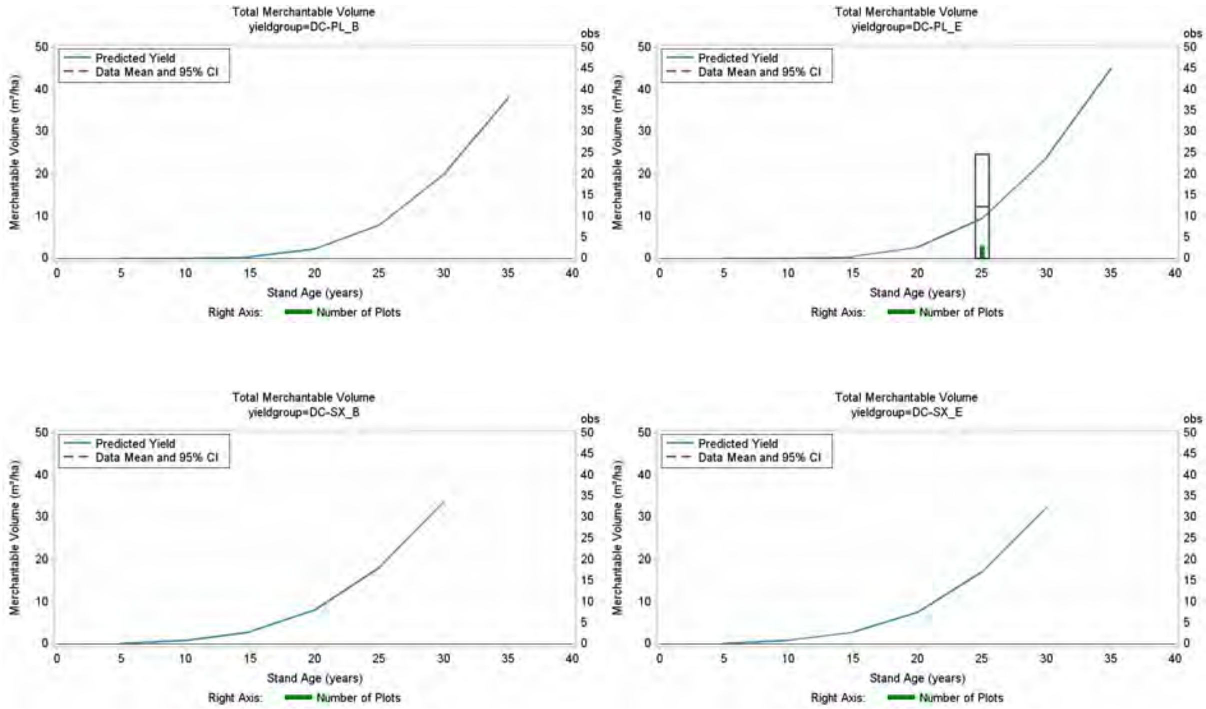


Figure 10. Average total merchantable volume by age class against the M91 yield curves.

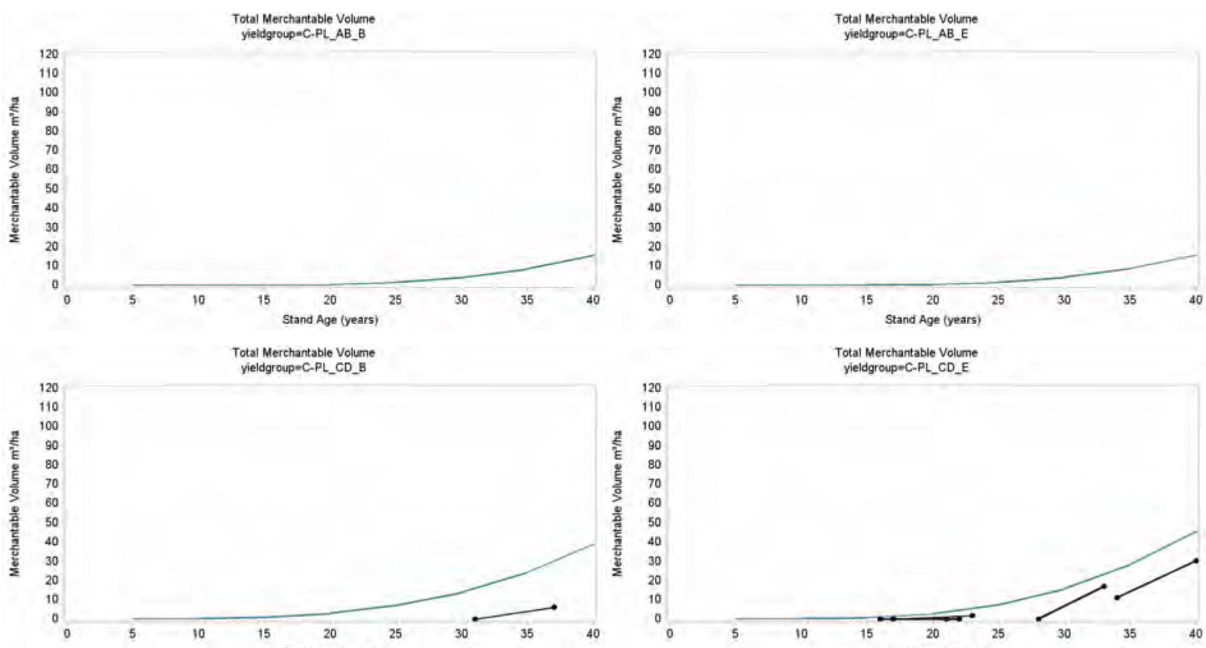


Figure 11. Total merchantable volume trajectories against the M91 yield curves.

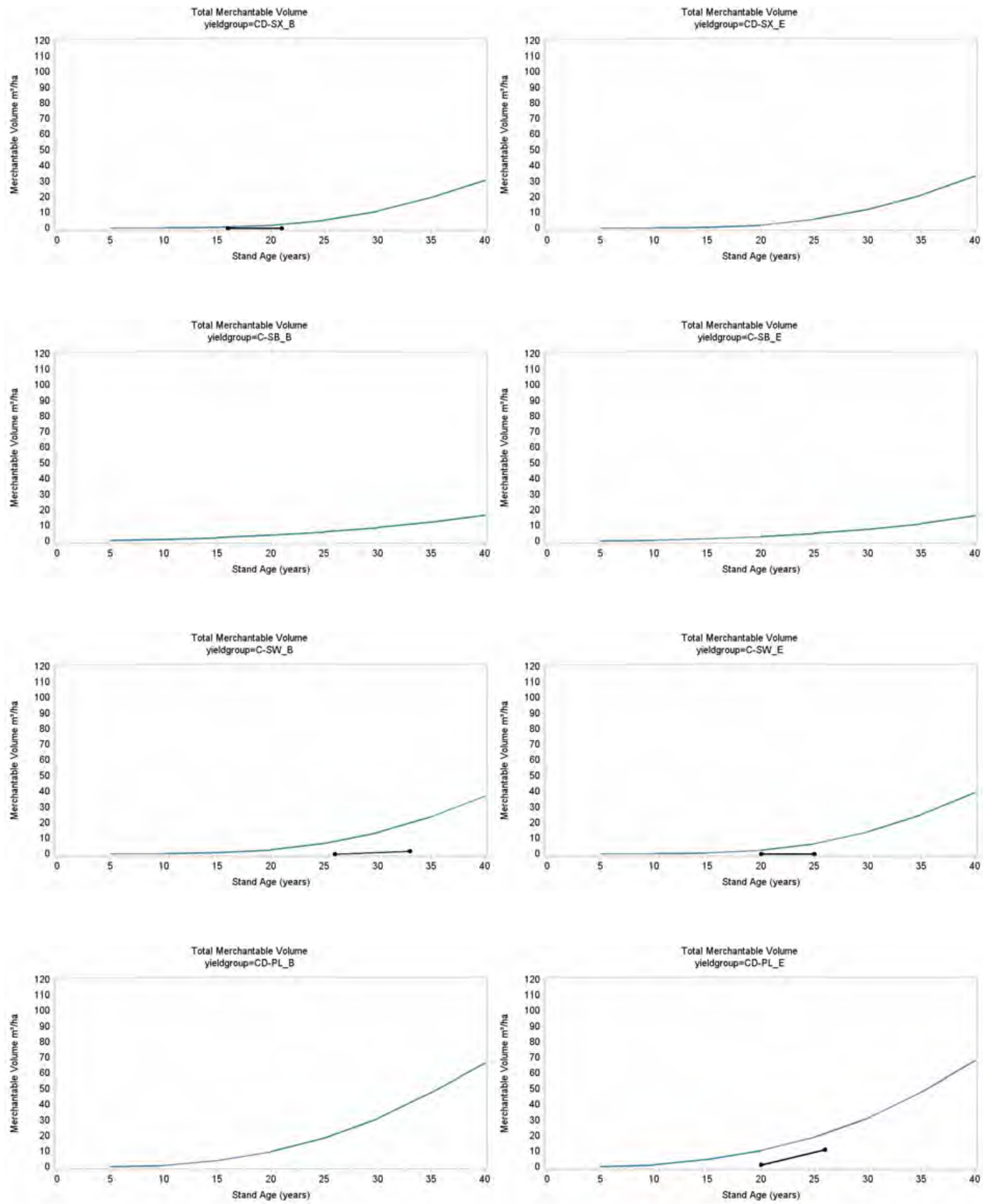


Figure 11. Total merchantable volume trajectories against the M91 yield curves.

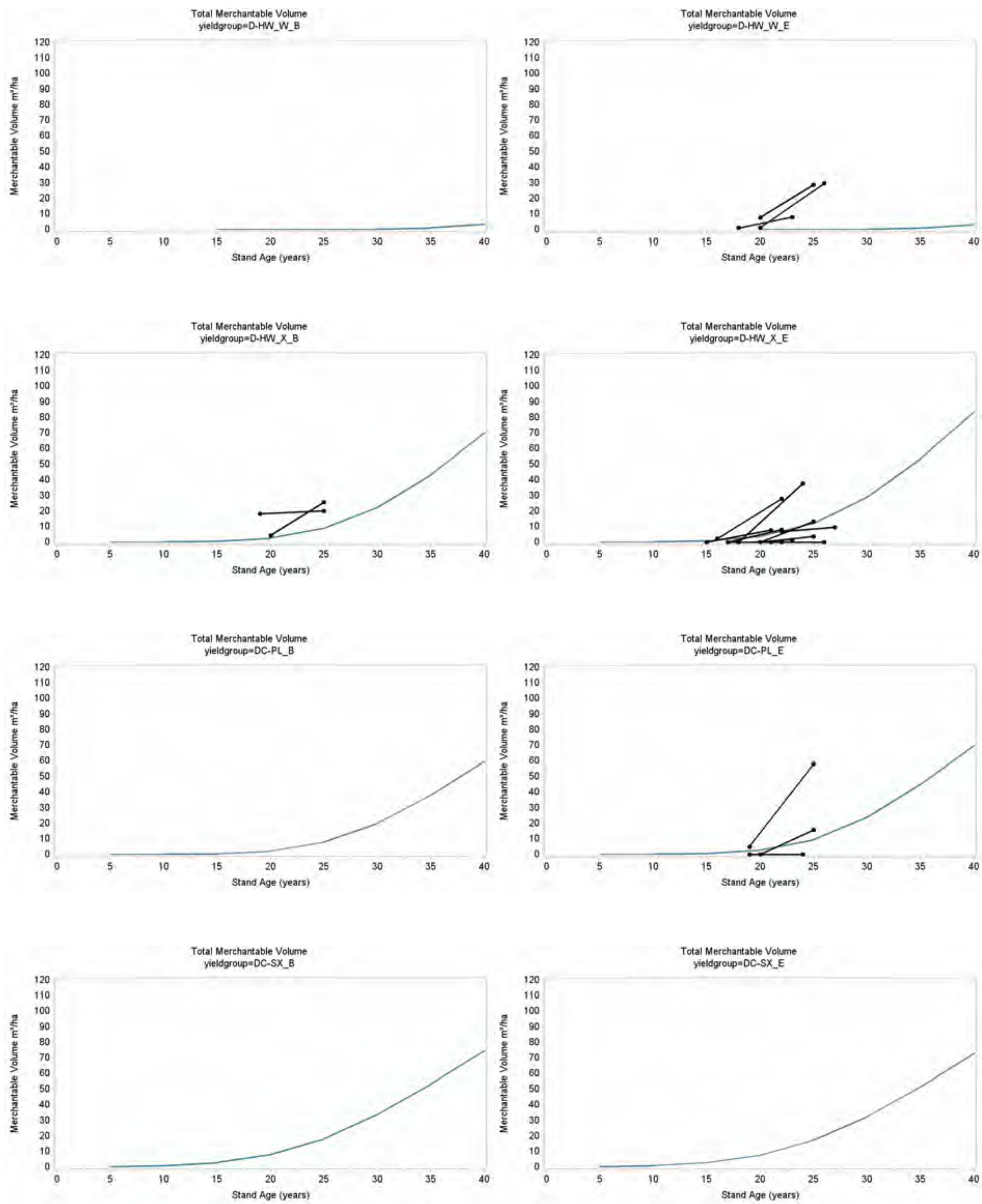
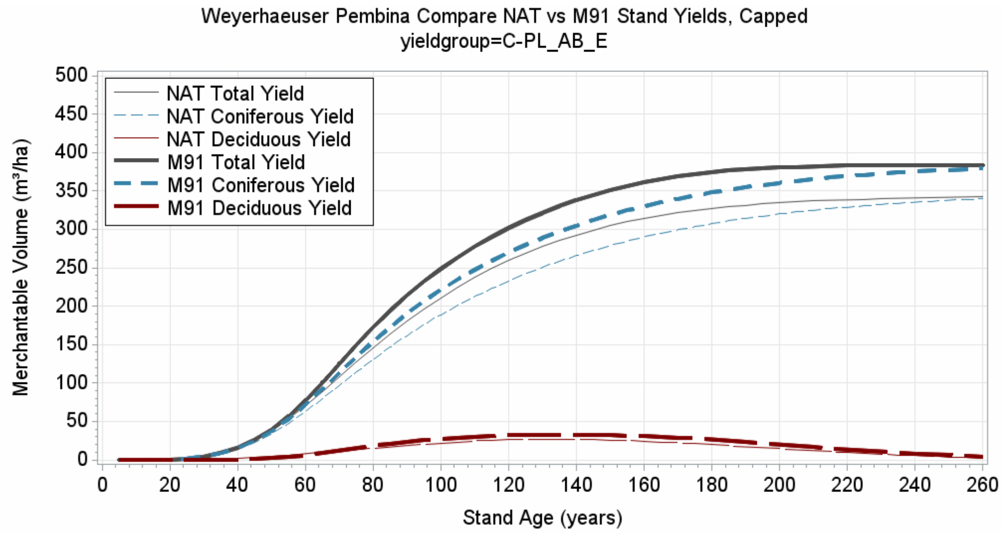
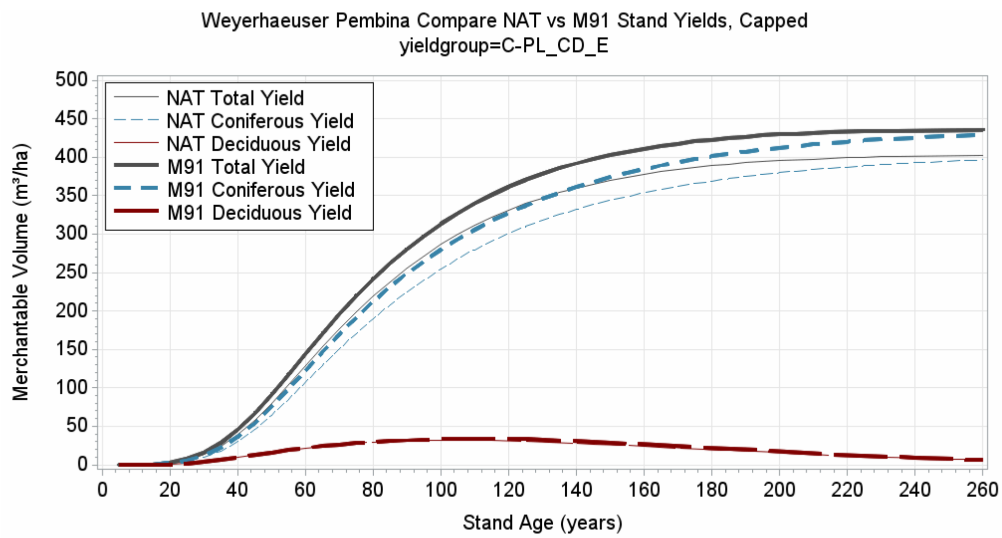


Figure 11. Total merchantable volume trajectories against the M91 yield curves.

3.6.3 Comparison with Natural Stand Yield Curves

The pre-1991 managed stand yield curves (M91) are graphically compared to the natural stand yield (NAT) in Figure 12. Conifer yields are somewhat higher for most yield group while deciduous volume gains are limited.





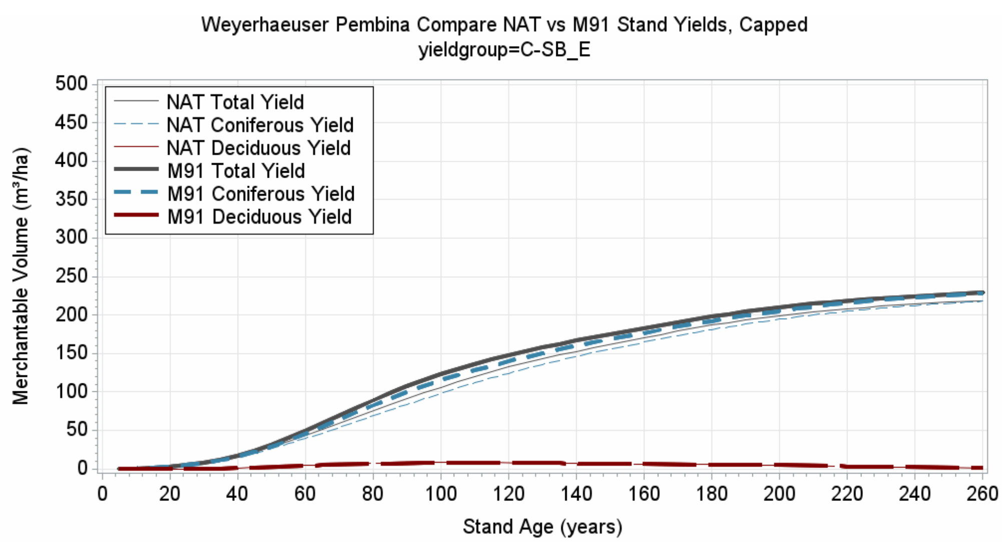
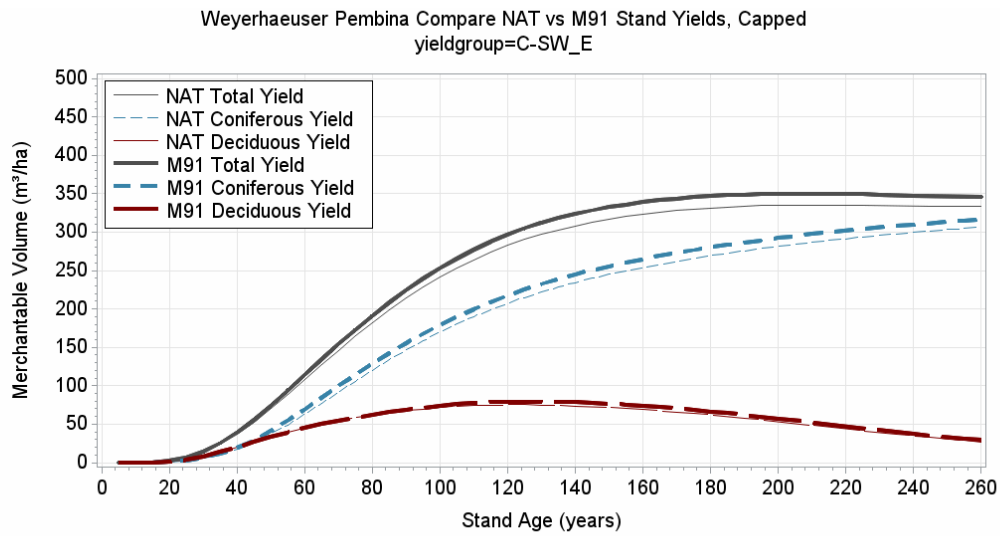
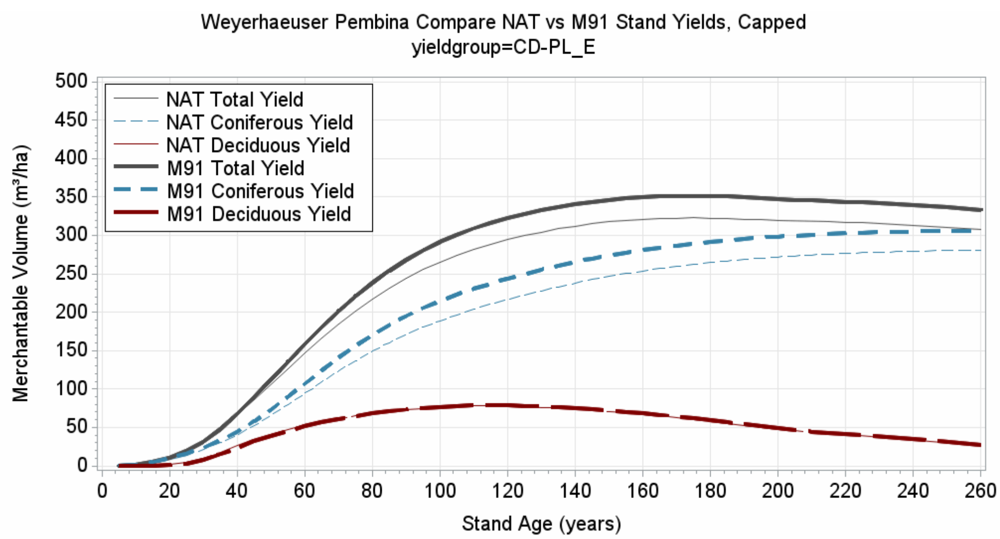


Figure 12. Comparison between M91 and NAT yield curves.





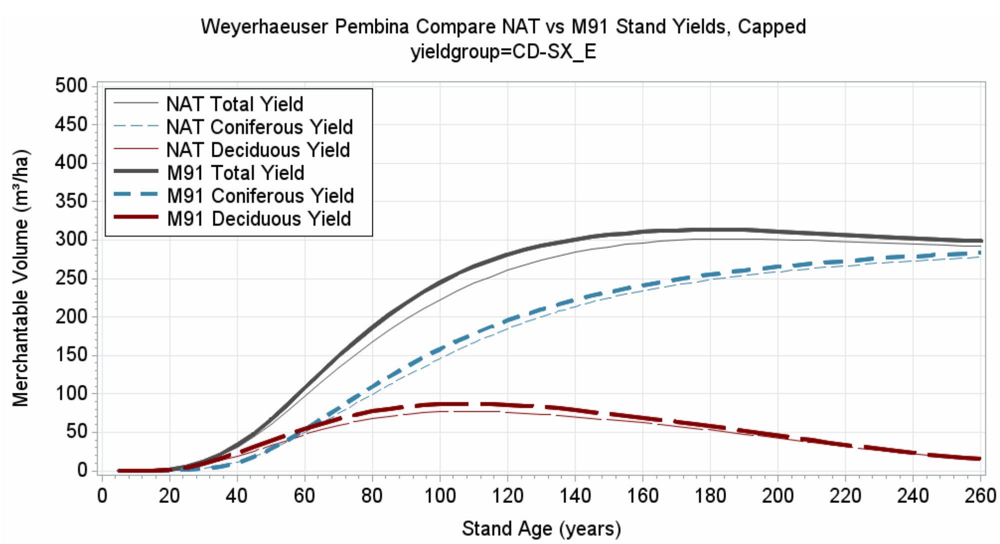
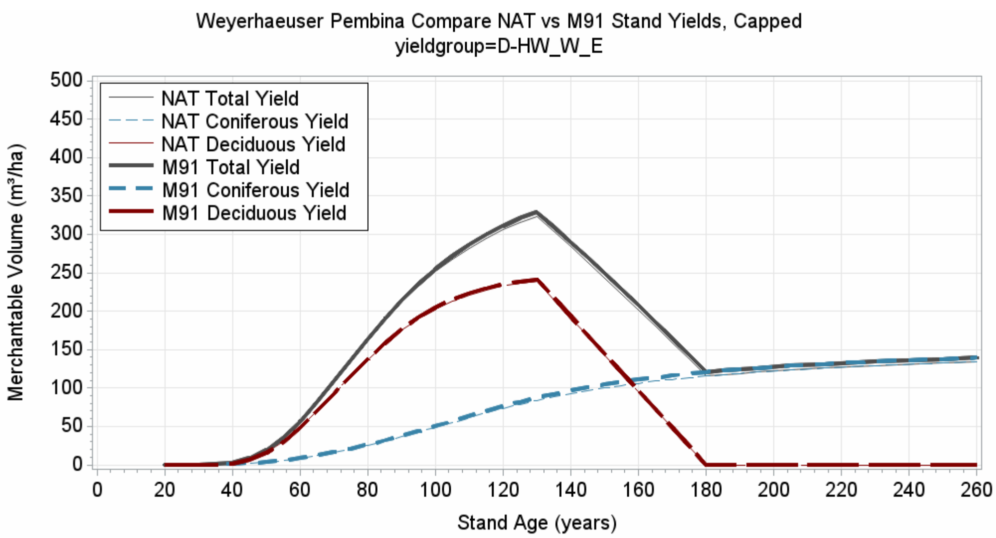
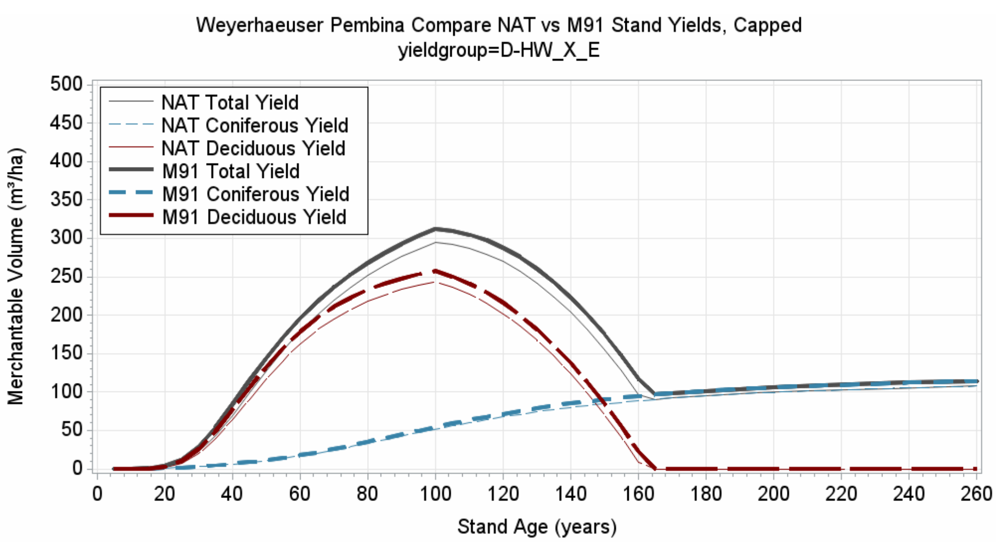


Figure 12. Comparison between M91 and NAT yield curves.





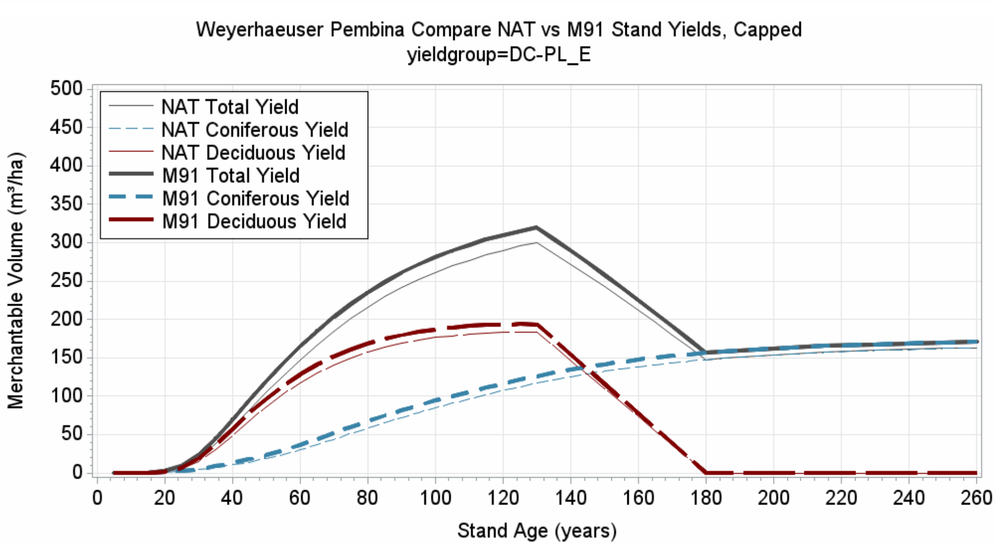


Figure 12. Comparison between M91 and NAT yield curves.

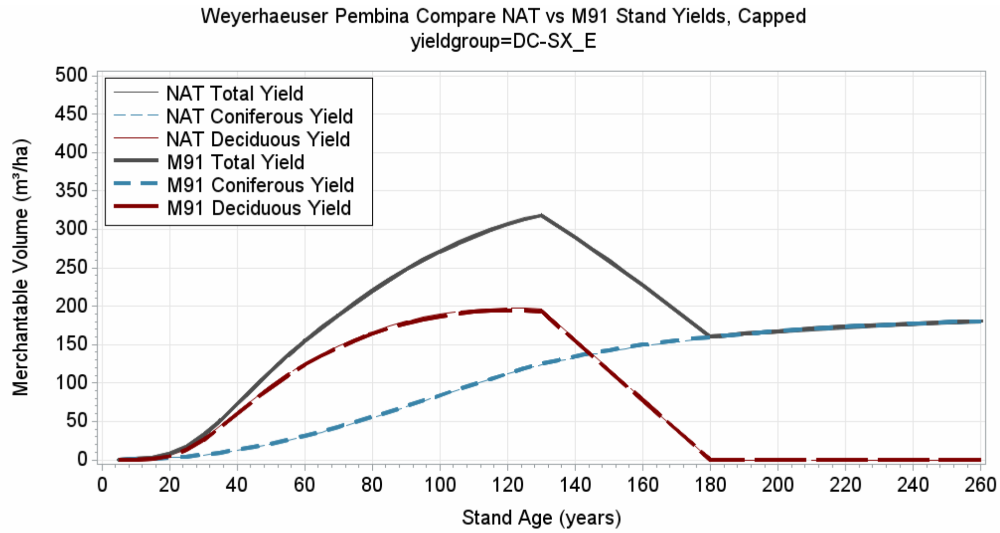
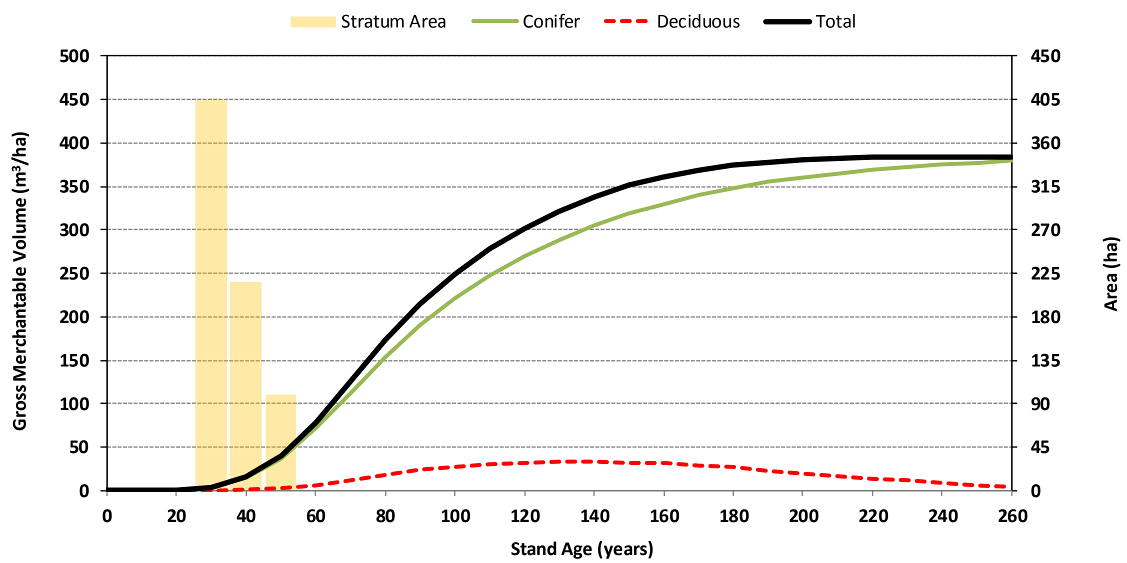


Figure 12. Comparison between M91 and NAT yield curves.

3.6.4 Final Yields

The final M91 yield tables are provided in Appendix III. An example is presented in Figure 13.

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	PRE-1991 CUTBLOCKS STRATUM: C-PL_AB_E

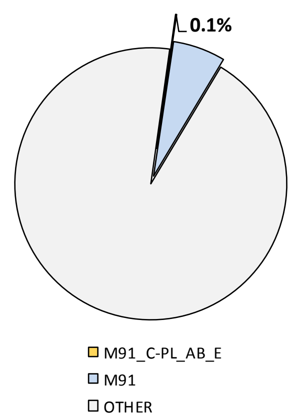


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.3	0.0	0.3	0.01	0.00	0.01
30	4.0	0.1	4.1	0.13	0.00	0.14
40	15.2	0.6	15.8	0.38	0.02	0.39
50	37.1	2.4	39.5	0.74	0.05	0.79
60	71.6	6.1	77.7	1.19	0.10	1.30
70	113.3	12.0	125.3	1.62	0.17	1.79
80	154.2	18.6	172.7	1.93	0.23	2.16
90	190.4	23.9	214.3	2.12	0.27	2.38
100	221.4	27.6	249.0	2.21	**0.28**	2.49
110	247.7	30.3	278.0	**2.25**	0.28	**2.53**
120	269.9	32.2	302.1	2.25	0.27	2.52
130	288.8	33.0	321.9	2.22	0.25	2.48
140	305.0	33.1	338.0	2.18	0.24	2.41
150	318.7	32.5	351.2	2.12	0.22	2.34
160	330.3	31.2	361.5	2.06	0.20	2.26
170	340.0	29.2	369.2	2.00	0.17	2.17
180	348.2	26.5	374.7	1.93	0.15	2.08
190	355.0	23.4	378.4	1.87	0.12	1.99
200	360.7	20.1	380.9	1.80	0.10	1.90
210	365.5	16.9	382.4	1.74	0.08	1.82
220	369.4	14.1	383.5	1.68	0.06	1.74
230	372.7	11.4	384.1	1.62	0.05	1.67
240	375.4	8.6	384.0	1.56	0.04	1.60
250	377.6	6.3	383.9	1.51	0.03	1.54
260	379.4	4.6	384.0	1.46	0.02	1.48

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	**M91_C-PL_AB_E**	**721**	**0.1%**

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	8,603	12
Deciduous	15/10/15/366/TL	393	1
Total		9,009	12

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

Figure 13. Final pre-1991 managed stand yield table summary for yield group: C-PL_AB_E.

4 Post-1991 Managed Stand Yield Curves (RSA)

Post-1991 managed stand yield curves (RSA) representing C, CD and DC declared PHR stands that were harvested on or after March 1, 1991 within the Weyerhaeuser Pembina FMA area will be used in the 2017 FMP. Post-1991 managed stand that were declared as D (pure deciduous) were based on the M91 enhanced deciduous yield curves. Genetic yield curves for Sw were created for PHR stands where I1 improved stock is deployed.

4.1 Overview

After discussion with AAF, the post-1991 yield curves were developed as per the methodology submitted by Weyerhaeuser (Weyerhaeuser 2015c). Agreement of principle was obtained on November 18, 2015 at the Planning and Development Team Meeting (AAF 2015e).

4.2 Input Datasets

4.2.1 Source Data

Available RSA performance survey data from 1,387 openings were used to develop post-1991 managed stand yield curves. All RSA submissions from 2009 to May 1, 2015 were recompiled and compared to the original submissions. All reported MAIs at the opening level were also verified against the ARIS submission based on the ARIS data extract provided by AAF[18]. A description of RSA data and the RSA compiler is provided in Section 1.6.3.

4.2.2 Yield Stratum Assignment

The Planning Standard, Section 3.11i, Annex 1, requires that areas harvested on or after March 1, 1991 be assigned to a yield stratum as defined in ARIS and the most current information on the harvest area and its associated regeneration stratum in ARIS.

The new AVI incorporated a link to ARIS and the skid clearance date via the cutblock reconciliation process described in the document titled “ARIS Net Landbase Reconciliation Procedures” (AAF 2015b).

All openings were assigned to a yield group consistent with the most recent of the following ARIS data:

- declared stratum[19];
- stratum resulting from an establishment survey finding; or
- stratum resulting from a performance survey finding.

[18] ARIS data extract was provided by Liana Luard (AAF) on November 24, 2015.

[19] If a harvest area is less than 2 years old and has not received a stratum declaration (reforestation target), use the harvest stratum assignment.

Stratification was based on the AAF 10 base regenerating strata (Table 1-1). ARIS declaration and silviculture records were used to assign openings at the opening-level to species-specific yield strata where RSA performance survey stratum was not available. If an RSA performance survey stratum was available, the SU linework was retained and yield strata were assigned at the SU-level.

Aerial programs used the photo-interpreted species class label (SP_CL) as the basis for the yield stratum assignment. Given that ground-interpreted labels are sometimes inaccurate[20] when compared to observed ground data and that ground-based labels are at coarser resolution than aerial program labels (e.g., MxPl); we reassigned non-photo programs based on the ground survey information. Ground survey based densities were used following the rules of aerial stratum assignment as per the RSA survey manual (AESRD 2015).

A detailed description of the rule set used to assign yield strata to existing managed stands is provided in Annex IV - Landbase document.

4.2.3 Data Exclusions

Fifteen non-photo surveys from pure deciduous stands were excluded from yield curve development. These surveys were undertaken by AESRD to test non-photo protocols in deciduous stands, but were not legislated surveys. Nine FRIAA openings (10 SUs) with non-photo surveys were also removed as the surveys were completely outside of the DFA and were also not in the official ARIS data extract. Removal of these 10 SUs is possible as the weight of each SU is 1.

In the aerial programs, 8 openings (9 SUs - 6 ANC, 3 Weyerhaeuser) with an SU flag of 1 were removed[21]. No other deletions were applied to the dataset, regardless of whether or not openings were spatially represented on the landbase, at the direction of AESRD. The total area and number of ground-sampled SUs by program type (aerial vs. non-photo) and yield stratum is presented in Table 4-1.

Table 4-1. Number of ground sampled SUs and population areas by RSA program and yield stratum.

Yield	Aerial		Non-Photo		Total	
Stratum	SUs	Area (ha)	SUs	Area (ha)	SUs	Area (ha)
Hw	50	489.1	32	339.4	82	828.4
HwPl	35	306.6	19	172.5	54	479.1
HwSx	90	1,495.9	67	622.6	157	2,118.5
Pl	192	9,631.0	28	235.7	220	9,866.7
PlHw	57	688.1	39	295.1	96	983.2
Sb	3	5.5	1	10.8	4	16.3
SbHw	1	5.2	2	6.1	3	11.3
Sw	113	3,940.3	13	68.7	126	4,009.0
SwHw	91	1,560.3	32	274.4	123	1,834.7
Grand Total	**632**	**18,121.9**	**233**	**2,025.2**	**865**	**20,147.1**

[20] Early non-photo programs tend to have some discrepancies between ground interpreted labels and observed ground data.

[21] Survey population deletion due to HH pure deciduous declaration where CSR-D surveys should have been conducted. These SUs were flagged by the companies as part of their sampling and associated weights prior to the official RSA compilation and submission.

4.3 Data Preparation

Several edits to 2009 performance survey data were required in order to load these data into the existing RSA compiler. These edits included:

- Adding nil tally plots;
- Constructing photo interpretation and opening tables (not required in the 2009 submissions)
- Moving shrub percentages to the plot location table; and
- Making the minimum number of data edits possible to enable data loading within the compiler.

In some of the original RSA datasets, there were 24 (5 aerial, 19 non-photo) incorrect opening numbers that were not corrected in the original data, but rather during submission of results into ARIS; the RSA compiler was edited to change these data to the correct opening number. All MAIs were independently compiled and validated against the official ARIS submission. There were only 7 openings[22] where the ARIS record showed that an RSA performance survey was completed but no data was received (99.5% success rate linking to ARIS).

4.4 Data Compilation

Data from the RSA compiler were used for yield curve development. SU-level density, basal area, site index and age (stand and species-level) were obtained from the GYPSY_INPUT table. The methods used for compiling data are documented in the Regeneration Standard of Alberta (AESRD 2013, AESRD 2015)[23]. Data were compiled to FMP base utilizations for the post-1991 managed stand yield curves.

4.5 Modelling

4.5.1 Growth Modelling Approach

The GYPSY model (Huang *et al*. 2009a, 2009b) was used for growth projections. Although the RSA compiler stored yield table outputs, these data are provided in 10-year increments which was unsuitable for timber supply analysis needs. Compiled RSA data were therefore re-projected using GYPSY to obtain 5-year outputs.

4.5.2 Model Inputs

SU-level inputs were taken from the RSA compiler's GYPSY_INPUT tables. Inputs included stand age, species age, site index, density, percent stocking and, where available, basal area. While basal area was not collected for all programs, it was used when available (in order to maintain consistency with the original RSA model projections).

[22] Missed RSA openings by stakeholder: CORS (5160563410C, 5170550102A), HANSEN (5110440679, 5110440699, 5110440784, 5110440821) and LFS (5100522795B).

[23] Note that changes to sample selection protocols and compilation routines occurred in 2014, therefore both of the 2013 and 2015 manuals are specifically being referenced here.

4.5.3 Model Outputs

The GYPSY model was projected to age 300 for all sampling units. Yield curves were generated from SU-level outputs as follows:

Aerial Programs

An average yield was generated for each aerial program by sampling stratum, employing the composite weighting approach developed for the RSA program (AESRD 2013) to roll individual projections to the program/sampling stratum level. Where sampling strata represented more than one yield stratum, e.g. a combined SbHw/SwHw sampling stratum, separate yield curves were created for each stratum with identical yields. The total population area (including all SUs, not just ground sampled SUs) was then assigned to each yield stratum within its respective program.

Non-Photo Programs

Each sampling unit had its own yield stratum assignment, yield projection, and area.

Averaging Across Programs

Yield curves were created by calculating area-weighted averages across all yield strata, combining program-level averaged yields from aerial programs and individual SU-level yields from non-photo programs.

4.5.4 Yield Curves for Deciduous Declared Openings

As per RSA protocols, no deciduous declarations were surveyed as part of the legislated performance survey standard, therefore the presence of Hw strata in RSA sampling units indicate "failed conifer treatment" in C/CD/DC declared openings. Up until 2014, pure deciduous declared openings were only subjected to a field stocking survey if they received a CSR (Conditional Satisfactorily Restocked) status[24] to determine the adequacy of stocking, survival and growth.

It is expected that the post-1991 managed stand yield curves for the Hw stratum constructed from legislated performance survey data (RSA) in C, CD and DC declared openings will reflect failed conifer treatments and therefore higher than normal conifer content when compared to regenerating Hw in stands from D declaration.

Weyerhaeuser used the M91 deciduous yield curves as the basis for constructing the pre-1991 pure deciduous managed stand yield curves.

Strata Hw_W will use the D-HW_W_E M91 yield curves for the deciduous yields and 50%[25] of the conifer yields in ARIS D declared blocks - in the old FMUs W5 and W6.

---

[24] This applies only in openings where the establishment survey was completed prior to May 1, 2010 (AESRD 2013).

[25] The M91 enhanced yield curves are based on the current AVI stratification and yield curves which were derived from 'leaf-on' imagery that includes a proportion of pure D stands where there is conifer understorey not captured in the interpretation process but it is part of the PSP data used to develop the yield curves. This is perfectly fine for constructing yield curves where the strata were also based on the same AVI. The D declared cutblocks however are stratified based on the ARIS declaration and silviculture, instead of the AVI therefore Weyerhaeuser expects significantly less conifer than present in the natural (AVI strata-based) deciduous stands therefore the predicted conifer yields were reduced to minimize risks of potential over-prediction of conifer volumes that other operators may rely on as incidental volume.

Strata Hw_X will use the D-HW_X_E M91 yield curves for the deciduous yields and 50% of the conifer yields in ARIS D declared blocks - in the old FMUs outside of W5 and W6.

In 2011, the AAF conducted an experimental non-photo RSA performance survey program in 15 openings that were declared as D (pure deciduous). These surveys were not part of the legislated performance surveys and the results were not recorded in ARIS; however they were done in the Pembina FMA. While these surveys were not used to construct yield curves due to the small sample size (and large population area), they indicate that there is minimal conifer volume present in these types of openings (Figure 14).

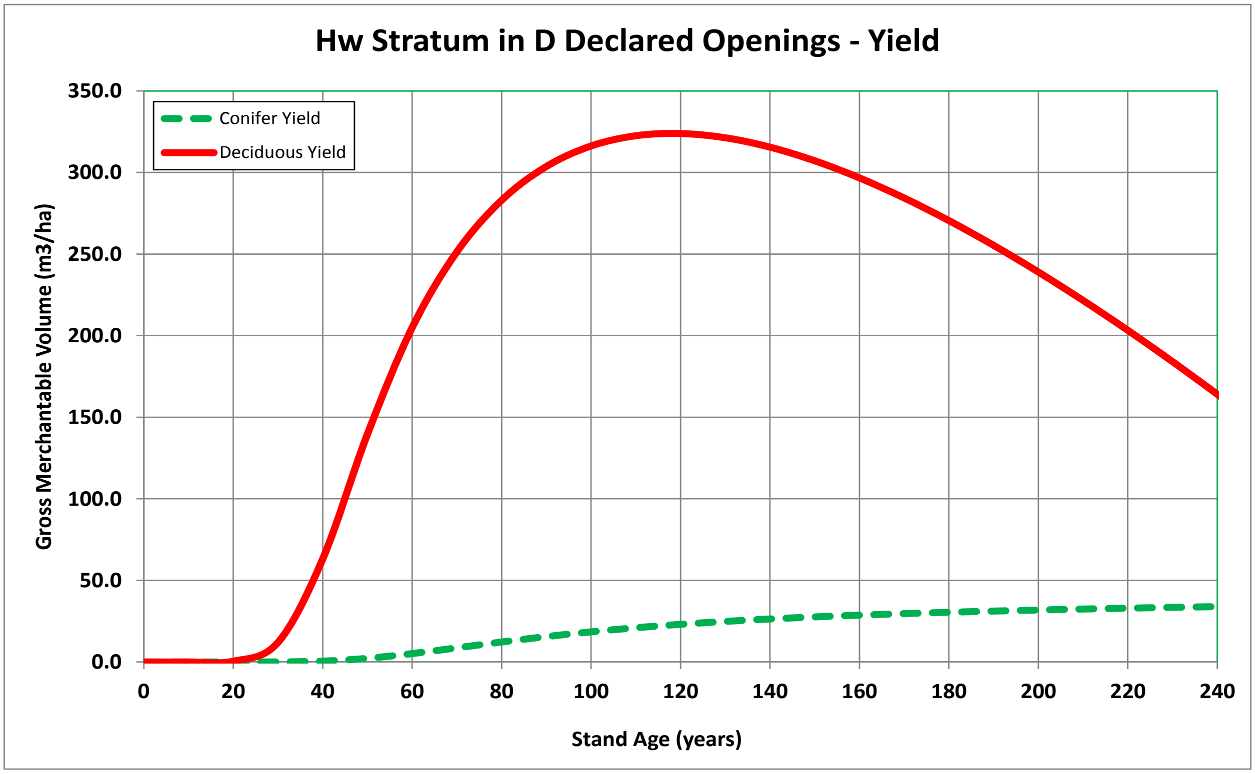


Figure 14. Average yield projection of non-legislated RSA surveys in D declared openings.

4.5.5 Genetic Yield Curve for Region I White Spruce

Weyerhaeuser is a proponent of Region I white spruce controlled parentage program (CPP) with growth and yield improvement as a primary objective. According to the Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS), trees selected by a comparison tree method and grafted into the seed orchard are eligible for 2 percent height genetic gain uplift (AAF 2016a).

Weyerhaeuser developed tree improvement (genetic) yield curves for white spruce (I1) leading regenerated stand yield strata to reflect increases in yield resulting from the deployment of genetically improved stock.

Regenerated stands genetic yield curves (SwG) were developed for all future cutblocks that are located within the approved boundaries of the tree improvement program deployment zones subject to seed availability. The genetic yield curves will be assigned as per regeneration transitions defined in the Silviculture Matrix.

In addition, 12 existing ARIS declared C openings were identified where improved stock was deployed and were located within the I1 breeding region. These blocks were also assigned with the SwG genetic yield curve.

The approach for incorporating genetic gain in the yield curves was to apply a flat 4% volume gain (2 times the approved height gain[26]) to the conifer yields of the RSA Sw yield curve.

4.5.6 Yield Adjustments

Post-1991 managed stand yield curves were adjusted for deciduous decline and stand breakup the same way as natural stand yield curves described in Section 2.5.4. In the deciduous leading strata of Hw, HwPl and HwSx a continuous deciduous volume stand decline was implemented starting at 130 years (maximum age) targeting zero volume at 180 years.

The Hw_W and Hw_X strata were using the same deciduous decline that was implemented in the original M91 enhanced yield curves.

4.6 Results

4.6.1 Area Summary

A summary of areas in the net harvestable landbase by RSA strata is presented in Table 4-2.

Table 4-2. Area summary by yield group in the post-1991 existing managed stands.

Yield Group	Area (ha)	Percent(%)
Hw	822.1	0.7%
HwPl	2,614.7	2.2%
HwSx	8,463.2	7.1%
Pl	43,660.8	36.7%
PlHw	4,114.5	3.5%
Sb	252.3	0.2%
SbHw	15.3	0.0%
Sw	15,627.4	13.1%
SwG	237.2	0.2%
SwHw	7,548.9	6.3%
Hw_W	14,364.8	12.1%
Hw_X	21,227.5	17.8%
	118,948.7	**100.0%**

[26] The Biometrics Unit of in consultation with the Genetics and Forest Improvement Unit recommend that a height-volume gain multiplier not to exceed 2.0 for Pl and Sw tree improvement programs in Alberta (AESRD 2006).

4.6.2 RSA Data Quality

All RSA programs to date have been accepted by AAF and the MAI results were submitted to ARIS. In order to ensure no systematic bias existed between the company submitted RSA data and the field audits conducted as part of Alberta's Forest Operations Monitoring Program (FOMP) activities, the MAIs were compared as shown in Figure 15. There were 24 field audited SUs available in the FOMP reports provided by AAF that show no systematic bias and any indication of significant data quality problems.

Future reporting and checking on RSA data quality and associated field data quality standards will be part of the FOMP activities as part of standard operating protocols[27].

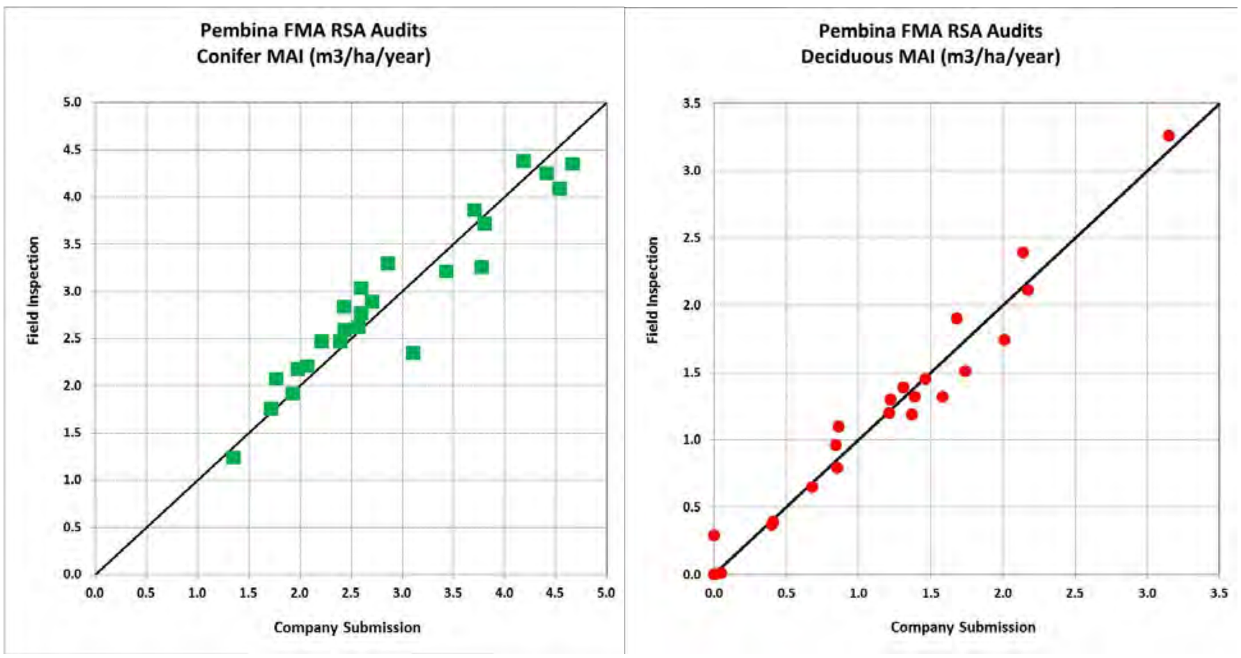


Figure 15. Comparison of conifer and deciduous MAIs between RSA surveys and FOMP field audit.

4.6.3 Post-1991 Managed Stand Yield Curves

The final adjusted yield curves for post-1991 managed stands are shown in Figure 16.

[27] Cosmin Tansanu (AAF) pers. comm (2016 April).

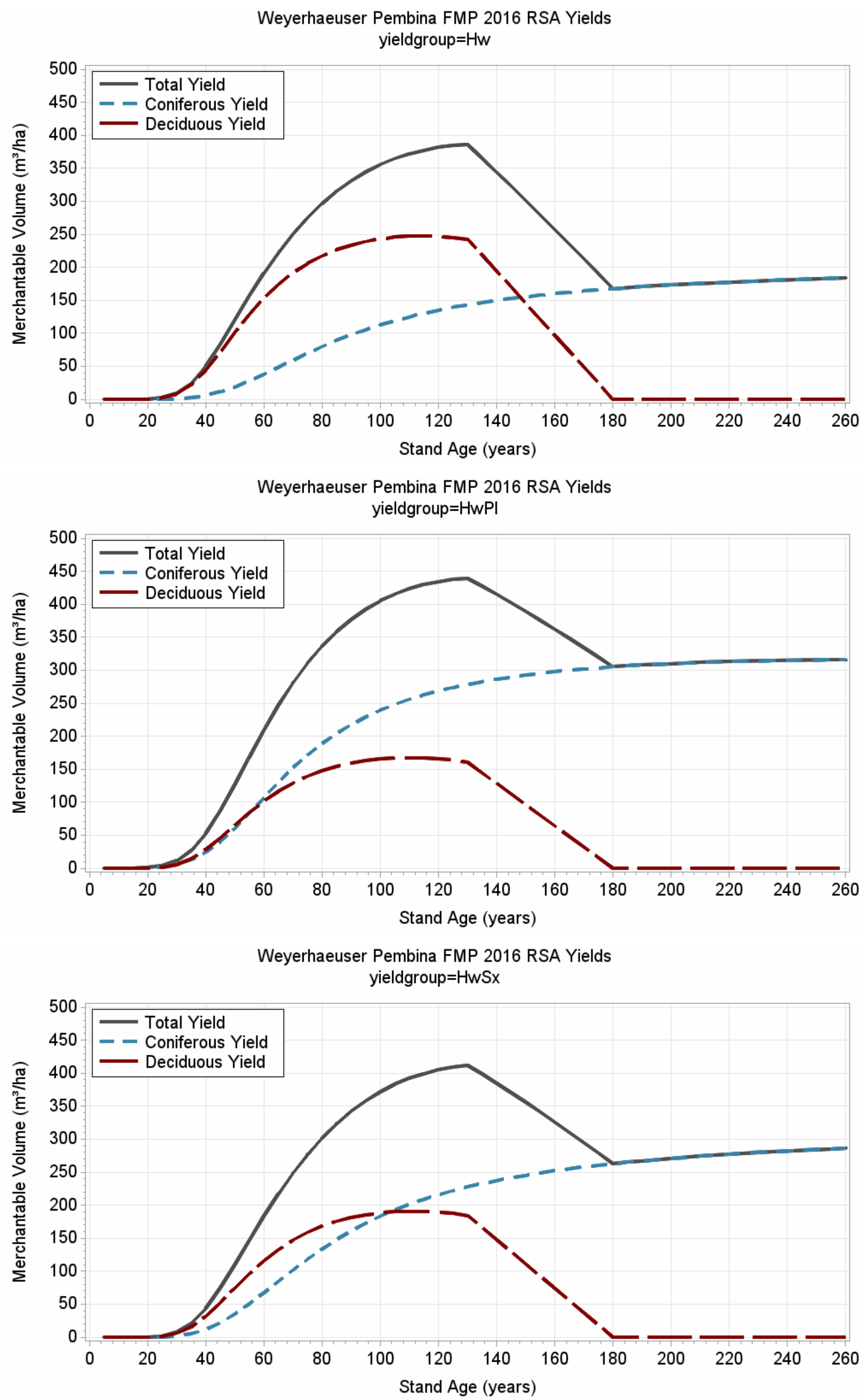


Figure 16. Final post-1991 managed stand yield curves (RSA).

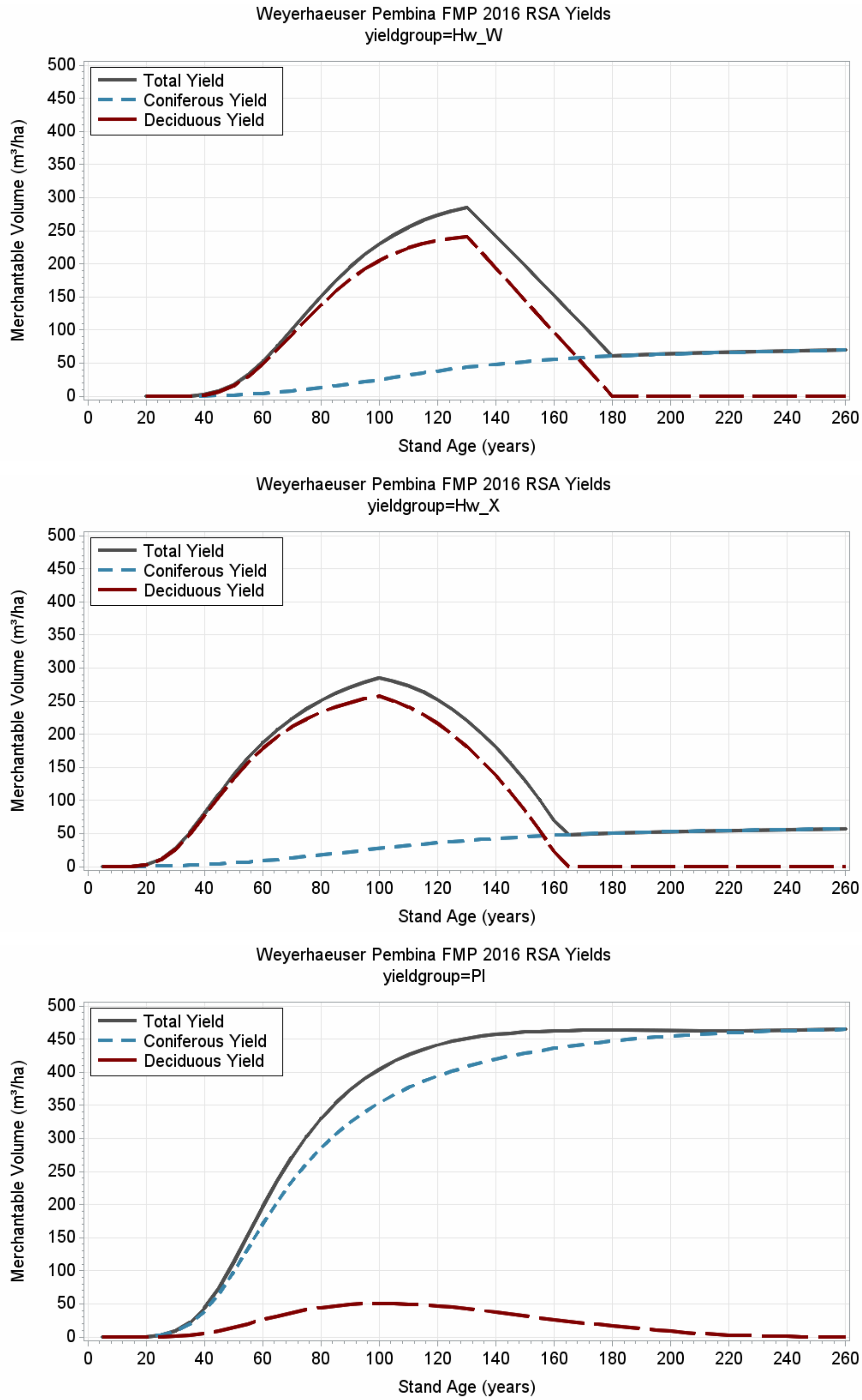


Figure 16. Final post-1991 managed stand yield curves (RSA).

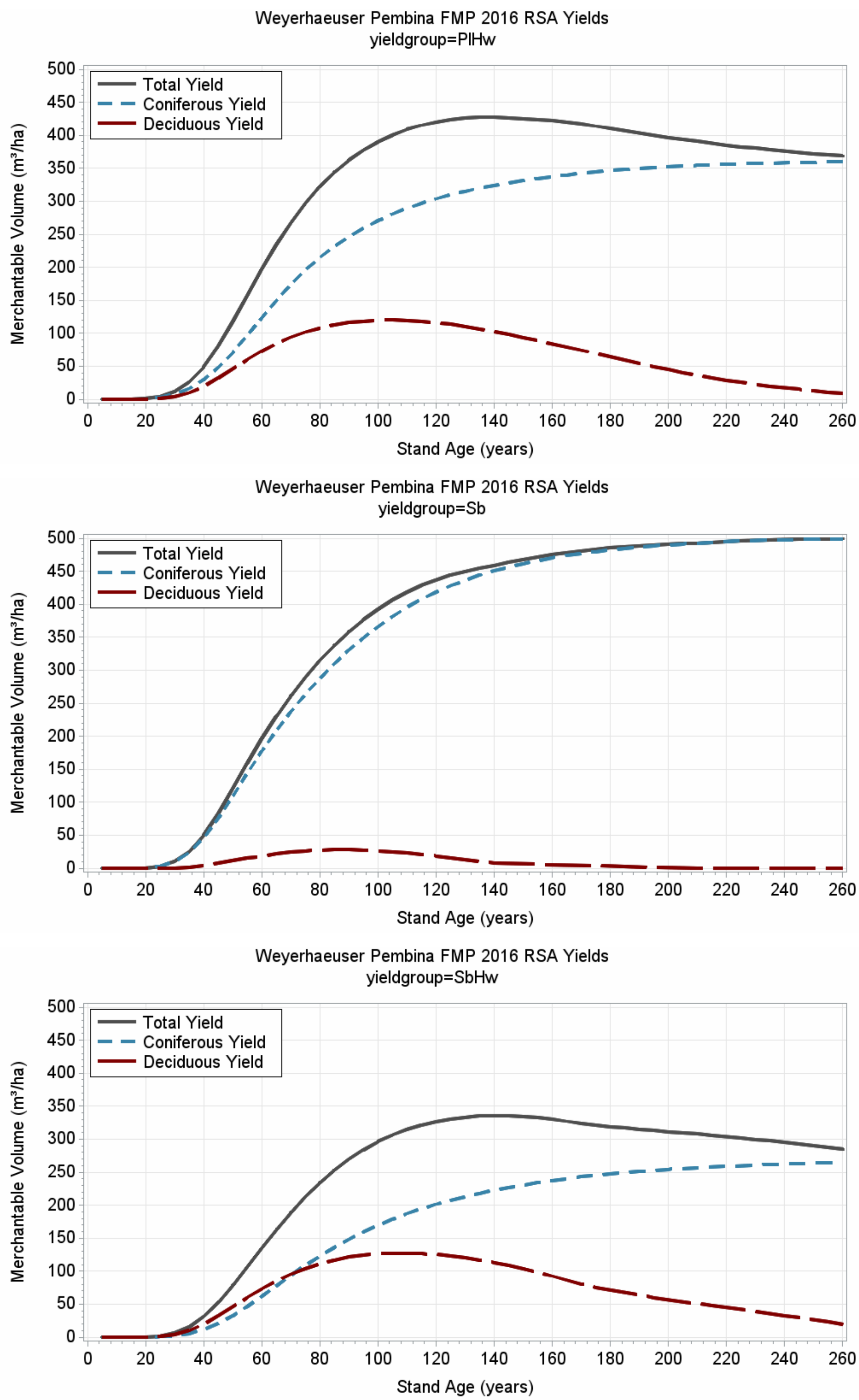


Figure 16. Final post-1991 managed stand yield curves (RSA).

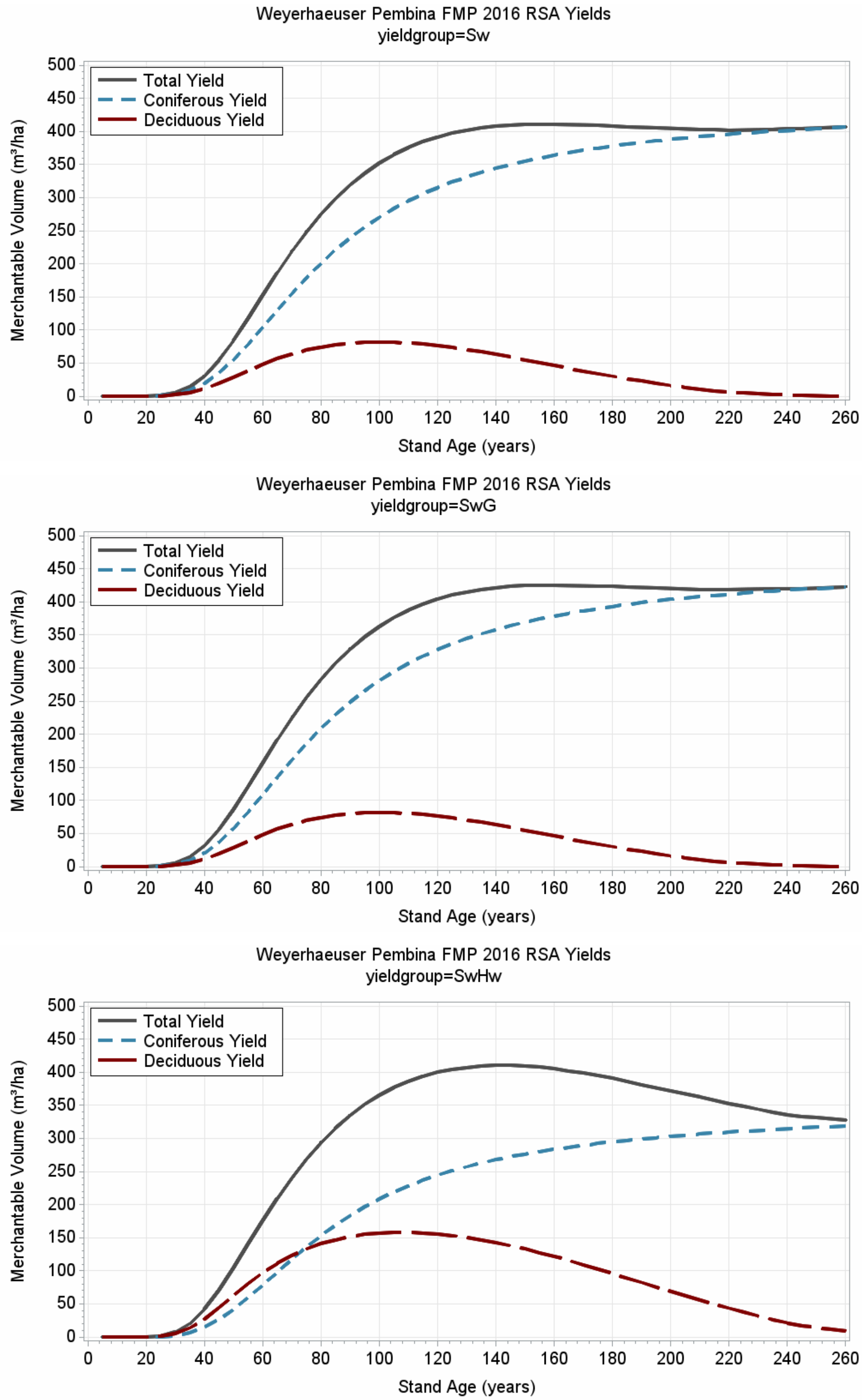


Figure 16. Final post-1991 managed stand yield curves (RSA).

4.6.4 Validation Against Managed Stand GYM Plot Data

The GYM plot data (Section 1.6.2) was compiled following the same protocols used for the natural stand PSP data. Gross merchantable volumes were compiled to FMA baseline utilization for the 56 GYM plots that were located in post-1991 (RSA) openings as per the landbase intersect. The number of GYM plots is not sufficient to draw any statistical conclusions from the data and the stands are still in the early development phase where merchantable volume starts to accumulate. However, volume accumulation will need to be continually monitored to ensure that yield projections are on track.

Total merchantable volumes were compared to the last measurement of the GYM plots[28] as shown in Figure 17 and volume growth trajectories are presented in Figure 18. All RSA yield curves are presented in the charts to also show the amount of plots available (or lacking) by age class.

Additional charts for conifer and deciduous merchantable volumes are included in Appendix VI.

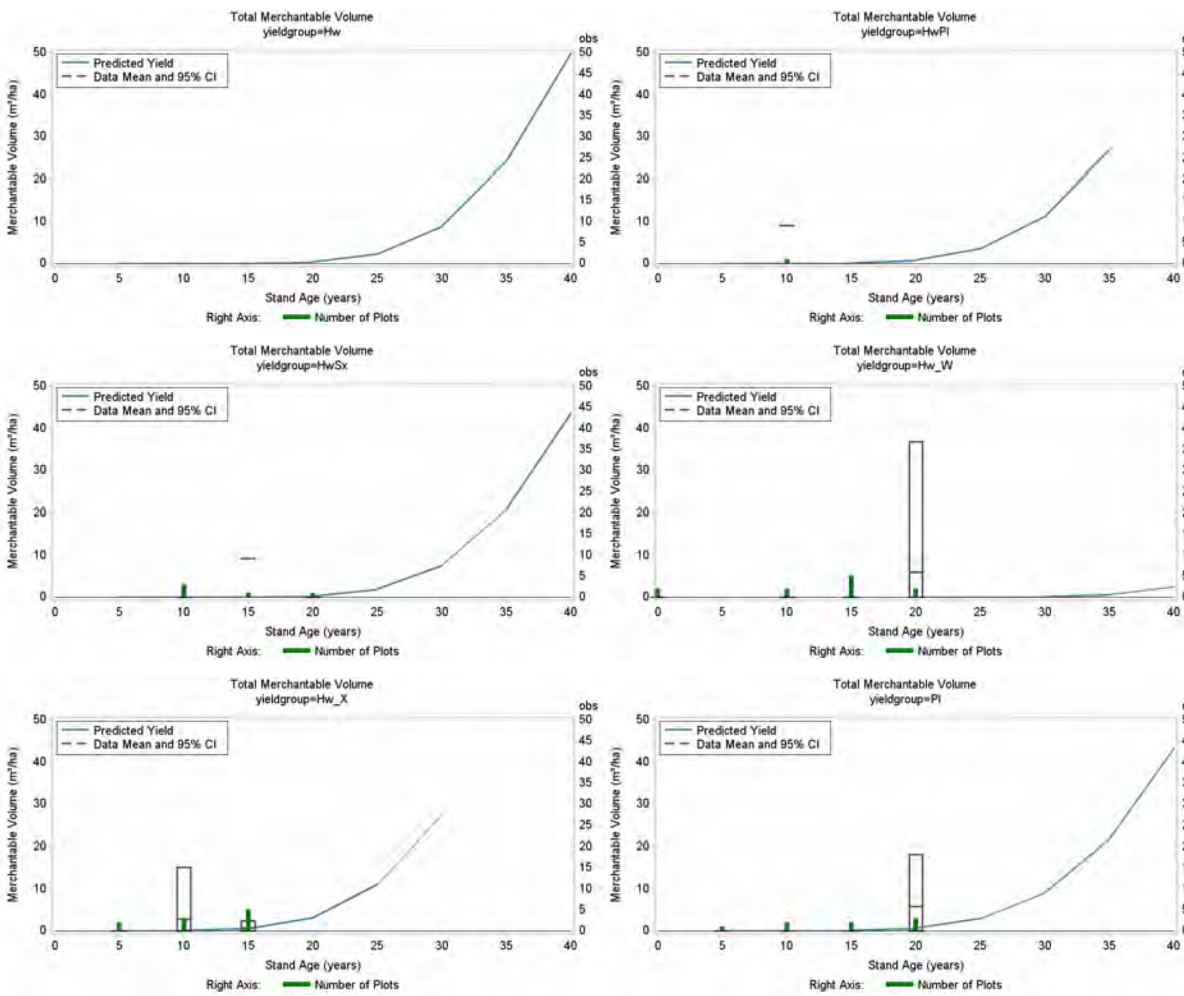


Figure 17. Average total merchantable volume by age class against the RSA yield curves.

[28] Plot 50541813 was suspect with high volumes and therefore it was dropped from the analysis.

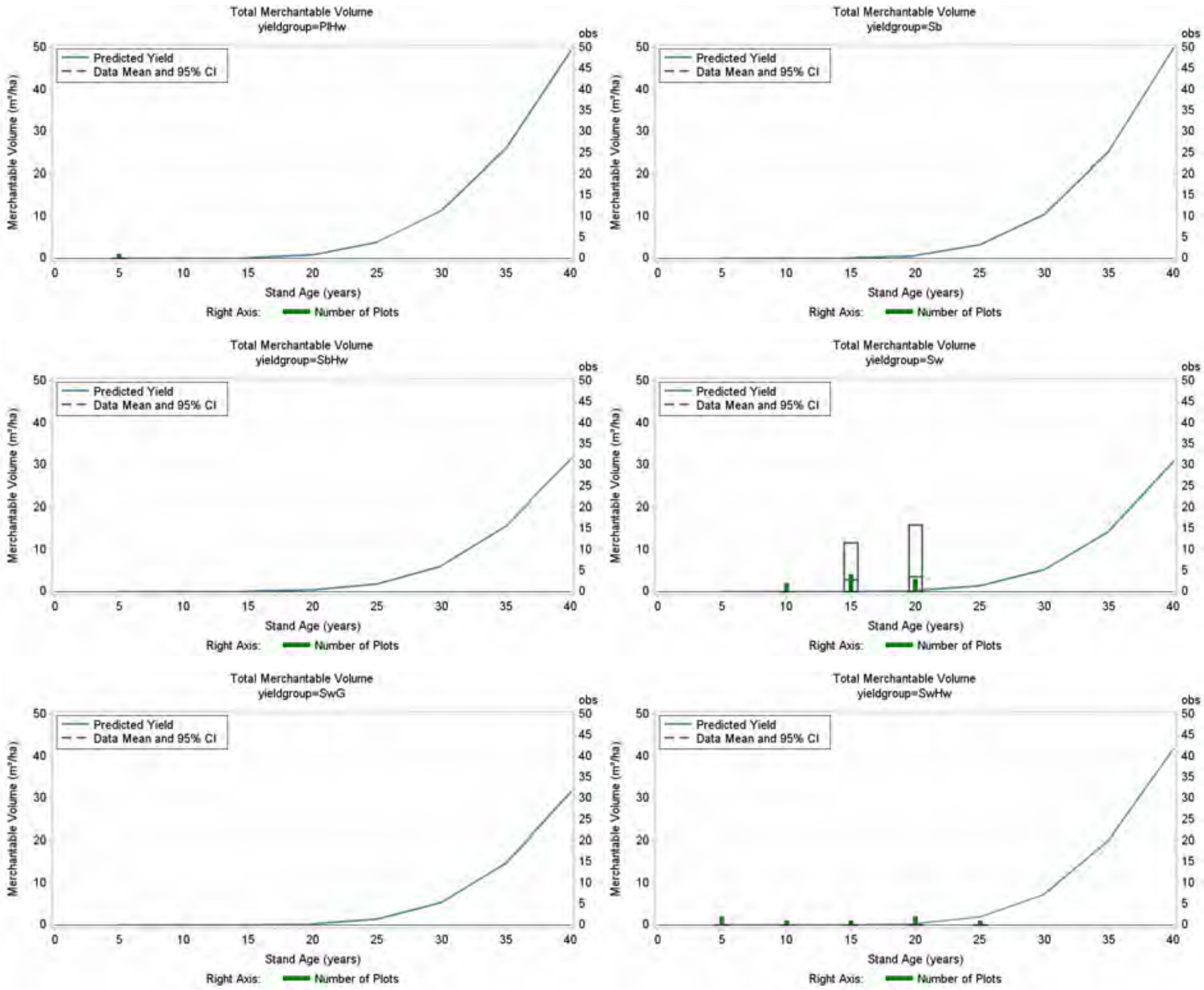


Figure 17. Average total merchantable volume by age class against the RSA yield curves.

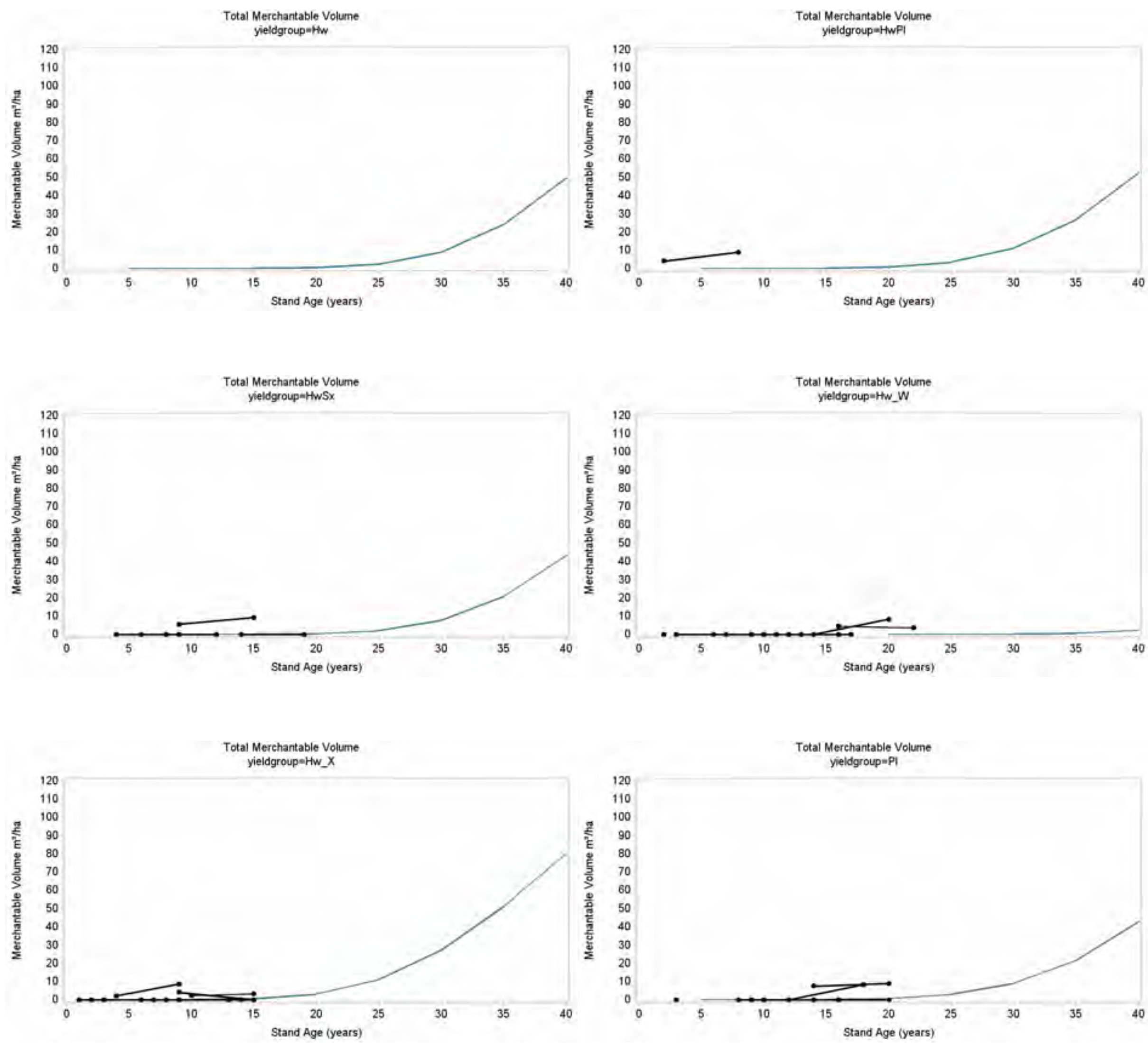


Figure 18. Total merchantable volume trajectories against the RSA yield curves.

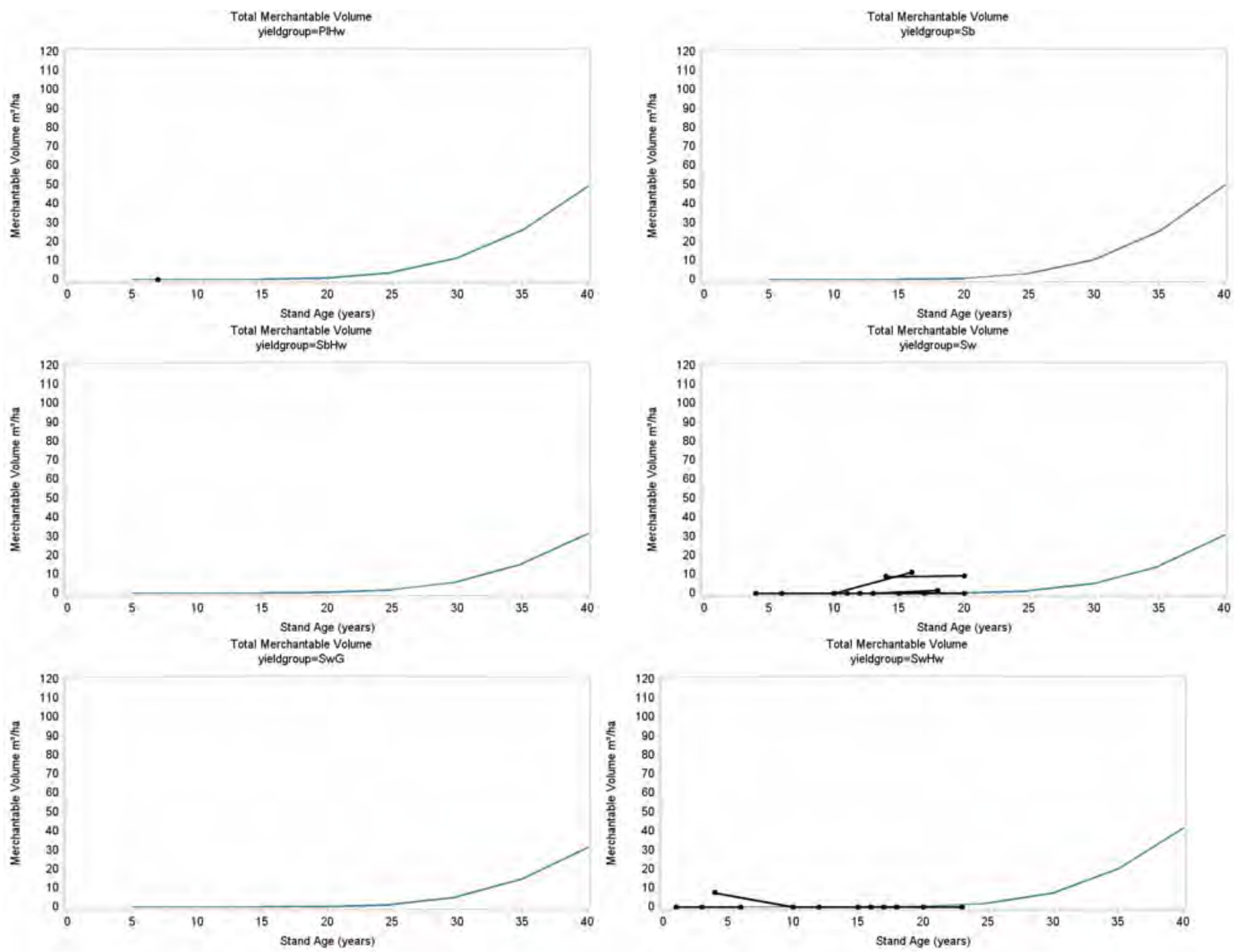
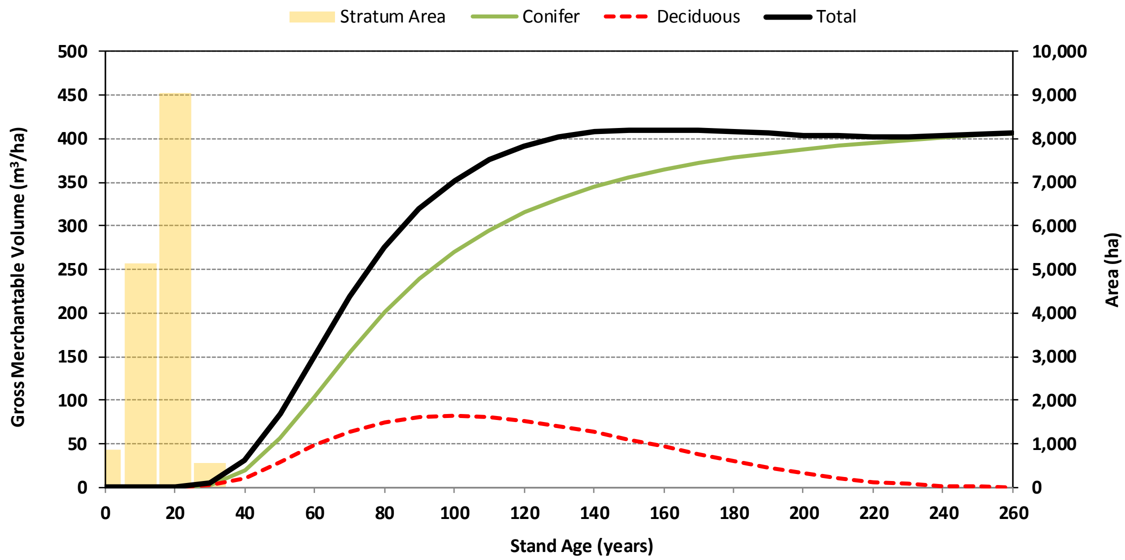


Figure 18. Total merchantable volume trajectories against the RSA yield curves.

4.6.5 Final Yields

The final RSA yield tables are provided in Appendix IV. An example is presented in Figure 19.

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	POST-1991 MANAGED STANDS STRATUM: Sw

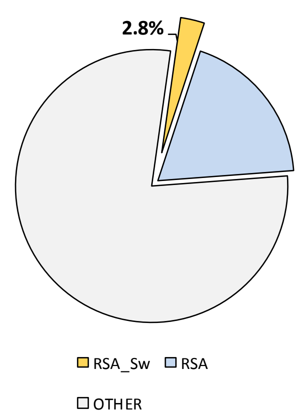


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.1	0.1	0.2	0.01	0.01	0.01
30	3.2	2.1	5.2	0.11	0.07	0.17
40	19.6	11.1	30.7	0.49	0.28	0.77
50	55.6	28.6	84.2	1.11	0.57	1.68
60	104.3	48.1	152.3	1.74	0.80	2.54
70	155.1	63.8	218.9	2.22	0.91	3.13
80	200.8	74.4	275.2	2.51	0.93	3.44
90	239.1	80.1	319.3	2.66	0.89	3.55
100	270.2	81.9	352.2	2.70	0.82	3.52
110	295.2	80.5	375.7	2.68	0.73	3.42
120	315.2	76.4	391.6	2.63	0.64	3.26
130	331.3	70.6	401.9	2.55	0.54	3.09
140	344.4	63.4	407.8	2.46	0.45	2.91
150	355.2	55.1	410.3	2.37	0.37	2.74
160	364.1	46.3	410.4	2.28	0.29	2.57
170	371.6	37.7	409.3	2.19	0.22	2.41
180	378.0	30.2	408.2	2.10	0.17	2.27
190	383.4	22.8	406.3	2.02	0.12	2.14
200	388.2	16.2	404.4	1.94	0.08	2.02
210	392.2	10.8	403.0	1.87	0.05	1.92
220	395.8	6.4	402.2	1.80	0.03	1.83
230	399.0	3.9	402.8	1.73	0.02	1.75
240	401.7	2.0	403.7	1.67	0.01	1.68
250	404.1	1.0	405.1	1.62	0.00	1.62
260	406.3	0.5	406.7	1.56	0.00	1.56

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Sw**	**15,627**	**2.8%**

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	2,720	0
Deciduous	15/10/15/366/TL	2,135	0
Total		4,856	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

Figure 19. Final post-1991 managed stand yield table summary for yield group: Sw.

5 Additional Analysis

5.1 Multiple Utilization Yield Curves

Weyerhaeuser developed natural stand yield curves using the 2017 FMP baseline utilization limits:

Conifer: 15/11/15/366/TL

Deciduous: 15/10/15/366/TL

The Weyerhaeuser Pembina Timberlands FMA operating ground rules (Weyerhaeuser 2011) and embedded quota holders require the projection of both conifer and deciduous gross merchantable volumes to various utilization limits and systems (Table 1-4).

All deciduous volumes are to be utilized with a 4.88 m usable length; however GYPSY merchantable volume projections were fixed at a 3.66 m minimum. Alberta Newsprint Company (ANC) and Millar Western (MW) both utilize conifer volumes at a 10 cm top DIB. In GYPSY, the modeler cannot specify alternate usable lengths, minimum log length, short logs, a mixture of different log sizes, trim allowance or other parameters. Development of adjustment factors to allow for different useable lengths and/or top diameter has to be done outside of the GYPSY model.

Weyerhaeuser submitted a proposal to develop utilization adjustment equations (Weyerhaeuser 2015b) that was subsequently agreed to in May 2015 (AAF 2015d).

Following the proposed methods, gross merchantable volumes were compiled for the same set of plot data used to develop the FMP baseline yield curves. Utilization limits included the alternative conifer utilization of 15/10/15/366/TL and alternative deciduous utilization of 15/10/15/488/TL. The alternative utilization limits will result in higher plot volumes for conifer and the same or lower plot volumes for deciduous when compared to the FMP baseline utilization (Figure 20).

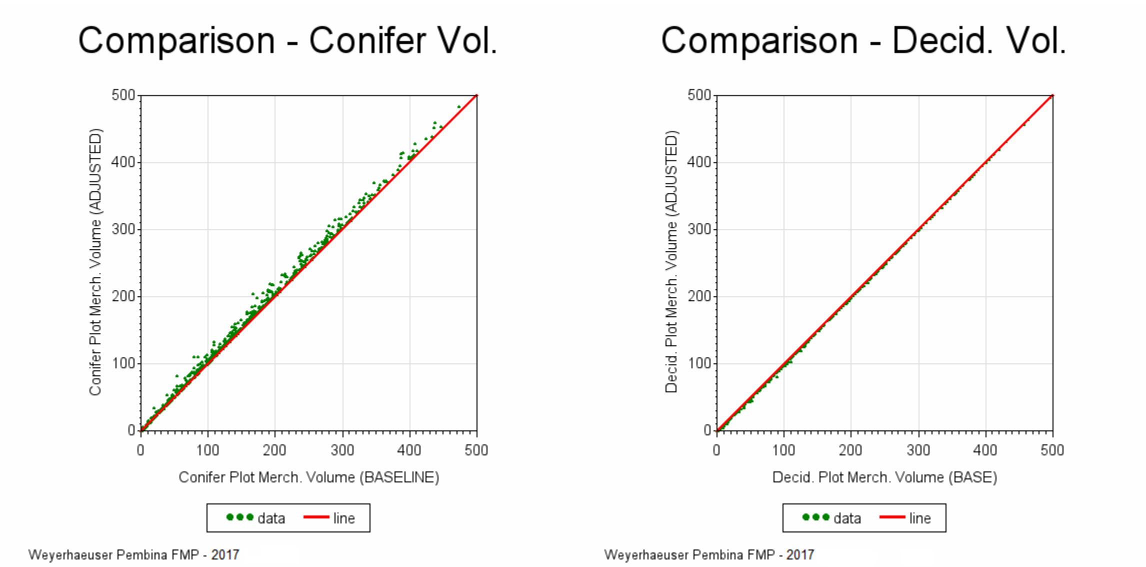


Figure 20. Merchantable volumes check by plot measurement for conifer (left panel) and deciduous.

Conifer trees are utilized to the 10 cm merchantable top which results in a longer merchantable length when compared to the baseline utilization of 11 cm. The increased length will cause full trees to be included that were shorter than 3.66 m useable length at 11 cm top utilization which will be more prevalent in younger stands with smaller trees. There is also a minor increase in merchantable volume on the top at the tree-level due to the additional gain in length to the 10 cm top.

Deciduous trees that are longer than 3.66 m usable length but shorter than 4.88 m will have no merchantable volume at the adjusted utilization. This will result in full trees being dropped. Therefore, stands that are younger with more small stems are expected to show higher proportions of loss in merchantable volume. The 4.88 m useable length will have minimal impact on merchantable volume in mature stands.

Adjustment equations were developed for 4 adjustment groups based on the yield stratification[29] used in the development of FMP baseline yield curves.

$$GMV_{UTIL} = GMV_{BASE} * \left(1 - e^{-t0*AGE^{t1}}\right)$$

where

GMV_{UTIL}: observed gross merchantable volume (conifer or deciduous) based on the new utilization limit in the plot (m^3/ha)

GMV_{BASE}: observed gross merchantable volume (conifer or deciduous) based on the FMP baseline utilization limit in the plot (m^3/ha)

AGE: stand age

t0, t1: equation coefficients

e: base of the natural logarithm

The fit statistics are presented in Table 5-1, all equations converged using the Marquardt method in SAS.

Table 5-1. Fit statistics for the utilization adjustment equations.

Species Type	Group	# of Plots*	t0**	t1
Conifer	C-PL	265	**0.6395**	**0.3502**
	C-SW	82	**1.6774**	**0.1689**
	CD-DC	133	**1.4959**	**0.1984**
	D-HW	288	**1.4357**	**0.2001**
Deciduous	C-PL	265	0.0000	**3.5422**
	C-SW	82	35.7889	-0.4016
	CD-DC	133	0.0849	**0.9495**
	D-HW	288	**0.2623**	**0.7179**

** Plot measurements between 40-200 years stand age were used.*

*** Bolded coefficients are all significant.*

[29] Four adjustment groups were created: C-PL, C-SW, CD/DC and D-HW. C-PL included the small amount of C-SB for modelling purposes. The CD-DC group included all 4 mixedwood strata.

The method avoids a number of the complications that might be encountered by explicitly refitting yield curves to different utilization limits and will also enable the accommodation of other utilization limits in the future. This approach effectively models the differences observed by major stratum and age class based on the modified Weibull equation[30].

Multiple-utilization yield curves were developed by applying the adjustment equations by yield group to the FMP baseline yield curve conifer and deciduous predicted gross merchantable volumes.

$$Adjusted\ Yield_{New\ Util} = Predicted\ Yield_{FMP\ Baseline} * \left(1 - e^{-t0*AGE^{t1}}\right)$$

The adjusted conifer and deciduous yields are presented for the C-PL_AB yield group in FFF. The conifer volume gain is around 3.4% at culmination age while the deciduous yields are practically unchanged.

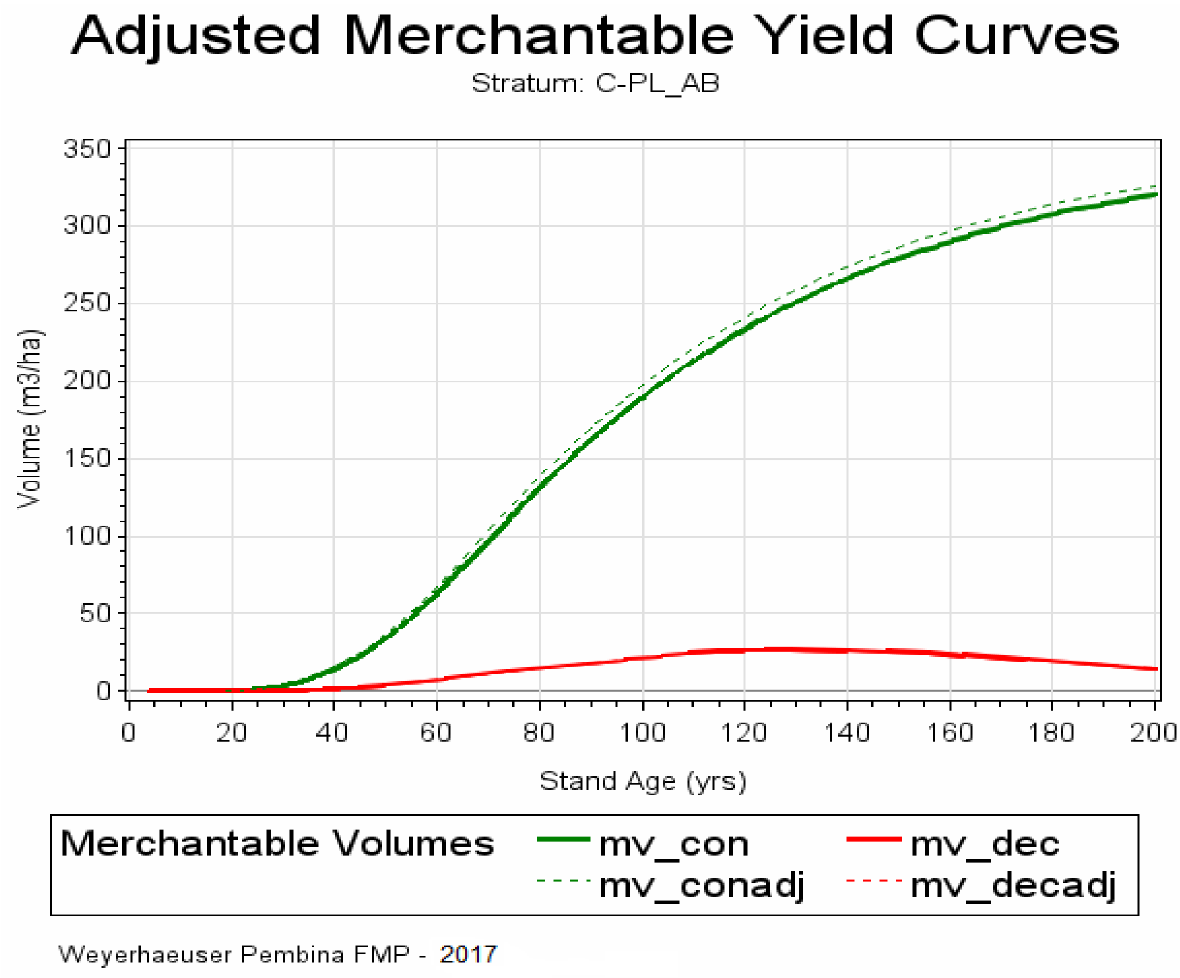


Figure 21. FMP baseline (solid line) and adjusted (dashed) natural stand yields for C-PL_AB.

Conifer and deciduous volume residual plots and the resulting adjusted yield curves are presented in Appendix VII.

[30] Other equation forms will also be explored but the general form of adjustment will stay the same.

5.2 Area Weighted Yield Curves

Area-weighted yield curves were created at the broad cover group level, using natural stand yield curves and natural stand landbase areas. A summary of net landbase areas is provided in Table 5-2.

Table 5-2. Natural stand net landbase areas.

Broad Cover Group	Yield Group	Area (ha)	Area (%)
C	C-PL_AB	44,394	11.2
	C-PL_CD	89,618	22.6
	C-SB	1,978	0.5
	C-SW	60,937	15.4
CD	CD-PL	14,515	3.7
	CD-SX	16,684	4.2
DC	DC-PL	14,414	3.6
	DC-SX	22,986	5.8
D	D-HW_W	45,477	11.5
	D-HW_X	85,900	21.6
Total		**396,902**	**100.0**

Area weighted yield curves are presented in Figure 22, Figure 23, Figure 24 and Figure 25.

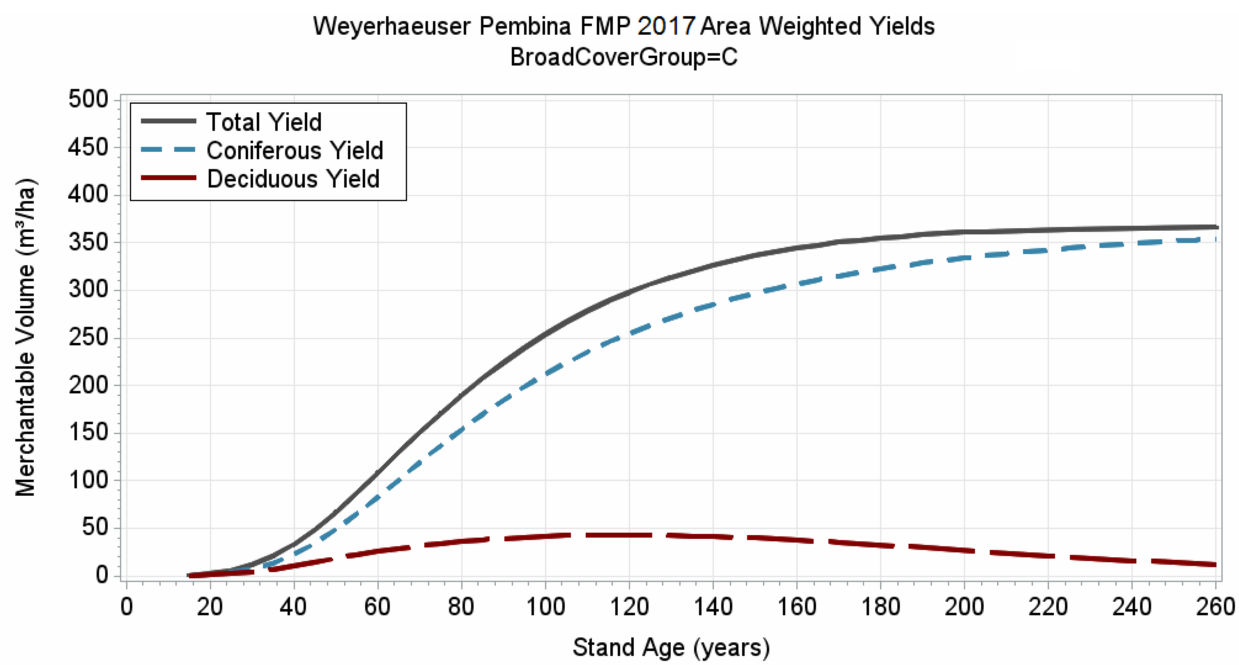


Figure 22. Area-weighted natural stand yield curve for BCG=C.

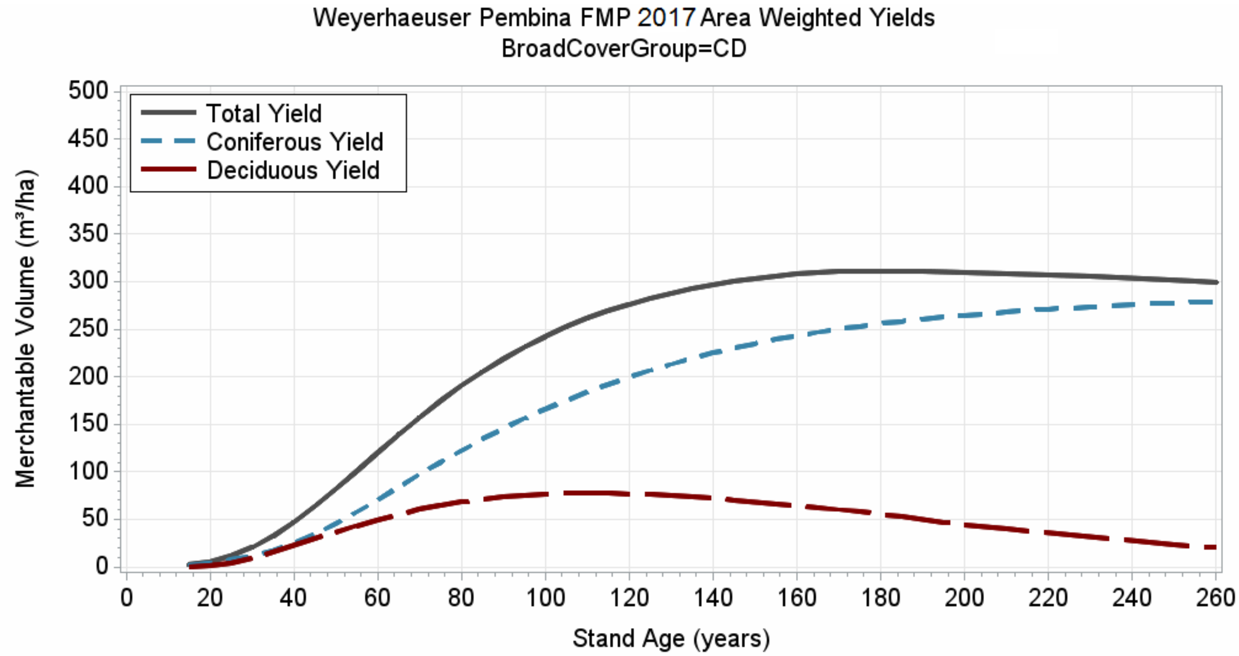


Figure 23. Area-weighted natural stand yield curve for BCG=CD.

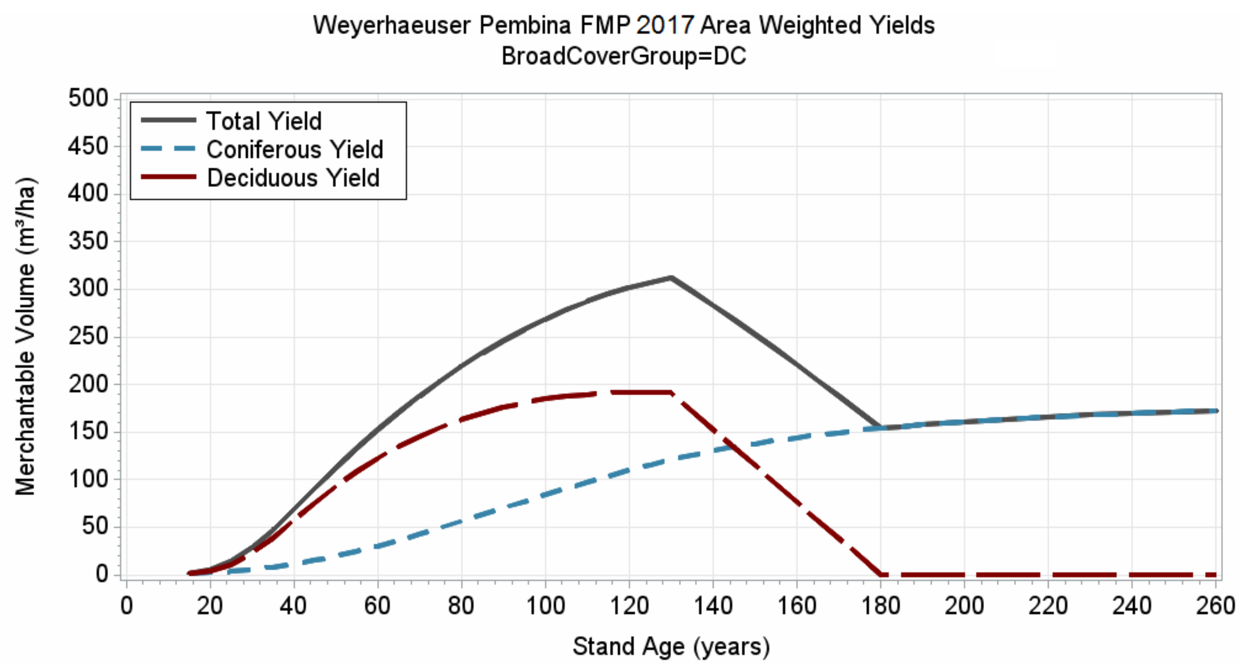


Figure 24. Area-weighted natural stand yield curve for BCG=DC.

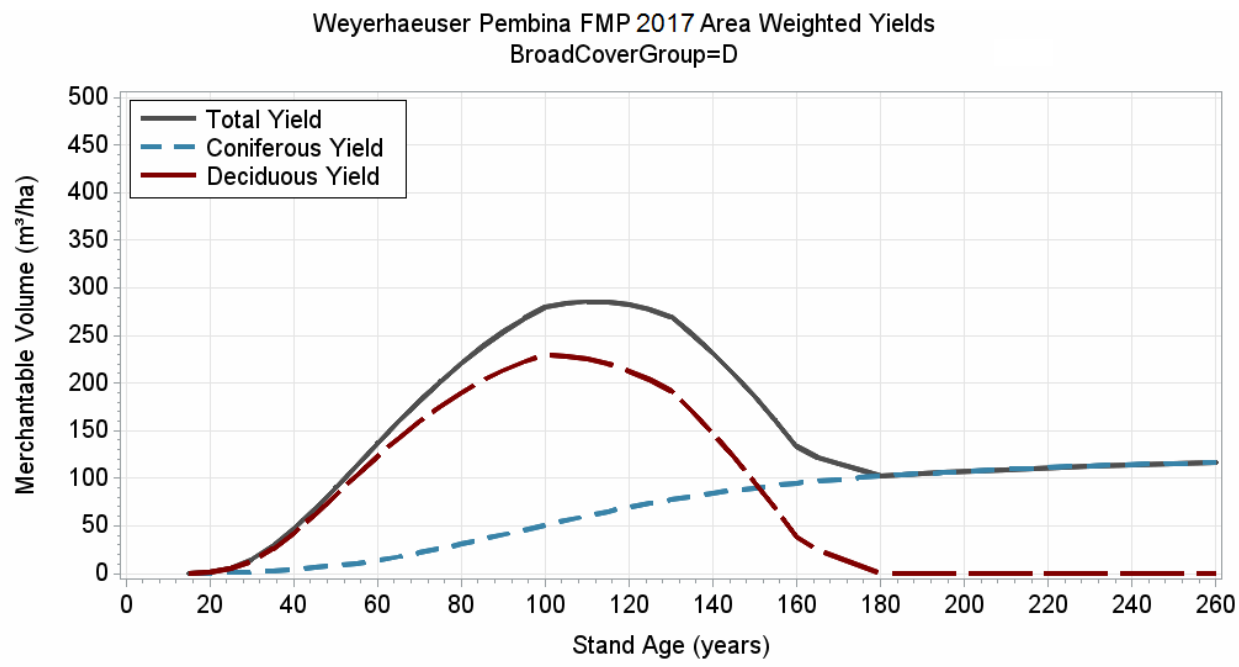


Figure 25. Area-weighted natural stand yield curve for BCG=D.

5.3 Piece Size Curves

The Planning Standard requires piece size to be included as part of the standard yield table output. Average piece size is especially important for the conifer component of the yield curves and its relative change over the planning horizon is being reported in the timber supply analysis. Piece size is a reported performance statistics only and it is not used as a constraint in the AAC determination.

Piece size curves were created based on natural stand GYPSY yield projections. The same set of plots used in natural stand yield curve development (see Section 2.2.1) was used for piece size curve development.

Merchantable density and merchantable volume were obtained from GYPSY model projections by species group, and then summed across species groups to create estimates for deciduous and coniferous species types (see Section 2.5). An average merchantable density and merchantable volume were calculated for each PSP measurement. Piece size was then calculated as m^3/tree (dividing merchantable volume by merchantable density).

First, the data were cleaned to remove implausible observations and obvious errors. Two specific issues were common to most yield strata:

The first case was unusually large piece size estimates at the beginning of the time series available for certain stands, which fell rapidly towards zero, before rising more predictably for the remainder of the series. This appears to be an artifact of the GYPSY model; in some cases (usually stands with low site index and low volume) the estimates of density are very low and hence piece size is unexpectedly large, despite low overall volumes. These anomalies were removed by setting piece size to a missing value at stand age below 40 years.

The second case was implausibly large piece size as stands age. This also appears to be an artifact of the model, which seems to decrease in density faster than volume in certain stands. Again, this usually occurs in stands with low site index and low initial volume. These anomalies were removed by flat-lining the piece size curve at 200 years for the coniferous component and at 140 years for the deciduous component. The piece size for the deciduous component was set to a missing value once the stand reached 0 m^3/ha merchantable volume.

The resulting piece size curves were plotted against the observed average piece size values by 20-year age class of the PSPs in the net landbase the same way merchantable volumes were done in Section 2.6.2.

The resulting validation chart for the conifer piece size in the C-PL_CD stratum and the deciduous piece size in the D-HW_X stratum which are the 2 largest natural strata are shown in Figure 26 and Figure 27, respectively.

The rest of the validation charts and the piece size curves are presented in Appendix VIII.

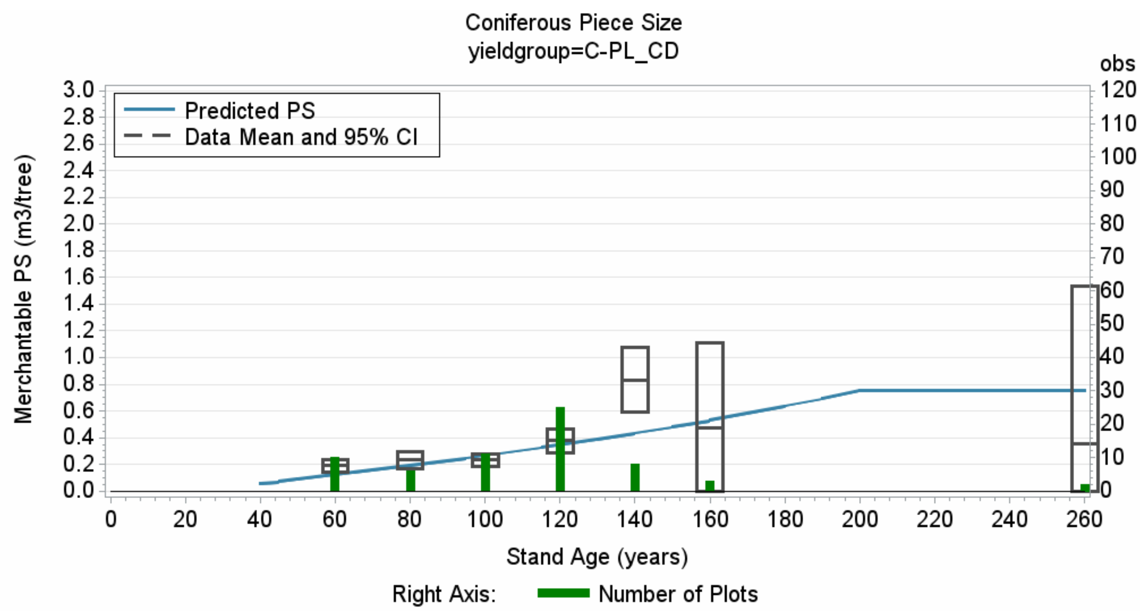


Figure 26. Conifer piece size curve against 20-year plot averages for yield group: C-PL_CD.

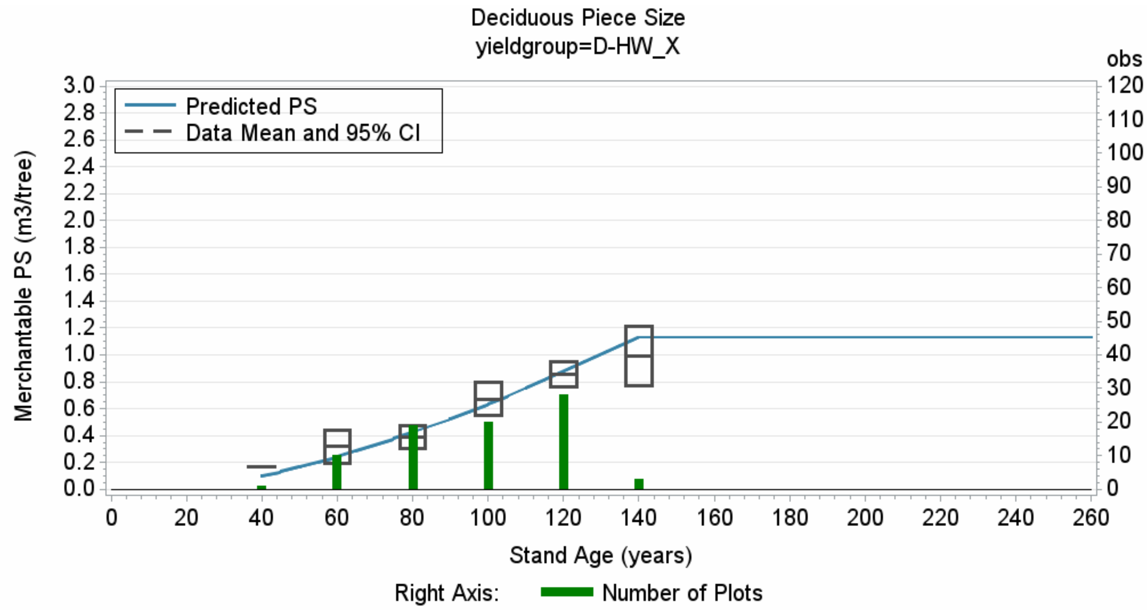


Figure 27. Deciduous piece size curve against 20-year plot averages for yield group: D-HW_X.

5.4 MAI Targets

As per the current Regeneration Standard of Alberta (AESRD 2015):

"Development of MAI standards is a mandatory component of the forest management planning process. Once developed and approved, the MAI standards will apply to all timber disposition operations covered by the Forest Management Plan (FMP). Should multiple Timber Supply Analyses (TSA) be included in the FMP (i.e., a TSA run for each FMU within a FMA), then the MAI standards shall reflect each TSA ... The number of MAI standards shall reflect the number of regenerated yield strata assumed in the FMP to a minimum of the Base 10 strata, as outlined in the Forest Management Planning Standard."

Since Weyerhaeuser's timber supply will be analyzed as one FMU (R15), culmination mean annual increment (MAI) targets were developed specific to FMU R15.

- Hw_W and Hw_X yield strata are managed for deciduous yield, and therefore deciduous culmination was used to select MAI targets.
- All coniferous and mixedwood strata are managed primarily for coniferous yield, and therefore for coniferous culmination was used to select MAI targets.

MAI targets are provided for Weyerhaeuser and quota holders in Table 5-3. Note that with the exception of the deciduous strata, all targets were derived by recompiling the RSA yield curves at 15/10/30/TL RSA utilization standard for both the conifer and deciduous components.

We used the Provincial Utilization Standard Conversion Tool (Stadt *et al.* 2014) for the Hw_W and Hw_X yield strata that were derived from the M91 yield curves. The conifer volume conversion factor was 0.983 and the deciduous conversion factor was 0.978 for the Foothills natural region in the 1-D base 10 stratum.

Table 5-3. Culmination MAI targets for FMU R15.

Yield Group	GoA Base 10	Yield Type	Culm. Age	Culmination MAI (m^3/ha/yr) Conifer	Deciduous	Total
Hw_W	Hw	DEC	100	0.25	2.00	2.25
Hw_X	Hw	DEC	70	0.18	2.94	3.12
HwPl	HwPl	CON	90	2.37	1.75	4.12
HwSx	HwSx	CON	110	1.80	1.72	3.52
Pl	Pl	CON	90	3.55	0.53	4.08
PlHw	PlHw	CON	90	2.69	1.27	3.96
Sw	Sw	CON	100	2.65	0.81	3.46
SwG	Sw	CON	100	2.76	0.81	3.57
SwHw	SwHw	CON	100	2.04	1.56	3.60

5.5 Regeneration Transitions

Weyerhaeuser's planned silviculture transitions to the 9 regenerating strata for areas harvested after the effective date of the plan are presented in Table 5-4.

Table 5-4. Regeneration transitions for FMU R15.

Yield Type		Current Yield Group	Regenerate To RSA	Regenerate To TI
NATURAL	NAT	C-PL_AB	Pl	
	NAT	C-PL_CD	Pl	
	NAT	C-SB	Pl	
	NAT	C-SW	Sw	SwG
	NAT	CD-PL	PlHw	
	NAT	CD-SX	SwHw	
	NAT	DC-PL	HwPl	
	NAT	DC-SX	HwSx	
	NAT	D-HW_W	Hw_W	
	NAT	D-HW_X	Hw_X	
PRE-1991 ENHANCED	M91	C-PL_AB_E	Pl	
	M91	C-PL_CD_E	Pl	
	M91	C-SB_E	Pl	
	M91	C-SW_E	Sw	SwG
	M91	CD-PL_E	PlHw	
	M91	CD-SX_E	SwHw	
	M91	DC-PL_E	HwPl	
	M91	DC-SX_E	HwSx	
	M91	D-HW_W_E	Hw_W	
	M91	D-HW_X_E	Hw_X	
PRE-1991 BASIC	M91	C-PL_AB_B	Pl	
	M91	C-PL_CD_B	Pl	
	M91	C-SB_B	Pl	
	M91	C-SW_B	Sw	SwG
	M91	CD-PL_B	PlHw	
	M91	CD-SX_B	SwHw	
	M91	DC-PL_B	HwPl	
	M91	DC-SX_B	HwSx	
	M91	D-HW_W_B	Hw_W	
	M91	D-HW_X_B	Hw_X	
POST-1991 MANAGED	RSA	Hw	Hw_W	
	RSA	Hw	Hw_X	
	RSA	Hw_W	Hw_W	
	RSA	Hw_X	Hw_X	
	RSA	HwPl	HwPl	
	RSA	HwSx	HwSx	
	RSA	Pl	Pl	
	RSA	PlHw	PlHw	
	RSA	Sb	Pl	
	RSA	SbHw	SwHw	
	RSA	Sw	Sw	SwG
	RSA	SwG		SwG
	RSA	SwHw	SwHw	

TI: Tree Improvement, genetic stock used in I1 Sw seed zone in Weyerhaeuser openings only.

5.6 Deciduous Volume Split by Species

Total scale cull of the deciduous volume is determined by species as shown in Table 1-6 which requires the prediction of the gross merchantable volume of GYPSY AW species group by species for the natural stand yield curves. We used the original PSP modeling data set that was used to fit the natural stand yield curves and calculated the average aspen (Aw), poplar (Pb) and birch (Bw) volumes by yield group. Only plots ≥40 years and ≤130 years stand age were used in the analysis. Percentages by individual deciduous species and yield group are shown in Table 5-5 and expressed as portion of the predicted total deciduous volume.

Table 5-5. Volume split for the AW GYPSY species group.

Yield Group	Gross Merch Volume (%)		
	Aw	Pb	Bw
C-PL_AB	79%	17%	4%
C-PL_CD	88%	10%	1%
C-SB	29%	71%	0%
C-SW	59%	39%	2%
CD-PL	93%	7%	0%
CD-SX	73%	19%	8%
D-HW_W	70%	25%	5%
D-HW_X	79%	18%	3%
DC-PL	76%	19%	4%
DC-SX	77%	20%	3%

Predicted gross merchantable deciduous volumes in the natural stand yield curves will be split by the individual deciduous species before the scale cull percentages are applied as per Table 1-6.

6 Agreement-In-Principle

On March 28, 2017 agreement-in-principle (AIP) was obtained for the yield projections based on a review of the October 26, 2016 submission of this document and associated data. The AIP letter is included in Appendix XVII. AIP was granted subject to a few conditions to be addressed in the FMP. The conditions and how they have been addressed within the FMP are included below.

Reforestation Standard of Alberta (RSA) Curves

a. *A sensitivity analysis (including all populations, pre and post 91) is required to quantify the impact of higher RSA yield curves on the annual allowable cut (AAC).*

   Back to Natural sensitivity analysis included in Annex IX: Timber Supply Analysis addresses this condition.

b. *A robust growth and yield program is required with a detailed commitment and additional permanent sample plots to ensure growth assumptions incorporated in the AAC are tracked and verified through time.*

   The Growth and Yield Program (Annex VIII) developed according to AAF's Growth and Yield Guidelines addresses this condition.

Silviculture Strategy Table

c. *Amend the Silviculture Strategy Table (FMP YIELD Strata column) to reflect the current stratification and proposed strata transitions, similar to Table 5-4 of the Yield Curve Development document.*

   The FMP Yield Strata in the Silviculture Strategy Table in Appendix 7-I of Chapter 7: FMP Implementation have been updated to match Table 5-4 of this document.

RSA Tree Improved Yield Curves (SwG)

d. *The silviculture prescription in the Silviculture Strategy Table must ensure that cutblocks are planted with 100% improved stock in order to match the assumptions in the yield curves.*

   The Silviculture Strategy Table in Appendix 7-I of Chapter 7: FMP Implementation has the following comment included for the SwG yield stratum:

   > "Blocks to be planted 100% with Tree Improvement Region I Sw seedlots only; all NSR eligible other than Upper Foothills and Sub Alpine."

e. *Ensure the growth and yield program provides detailed documentation on how stands with improved stock will be monitored to ensure assumed gains are realized.*

   The Growth and Yield Program (Annex VIII) developed according to AAF's Growth and Yield Guidelines addresses this condition.

Additional Comments

f. *All outliers removed from the analysis should be presented in tabular format with their coniferous and deciduous volumes, stand/plot age and reason for deletion.*

   This condition is addressed in Appendix IX of this document.

g. *Table 5-3 must be updated with the Mean Annual increment culmination ages.*

Table 5-3 in this document has been updated as required.

7 References

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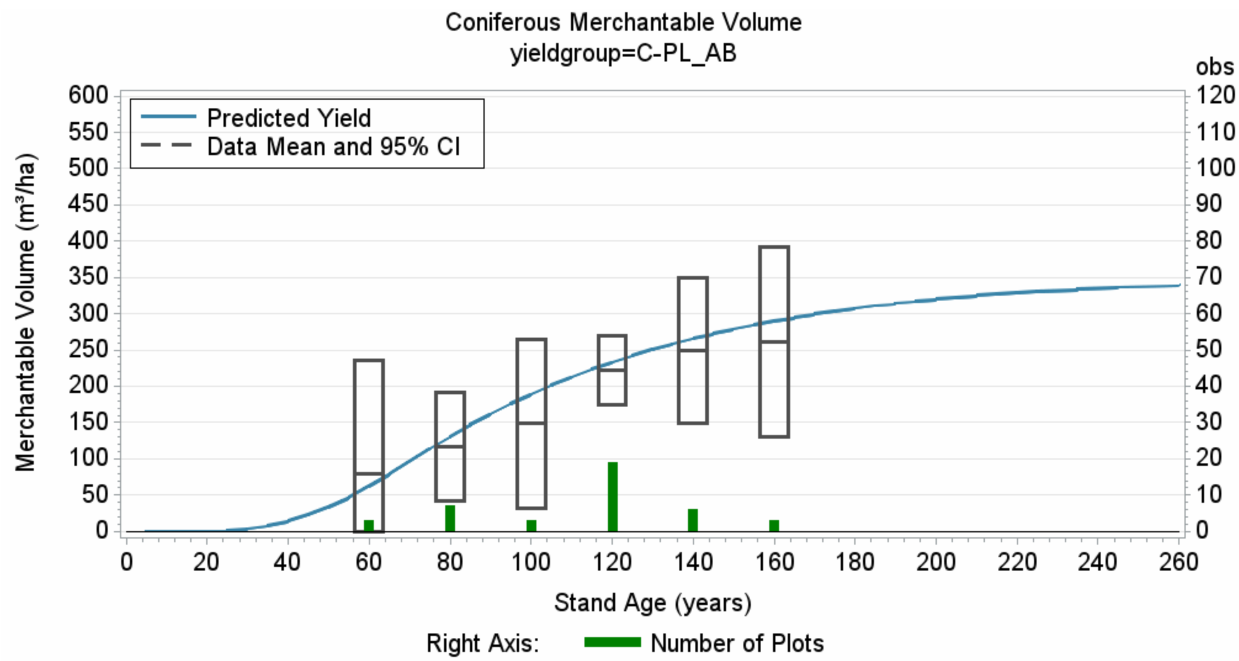
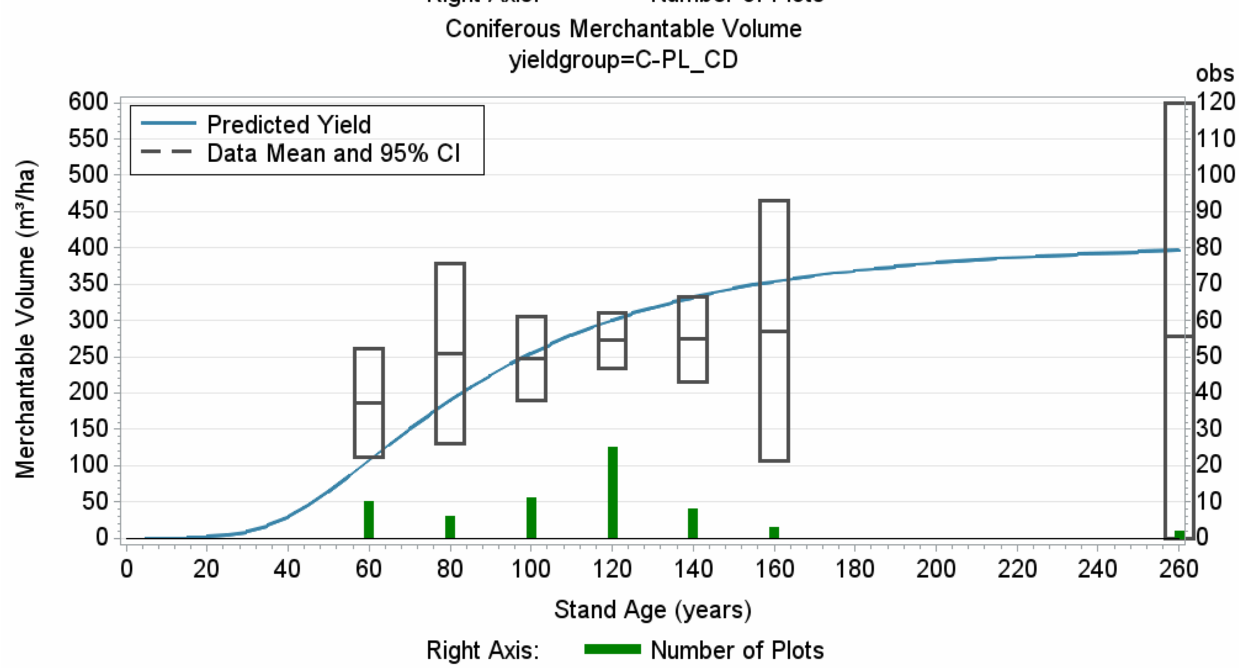
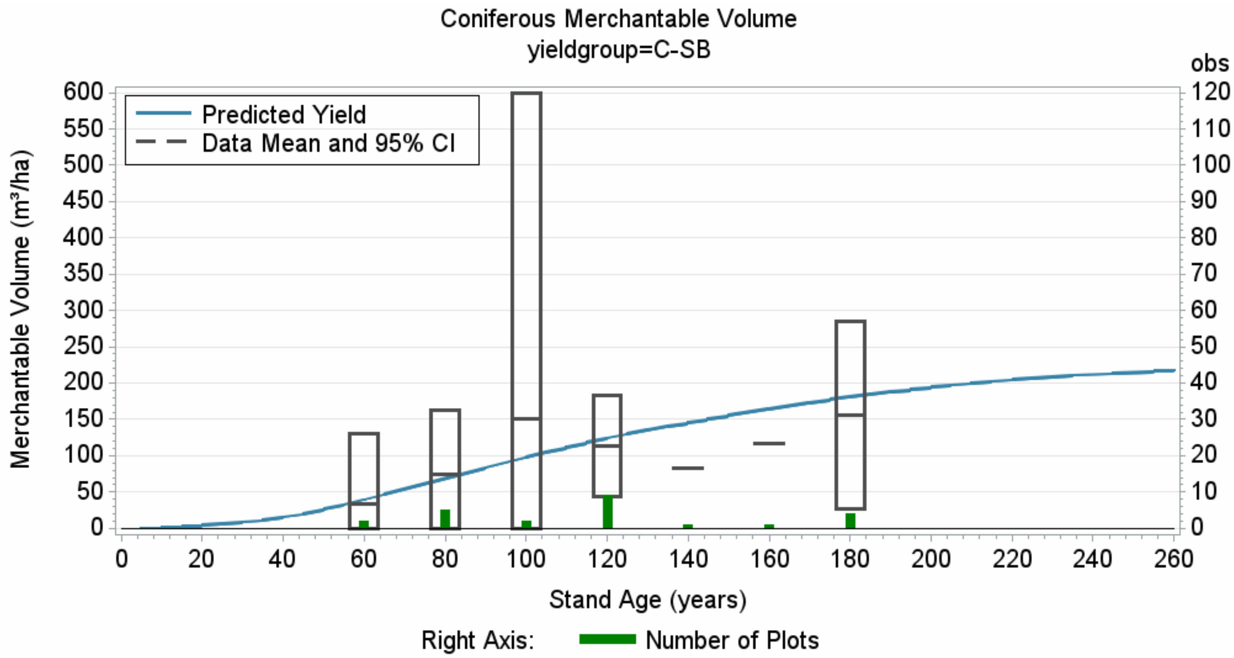
Weyerhaeuser 2016b. GY-004: Estimating Stand Decline in Deciduous Stands. May 2016. Weyerhaeuser Company Ltd. Pembina 2017-2026 FMP Development, G&Y Issue Document, 9 p.

Appendix I – Additional Validation Graphs - Final Natural Yield Curves

Natural stand final conifer yield curves against 20-year plot averages



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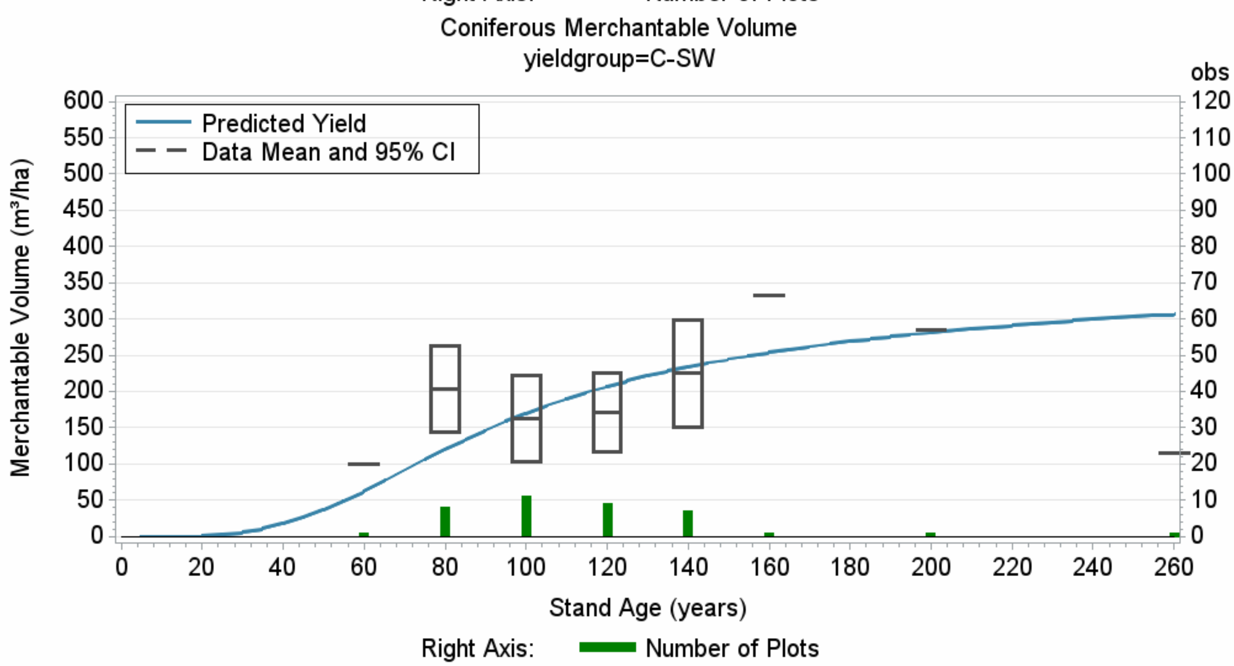
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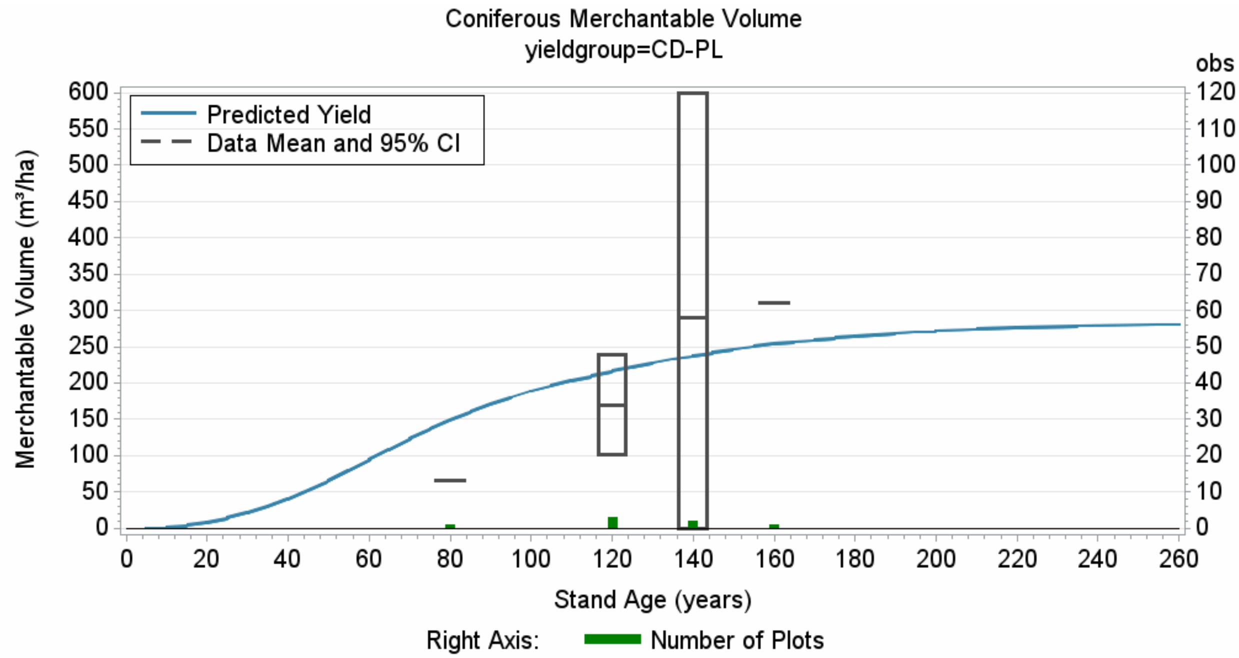
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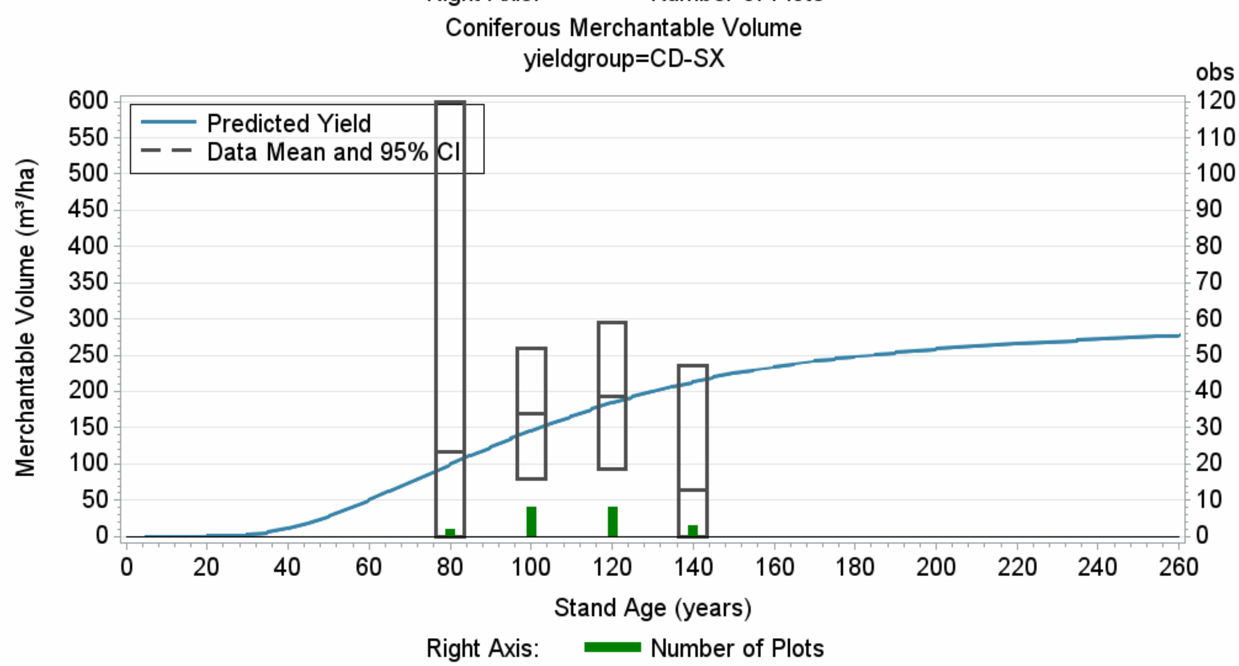
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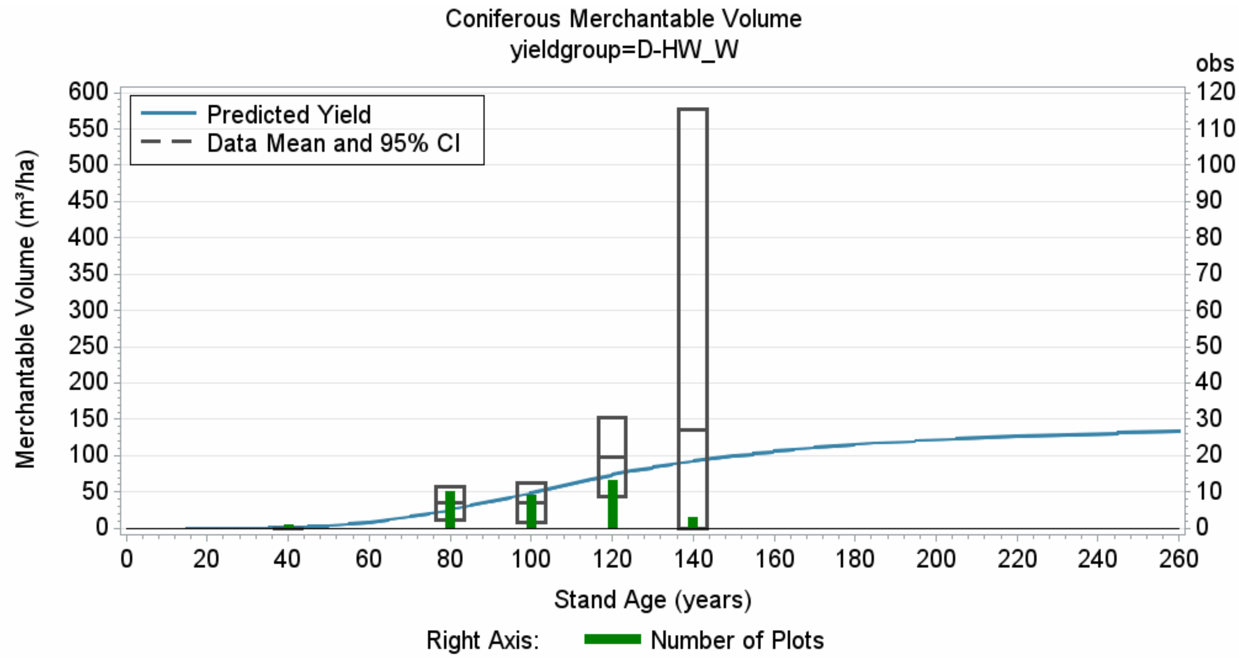
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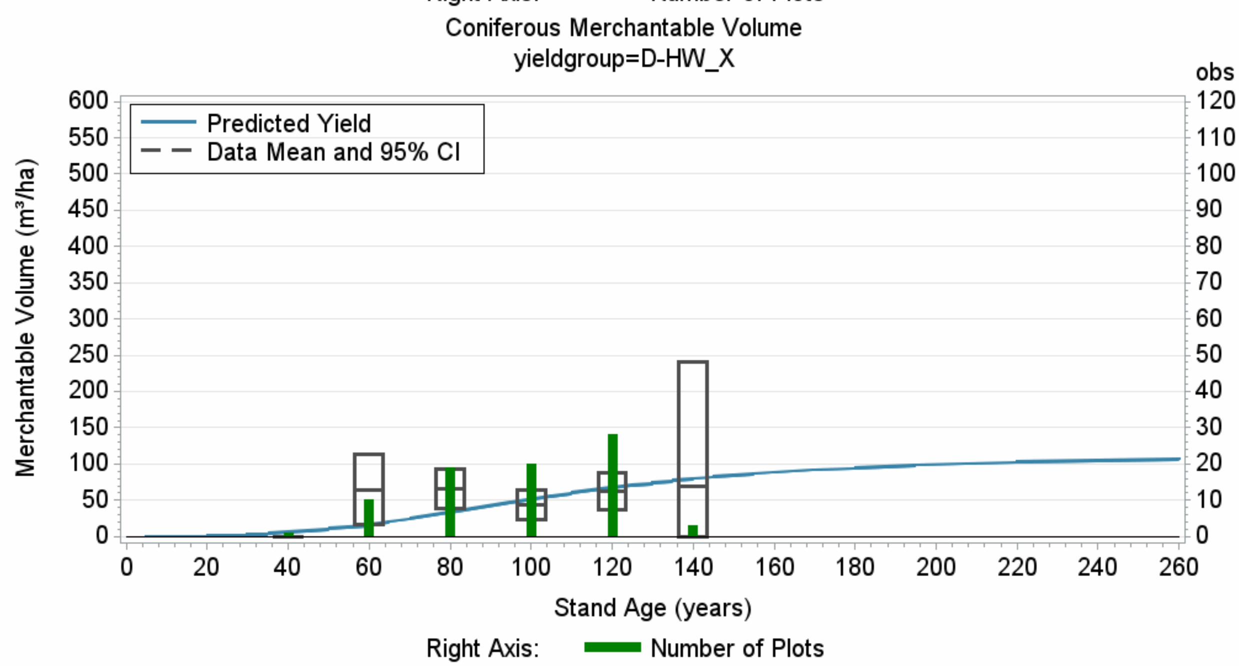
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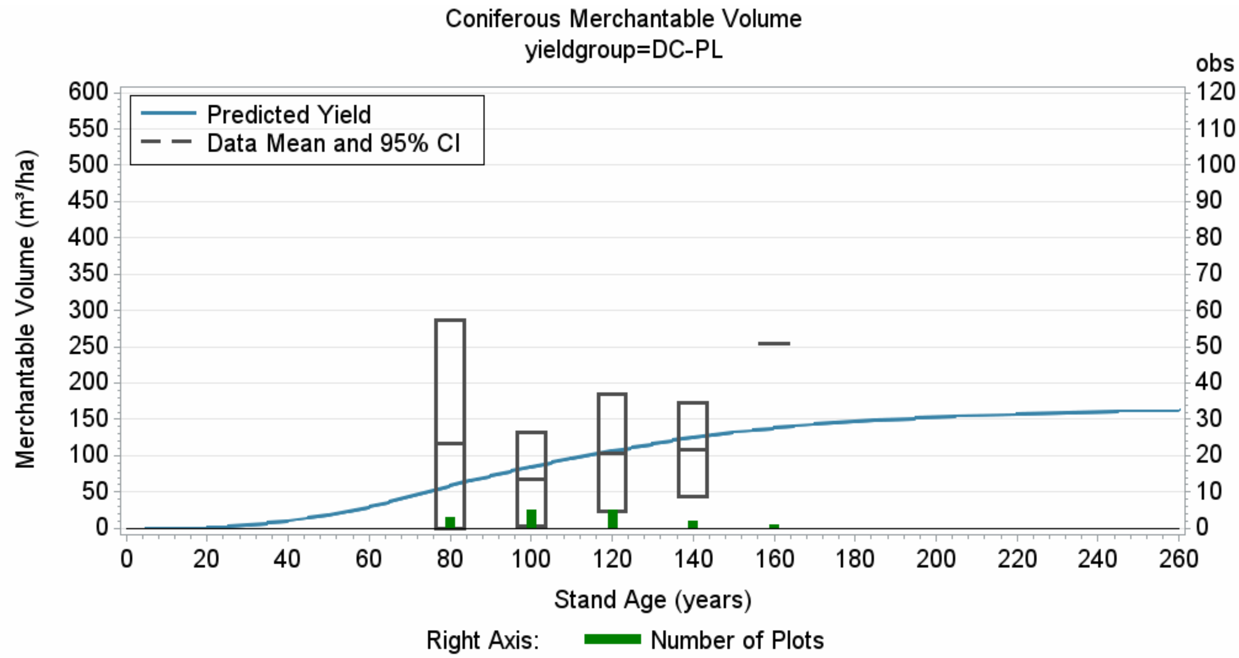
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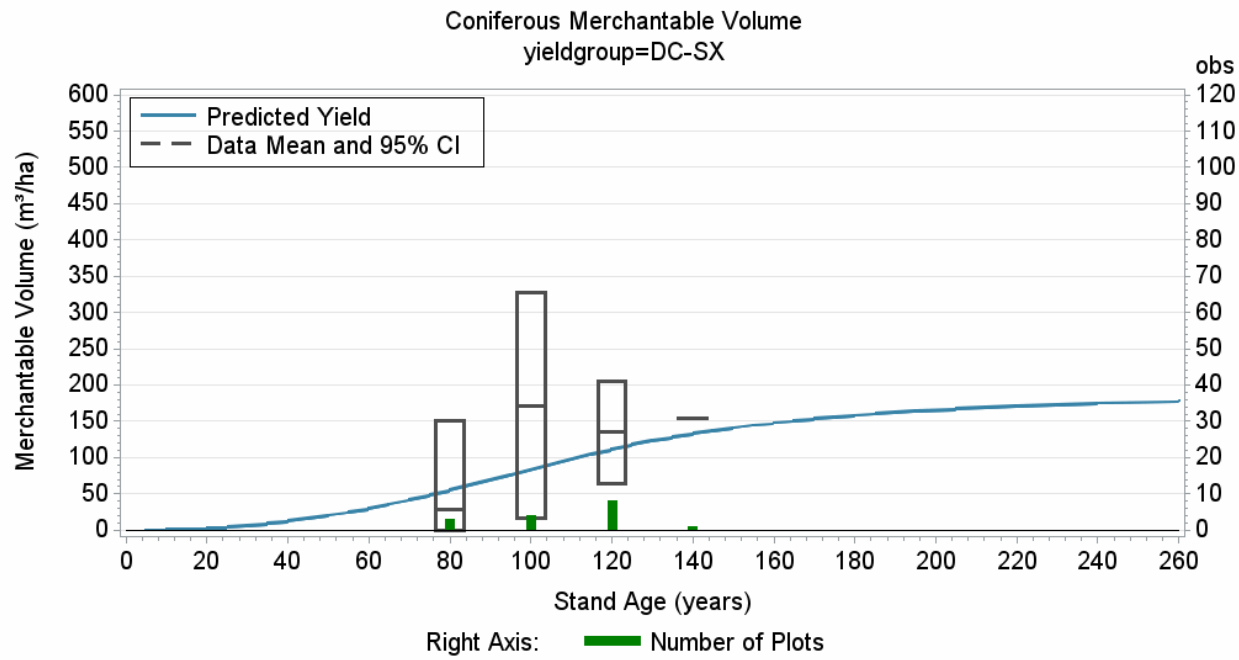
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Stand Age (years)
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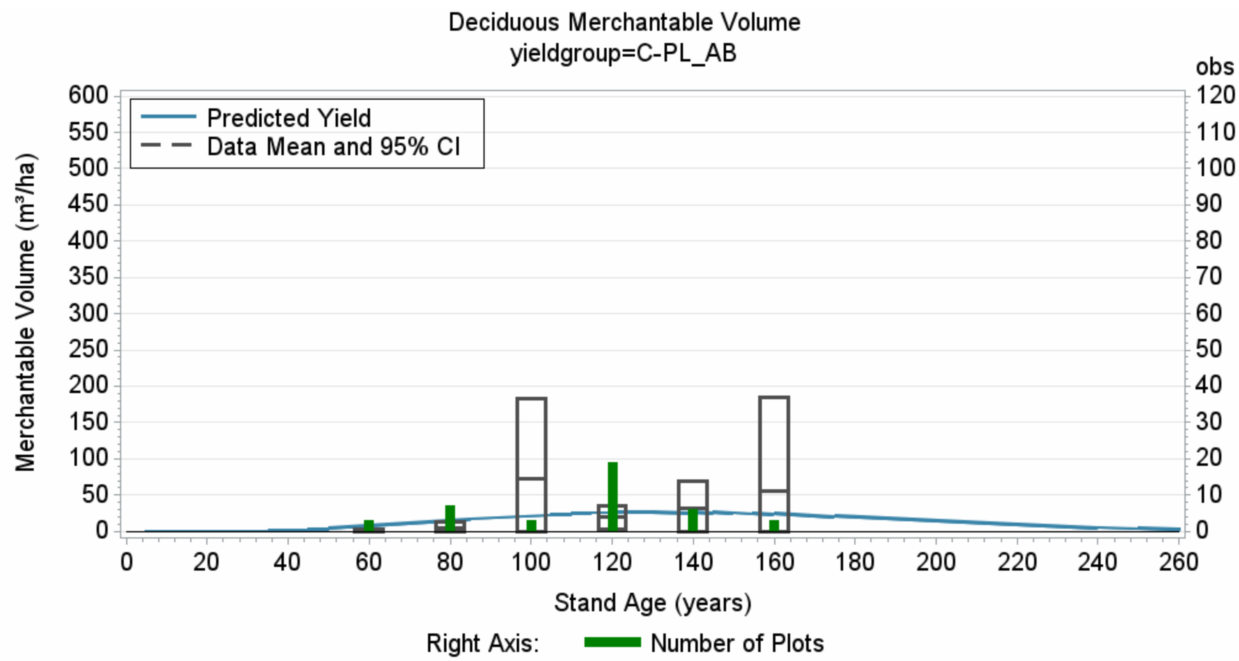
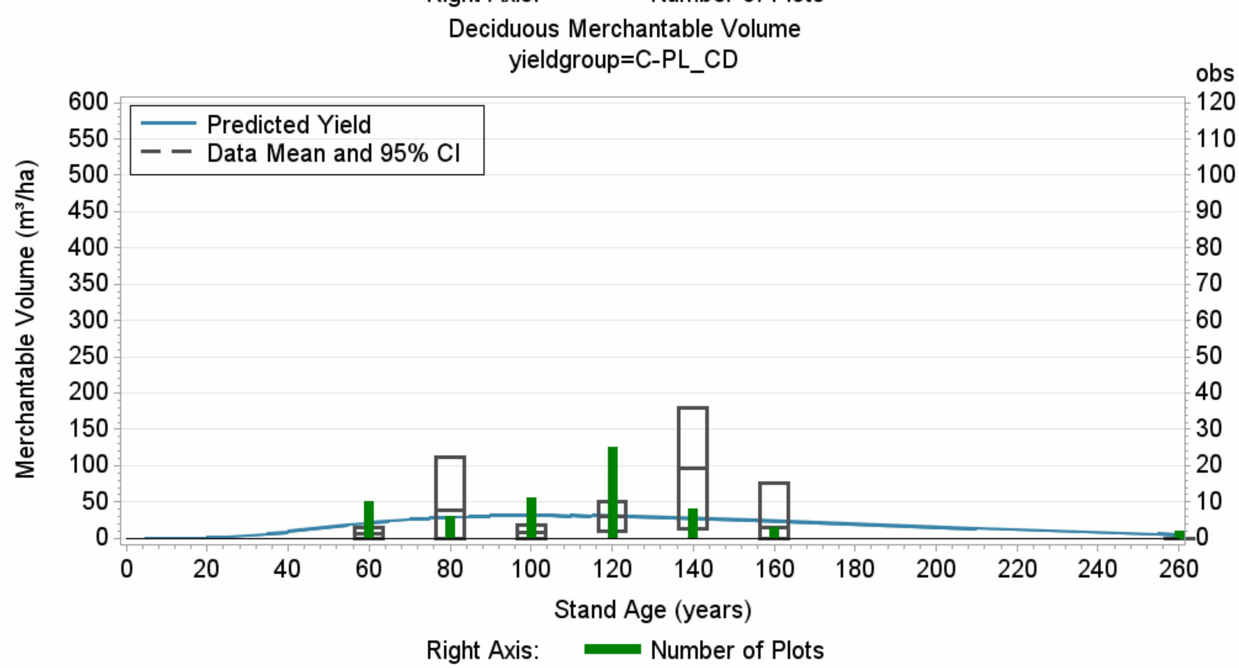
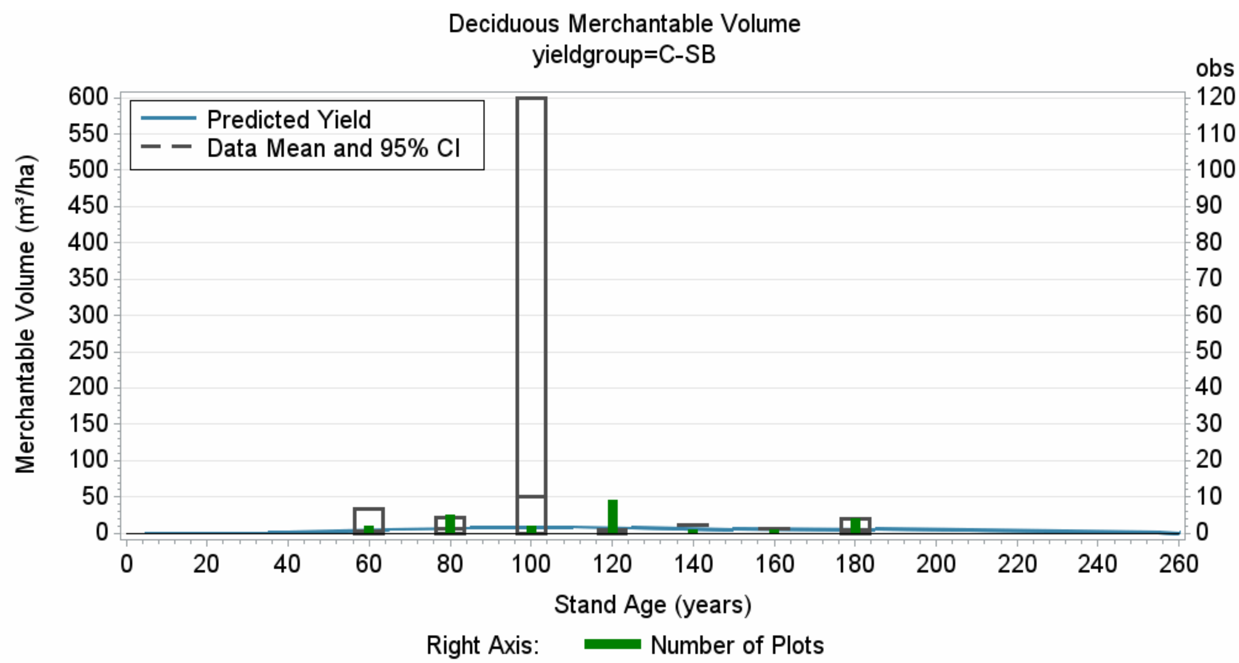
Natural stand final deciduous yield curves against 20-year plot averages



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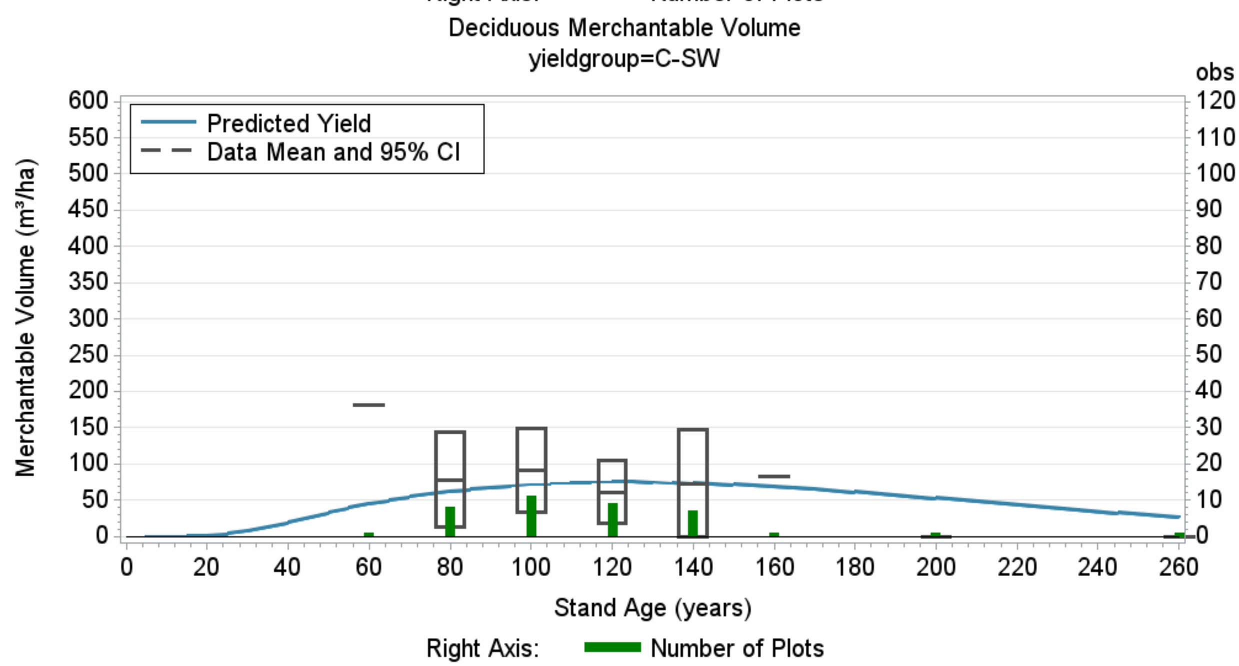
Stand Age (years)
Right Axis:
Number of Plots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Stand Age (years)
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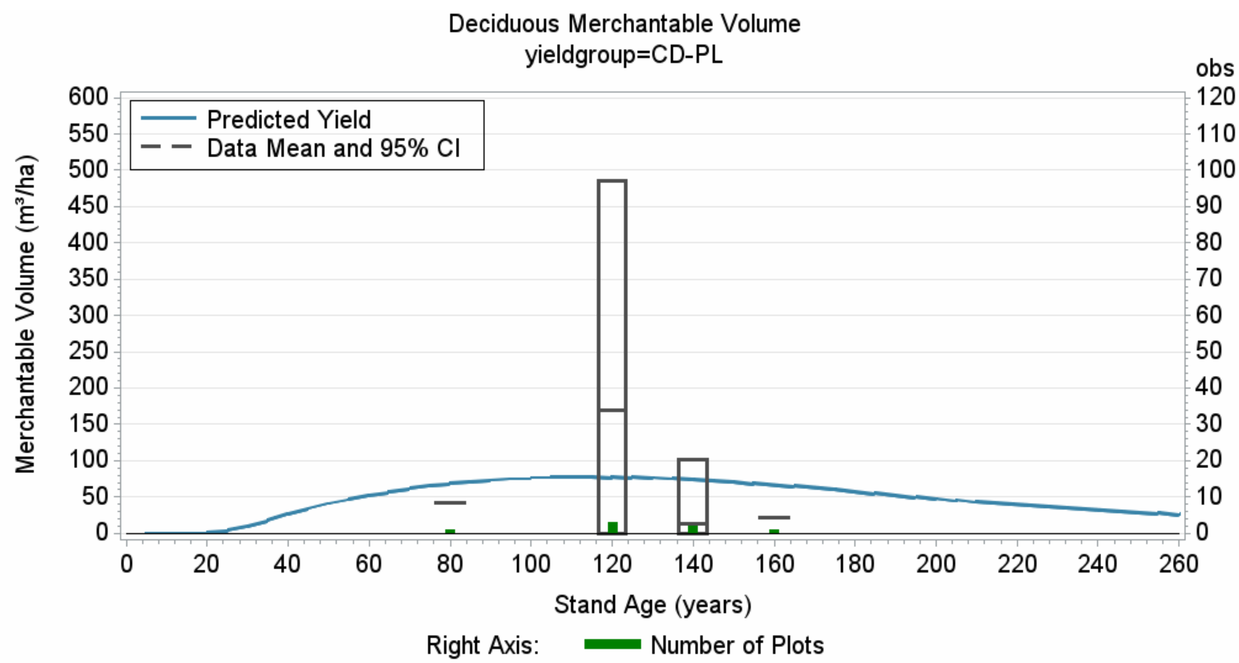
Number of Plots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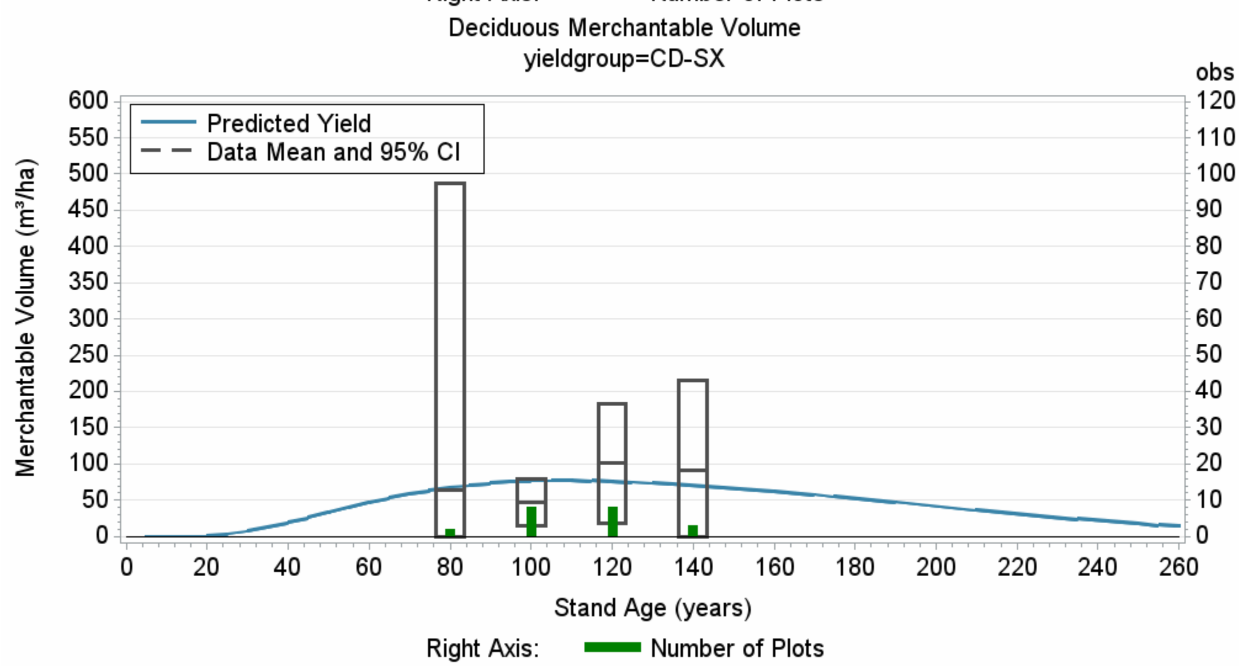
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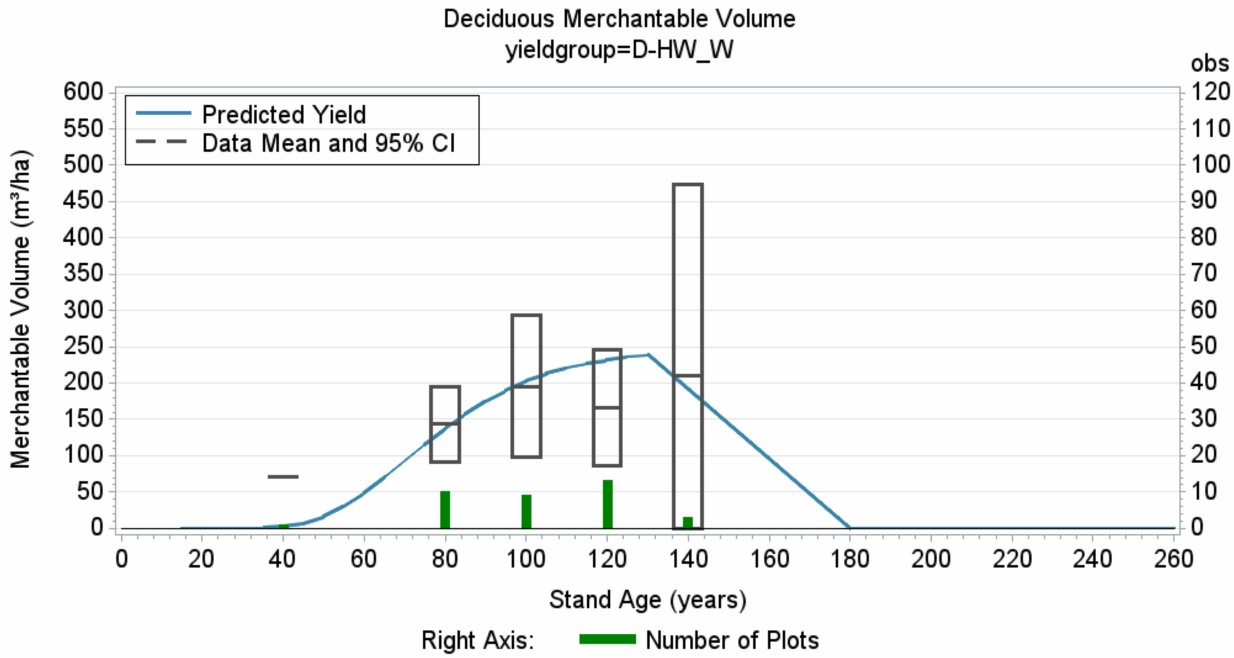
Number of Plots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Merchantable Volume (m³/ha)
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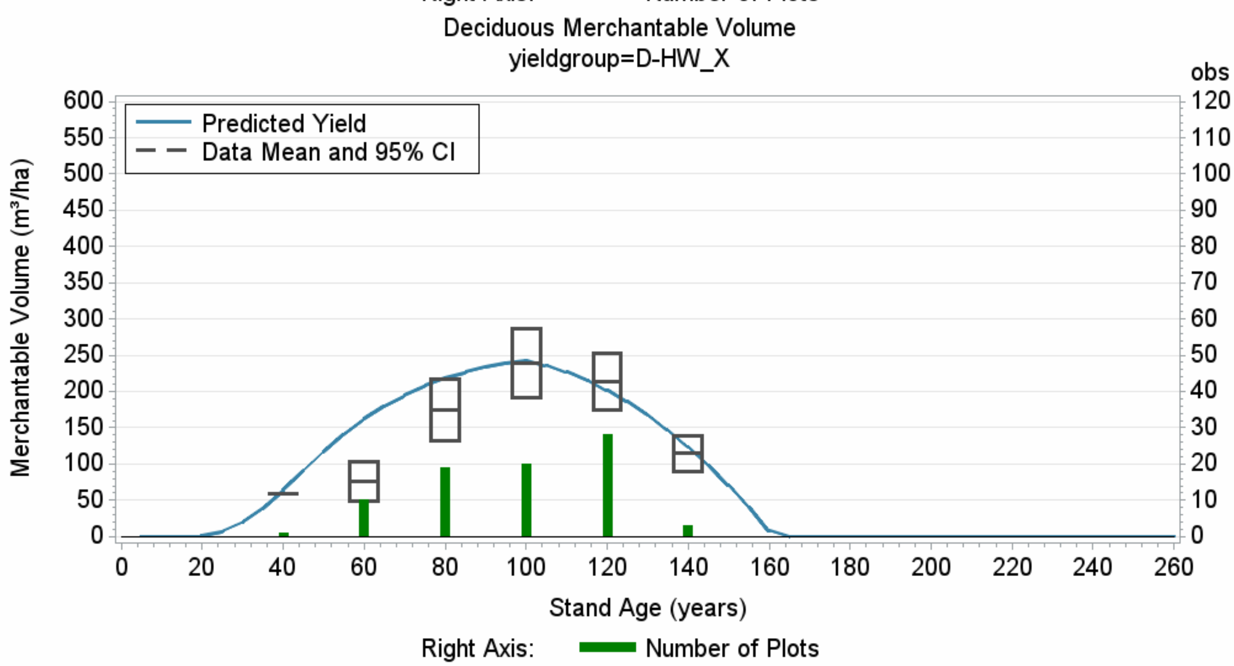
Stand Age (years)
Right Axis: Number of Plots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Stand Age (years)
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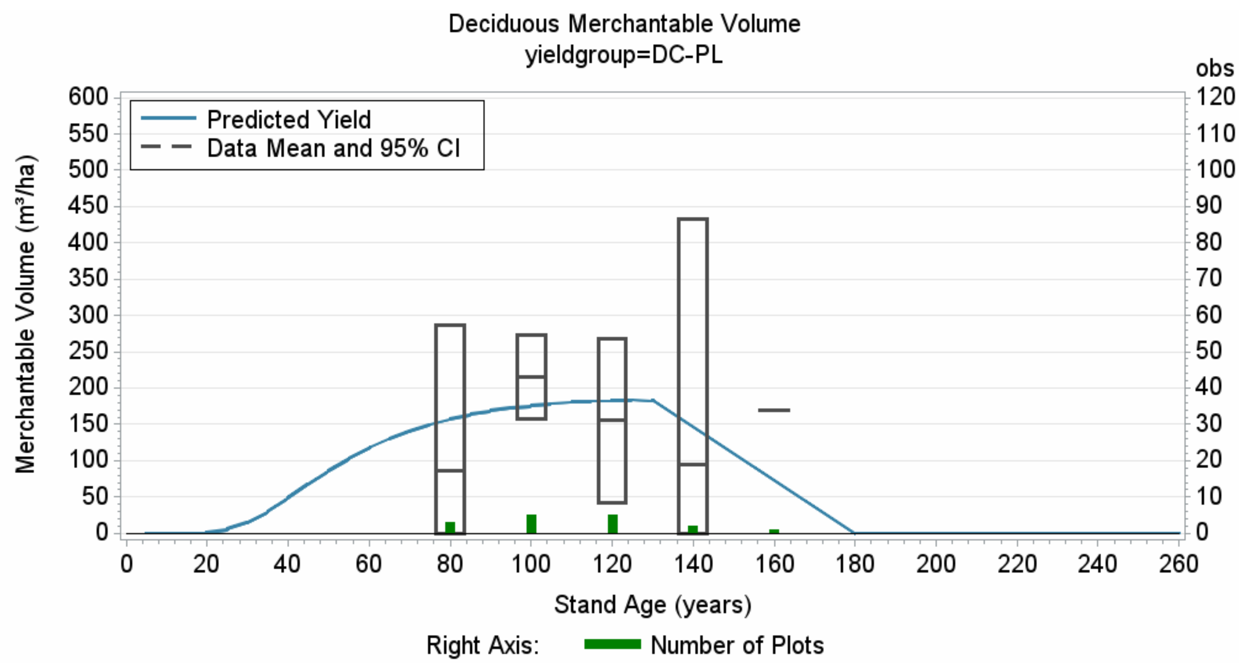
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Merchantable Volume (m³/ha)
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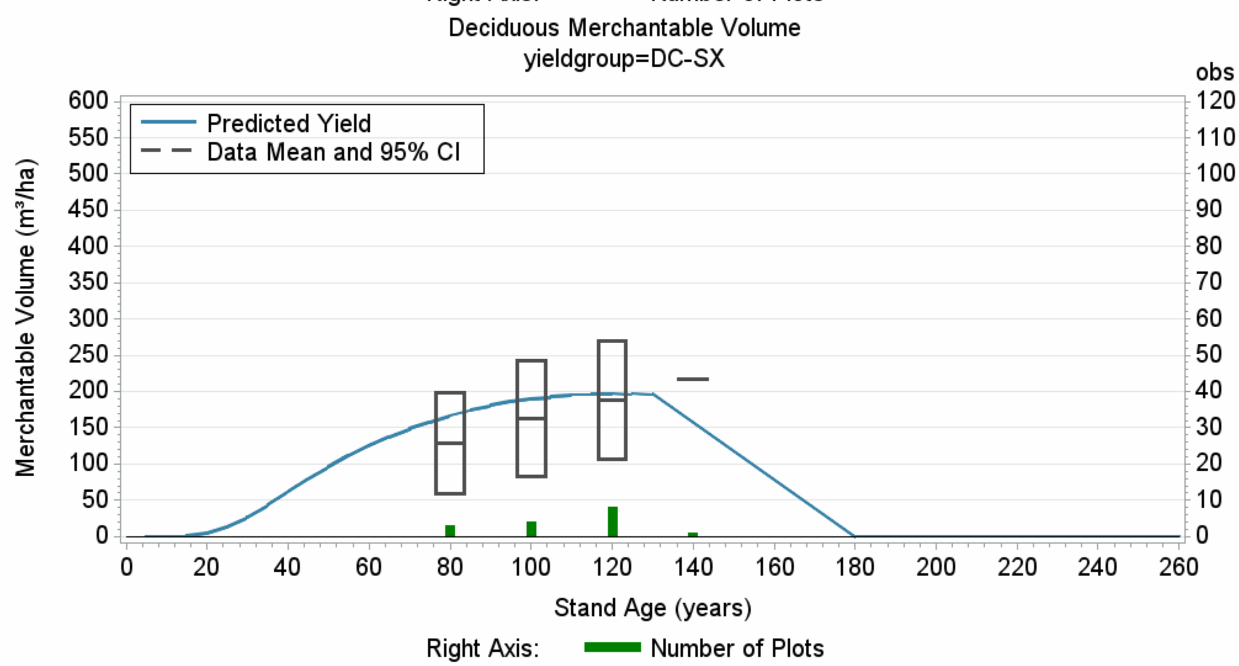
Stand Age (years)
Right Axis:
Number of Plots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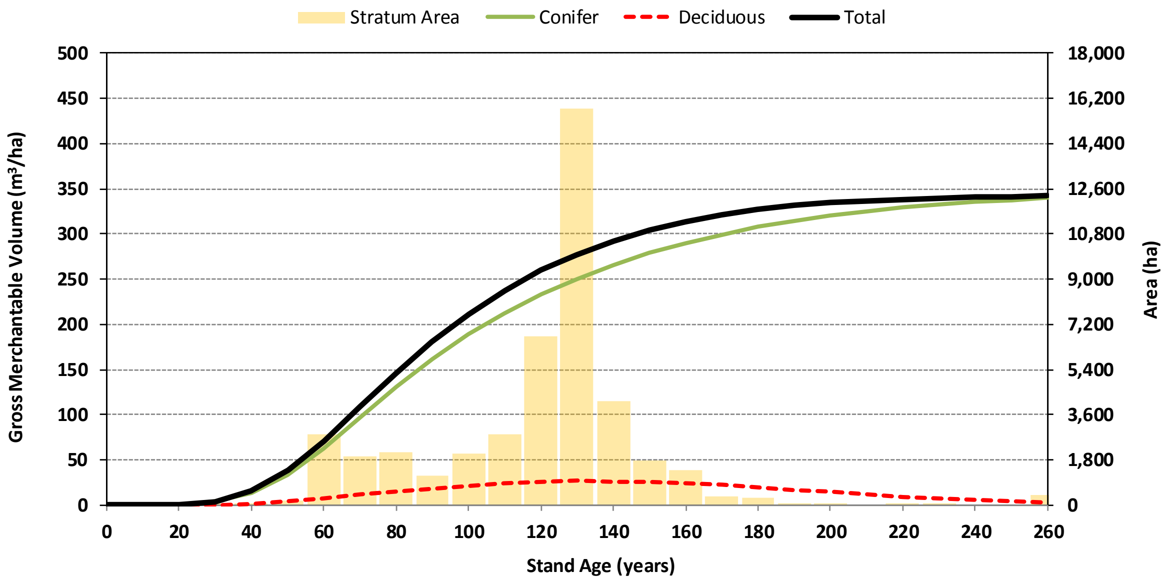
Stand Age (years)
Right Axis:
Number of Plots

Appendix II – Natural Stand Yield Tables

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	NATURAL STANDS STRATUM: C-PL_AB

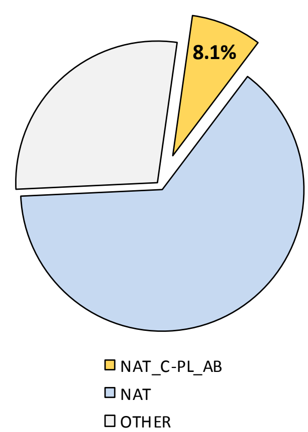


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.3	0.0	0.3	0.01	0.00	0.01
30	3.7	0.3	4.0	0.12	0.01	0.13
40	14.2	1.6	15.7	0.35	0.04	0.39
50	33.9	4.2	38.1	0.68	0.08	0.76
60	62.9	7.7	70.6	1.05	0.13	1.18
70	96.9	11.6	108.6	1.38	0.17	1.55
80	130.9	15.2	146.1	1.64	0.19	1.83
90	161.8	18.6	180.4	1.80	0.21	2.00
100	189.0	21.8	210.9	1.89	0.22	2.11
110	212.7	24.6	237.3	1.93	**0.22**	2.16
120	233.1	26.4	259.4	**1.94**	0.22	**2.16**
130	250.7	26.7	277.5	1.93	0.21	2.13
140	265.9	26.5	292.4	1.90	0.19	2.09
150	278.9	25.7	304.6	1.86	0.17	2.03
160	290.1	24.2	314.3	1.81	0.15	1.96
170	299.6	22.1	321.7	1.76	0.13	1.89
180	307.6	19.5	327.1	1.71	0.11	1.82
190	314.4	16.9	331.3	1.65	0.09	1.74
200	320.2	14.4	334.5	1.60	0.07	1.67
210	325.0	11.9	336.9	1.55	0.06	1.60
220	329.1	9.4	338.5	1.50	0.04	1.54
230	332.5	7.3	339.8	1.45	0.03	1.48
240	335.5	5.3	340.7	1.40	0.02	1.42
250	337.9	3.9	341.8	1.35	0.02	1.37
260	339.9	3.0	342.9	1.31	0.01	1.32

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_C-PL_AB**	**44,394**	**8.1%**

Stratum % of the Active Landbase



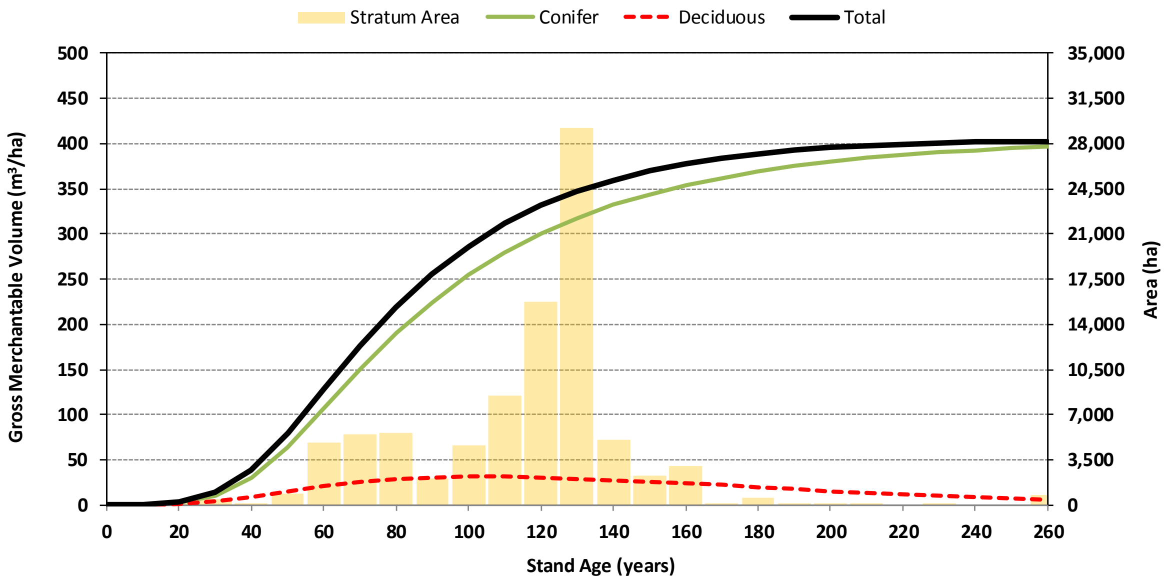
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	9,745,004	220
Deciduous	15/10/15/366/TL	1,018,474	23
Total		10,763,720	242

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

STRATUM: C-PL_CD

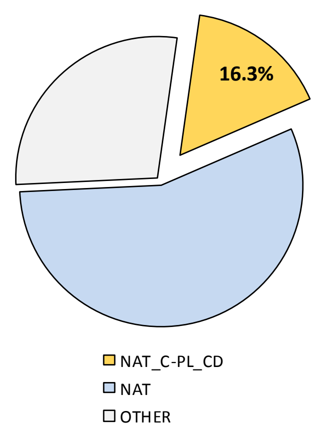


Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.1	0.00	0.00	0.01
20	2.1	0.8	3.0	0.11	0.04	0.15
30	10.1	3.7	13.8	0.34	0.12	0.46
40	29.9	9.1	39.0	0.75	0.23	0.97
50	64.4	15.7	80.1	1.29	0.31	1.60
60	107.4	21.7	129.0	1.79	0.36	2.15
70	150.5	26.2	176.7	2.15	0.37	2.52
80	189.9	29.2	219.1	2.37	0.36	2.74
90	224.6	31.0	255.6	2.50	0.34	2.84
100	254.6	31.9	286.5	2.55	0.32	2.87
110	279.9	31.7	311.6	2.54	0.29	2.83
120	300.7	30.7	331.4	2.51	0.26	2.76
130	317.9	29.3	347.1	2.45	0.23	2.67
140	332.1	27.7	359.8	2.37	0.20	2.57
150	343.9	26.0	369.9	2.29	0.17	2.47
160	353.8	24.1	377.8	2.21	0.15	2.36
170	362.1	22.0	384.1	2.13	0.13	2.26
180	369.0	19.9	388.9	2.05	0.11	2.16
190	374.9	17.8	392.6	1.97	0.09	2.07
200	379.8	15.6	395.4	1.90	0.08	1.98
210	383.9	13.6	397.5	1.83	0.06	1.89
220	387.3	11.9	399.3	1.76	0.05	1.81
230	390.3	10.4	400.7	1.70	0.05	1.74
240	392.7	8.8	401.5	1.64	0.04	1.67
250	394.8	7.3	402.1	1.58	0.03	1.61
260	396.5	6.2	402.7	1.53	0.02	1.55

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	NAT_C-PL_CD	89,618	16.3%

Stratum % of the Active Landbase



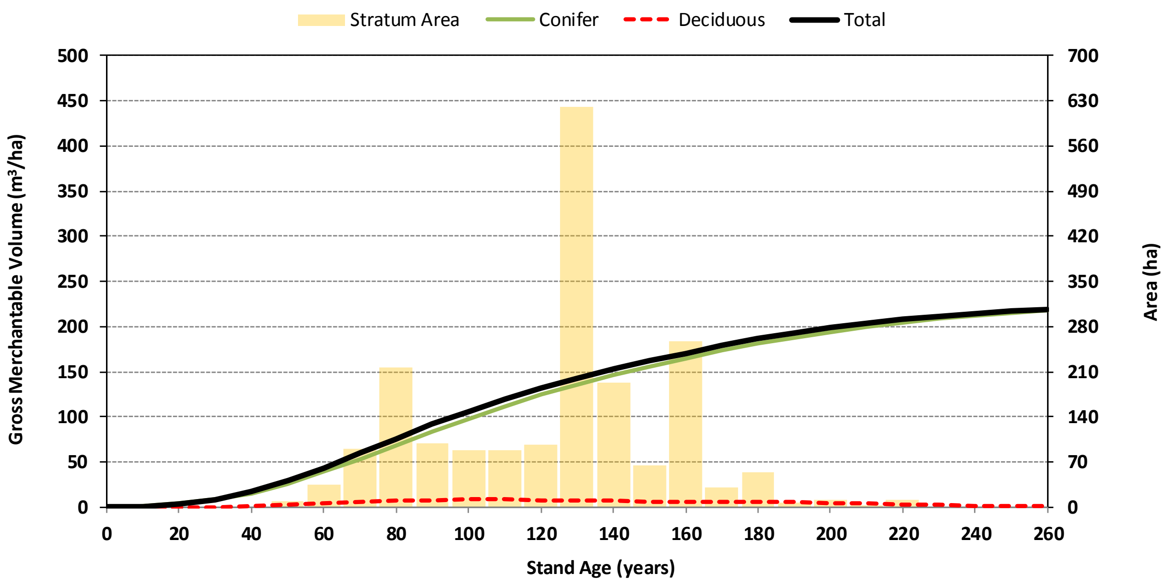
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	24,694,361	276
Deciduous	15/10/15/366/TL	2,541,288	28
Total		27,235,953	304

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

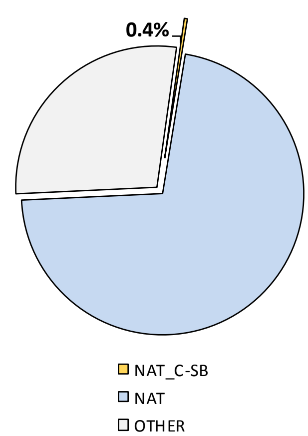
STRATUM: C-SB



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	1.1	0.0	1.1	0.11	0.00	0.11
20	4.0	0.0	4.0	0.20	0.00	0.20
30	8.5	0.2	8.7	0.28	0.01	0.29
40	15.5	1.2	16.8	0.39	0.03	0.42
50	26.1	2.8	28.9	0.52	0.06	0.58
60	39.3	4.4	43.7	0.65	0.07	0.73
70	53.8	5.7	59.5	0.77	0.08	0.85
80	68.8	6.8	75.6	0.86	0.09	0.95
90	83.6	7.8	91.4	0.93	**0.09**	1.02
100	98.0	8.2	106.3	0.98	0.08	1.06
110	111.6	8.4	120.0	1.01	0.08	1.09
120	124.2	8.1	132.3	1.04	0.07	**1.10**
130	135.7	7.6	143.3	**1.04**	0.06	1.10
140	146.1	6.8	152.8	1.04	0.05	1.09
150	155.6	6.1	161.8	1.04	0.04	1.08
160	164.6	6.1	170.6	1.03	0.04	1.07
170	173.1	6.0	179.1	1.02	0.04	1.05
180	181.0	5.9	186.9	1.01	0.03	1.04
190	188.1	5.4	193.6	0.99	0.03	1.02
200	194.4	4.7	199.2	0.97	0.02	1.00
210	200.0	3.9	203.8	0.95	0.02	0.97
220	204.7	3.1	207.8	0.93	0.01	0.94
230	208.8	2.5	211.3	0.91	0.01	0.92
240	212.4	1.8	214.2	0.88	0.01	0.89
250	215.4	1.4	216.7	0.86	0.01	0.87
260	217.9	1.0	218.9	0.84	0.00	0.84

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_C-SB**	**1,978**	**0.4%**

Stratum % of the Active Landbase



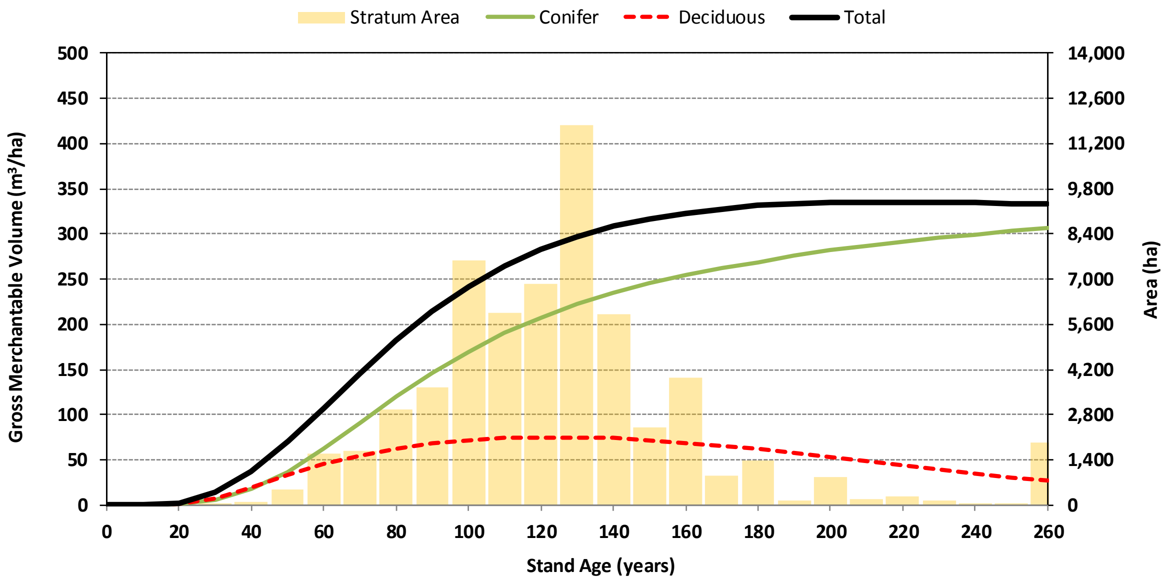
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	246,529	125
Deciduous	15/10/15/366/TL	13,790	7
Total		260,451	132

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

STRATUM: C-SW

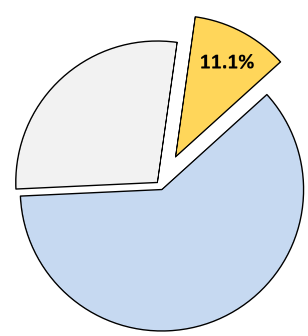


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.1	0.1	0.1	0.01	0.01	0.01
20	1.1	1.5	2.6	0.06	0.08	0.13
30	5.9	7.8	13.7	0.20	0.26	0.46
40	17.5	19.5	37.0	0.44	0.49	0.93
50	37.0	33.1	70.1	0.74	0.66	1.40
60	62.7	45.3	107.9	1.04	0.75	1.80
70	91.5	54.8	146.3	1.31	0.78	2.09
80	120.2	62.2	182.4	1.50	0.78	2.28
90	146.6	67.8	214.4	1.63	0.75	2.38
100	169.8	71.7	241.5	1.70	0.72	2.42
110	190.1	74.2	264.3	1.73	0.67	2.40
120	207.4	75.3	282.7	1.73	0.63	2.36
130	222.1	75.1	297.1	1.71	0.58	2.29
140	234.4	73.8	308.2	1.67	0.53	2.20
150	245.0	71.8	316.7	1.63	0.48	2.11
160	254.1	69.1	323.2	1.59	0.43	2.02
170	262.1	65.9	327.9	1.54	0.39	1.93
180	269.3	62.1	331.3	1.50	0.34	1.84
190	275.8	57.8	333.6	1.45	0.30	1.76
200	281.6	53.2	334.8	1.41	0.27	1.67
210	286.8	48.5	335.3	1.37	0.23	1.60
220	291.5	43.9	335.4	1.33	0.20	1.52
230	295.7	39.2	335.0	1.29	0.17	1.46
240	299.6	34.8	334.4	1.25	0.14	1.39
250	303.3	30.8	334.2	1.21	0.12	1.34
260	306.8	27.2	334.0	1.18	0.10	1.28

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_C-SW**	**60,937**	**11.1%**

Stratum % of the Active Landbase



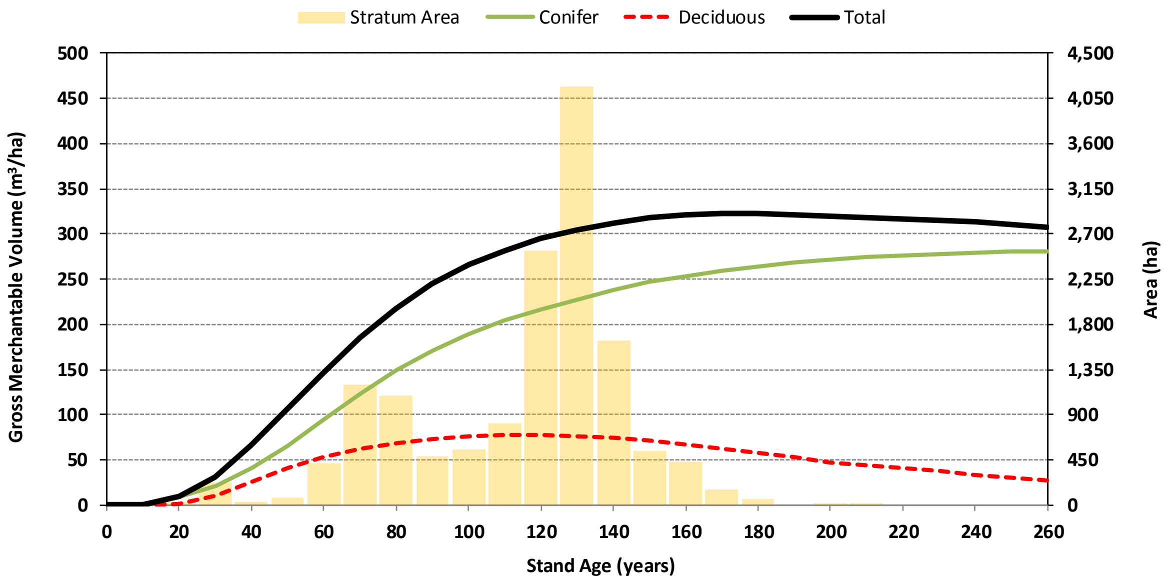
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	12,263,013	201
Deciduous	15/10/15/366/TL	4,161,179	68
Total		16,424,462	270

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

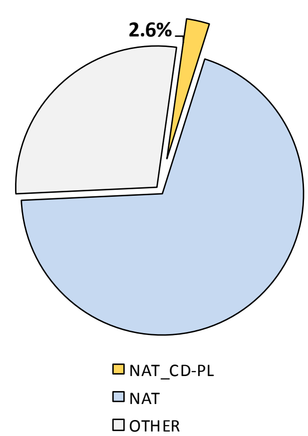
STRATUM: CD-PL



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.9	0.0	0.9	0.09	0.00	0.09
20	8.5	1.3	9.8	0.43	0.06	0.49
30	21.5	9.7	31.2	0.72	0.32	1.04
40	40.5	26.1	66.6	1.01	0.65	1.66
50	65.6	41.2	106.8	1.31	0.82	2.14
60	94.2	52.7	146.9	1.57	0.88	2.45
70	123.2	61.7	184.8	1.76	0.88	2.64
80	149.1	68.4	217.5	1.86	0.86	2.72
90	171.0	73.3	244.3	1.90	0.81	2.71
100	189.0	76.5	265.5	1.89	0.76	2.66
110	203.9	77.9	281.8	1.85	0.71	2.56
120	216.7	77.8	294.5	1.81	0.65	2.45
130	228.0	76.4	304.4	1.75	0.59	2.34
140	237.9	74.1	312.0	1.70	0.53	2.23
150	246.4	71.0	317.5	1.64	0.47	2.12
160	253.7	67.2	320.9	1.59	0.42	2.01
170	259.7	62.8	322.5	1.53	0.37	1.90
180	264.6	58.0	322.5	1.47	0.32	1.79
190	268.6	52.6	321.2	1.41	0.28	1.69
200	271.8	47.6	319.4	1.36	0.24	1.60
210	274.4	44.0	318.4	1.31	0.21	1.52
220	276.5	40.8	317.2	1.26	0.19	1.44
230	278.1	37.5	315.6	1.21	0.16	1.37
240	279.4	34.0	313.4	1.16	0.14	1.31
250	280.3	30.5	310.8	1.12	0.12	1.24
260	281.0	26.8	307.8	1.08	0.10	1.18

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_CD-PL**	**14,515**	**2.6%**

Stratum % of the Active Landbase



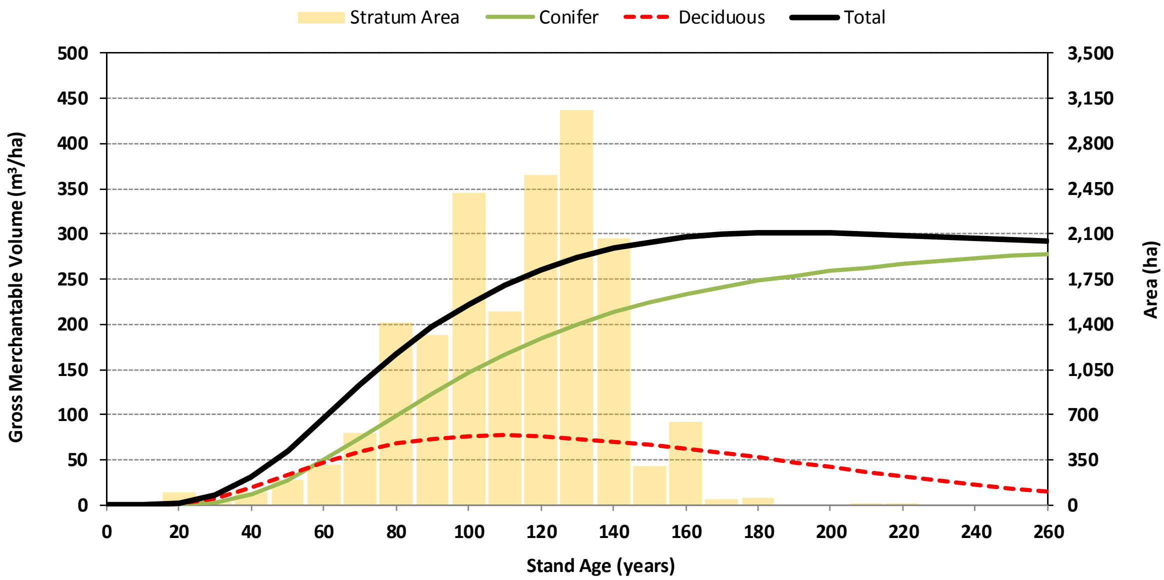
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	2,918,547	201
Deciduous	15/10/15/366/TL	1,039,211	72
Total		3,958,031	273

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

STRATUM: CD-SX

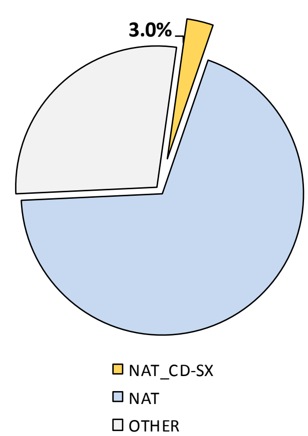


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.6	1.1	1.8	0.03	0.06	0.09
30	3.1	7.9	11.0	0.10	0.26	0.37
40	11.3	19.4	30.7	0.28	0.49	0.77
50	28.0	32.8	60.8	0.56	0.66	1.22
60	50.3	47.0	97.3	0.84	0.78	1.62
70	74.8	59.2	134.0	1.07	0.85	1.91
80	99.5	68.1	167.6	1.24	0.85	2.10
90	123.4	73.7	197.0	1.37	0.82	2.19
100	145.7	76.6	222.3	1.46	0.77	2.22
110	166.3	77.4	243.7	1.51	0.70	2.22
120	184.6	76.2	260.8	1.54	0.63	2.17
130	200.3	73.7	274.0	1.54	0.57	2.11
140	213.8	70.2	284.0	1.53	0.50	2.03
150	224.9	66.4	291.3	1.50	0.44	1.94
160	234.1	62.4	296.5	1.46	0.39	1.85
170	241.8	58.1	299.8	1.42	0.34	1.76
180	248.3	53.1	301.4	1.38	0.29	1.67
190	253.9	47.7	301.6	1.34	0.25	1.59
200	258.7	42.0	300.7	1.29	0.21	1.50
210	262.9	36.5	299.4	1.25	0.17	1.43
220	266.6	31.4	298.1	1.21	0.14	1.35
230	270.0	26.6	296.5	1.17	0.12	1.29
240	272.9	22.1	295.0	1.14	0.09	1.23
250	275.6	17.7	293.3	1.10	0.07	1.17
260	278.0	14.6	292.6	1.07	0.06	1.13

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_CD-SX**	**16,684**	**3.0%**

Stratum % of the Active Landbase



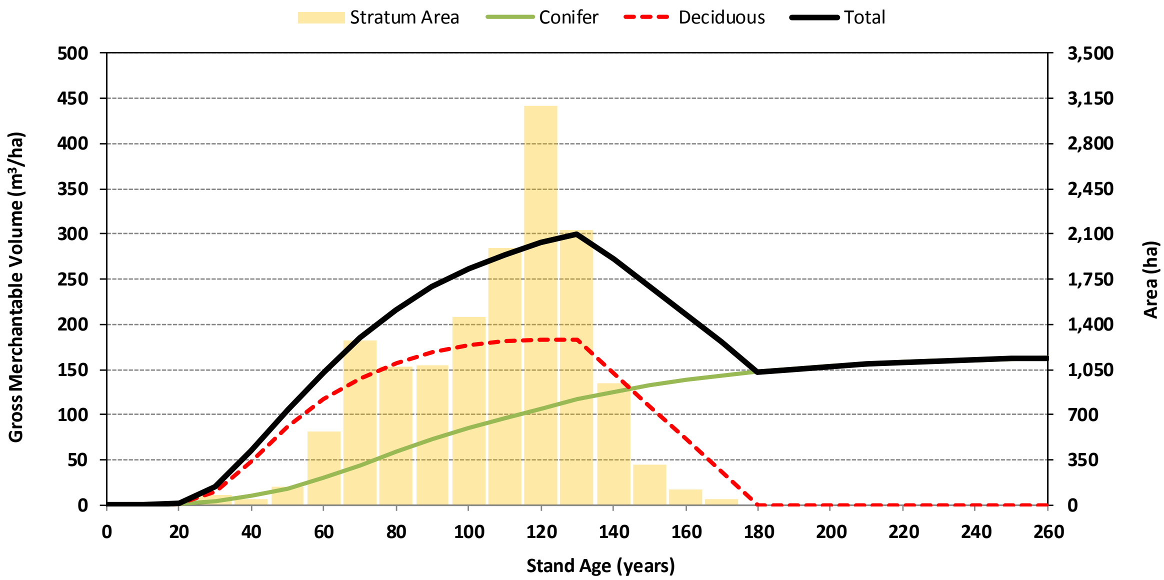
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	2,742,851	164
Deciduous	15/10/15/366/TL	1,183,097	71
Total		3,926,183	235

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

STRATUM: DC-PL

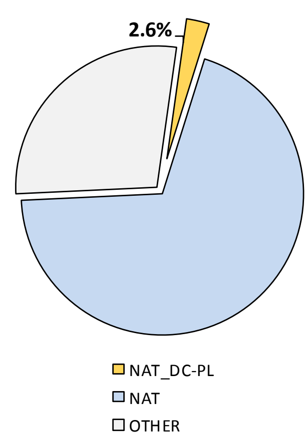


Stand Age	Gross Merchantable Volume (m^3/ha) Conifer	Deciduous	Total	Mean Annual Increment (m^3/ha/year) Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.8	1.4	2.2	0.04	0.07	0.11
30	4.4	15.6	19.9	0.15	0.52	0.66
40	10.5	49.2	59.7	0.26	1.23	1.49
50	18.7	86.6	105.2	0.37	1.73	2.10
60	30.0	117.7	147.7	0.50	1.96	2.46
70	43.9	140.9	184.8	0.63	2.01	2.64
80	58.6	157.4	216.0	0.73	1.97	2.70
90	72.5	168.8	241.2	0.81	1.88	2.68
100	85.0	176.3	261.2	0.85	1.76	2.61
110	96.5	180.7	277.2	0.88	1.64	2.52
120	107.1	183.0	290.1	0.89	1.53	2.42
130	116.8	183.2	300.1	0.90	1.41	2.31
140	125.3	146.6	271.9	0.90	1.05	1.94
150	132.5	109.9	242.5	0.88	0.73	1.62
160	138.5	73.3	211.8	0.87	0.46	1.32
170	143.4	36.7	180.1	0.84	0.22	1.06
180	147.5	0.0	147.5	0.82	0.00	0.82
190	150.8	0.0	150.8	0.79	0.00	0.79
200	153.6	0.0	153.6	0.77	0.00	0.77
210	155.9	0.0	155.9	0.74	0.00	0.74
220	157.8	0.0	157.8	0.72	0.00	0.72
230	159.5	0.0	159.5	0.69	0.00	0.69
240	160.8	0.0	160.8	0.67	0.00	0.67
250	162.0	0.0	162.0	0.65	0.00	0.65
260	163.0	0.0	163.0	0.63	0.00	0.63

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_DC-PL**	**14,414**	**2.6%**

Stratum % of the Active Landbase



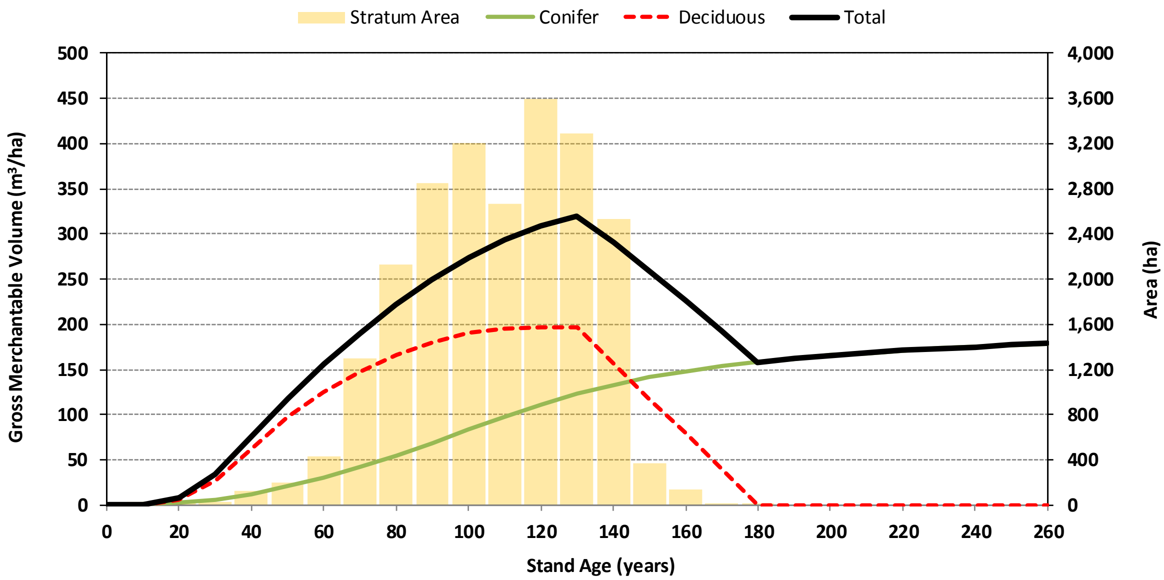
FMA Baseline Utilization		Standing Timber m3	m3/ha
Conifer	15/11/15/366/TL	1,298,260	90
Deciduous	15/10/15/366/TL	2,371,840	165
Total		3,670,355	255

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

NATURAL STANDS

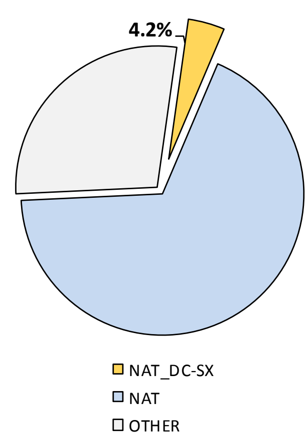
STRATUM: DC-SX



Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.7	0.2	0.8	0.07	0.02	0.08
20	2.8	5.2	8.0	0.14	0.26	0.40
30	6.3	27.4	33.7	0.21	0.91	1.12
40	12.4	62.3	74.7	0.31	1.56	1.87
50	20.7	96.7	117.4	0.41	1.93	2.35
60	30.4	125.7	156.2	0.51	2.10	2.60
70	41.9	148.3	190.2	0.60	2.12	2.72
80	55.0	166.7	221.8	0.69	2.08	2.77
90	69.0	180.6	249.6	0.77	2.01	2.77
100	83.3	190.1	273.4	0.83	1.90	2.73
110	97.9	195.5	293.3	0.89	1.78	2.67
120	111.8	197.3	309.1	0.93	1.64	2.58
130	123.7	196.2	319.9	0.95	1.51	2.46
140	133.3	157.0	290.2	0.95	1.12	2.07
150	141.3	117.7	259.1	0.94	0.78	1.73
160	148.0	78.5	226.5	0.92	0.49	1.42
170	153.5	39.2	192.7	0.90	0.23	1.13
180	158.1	0.0	158.1	0.88	0.00	0.88
190	162.1	0.0	162.1	0.85	0.00	0.85
200	165.5	0.0	165.5	0.83	0.00	0.83
210	168.4	0.0	168.4	0.80	0.00	0.80
220	170.9	0.0	170.9	0.78	0.00	0.78
230	173.2	0.0	173.2	0.75	0.00	0.75
240	175.2	0.0	175.2	0.73	0.00	0.73
250	177.0	0.0	177.0	0.71	0.00	0.71
260	178.5	0.0	178.5	0.69	0.00	0.69

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_DC-SX**	**22,986**	**4.2%**

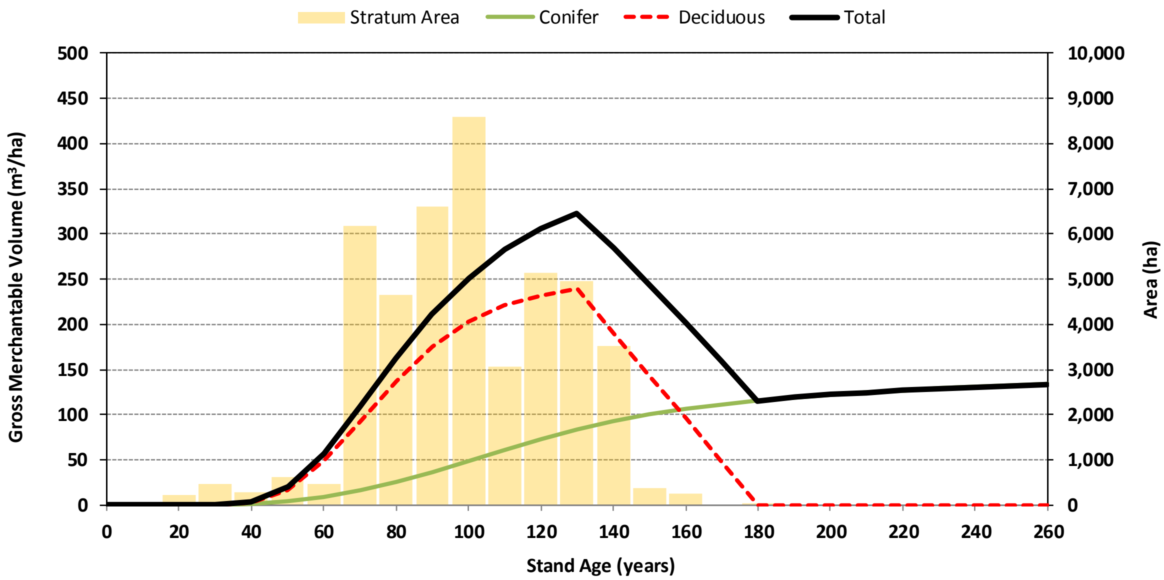
Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	2,140,824	93
Deciduous	15/10/15/366/TL	4,088,973	178
Total		6,230,068	271

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	NATURAL STANDS STRATUM: D-HW_W

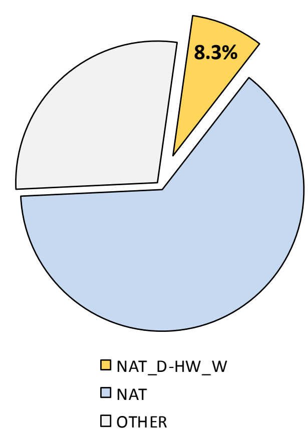


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.0	0.0	0.0	0.00	0.00	0.00
30	0.2	0.0	0.2	0.01	0.00	0.01
40	1.4	2.1	3.5	0.04	0.05	0.09
50	3.7	16.3	20.0	0.07	0.33	0.40
60	8.4	48.8	57.3	0.14	0.81	0.95
70	16.1	92.8	108.9	0.23	1.33	1.56
80	25.7	136.9	162.7	0.32	1.71	2.03
90	36.8	175.1	211.9	0.41	1.95	2.35
100	48.8	202.8	251.6	0.49	**2.03**	2.52
110	61.4	221.1	282.5	0.56	2.01	**2.57**
120	73.6	232.5	306.0	0.61	1.94	2.55
130	84.0	238.8	322.8	0.65	1.84	2.48
140	92.7	191.1	283.8	0.66	1.36	2.03
150	100.1	143.3	243.4	**0.67**	0.96	1.62
160	106.2	95.5	201.8	0.66	0.60	1.26
170	111.3	47.8	159.1	0.65	0.28	0.94
180	115.6	0.0	115.6	0.64	0.00	0.64
190	119.2	0.0	119.2	0.63	0.00	0.63
200	122.3	0.0	122.3	0.61	0.00	0.61
210	124.9	0.0	124.9	0.59	0.00	0.59
220	127.2	0.0	127.2	0.58	0.00	0.58
230	129.2	0.0	129.2	0.56	0.00	0.56
240	131.0	0.0	131.0	0.55	0.00	0.55
250	132.6	0.0	132.6	0.53	0.00	0.53
260	134.0	0.0	134.0	0.52	0.00	0.52

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	**NAT_D-HW_W**	**45,477**	**8.3%**

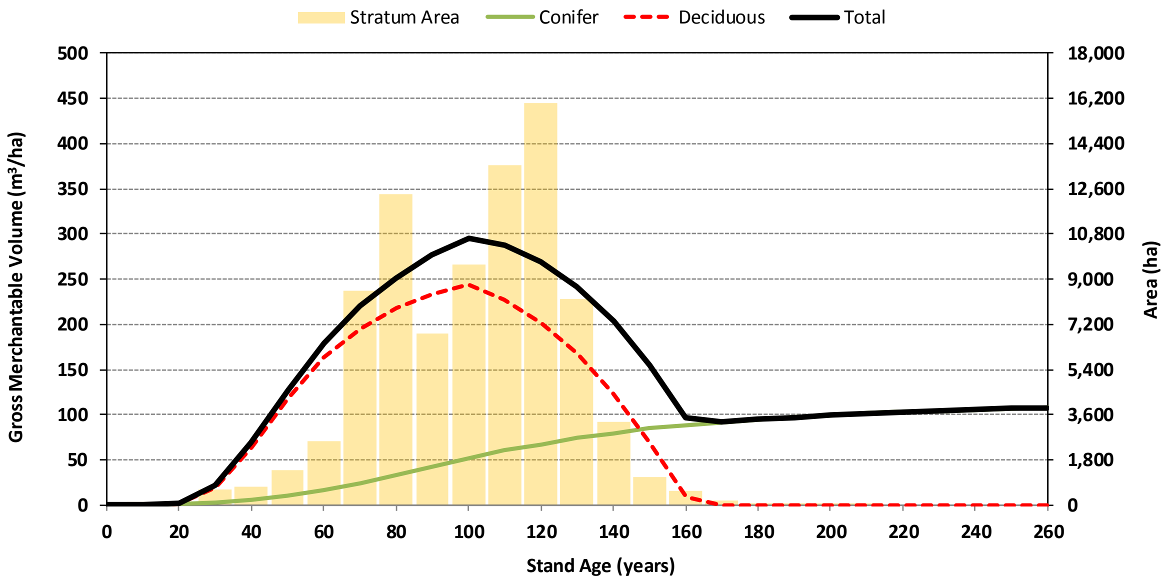
Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	2,265,092	50
Deciduous	15/10/15/366/TL	7,957,650	175
Total		10,222,966	225

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	NATURAL STANDS STRATUM: D-HW_X

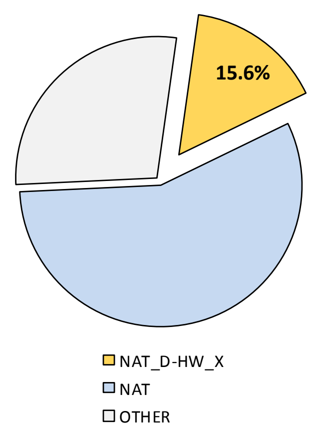


Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.9	1.8	2.6	0.04	0.09	0.13
30	2.8	19.5	22.3	0.09	0.65	0.74
40	6.0	63.8	69.8	0.15	1.59	1.75
50	10.6	117.0	127.6	0.21	2.34	2.55
60	16.7	162.4	179.1	0.28	2.71	2.99
70	24.5	195.3	219.9	0.35	**2.79**	3.14
80	33.5	218.2	251.6	0.42	2.73	**3.15**
90	42.7	233.5	276.3	0.47	2.59	3.07
100	51.7	243.4	295.0	0.52	2.43	2.95
110	60.1	227.4	287.4	0.55	2.07	2.61
120	67.7	202.1	269.7	0.56	1.68	2.25
130	74.2	167.5	241.7	**0.57**	1.29	1.86
140	79.9	123.7	203.5	0.57	0.88	1.45
150	84.7	70.6	155.2	0.56	0.47	1.03
160	88.7	8.3	96.9	0.55	0.05	0.61
170	92.1	0.0	92.1	0.54	0.00	0.54
180	95.0	0.0	95.0	0.53	0.00	0.53
190	97.4	0.0	97.4	0.51	0.00	0.51
200	99.5	0.0	99.5	0.50	0.00	0.50
210	101.3	0.0	101.3	0.48	0.00	0.48
220	102.9	0.0	102.9	0.47	0.00	0.47
230	104.3	0.0	104.3	0.45	0.00	0.45
240	105.6	0.0	105.6	0.44	0.00	0.44
250	106.7	0.0	106.7	0.43	0.00	0.43
260	107.7	0.0	107.7	0.41	0.00	0.41

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	NAT	396,902	72.0%
Stratum	NAT_D-HW_X	85,900	15.6%

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	4,411,546	51
Deciduous	15/10/15/366/TL	17,103,521	199
Total		21,515,318	250

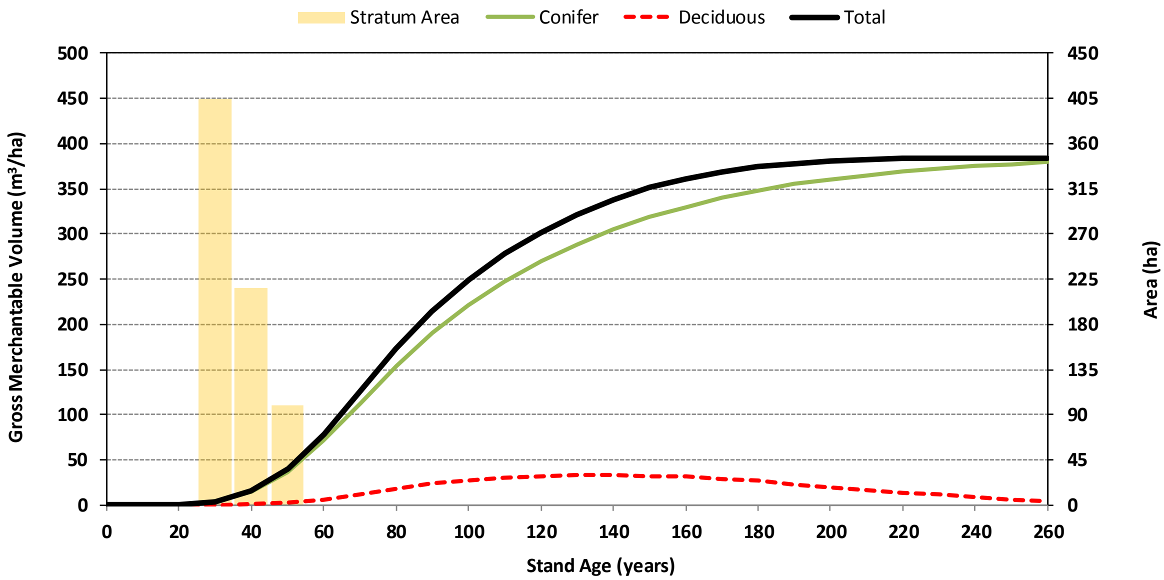
Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

Appendix III – Pre-1991 Managed Stand Yield Tables

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

STRATUM: C-PL_AB_E

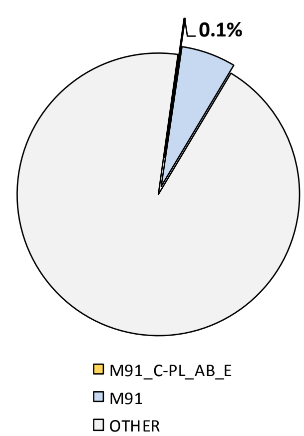


Stand Age	Gross Merchantable Volume (m^3/ha) Conifer	Deciduous	Total	Mean Annual Increment (m^3/ha/year) Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.3	0.0	0.3	0.01	0.00	0.01
30	4.0	0.1	4.1	0.13	0.00	0.14
40	15.2	0.6	15.8	0.38	0.02	0.39
50	37.1	2.4	39.5	0.74	0.05	0.79
60	71.6	6.1	77.7	1.19	0.10	1.30
70	113.3	12.0	125.3	1.62	0.17	1.79
80	154.2	18.6	172.7	1.93	0.23	2.16
90	190.4	23.9	214.3	2.12	0.27	2.38
100	221.4	27.6	249.0	2.21	**0.28**	2.49
110	247.7	30.3	278.0	**2.25**	0.28	**2.53**
120	269.9	32.2	302.1	2.25	0.27	2.52
130	288.8	33.0	321.9	2.22	0.25	2.48
140	305.0	33.1	338.0	2.18	0.24	2.41
150	318.7	32.5	351.2	2.12	0.22	2.34
160	330.3	31.2	361.5	2.06	0.20	2.26
170	340.0	29.2	369.2	2.00	0.17	2.17
180	348.2	26.5	374.7	1.93	0.15	2.08
190	355.0	23.4	378.4	1.87	0.12	1.99
200	360.7	20.1	380.9	1.80	0.10	1.90
210	365.5	16.9	382.4	1.74	0.08	1.82
220	369.4	14.1	383.5	1.68	0.06	1.74
230	372.7	11.4	384.1	1.62	0.05	1.67
240	375.4	8.6	384.0	1.56	0.04	1.60
250	377.6	6.3	383.9	1.51	0.03	1.54
260	379.4	4.6	384.0	1.46	0.02	1.48

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_C-PL_AB_E	721	0.1%

Stratum % of the Active Landbase



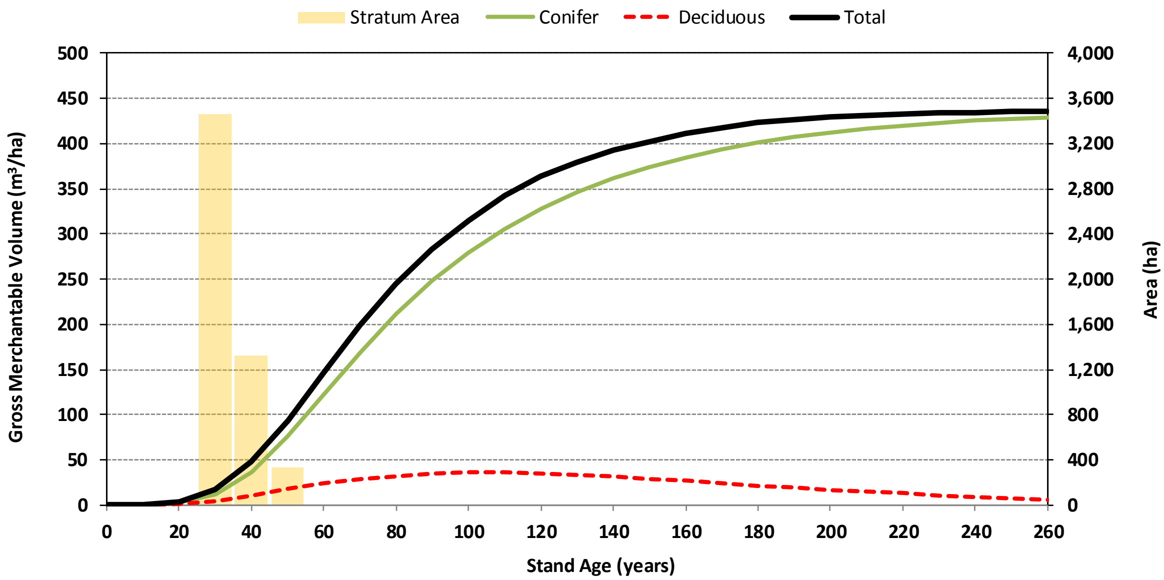
FMA Baseline Utilization		Standing Timber m3	m3/ha
Conifer	15/11/15/366/TL	8,603	12
Deciduous	15/10/15/366/TL	393	1
Total		9,009	12

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

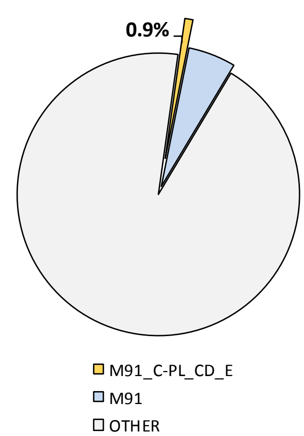
STRATUM: C-PL_CD_E



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	2.2	0.8	3.0	0.11	0.04	0.15
30	12.1	4.6	16.7	0.40	0.15	0.56
40	36.2	11.0	47.2	0.90	0.28	1.18
50	75.5	18.1	93.6	1.51	0.36	1.87
60	122.6	24.3	146.8	2.04	0.40	2.45
70	169.8	28.9	198.6	2.43	0.41	2.84
80	212.5	32.1	244.6	2.66	0.40	3.06
90	248.9	34.4	283.3	2.77	0.38	3.15
100	279.8	35.8	315.6	2.80	0.36	3.16
110	305.8	36.2	342.0	2.78	0.33	3.11
120	327.6	35.6	363.2	2.73	0.30	3.03
130	345.9	33.8	379.7	2.66	0.26	2.92
140	361.2	31.3	392.5	2.58	0.22	2.80
150	374.0	28.9	402.9	2.49	0.19	2.69
160	384.8	26.5	411.3	2.40	0.17	2.57
170	393.7	24.2	417.9	2.32	0.14	2.46
180	401.2	21.8	423.0	2.23	0.12	2.35
190	407.4	19.5	426.9	2.14	0.10	2.25
200	412.5	17.2	429.7	2.06	0.09	2.15
210	416.8	14.9	431.6	1.98	0.07	2.06
220	420.3	12.8	433.1	1.91	0.06	1.97
230	423.3	10.9	434.1	1.84	0.05	1.89
240	425.7	9.1	434.8	1.77	0.04	1.81
250	427.7	7.7	435.4	1.71	0.03	1.74
260	429.4	6.5	435.9	1.65	0.02	1.68

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_C-PL_CD_E	5,109	0.9%

Stratum % of the Active Landbase



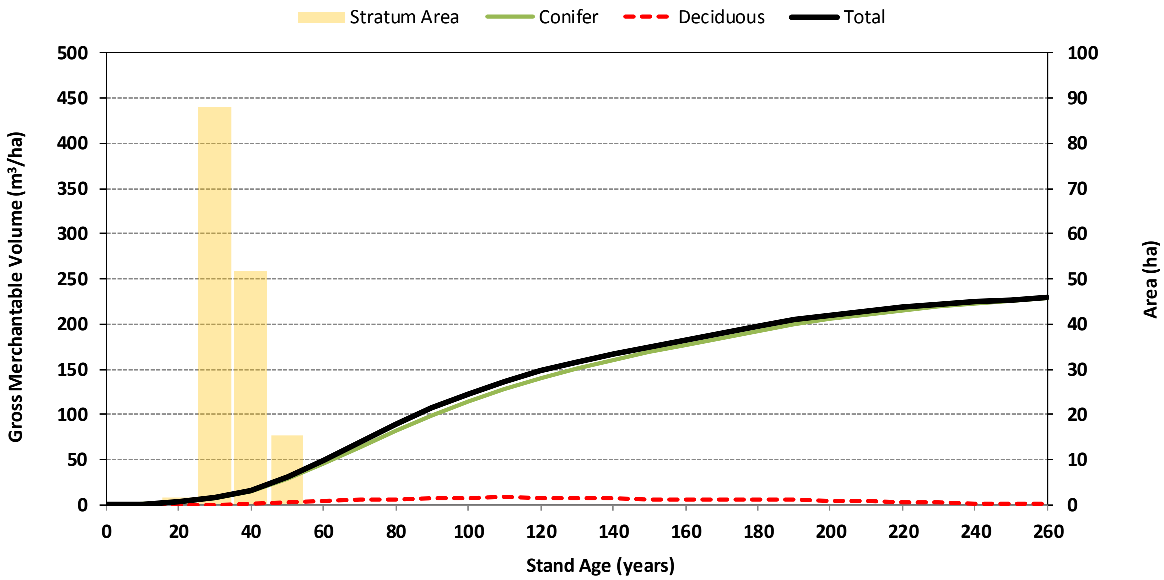
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	114,402	22
Deciduous	15/10/15/366/TL	36,408	7
Total		150,839	30

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

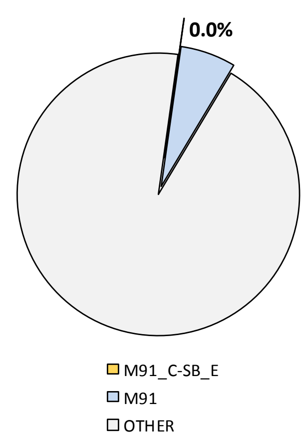
STRATUM: C-SB_E



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.6	0.0	0.6	0.06	0.00	0.06
20	3.0	0.0	3.0	0.15	0.00	0.15
30	7.6	0.1	7.7	0.25	0.00	0.26
40	15.7	0.8	16.5	0.39	0.02	0.41
50	28.6	2.3	31.0	0.57	0.05	0.62
60	45.5	4.0	49.5	0.76	0.07	0.83
70	64.0	5.4	69.3	0.91	0.08	0.99
80	82.4	6.5	88.9	1.03	0.08	1.11
90	99.6	7.5	107.1	1.11	0.08	1.19
100	114.9	8.1	123.0	1.15	0.08	1.23
110	128.2	8.3	136.5	1.17	0.08	1.24
120	139.9	8.1	148.1	1.17	0.07	1.23
130	150.4	7.6	158.0	1.16	0.06	1.22
140	159.9	6.9	166.7	1.14	0.05	1.19
150	168.6	6.2	174.7	1.12	0.04	1.16
160	176.8	5.9	182.7	1.11	0.04	1.14
170	184.7	5.9	190.6	1.09	0.03	1.12
180	192.3	5.8	198.0	1.07	0.03	1.10
190	199.1	5.4	204.6	1.05	0.03	1.08
200	205.3	4.8	210.1	1.03	0.02	1.05
210	210.7	3.9	214.7	1.00	0.02	1.02
220	215.4	3.1	218.6	0.98	0.01	0.99
230	219.5	2.6	222.0	0.95	0.01	0.97
240	222.9	1.9	224.8	0.93	0.01	0.94
250	225.8	1.4	227.2	0.90	0.01	0.91
260	228.3	1.0	229.3	0.88	0.00	0.88

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_C-SB_E	157	0.0%

Stratum % of the Active Landbase



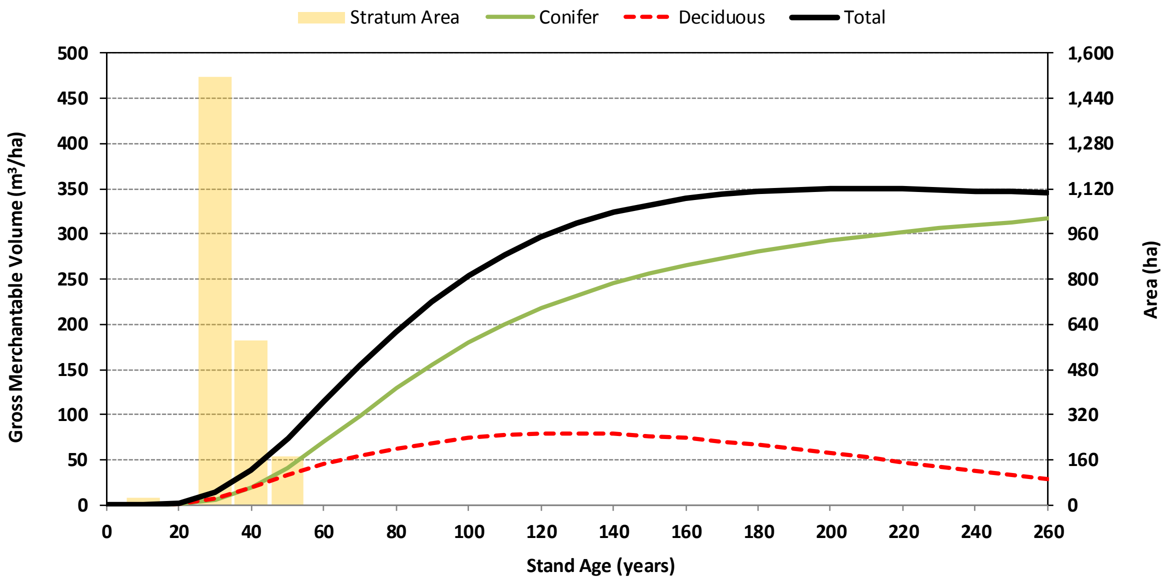
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	1,918	12
Deciduous	15/10/15/366/TL	84	1
Total		2,015	13

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

STRATUM: C-SW_E

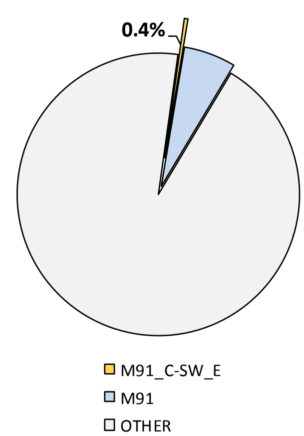


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.1	0.0	0.1	0.01	0.00	0.01
20	1.1	1.1	2.2	0.06	0.06	0.11
30	6.2	8.0	14.3	0.21	0.27	0.48
40	19.2	20.2	39.4	0.48	0.51	0.98
50	41.2	33.2	74.4	0.82	0.66	1.49
60	69.4	44.9	114.3	1.16	0.75	1.91
70	99.7	54.8	154.5	1.42	**0.78**	2.21
80	128.9	62.5	191.3	1.61	0.78	2.39
90	155.7	68.8	224.5	1.73	0.76	2.49
100	179.3	74.0	253.3	1.79	0.74	**2.53**
110	199.9	77.6	277.4	**1.82**	0.71	2.52
120	217.6	79.4	297.0	1.81	0.66	2.47
130	232.5	79.6	312.2	1.79	0.61	2.40
140	245.1	78.7	323.8	1.75	0.56	2.31
150	255.9	76.7	332.5	1.71	0.51	2.22
160	265.0	73.9	338.9	1.66	0.46	2.12
170	273.0	70.6	343.6	1.61	0.42	2.02
180	280.2	66.7	346.9	1.56	0.37	1.93
190	286.6	62.3	348.9	1.51	0.33	1.84
200	292.3	57.5	349.8	1.46	0.29	1.75
210	297.4	52.5	350.0	1.42	0.25	1.67
220	302.0	47.6	349.7	1.37	0.22	1.59
230	306.2	42.6	348.8	1.33	0.19	1.52
240	309.9	37.5	347.5	1.29	0.16	1.45
250	313.5	33.3	346.8	1.25	0.13	1.39
260	316.8	29.4	346.2	1.22	0.11	1.33

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_C-SW_E	2,300	0.4%

Stratum % of the Active Landbase



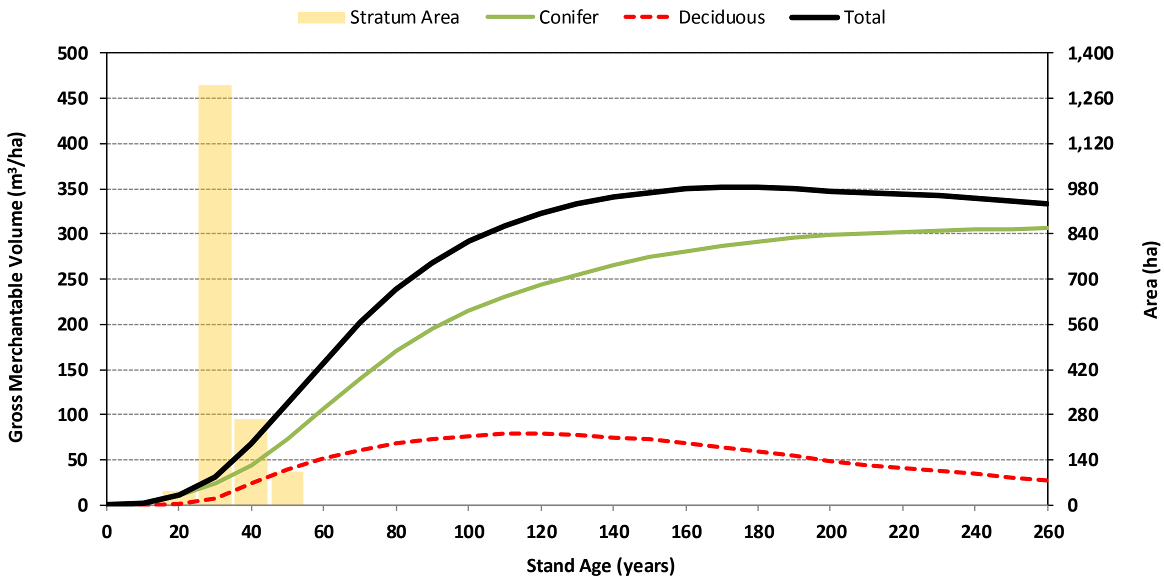
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	27,743	12
Deciduous	15/10/15/366/TL	29,687	13
Total		57,455	25

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

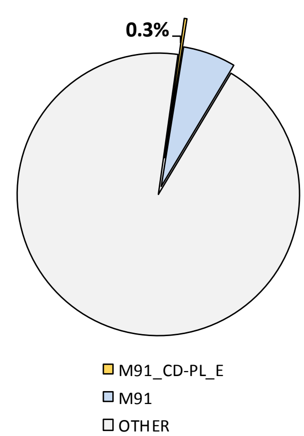
STRATUM: CD-PL_E



Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	1.3	0.0	1.3	0.13	0.00	0.13
20	9.7	0.8	10.6	0.49	0.04	0.53
30	23.7	7.7	31.4	0.79	0.26	1.05
40	44.4	23.6	68.0	1.11	0.59	1.70
50	73.4	39.4	112.8	1.47	0.79	2.26
60	107.0	51.4	158.5	1.78	0.86	2.64
70	140.8	61.0	201.7	2.01	0.87	2.88
80	170.5	68.1	238.5	2.13	0.85	2.98
90	195.1	73.2	268.3	2.17	0.81	2.98
100	214.7	76.7	291.5	2.15	0.77	2.91
110	230.5	78.5	309.0	2.10	0.71	2.81
120	243.9	78.6	322.5	2.03	0.65	2.69
130	255.4	77.5	332.9	1.96	0.60	2.56
140	265.4	75.3	340.7	1.90	0.54	2.43
150	273.9	72.3	346.3	1.83	0.48	2.31
160	281.1	68.6	349.7	1.76	0.43	2.19
170	287.0	64.3	351.3	1.69	0.38	2.07
180	291.7	59.5	351.2	1.62	0.33	1.95
190	295.5	54.2	349.7	1.56	0.29	1.84
200	298.5	48.7	347.2	1.49	0.24	1.74
210	300.9	44.5	345.4	1.43	0.21	1.64
220	302.7	41.3	344.0	1.38	0.19	1.56
230	304.1	38.0	342.1	1.32	0.17	1.49
240	305.1	34.5	339.6	1.27	0.14	1.42
250	305.8	31.0	336.8	1.22	0.12	1.35
260	306.2	27.3	333.5	1.18	0.10	1.28

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_CD-PL_E	1,712	0.3%

Stratum % of the Active Landbase



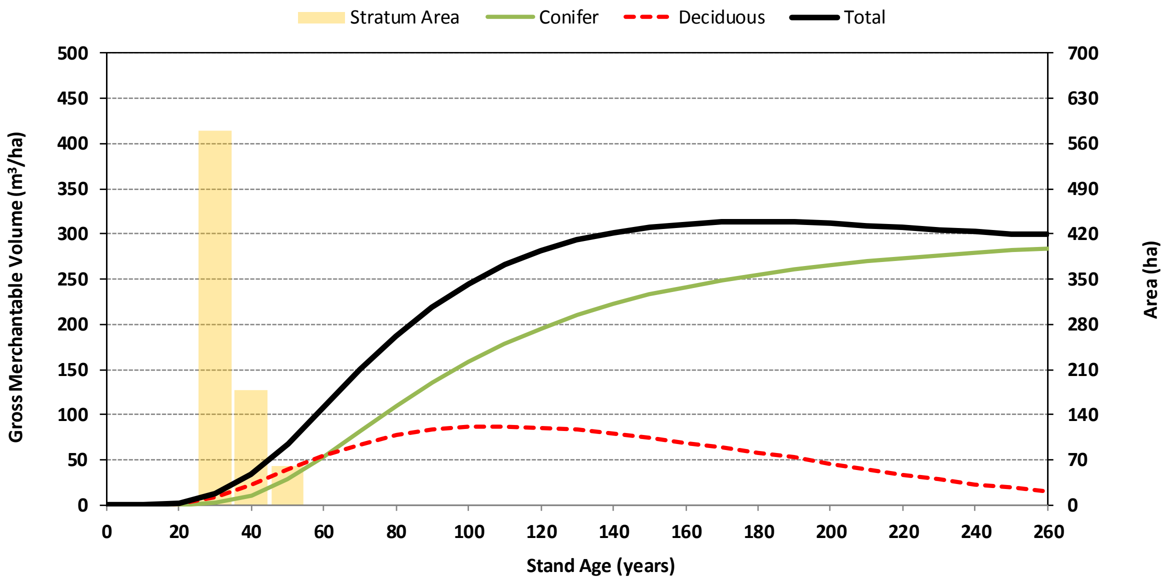
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	50,553	30
Deciduous	15/10/15/366/TL	20,341	12
Total		70,936	41

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

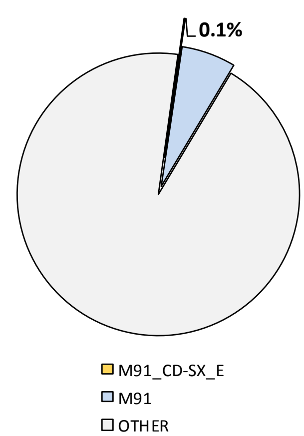
STRATUM: CD-SX_E



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.5	1.4	1.8	0.02	0.07	0.09
30	2.6	9.4	12.1	0.09	0.31	0.40
40	10.4	23.2	33.6	0.26	0.58	0.84
50	28.4	38.7	67.1	0.57	0.77	1.34
60	53.9	54.4	108.3	0.90	0.91	1.81
70	82.0	67.6	149.6	1.17	0.97	2.14
80	109.8	77.3	187.0	1.37	0.97	2.34
90	135.7	83.3	219.0	1.51	0.93	2.43
100	158.8	86.3	245.1	1.59	0.86	2.45
110	178.7	87.1	265.7	1.62	0.79	2.42
120	195.6	85.8	281.4	1.63	0.72	2.35
130	210.0	83.0	293.0	1.62	0.64	2.25
140	222.3	78.9	301.2	1.59	0.56	2.15
150	232.7	74.0	306.8	1.55	0.49	2.05
160	241.5	69.1	310.6	1.51	0.43	1.94
170	248.9	64.0	313.0	1.46	0.38	1.84
180	255.2	58.4	313.7	1.42	0.32	1.74
190	260.6	52.5	313.1	1.37	0.28	1.65
200	265.3	46.2	311.5	1.33	0.23	1.56
210	269.4	39.7	309.1	1.28	0.19	1.47
220	273.0	33.8	306.8	1.24	0.15	1.39
230	276.2	28.3	304.5	1.20	0.12	1.32
240	279.1	23.4	302.4	1.16	0.10	1.26
250	281.7	18.9	300.6	1.13	0.08	1.20
260	284.0	15.1	299.1	1.09	0.06	1.15

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_CD-SX_E	823	0.1%

Stratum % of the Active Landbase



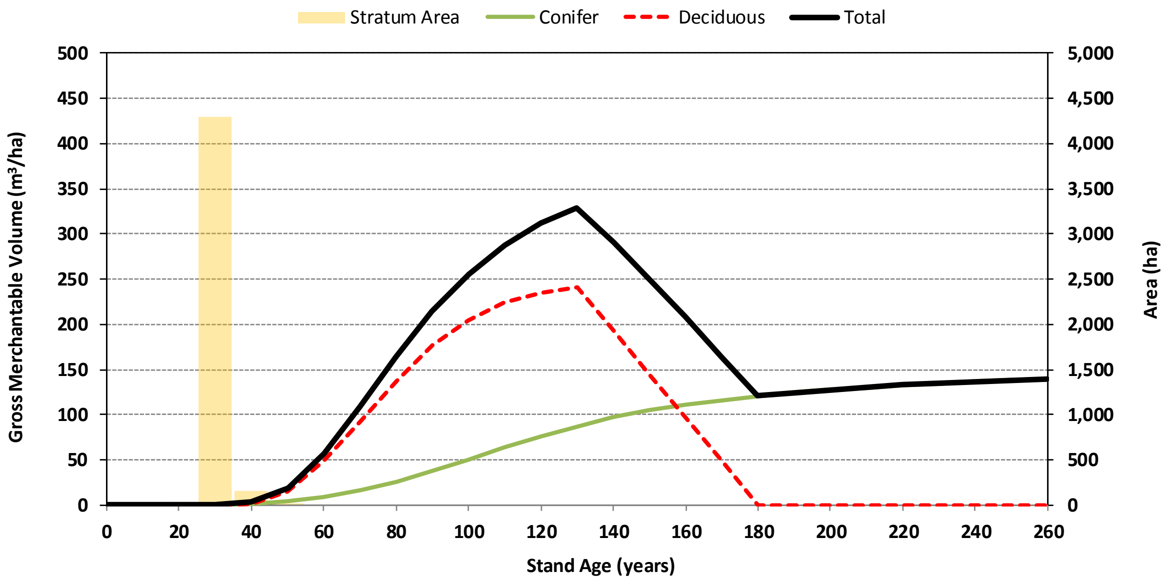
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	5,115	6
Deciduous	15/10/15/366/TL	11,974	15
Total		17,110	21

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

STRATUM: D-HW_W_E

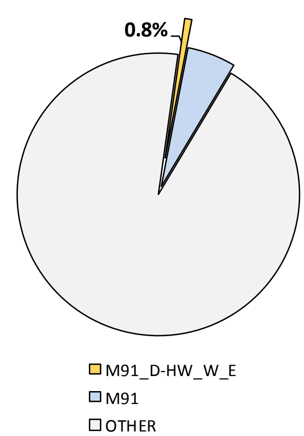


Stand Age	Gross Merchantable Volume (m^3/ha) Conifer	Deciduous	Total	Mean Annual Increment (m^3/ha/year) Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.0	0.0	0.0	0.00	0.00	0.00
30	0.1	0.0	0.1	0.00	0.00	0.00
40	1.4	1.7	3.1	0.03	0.04	0.08
50	3.7	15.4	19.1	0.07	0.31	0.38
60	8.5	48.4	57.0	0.14	0.81	0.95
70	16.4	93.0	109.5	0.23	1.33	1.56
80	26.2	137.7	163.9	0.33	1.72	2.05
90	37.6	176.8	214.4	0.42	1.96	2.38
100	50.1	205.1	255.2	0.50	2.05	2.55
110	63.5	223.6	287.1	0.58	2.03	2.61
120	76.4	235.1	311.5	0.64	1.96	2.60
130	87.4	241.6	329.0	0.67	1.86	2.53
140	96.8	193.2	290.0	0.69	1.38	2.07
150	104.6	144.9	249.5	0.70	0.97	1.66
160	111.0	96.6	207.6	0.69	0.60	1.30
170	116.4	48.3	164.7	0.68	0.28	0.97
180	120.8	0.0	120.8	0.67	0.00	0.67
190	124.5	0.0	124.5	0.66	0.00	0.66
200	127.6	0.0	127.6	0.64	0.00	0.64
210	130.3	0.0	130.3	0.62	0.00	0.62
220	132.6	0.0	132.6	0.60	0.00	0.60
230	134.6	0.0	134.6	0.59	0.00	0.59
240	136.4	0.0	136.4	0.57	0.00	0.57
250	138.0	0.0	138.0	0.55	0.00	0.55
260	139.4	0.0	139.4	0.54	0.00	0.54

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_D-HW_W_E	4,494	0.8%

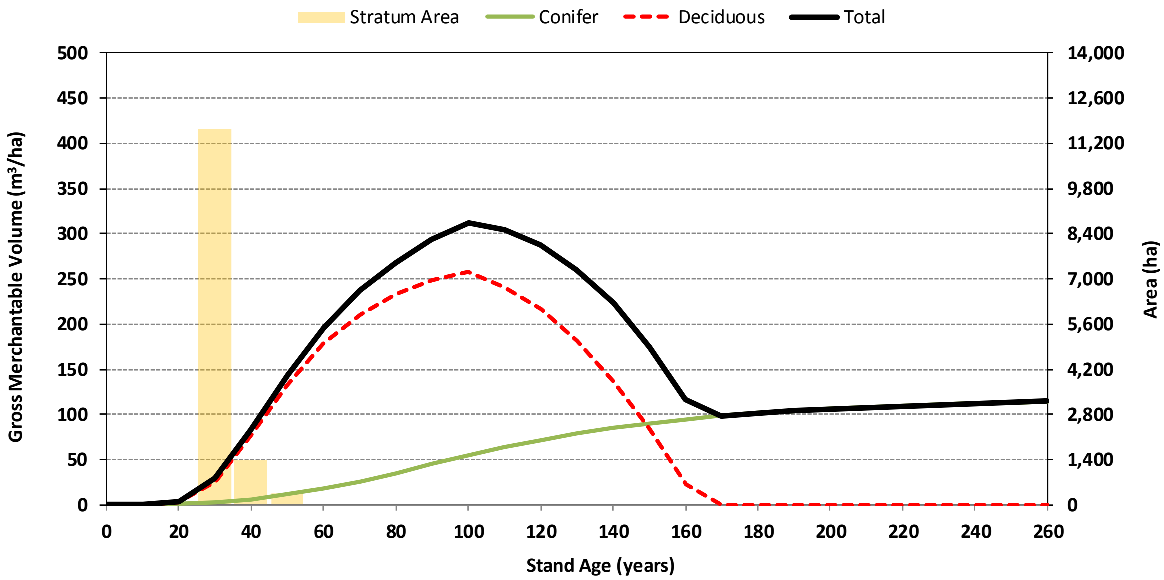
Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	m3/ha
Conifer	15/11/15/366/TL	572	0
Deciduous	15/10/15/366/TL	420	0
Total		993	0

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS FMA # 0900046 YIELD CURVES	PRE-1991 CUTBLOCKS STRATUM: D-HW_X_E

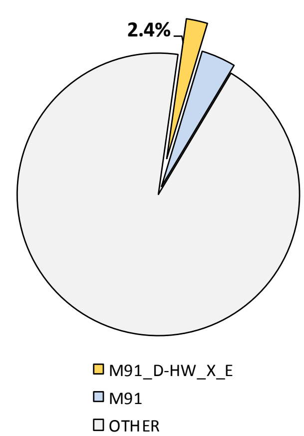


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.1	0.00	0.00	0.01
20	0.9	2.6	3.6	0.05	0.13	0.18
30	3.0	25.8	28.8	0.10	0.86	0.96
40	6.5	77.0	83.4	0.16	1.92	2.09
50	11.2	133.2	144.4	0.22	2.66	2.89
60	17.6	178.7	196.3	0.29	2.98	3.27
70	25.7	211.0	236.7	0.37	3.01	3.38
80	35.1	233.2	268.3	0.44	2.91	3.35
90	45.0	248.1	293.0	0.50	2.76	3.26
100	54.5	257.5	312.0	0.55	2.57	3.12
110	63.6	241.5	305.1	0.58	2.20	2.77
120	71.9	216.2	288.1	0.60	1.80	2.40
130	79.0	181.6	260.6	0.61	1.40	2.00
140	85.2	137.8	223.0	0.61	0.98	1.59
150	90.4	84.7	175.1	0.60	0.56	1.17
160	94.7	22.4	117.1	0.59	0.14	0.73
170	98.3	0.0	98.3	0.58	0.00	0.58
180	101.4	0.0	101.4	0.56	0.00	0.56
190	103.9	0.0	103.9	0.55	0.00	0.55
200	106.1	0.0	106.1	0.53	0.00	0.53
210	108.0	0.0	108.0	0.51	0.00	0.51
220	109.6	0.0	109.6	0.50	0.00	0.50
230	111.0	0.0	111.0	0.48	0.00	0.48
240	112.2	0.0	112.2	0.47	0.00	0.47
250	113.3	0.0	113.3	0.45	0.00	0.45
260	114.3	0.0	114.3	0.44	0.00	0.44

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_D-HW_X_E	13,406	2.4%

Stratum % of the Active Landbase



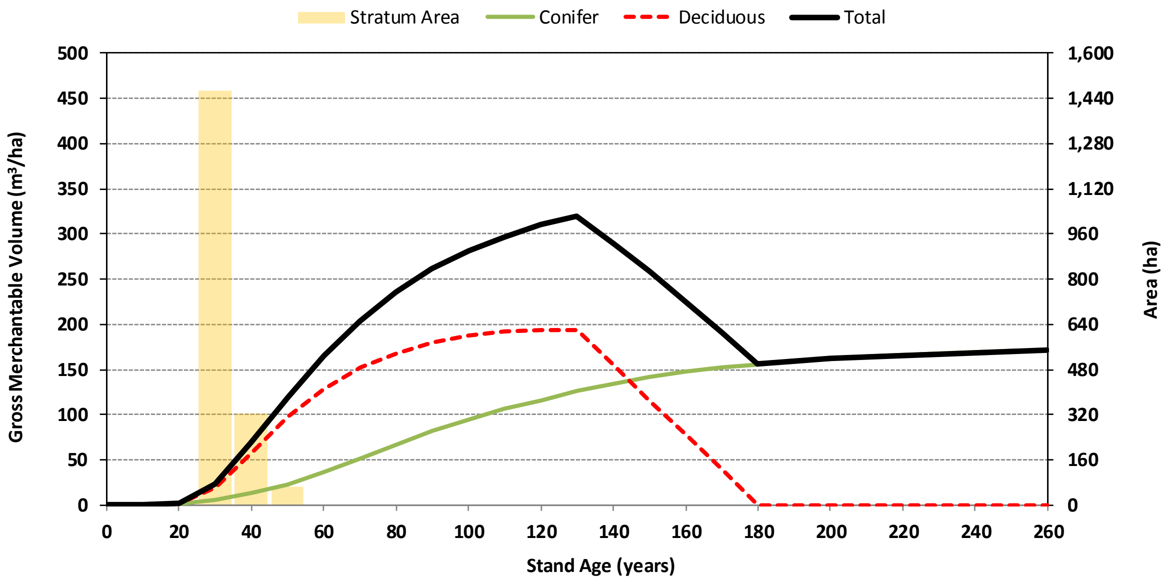
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	48,368	4
Deciduous	15/10/15/366/TL	454,599	34
Total		503,004	38

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

STRATUM: DC-PL_E

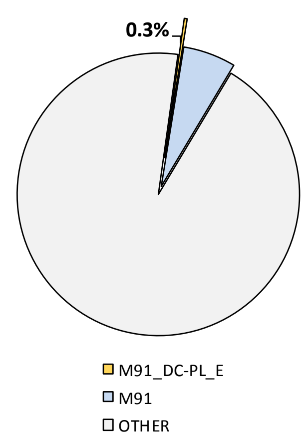


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	1.1	1.6	2.7	0.05	0.08	0.13
30	5.2	18.9	24.1	0.17	0.63	0.80
40	12.8	57.2	70.0	0.32	1.43	1.75
50	23.1	96.8	119.9	0.46	1.94	2.40
60	36.4	128.6	165.0	0.61	2.14	2.75
70	51.9	152.0	203.9	0.74	2.17	2.91
80	67.1	168.5	235.6	0.84	2.11	2.94
90	81.5	179.7	261.2	0.91	2.00	2.90
100	94.3	187.0	281.3	0.94	1.87	2.81
110	105.9	191.5	297.4	0.96	1.74	2.70
120	116.5	193.7	310.2	0.97	1.61	2.58
130	126.1	193.8	319.9	0.97	1.49	2.46
140	134.5	155.0	289.5	0.96	1.11	2.07
150	141.6	116.3	257.9	0.94	0.78	1.72
160	147.5	77.5	225.0	0.92	0.48	1.41
170	152.3	38.8	191.1	0.90	0.23	1.12
180	156.3	0.0	156.3	0.87	0.00	0.87
190	159.5	0.0	159.5	0.84	0.00	0.84
200	162.2	0.0	162.2	0.81	0.00	0.81
210	164.4	0.0	164.4	0.78	0.00	0.78
220	166.2	0.0	166.2	0.76	0.00	0.76
230	167.7	0.0	167.7	0.73	0.00	0.73
240	169.0	0.0	169.0	0.70	0.00	0.70
250	170.0	0.0	170.0	0.68	0.00	0.68
260	170.9	0.0	170.9	0.66	0.00	0.66

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_DC-PL_E	1,856	0.3%

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	13,270	7
Deciduous	15/10/15/366/TL	52,577	28
Total		65,882	35

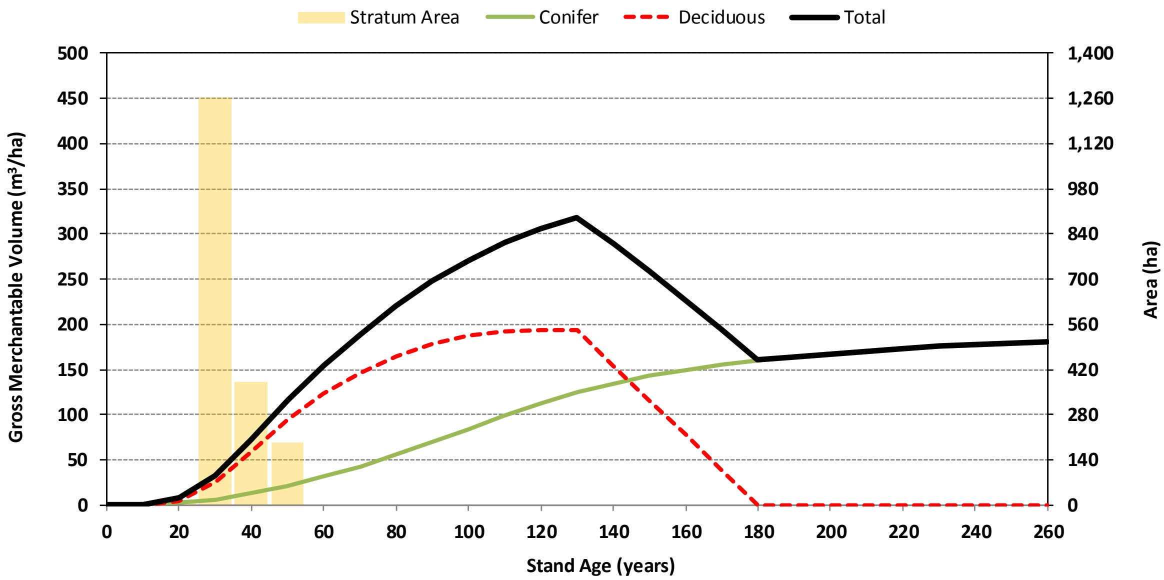
Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

Weyerhaeuser

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

PRE-1991 CUTBLOCKS

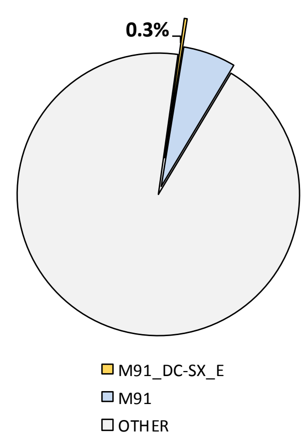
STRATUM: DC-SX_E



Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.7	0.2	0.9	0.07	0.02	0.09
20	2.9	4.6	7.5	0.15	0.23	0.37
30	6.5	25.8	32.3	0.22	0.86	1.08
40	12.8	60.0	72.8	0.32	1.50	1.82
50	21.3	94.6	115.9	0.43	1.89	2.32
60	31.3	123.5	154.9	0.52	2.06	2.58
70	42.9	145.9	188.8	0.61	2.08	2.70
80	56.2	164.0	220.1	0.70	2.05	2.75
90	70.1	177.7	247.9	0.78	1.97	2.75
100	84.2	187.0	271.2	0.84	1.87	2.71
110	98.3	192.4	290.6	0.89	1.75	2.64
120	112.1	194.3	306.4	0.93	1.62	2.55
130	124.8	193.3	318.1	0.96	1.49	2.45
140	134.7	154.6	289.3	0.96	1.10	2.07
150	143.0	116.0	258.9	0.95	0.77	1.73
160	149.8	77.3	227.1	0.94	0.48	1.42
170	155.4	38.7	194.1	0.91	0.23	1.14
180	160.2	0.0	160.2	0.89	0.00	0.89
190	164.2	0.0	164.2	0.86	0.00	0.86
200	167.6	0.0	167.6	0.84	0.00	0.84
210	170.6	0.0	170.6	0.81	0.00	0.81
220	173.1	0.0	173.1	0.79	0.00	0.79
230	175.4	0.0	175.4	0.76	0.00	0.76
240	177.4	0.0	177.4	0.74	0.00	0.74
250	179.1	0.0	179.1	0.72	0.00	0.72
260	180.7	0.0	180.7	0.69	0.00	0.69

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	M91	35,103	6.4%
Stratum	M91_DC-SX_E	1,845	0.3%

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	17,212	9
Deciduous	15/10/15/366/TL	73,838	40
Total		91,100	49

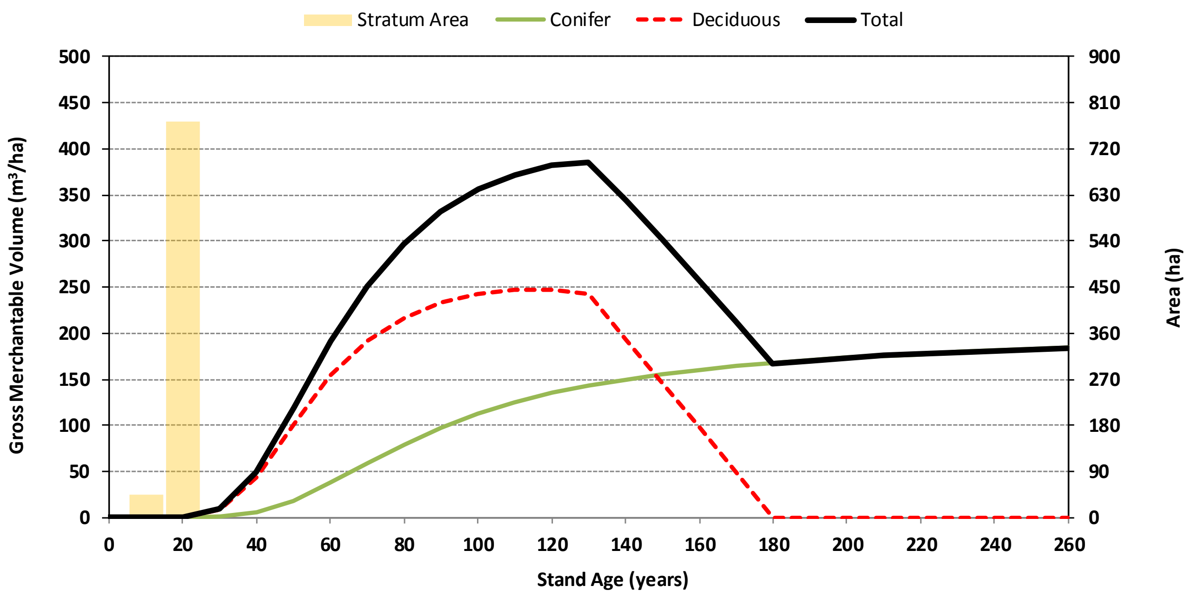
Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

Appendix IV – Post-1991 Managed Stand Yield Tables

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: Hw

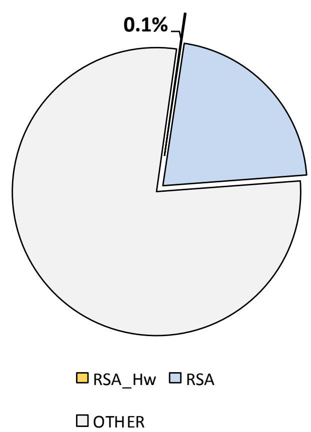


Stand Age	Gross Merchantable Volume (m^3/ha) Conifer	Deciduous	Total	Mean Annual Increment (m^3/ha/year) Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.0	0.3	0.4	0.00	0.02	0.02
30	0.7	8.2	8.9	0.02	0.27	0.30
40	5.7	44.1	49.8	0.14	1.10	1.24
50	18.6	101.3	119.9	0.37	2.03	2.40
60	37.8	153.3	191.2	0.63	2.56	3.19
70	59.2	191.4	250.6	0.85	**2.73**	3.58
80	79.7	217.2	296.9	1.00	2.71	**3.71**
90	97.6	233.6	331.2	1.08	2.60	3.68
100	112.7	243.0	355.7	1.13	2.43	3.56
110	125.0	247.0	372.0	**1.14**	2.25	3.38
120	135.0	246.7	381.7	1.13	2.06	3.18
130	143.2	242.9	386.1	1.10	1.87	2.97
140	149.9	194.3	344.2	1.07	1.39	2.46
150	155.5	145.7	301.2	1.04	0.97	2.01
160	160.2	97.1	257.3	1.00	0.61	1.61
170	164.1	48.6	212.7	0.97	0.29	1.25
180	167.5	0.0	167.5	0.93	0.00	0.93
190	170.5	0.0	170.5	0.90	0.00	0.90
200	173.2	0.0	173.2	0.87	0.00	0.87
210	175.5	0.0	175.5	0.84	0.00	0.84
220	177.6	0.0	177.6	0.81	0.00	0.81
230	179.4	0.0	179.4	0.78	0.00	0.78
240	181.1	0.0	181.1	0.75	0.00	0.75
250	182.6	0.0	182.6	0.73	0.00	0.73
260	183.9	0.0	183.9	0.71	0.00	0.71

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Hw**	**822**	**0.1%**

Stratum % of the Active Landbase



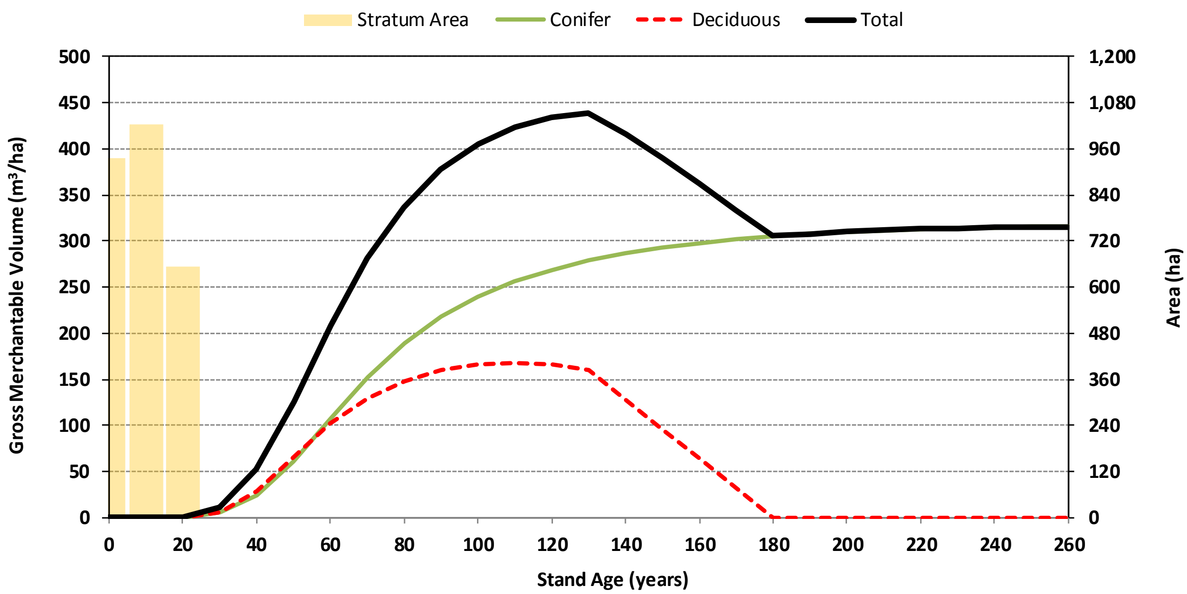
FMA Baseline Utilization		Standing Timber m3	m3/ha
Conifer	15/11/15/366/TL	19	0
Deciduous	15/10/15/366/TL	308	0
Total		327	0

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

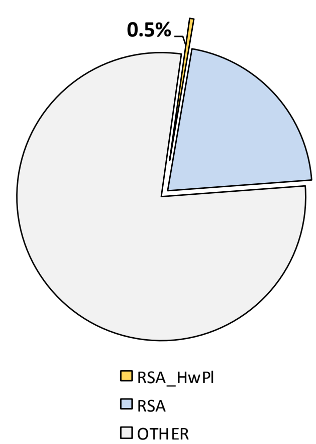
STRATUM: HwPl



Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.5	0.3	0.8	0.02	0.02	0.04
30	5.6	5.6	11.2	0.19	0.19	0.37
40	24.2	28.5	52.7	0.60	0.71	1.32
50	60.6	65.8	126.5	1.21	1.32	2.53
60	107.3	101.6	208.9	1.79	1.69	3.48
70	152.1	129.0	281.1	2.17	1.84	4.02
80	189.0	147.9	336.9	2.36	1.85	4.21
90	217.5	159.7	377.2	2.42	1.77	4.19
100	239.2	165.9	405.1	2.39	1.66	4.05
110	255.9	167.6	423.5	2.33	1.52	3.85
120	268.7	165.7	434.4	2.24	1.38	3.62
130	278.7	160.8	439.5	2.14	1.24	3.38
140	286.6	128.7	415.3	2.05	0.92	2.97
150	292.9	96.5	389.4	1.95	0.64	2.60
160	297.9	64.3	362.3	1.86	0.40	2.26
170	302.0	32.2	334.2	1.78	0.19	1.97
180	305.3	0.0	305.3	1.70	0.00	1.70
190	308.0	0.0	308.0	1.62	0.00	1.62
200	310.1	0.0	310.1	1.55	0.00	1.55
210	311.8	0.0	311.8	1.48	0.00	1.48
220	313.2	0.0	313.2	1.42	0.00	1.42
230	314.2	0.0	314.2	1.37	0.00	1.37
240	315.0	0.0	315.0	1.31	0.00	1.31
250	315.5	0.0	315.5	1.26	0.00	1.26
260	315.7	0.0	315.7	1.21	0.00	1.21

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_HwPl**	**2,615**	**0.5%**

Stratum % of the Active Landbase



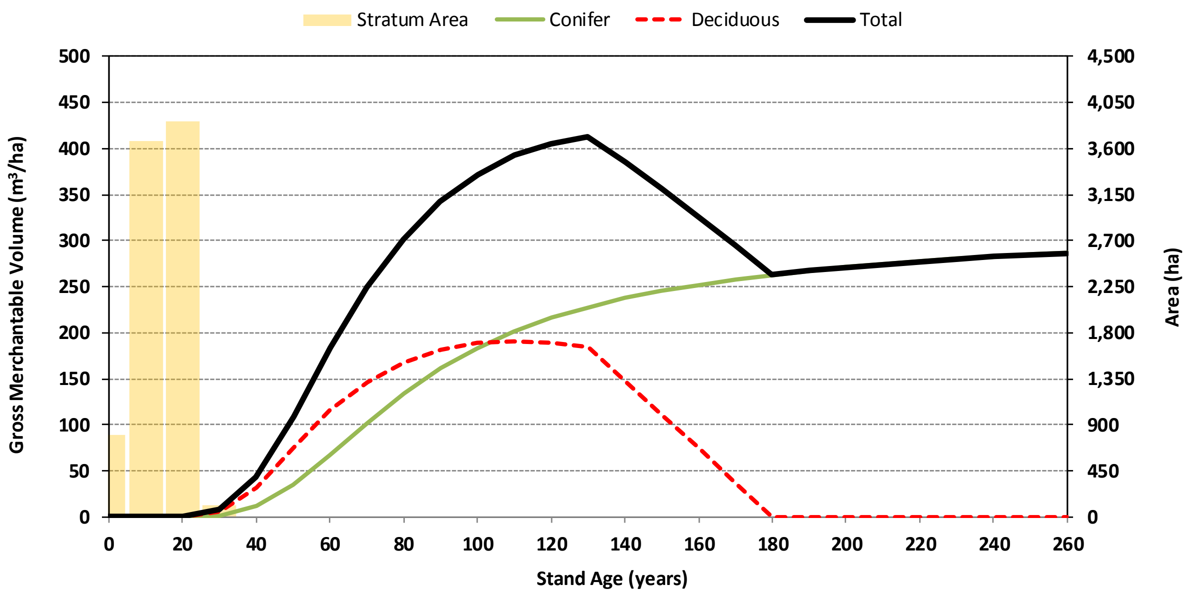
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	293	0
Deciduous	15/10/15/366/TL	196	0
Total		489	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: HwSx

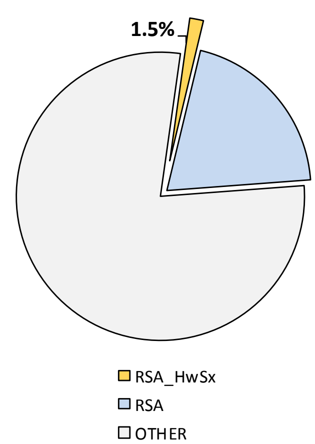


Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.0	0.2	0.3	0.00	0.01	0.01
30	1.7	5.9	7.6	0.06	0.20	0.25
40	11.8	31.7	43.5	0.30	0.79	1.09
50	35.1	74.6	109.7	0.70	1.49	2.19
60	67.3	115.7	183.1	1.12	1.93	3.05
70	101.8	146.9	248.7	1.45	2.10	3.55
80	133.8	168.1	301.9	1.67	2.10	3.77
90	161.0	181.4	342.4	1.79	2.02	3.80
100	183.4	188.6	371.9	1.83	1.89	3.72
110	201.4	190.9	392.3	1.83	1.74	3.57
120	216.0	189.3	405.3	1.80	1.58	3.38
130	227.8	184.6	412.3	1.75	1.42	3.17
140	237.4	147.7	385.1	1.70	1.05	2.75
150	245.4	110.8	356.2	1.64	0.74	2.37
160	252.2	73.8	326.0	1.58	0.46	2.04
170	257.9	36.9	294.8	1.52	0.22	1.73
180	262.8	0.0	262.8	1.46	0.00	1.46
190	267.1	0.0	267.1	1.41	0.00	1.41
200	270.9	0.0	270.9	1.35	0.00	1.35
210	274.3	0.0	274.3	1.31	0.00	1.31
220	277.3	0.0	277.3	1.26	0.00	1.26
230	280.0	0.0	280.0	1.22	0.00	1.22
240	282.4	0.0	282.4	1.18	0.00	1.18
250	284.6	0.0	284.6	1.14	0.00	1.14
260	286.6	0.0	286.6	1.10	0.00	1.10

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_HwSx**	**8,463**	**1.5%**

Stratum % of the Active Landbase



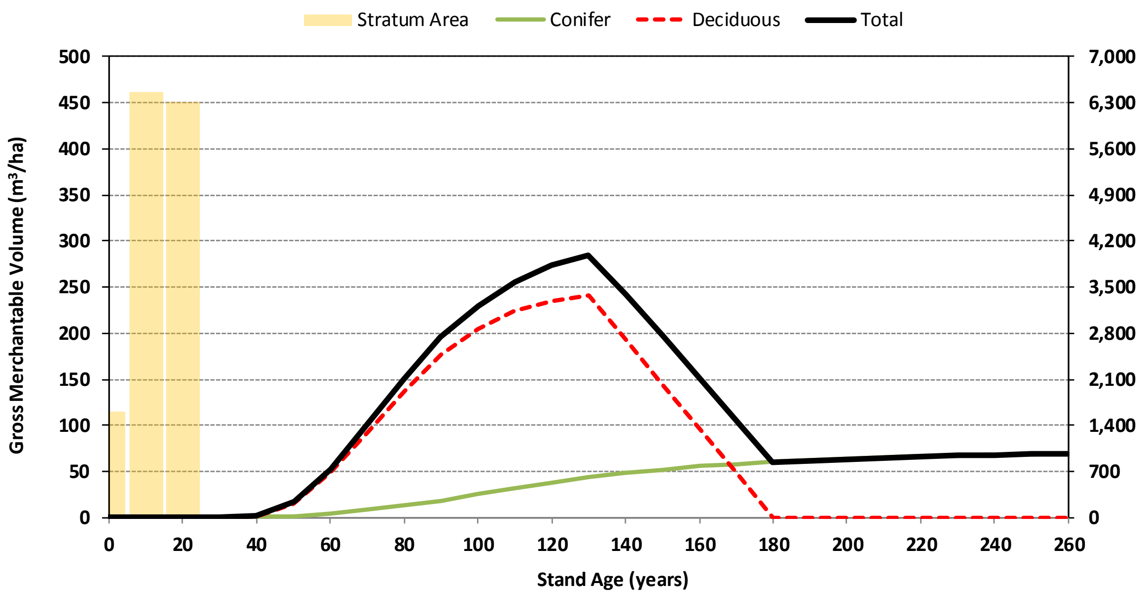
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	345	0
Deciduous	15/10/15/366/TL	1,597	0
Total		1,942	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: Hw_W

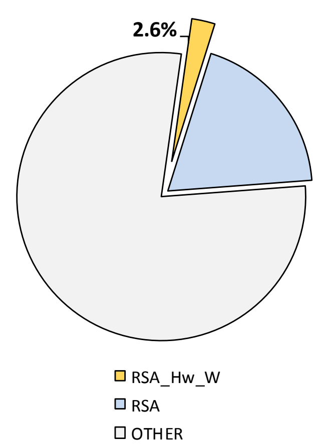


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.0	0.0	0.0	0.00	0.00	0.00
30	0.0	0.0	0.1	0.00	0.00	0.00
40	0.7	1.7	2.4	0.02	0.04	0.06
50	1.9	15.4	17.2	0.04	0.31	0.34
60	4.3	48.4	52.7	0.07	0.81	0.88
70	8.2	93.0	101.3	0.12	1.33	1.45
80	13.1	137.7	150.8	0.16	1.72	1.88
90	18.8	176.8	195.6	0.21	1.96	2.17
100	25.1	205.1	230.2	0.25	2.05	2.30
110	31.7	223.6	255.3	0.29	2.03	2.32
120	38.2	235.1	273.3	0.32	1.96	2.28
130	43.7	241.6	285.3	0.34	1.86	2.19
140	48.4	193.2	241.6	0.35	1.38	1.73
150	52.3	144.9	197.2	0.35	0.97	1.31
160	55.5	96.6	152.1	0.35	0.60	0.95
170	58.2	48.3	106.5	0.34	0.28	0.63
180	60.4	0.0	60.4	0.34	0.00	0.34
190	62.2	0.0	62.2	0.33	0.00	0.33
200	63.8	0.0	63.8	0.32	0.00	0.32
210	65.2	0.0	65.2	0.31	0.00	0.31
220	66.3	0.0	66.3	0.30	0.00	0.30
230	67.3	0.0	67.3	0.29	0.00	0.29
240	68.2	0.0	68.2	0.28	0.00	0.28
250	69.0	0.0	69.0	0.28	0.00	0.28
260	69.7	0.0	69.7	0.27	0.00	0.27

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Hw_W**	**14,365**	**2.6%**

Stratum % of the Active Landbase



FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	0	0
Deciduous	15/10/15/366/TL	0	0
Total		0	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
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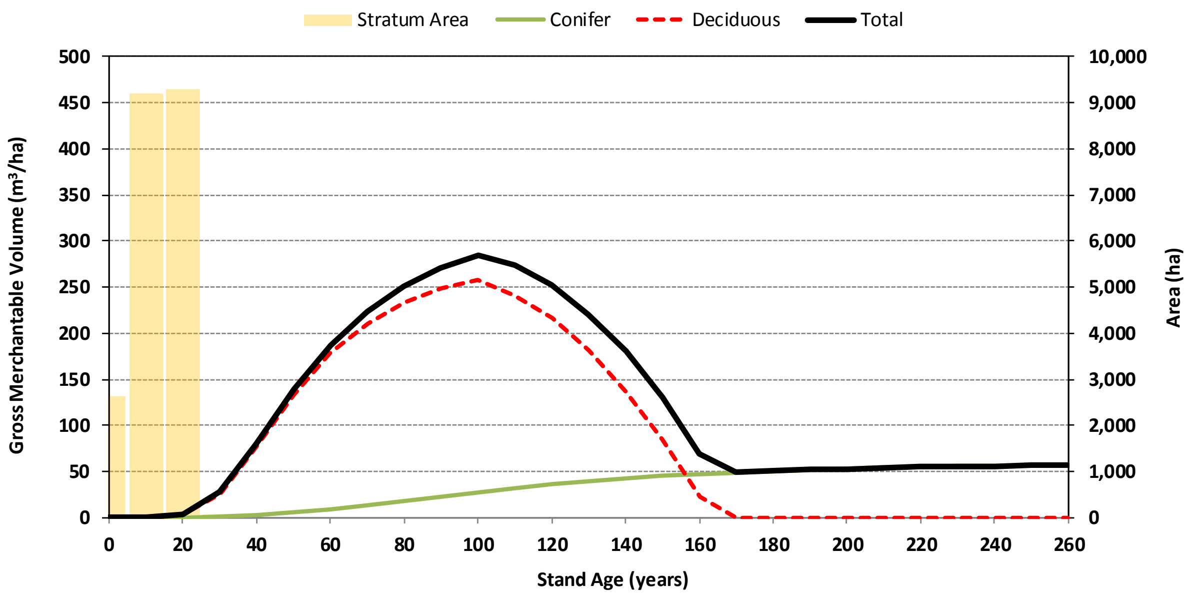
POST-1991 MANAGED STANDS

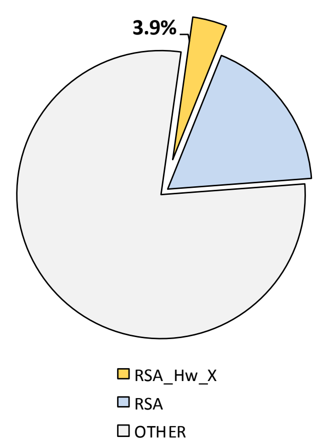
STRATUM: Hw_X



Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.5	2.6	3.1	0.02	0.13	0.15
30	1.5	25.8	27.3	0.05	0.86	0.91
40	3.2	77.0	80.2	0.08	1.92	2.00
50	5.6	133.2	138.8	0.11	2.66	2.78
60	8.8	178.7	187.5	0.15	2.98	3.12
70	12.9	211.0	223.8	0.18	**3.01**	**3.20**
80	17.6	233.2	250.8	0.22	2.91	3.13
90	22.5	248.1	270.5	0.25	2.76	3.01
100	27.3	257.5	284.8	0.27	2.57	2.85
110	31.8	241.5	273.3	0.29	2.20	2.48
120	36.0	216.2	252.1	0.30	1.80	2.10
130	39.5	181.6	221.1	0.30	1.40	1.70
140	42.6	137.8	180.4	**0.30**	0.98	1.29
150	45.2	84.7	129.9	0.30	0.56	0.87
160	47.4	22.4	69.7	0.30	0.14	0.44
170	49.2	0.0	49.2	0.29	0.00	0.29
180	50.7	0.0	50.7	0.28	0.00	0.28
190	52.0	0.0	52.0	0.27	0.00	0.27
200	53.0	0.0	53.0	0.27	0.00	0.27
210	54.0	0.0	54.0	0.26	0.00	0.26
220	54.8	0.0	54.8	0.25	0.00	0.25
230	55.5	0.0	55.5	0.24	0.00	0.24
240	56.1	0.0	56.1	0.23	0.00	0.23
250	56.7	0.0	56.7	0.23	0.00	0.23
260	57.1	0.0	57.1	0.22	0.00	0.22

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Hw_X**	**21,228**	**3.9%**

Stratum % of the Active Landbase



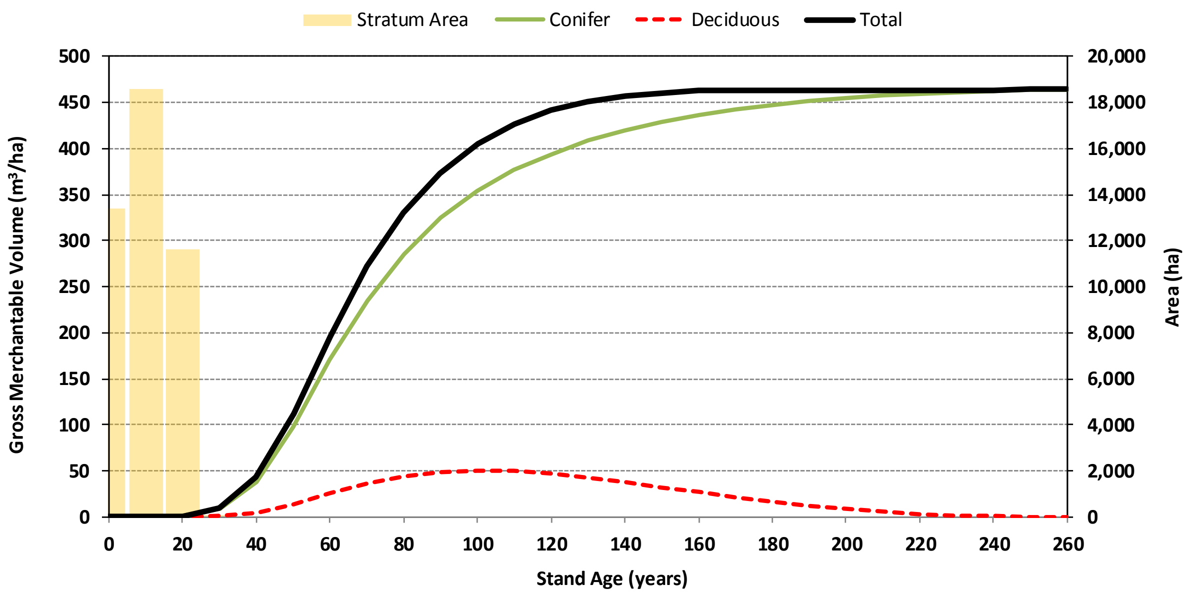
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	4,676	0
Deciduous	15/10/15/366/TL	26,553	1
Total		31,231	1

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: Pl

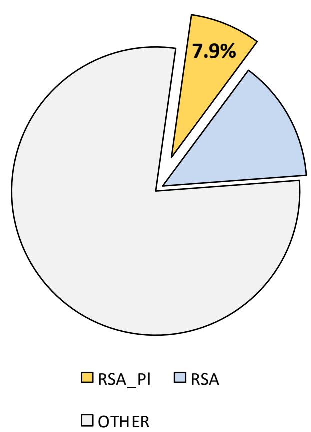


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.6	0.0	0.6	0.03	0.00	0.03
30	8.3	0.7	9.0	0.28	0.02	0.30
40	38.4	4.8	43.2	0.96	0.12	1.08
50	97.8	14.1	111.9	1.96	0.28	2.24
60	170.1	26.0	196.1	2.84	0.43	3.27
70	234.9	36.7	271.6	3.36	0.52	3.88
80	285.7	44.6	330.3	3.57	0.56	4.13
90	324.4	49.2	373.6	3.60	0.55	4.15
100	353.9	50.7	404.5	3.54	0.51	4.05
110	376.6	49.7	426.3	3.42	0.45	3.88
120	394.4	46.7	441.2	3.29	0.39	3.68
130	408.5	42.6	451.1	3.14	0.33	3.47
140	419.7	37.6	457.3	3.00	0.27	3.27
150	428.8	31.9	460.7	2.86	0.21	3.07
160	436.1	26.5	462.6	2.73	0.17	2.89
170	442.2	21.3	463.5	2.60	0.13	2.73
180	447.1	16.6	463.7	2.48	0.09	2.58
190	451.2	12.4	463.6	2.37	0.07	2.44
200	454.5	8.5	463.1	2.27	0.04	2.32
210	457.3	5.4	462.7	2.18	0.03	2.20
220	459.5	3.2	462.8	2.09	0.01	2.10
230	461.4	1.8	463.1	2.01	0.01	2.01
240	462.8	0.7	463.5	1.93	0.00	1.93
250	463.9	0.4	464.3	1.86	0.00	1.86
260	464.7	0.1	464.9	1.79	0.00	1.79

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	RSA_Pl	43,661	7.9%

Stratum % of the Active Landbase



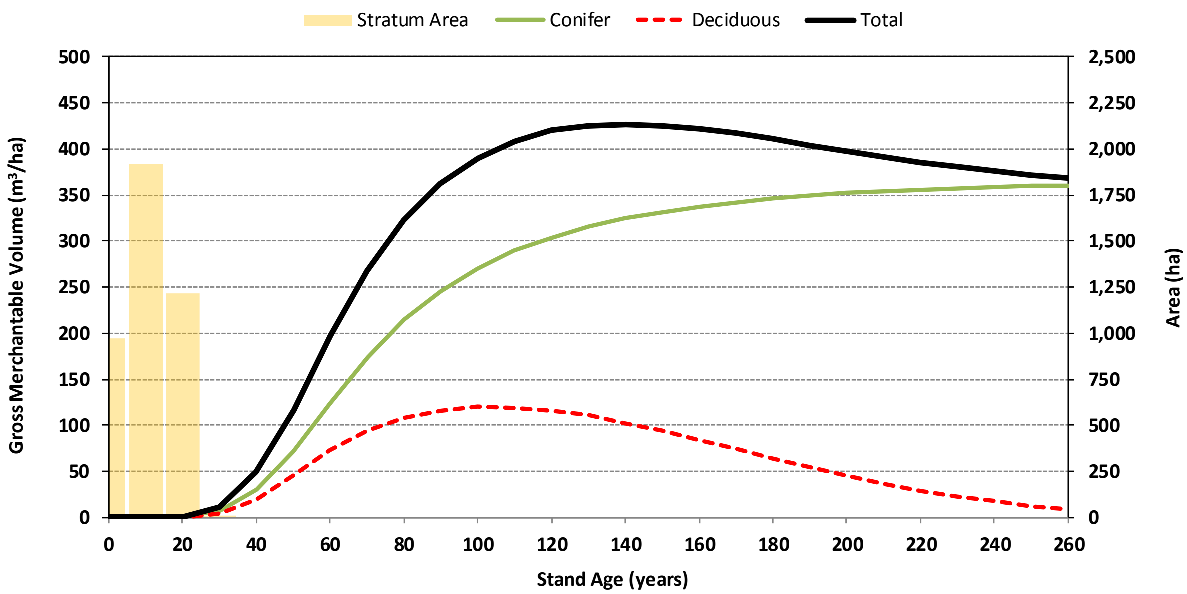
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	7,252	0
Deciduous	15/10/15/366/TL	405	0
Total		7,657	0

Note: Peak MAIs are highlighted in yellow.
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: PlHw

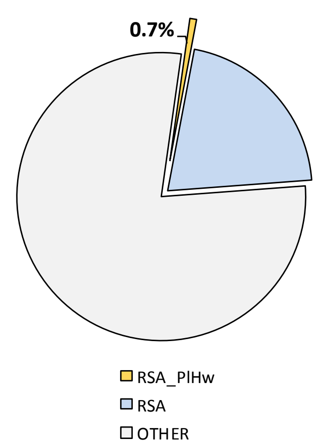


Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.7	0.2	0.9	0.03	0.01	0.04
30	7.7	3.8	11.5	0.26	0.13	0.38
40	29.7	19.5	49.2	0.74	0.49	1.23
50	71.1	46.2	117.3	1.42	0.92	2.35
60	123.8	73.0	196.8	2.06	1.22	3.28
70	173.9	93.9	267.7	2.48	1.34	3.82
80	214.7	108.0	322.7	2.68	**1.35**	**4.03**
90	246.3	116.2	362.6	**2.74**	1.29	4.03
100	270.6	119.8	390.4	2.71	1.20	3.90
110	289.4	119.5	408.9	2.63	1.09	3.72
120	303.9	116.2	420.1	2.53	0.97	3.50
130	315.3	110.5	425.8	2.43	0.85	3.28
140	324.4	102.8	427.2	2.32	0.73	3.05
150	331.7	93.9	425.6	2.21	0.63	2.84
160	337.6	84.2	421.8	2.11	0.53	2.64
170	342.4	74.4	416.8	2.01	0.44	2.45
180	346.3	64.5	410.8	1.92	0.36	2.28
190	349.5	54.4	403.9	1.84	0.29	2.13
200	352.2	44.9	397.1	1.76	0.22	1.99
210	354.4	36.5	390.9	1.69	0.17	1.86
220	356.2	29.1	385.3	1.62	0.13	1.75
230	357.6	22.7	380.3	1.55	0.10	1.65
240	358.7	17.5	376.2	1.49	0.07	1.57
250	359.5	12.7	372.2	1.44	0.05	1.49
260	360.1	8.6	368.7	1.39	0.03	1.42

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_PlHw**	**4,115**	**0.7%**

Stratum % of the Active Landbase



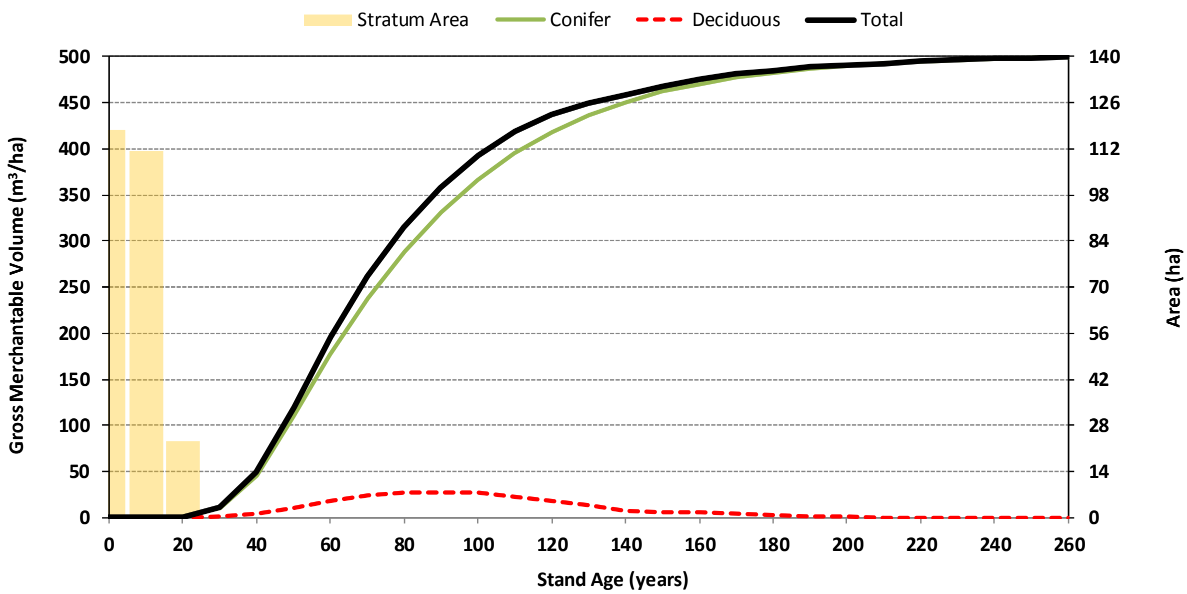
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	847	0
Deciduous	15/10/15/366/TL	271	0
Total		1,118	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

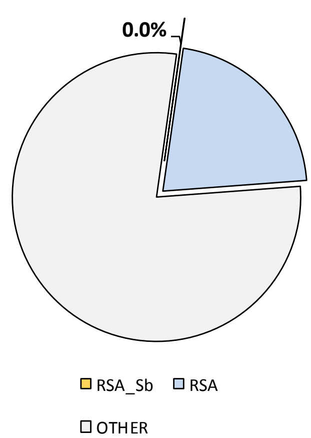
STRATUM: Sb



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.6	0.0	0.6	0.03	0.00	0.03
30	9.9	0.5	10.5	0.33	0.02	0.35
40	45.7	4.1	49.8	1.14	0.10	1.25
50	109.2	11.2	120.3	2.18	0.22	2.41
60	177.5	18.6	196.2	2.96	0.31	3.27
70	237.3	24.2	261.5	3.39	**0.35**	3.74
80	287.8	27.3	315.1	3.60	0.34	3.94
90	330.6	28.0	358.6	**3.67**	0.31	**3.98**
100	366.3	26.5	392.8	3.66	0.26	3.93
110	395.4	23.2	418.6	3.59	0.21	3.81
120	418.5	18.6	437.1	3.49	0.15	3.64
130	436.6	13.0	449.6	3.36	0.10	3.46
140	450.7	7.8	458.5	3.22	0.06	3.27
150	461.7	6.5	468.3	3.08	0.04	3.12
160	470.3	5.3	475.6	2.94	0.03	2.97
170	477.1	4.0	481.1	2.81	0.02	2.83
180	482.5	2.8	485.3	2.68	0.02	2.70
190	486.8	1.7	488.4	2.56	0.01	2.57
200	490.2	0.7	490.9	2.45	0.00	2.45
210	492.9	0.0	492.9	2.35	0.00	2.35
220	495.0	0.0	495.0	2.25	0.00	2.25
230	496.6	0.0	496.6	2.16	0.00	2.16
240	497.9	0.0	497.9	2.07	0.00	2.07
250	498.7	0.0	498.7	1.99	0.00	1.99
260	499.3	0.0	499.3	1.92	0.00	1.92

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Sb**	**252**	**0.0%**

Stratum % of the Active Landbase



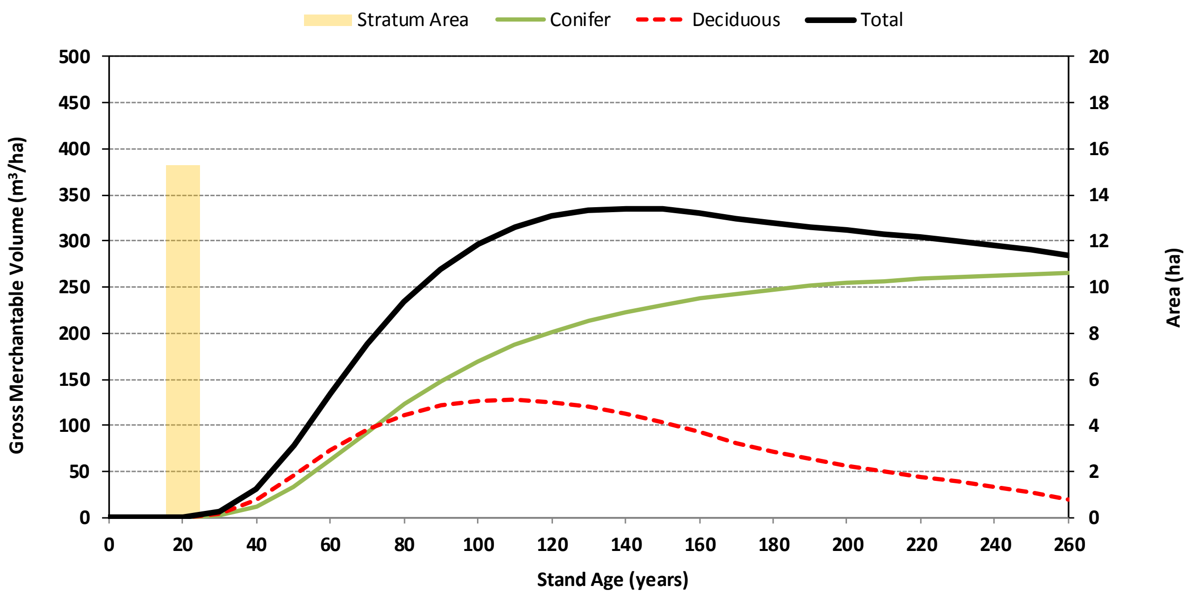
FMA Baseline Utilization		Standing Timber	
		m3	m3/ha
Conifer	15/11/15/366/TL	14	0
Deciduous	15/10/15/366/TL	0	0
Total		14	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

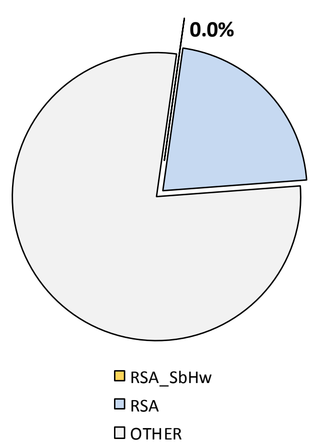
STRATUM: SbHw



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.2	0.2	0.4	0.01	0.01	0.02
30	2.3	3.9	6.2	0.08	0.13	0.21
40	11.8	19.6	31.5	0.30	0.49	0.79
50	32.7	46.2	78.8	0.65	0.92	1.58
60	62.0	73.1	135.1	1.03	1.22	2.25
70	93.6	95.3	188.9	1.34	1.36	2.70
80	123.0	111.3	234.3	1.54	1.39	2.93
90	148.5	121.4	269.9	1.65	1.35	3.00
100	169.8	126.5	296.3	1.70	1.27	2.96
110	187.2	127.6	314.8	1.70	1.16	2.86
120	201.5	125.3	326.8	1.68	1.04	2.72
130	213.2	120.2	333.4	1.64	0.92	2.56
140	222.8	112.9	335.7	1.59	0.81	2.40
150	230.9	103.6	334.4	1.54	0.69	2.23
160	237.5	92.7	330.2	1.48	0.58	2.06
170	243.0	80.8	323.8	1.43	0.48	1.90
180	247.6	71.5	319.1	1.38	0.40	1.77
190	251.4	63.8	315.2	1.32	0.34	1.66
200	254.5	57.0	311.4	1.27	0.28	1.56
210	257.0	50.9	307.8	1.22	0.24	1.47
220	259.2	44.7	303.9	1.18	0.20	1.38
230	261.0	38.9	299.9	1.13	0.17	1.30
240	262.6	32.8	295.4	1.09	0.14	1.23
250	263.8	26.5	290.3	1.06	0.11	1.16
260	264.8	19.9	284.7	1.02	0.08	1.09

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	RSA_SbHw	15	0.0%

Stratum % of the Active Landbase



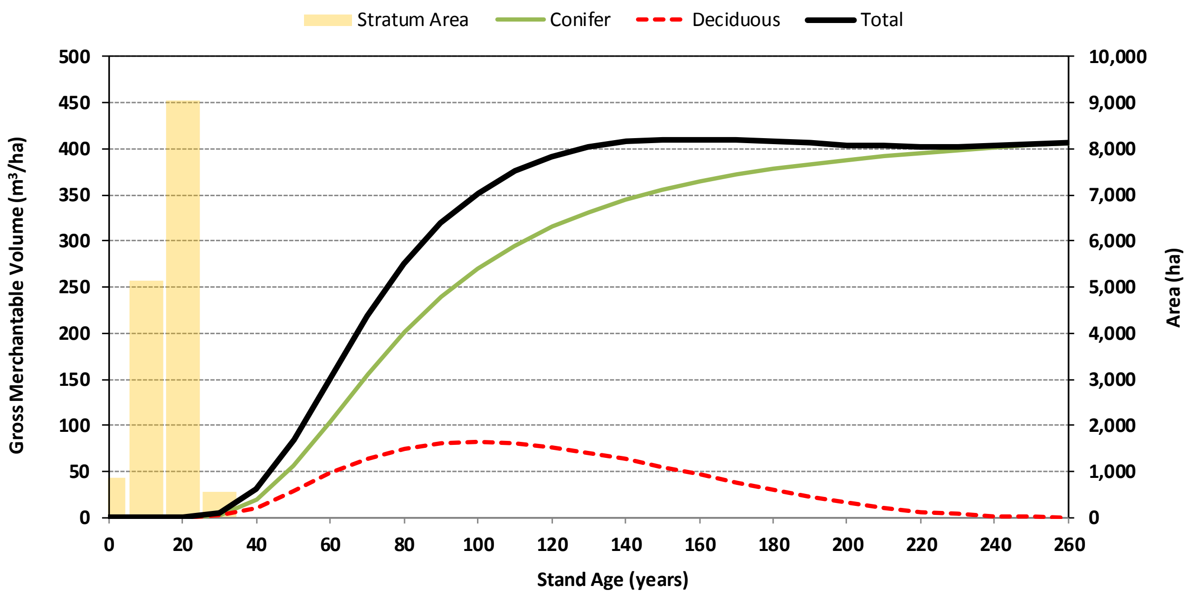
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	3	0
Deciduous	15/10/15/366/TL	3	0
Total		7	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

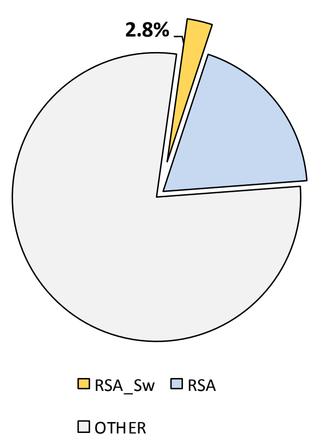
STRATUM: Sw



Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.1	0.1	0.2	0.01	0.01	0.01
30	3.2	2.1	5.2	0.11	0.07	0.17
40	19.6	11.1	30.7	0.49	0.28	0.77
50	55.6	28.6	84.2	1.11	0.57	1.68
60	104.3	48.1	152.3	1.74	0.80	2.54
70	155.1	63.8	218.9	2.22	0.91	3.13
80	200.8	74.4	275.2	2.51	0.93	3.44
90	239.1	80.1	319.3	2.66	0.89	3.55
100	270.2	81.9	352.2	2.70	0.82	3.52
110	295.2	80.5	375.7	2.68	0.73	3.42
120	315.2	76.4	391.6	2.63	0.64	3.26
130	331.3	70.6	401.9	2.55	0.54	3.09
140	344.4	63.4	407.8	2.46	0.45	2.91
150	355.2	55.1	410.3	2.37	0.37	2.74
160	364.1	46.3	410.4	2.28	0.29	2.57
170	371.6	37.7	409.3	2.19	0.22	2.41
180	378.0	30.2	408.2	2.10	0.17	2.27
190	383.4	22.8	406.3	2.02	0.12	2.14
200	388.2	16.2	404.4	1.94	0.08	2.02
210	392.2	10.8	403.0	1.87	0.05	1.92
220	395.8	6.4	402.2	1.80	0.03	1.83
230	399.0	3.9	402.8	1.73	0.02	1.75
240	401.7	2.0	403.7	1.67	0.01	1.68
250	404.1	1.0	405.1	1.62	0.00	1.62
260	406.3	0.5	406.7	1.56	0.00	1.56

Area Distribution			
Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_Sw**	**15,627**	**2.8%**

Stratum % of the Active Landbase



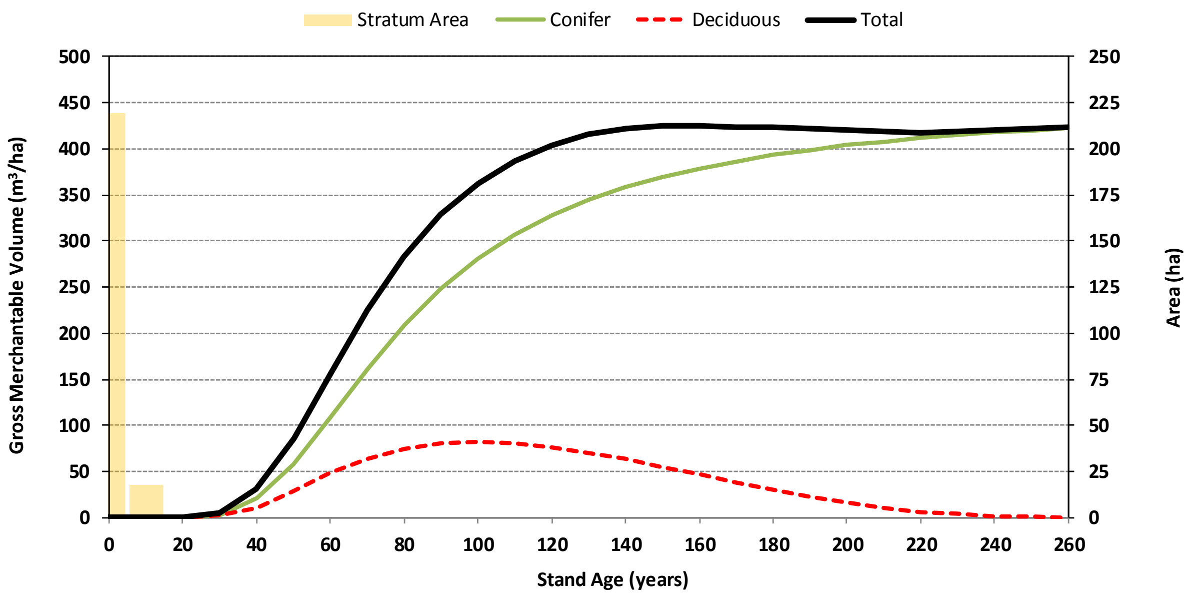
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	2,720	0
Deciduous	15/10/15/366/TL	2,135	0
Total		4,856	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: SwG

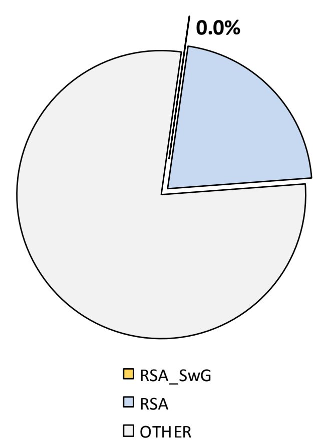


Stand Age	Gross Merchantable Volume (m³/ha)			Mean Annual Increment (m³/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.1	0.1	0.2	0.01	0.01	0.01
30	3.3	2.1	5.4	0.11	0.07	0.18
40	20.4	11.1	31.5	0.51	0.28	0.79
50	57.8	28.6	86.4	1.16	0.57	1.73
60	108.5	48.1	156.5	1.81	0.80	2.61
70	161.3	63.8	225.1	2.30	0.91	3.22
80	208.8	74.4	283.2	2.61	**0.93**	3.54
90	248.7	80.1	328.8	2.76	0.89	**3.65**
100	281.1	81.9	363.0	**2.81**	0.82	3.63
110	307.0	80.5	387.5	2.79	0.73	3.52
120	327.8	76.4	404.2	2.73	0.64	3.37
130	344.6	70.6	415.2	2.65	0.54	3.19
140	358.2	63.4	421.6	2.56	0.45	3.01
150	369.4	55.1	424.5	2.46	0.37	2.83
160	378.7	46.3	425.0	2.37	0.29	2.66
170	386.5	37.7	424.2	2.27	0.22	2.50
180	393.1	30.2	423.3	2.18	0.17	2.35
190	398.8	22.8	421.6	2.10	0.12	2.22
200	403.7	16.2	419.9	2.02	0.08	2.10
210	407.9	10.8	418.7	1.94	0.05	1.99
220	411.6	6.4	418.0	1.87	0.03	1.90
230	414.9	3.9	418.8	1.80	0.02	1.82
240	417.8	2.0	419.7	1.74	0.01	1.75
250	420.3	1.0	421.3	1.68	0.00	1.69
260	422.5	0.5	423.0	1.63	0.00	1.63

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_SwG**	**237**	**0.0%**

Stratum % of the Active Landbase



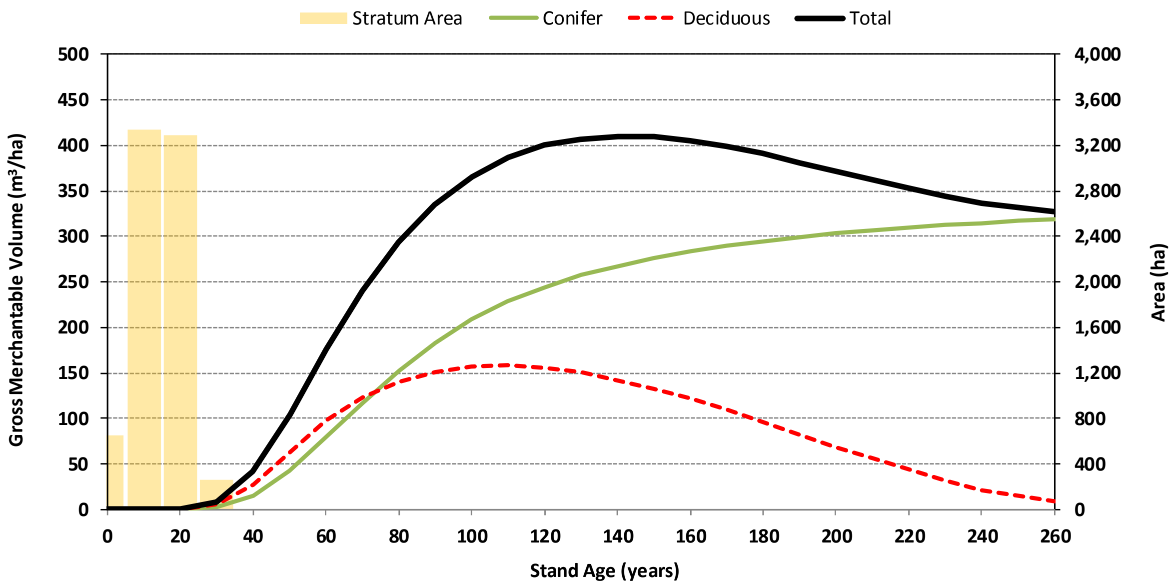
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	0	0
Deciduous	15/10/15/366/TL	0	0
Total		0	0

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

PEMBINA TIMBERLANDS
FMA # 0900046
YIELD CURVES

POST-1991 MANAGED STANDS

STRATUM: SwHw



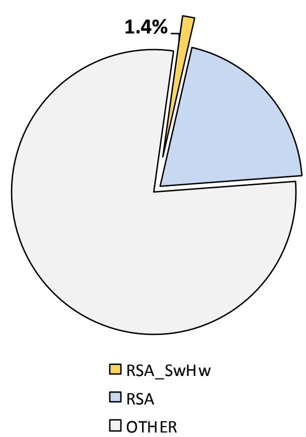
Stand Age	Gross Merchantable Volume (m^3/ha)			Mean Annual Increment (m^3/ha/year)		
	Conifer	Deciduous	Total	Conifer	Deciduous	Total
0	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
20	0.1	0.2	0.3	0.00	0.01	0.02
30	2.2	5.2	7.4	0.07	0.17	0.25
40	14.5	27.2	41.8	0.36	0.68	1.04
50	41.8	62.9	104.7	0.84	1.26	2.09
60	78.5	97.0	175.5	1.31	1.62	2.93
70	117.3	123.0	240.4	1.68	1.76	3.43
80	153.1	140.8	293.9	1.91	**1.76**	3.67
90	183.6	151.6	335.3	2.04	1.68	**3.73**
100	208.5	157.1	365.5	**2.08**	1.57	3.66
110	228.4	158.1	386.5	2.08	1.44	3.51
120	244.4	155.6	400.0	2.04	1.30	3.33
130	257.2	150.2	407.4	1.98	1.16	3.13
140	267.7	142.5	410.2	1.91	1.02	2.93
150	276.3	132.9	409.2	1.84	0.89	2.73
160	283.5	121.7	405.2	1.77	0.76	2.53
170	289.5	109.2	398.8	1.70	0.64	2.35
180	294.7	96.0	390.7	1.64	0.53	2.17
190	299.2	82.3	381.5	1.57	0.43	2.01
200	303.1	69.2	372.3	1.52	0.35	1.86
210	306.5	55.9	362.4	1.46	0.27	1.73
220	309.6	43.4	352.9	1.41	0.20	1.60
230	312.3	31.8	344.0	1.36	0.14	1.50
240	314.7	21.4	336.1	1.31	0.09	1.40
250	316.9	14.3	331.2	1.27	0.06	1.32
260	318.9	8.9	327.7	1.23	0.03	1.26

Note: *Peak MAIs are highlighted in yellow.*
Standing timber volumes are approximate.

Area Distribution

Landbase Category		(ha)	(%)
Active Landbase		*550,954*	
LB Type	RSA	118,949	21.6%
Stratum	**RSA_SwHw**	**7,549**	**1.4%**

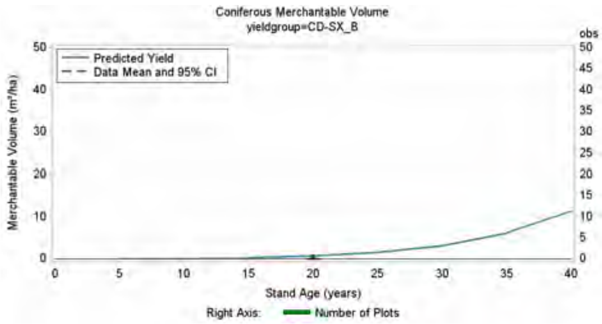
Stratum % of the Active Landbase

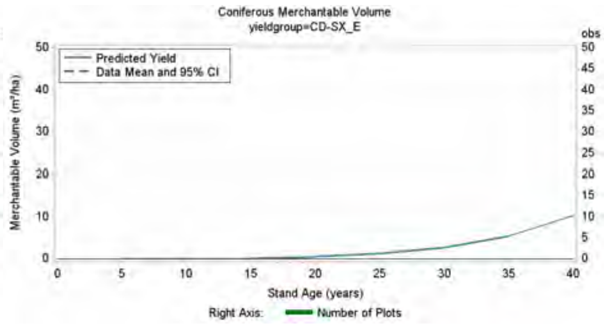


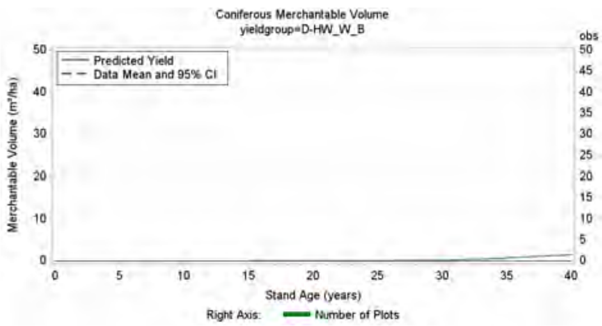
FMA Baseline Utilization		Standing Timber m3	Standing Timber m3/ha
Conifer	15/11/15/366/TL	768	0
Deciduous	15/10/15/366/TL	2,181	0
Total		2,949	0

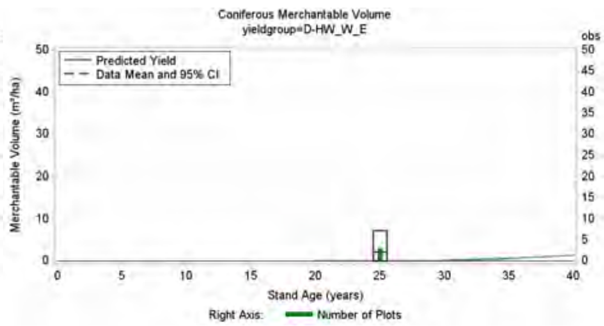
Appendix V – Validation of Pre-1991 Yield Curves

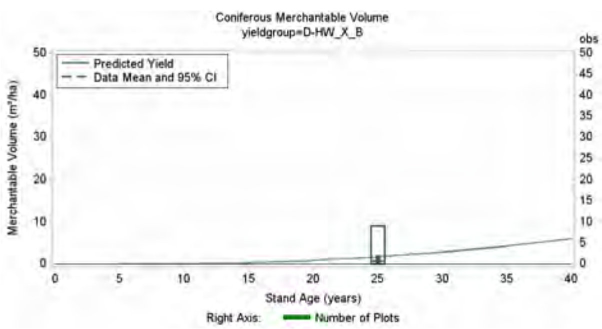
Average conifer merchantable volumes by age class against the M91 yield curves

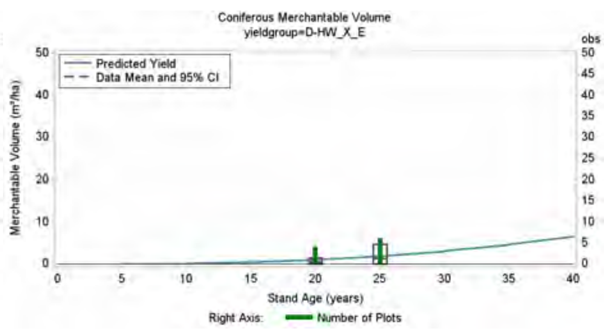

Coniferous Merchantable Volume
yieldgroup=CD-SX_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

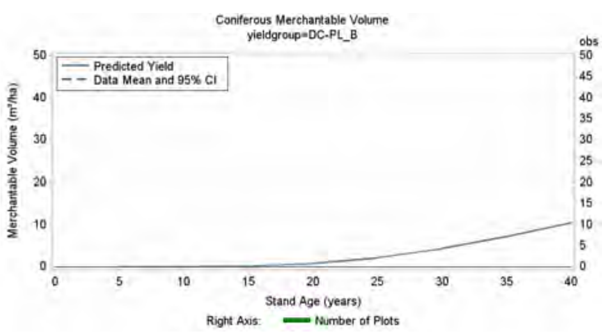

Coniferous Merchantable Volume
yieldgroup=CD-SX_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

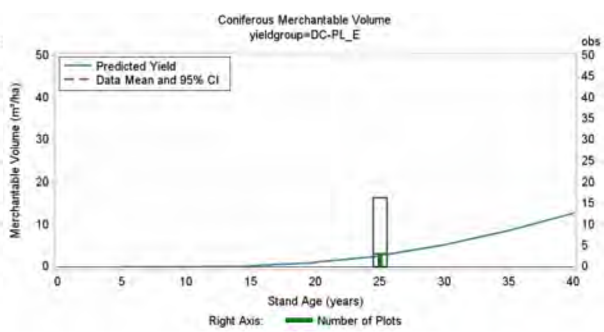

Coniferous Merchantable Volume
yieldgroup=D-HW_W_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

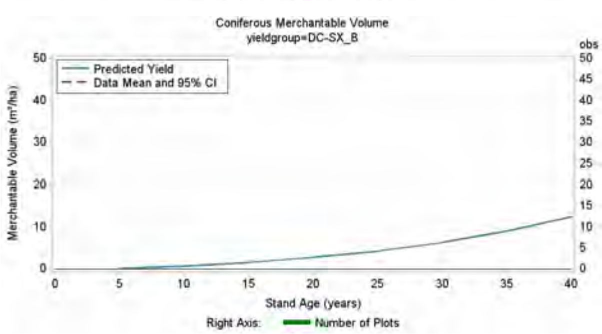

Coniferous Merchantable Volume
yieldgroup=D-HW_W_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

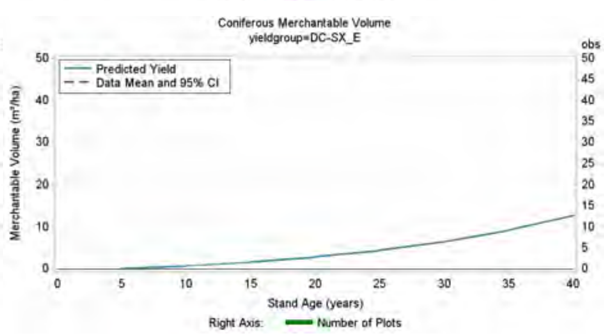

Coniferous Merchantable Volume
yieldgroup=D-HW_X_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

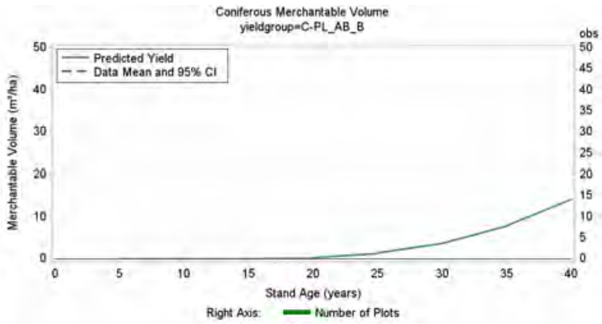

Coniferous Merchantable Volume
yieldgroup=D-HW_X_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

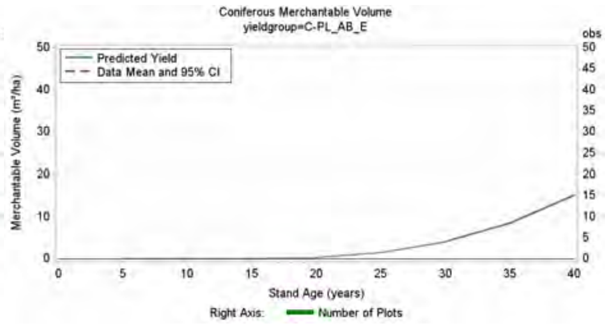

Coniferous Merchantable Volume
yieldgroup=DC-PL_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

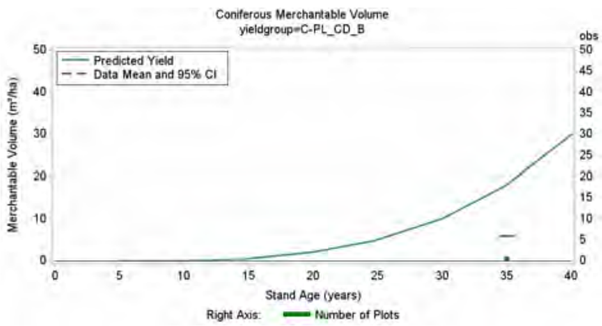

Coniferous Merchantable Volume
yieldgroup=DC-PL_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

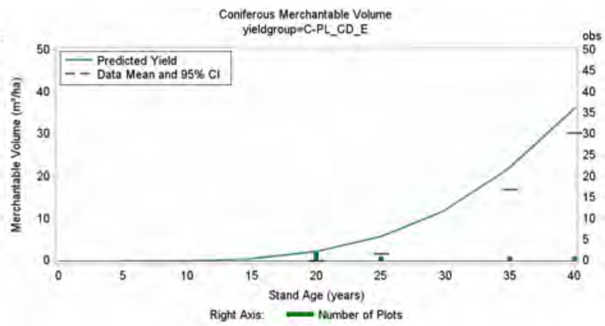

Coniferous Merchantable Volume
yieldgroup=DC-SX_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

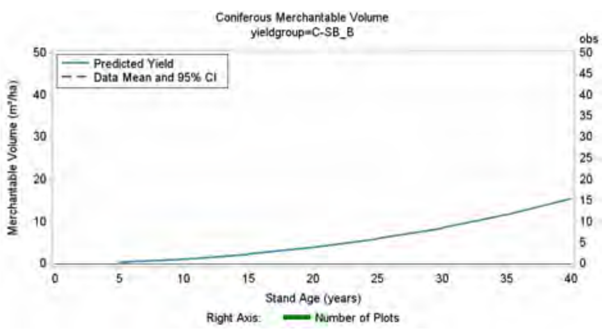

Coniferous Merchantable Volume
yieldgroup=DC-SX_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

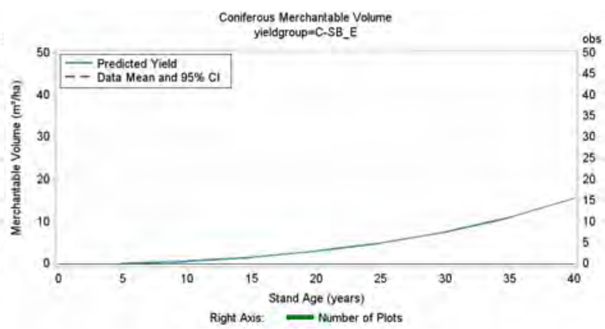

Coniferous Merchantable Volume
yieldgroup=C-PL_AB_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
yieldgroup=C-PL_AB_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
yieldgroup=C-PL_CD_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
yieldgroup=C-PL_CD_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
yieldgroup=C-SB_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
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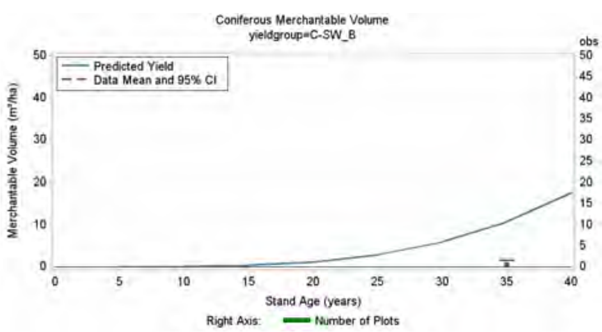
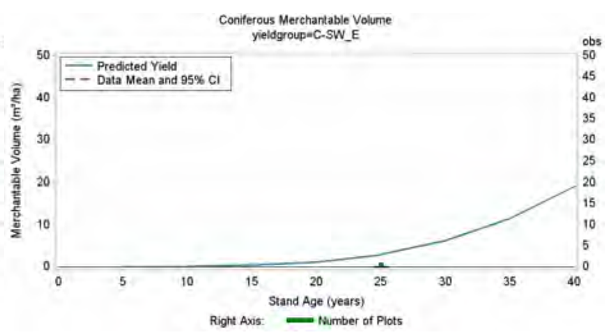
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Merchantable Volume
yieldgroup=C-SW_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots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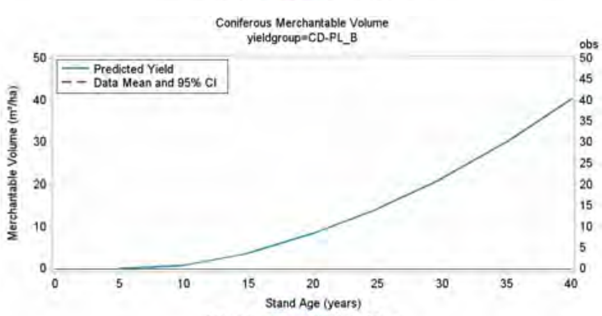
yieldgroup=C-SW_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots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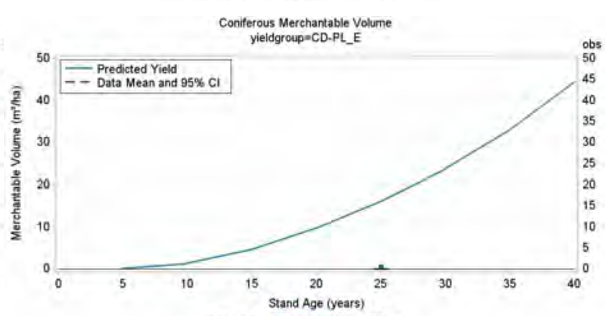
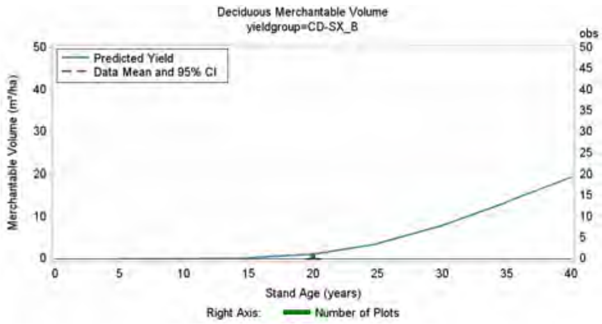
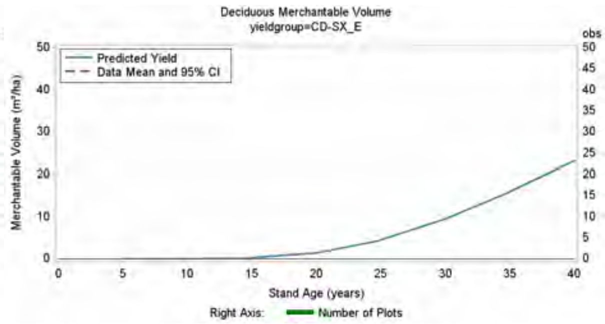
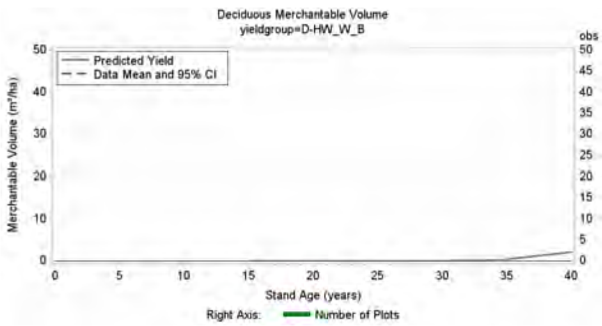
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

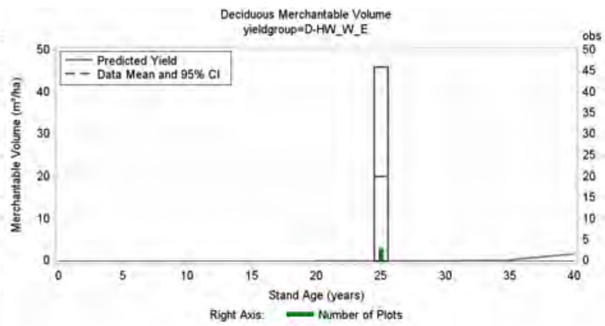

Coniferous Merchantable Volume
yieldgroup=CD-PL_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

Average deciduous merchantable volumes by age class against the M91 yield curves


Deciduous Merchantable Volume
yieldgroup=CD-SX_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=CD-SX_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=D-HW_W_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots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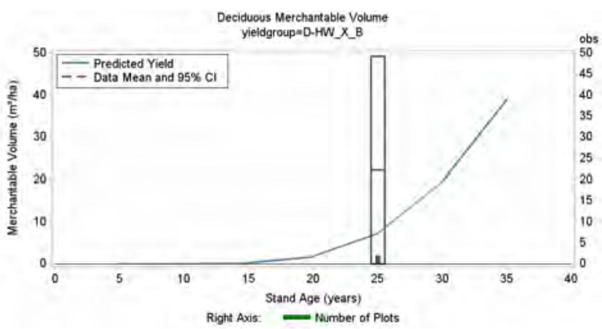
yieldgroup=D-HW_W_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots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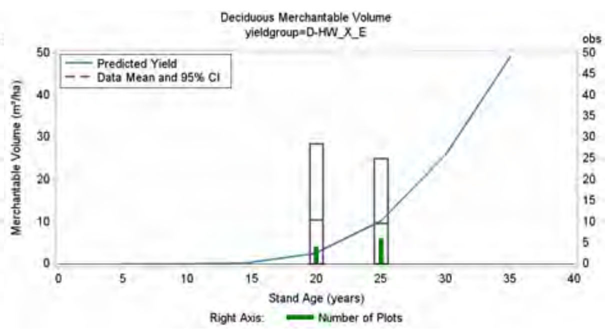
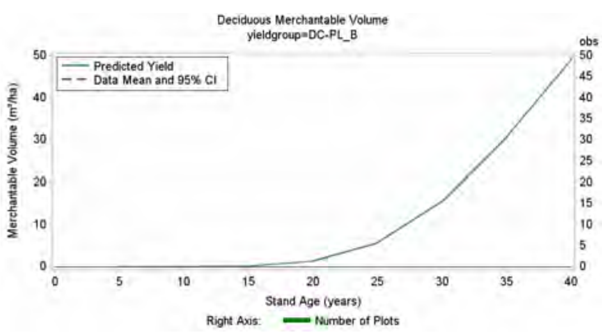
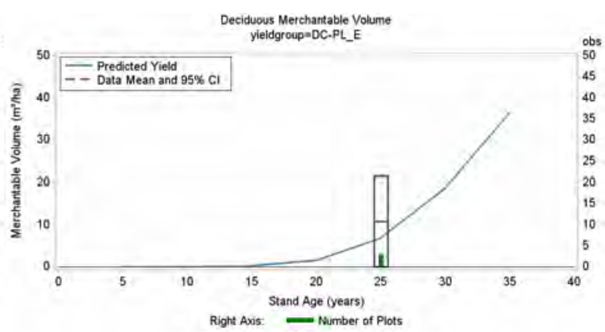
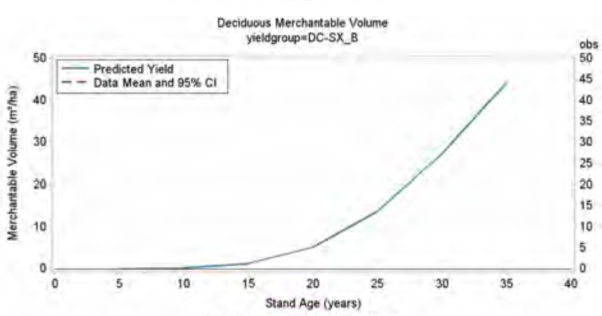
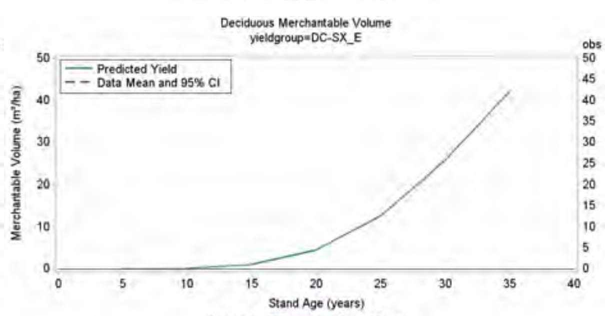
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

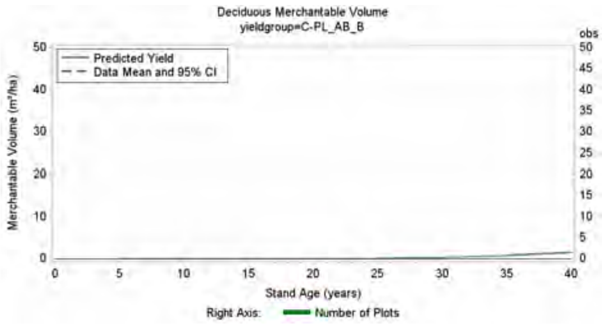

Deciduous Merchantable Volume
yieldgroup=D-HW_X_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

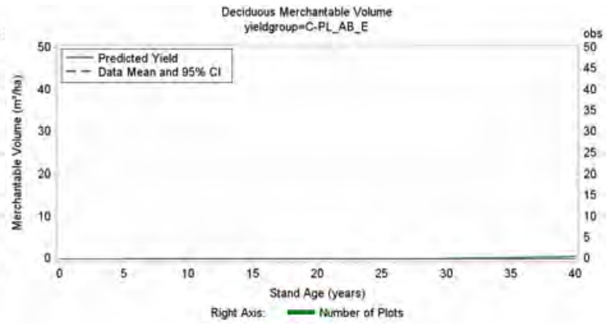

Deciduous Merchantable Volume
yieldgroup=DC-PL_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

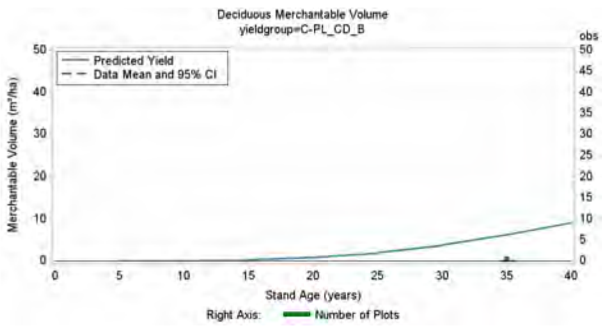

Deciduous Merchantable Volume
yieldgroup=DC-PL_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

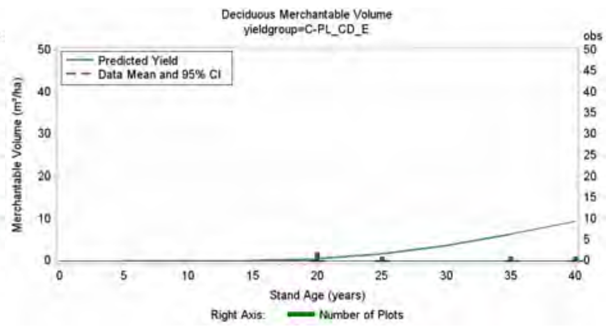

Deciduous Merchantable Volume
yieldgroup=DC-SX_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

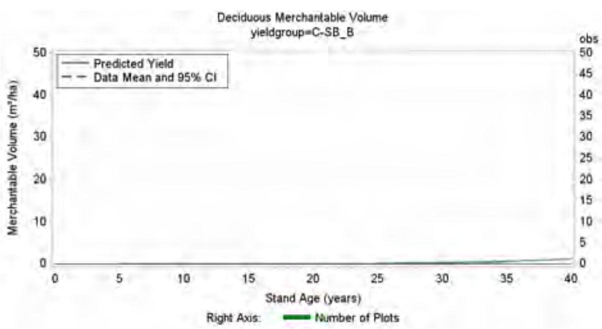

Deciduous Merchantable Volume
yieldgroup=DC-SX_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m^3/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

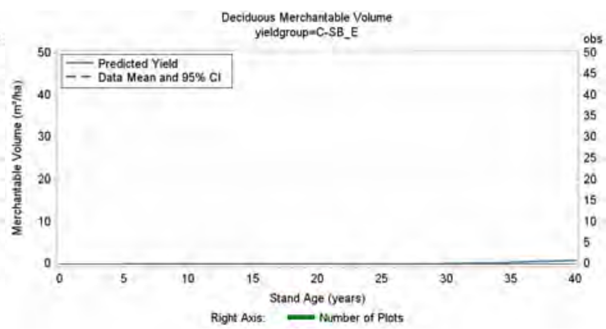

Deciduous Merchantable Volume
yieldgroup=C-PL_AB_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

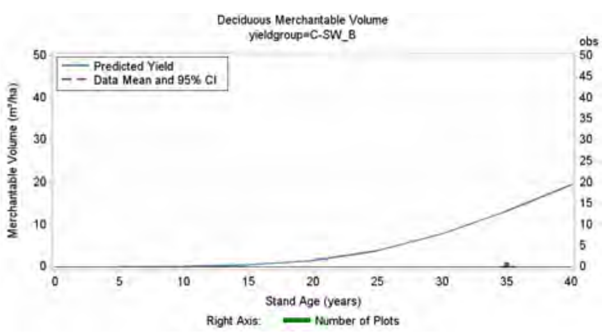

Deciduous Merchantable Volume
yieldgroup=C-PL_AB_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

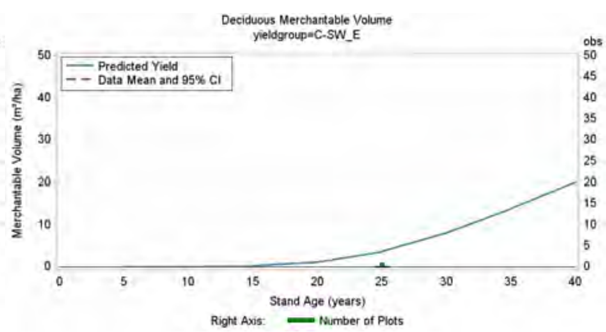

Deciduous Merchantable Volume
yieldgroup=C-PL_CD_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

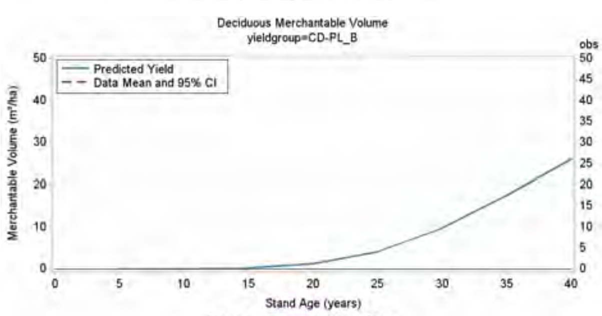

Deciduous Merchantable Volume
yieldgroup=C-PL_CD_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

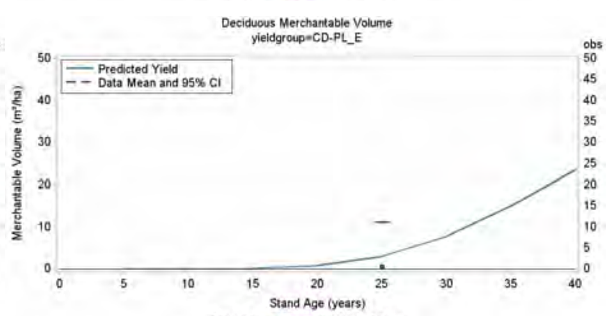

Deciduous Merchantable Volume
yieldgroup=C-SB_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=C-SB_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

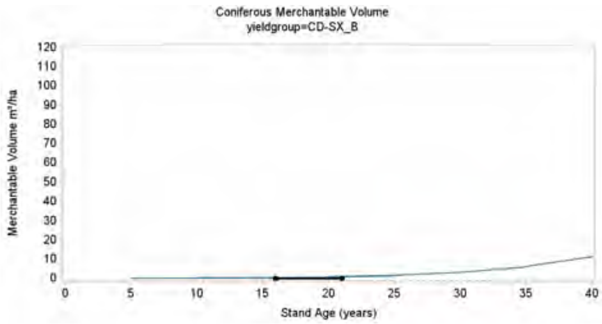

Deciduous Merchantable Volume
yieldgroup=C-SW_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=C-SW_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=CD-PL_B
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=CD-PL_E
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

Conifer merchantable volume trajectories against the M91 yield curves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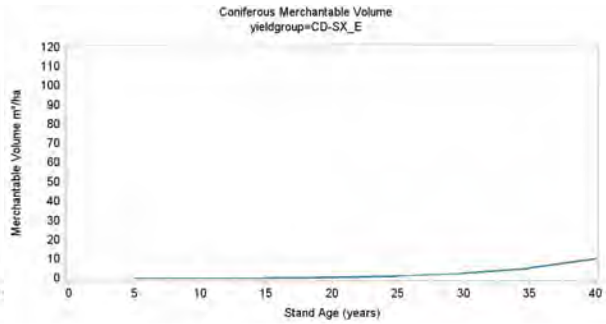
yieldgroup=CD-SX_B
Merchantable Volume m³/ha
Stand Age (years)


Coniferous Merchantable Volume
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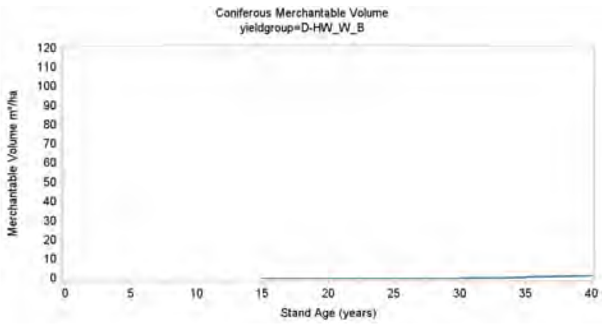
Merchantable Volume m³/ha
Stand Age (years)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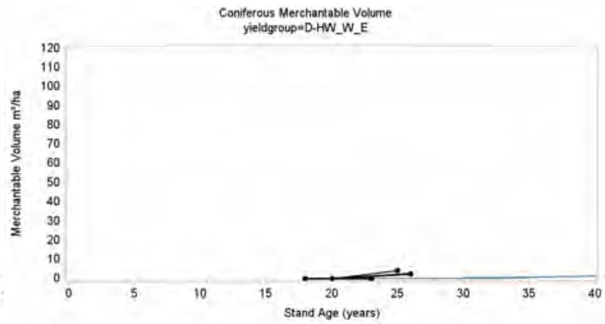
Merchantable Volume m³/ha
Stand Age (years)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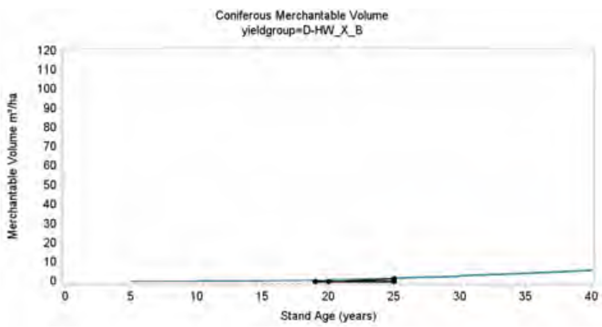
Merchantable Volume m³/ha
Stand Age (years)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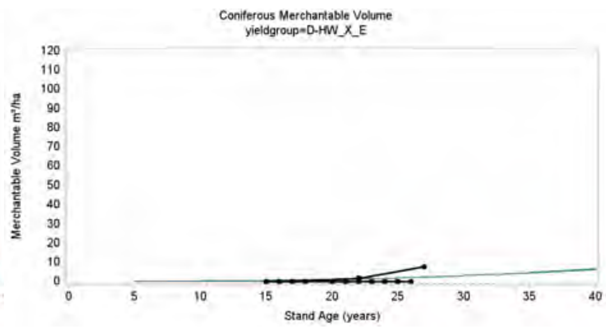
Merchantable Volume m³/ha
Stand Age (years)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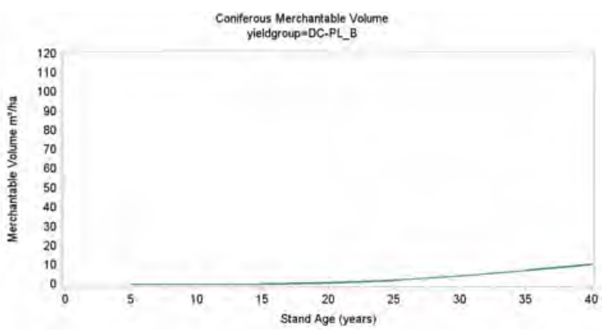
Merchantable Volume m³/ha
Stand Age (years)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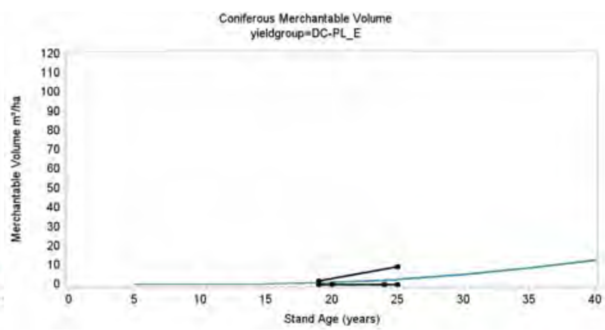
Merchantable Volume m³/ha
Stand Age (years)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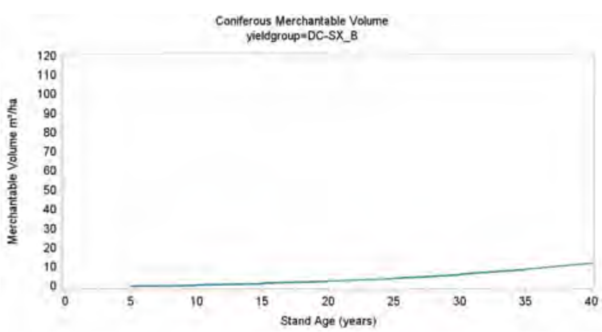
Merchantable Volume m³/ha
Stand Age (years)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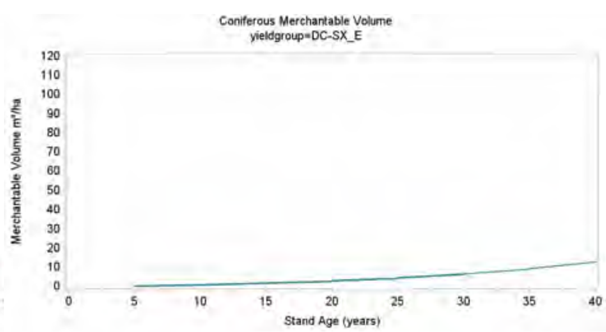
yieldgroup=DC-SX_B
Merchantable Volume m³/ha
Stand Age (years)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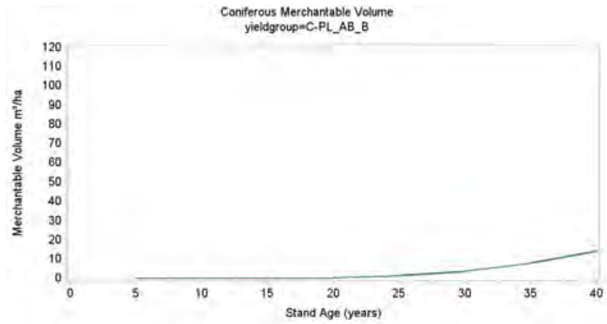
yieldgroup=DC-SX_E
Merchantable Volume m³/ha
Stand Age (years)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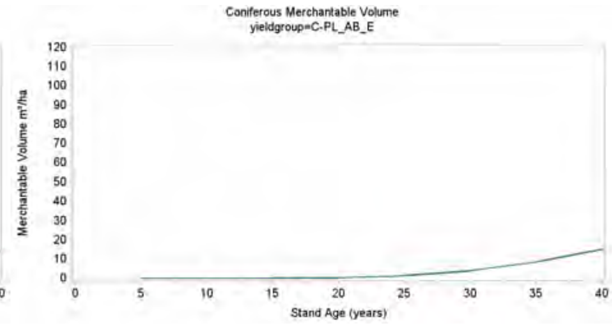
yieldgroup=C-PL_AB_B
Merchantable Volume m³/ha
Stand Age (years)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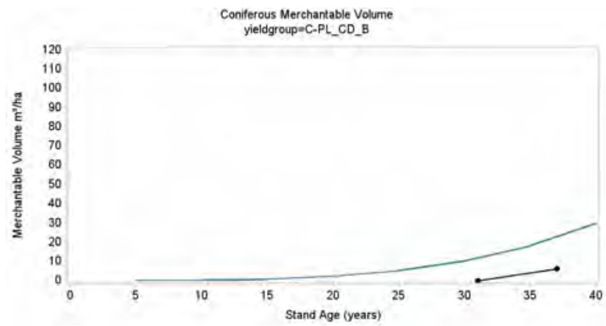
Merchantable Volume m³/ha
Stand Age (years)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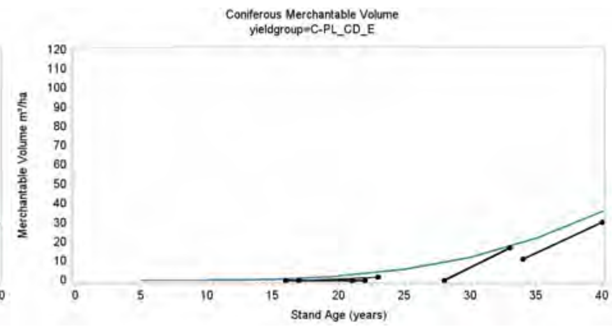
yieldgroup=C-PL_CD_B
Merchantable Volume m³/ha
Stand Age (years)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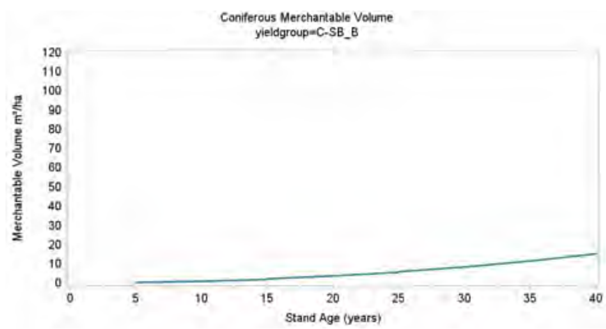
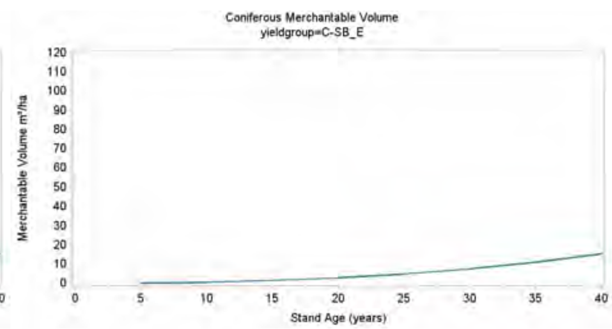
yieldgroup=C-PL_CD_E
Merchantable Volume m³/ha
Stand Age (years)


Coniferous Merchantable Volume
yieldgroup=C-SB_B
Merchantable Volume m³/ha
Stand Age (years)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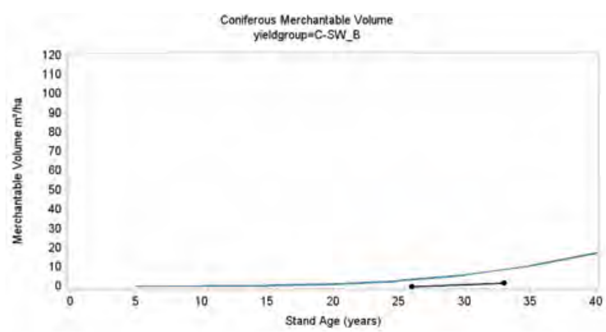
yieldgroup=C-SB_E
Merchantable Volume m³/ha
Stand Age (years)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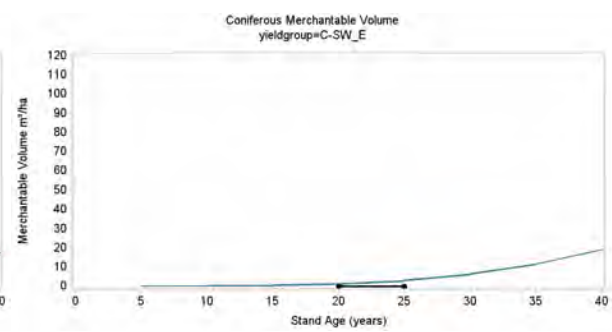
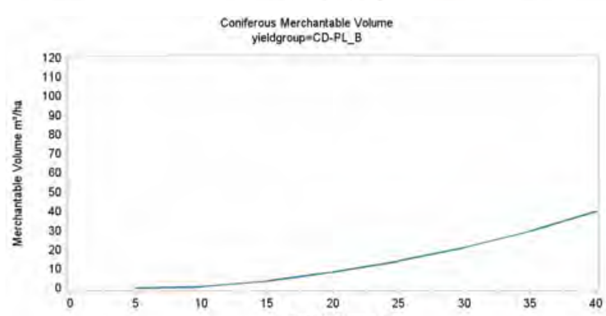
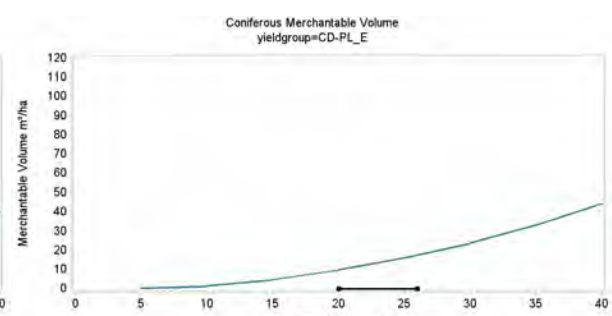
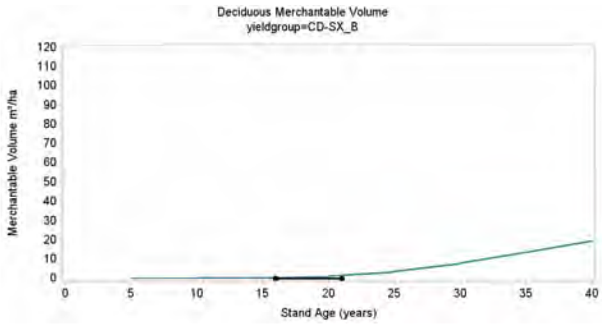
yieldgroup=C-SW_B
Merchantable Volume m³/ha
Stand Age (years)

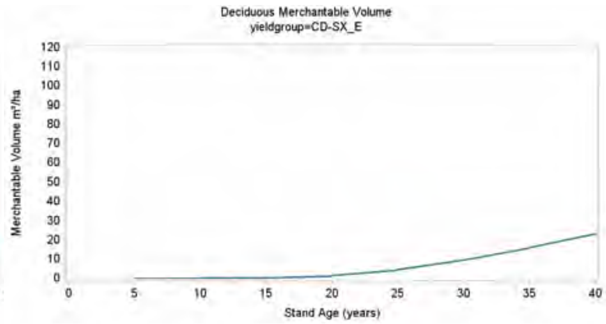

Coniferous Merchantable Volume
yieldgroup=C-SW_E
Merchantable Volume m³/ha
Stand Age (years)


Coniferous Merchantable Volume
yieldgroup=CD-PL_B
Merchantable Volume m³/ha
Stand Age (years)


Coniferous Merchantable Volume
yieldgroup=CD-PL_E
Merchantable Volume m³/ha
Stand Age (years)

Deciduous merchantable volume trajectories against the M91 yield curves


Deciduous Merchantable Volume
yieldgroup=CD-SX_B
Merchantable Volume m³/ha
Stand Age (years)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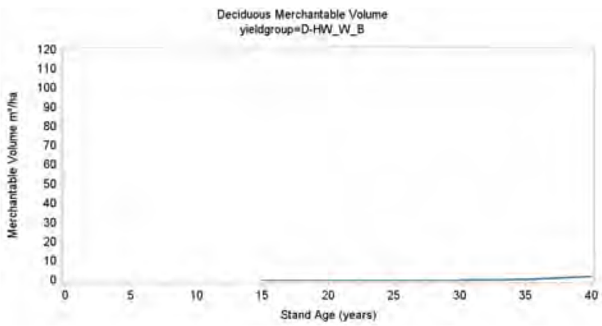
yieldgroup=CD-SX_E
Merchantable Volume m³/ha
Stand Age (years)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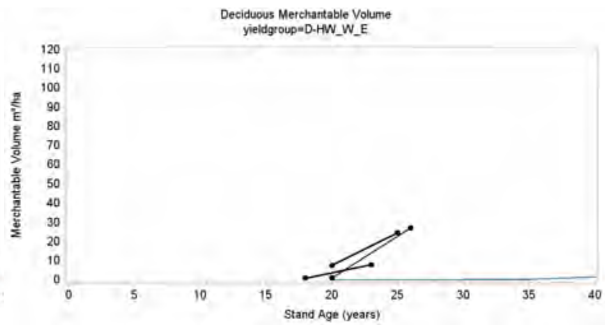
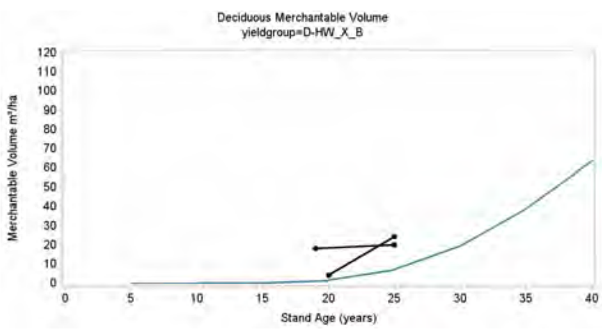
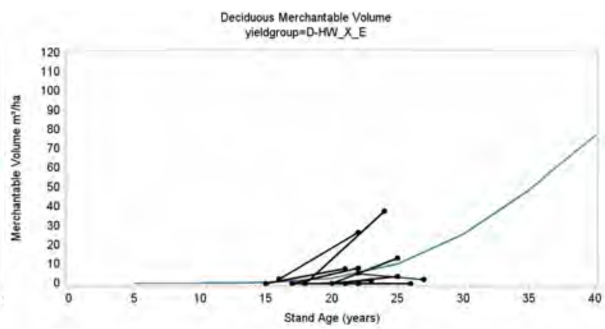
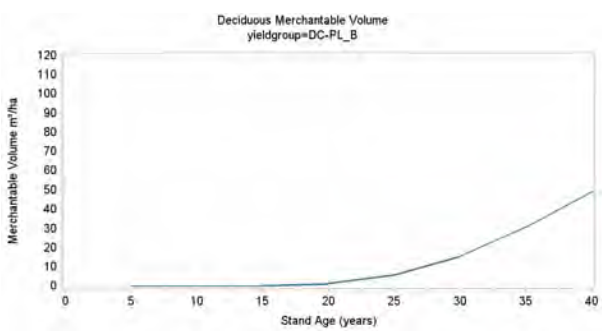
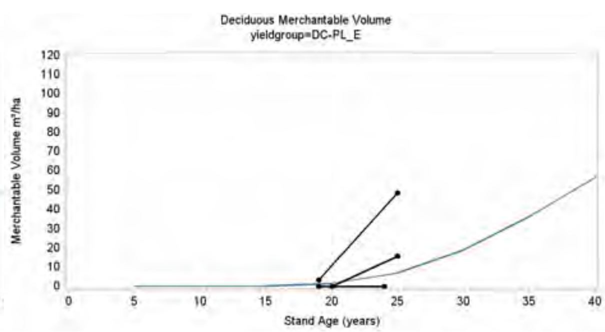
yieldgroup=D-HW_W_B
Merchantable Volume m³/ha
Stand Age (years)

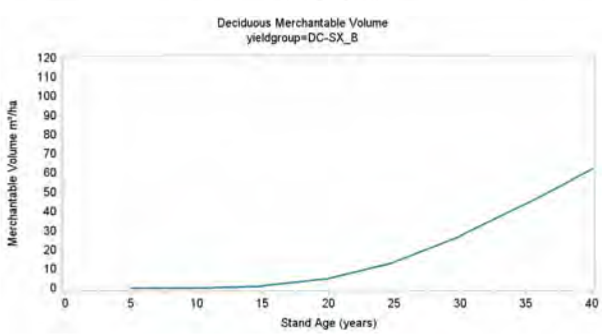

Deciduous Merchantable Volume
yieldgroup=D-HW_W_E
Merchantable Volume m³/ha
Stand Age (years)

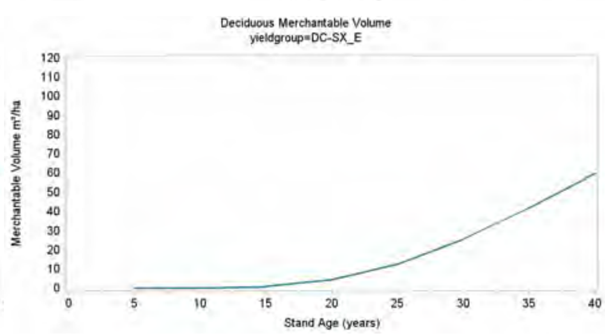

Deciduous Merchantable Volume
yieldgroup=D-HW_X_B
Merchantable Volume m³/ha
Stand Age (years)

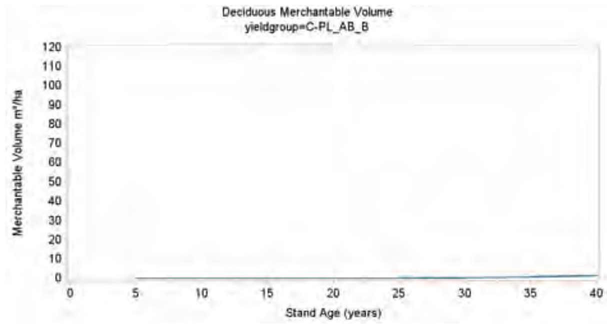

Deciduous Merchantable Volume
yieldgroup=D-HW_X_E
Merchantable Volume m³/ha
Stand Age (years)

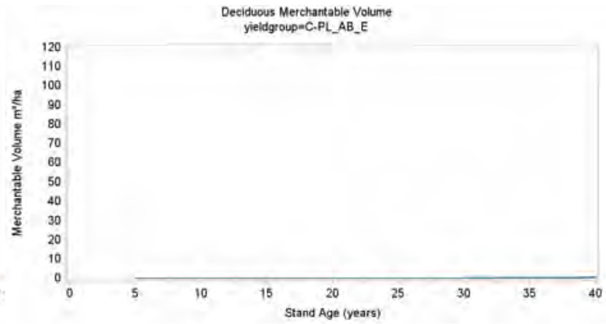

Deciduous Merchantable Volume
yieldgroup=DC-PL_B
Merchantable Volume m³/ha
Stand Age (years)

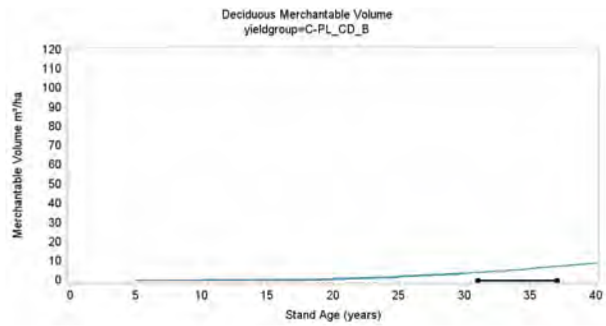

Deciduous Merchantable Volume
yieldgroup=DC-PL_E
Merchantable Volume m³/ha
Stand Age (years)

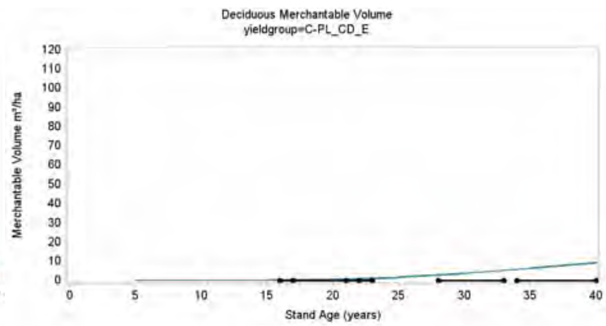

Deciduous Merchantable Volume
yieldgroup=DC-SX_B
Merchantable Volume m³/ha
Stand Age (years)

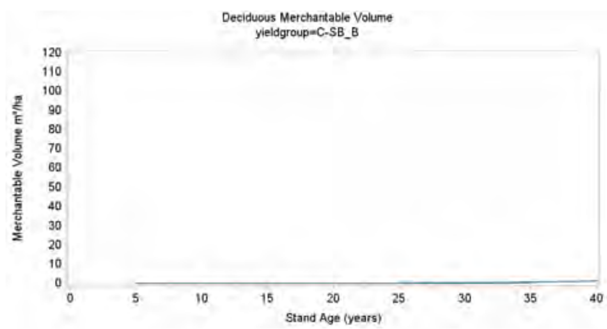

Deciduous Merchantable Volume
yieldgroup=DC-SX_E
Merchantable Volume m³/ha
Stand Age (years)

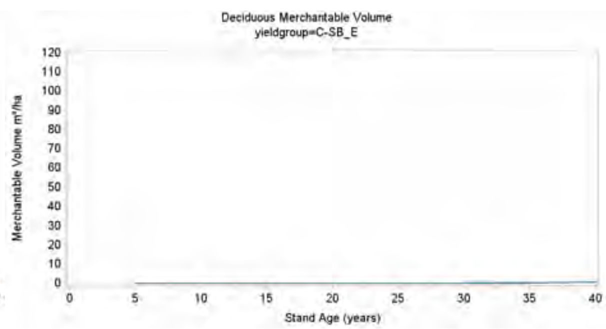

Deciduous Merchantable Volume
yieldgroup=C-PL_AB_B
Merchantable Volume m³/ha
Stand Age (years)

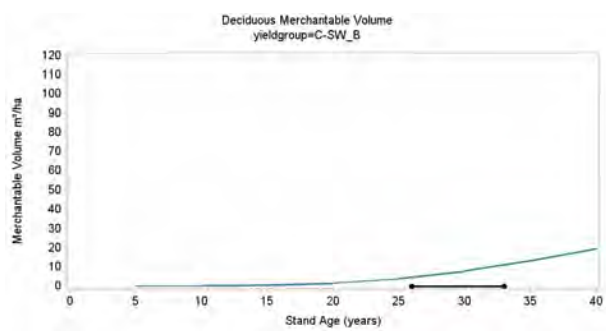

Deciduous Merchantable Volume
yieldgroup=C-PL_AB_E
Merchantable Volume m³/ha
Stand Age (years)

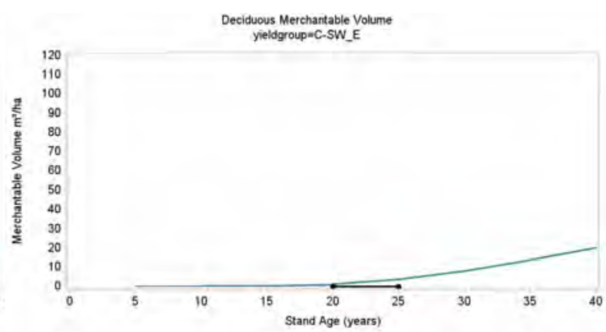

Deciduous Merchantable Volume
yieldgroup=C-PL_CD_B
Merchantable Volume m³/ha
Stand Age (years)

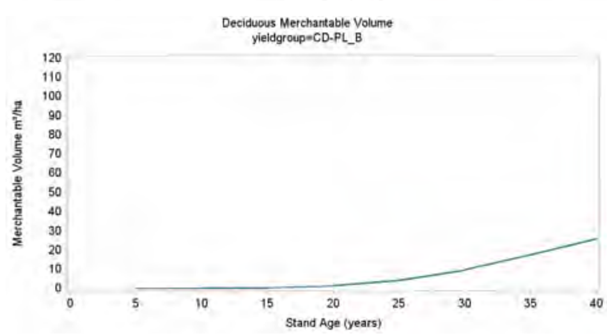

Deciduous Merchantable Volume
yieldgroup=C-PL_CD_E
Merchantable Volume m³/ha
Stand Age (years)

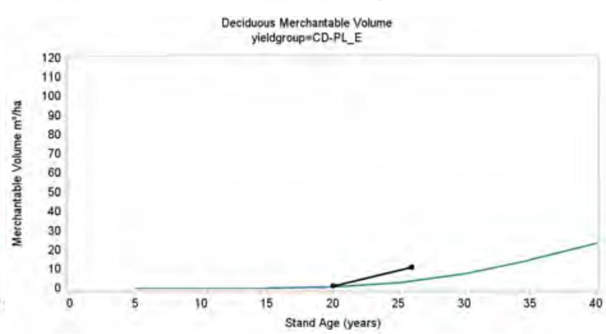

Deciduous Merchantable Volume
yieldgroup=C-SB_B
Merchantable Volume m³/ha
Stand Age (years)


Deciduous Merchantable Volume
yieldgroup=C-SB_E
Merchantable Volume m³/ha
Stand Age (years)


Deciduous Merchantable Volume
yieldgroup=C-SW_B
Merchantable Volume m³/ha
Stand Age (years)

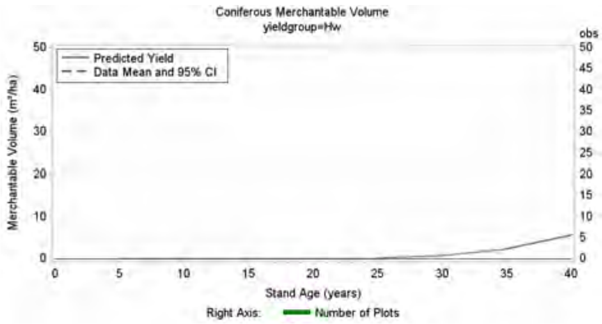

Deciduous Merchantable Volume
yieldgroup=C-SW_E
Merchantable Volume m³/ha
Stand Age (years)

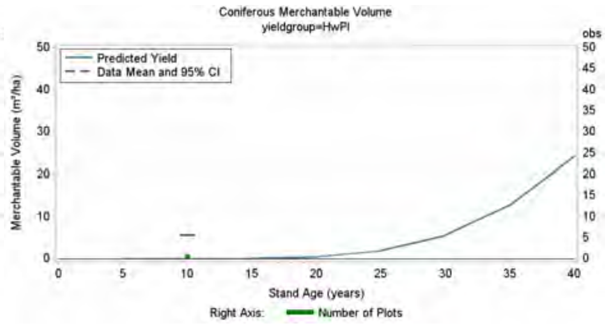

Deciduous Merchantable Volume
yieldgroup=CD-PL_B
Merchantable Volume m³/ha
Stand Age (years)

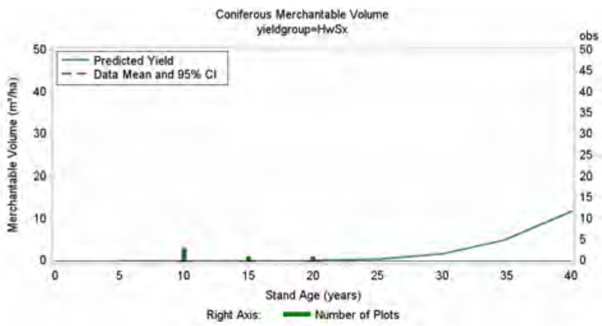

Deciduous Merchantable Volume
yieldgroup=CD-PL_E
Merchantable Volume m³/ha
Stand Age (years)

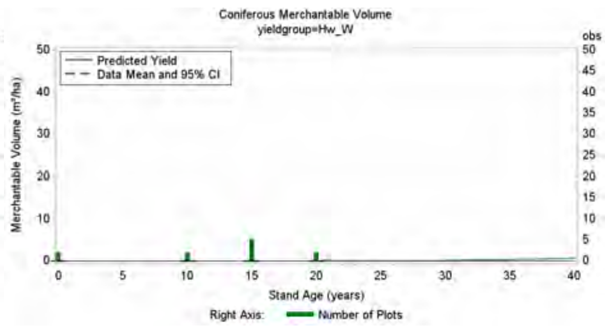
Appendix VI – Validation of Post-1991 Yield Curves

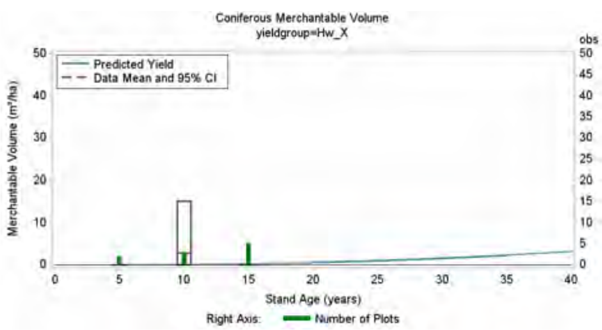
Average conifer merchantable volumes by age class against the RSA yield curves

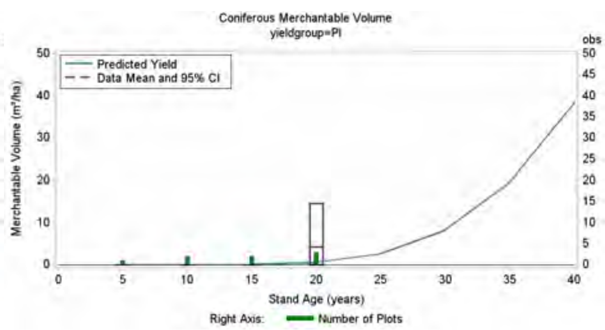

Coniferous Merchantable Volume
yieldgroup=Hw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

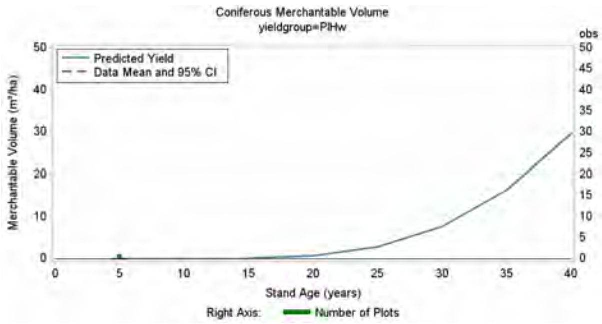

Coniferous Merchantable Volume
yieldgroup=HwPl
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

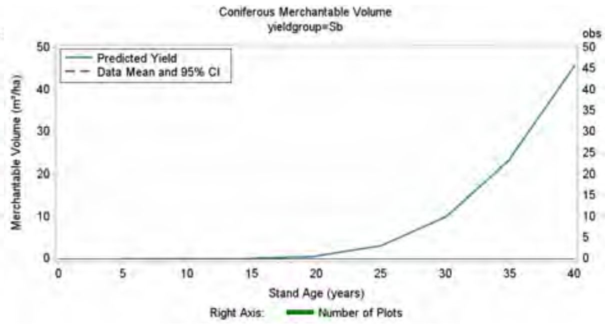

Coniferous Merchantable Volume
yieldgroup=HwSx
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

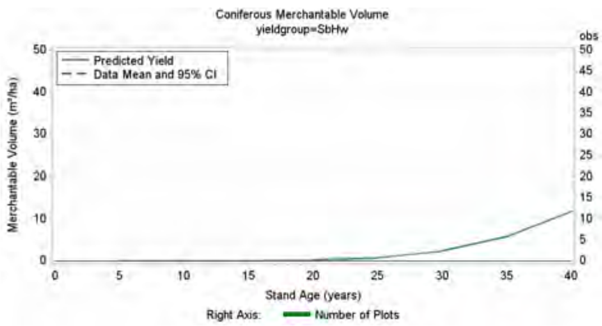

Coniferous Merchantable Volume
yieldgroup=Hw_W
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

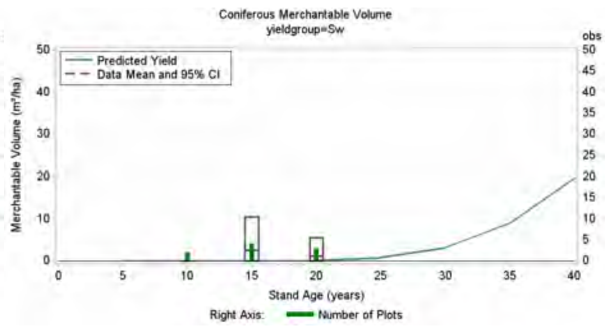

Coniferous Merchantable Volume
yieldgroup=Hw_X
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

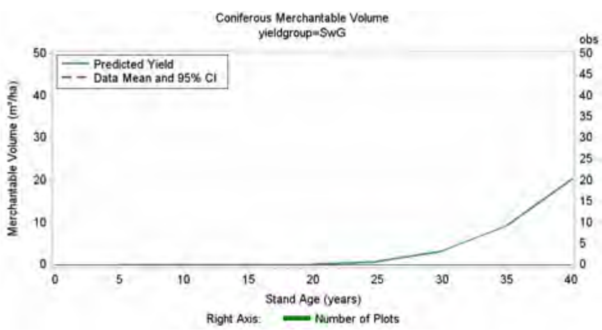

Coniferous Merchantable Volume
yieldgroup=Pl
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

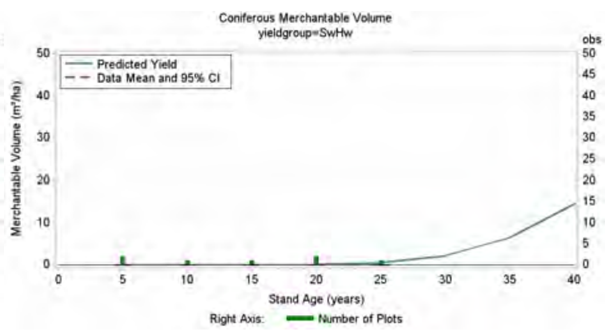

Coniferous Merchantable Volume
yieldgroup=PlHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots


Coniferous Merchantable Volume
yieldgroup=Sb
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

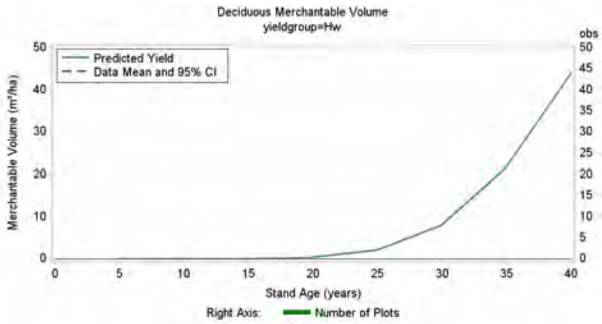

Coniferous Merchantable Volume
yieldgroup=SbHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

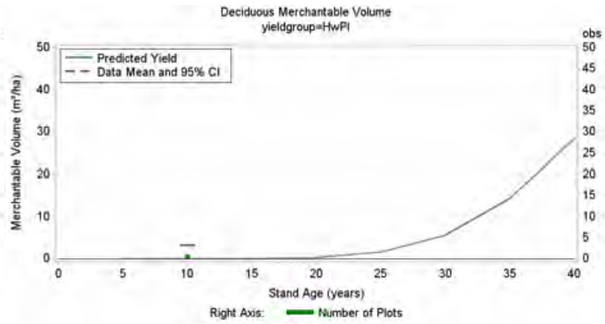

Coniferous Merchantable Volume
yieldgroup=Sw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

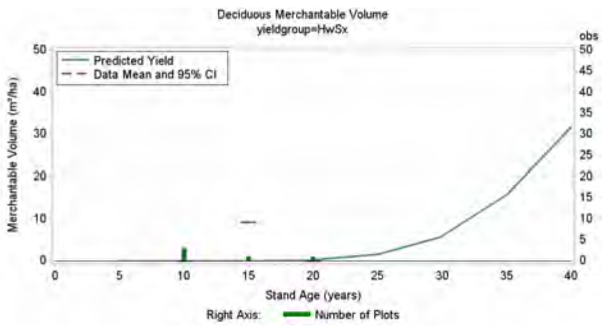

Coniferous Merchantable Volume
yieldgroup=SwG
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

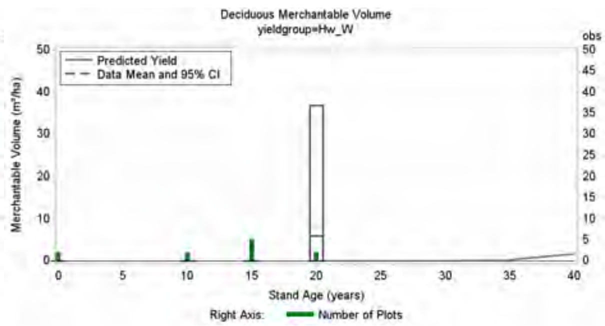

Coniferous Merchantable Volume
yieldgroup=SwHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis:
Number of Plots

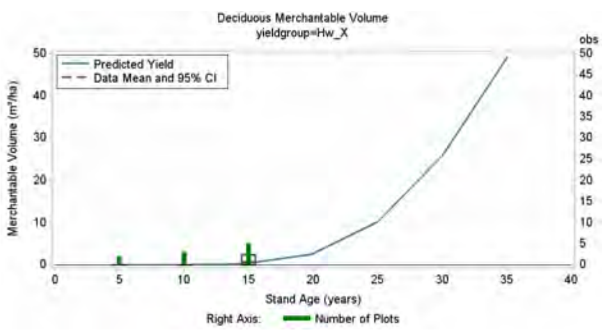
Average deciduous merchantable volumes by age class against the RSA yield curves

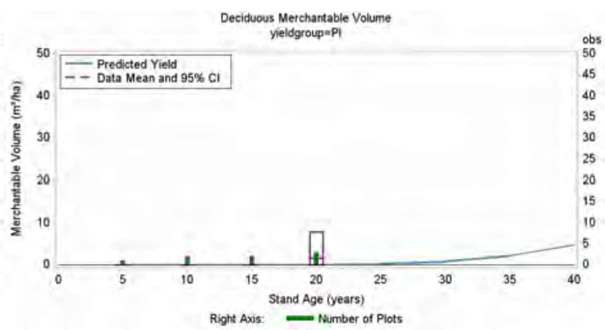

Deciduous Merchantable Volume
yieldgroup=Hw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

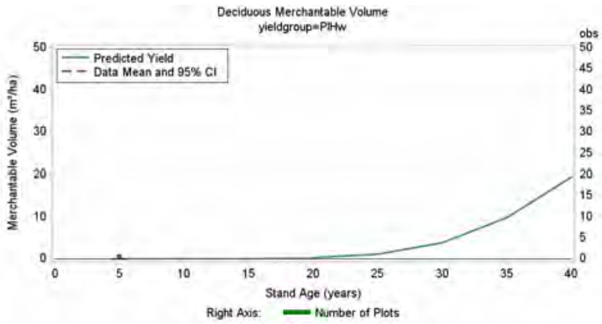

Deciduous Merchantable Volume
yieldgroup=HwPl
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

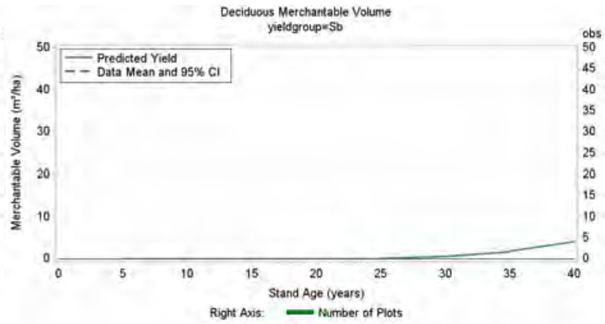

Deciduous Merchantable Volume
yieldgroup=HwSx
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

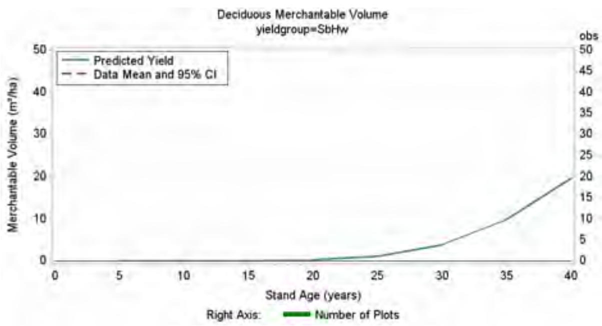

Deciduous Merchantable Volume
yieldgroup=Hw_W
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

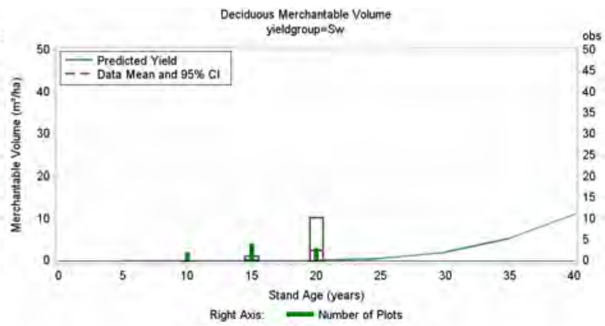

Deciduous Merchantable Volume
yieldgroup=Hw_X
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

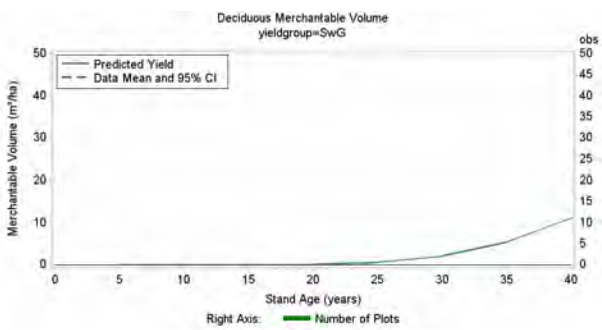

Deciduous Merchantable Volume
yieldgroup=Pl
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
obs
Stand Age (years)
Right Axis: Number of Plots

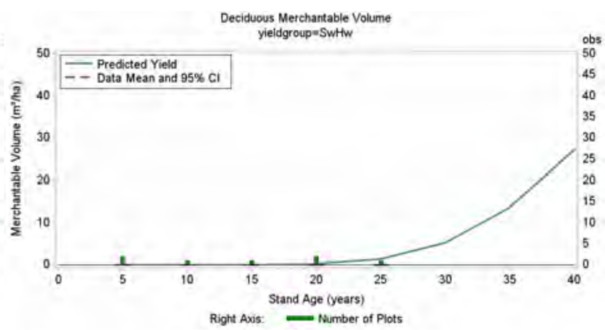

Deciduous Merchantable Volume
yieldgroup=PlHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots


Deciduous Merchantable Volume
yieldgroup=Sb
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots

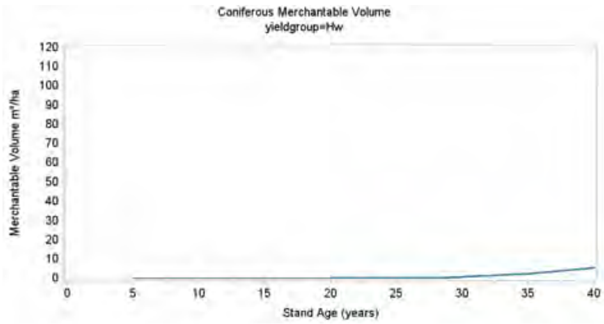

Deciduous Merchantable Volume
yieldgroup=SbHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots

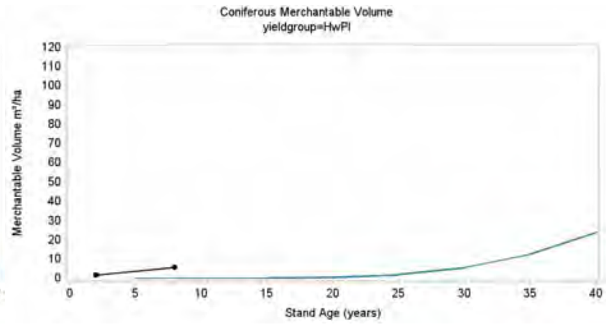

Deciduous Merchantable Volume
yieldgroup=Sw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots

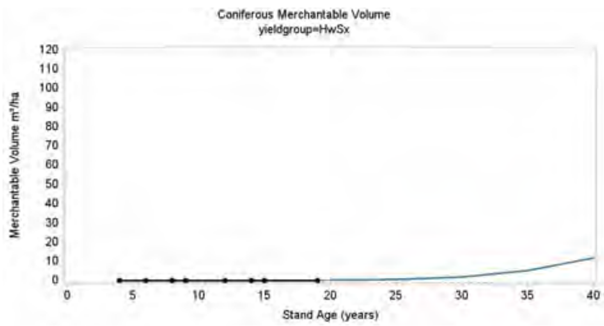

Deciduous Merchantable Volume
yieldgroup=SwG
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots

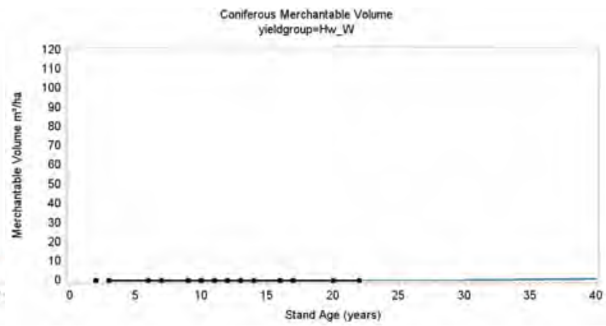

Deciduous Merchantable Volume
yieldgroup=SwHw
Predicted Yield
Data Mean and 95% CI
Merchantable Volume (m³/ha)
Stand Age (years)
obs
Right Axis: Number of Plots

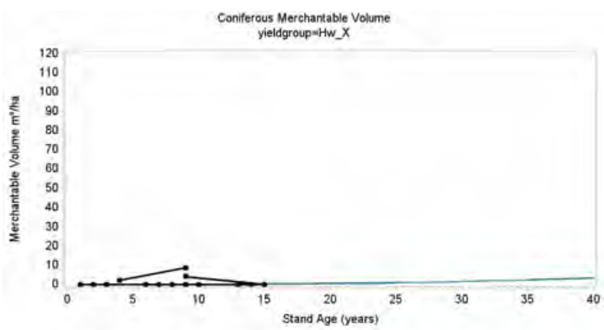
Conifer merchantable volume trajectories against the RSA yield curves

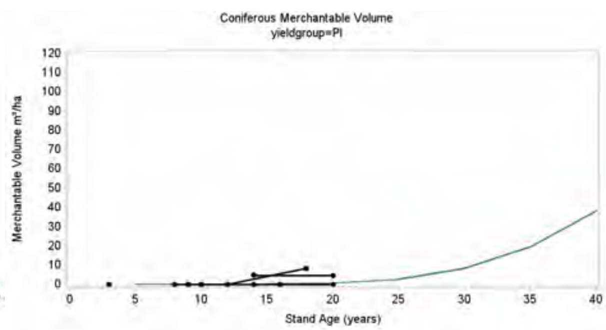

Coniferous Merchantable Volume
yieldgroup=Hw
Merchantable Volume m³/ha
Stand Age (years)

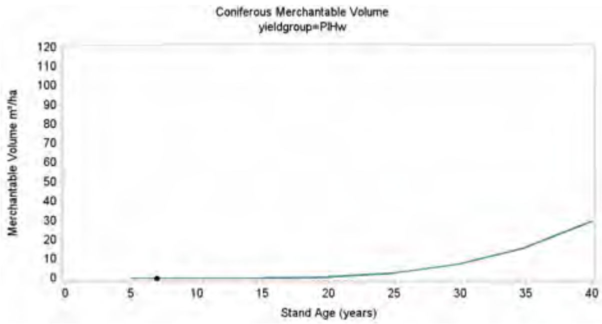

Coniferous Merchantable Volume
yieldgroup=HwPl
Merchantable Volume m³/ha
Stand Age (years)

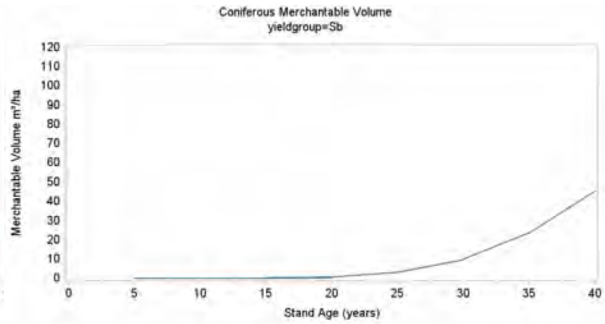

Coniferous Merchantable Volume
yieldgroup=HwSx
Merchantable Volume m³/ha
Stand Age (years)

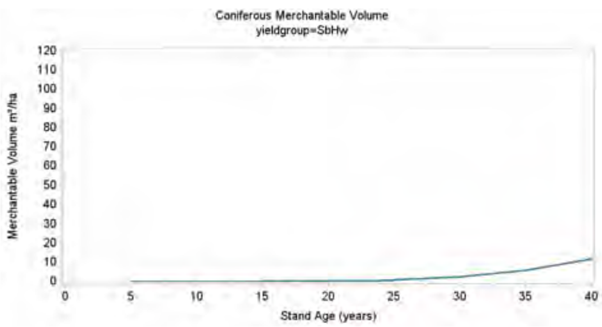

Coniferous Merchantable Volume
yieldgroup=Hw_W
Merchantable Volume m³/ha
Stand Age (years)

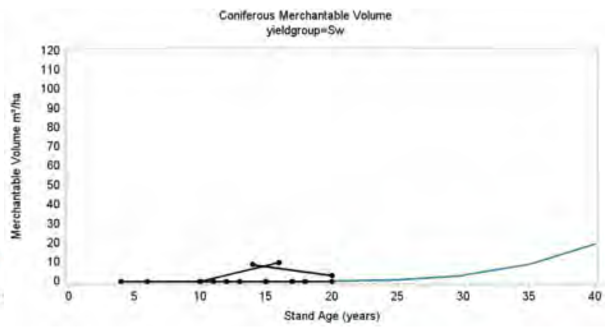

Coniferous Merchantable Volume
yieldgroup=Hw_X
Merchantable Volume m³/ha
Stand Age (years)

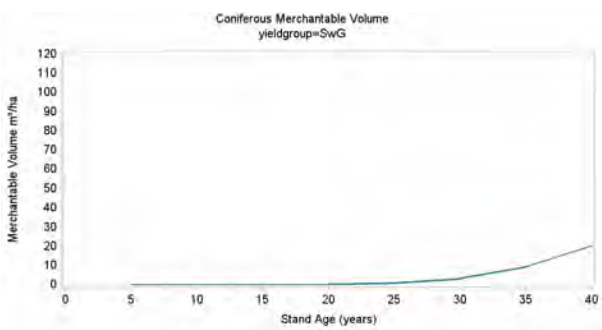

Coniferous Merchantable Volume
yieldgroup=Pl
Merchantable Volume m³/ha
Stand Age (years)

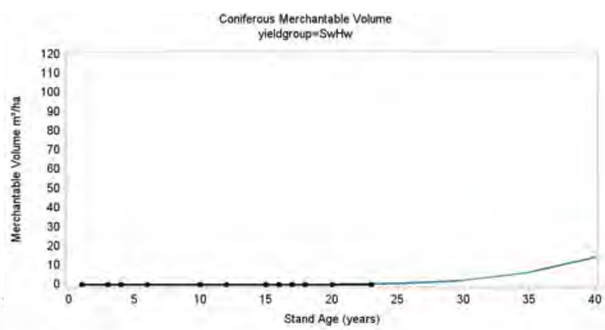

Coniferous Merchantable Volume
yieldgroup=PlHw
Merchantable Volume m³/ha
Stand Age (years)


Coniferous Merchantable Volume
yieldgroup=Sb
Merchantable Volume m³/ha
Stand Age (years)

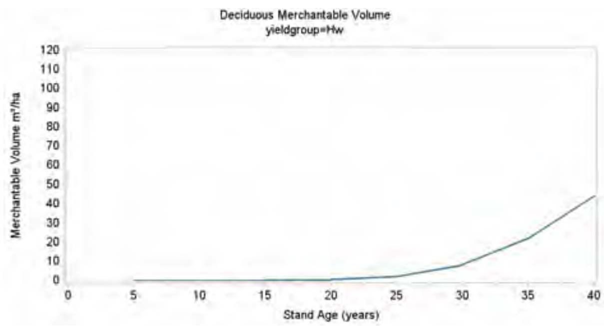

Coniferous Merchantable Volume
yieldgroup=SbHw
Merchantable Volume m³/ha
Stand Age (years)

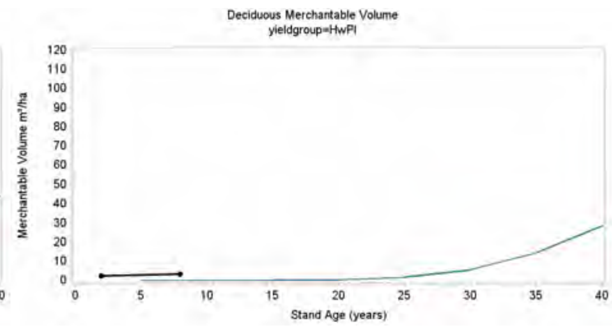

Coniferous Merchantable Volume
yieldgroup=Sw
Merchantable Volume m³/ha
Stand Age (years)

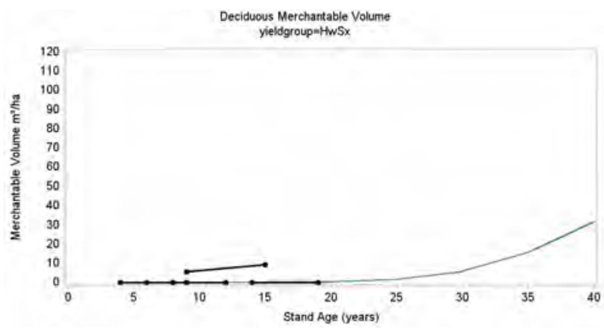

Coniferous Merchantable Volume
yieldgroup=SwG
Merchantable Volume m³/ha
Stand Age (years)

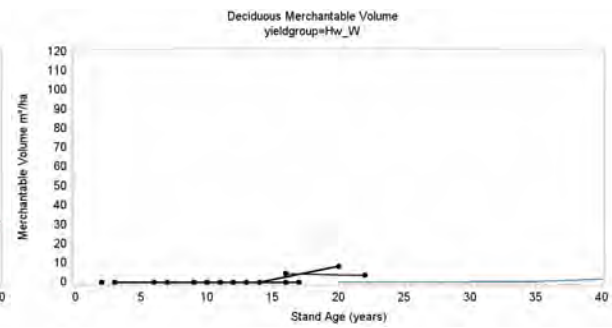

Coniferous Merchantable Volume
yieldgroup=SwHw
Merchantable Volume m³/ha
Stand Age (years)

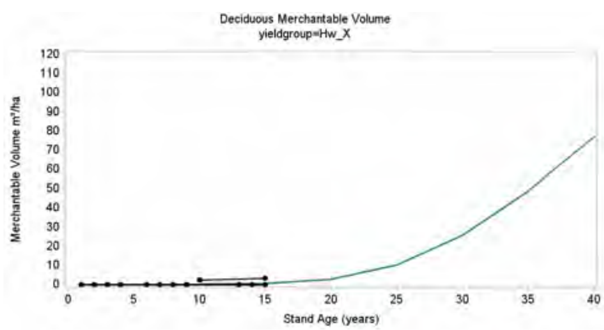
Deciduous merchantable volume trajectories against the RSA yield curves

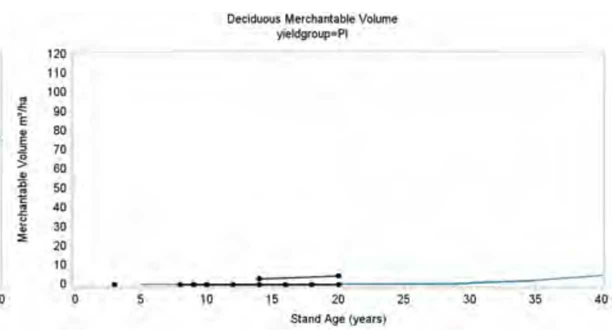

Deciduous Merchantable Volume
yieldgroup=Hw
Merchantable Volume m³/ha
Stand Age (years)

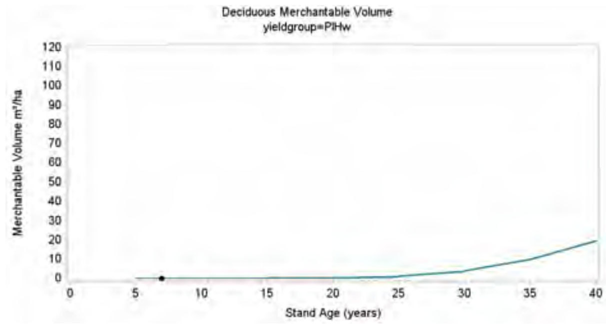

Deciduous Merchantable Volume
yieldgroup=HwPl
Merchantable Volume m³/ha
Stand Age (years)

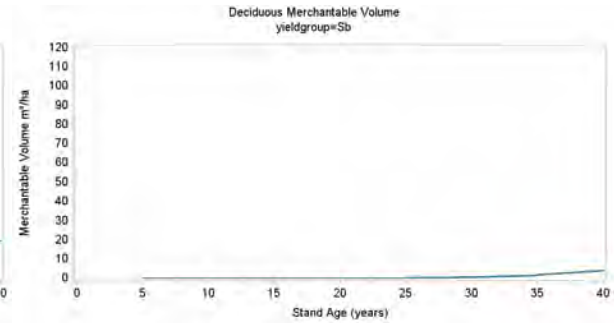

Deciduous Merchantable Volume
yieldgroup=HwSx
Merchantable Volume m³/ha
Stand Age (years)

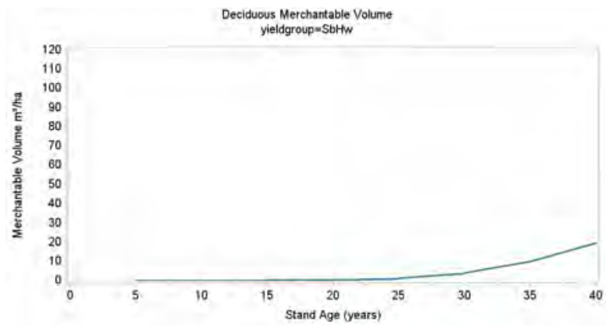

Deciduous Merchantable Volume
yieldgroup=Hw_W
Merchantable Volume m³/ha
Stand Age (years)

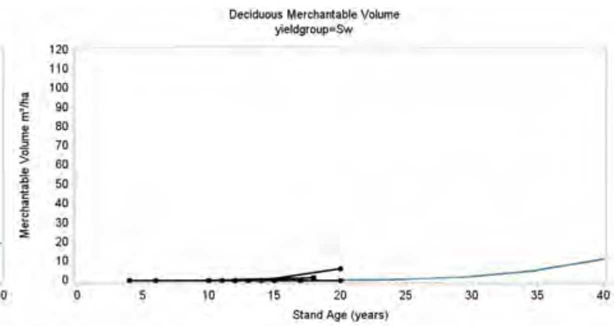

Deciduous Merchantable Volume
yieldgroup=Hw_X
Merchantable Volume m³/ha
Stand Age (years)

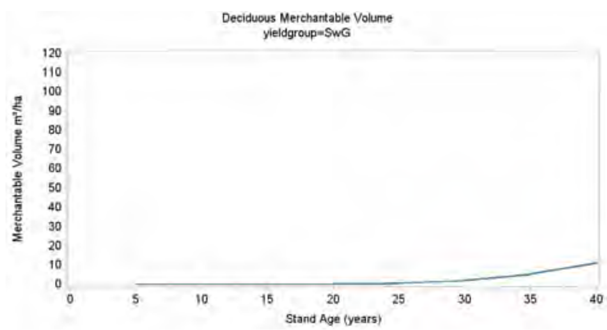

Deciduous Merchantable Volume
yieldgroup=Pl
Merchantable Volume m³/ha
Stand Age (years)

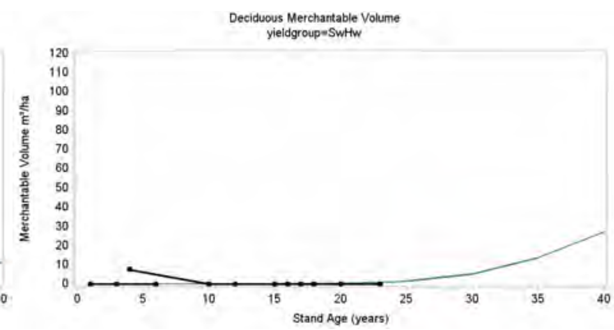

Deciduous Merchantable Volume
yieldgroup=PlHw
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40


Deciduous Merchantable Volume
yieldgroup=Sb
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40


Deciduous Merchantable Volume
yieldgroup=SbHw
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40

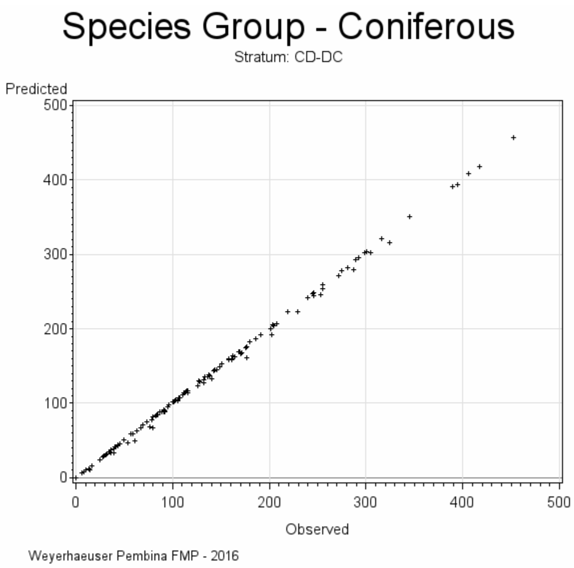

Deciduous Merchantable Volume
yieldgroup=Sw
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40

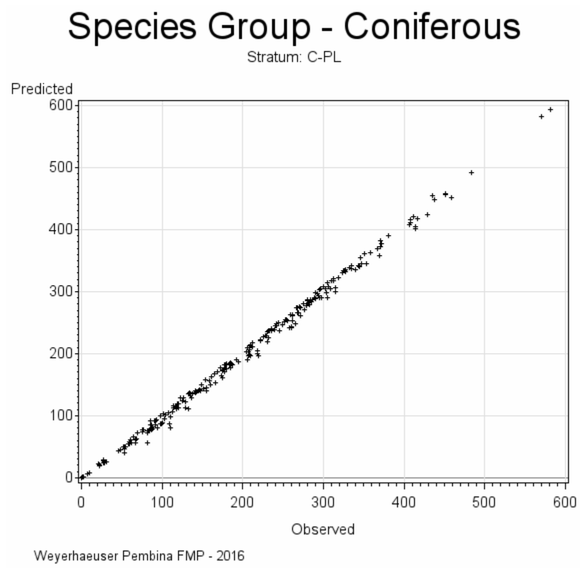

Deciduous Merchantable Volume
yieldgroup=SwG
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40

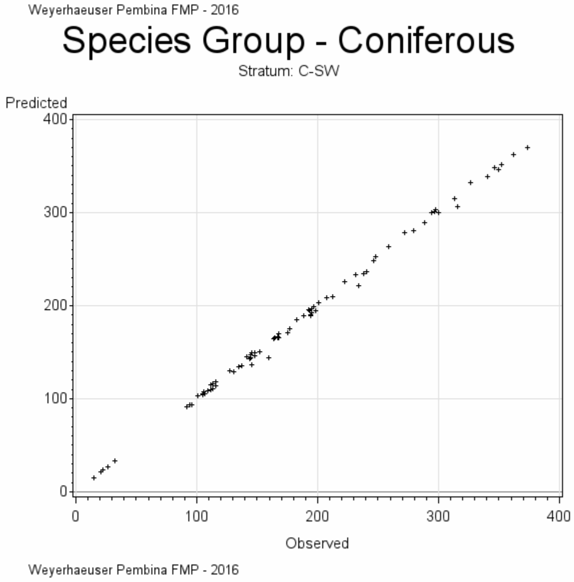

Deciduous Merchantable Volume
yieldgroup=SwHw
Merchantable Volume m³/ha
Stand Age (years)
0 10 20 30 40 50 60 70 80 90 100 110 120
0 5 10 15 20 25 30 35 40

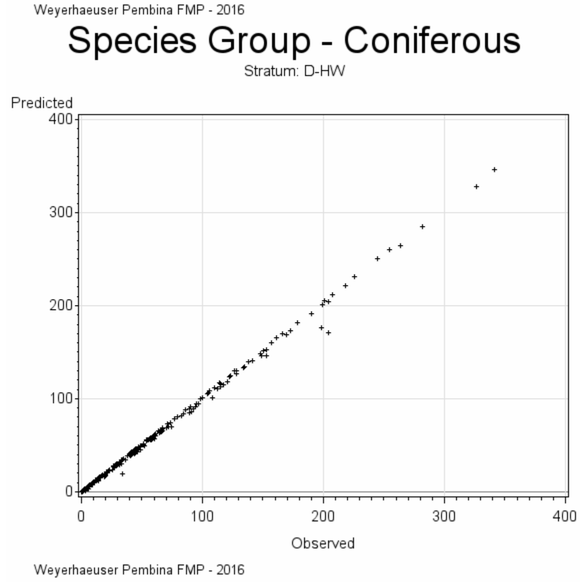
Appendix VII – Multiple Utilization Yield Curves

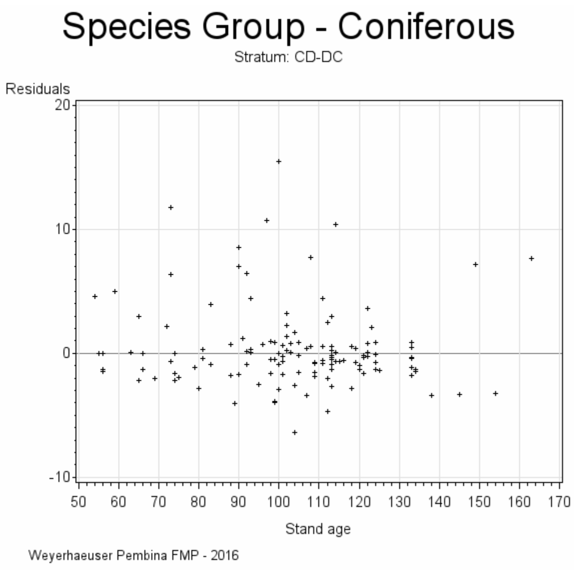
Residual plots for the utilization adjustment equations - conifer species group

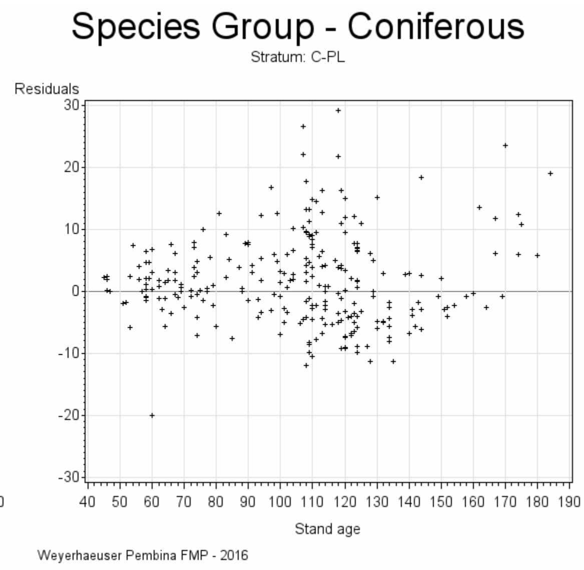

Species Group - Coniferous
Stratum: CD-DC
Predicted
Observed
Weyerhaeuser Pembina FMP - 2016

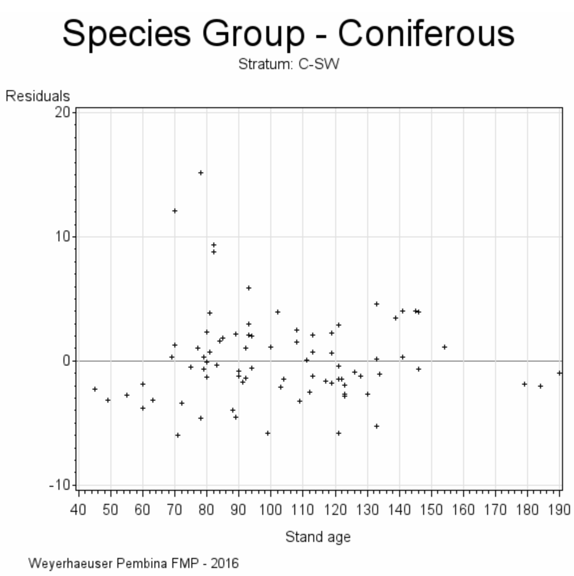

Species Group - Coniferous
Stratum: C-PL
Predicted
Observed
Weyerhaeuser Pembina FMP - 2016

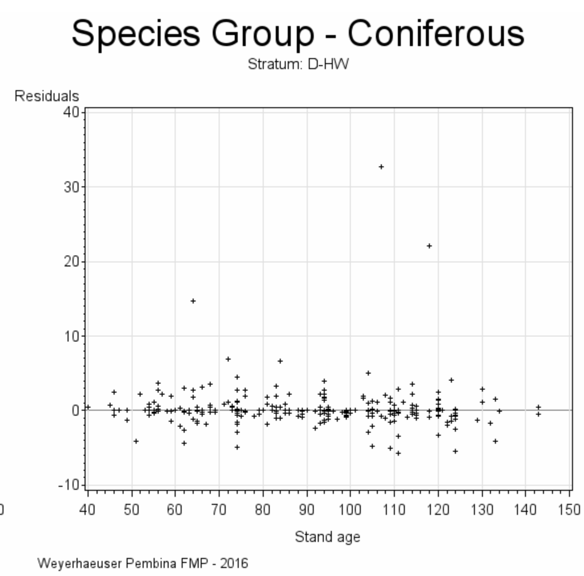

Species Group - Coniferous
Stratum: C-SW
Predicted
Observed
Weyerhaeuser Pembina FMP - 2016


Species Group - Coniferous
Stratum: D-HW
Predicted
Observed
Weyerhaeuser Pembina FMP - 2016


Species Group - Coniferous
Stratum: CD-DC
Residuals
20
10
0
-10
50 60 70 80 90 100 110 120 130 140 150 160 170
Stand age
Weyerhaeuser Pembina FMP - 2016

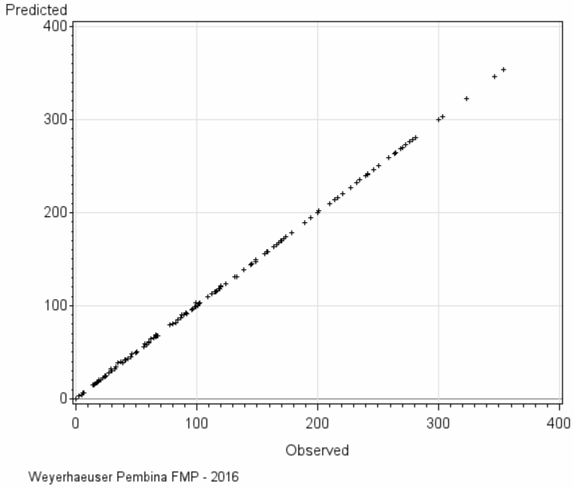

Species Group - Coniferous
Stratum: C-PL
Residuals
30
20
10
0
-10
-20
-30
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
Stand age
Weyerhaeuser Pembina FMP - 2016


Species Group - Coniferous
Stratum: C-SW
Residuals
20
10
0
-10
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
Stand age
Weyerhaeuser Pembina FMP - 2016

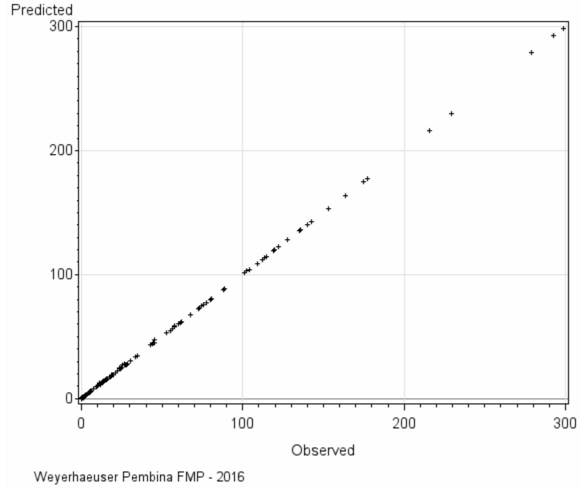

Species Group - Coniferous
Stratum: D-HW
Residuals
40
30
20
10
0
-10
40 50 60 70 80 90 100 110 120 130 140 150
Stand age
Weyerhaeuser Pembina FMP - 2016

Residual plots for the utilization adjustment equations - deciduous species group

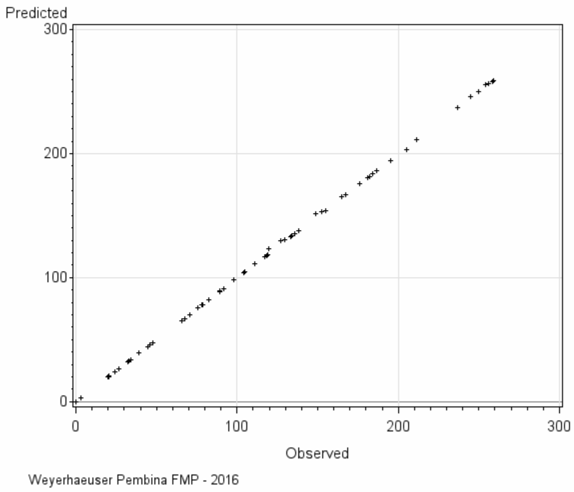
Species Group - Deciduous
Stratum: CD-DC



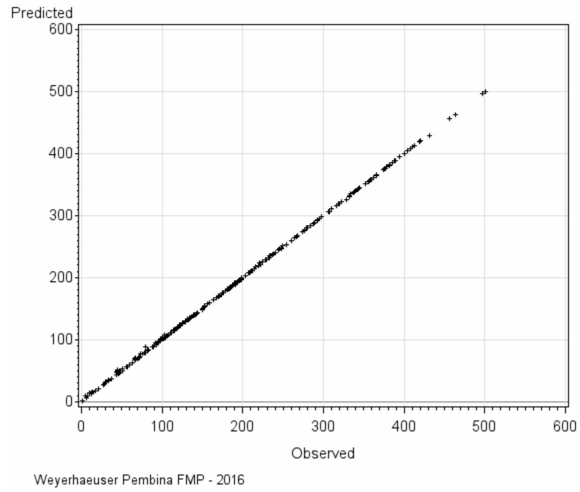
Species Group - Deciduous
Stratum: C-PL

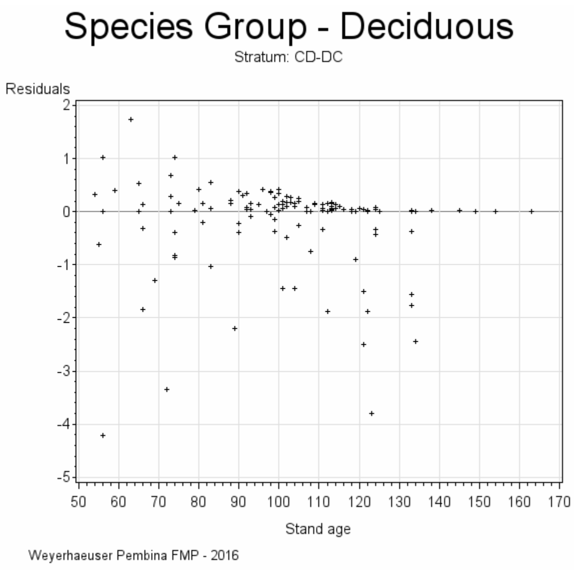


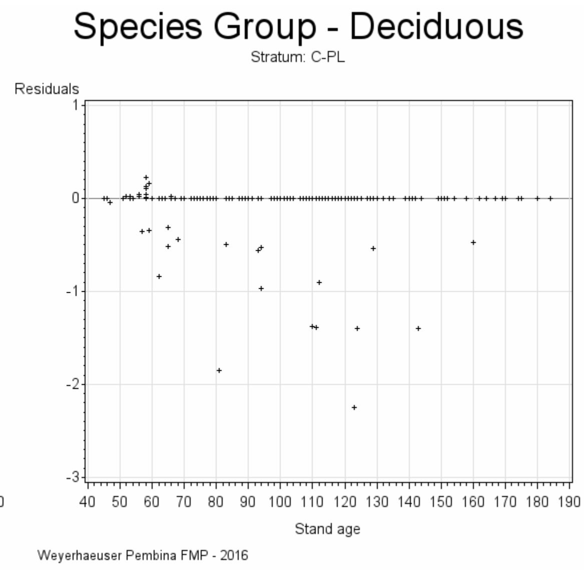
Species Group - Deciduous
Stratum: C-SW

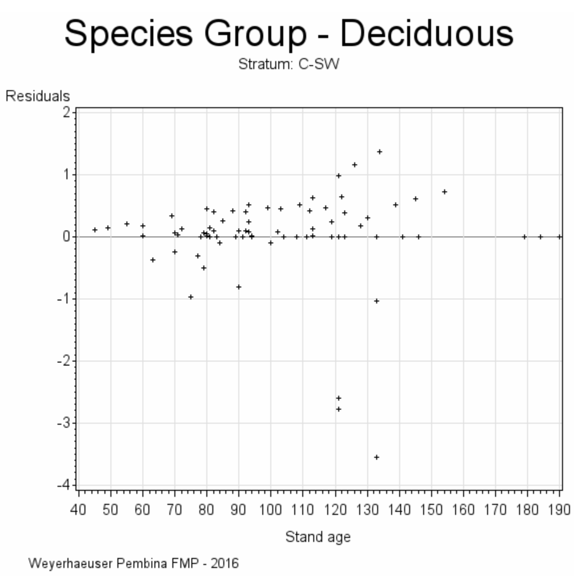


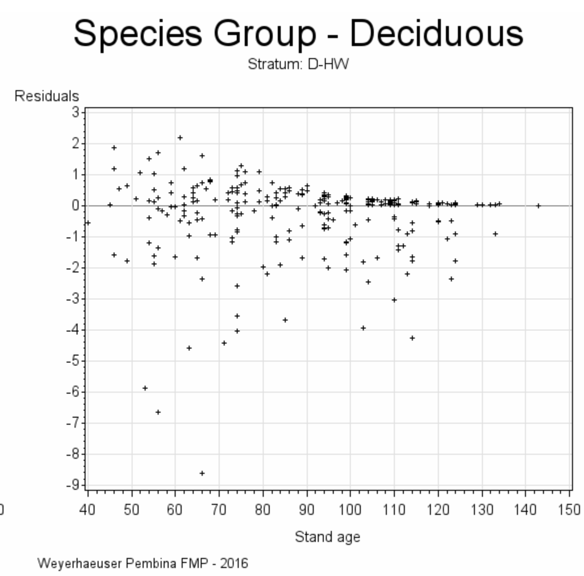
Species Group - Deciduous
Stratum: D-HW



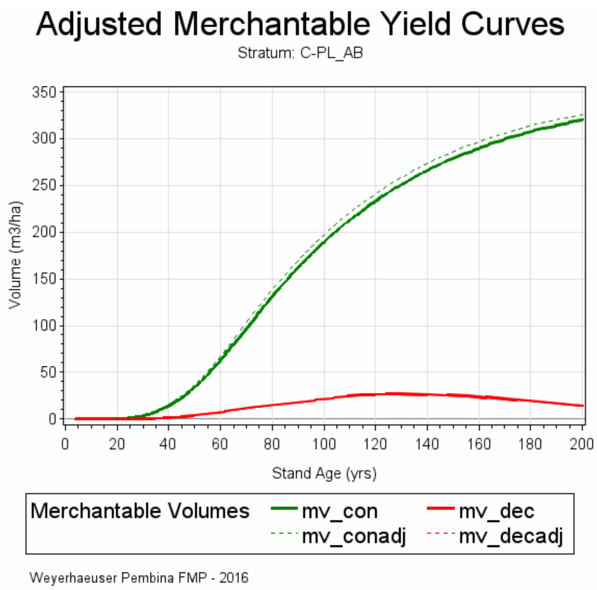

Species Group - Deciduous
Stratum: CD-DC
Residuals
2
1
0
-1
-2
-3
-4
-5
50 60 70 80 90 100 110 120 130 140 150 160 170
Stand age
Weyerhaeuser Pembina FMP - 2016

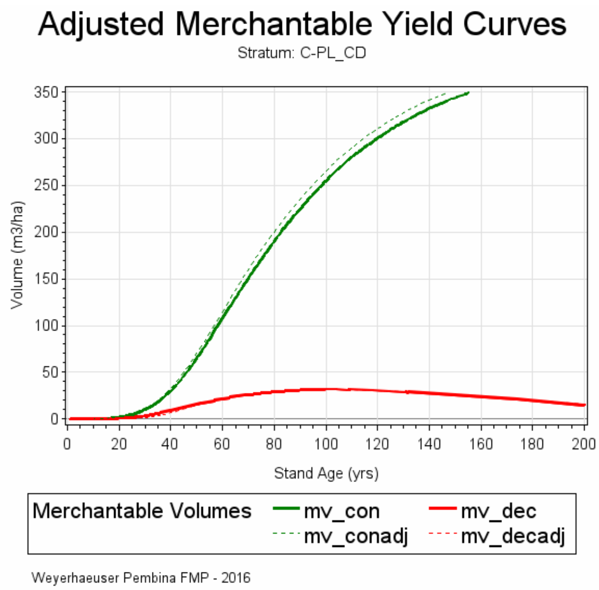

Species Group - Deciduous
Stratum: C-PL
Residuals
1
0
-1
-2
-3
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
Stand age
Weyerhaeuser Pembina FMP - 2016

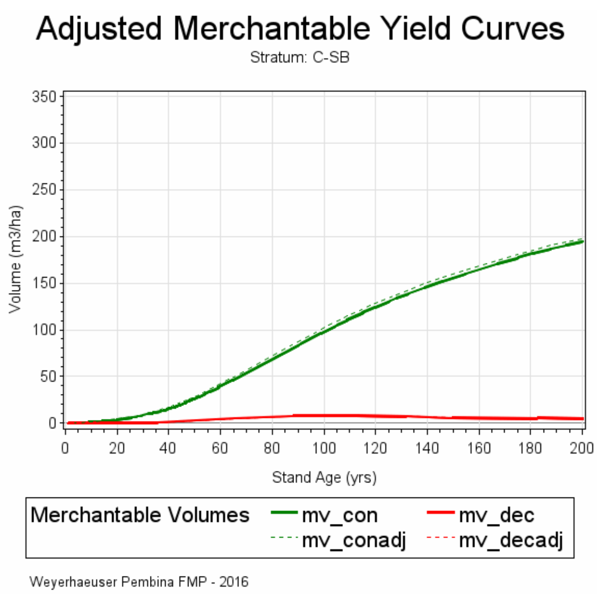

Species Group - Deciduous
Stratum: C-SW
Residuals
2
1
0
-1
-2
-3
-4
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
Stand age
Weyerhaeuser Pembina FMP - 2016

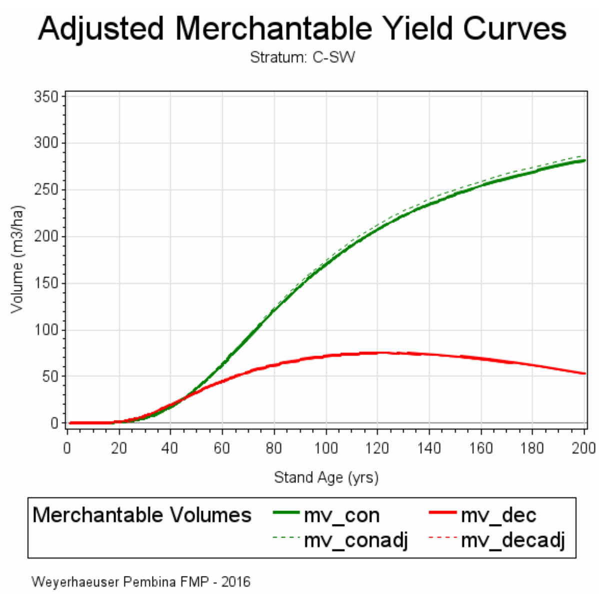

Species Group - Deciduous
Stratum: D-HW
Residuals
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
40 50 60 70 80 90 100 110 120 130 140 150
Stand age
Weyerhaeuser Pembina FMP - 2016

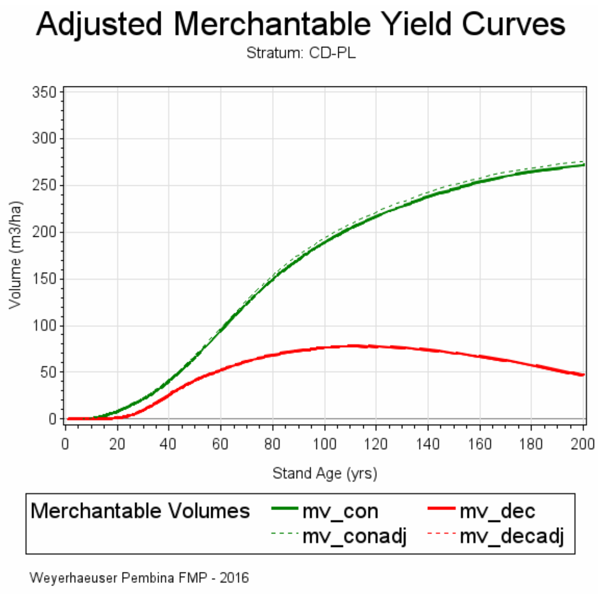
Adjusted FMP natural stand yield curves

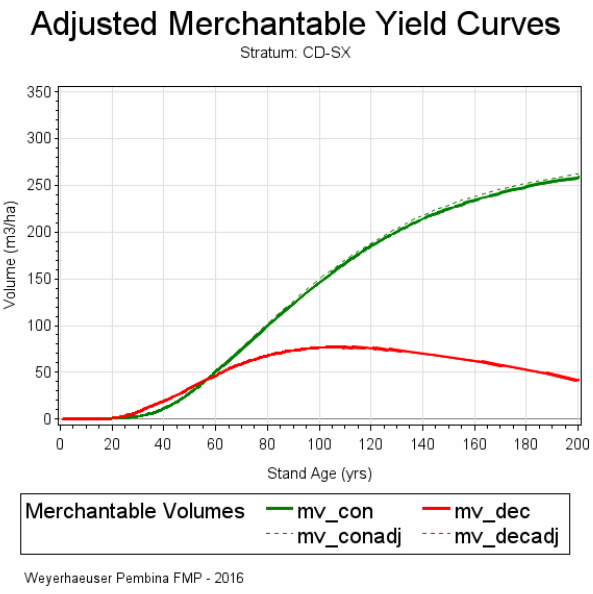

Adjusted Merchantable Yield Curves
Stratum: C-PL_AB
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

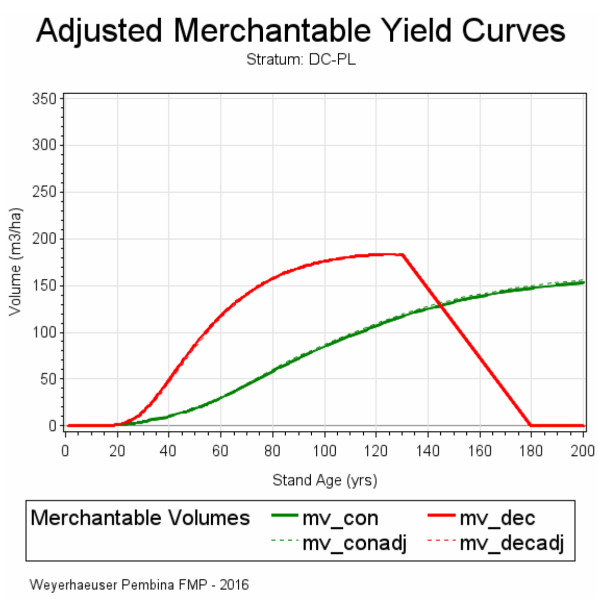

Adjusted Merchantable Yield Curves
Stratum: C-PL_CD
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

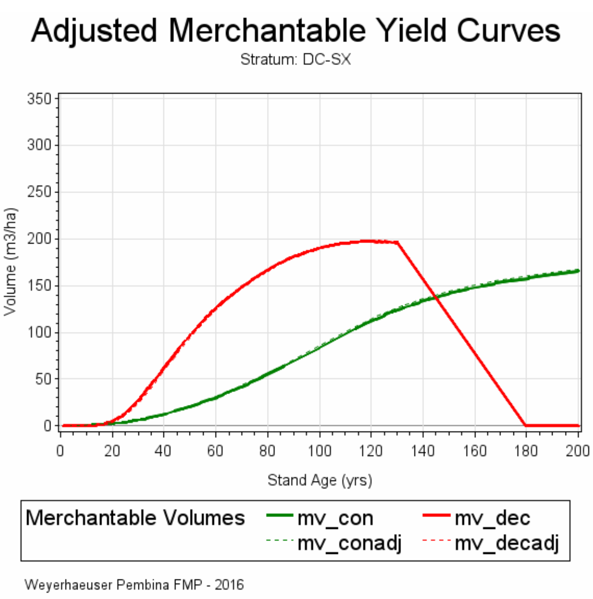

Adjusted Merchantable Yield Curves
Stratum: C-SB
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

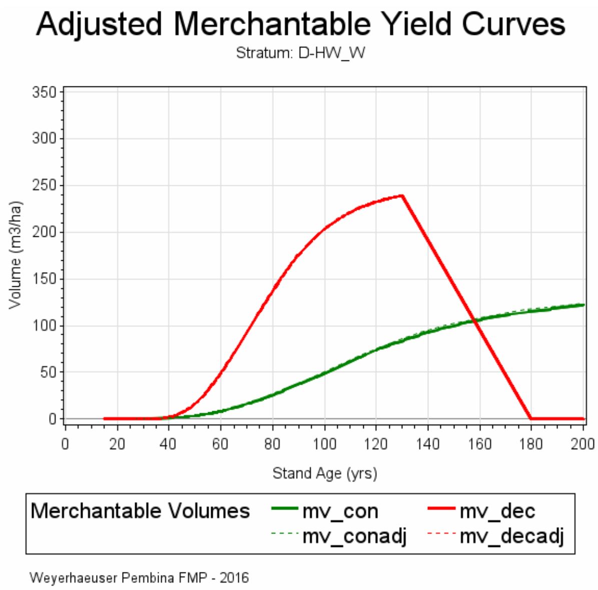

Adjusted Merchantable Yield Curves
Stratum: C-SW
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

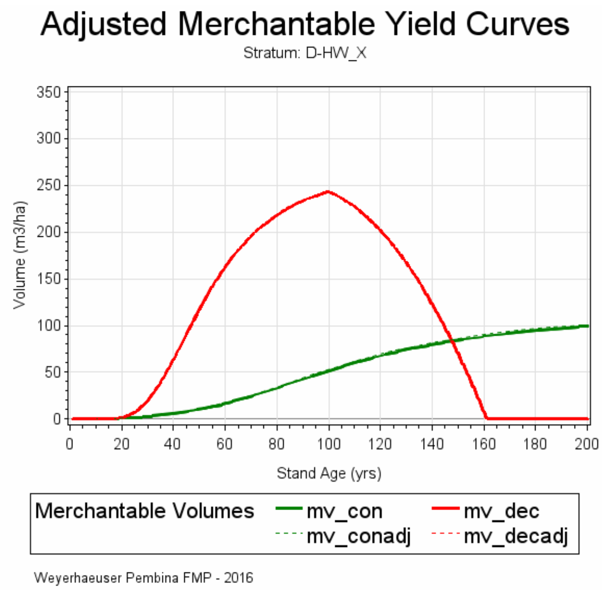

Adjusted Merchantable Yield Curves
Stratum: CD-PL
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016


Adjusted Merchantable Yield Curves
Stratum: CD-SX
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016


Adjusted Merchantable Yield Curves
Stratum: DC-PL
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

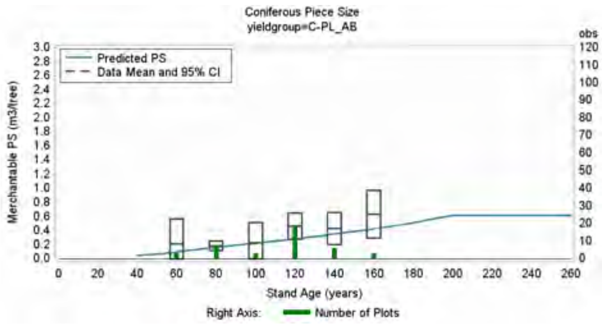

Adjusted Merchantable Yield Curves
Stratum: DC-SX
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

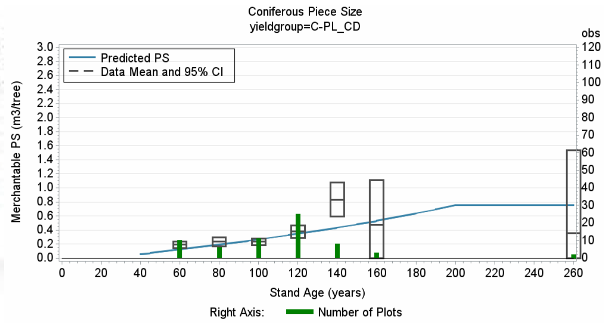

Adjusted Merchantable Yield Curves
Stratum: D-HW_W
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

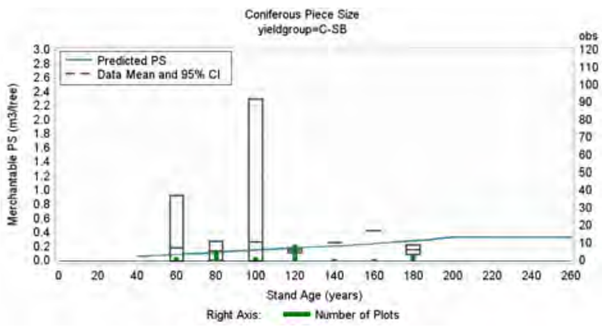

Adjusted Merchantable Yield Curves
Stratum: D-HW_X
Volume (m3/ha)
Stand Age (yrs)
Merchantable Volumes
mv_con
mv_dec
mv_conadj
mv_decadj
Weyerhaeuser Pembina FMP - 2016

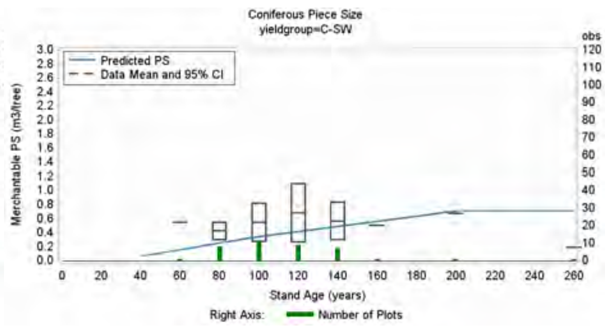
Appendix VIII – Piece Size Curves

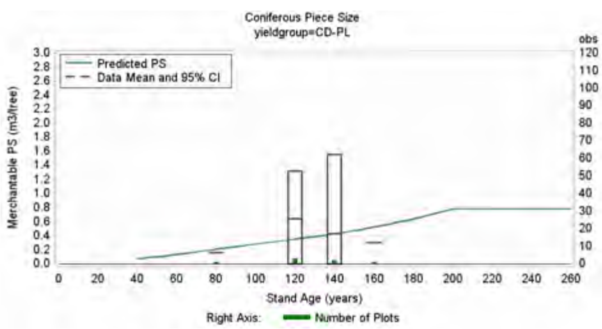
Average conifer piece size by age class against the conifer piece size curves

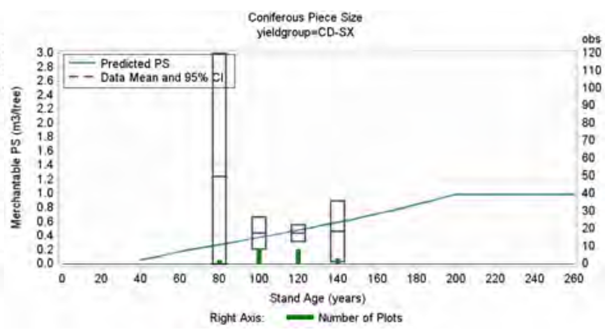

Coniferous Piece Size
yieldgroup=C-PL_AB
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

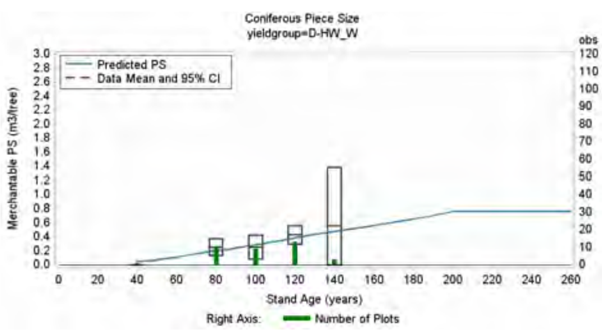

Coniferous Piece Size
yieldgroup=C-PL_CD
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

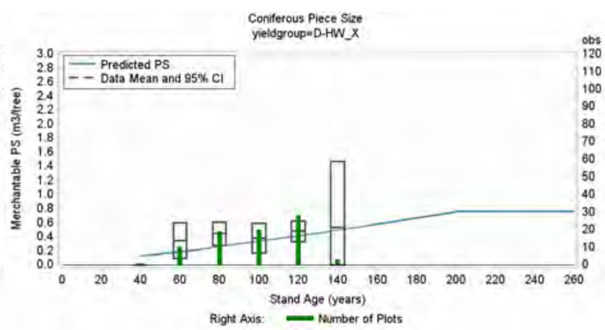

Coniferous Piece Size
yieldgroup=C-SB
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

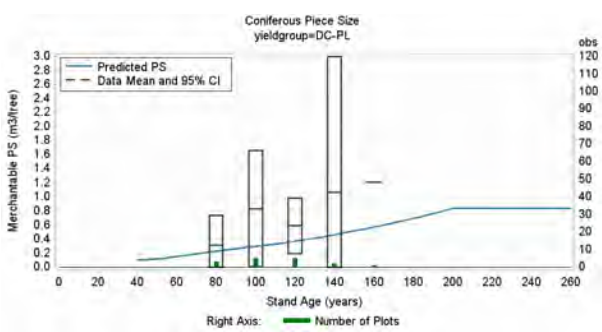

Coniferous Piece Size
yieldgroup=C-SW
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

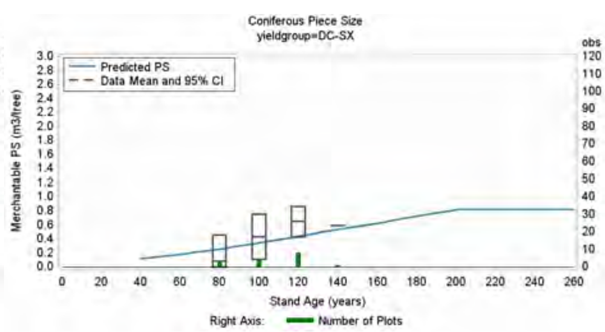

Coniferous Piece Size
yieldgroup=CD-PL
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots


Coniferous Piece Size
yieldgroup=CD-SX
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

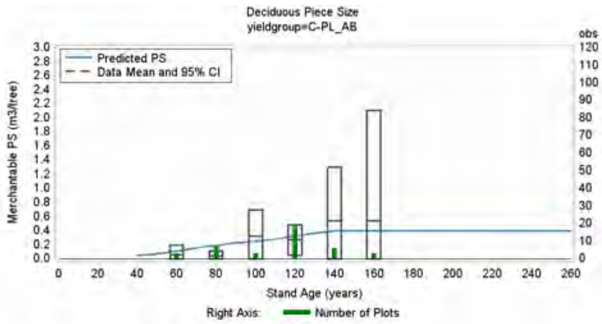

Coniferous Piece Size
yieldgroup=D-HW_W
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

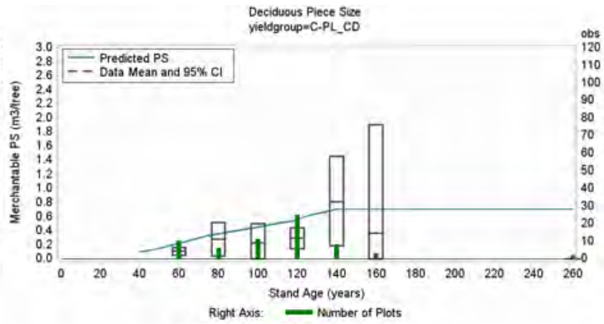

Coniferous Piece Size
yieldgroup=D-HW_X
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

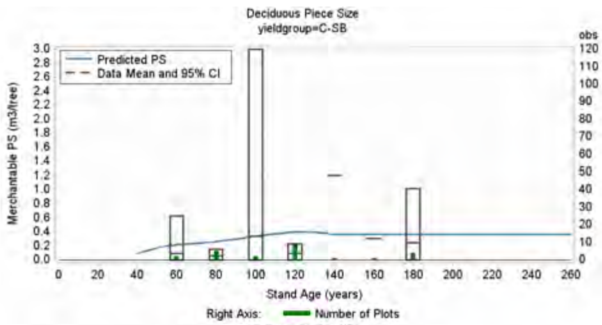

Coniferous Piece Size
yieldgroup=DC-PL
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

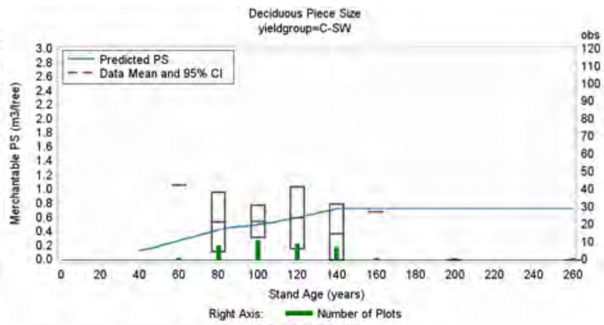

Coniferous Piece Size
yieldgroup=DC-SX
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

Average deciduous piece size by age class against the deciduous piece size curves


Deciduous Piece Size
yieldgroup=C-PL_AB
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Piece Size
yieldgroup=C-PL_CD
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots


Deciduous Piece Size
yieldgroup=C-SB
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots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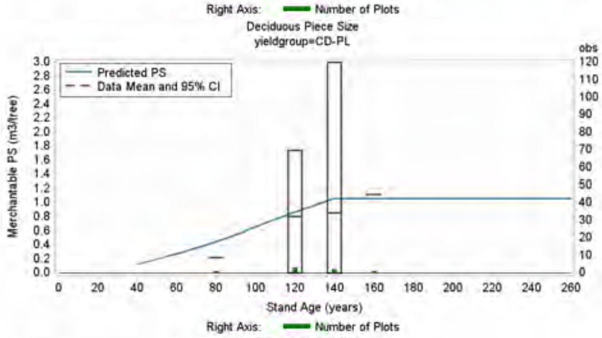
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots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Merchantable PS (m3/tree)
obs
Stand Age (years)
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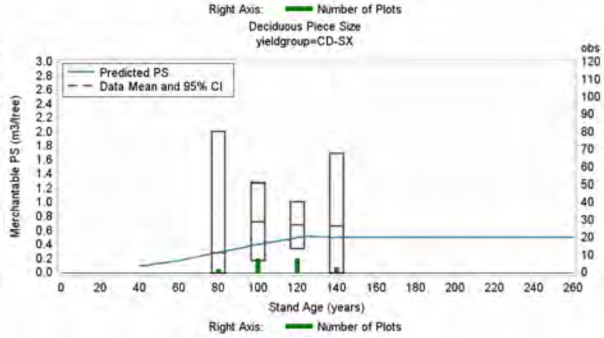
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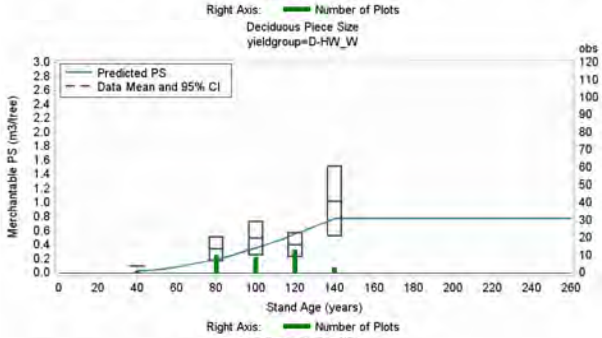
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots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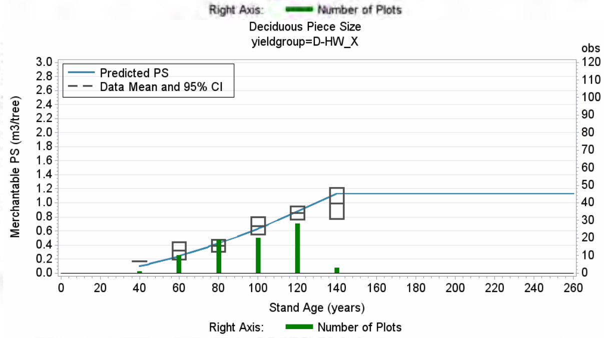
yieldgroup=D-HW_W
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots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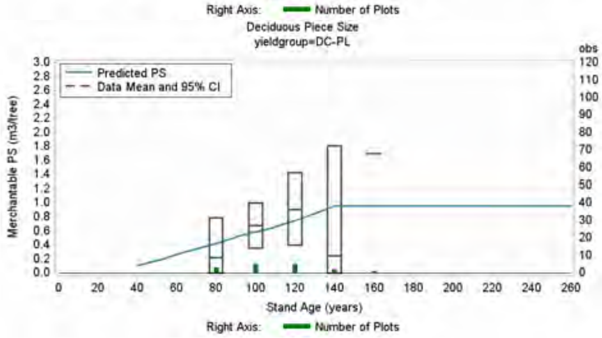
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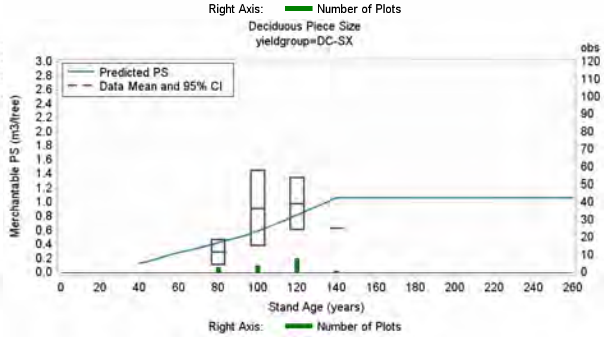
obs
Stand Age (years)
Right Axis: Number of Plots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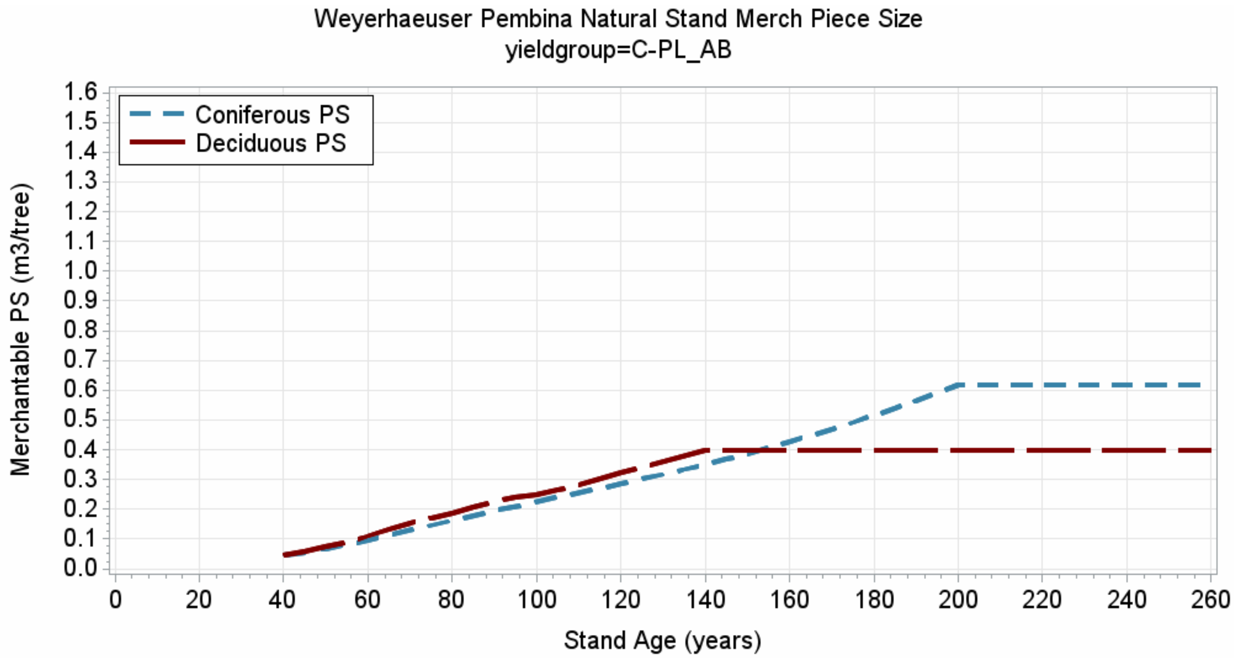
Predicted PS
Data Mean and 95% CI
Merchantable PS (m3/tree)
obs
Stand Age (years)
Right Axis: Number of Plots

Final piece size curves for natural stands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Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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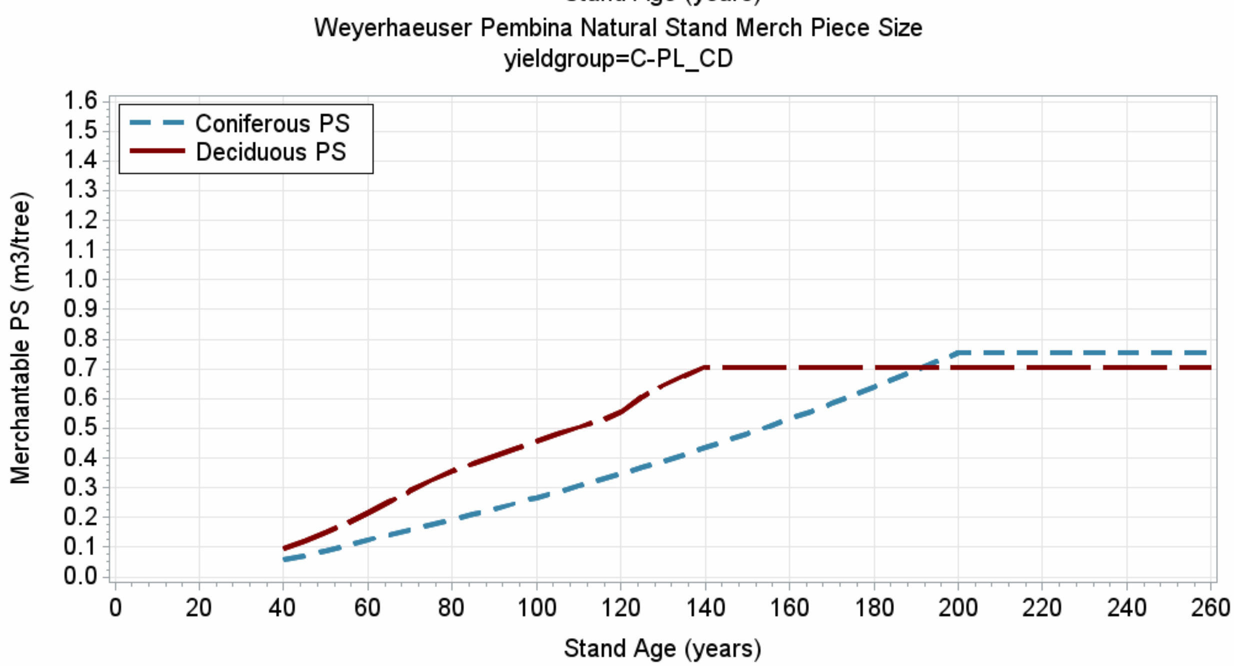
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Deciduous PS
Merchantable PS (m3/tree)
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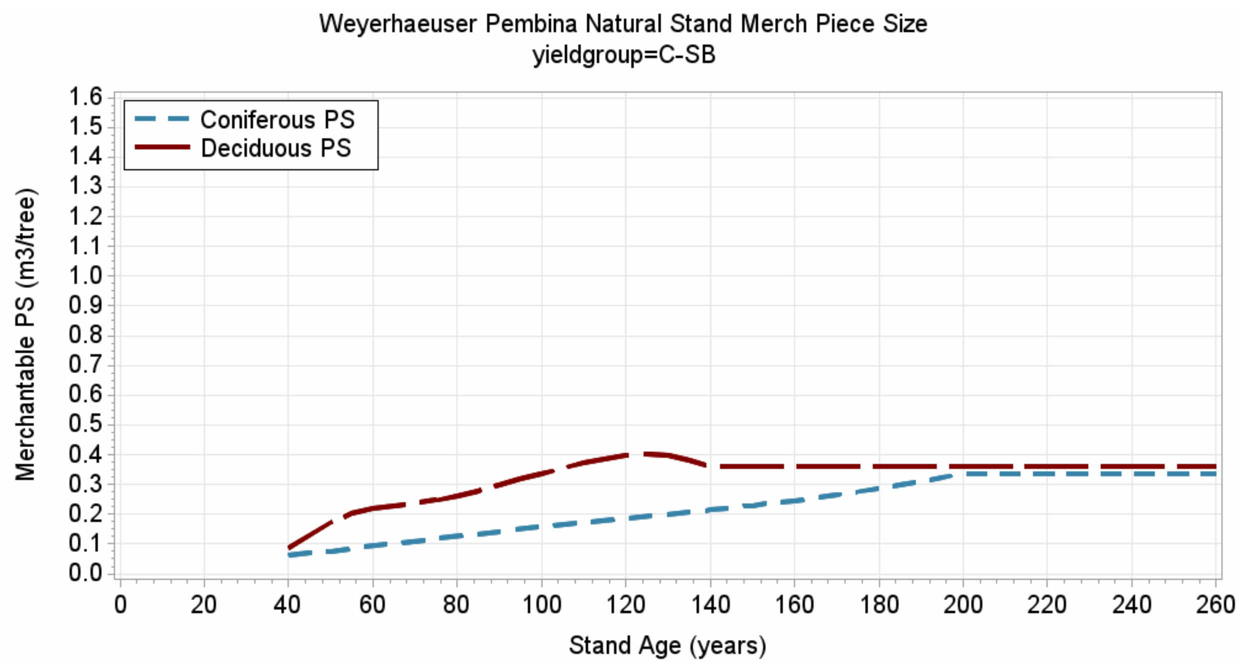
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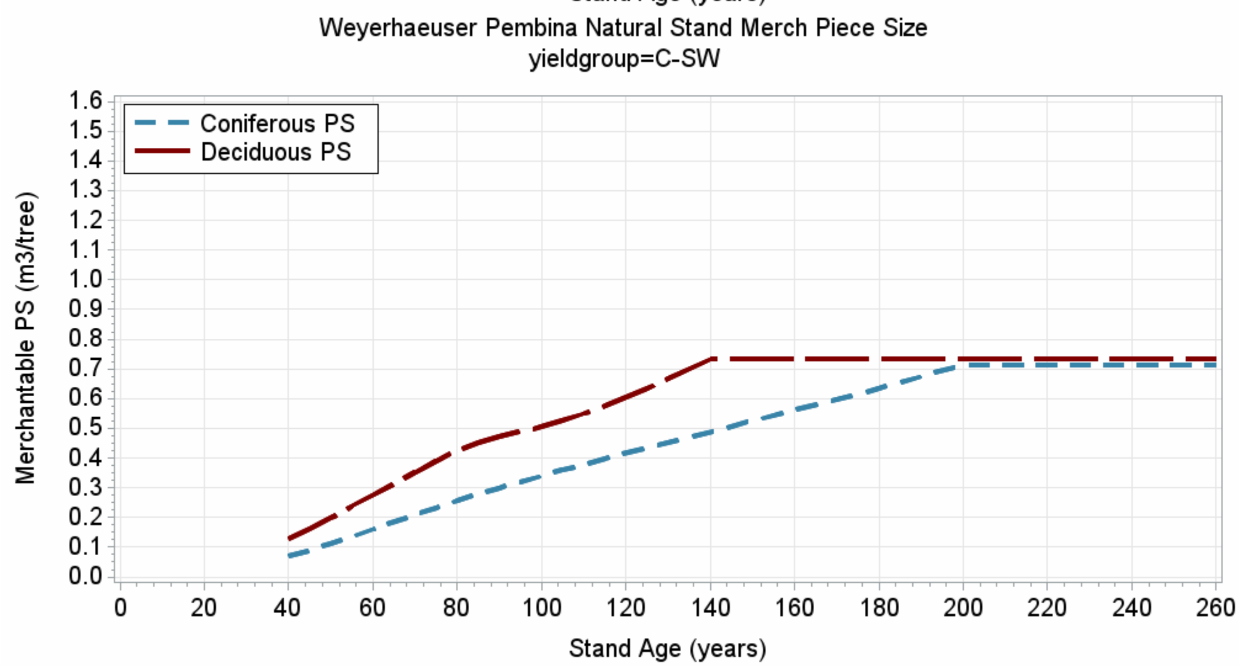
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)


Weyerhaeuser Pembina Natural Stand Merch Piece Size
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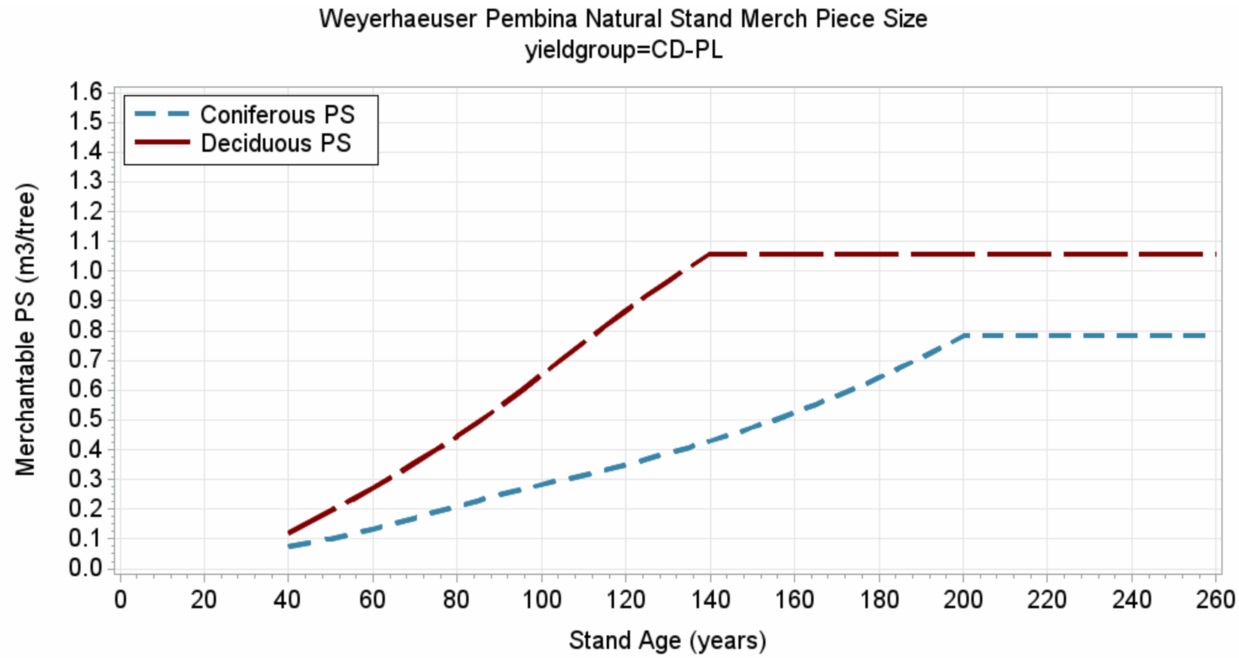
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)


Weyerhaeuser Pembina Natural Stand Merch Piece Size
yieldgroup=CD-PL
Coniferous PS
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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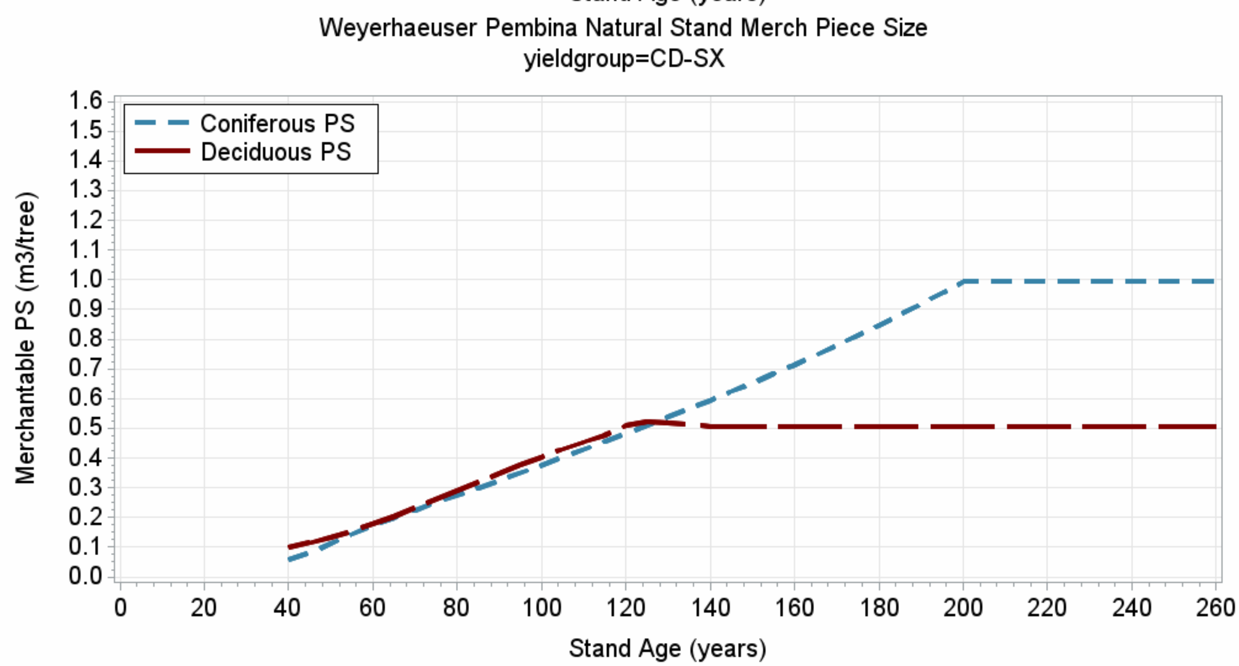
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Deciduous PS
Merchantable PS (m3/tree)
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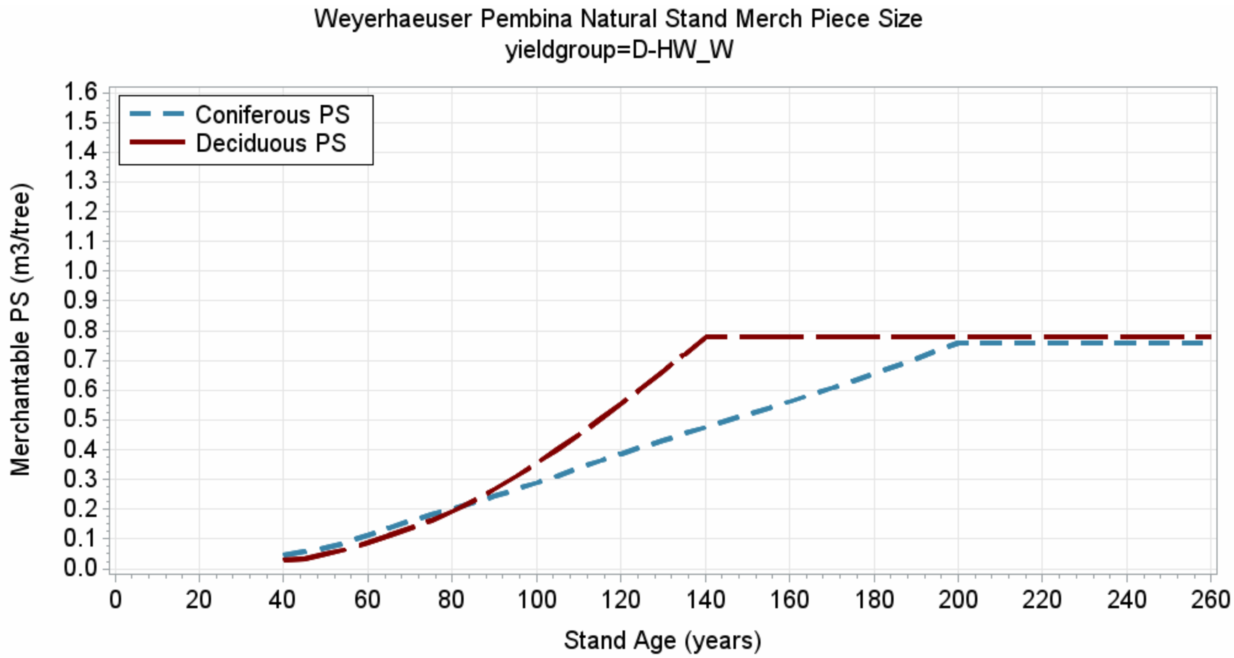
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yieldgroup=D-HW_W
Coniferous PS
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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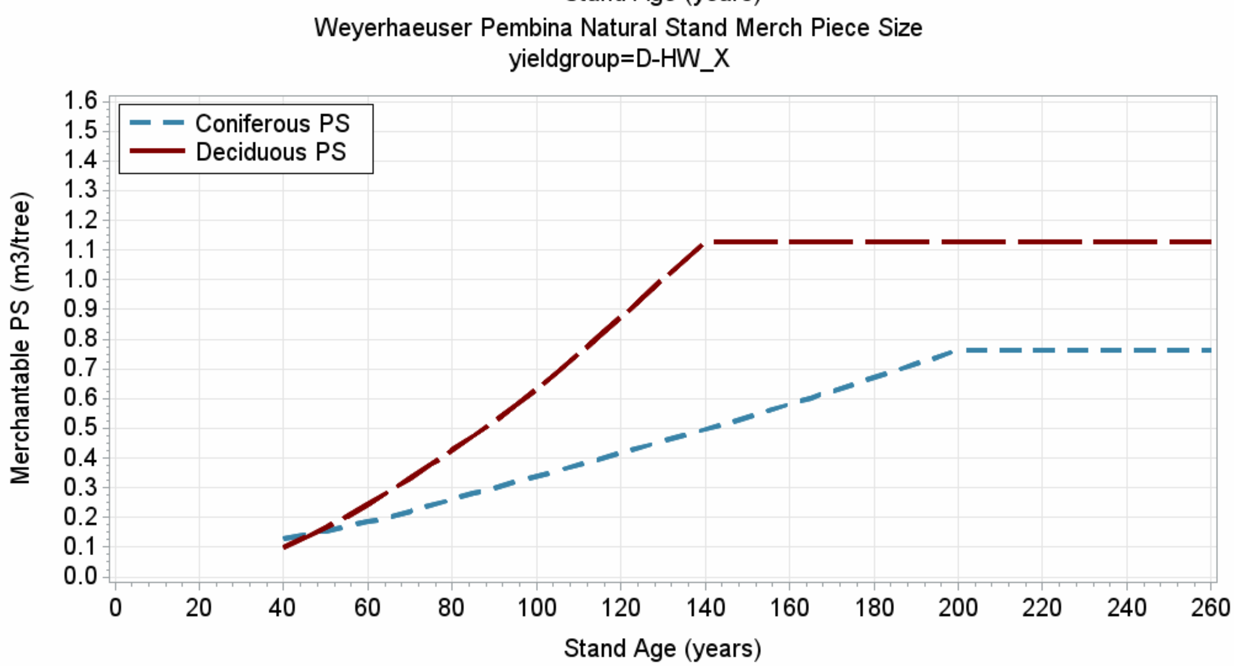
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Coniferous PS
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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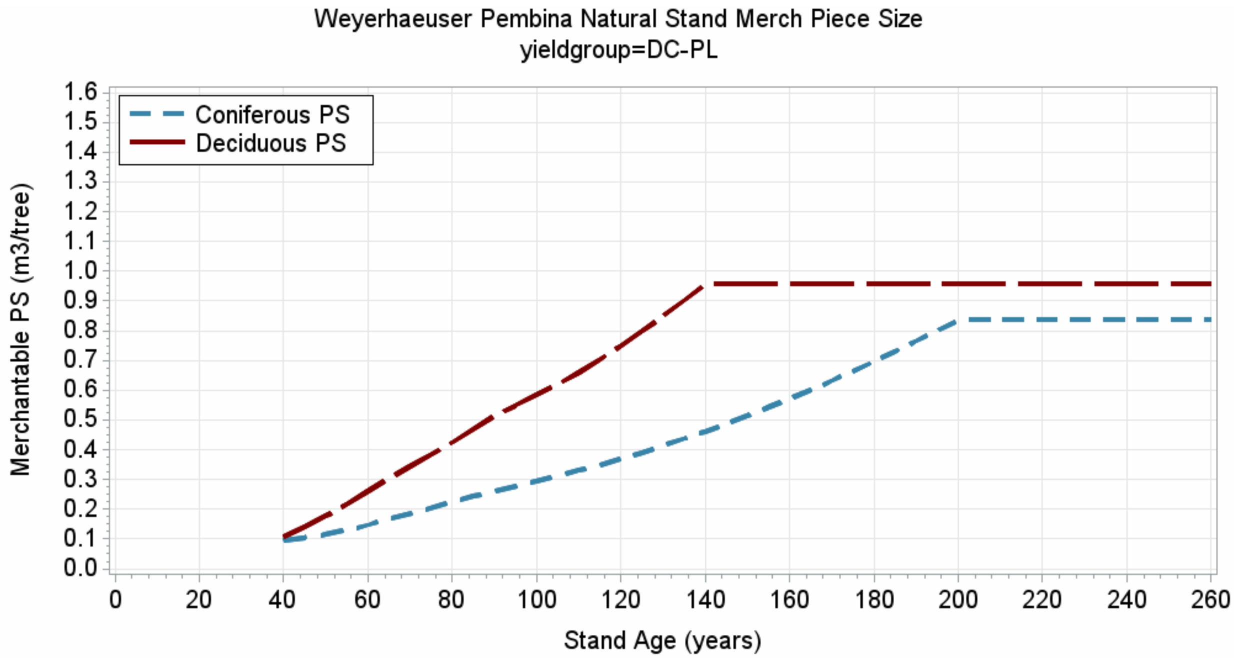
Weyerhaeuser Pembina Natural Stand Merch Piece Size
yieldgroup=DC-PL
Coniferous PS
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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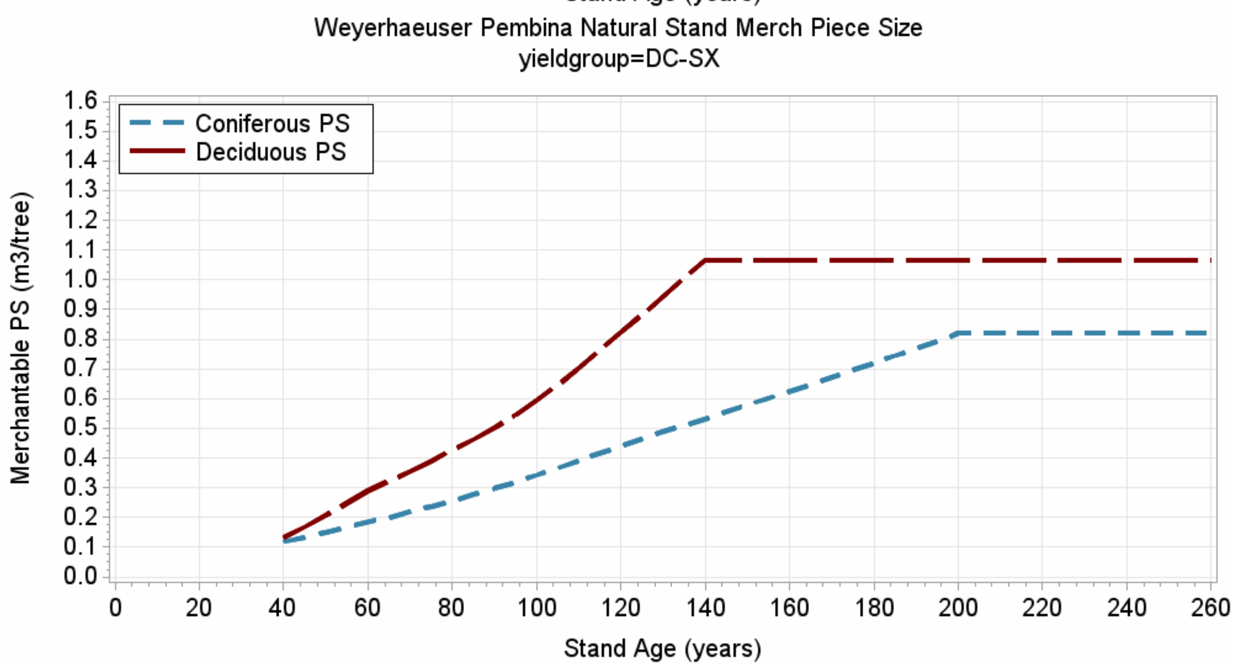
Weyerhaeuser Pembina Natural Stand Merch Piece Size
yieldgroup=DC-SX
Coniferous PS
Deciduous PS
Merchantable PS (m3/tree)
Stand Age (years)
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Appendix IX – Outliers

After careful review of the compiled plot and tree measurement data and associated AVI information, we removed 8 plots (19 measurements) from the modeling data set. The three main reasons for deletion were:

1) Very high compiled plot volumes - where the tree details revealed potential issues with the data that could not be resolved. We dropped all measurements of the plot rather than trying to use potentially erroneous information.
2) High volumes at a young stand age that would potentially significantly influence regression lines and shapes by over-predicting volumes.
3) High volumes that were also exacerbated by suspect site index/age or other data anomalies that would result in GYPSY projection issues.

Only 3 DC (SX or PL) and 5 pure D (D-HW_X or D-HW_W) plots were affected. The plots are listed in Table IX-1.

Table IX-1. Outliers and influential points removed from modelling

Plot ID	Meas Year	Yield Group	Stand Age	Total Vol (m3/ha)	Conifer Vol (m3/ha)	Deciduous Vol (m3/ha)	Reason for Deletion
DV026	1995	D-HW_X	95	614.5	23.8	590.6	high volumes/suspect plot data
DV026	2006	D-HW_X	106	561.3	40.8	520.5	high volumes/suspect plot data
DV026	2014	D-HW_X	114	381.9	77.8	304.1	suspect plot data, all measurements of plot removed
DV068	1997	D-HW_X	107	623.8	78.0	545.8	high volumes/suspect plot data
DV068	2008	D-HW_X	118	680.0	68.2	611.9	high volumes/suspect plot data
DV142	1999	D-HW_X	99	665.4	19.6	645.8	high volumes/suspect plot data
DV142	2010	D-HW_X	110	681.1	24.7	656.4	high volumes/suspect plot data
DV186	2000	D-HW_X	100	634.9	67.0	567.9	high volumes/suspect plot data
DV186	2012	D-HW_X	112	695.4	79.6	615.8	high volumes/suspect plot data
ED106	2002	D-HW_W	53	385.2	64.8	320.4	influential point, young stand age high volumes
ED106	2013	D-HW_W	64	416.8	70.7	346.1	influential point, young stand age high volumes
DV006	1995	DC-SX	105	463.1	12.8	450.3	high volumes/suspect plot data/GYPSY projections suspect (site index/age)
DV006	1999	DC-SX	109	488.2	15.7	472.5	high volumes/suspect plot data/GYPSY projections suspect (site index/age)
DV006	2005	DC-SX	115	503.8	24.9	478.8	high volumes/suspect plot data/GYPSY projections suspect (site index/age)
DV006	2010	DC-SX	120	490.3	31.6	458.7	high volumes/suspect plot data/GYPSY projections suspect (site index/age)
ED091	2001	DC-PL	71	469.9	435.6	34.4	high conifer volumes/suspect plot data
ED091	2013	DC-PL	83	527.8	486.6	41.2	high volumes/suspect plot data
ED105	2002	DC-PL	102	720.3	87.5	632.8	high volumes/suspect plot data
ED105	2014	DC-PL	114	691.1	98.4	592.6	high volumes/suspect plot data

We carried out a sensitivity analysis after the yield curve development process to gauge the impact of outliers that were removed from modeling (Table IX-2).

Table IX-2. Bias statistics with and without the outliers

	Bias % without outiers (submission)				Bias % with all outiers included			
BCG	N	Decid	Conifer	Total	N	Decid	Conifer	Total
C	172	7.6	-1.7	-0.4	172	7.6	-1.7	-0.4
CD	28	8.1	-0.6	1.9	28	8.1	-0.6	1.9
D	32	-8.8	25.2	-2.1	37	-6.2	24.2	-0.4
DC	117	-8.1	25.4	3.4	120	-8.9	28.7	3.1
All	349	**-4.9**	**2.8**	**-0.4**	357	**-3.6**	**2.9**	**0.1**

As per Table IX-2, the removal of outliers did not have a significant impact on the outcome at all. In fact, had we included the outliers, deciduous volume prediction bias would have slightly improved (4.9% to 3.6% over-prediction). The conifer volume prediction bias did not change.

The implementation of capping of deciduous volumes in the D and DC strata yield curves to account for stand decline and mortality in natural stands resulted in the impact of these high volume suspect plots and influential points completely mitigated.

The submitted final yield curves (without outliers) and the yield curves with the outliers are shown for the relevant strata side-by-side in Figures IX-1 to IX-4.

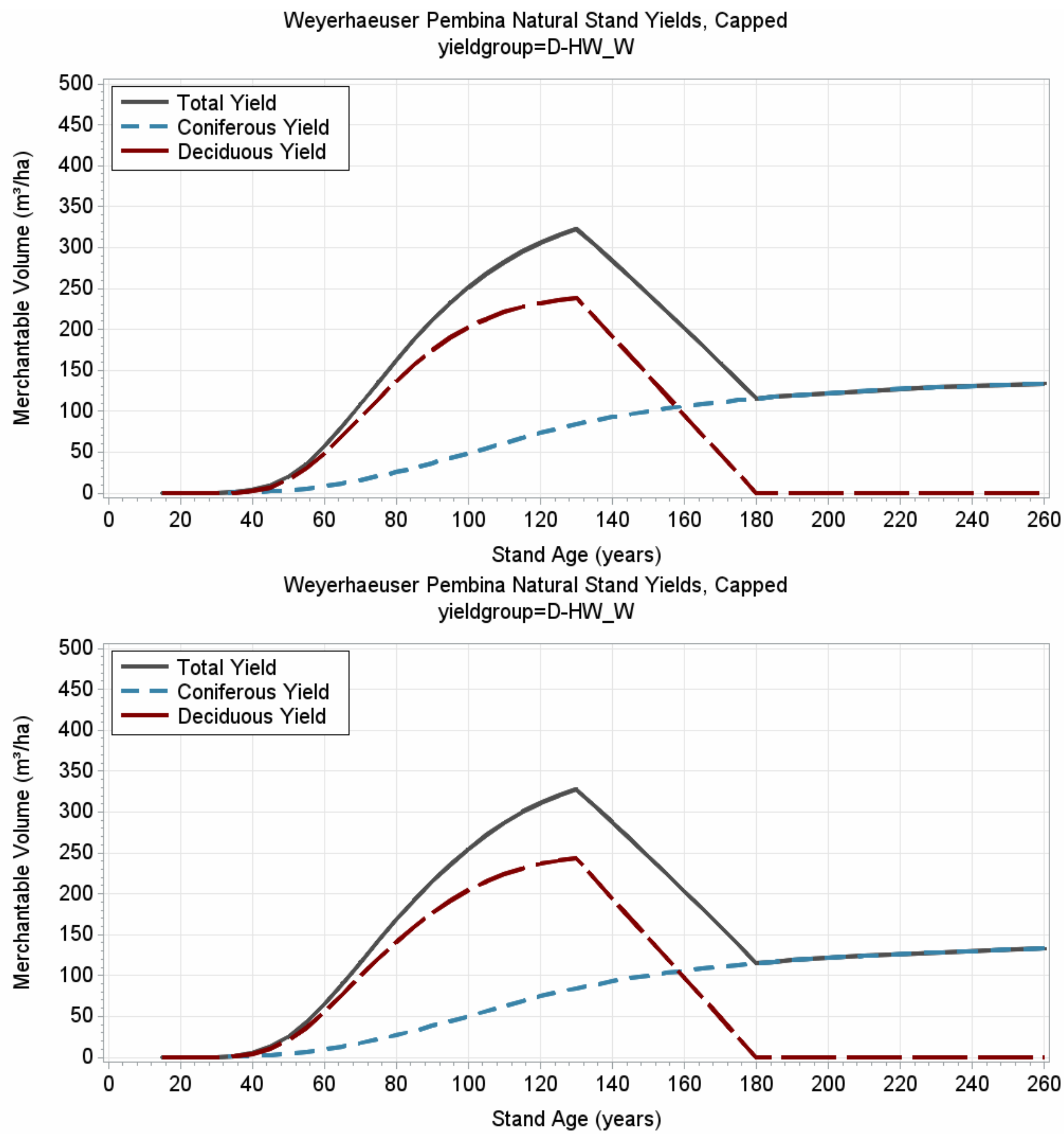

Figure IX-1. Original submission (top) vs refitted yield curves with outliers for yield group D-HW_W

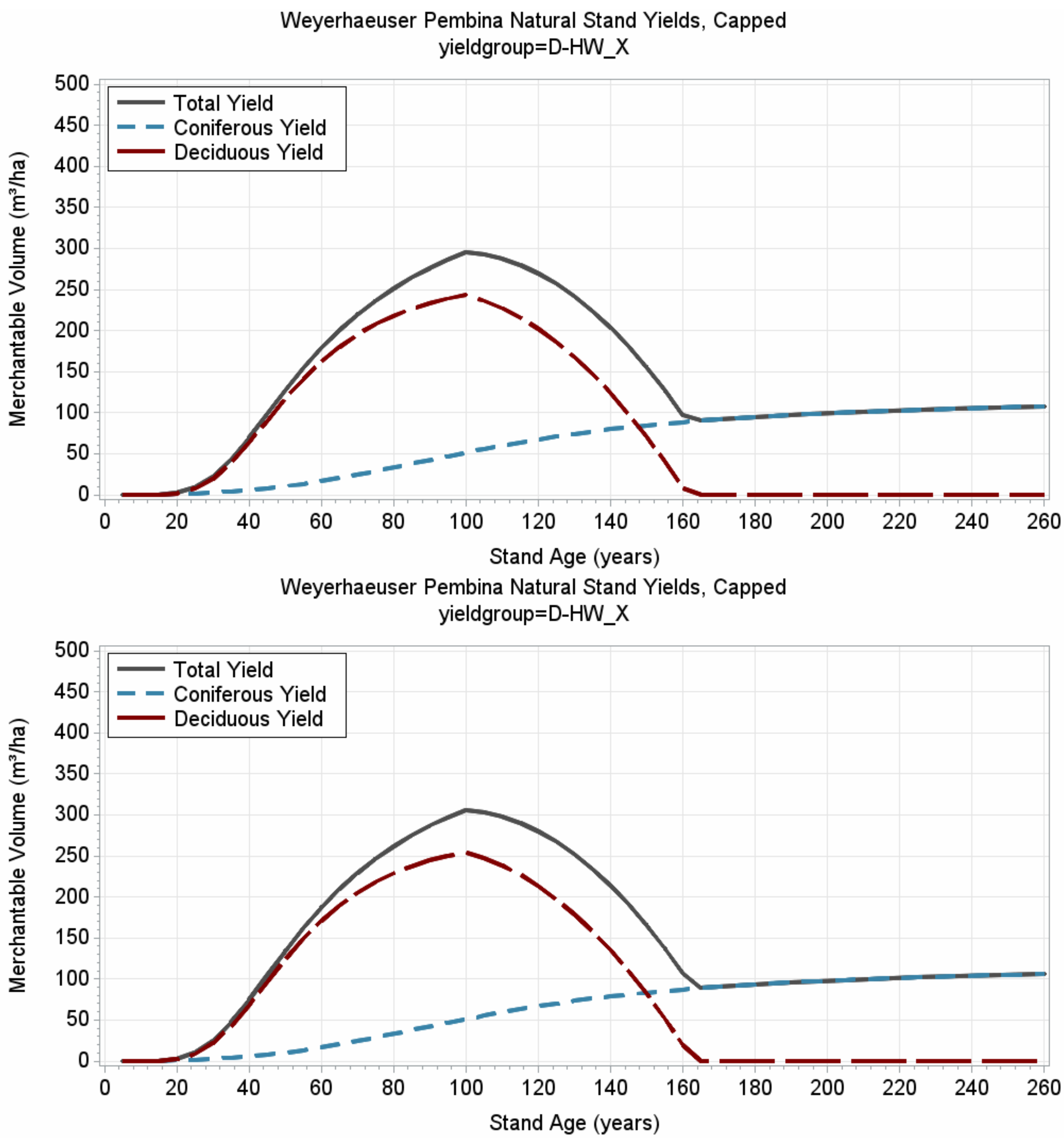

Figure IX-2. Original submission (top) vs refitted yield curves with outliers for yield group D-HW_X

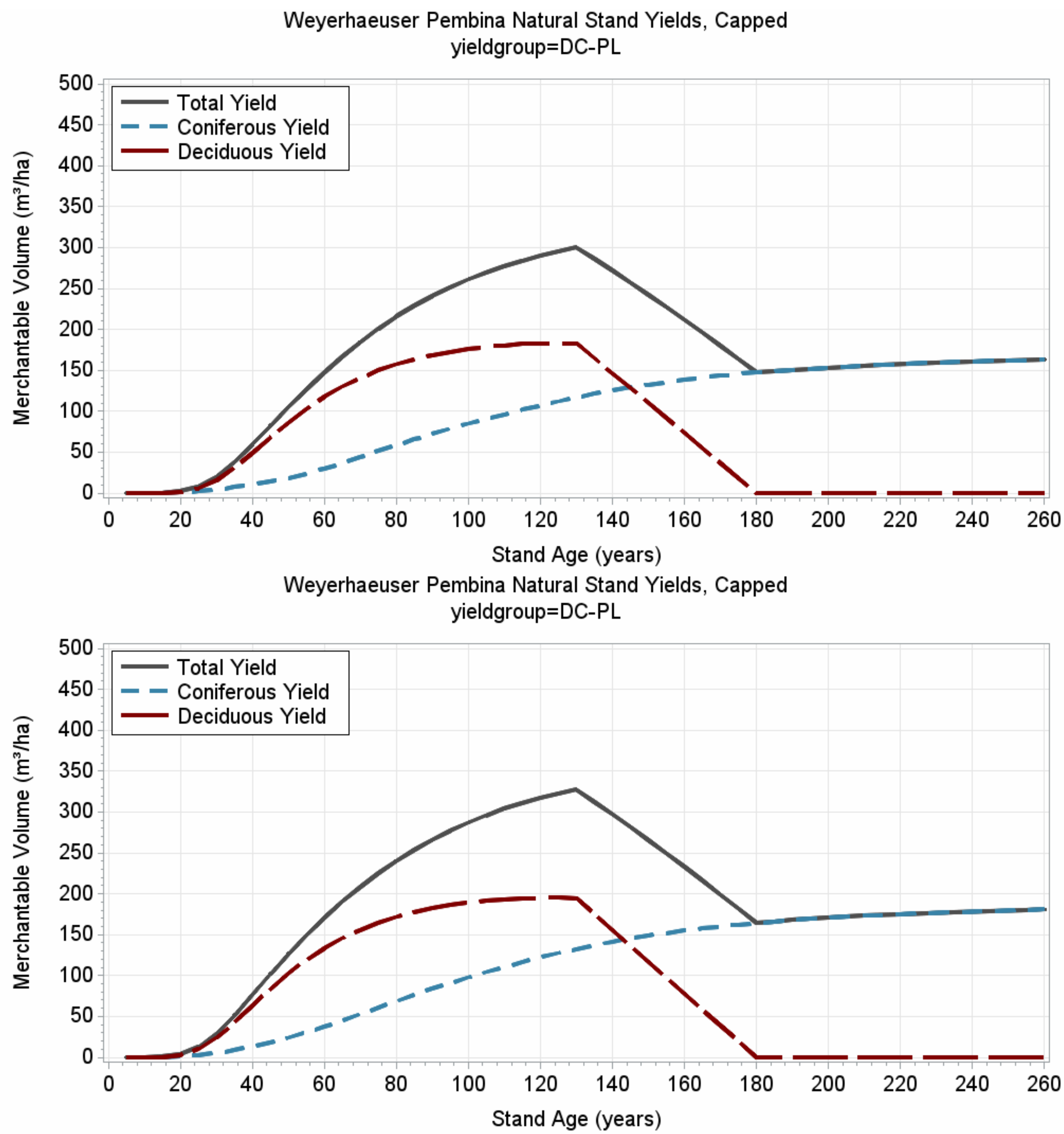

Figure IX-3. Original submission (top) vs refitted yield curves with outliers for yield group DC-PL

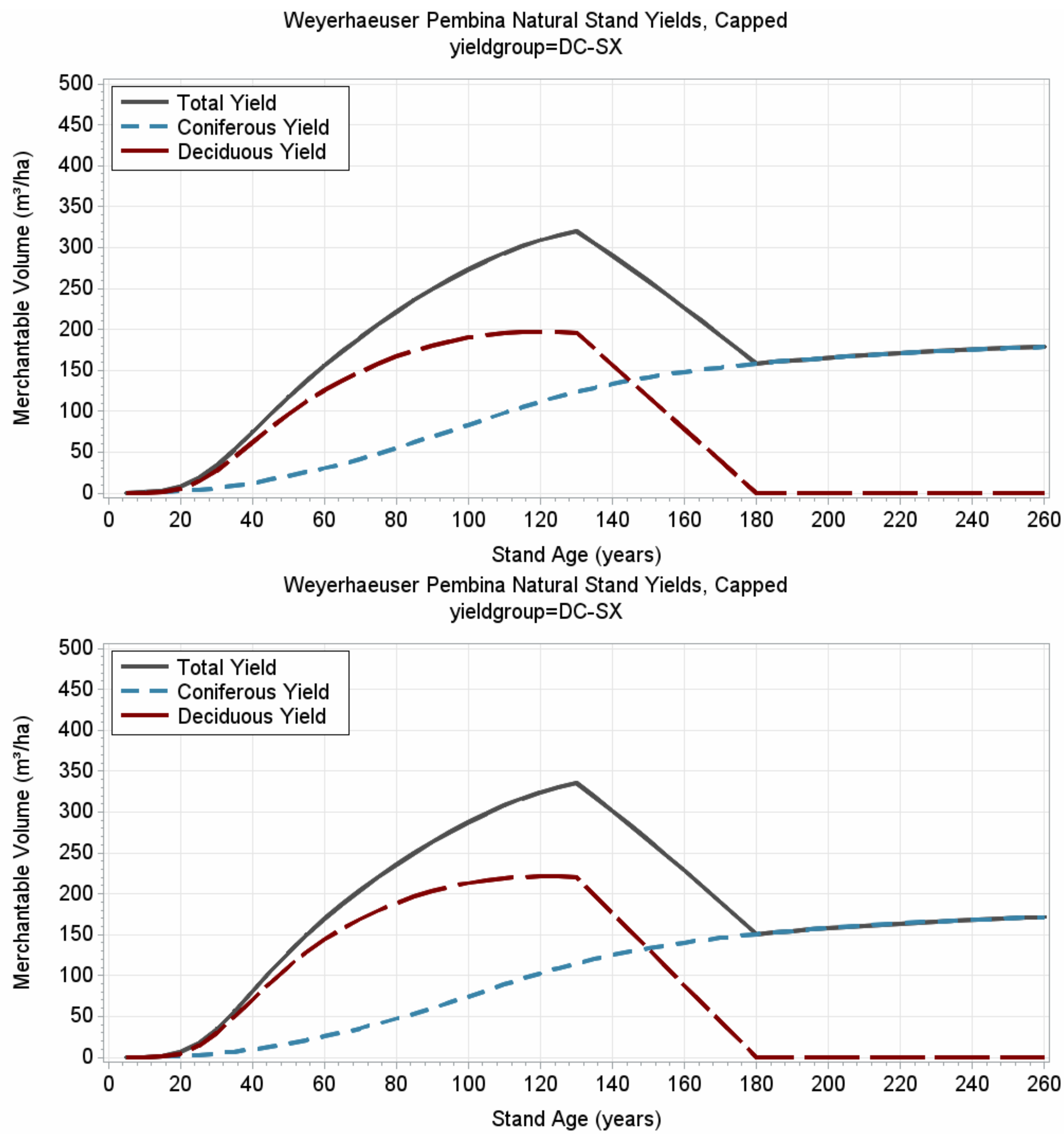

Figure IX-4. Original submission (top) vs refitted yield curves with outliers for yield group DC-SX

Appendix X: GY-001 Consolidated Cull Proposal

This appendix includes the consolidated cull proposal as well as individual Agreement-in-Principle letters for Mill Scale Cull (December 10, 2014) and Field Cull (May 4, 2015).

Issue Number: GY - 001

Consolidated Cull Proposal

Type: ✓ Requires Resolution ☐ Discussion Item

1 Background

Weyerhaeuser Company Limited (Weyerhaeuser) is required to complete a Forest Management Plan (FMP) for the Pembina Timberlands (FMA # 0900046) by April 1, 2016.

On November 1, 2013 Weyerhaeuser submitted a document titled "*Deciduous and conifer cull deductions in support of FMP 2016 for the Pembina Timberlands FMA*". The document addressed the mill scale portion of total cull and the proposed numbers were agreed to in-principle[1] by Alberta Environment and Sustainable Resource Development (ESRD) in December 2014 subject to the following 2 conditions:

1. *Cull deductions need to apply directly to yield projections as defined in Section 4.2.7(d) of the Alberta Forest Management Planning Standard Annex 1 (2006).*
2. *The field operational cull portion of the total cull must be quantified and accounted for.*

In 2013/2014 Weyerhaeuser collected field operational cull information as part of the on-going processor production study on the FMA. These data were compiled for the cut-to-length (CTL), OSB and tree-length (TL) operations in order to quantify field cull.

The main focus of this document is the quantification of field operational cull and related data collection methods. However, this document consolidates previous documentation on mill scale cull to provide relevant information on total cull under one cover.

2 Objectives

The main objective is to obtain approval from ESRD regarding the proposed approach to quantifying field operational cull so that changes can be made early in the process without jeopardizing the timelines of the Plan.

[1] Agreement-In-Principle: Weyerhaeuser Company Limited, Pembina Timberlands Mill Scale Cull Percentage Proposal for Use in the 2016 Forest Management Plan. December 10, 2014, by Robert J. Popowich, RPF, Senior Manager, Forest Resource Management, ESRD. File Reference: 06332-R01-01.

3 Methods

During the development of FMP yield curves, tree data are compiled to provide volume information at the sampling unit (usually plot) level. Gross merchantable volumes per hectare by species are summarized where volume is 'lost' in the tree:

- Stump volume below the stump height; and
- Top volume above the minimum merchantable top diameter inside bark.

In addition, full tree volumes are also dropped if the tree is:

- Not a merchantable tree species (i.e. larch);
- Dead (standing or down);
- Not merchantable due to smaller than the minimum stump diameter over bark; and
- Not merchantable due to not having a minimum merchantable length (useable length) above stump height to the merchantable top of the tree.

There are two sources of cull that must be quantified:

Field operational cull: includes waste left in the bush as result of processor operator decisions based on individual tree rot, butt flare, poor form (sweep/crook) or forks.

Mill scale cull: includes waste that is deducted at the scaling deck to determine the proportion of sound wood in bolts.

Net volumes are calculated by deducting cull from the gross merchantable volumes in the order the cull was derived. As per the Alberta Forest Management Planning Standard, cull is applied directly to the yield curves by deducting cull from the projected gross merchantable volume as follows:

NET VOLUME = GROSS MERCHANTABLE VOLUME*(1-FIELD CULL %)*(1- SCALE CULL %)

It is important to quantify both types of cull to properly estimate projected net volumes in FMP yield curves. However, it is also important to recognize that:

- The cull data collected will be based on recent harvest history and operating conditions and do not necessarily reflect cull on the long run. Therefore, monitoring of cull over time will be also important.
- The accuracy in yield curve projections and associated sampling and model errors will also impact the level of precision required for cull.

In order to quantify both types of cull for FMP 2016, Weyerhaeuser carried out the following steps:

1. Refined the processor production study to collect field operational cull data in 2013 & 2014.
2. Compiled the field operational cull percentage by processing method and species group.

3. Assembled the latest volume scaling data collected from timber years 2004 to 2012 for the Pembina FMA scaling population.
4. Compiled the scale cull percentage by species for application to FMP yield projections.

The following sections provide some detail on each step. Additional information is provided in the Appendices.

3.1 Field operational cull - data collection

In 2009, Weyerhaeuser began a series of studies to measure the productivity of all the harvesting equipment. While the focus of the studies was the impact of tree size on the productivity of the phases of the harvest, the design was such that we could easily incorporate the additional metrics to quantify the volume removed at the processing phase.

The compiled and processed data included:

- total volume;
- # of stems;
- average m^3/stem;
- average stems/m^3;
- volume per productive machine hour (PMH); and
- # of bolts.

This data was then further manipulated to show trees/PMH and bolts/PMH.

In 2012, the process was expanded, in an attempt to quantify the different site and growing conditions, the number of bolts per tree was collected in an effort to show the relationship between the tree size and production volume. We also started collecting data such as extra bucks for rot and butt flare, forks, dead/undersized trees and mixed species. The length of the extra bucks was not estimated at this time and was assumed to be 30 cm when being summarized. This was based on the maximum allowable buck for rot (60 cm) and 0 cm, which is occasionally done to reset the measuring devices in the processors.

In late 2013, after discussion with Weyerhaeuser staff and consultants and the conversion of the Drayton Valley Sawmill to 100% CTL conifer, it was decided to further refine the production studies. A spreadsheet with toggle buttons was developed for a touch-screen tablet. This allowed for more data to be captured at production speed, while reducing the potential for copy errors.

The following improvements were made:

- Increased resolution on the “extra bucks”. The extra cuts required at the butt for rot and butt flares were to be estimated at 0 cm (processor registration cut), 7.5 cm, 15 cm, 30 cm, 60 cm, 120 cm and 240 cm. Estimates of the categories of these cuts were based on landmarks on the processor head and visual observation of the slash pile after processing. The volume of each category was calculated based on the average volume per linear metre for each sample.

- Increased resolution on the volume per log. Because the CTL wood was being sorted and decked according to diameter (> 9” and <9”) during processing, number of pieces of each length (8’, 10’, 12’ 14’ and 16’) per deck was also collected.
- The number of oversized (>60 cm) bolts was collected. The number of bolts per tree was still being collected as was the number of dead/cull trees, number of undersize trees, number of forks, bucks/dead tree and bucks/ undersize tree. These numbers are collected to establish relationships between the different phases of logging and how they affect processing.

Cull assessment was based on visual estimates of the bucked sections. Cull volume was assigned for bucking for rot (>50 %) and for trimming butt flare. Bucked sections were placed in one of the following length categories: 0 cm, 7.5 cm, 15 cm, 30 cm, 60 cm, 120 cm and 240 cm.

The visual estimates were based partly on landmarks on the processing equipment, and visual confirmation was also made during the scaling portion of the study.

Dead trees were tallied as such and not included in the volume or stem count. Undersize trees were also tallied this way but not included to ensure no double accounting for the losses of trees already excluded in the gross merchantable volume compilation during the yield curve development process.

Very few trees were culled completely because of rot. They generally had at least one acceptable bolt.

Additional detail on the data collection protocols is presented in Appendix I.

3.2 Field operational cull - proposed percentages by species group

Field operational cull data was collected in 2013 and 2014 in the Pembina FMA. Data was collected by processing method as follows:

- Conifer CTL;
- Conifer TL; and
- Deciduous OSB

The actual raw field cull data collected by processing method are shown in Appendix II. The compiled field operational cull percentages are presented in Table 1.

Table 1. Field operational cull by processing method

Processing Method	Gross Volume (m^3)	Cull Volume (m^3)	Cull Percent (%)
Conifer CTL	1,954.96	23.10	1.2
Conifer TL	443.19	5.39	1.2
Deciduous OSB	227.96	4.27	1.9

Based on the results, we propose the field operational cull percentage of 1.2% for all merchantable conifer species (regardless of processing method) and 1.9% for all deciduous in both natural and managed stands.

3.3 Mill scale cull - data assembly

Estimates of cull were based on the latest volume scaling data collected from timber years 2004 to 2012 for the Pembina FMA scaling population (i.e., W13, salvage, purchased and private wood were excluded).

Deciduous cull data were assembled by Weyerhaeuser. There were 447 loads (in 273 cutblocks) available for the analysis. The scale loads were stratified by species (trembling aspen, balsam poplar or white birch).[2] Conifer cull data were also assembled by Weyerhaeuser. There were 247 sample loads available for the analysis.

The raw data for the conifer and deciduous cull are presented in Appendix III.

3.4 Mill scale cull percentages by species group

The mill scale cull deductions are summarized in Table 2. Detailed discussion is included in the subsequent sections.

NOTE: THESE MILL SCALE CULL PERCENTAGES WERE AGREED TO IN PRINCIPLE BY ESRD ON DECEMBER 10, 2014.

Table 2. Mill scale cull by species group and stand type

Species Group	Species	Natural Stands		Managed Stands
		≤ 130 years	> 130 years	
Deciduous	Aw	10.0%	17.4%*	7.0%
	Pb	5.3%		
	Bw	4.6%		
Conifer	All	1.2%		1.2%

** implemented as part of the deciduous stand decline function*

3.4.1 Deciduous Cull

The overall trend of deciduous cull % by timber year is presented in Figure 1. The average deciduous cull in the FMA is 9.2% based on the last 9 years of scale data.

There is a major difference between aspen (Aw) and balsam poplar (Pb) cull as shown in Figure 2. The average aspen cull is around 11.5% while balsam poplar cull is at 5.3%.

[2] A very minor conifer content (balsam or spruce) was not excluded from the scale loads (<0.1%) with no impact on the results of this analysis.

Species: (All)

YEAR	GROSS	CULL	N	CULL%
2004-2005	3,155.4	233.9	85	7.4%
2005-2006	3,895.5	322.2	92	8.3%
2006-2007	2,108.3	188.3	49	8.9%
2007-2008	1,306.4	146.1	29	11.2%
2008-2009	1,053.3	119.8	24	11.4%
2009-2010	2,360.0	220.0	56	9.3%
2010-2011	1,955.6	199.5	43	10.2%
2011-2012	1,720.2	144.9	39	8.4%
2012-2013	1,405.0	172.7	30	12.3%
Grand Total	**18,959.7**	**1,747.3**	**447**	**9.2%**

Notes:
FMA scaling population only
No Private, Salvage, or Purchased Wood

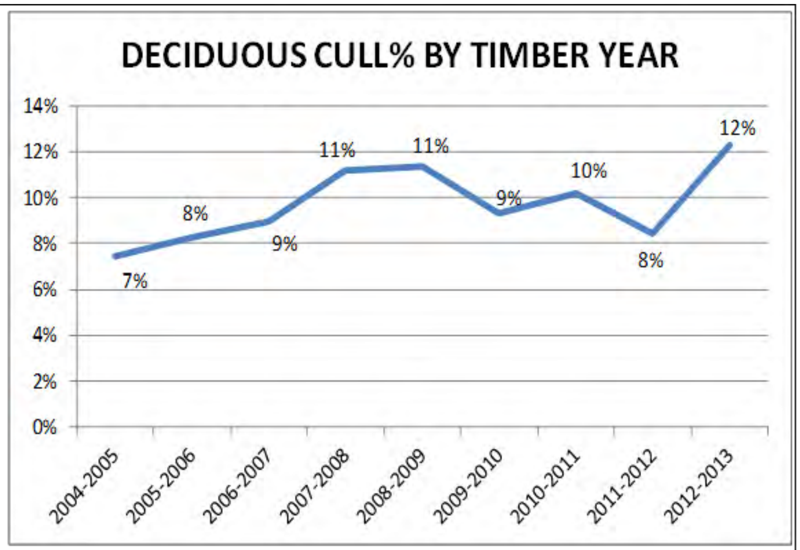

Figure 1. Overall deciduous cull % by timber year (Source: Weyerhaeuser scale data 2004-2012)

Species: Aw | Pb

YEAR	GROSS (Aw)	CULL (Aw)	N (Aw)	CULL% (Aw)	GROSS (Pb)	CULL (Pb)	N (Pb)	CULL% (Pb)
2004-2005	2,031.8	178.6	53	8.8%	1,123.6	55.3	32	4.9%
2005-2006	2,255.9	229.3	51	10.2%	1,639.7	92.9	41	5.7%
2006-2007	1,239.9	146.4	28	11.8%	868.4	41.8	21	4.8%
2007-2008	1,024.1	130.4	22	12.7%	282.3	15.7	7	5.6%
2008-2009	755.1	105.0	16	13.9%	298.2	14.8	8	5.0%
2009-2010	1,235.7	152.7	27	12.4%	1,124.3	67.3	29	6.0%
2010-2011	1,360.0	159.8	29	11.7%	595.5	39.7	14	6.7%
2011-2012	1,041.0	117.7	22	11.3%	679.2	27.2	17	4.0%
2012-2013	1,110.0	161.0	23	14.5%	294.9	11.7	7	4.0%
Grand Total	**12,053.6**	**1,380.9**	**271**	**11.5%**	**6,906.1**	**366.4**	**176**	**5.3%**

Notes:
FMA scaling population only
No Private, Salvage, or Purchased Wood

Figure 2. Deciduous cull % by species & timber year

The recent increase in aspen cull is attributed to harvesting older aspen stands. This was investigated by linking the sample loads to the spatial AVI coverage of the cutblocks. In our analysis 166 of the 273 sampled blocks were successfully linked. D and DC cover types were summarized and any origin group with a total area over 10 ha sampled was included in the analysis (origin: 1860-1940).

Aspen leading strata *D and DC covertype*		
ORIGIN	**CULL**	**AREAHA**
1860	17.6%	346
1880	17.2%	267
1890	9.7%	1,184
1900	10.7%	547
1910	9.1%	368
1920	9.8%	102
1930	10.5%	329
1940	12.1%	48
Total	*11.4%*	*3,190*

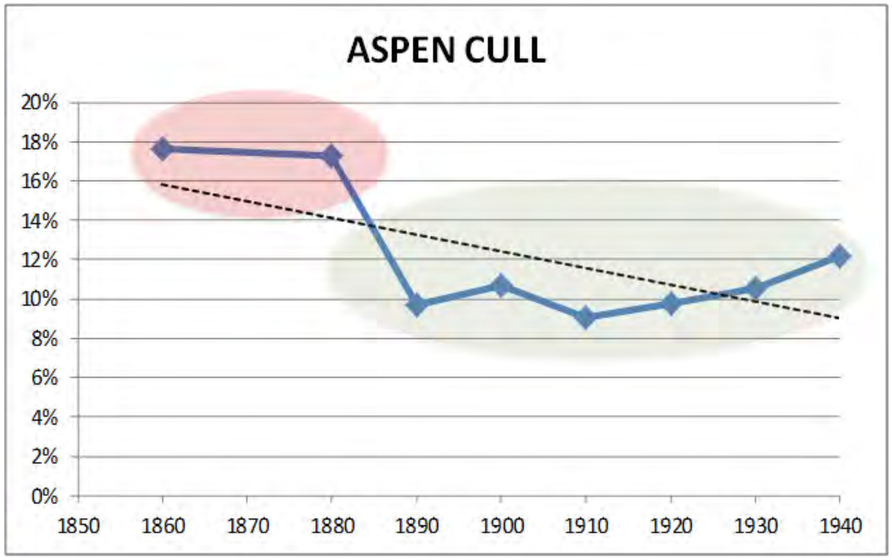

Figure 3. Aspen cull % by stand origin (1860-1940)

Calculation of cull% was based on sample cull % of the block weighted by the area of the AVI polygons (i.e., we assumed that all D and DC AVI polygons contributed equally to the cull% of that cutblock since we have no spatial information which part of the cutblock the sample load actually came from). Based on our linked data the overall total aspen cull was 11.4% which indicates that the data used in this analysis is representing the 2004-2012 sample loads well. The results are presented in Figure 3.

There is evidence that the cull percent is closer to 17-18% for stands that are 130 years of age or older (origin of 1880). The weighted average of stands that are younger than 130 years is 10.0% for aspen.

We propose that in FMP 2016 the aspen cull deduction should be set at 10.0% for natural stands that are younger than 130 years. Weyerhaeuser will be implementing the higher aspen cull deduction for older stands as part of a deciduous stand decline function that starts at 130 years with a terminal age of 180 years. Balsam poplar cull deduction will be set at 5.3%. Cull deduction for white birch will be set at 4.6% based on a limited amount of available sample load data (42 loads).

Using the recent scale data and the implemented stand decline function will ensure that Weyerhaeuser will be applying a reliable and representative cull % to deciduous stands that will be harvested in the next 15-20 years (many of the older and decadent aspen stands in the FMA). However, historical scale data suggests that overall deciduous cull is around 7% that represents the overall deciduous profile better. Therefore, we propose that any managed stand yield curve should use the 7% overall deciduous cull. Note that the deciduous stand decline function will be implemented the same way in both natural and regenerating stands.

3.4.2 Conifer Cull

The overall trend of conifer cull % by timber year is presented in Figure 4. The average conifer cull in the FMA is 1.2% based on the last 9 years of scale data.

YEAR	GROSS	CULL	N	PCT
2004-2005	1,511	23	32	1.5%
2005-2006	1,534	18	31	1.2%
2006-2007	1,663	27	35	1.6%
2007-2008	1,268	18	24	1.4%
2008-2009	1,238	11	23	0.9%
2009-2010	1,041	8	19	0.8%
2010-2011	1,713	22	31	1.3%
2011-2012	1,467	14	27	1.0%
2012-2013	1,378	18	25	1.3%
Grand Total	**12,814**	**159**	**247**	**1.2%**

FMA scaling population only
No Private, Salvage or Purchased Wood

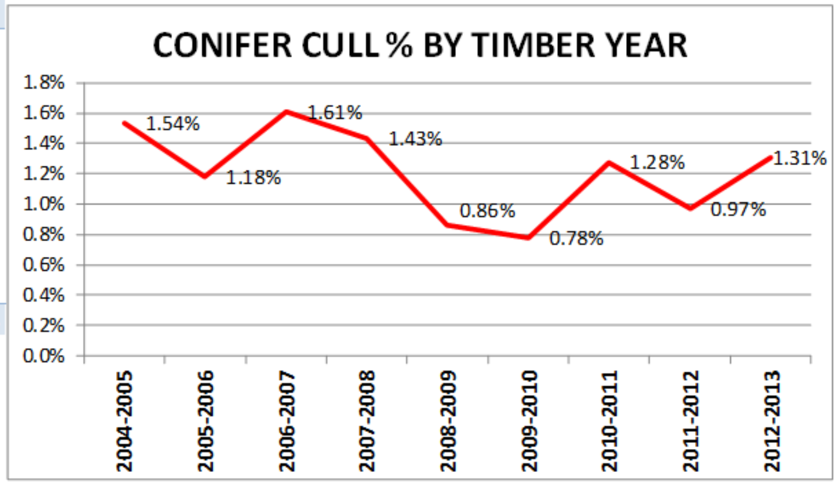

Figure 4. Overall conifer cull % by timber year (Source: Weyerhaeuser scale data 2004-2012)

We propose that in FMP 2016 the conifer cull deduction should be 1.2% for natural and regenerating stands.

APPENDIX I - Processor Production Study Methods

1 Background

In 2009, Weyerhaeuser Pembina began a series of studies to measure the productivity of all the harvesting equipment. While the focus of the studies was the impact of tree size on the productivity of the phases of the harvest, the design was such that we could easily incorporate the additional metrics to quantify the volume removed at the processing phase.

These studies are based on older (pre-2010) production study spreadsheets where production figures were based on number of stems and bolts produced plotted against time. Produced volumes were measured post-production either by stack scale, piece scale. Volumes were also determined pre-processing using a tree by tree butt scale and local volume tables (LVT). Volume measurement methods varied and were determined by deck size, deck location, production study length, species and proximity of equipment. When time permitted, more than one method was used to establish comparative baselines. Volume measurement was also done to avoid causing unnecessary or prolonged downtime for the equipment.

The study length at this time was not based on any desired sample size. Production study length was determined organically, and timing was stopped for equipment breakdowns, coffee breaks, stops for traffic, etc. The study length was determined by deck size, scheduled breaks, time of day; emphasis was to avoid interfering with the processing as much as possible.

When the production study started mid-deck the pre-study wood was separated from the study wood using spray paint.

This data were collected with pencil and paper, on a standard tally form. The compiled and processed data included:

- total volume;
- # of stems;
- average m^3/stem;
- average stems/m^3;
- volume per productive machine hour (PMH); and
- # of bolts.

This data was then further manipulated to show trees/PMH and bolts/PMH.

In 2012, the process was expanded, in an attempt to quantify the different site and growing conditions, the number of bolts per tree was collected in an effort to show the relationship between the tree size and production volume. We also started collecting data such as extra bucks for rot and butt flare, forks, dead/undersized trees and mixed species. The length of the extra bucks was not estimated at this time and was assumed to be 30 cm when being summarized. This was based on the maximum allowable buck for rot (60 cm) and 0 cm, which is occasionally done to reset the measuring devices in the processors.

2 Improvements for the FMP Field Cull Calculation in 2013

In late 2013, after discussion with Weyerhaeuser staff and consultants and the conversion of the Drayton Valley Sawmill to 100% cut-to-length (CTL) conifer, it was decided to further refine the production studies. A spreadsheet with toggle buttons was developed for a touch-screen tablet. This allowed for more data to be captured at production speed, while reducing the potential for copy errors.

The following improvements were made:

1. Increased resolution on the "extra bucks". The extra cuts required at the butt for rot and butt flares were to be estimated at 0 cm (processor registration cut), 7.5 cm, 15 cm, 30 cm, 60 cm, 120 cm and 240 cm. Estimates of the categories of these cuts were based on landmarks on the processor head and visual observation of the slash pile after processing. The volume of each category was calculated based on the average volume per linear metre for each sample.
2. Increased resolution on the volume per log. Because the CTL wood was being sorted and decked according to diameter (> 9" and <9") during processing, number of pieces of each length (8', 10', 12' 14' and 16') per deck was also collected.
3. The number of oversized (>60 cm) bolts was collected. The number of bolts per tree was still being collected as was the number of dead/cull trees, number of undersize trees, number of forks, bucks/dead tree and bucks/ undersize tree. These numbers are collected to establish relationships between the different phases of logging and how they affect processing.

A copy of the data collecting page of the production study spreadsheet is shown in Figure 5. Formulas used are linked to various scaling sheets within the production study. This data collecting page was used for all methods of processing: CTL, OSB and TL (tree length).

3 Sample Size

It was determined that approximately 100 trees would be the satisfactory sample size, statistically. This size was generally achievable but was often influenced by deck size, scheduled and unscheduled breaks, mechanical breakdowns, time of day, access and the need to avoid disrupting the processing as much as possible.

The length of each study was determined by the tree size, species, decking quality, tree quality, and time of day, scheduled and unscheduled breaks, and other interruptions.

For example: If 50+ trees were processed and an operator's scheduled coffee or lunch break was due, the study would be stopped with the break being taken advantage of to measure the produced volume. The same would apply for breakdowns and completion of processing of the study decks.

Weyerhaeuser

Pembina Timberlands Productivity Study							
			Processor (CTL)				
Deck #1	#		Deck #2	#			# Stems
>9"	BOLTS		<9"	BOLTS			+ - 0
16'-4.88m	+ - 0		16'	+ - 0		Bolts/Stem	
14'-4.27m	+ - 0		14'	+ - 0		0	+ - 0
12'-3.66m	+ - 0		12'	+ - 0		1	+ - 0
10'-3.05m	+ - 0		10'	+ - 0		2	+ - 0
8'-2.43m	+ - 0		8'	+ - 0		3	+ - 0
						4	+ - 0
Total Bolts	0		Total Bolts	0		5	+ - 0
AveLength	#DIV/0!		AveLength	#DIV/0!		6	+ - 0
Deck Vol	#DIV/0!		Deck Vol	#DIV/0!		7	+ - 0
Extra Bucks		Total Bolts	0			8	+ - 0
Thickness cm		Total Bolts	0			9	+ - 0
0	+ - 0					10	+ - 0
7.5	+ - 0					11	+ - 0
15	+ - 0					12	+ - 0
30	+ - 0						
60	+ - 0					Total Stems	0
120	+ - 0						
240	+ - 0					Total Bolts	0
Dead/Cull		Undersize		O/S bolts			
+ - 0		+ - 0		+ - 0			
Bucks/Dead		Bucks/US		Forks			
+ - 0		+ - 0		+ - 0			
Machine Vol							

Figure 5. Production Study Spreadsheet

4 Processor Operators

Pre-study discussions took place with the processor operators and foremen to go over the study process, main study objectives, study length and methods and to emphasize that the study was less about their individual production but more about the whole production picture and the relationships between tree size, species, decking quality and all the other variables. Previous studies tended to be very short (15-30 min) and seemed to the operators to be focused on their individual production which made some of them nervous and/or resentful.

It was important to the study from a production perspective that they operate as normally as possible.

We also discussed whether the processor and operator had the ability to measure and record their production. If so, it was requested that they either zero out the measurements or otherwise record the machine volumes for comparison to this study.

Radio contact was also established at this time.

5 Observation Methodology

These studies began with choosing a safe and nearby vantage point. The best options were within 30 m with a clear view of the equipment as well as of the decks, ideally level with or higher than the equipment and at an angle to the processing head to stay out of the chain-shot line. The best vantage point was generally behind the processor, down the deck. This meant that the processor was working toward the observer so moves might be required as the work progressed, which was easy to accommodate.

Processing was usually done progressively and log decks were chosen as worked. This was done to avoid any selection bias. Attempts were made to observe each operator at least once.

Prior to the study start and if starting mid-deck the pre-study processed wood was marked with spray paint.

A hand-held or tablet based stopwatch was started with the first tree. For each merchantable tree the following data was collected:

- # Stems (tree count)
- Total bolts/stem
- # of bolts/stem by diameter and length
- Extra bucks by estimated length (if any), registration bucks marked as zero for no or very thin cookies, two or more thin registration cuts were tallied as a 7.5 cm buck (accumulated to representative volume).
- Forks (if any)
- Oversize bolts (if any)

- Dead or undersize stems were compiled separately from the merchantable trees to avoid skewing the volume data. Extra bucks on these stems were also compiled separately.

The study continued on until the desired number of trees was reached and/or a convenient or unscheduled break occurred with less than the desired number of trees. Radio contact was used to end studies.

The stopwatches were stopped for any interruptions to processing such as traffic, mechanical breakdowns and other breaks in production.

This process was used for all methods of processing: OSB, CTL and TL. The number of OSB bolts was also collected during tree length processing (merchandized due to poor form and defect). This smaller amount of wood could not be measured directly as it was usually covered up by the tree length logs.

6 Cull Assessment and Categories for all Processing

Cull assessment was based on visual estimates of the bucked sections. Cull volume was assigned for bucking for rot (>50 %) and for trimming butt flare. Bucked sections were placed in one of the following length categories:

- 0 cm
- 7.5 cm
- 15 cm
- 30 cm
- 60 cm
- 120 cm
- 240 cm

The visual estimates were based partly on landmarks on the processing equipment, and visual confirmation was also made during the scaling portion of the study.

Dead trees were tallied as such and not included in the volume or stem count. Undersize trees were also tallied this way. Very few trees were culled completely because of rot. They generally had at least one acceptable bolt.

7 Scaling Methods

Scaling methods varied depending on the product. Short wood deciduous was stack-scaled and converted to solid wood as per the formula taken from the Production Study:

Deck Length X Average Height X 2.54 (log length) X 0.57 (deciduous conversion factor for air space)

This is consistent with the Alberta Cube Scale methodology. The average height of the pile was determined by measuring the deck height every 1–1.5 m. Occasionally, when circumstances permitted the processed wood was measured piece by piece for comparisons purposes.

CTL decks were also stack-scaled but more intensively. Both ends of each deck (>9” diameter and <9” diameter) were scaled to account for taper with the volume being calculated using the following formula, also from the Production Study:

Deck Length X Average Height X Average Log Length X 0.65 (conifer conversion factor for air space)

The average log length was determined using the estimates for the length of each log, as tallied during the study. The average height of the deck was determined by measuring the deck height on both ends of the deck every 1–1.5 m. As a comparison check and with circumstances permitting, a 100% butt scale was performed using the CTL local volume tables based on Drayton Valley sawmill scaling data. This was usually only done on the >9” log deck. Log lengths sometimes have to be estimated using this method as the logs are often covered by other logs. This occurred more on the small diameter log decks because of the higher variability in lengths.

Oversized logs were scaled piece by piece.

Tree length processed wood was scaled using a 100% butt scale with volumes being determined using the local volume tables. The number of OSB bolts was also collected during tree length processing. This smaller amount of wood could not be measured directly as it was usually covered up by the tree length logs. An estimate of this volume was calculated based on the number of pieces and assuming a 14-cm diameter, as the OSB was typically being cut from the top or marginal stems.

APPENDIX II - Raw Data - Processor Production Study 2013-2014

PRODUCTION STUDIES SUMMARY - 2013-2014

Date	Contractor	Operator	Model	Location	Study #	Block	Spp	Time Min	Time-hrs	Volume	Vol/PMH	#Stems	0cm	7.5cm	15cm	30cm	60cm	120cm	240cm	Forks	Dead/Rot UM	m3/stem	Stem/m3	Bolts	Bolts/Tree	m3/bolt	Bolts/ PMH	Stems/ PMH
Aw OSB																												
17-Dec-2013	DGTL	Michel	Hornet	South Rat	Aw # 1 Dec 17, 2013	5110490487	Aw	75.800	1.263	36.429	28.836	82		0	0	5	9	10		6	0	0.440	2.250	327	3.988	0.111	258.839	64.908
17-Dec-2013	DGTL	Luke	Hornet	South Rat	Aw # 2 Dec17, 2013	5110490487	Aw	105.733	1.762	48.500	27.522	87			0	15	16	3		3	3	**0.557**	**1.794**	383	4.402	0.127	217.340	49.370
15-Jan-2014	DGTL	Michel	Hornet	South Rat	Aw # 1 Jan 15, 2014	5120491168	Aw	111.250	1.854	74.077	39.950	105		14	18	20	31	2		7	1	0.710	1.420	769	7.324	0.096	414.742	56.629
15-Jan-2014	DGTL	Michel	Hornet	South Rat	Aw # 2 Jan 15, 2014	5120491168	Aw	98.667	1.644	68.951	41.930	91		3	12	10	10	12		3	2	0.760	1.320	683	7.505	0.101	415.336	55.338
SP CTL																												
18-Dec-2013	DGTL	Wade	Waratah	South Rat	SP # 1 Dec 18, 2013	5120490171	SP	118.950	1.983	125.190	63.148	130		10	20	44	31	6		0	0	0.960	1.040	409	3.146	0.306	206.305	65.574
18-Dec-2013	DGTL	Clayton	Waratah	South Rat	SP # 2 Dec 18, 2013	5120490171	SP	81.020	1.350	103.500	76.648	80		20	23	2	1	0		3	6	1.290	0.770	318	3.975	0.325	235.497	59.245
18-Dec-2013	DGTL	Wade	Waratah	South Rat	SP # 3 Dec 18, 2013	5120490171	SP	84.650	1.411	117.870	83.546	87		20	33	6	4	1		1	9	1.350	0.740	341	3.920	0.346	241.701	61.666
22-Jan-2014	Lydell	Jeff	Waratah	Rapid Creek	SP # 1 Jan 22, 2014	5140423410	SP	112.170	1.870	28.379	15.180	88		33	9	6	4	2		0	5	0.320	3.100	257	2.920	0.110	137.470	47.071
27-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 1 Jan 27, 2014	5100473412	SP	123.380	2.056	67.980	33.059	107	24	53	27	11	7	1	2	6	3	0.640	1.570	352	3.290	0.193	171.178	52.034
27-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 2 Jan 27, 2014	5100473412	SP	114.830	1.914	103.500	54.080	93	15	51	19	10	13	2	1	3	3	**1.113**	**0.899**	351	3.774	0.295	183.402	48.594
28-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 1 Jan 28, 2014	5100473412	SP	98.000	1.633	48.830	29.896	86	23	39	7	9	3	1	2	2	0	0.570	1.760	269	3.128	0.182	164.694	52.653
28-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 2 Jan 28, 2014	5100473412	SP	89.830	1.497	61.890	41.338	88	11	47	14	7	1	0	1	6	1	0.700	1.420	282	3.205	0.219	188.356	58.778
28-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 3 Jan 28, 2014	5100473412	SP	103.250	1.721	81.315	47.253	89	22	37	14	11	5	0	0	6	2	0.910	1.090	332	3.730	0.245	192.930	51.719
29-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 1 Jan 29, 2014	5100473341	SP	64.430	1.074	44.850	41.766	49	12	28	5	4	0	1	0	2	1	0.920	1.090	174	3.551	0.258	162.036	45.631
29-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 2 Jan 29, 2014	5100473341	SP	93.133	1.552	43.960	28.321	65	13	34	6	2	1	0	0	0	1	0.680	1.480	210	3.231	0.209	135.290	41.876
29-Jan-2014	Lydell	Marc	Hornet	LodgepoleFire	SP # 3 Jan 29, 2014	5100473341	SP	110.830	1.847	49.636	26.871	85	25	36	1	2	1	0	0	1	1	0.580	1.710	332	3.906	0.150	179.735	46.016
4-Feb-2014	Lydell	Greg	Waratah	Wawa	SP # 1 Feb 4, 2014	5160430305	SP	79.300	1.322	55.745	42.178	102	24	41	10	5	6	6	1	9	13	0.550	1.830	303	2.971	0.184	229.256	77.175
4-Feb-2014	Lydell	Greg	Waratah	Wawa	SP # 2 Feb 4, 2014	5160430305	SP	71.330	1.189	41.440	34.858	110	26	37	11	9	4	1	0	5	5	0.380	2.650	306	2.782	0.135	257.395	92.528
4-Feb-2014	Lydell	Greg	Waratah	Wawa	SP # 3 Feb 4, 2014	5160430305	SP	59.830	0.997	34.738	34.837	92	21	28	7	7	10	3	0	5	7	0.380	2.650	252	2.739	0.138	252.716	92.261
4-Feb-2014	Lydell	Greg	Waratah	Wawa	SP # 4 Feb 4, 2014	5160430305	SP	58.320	0.972	39.210	40.340	99	30	38	4	3	3	0	1	3	6	0.400	2.520	284	2.869	0.138	292.181	101.852
5-Feb-2014	Lydell	Rob	Waratah	Wawa	SP # 1 Feb 5, 2014	5160430305	SP	68.100	1.135	27.630	24.344	101	24	24	1	1	1	0	0	0	7	0.270	3.660	274	2.713	0.101	241.410	88.987
5-Feb-2014	Lydell	Rob	Waratah	Wawa	SP # 2 Feb 5, 2014	5160430305	SP	64.850	1.081	23.290	21.548	97	40	37	2	3	1	0	2	2	9	0.240	4.170	256	2.639	0.091	236.854	89.746
5-Feb-2014	Lydell	Rob	Waratah	Wawa	SP # 3 Feb 5, 2014	5160430305	SP	84.650	1.411	33.300	23.603	102	21	24	3	0	2	0	0	4	9	0.330	3.060	291	2.853	0.114	206.261	72.298
5-Feb-2014	Lydell	Rob	Waratah	Wawa	SP # 4 Feb 5, 2014	5160430305	SP	72.430	1.207	24.670	20.436	80	37	17	2	5	0	1	0	4	2	0.310	3.240	234	2.925	0.105	193.842	66.271
6-Feb-2014	Lydell	Harold	Hornet	Wawa	SP # 1 Feb 6, 2014	5160430305	SP	80.580	1.343	38.422	28.609	104	42	48	8	4	3	1	0	3	8	0.370	2.710	247	2.375	0.156	183.917	77.439
6-Feb-2014	Lydell	Harold	Hornet	Wawa	SP # 2 Feb 6, 2014	5160430305	SP	114.670	1.911	35.230	18.434	131	67	51	14	10	3	0	0	5	12	0.270	3.720	316	2.412	0.111	165.344	68.545
6-Feb-2014	Lydell	Harold	Hornet	Wawa	SP # 3 Feb 6, 2014	5160430305	SP	76.170	1.270	29.860	23.521	99	39	53	7	5	4	1	1	4	7	0.300	3.320	231	2.333	0.129	181.961	77.983

PRODUCTION STUDIES SUMMARY - 2013-2014

Date	Contractor	Operator	Model	Location	Study #	Block	Spp	Time Min	Time-hrs	Volume	Vol/PMH	#Stems	0cm	7.5cm	15cm	30cm	60cm	120cm	240cm	Forks	Dead/Rot UM	m3/stem	Stem/m3	CTL Bolts	Bolts/Tree	Stems c/w CTL	CTL Bolts PMH	Stems/ PMH
PL TL																												
7-Jan-2014	JBL	Dustin	Waratah	Chip Lake	#1 Jan 7, 2014	5100513580	Pl	51.333	0.856	80.37	93.940	142		0	76	22	21	0			5	1	1.77	93	1.755	53	108.702	165.975
																				4								
7-Jan-2014	JBL	Dustin	Waratah	Chip Lake	#2 Jan 7, 2014	5100513580	Pl	36.98	0.616	51.46	83.494	103		0	35	8	23	1			5	0.5	2.00	56	1.750	32	90.860	167.117
7-Jan-2014	JBL	Dustin	Waratah	Chip Lake	#3 Jan 7, 2014	5100513580	Pl	35.58	0.593	45.65	76.981	99		0	28	11	8	2		1	1	0.46	2.17	50	1.613	31	84.317	166.948
																				1								
9-Jan-2014	Lydell	Derek	Waratah	Rapid Creek	#1 Jan 9, 2014	5130430696	SP	32.35	0.539	42.35	78.547	61		16	6	5	0	0			6	**0.69**	**1.44**	39	1.696	23	72.334	113.138
9-Jan-2014	Lydell	Derek	Waratah	Rapid Creek	#2 Jan 9, 2014	5130430696	SP	82.3	1.372	52.166	38.031	114		43	15	7	2	0			16	0.46	2.19	63	1.909	33	45.930	83.111
																				2								
10-Jan-2014	JBL	Matt	Waratah	Chip Lake	#1 Jan 10, 2014	5100513580	Pl	62.5	1.042	42.07	40.387	107		48	29	5	0	0			9	0	2.54	158	2.225	71	151.680	102.720
10-Jan-2014	JBL	Matt	Waratah	Chip Lake	#2 Jan 10, 2014	5100513580	Pl	63.6	1.060	49.35	46.557	110		46	32	5	1	0		0	17	0.45	2.23	129	2.263	57	121.698	103.774
10-Jan-2014	JBL	Matt	Waratah	Chip Lake	#3 Jan 10, 2014	5100513580	Pl	65.32	1.089	47.96	44.054	106		47	26	14	1	0		0	28	0.45	2.21	126	2.032	62	115.738	97.367
10-Jan-2014	JBL	Dustin	Waratah	Chip Lake	#4 Jan 10, 2014	5100513580	Pl/Sw	32.52	0.542	31.81	58.690	104		42	13	4	2	0		0	10	0.31	3.27	76	1.583	48	140.221	191.882
SP CTL																												
22-Jan-14	Lydell	Derek	Waratah	Rapid Creek	#1 Jan 22, 2014	ROW	Pl	73.93	1.232	28.32	22.984	95		45	31	6	1	0			19	0.3	3.35	257	2.705	95	208.576	77.100
22-Jan-14	Lydell	Charlie	Waratah	Rapid Creek	#2 Jan 22, 2014	ROW	Pl	55	0.917	30.08	32.815	95		61	18	5	2	2		0	15	0.32	3.136	255	2.684	95	278.182	103.636
																				0								
24-Jan-14	Lydell	Derek	Waratah	Hawrlek	#1 Jan 24, 2014	5140423419	Pl	93.37	1.556	36.56	23.494	97	5	51	23	9	14	1			56	0.380	2.65	258	2.660	97	165.792	62.333
24-Jan-14	Lydell	Derek	Waratah	Hawrlek	#1 Jan 24, 2014	5140423419	Pl	78.05	1.301	44.84	34.470	95	19	47	16	8	2	4		0	31	0.470	2.12	268	2.821	95	206.022	73.030
24-Jan-14	Lydell	Derek	Waratah	Hawrlek	#1 Jan 24, 2014	5140423419	Pl	81.08	1.351	37.17	27.506	104	13	61	20	8	3	0		0	36	0.36	2.8	294	2.827	104	217.563	76.961
																				0								
11-Feb-14	Roper	Sam	Waratah	Grey Owl	#1 Feb 11, 2014	5120431072	Sw	105.6	1.760	72.91	41.426	94	23	44	16	17	19	8	2	2	8	0.780	1.29	277	2.947	94	157.386	53.409
11-Feb-14	Roper	Sam	Waratah	Grey Owl	#2 Feb 11, 2014	5120431072	Sw	81.75	1.363	50.02	36.712	96	24	53	18	3	14	6	3	4	7	0.520	1.92	270	2.813	96	198.165	70.459
11-Feb-14	Roper	Sam	Waratah	Grey Owl	#3 Feb 11, 2014	5120431072	Sw	81.18	1.353	54.78	40.488	90	40	35	12	5	16	2	0	1	8	0.61	1.64	252	2.800	90	186.253	66.519
12-Feb-14	Roper	Todd	Waratah	Grey Owl	#1 Feb 12, 2014	5120431574	Sw	58.87	0.981	48.87	49.808	113	70	16	4	1	9	4	4	1	14	0.432	2.31	302	2.673	113	307.797	115.169
12-Feb-14	Roper	Todd	Waratah	Grey Owl	#2 Feb 12, 2014	5120431574	Sw	56.38	0.940	52.08	55.424	113	75	21	3	2	3	2	3	2	14	0.461	2.17	331	2.929	113	352.253	120.255
12-Feb-14	Roper	Todd	Waratah	Grey Owl	#3 Feb 12, 2014	5120431574	Sw	53.083	0.885	42.47	48.004	112	60	16	4	4	7	2	2	2	15	0.38	2.64	300	3.333	90	339.092	126.594
12-Feb-14	Roper	Todd	Waratah	Grey Owl	#4 Feb 12, 2014	5120431574	SW	49.667	0.828	43.02	51.970	108	58	18	4	2	3	3	4	5	12	0.40	2.51	281	3.122	90	339.461	130.469
12-Feb-14	Roper	Mike	Waratah	Grey Owl	#1 Feb 13, 2014	5120431574	Sw	75.83	1.264	42.5	33.628	104	41	37	8	17	8	2	0	3	16	0.409	2.45	252	2.423	104	199.393	82.289
12-Feb-14	Roper	Mike	Waratah	Grey Owl	#2 Feb 13, 2014	5120431574	Sw	73.52	1.225	38.52	31.436	105	27	42	13	17	3	3	0	4	16	0.367	2.73	239	2.276	105	195.049	85.691
12-Feb-14	Roper	Mike	Waratah	Grey Owl	#3 Feb 13, 2014	5120431574	Sw	64.08	1.068	38.65	36.189	82	24	32	17	11	3	6	0	1	12	0.47	2.12	228	2.780	82	213.483	76.779
12-Feb-14	Roper	Mike	Waratah	Grey Owl	#4 Feb 13, 2014	5120431574	Sw	67.83	1.131	33.73	29.836	102	25	36	10	7	5	2	0	1	20	0.33	3.02	236	2.314	102	208.757	90.226

APPENDIX III - Raw Data - Weyerhaeuser Pembina Scale Volume 2004-2012

Conifer Data

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
08/07/2011 15:52	WD00091980	3134796	5.637	0.006	SP	06	GR	759.087
08/07/2011 15:52	WD00091980	3134796	47.457	0.538	SP	01	GR	759.087
26/07/2011 14:40	WD00090652	3140944	53.867	0.399	SP	01	GR	721.443
26/07/2011 14:40	WD00090652	3140944	0.522	0.001	SP	06	GR	721.443
12/08/2011 9:42	WD00092419	3149486	59.468	0.411	SP	01	GR	620.548
12/08/2011 9:42	WD00092419	3149486	4.877	0.001	SP	06	GR	620.548
12/08/2011 9:42	WD00092419	3149486	0.365	0.000	SP	99	GR	620.548
18/08/2011 11:44	WD00095002	3152136	5.456	0.003	SP	06	GR	714.972
18/08/2011 11:44	WD00095002	3152136	0.332	0.000	SP	99	GR	714.972
18/08/2011 11:44	WD00095002	3152136	48.697	0.354	SP	01	GR	714.972
18/08/2011 12:21	WD00095006	3152137	6.892	0.027	SP	06	GR	747.092
18/08/2011 12:21	WD00095006	3152137	0.315	0.001	SP	99	GR	747.092
18/08/2011 12:21	WD00095006	3152137	45.727	0.543	SP	01	GR	747.092
19/08/2011 12:39	WD00095044	3153021	0.677	0.005	SP	99	GR	725.861
19/08/2011 12:39	WD00095044	3153021	44.961	0.260	SP	01	GR	725.861
19/08/2011 12:39	WD00095044	3153021	7.726	0.031	SP	06	GR	725.861
22/08/2011 12:12	WD00095067	3153856	45.860	0.270	SP	01	GR	724.133
22/08/2011 12:12	WD00095067	3153856	0.048	0.000	SP	99	GR	724.133
22/08/2011 12:12	WD00095067	3153856	6.909	0.029	SP	06	GR	724.133
12/09/2011 7:53	WD00095405	3165647	46.793	0.521	SP	01	GR	717.766
12/09/2011 7:53	WD00095405	3165647	0.319	0.001	SP	99	GR	717.766
12/09/2011 7:53	WD00095405	3165647	6.803	0.033	SP	06	GR	717.766
21/09/2011 11:32	WD00095637	3172227	48.595	0.450	SP	01	GR	693.548

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
21/09/2011 11:32	WD00095637	3172227	8.761	0.039	SP	06	GR	693.548
28/09/2011 6:26	WD00093599	3177387	19.485	0.210	SP	06	GR	731.139
28/09/2011 6:26	WD00093599	3177387	32.137	0.141	SP	01	GR	731.139
28/09/2011 6:26	WD00093599	3177387	3.753	0.055	SP	99	GR	731.139
19/10/2011 18:13	WD00094033	3191269	0.535	0.003	SP	99	GR	795.647
19/10/2011 18:13	WD00094033	3191269	35.191	0.424	SP	01	GR	795.647
19/10/2011 18:13	WD00094033	3191269	8.936	0.032	SP	06	GR	795.647
21/10/2011 12:59	WD00096244	3193042	40.878	0.295	SP	01	GR	752.748
21/10/2011 12:59	WD00096244	3193042	12.302	0.034	SP	06	GR	752.748
21/10/2011 12:59	WD00096244	3193042	0.822	0.003	SP	99	GR	752.748
14/11/2011 15:02	WD00088862	3212205	1.180	0.012	SP	99	GR	762.944
14/11/2011 15:02	WD00088862	3212205	18.830	0.095	SP	06	GR	762.944
14/11/2011 15:02	WD00088862	3212205	32.863	0.154	SP	01	GR	762.944
17/11/2011 12:37	WD00094536	3216892	12.799	0.009	SP	06	GR	811.625
17/11/2011 12:37	WD00094536	3216892	29.694	0.067	SP	01	GR	811.625
17/11/2011 12:37	WD00094536	3216892	2.074	0.000	SP	99	GR	811.625
02/12/2011 7:38	WD00097255	3236879	7.532	0.002	SP	06	GR	771.323
02/12/2011 7:38	WD00097255	3236879	39.956	0.544	SP	01	GR	771.323
02/12/2011 7:38	WD00097255	3236879	0.483	0.000	SP	99	GR	771.323
13/12/2011 17:44	WD00097371	3250273	34.590	0.305	SP	01	GR	772.798
13/12/2011 17:44	WD00097371	3250273	13.829	0.033	SP	06	GR	772.798
13/12/2011 17:44	WD00097371	3250273	2.165	0.000	SP	99	GR	772.798
13/12/2011 17:44	WD00097372	3250272	39.763	0.312	SP	01	GR	789.081
13/12/2011 17:44	WD00097372	3250272	11.638	0.089	SP	06	GR	789.081
13/12/2011 17:44	WD00097372	3250272	0.542	0.001	SP	99	GR	789.081
21/12/2011 14:29	WD00100014	3261786	0.040	0.000	SP	99	GR	791.193
21/12/2011 14:29	WD00100014	3261786	4.947	0.100	SP	06	GR	791.193
21/12/2011 14:29	WD00100014	3261786	42.949	0.553	SP	01	GR	791.193
10/01/2012 5:59	WD00100217	3278178	43.468	0.696	SP	01	GR	764.544

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
10/01/2012 5:59	WD00100217	3278178	7.299	0.073	SP	06	GR	764.544
10/01/2012 5:59	WD00100217	3278178	0.058	0.000	SP	99	GR	764.544
19/01/2012 6:52	WD00097956	3290848	52.854	0.934	SP	01	GR	729.735
19/01/2012 6:52	WD00097956	3290848	0.412	0.000	SP	99	GR	729.735
19/01/2012 6:52	WD00097956	3290848	9.695	0.073	SP	06	GR	729.735
26/01/2012 14:40	WD00101391	3300685	5.947	0.177	SP	06	GR	774.038
26/01/2012 14:40	WD00101391	3300685	0.555	0.002	SP	99	GR	774.038
26/01/2012 14:40	WD00101391	3300685	52.307	1.979	SP	01	GR	774.038
06/02/2012 18:23	U004022784	3316277	5.684	0.017	SP	06	GR	779.471
06/02/2012 18:23	U004022784	3316277	52.077	1.126	SP	01	GR	779.471
06/02/2012 18:23	U004022784	3316277	0.024	0.001	SP	99	GR	779.471
09/02/2012 13:24	WD00101692	3322657	0.320	0.000	SP	99	GR	769.764
09/02/2012 13:24	WD00101692	3322657	10.320	0.038	SP	06	GR	769.764
09/02/2012 13:24	WD00101692	3322657	47.490	0.373	SP	01	GR	769.764
21/02/2012 10:15	U3226718	3339207	38.108	0.528	SP	01	GR	691.059
21/02/2012 10:15	U3226718	3339207	1.329	0.000	SP	99	GR	691.059
21/02/2012 10:15	U3226718	3339207	11.482	0.019	SP	06	GR	691.059
01/03/2012 12:09	WD00103535	3355145	49.591	2.716	SP	01	GR	829.323
01/03/2012 12:09	WD00103535	3355145	7.186	0.235	SP	06	GR	829.323
01/03/2012 12:09	WD00103535	3355145	0.419	0.008	SP	99	GR	829.323
14/03/2012 4:23	U004024165	3370786	10.451	0.096	SP	06	GR	775.808
14/03/2012 4:23	U004024165	3370786	0.849	0.003	SP	99	GR	775.808
14/03/2012 4:23	U004024165	3370786	36.282	0.938	SP	01	GR	775.808
17/08/2011 8:56	WD00021159	3151505	0.049	0.000	SP	99	GR	695.146
17/08/2011 8:56	WD00021159	3151505	50.287	0.054	SP	01	GR	695.146
17/08/2011 8:56	WD00021159	3151505	4.991	0.004	SP	06	GR	695.146
24/08/2011 8:54	WD00021170	3155373	0.027	0.000	SP	99	GR	615.525
24/08/2011 8:54	WD00021170	3155373	1.788	0.000	SP	06	GR	615.525
24/08/2011 8:54	WD00021170	3155373	67.126	0.073	SP	01	GR	615.525

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
26/08/2011 13:39	WD00021181	3157081	66.073	0.538	SP	01	GR	642.405
07/09/2011 11:47	WE00137432	3162887	3.396	0.007	SP	06	GR	680.968
07/09/2011 11:47	WE00137432	3162887	55.457	0.053	SP	01	GR	680.968
07/09/2011 11:47	WE00137432	3162887	0.314	0.000	SP	99	GR	680.968
14/12/2011 11:45	WE00139274	3252327	53.620	0.160	SP	01	GR	776.455
14/12/2011 11:45	WE00139274	3252327	3.148	0.001	SP	06	GR	776.455
14/12/2011 11:45	WE00139274	3252327	0.357	0.000	SP	99	GR	776.455
06/08/2012 16:34	WD00102858	3454283	9.571	0.085	SP	06	GR	709.402
06/08/2012 16:34	WD00102858	3454283	1.672	0.014	SP	99	GR	709.402
06/08/2012 16:34	WD00102858	3454283	41.538	0.469	SP	01	GR	709.402
10/08/2012 5:31	WD00102893	3459377	0.058	0.001	SP	99	GR	737.930
10/08/2012 5:31	WD00102893	3459377	3.790	0.028	SP	06	GR	737.930
10/08/2012 5:31	WD00102893	3459377	50.922	1.118	SP	01	GR	737.930
22/08/2012 7:46	WD00107253	3468923	2.823	0.015	SP	06	GR	712.859
22/08/2012 7:46	WD00107253	3468923	52.891	0.625	SP	01	GR	712.859
07/09/2012 13:24	WD00111022	3484220	0.536	0.011	SP	99	GR	756.014
07/09/2012 13:24	WD00111022	3484220	13.137	0.141	SP	06	GR	756.014
07/09/2012 13:24	WD00111022	3484220	41.291	0.686	SP	01	GR	756.014
17/09/2012 11:26	U004587415	3493421	49.361	0.772	SP	01	GR	707.712
17/09/2012 11:26	U004587415	3493421	0.324	0.000	SP	99	GR	707.712
17/09/2012 11:26	U004587415	3493421	8.270	0.027	SP	06	GR	707.712
26/09/2012 7:03	U004588139	3503085	51.286	0.721	SP	01	GR	682.350
26/09/2012 7:03	U004588139	3503085	0.213	0.000	SP	99	GR	682.350
26/09/2012 7:03	U004588139	3503085	6.927	0.022	SP	06	GR	682.350
09/10/2012 18:39	WD00107755	3512993	1.037	0.000	SP	99	GR	722.597
09/10/2012 18:39	WD00107755	3512993	8.783	0.036	SP	06	GR	722.597
09/10/2012 18:39	WD00107755	3512993	46.247	1.201	SP	01	GR	722.597
18/10/2012 8:25	WD00110038	3520322	2.427	0.000	SP	06	GR	741.083
18/10/2012 8:25	WD00110038	3520322	0.043	0.000	SP	99	GR	741.083

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
18/10/2012 8:25	WD00110038	3520322	45.175	0.066	SP	01	GR	741.083
24/10/2012 10:48	WD00099808	3525562	8.984	0.033	SP	06	GR	794.096
24/10/2012 10:48	WD00099808	3525562	0.016	0.000	SP	99	GR	794.096
24/10/2012 10:48	WD00099808	3525562	39.598	0.460	SP	01	GR	794.096
09/11/2012 10:02	WD00110273	3545490	1.779	0.004	SP	99	GR	807.205
09/11/2012 10:02	WD00110273	3545490	25.375	0.313	SP	01	GR	807.205
09/11/2012 10:02	WD00110273	3545490	17.730	0.043	SP	06	GR	807.205
14/11/2012 14:19	WD00113202	3549437	12.963	0.023	SP	06	GR	779.229
14/11/2012 14:19	WD00113202	3549437	0.256	0.010	SP	99	GR	779.229
14/11/2012 14:19	WD00113202	3549437	35.253	0.353	SP	01	GR	779.229
27/11/2012 16:19	WD00113503	3565376	0.329	0.002	SP	99	GR	786.507
27/11/2012 16:19	WD00113503	3565376	37.105	0.456	SP	01	GR	786.507
27/11/2012 16:19	WD00113503	3565376	10.451	0.053	SP	06	GR	786.507
06/12/2012 11:37	WD00111762	3577273	17.210	0.222	SP	06	GR	738.958
06/12/2012 11:37	WD00111762	3577273	2.232	0.035	SP	99	GR	738.958
06/12/2012 11:37	WD00111762	3577273	33.369	0.413	SP	01	GR	738.958
10/12/2012 12:15	WD00113770	3580797	8.113	0.073	SP	06	GR	788.157
10/12/2012 12:15	WD00113770	3580797	0.341	0.001	SP	99	GR	788.157
10/12/2012 12:15	WD00113770	3580797	42.864	0.277	SP	01	GR	788.157
19/12/2012 15:14	WD00104942	3593794	8.186	0.019	SP	06	GR	775.247
19/12/2012 15:14	WD00104942	3593794	0.744	0.003	SP	99	GR	775.247
19/12/2012 15:14	WD00104942	3593794	46.824	0.498	SP	01	GR	775.247
08/01/2013 10:39	WD00110832	3609883	7.030	0.017	SP	06	GR	783.991
08/01/2013 10:39	WD00110832	3609883	49.251	1.839	SP	01	GR	783.991
08/01/2013 10:39	WD00110832	3609883	0.870	0.001	SP	99	GR	783.991
15/01/2013 4:32	U003505905	3620674	0.683	0.007	SP	99	GR	729.008
15/01/2013 4:32	U003505905	3620674	52.812	0.715	SP	01	GR	729.008
15/01/2013 4:32	U003505905	3620674	4.545	0.213	SP	06	GR	729.008
16/01/2013 17:08	U004589080	3622753	49.731	1.742	SP	01	GR	799.005

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
16/01/2013 17:08	U004589080	3622753	0.129	0.000	SP	99	GR	799.005
16/01/2013 17:08	U004589080	3622753	5.384	0.048	SP	06	GR	799.005
23/01/2013 16:16	WD00120014	3633442	3.333	0.000	SP	99	GR	789.785
23/01/2013 16:16	WD00120014	3633442	9.503	0.077	SP	06	GR	789.785
23/01/2013 16:16	WD00120014	3633442	43.983	0.195	SP	01	GR	789.785
30/01/2013 8:22	WD00112372	3644111	45.972	0.856	SP	01	GR	753.115
30/01/2013 8:22	WD00112372	3644111	11.340	0.279	SP	06	GR	753.115
30/01/2013 8:22	WD00112372	3644111	0.822	0.009	SP	99	GR	753.115
06/02/2013 6:38	WD00114611	3656319	48.025	0.460	SP	01	GR	743.339
06/02/2013 6:38	WD00114611	3656319	10.749	0.105	SP	06	GR	743.339
06/02/2013 6:38	WD00114611	3656319	0.233	0.003	SP	99	GR	743.339
14/02/2013 16:36	WD00120233	3670274	2.758	0.024	SP	99	GR	769.943
14/02/2013 16:36	WD00120233	3670274	13.941	0.144	SP	06	GR	769.943
14/02/2013 16:36	WD00120233	3670274	44.450	0.509	SP	01	GR	769.943
26/02/2013 4:39	WD00116164	3689863	63.659	0.586	SP	01	GR	713.459
28/02/2013 7:12	WD00124134	3692434	35.985	0.525	SP	01	GR	760.498
28/02/2013 7:12	WD00124134	3692434	19.474	0.107	SP	06	GR	760.498
28/02/2013 7:12	WD00124134	3692434	3.934	0.010	SP	99	GR	760.498
15/02/2013 10:20	WD00021684	3674105	0.217	0.001	SP	99	GR	745.297
15/02/2013 10:20	WD00021684	3674105	56.724	0.166	SP	01	GR	745.297
15/02/2013 10:20	WD00021684	3674105	4.107	0.073	SP	06	GR	745.297
31/07/2004	YTDJUL0201	328374	40.286	0.000	SP	06	GR	726.013
31/07/2004	YTDJUL0201	328374	112.659	0.000	SP	01	GR	726.013
08/09/2004 15:25	U2083694	61483	47.620	2.569	SP	01	GR	777.707
08/09/2004 15:25	U2083694	61483	2.139	0.000	SP	06	GR	777.707
22/09/2004 19:48	I084215	76273	0.031	0.000	SP	99	GR	832.606
22/09/2004 19:48	I084215	76273	5.655	0.000	SP	06	GR	832.606
22/09/2004 19:48	I084215	76273	39.797	1.957	SP	01	GR	832.606
05/10/2004 14:39	I085047	99945	37.478	0.923	SP	01	GR	756.340

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
05/10/2004 14:39	I085047	99945	13.044	0.428	SP	06	GR	756.340
07/10/2004 8:12	WD00016757	105931	3.015	0.049	SP	06	GR	800.497
07/10/2004 8:12	WD00016757	105931	50.760	0.559	SP	01	GR	800.497
01/11/2004 18:21	WE00069743	147088	37.018	0.534	SP	01	GR	707.153
01/11/2004 18:21	WE00069743	147088	1.175	0.020	SP	99	GR	707.153
01/11/2004 18:21	WE00069743	147088	11.696	0.294	SP	06	GR	707.153
01/11/2004 18:21	WE00069743	147088	0.138	0.000	F	06	GR	707.153
01/11/2004 18:21	WE00069743	147088	0.188	0.000	F	01	GR	707.153
11/11/2004 7:32	WD00004698	168458	22.854	0.108	SP	01	GR	794.849
11/11/2004 7:32	WD00004698	168458	21.008	0.186	SP	06	GR	794.849
30/11/2004 6:26	WD00014108	211023	0.115	0.000	SP	99	GR	790.659
30/11/2004 6:26	WD00014108	211023	11.733	0.096	SP	06	GR	790.659
30/11/2004 6:26	WD00014108	211023	34.903	0.238	SP	01	GR	790.659
14/12/2004 6:25	WE00070370	245675	33.237	0.764	SP	01	GR	800.403
14/12/2004 6:25	WE00070370	245675	17.493	0.093	SP	06	GR	800.403
14/12/2004 6:25	WE00070370	245675	0.789	0.000	SP	99	GR	800.403
22/12/2004 13:21	U2093780	273448	8.305	0.370	SP	06	GR	841.998
22/12/2004 13:21	U2093780	273448	38.643	0.414	SP	01	GR	841.998
03/01/2005 16:19	WD00017104	287867	37.029	0.579	SP	01	GR	753.084
03/01/2005 16:19	WD00017104	287867	0.120	0.000	SP	99	GR	753.084
03/01/2005 16:19	WD00017104	287867	17.169	0.478	SP	06	GR	753.084
04/01/2005 8:57	WD00017113	292324	0.382	0.000	F	01	GR	715.377
04/01/2005 8:57	WD00017113	292324	48.589	0.188	SP	01	GR	715.377
04/01/2005 8:57	WD00017113	292324	0.066	0.000	F	06	GR	715.377
04/01/2005 8:57	WD00017113	292324	0.148	0.000	SP	99	GR	715.377
04/01/2005 8:57	WD00017113	292324	9.361	0.081	SP	06	GR	715.377
17/01/2005 11:00	WD00017332	331444	0.210	0.000	SP	99	GR	809.971
17/01/2005 11:00	WD00017332	331444	37.769	0.176	SP	01	GR	809.971
17/01/2005 11:00	WD00017332	331444	12.127	0.064	SP	06	GR	809.971

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
23/01/2005 14:31	WD00005396	350516	0.592	0.008	SP	06	GR	663.657
23/01/2005 14:31	WD00005396	350516	59.088	0.530	SP	01	GR	663.657
31/01/2005 17:46	WD00017555	380093	43.507	0.255	SP	01	GR	871.288
31/01/2005 17:46	WD00017555	380093	7.552	0.091	SP	06	GR	871.288
31/01/2005 17:46	WD00017555	380093	0.005	0.000	SP	99	GR	871.288
10/02/2005 5:59	WD00005612	412969	54.521	0.421	SP	01	GR	723.804
10/02/2005 5:59	WD00005612	412969	8.371	0.037	SP	06	GR	723.804
16/02/2005 9:14	I087353	434282	44.134	0.202	SP	01	GR	780.980
03/03/2005 1:08	WE00073707	487986	32.510	0.104	SP	01	GR	755.221
03/03/2005 1:08	WE00073707	487986	10.527	0.062	SP	06	GR	755.221
03/03/2005 1:08	WE00073707	487986	0.176	0.000	SP	99	GR	755.221
03/03/2005 10:00	WD00014806	487806	3.010	0.018	SP	06	GR	806.219
03/03/2005 10:00	WD00014806	487806	49.251	0.272	SP	01	GR	806.219
16/03/2005 9:02	WD00009306	523454	0.076	0.000	SP	99	GR	831.822
16/03/2005 9:02	WD00009306	523454	4.380	0.024	SP	06	GR	831.822
16/03/2005 9:02	WD00009306	523454	27.623	0.065	SP	01	GR	831.822
05/04/2005 10:51	WD00018356	566869	0.083	0.000	SP	99	GR	715.430
05/04/2005 10:51	WD00018356	566869	15.589	0.106	SP	06	GR	715.430
05/04/2005 10:51	WD00018356	566869	36.345	0.110	SP	01	GR	715.430
12/04/2005 12:57	WD00018447	574865	40.665	0.981	SP	01	GR	778.596
12/04/2005 12:57	WD00018447	574865	8.265	0.343	SP	06	GR	778.596
12/04/2005 12:57	WD00018447	574865	0.031	0.000	SP	99	GR	778.596
19/04/2005 15:19	U2494239	585179	7.873	0.119	SP	06	GR	753.590
19/04/2005 15:19	U2494239	585179	0.032	0.007	SP	99	GR	753.590
19/04/2005 15:19	U2494239	585179	1.352	0.003	F	01	GR	753.590
19/04/2005 15:19	U2494239	585179	38.269	0.431	SP	01	GR	753.590
19/04/2005 15:19	U2494239	585179	0.595	0.002	F	06	GR	753.590
31/07/2004	YTDJUL0204	328407	72.570	0.000	SP	01	GR	723.653
31/07/2004	YTDJUL0204	328407	4.221	0.000	SP	06	GR	723.653

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
09/08/2004 14:27	WE055635	32905	0.142	0.000	F	01	GR	800.813
09/08/2004 14:27	WE055635	32905	7.969	0.188	SP	06	GR	800.813
09/08/2004 14:27	WE055635	32905	0.086	0.000	F	06	GR	800.813
09/08/2004 14:27	WE055635	32905	23.342	0.345	SP	01	GR	800.813
24/09/2004 16:31	WE056773	82102	11.555	0.135	SP	06	GR	717.895
24/09/2004 16:31	WE056773	82102	26.613	0.033	SP	01	GR	717.895
30/09/2004 15:40	WE057175	90611	2.503	0.022	SP	06	GR	828.568
30/09/2004 15:40	WE057175	90611	15.420	0.063	SP	01	GR	828.568
20/12/2004 10:51	WE00070472	263592	37.208	0.548	SP	01	GR	814.249
20/12/2004 10:51	WE00070472	263592	5.694	0.025	SP	06	GR	814.249
20/12/2004 10:51	WE00070472	263592	1.314	0.020	SP	99	GR	814.249
09/01/2005 13:16	WD00005255	307514	7.118	0.180	SP	06	GR	852.200
09/01/2005 13:16	WD00005255	307514	35.261	1.822	SP	01	GR	852.200
09/01/2005 13:16	WD00005255	307514	0.435	0.000	SP	99	GR	852.200
12/01/2005 11:02	WD00005306	319619	5.231	0.048	SP	06	GR	790.013
12/01/2005 11:02	WD00005306	319619	50.666	0.698	SP	01	GR	790.013
17/01/2005 20:07	WD00005339	331445	0.110	0.000	SP	99	GR	759.443
17/01/2005 20:07	WD00005339	331445	11.684	0.161	SP	06	GR	759.443
17/01/2005 20:07	WD00005339	331445	33.459	0.217	SP	01	GR	759.443
26/01/2005 8:52	WD00005445	366397	38.502	0.771	SP	01	GR	864.473
26/01/2005 8:52	WD00005445	366397	0.037	0.000	SP	99	GR	864.473
26/01/2005 8:52	WD00005445	366397	6.119	0.346	SP	06	GR	864.473
24/02/2005 6:53	WD00009179	463331	5.588	0.038	SP	06	GR	851.082
24/02/2005 6:53	WD00009179	463331	0.015	0.000	SP	99	GR	851.082
24/02/2005 6:53	WD00009179	463331	41.227	0.263	SP	01	GR	851.082
06/04/2005 8:21	WD00013371	568195	45.510	0.957	SP	01	GR	853.366
07/04/2005 9:40	WD00013397	570051	7.523	0.194	SP	06	GR	782.966
07/04/2005 9:40	WD00013397	570051	0.547	0.004	SP	99	GR	782.966
07/04/2005 9:40	WD00013397	570051	41.126	1.563	SP	01	GR	782.966

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
14/05/2005 7:26	U2495058	624061	43.806	0.994	SP	01	GR	716.120
14/05/2005 7:26	U2495058	624061	4.396	0.098	SP	06	GR	716.120
14/05/2005 7:26	U2495058	624061	0.005	0.000	SP	99	GR	716.120
27/05/2005 5:57	U2495124	646391	0.167	0.000	F	01	GR	745.174
27/05/2005 5:57	U2495124	646391	30.118	0.233	SP	01	GR	745.174
27/05/2005 5:57	U2495124	646391	0.120	0.006	F	06	GR	745.174
27/05/2005 5:57	U2495124	646391	19.335	0.194	SP	06	GR	745.174
27/05/2005 5:57	U2495124	646391	0.064	0.000	SP	99	GR	745.174
06/10/2005 16:22	U2492722	951202	0.049	0.000	F	06	GR	809.041
06/10/2005 16:22	U2492722	951202	0.019	0.000	SP	99	GR	809.041
06/10/2005 16:22	U2492722	951202	6.728	0.030	SP	06	GR	809.041
06/10/2005 16:22	U2492722	951202	41.442	0.689	SP	01	GR	809.041
06/10/2005 16:22	U2492722	951202	0.130	0.000	F	01	GR	809.041
13/10/2005 10:41	WD00030586	966064	5.956	0.047	SP	06	GR	790.093
13/10/2005 10:41	WD00030586	966064	0.010	0.000	SP	99	GR	790.093
13/10/2005 10:41	WD00030586	966064	47.796	0.620	SP	01	GR	790.093
14/10/2005 6:54	WD00028760	969817	5.097	0.037	SP	06	GR	777.358
14/10/2005 6:54	WD00028760	969817	44.132	0.450	SP	01	GR	777.358
21/10/2005 10:47	WD00030646	984785	6.426	0.081	SP	06	GR	795.249
21/10/2005 10:47	WD00030646	984785	45.693	0.452	SP	01	GR	795.249
21/10/2005 10:47	WD00030646	984785	0.448	0.000	SP	99	GR	795.249
22/10/2005 13:05	WD00010375	984919	0.015	0.000	SP	99	GR	783.744
22/10/2005 13:05	WD00010375	984919	2.990	0.028	SP	06	GR	783.744
22/10/2005 13:05	WD00010375	984919	48.214	0.945	SP	01	GR	783.744
24/10/2005 10:14	WD00028780	988195	0.388	0.020	F	06	GR	906.136
24/10/2005 10:14	WD00028780	988195	36.368	0.601	SP	01	GR	906.136
24/10/2005 10:14	WD00028780	988195	2.590	0.000	F	01	GR	906.136
24/10/2005 10:14	WD00028780	988195	5.136	0.170	SP	06	GR	906.136
24/10/2005 13:45	WD00030703	988290	46.796	0.100	SP	01	GR	827.235

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
24/10/2005 13:45	WD00030703	988290	4.142	0.006	SP	06	GR	827.235
03/11/2005 8:04	WE00084719	1019633	6.570	0.011	SP	06	GR	807.510
03/11/2005 8:04	WE00084719	1019633	40.490	0.209	SP	01	GR	807.510
03/11/2005 8:04	WE00084719	1019633	0.082	0.000	SP	99	GR	807.510
13/11/2005 6:59	WD00010442	1038412	3.437	0.000	F	01	GR	933.097
13/11/2005 6:59	WD00010442	1038412	0.151	0.000	F	06	GR	933.097
13/11/2005 6:59	WD00010442	1038412	3.724	0.070	SP	06	GR	933.097
13/11/2005 6:59	WD00010442	1038412	35.930	0.304	SP	01	GR	933.097
16/11/2005 11:44	U2490551	1049850	0.131	0.000	SP	99	GR	776.746
16/11/2005 11:44	U2490551	1049850	37.734	0.186	SP	01	GR	776.746
16/11/2005 11:44	U2490551	1049850	9.969	0.052	SP	06	GR	776.746
01/12/2005 7:33	WD00031427	1091276	43.381	0.432	SP	01	GR	802.738
01/12/2005 7:33	WD00031427	1091276	0.272	0.000	F	06	GR	802.738
01/12/2005 7:33	WD00031427	1091276	7.297	0.051	SP	06	GR	802.738
01/12/2005 7:33	WD00031427	1091276	0.105	0.000	SP	99	GR	802.738
01/12/2005 7:33	WD00031427	1091276	0.561	0.008	F	01	GR	802.738
12/12/2005 7:53	U2484263	1122894	0.059	0.000	SP	99	GR	754.717
12/12/2005 7:53	U2484263	1122894	41.661	0.351	SP	01	GR	754.717
12/12/2005 7:53	U2484263	1122894	6.557	0.014	SP	06	GR	754.717
21/12/2005 16:21	WE0108153	1153531	51.847	0.714	SP	01	GR	779.536
22/12/2005 13:01	U2484129	1159187	7.433	0.020	SP	06	GR	783.438
22/12/2005 13:01	U2484129	1159187	0.145	0.000	SP	99	GR	783.438
22/12/2005 13:01	U2484129	1159187	42.215	0.286	SP	01	GR	783.438
13/01/2006 16:49	WE00090879	1214611	0.114	0.002	SP	99	GR	738.466
13/01/2006 16:49	WE00090879	1214611	5.036	0.019	SP	06	GR	738.466
13/01/2006 16:49	WE00090879	1214611	48.896	0.468	SP	01	GR	738.466
17/01/2006 18:33	U2484376	1226771	1.496	0.002	SP	99	GR	658.499
17/01/2006 18:33	U2484376	1226771	50.153	0.592	SP	06	GR	658.499
17/01/2006 18:33	U2484376	1226771	2.029	0.003	F	06	GR	658.499

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
17/01/2006 18:33	U2484376	1226771	10.691	0.056	SP	01	GR	658.499
17/01/2006 18:33	U2484376	1226771	0.525	0.004	F	01	GR	658.499
20/01/2006 11:36	U2480804	1242311	0.061	0.000	SP	99	GR	748.572
20/01/2006 11:36	U2480804	1242311	24.915	0.240	SP	06	GR	748.572
20/01/2006 11:36	U2480804	1242311	0.086	0.000	F	06	GR	748.572
20/01/2006 11:36	U2480804	1242311	0.332	0.000	F	01	GR	748.572
20/01/2006 11:36	U2480804	1242311	29.146	0.202	SP	01	GR	748.572
20/01/2006 11:36	U2480804	1242311	0.005	0.000	F	99	GR	748.572
24/01/2006 15:23	WD00032434	1251876	0.021	0.000	F	06	GR	766.888
24/01/2006 15:23	WD00032434	1251876	4.536	0.107	SP	06	GR	766.888
24/01/2006 15:23	WD00032434	1251876	46.456	0.788	SP	01	GR	766.888
24/01/2006 15:23	WD00032434	1251876	0.048	0.000	F	99	GR	766.888
24/01/2006 15:23	WD00032434	1251876	0.076	0.000	SP	99	GR	766.888
08/02/2006 14:33	WE00075045	1308161	11.234	0.331	SP	01	GR	807.117
13/02/2006 18:51	WE00091765	1324546	49.202	0.670	SP	01	GR	713.387
13/02/2006 18:51	WE00091765	1324546	0.220	0.000	F	01	GR	713.387
13/02/2006 18:51	WE00091765	1324546	0.010	0.000	SP	99	GR	713.387
13/02/2006 18:51	WE00091765	1324546	10.137	0.067	SP	06	GR	713.387
24/02/2006 9:44	WD00029269	1372712	42.835	0.286	SP	01	GR	751.752
24/02/2006 9:44	WD00029269	1372712	11.058	0.054	SP	06	GR	751.752
24/02/2006 9:44	WD00029269	1372712	0.095	0.000	SP	99	GR	751.752
20/03/2006 6:21	WD00036060	1451261	0.216	0.000	SP	99	GR	777.873
20/03/2006 6:21	WD00036060	1451261	37.655	0.684	SP	01	GR	777.873
20/03/2006 6:21	WD00036060	1451261	15.305	0.067	SP	06	GR	777.873
27/03/2006 9:40	WD00036197	1474818	5.793	0.044	SP	06	GR	928.185
27/03/2006 9:40	WD00036197	1474818	0.030	0.000	SP	99	GR	928.185
27/03/2006 9:40	WD00036197	1474818	0.066	0.000	F	06	GR	928.185
27/03/2006 9:40	WD00036197	1474818	38.366	0.203	SP	01	GR	928.185
27/03/2006 9:40	WD00036197	1474818	0.175	0.000	F	01	GR	928.185

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
18/04/2006 14:13	U2654552	1504279	0.970	0.010	F	01	GR	715.107
18/04/2006 14:13	U2654552	1504279	42.370	0.259	SP	01	GR	715.107
18/04/2006 14:13	U2654552	1504279	0.066	0.000	F	06	GR	715.107
18/04/2006 14:13	U2654552	1504279	13.451	0.116	SP	06	GR	715.107
18/04/2006 14:13	U2654552	1504279	0.065	0.000	SP	99	GR	715.107
07/08/2005 9:09	WE00078043	804870	31.641	1.129	SP	01	GR	813.160
07/08/2005 9:09	WE00078043	804870	4.465	0.241	SP	06	GR	813.160
07/08/2005 9:09	WE00078043	804870	0.005	0.000	SP	99	GR	813.160
15/11/2005 17:18	WE00073998	1046355	0.106	0.000	SP	06	GR	665.830
15/11/2005 17:18	WE00073998	1046355	60.478	0.839	SP	01	GR	665.830
21/11/2005 17:10	WE00084977	1060273	0.242	0.000	SP	99	GR	845.686
21/11/2005 17:10	WE00084977	1060273	10.392	0.132	SP	06	GR	845.686
21/11/2005 17:10	WE00084977	1060273	34.343	0.254	SP	01	GR	845.686
09/02/2006 14:40	WE00086362	1312995	5.971	0.014	SP	06	GR	824.485
09/02/2006 14:40	WE00086362	1312995	0.036	0.000	SP	99	GR	824.485
09/02/2006 14:40	WE00086362	1312995	44.428	1.445	SP	01	GR	824.485
24/03/2006 1:32	WE00087041	1470146	38.074	0.165	SP	01	GR	916.410
24/03/2006 1:32	WE00087041	1470146	0.209	0.000	F	01	GR	916.410
24/03/2006 1:32	WE00087041	1470146	0.081	0.000	F	06	GR	916.410
24/03/2006 1:32	WE00087041	1470146	11.634	0.159	SP	06	GR	916.410
24/03/2006 1:32	WE00087041	1470146	0.009	0.000	SP	99	GR	916.410
14/08/2006 15:09	WD00045118	1701327	0.131	0.000	SP	99	GR	806.053
14/08/2006 15:09	WD00045118	1701327	41.717	0.562	SP	01	GR	806.053
14/08/2006 15:09	WD00045118	1701327	4.606	0.163	SP	06	GR	806.053
06/09/2006 13:44	WD00036941	1751614	0.177	0.000	SP	99	GR	766.699
06/09/2006 13:44	WD00036941	1751614	5.375	0.056	SP	06	GR	766.699
06/09/2006 13:44	WD00036941	1751614	35.505	0.894	SP	01	GR	766.699
11/09/2006 17:28	WD00045298	1761119	11.337	0.119	SP	06	GR	771.364
11/09/2006 17:28	WD00045298	1761119	40.448	0.587	SP	01	GR	771.364

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
11/09/2006 17:28	WD00045298	1761119	0.481	0.002	SP	99	GR	771.364
10/10/2006 9:04	WE00089861	1813928	3.341	0.013	SP	06	GR	765.452
10/10/2006 9:04	WE00089861	1813928	38.117	0.528	SP	01	GR	765.452
26/10/2006 14:18	U2678503	1844665	39.427	0.278	SP	01	GR	792.053
26/10/2006 14:18	U2678503	1844665	14.378	0.076	SP	06	GR	792.053
26/10/2006 14:18	U2678503	1844665	0.005	0.000	SP	99	GR	792.053
12/11/2006 8:40	WE00072454	1877544	0.049	0.000	SP	99	GR	751.856
12/11/2006 8:40	WE00072454	1877544	6.898	0.011	SP	06	GR	751.856
12/11/2006 8:40	WE00072454	1877544	40.391	0.443	SP	01	GR	751.856
23/11/2006 10:27	WE00088099	1903877	0.005	0.000	SP	99	GR	955.891
23/11/2006 10:27	WE00088099	1903877	25.298	0.043	SP	01	GR	955.891
23/11/2006 10:27	WE00088099	1903877	15.466	0.031	SP	06	GR	955.891
13/12/2006 10:06	WD00046995	1949128	0.020	0.000	SP	99	GR	875.444
13/12/2006 10:06	WD00046995	1949128	6.610	0.021	SP	06	GR	875.444
13/12/2006 10:06	WD00046995	1949128	44.031	1.088	SP	01	GR	875.444
18/12/2006 15:32	WD00037575	1960971	2.980	0.018	SP	06	GR	785.768
18/12/2006 15:32	WD00037575	1960971	49.141	3.310	SP	01	GR	785.768
05/01/2007 9:38	WE00099404	1989271	0.094	0.000	F	06	GR	1038.326
05/01/2007 9:38	WE00099404	1989271	0.649	0.005	F	01	GR	1038.326
05/01/2007 9:38	WE00099404	1989271	6.523	0.101	SP	06	GR	1038.326
05/01/2007 9:38	WE00099404	1989271	28.766	0.571	SP	01	GR	1038.326
23/01/2007 17:31	WD00048225	2031371	0.051	0.000	SP	99	GR	797.438
23/01/2007 17:31	WD00048225	2031371	12.405	0.066	SP	06	GR	797.438
23/01/2007 17:31	WD00048225	2031371	39.582	0.131	SP	01	GR	797.438
06/02/2007 7:51	WD00048461	2069034	9.457	0.069	SP	06	GR	763.331
06/02/2007 7:51	WD00048461	2069034	43.292	0.265	SP	01	GR	763.331
09/02/2007 9:53	U3004888	2081232	49.886	0.165	SP	01	GR	761.768
09/02/2007 9:53	U3004888	2081232	9.641	0.092	SP	06	GR	761.768
20/02/2007 12:23	WE00101849	2105492	3.946	0.059	SP	06	GR	780.030

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
20/02/2007 12:23	WE00101849	2105492	0.017	0.000	SP	99	GR	780.030
20/02/2007 12:23	WE00101849	2105492	44.828	0.439	SP	01	GR	780.030
06/07/2006 20:51	WE00094516	1627748	22.880	0.172	SP	01	GR	661.857
06/07/2006 20:51	WE00094516	1627748	0.131	0.000	SP	99	GR	661.857
06/07/2006 20:51	WE00094516	1627748	17.943	0.169	SP	06	GR	661.857
17/07/2006 14:43	WD00054079	1647459	6.986	0.024	SP	06	GR	659.539
17/07/2006 14:43	WD00054079	1647459	0.425	0.006	F	01	GR	659.539
17/07/2006 14:43	WD00054079	1647459	0.265	0.000	F	06	GR	659.539
17/07/2006 14:43	WD00054079	1647459	54.818	0.451	SP	01	GR	659.539
24/07/2006 7:59	WD00054169	1663339	9.258	0.137	SP	06	GR	652.289
24/07/2006 7:59	WD00054169	1663339	51.592	0.401	SP	01	GR	652.289
24/07/2006 7:59	WD00054169	1663339	0.015	0.000	SP	99	GR	652.289
24/07/2006 7:59	WD00054169	1663339	0.091	0.000	F	06	GR	652.289
03/08/2006 14:56	WE00089178	1684495	3.969	0.064	SP	06	GR	683.817
03/08/2006 14:56	WE00089178	1684495	6.803	0.144	SP	01	GR	683.817
03/08/2006 14:56	WE00089178	1684495	0.009	0.000	SP	99	GR	683.817
12/10/2006 15:53	WE00097667	1820071	43.628	0.848	SP	01	GR	700.822
12/10/2006 15:53	WE00097667	1820071	5.900	0.137	SP	06	GR	700.822
30/10/2006 7:17	WE00089943	1850600	0.106	0.000	SP	06	GR	834.728
30/10/2006 7:17	WE00089943	1850600	0.644	0.000	F	01	GR	834.728
30/10/2006 7:17	WE00089943	1850600	45.735	0.470	SP	01	GR	834.728
14/11/2006 7:44	WE00087985	1882423	0.038	0.000	SP	06	GR	940.210
14/11/2006 7:44	WE00087985	1882423	43.061	1.002	SP	01	GR	940.210
23/11/2006 11:01	WE00097401	1903850	30.368	1.275	SP	01	GR	839.303
23/11/2006 11:01	WE00097401	1903850	1.929	0.032	SP	06	GR	839.303
07/12/2006 6:23	WE00090444	1934860	0.023	0.000	SP	99	GR	941.428
07/12/2006 6:23	WE00090444	1934860	36.889	0.208	SP	01	GR	941.428
07/12/2006 6:23	WE00090444	1934860	4.035	0.003	SP	06	GR	941.428
18/12/2006 12:02	WE00115976	1960970	49.550	4.568	SP	01	GR	971.602

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
18/12/2006 12:02	WE00115976	1960970	2.304	0.065	SP	06	GR	971.602
03/01/2007 6:41	WE00116092	1982478	8.281	0.052	SP	06	GR	940.708
03/01/2007 6:41	WE00116092	1982478	39.519	0.185	SP	01	GR	940.708
03/01/2007 6:41	WE00116092	1982478	0.167	0.000	F	01	GR	940.708
07/01/2007 9:49	WE00096998	1989114	3.988	0.102	SP	06	GR	829.817
07/01/2007 9:49	WE00096998	1989114	42.820	0.732	SP	01	GR	829.817
18/01/2007 8:59	WE00116377	2022381	4.429	0.014	SP	06	GR	944.498
18/01/2007 8:59	WE00116377	2022381	39.333	0.254	SP	01	GR	944.498
23/01/2007 13:15	WE00116469	2031370	0.062	0.000	F	06	GR	915.629
23/01/2007 13:15	WE00116469	2031370	6.239	0.097	SP	06	GR	915.629
23/01/2007 13:15	WE00116469	2031370	45.952	0.992	SP	01	GR	915.629
23/01/2007 13:15	WE00116469	2031370	0.705	0.003	F	01	GR	915.629
25/01/2007 6:35	WE00116502	2038694	44.388	0.280	SP	01	GR	848.318
25/01/2007 6:35	WE00116502	2038694	6.729	0.036	SP	06	GR	848.318
25/01/2007 6:35	WE00116502	2038694	0.203	0.000	F	06	GR	848.318
25/01/2007 6:35	WE00116502	2038694	1.965	0.000	F	01	GR	848.318
25/01/2007 6:35	WE00116502	2038694	0.030	0.000	SP	99	GR	848.318
28/01/2007 18:58	WE063600	2042902	3.322	0.015	SP	06	GR	892.443
28/01/2007 18:58	WE063600	2042902	44.735	1.025	SP	01	GR	892.443
30/01/2007 8:38	WD00056104	2051300	27.869	0.219	SP	01	GR	844.823
30/01/2007 8:38	WD00056104	2051300	19.072	0.085	SP	06	GR	844.823
31/01/2007 14:33	WE00117587	2055104	27.254	0.682	SP	01	GR	848.845
31/01/2007 14:33	WE00117587	2055104	22.119	0.263	SP	06	GR	848.845
31/01/2007 14:33	WE00117587	2055104	0.085	0.000	SP	99	GR	848.845
02/02/2007 11:51	WE065317	2062851	7.650	0.033	SP	06	GR	857.046
02/02/2007 11:51	WE065317	2062851	45.579	0.200	SP	01	GR	857.046
06/02/2007 17:11	WE065341	2069035	0.060	0.000	SP	99	GR	759.052
06/02/2007 17:11	WE065341	2069035	40.188	0.380	SP	01	GR	759.052
06/02/2007 17:11	WE065341	2069035	16.330	0.049	SP	06	GR	759.052

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
13/02/2007 9:05	WE00117835	2088358	0.296	0.015	F	01	GR	858.207
13/02/2007 9:05	WE00117835	2088358	33.573	0.535	SP	01	GR	858.207
13/02/2007 9:05	WE00117835	2088358	0.155	0.002	F	06	GR	858.207
13/02/2007 9:05	WE00117835	2088358	15.727	0.138	SP	06	GR	858.207
13/02/2007 9:05	WE00117835	2088358	0.053	0.000	SP	99	GR	858.207
31/07/2007 14:38	U3012633	2228517	8.037	0.154	SP	06	GR	667.308
31/07/2007 14:38	U3012633	2228517	2.786	0.013	SP	99	GR	667.308
31/07/2007 14:38	U3012633	2228517	44.749	1.382	SP	01	GR	667.308
22/08/2007 15:08	WD00049862	2249975	1.573	0.038	SP	99	GR	752.375
22/08/2007 15:08	WD00049862	2249975	14.745	0.342	SP	06	GR	752.375
22/08/2007 15:08	WD00049862	2249975	37.742	0.741	SP	01	GR	752.375
30/08/2007 14:19	WD00049972	2258680	13.335	0.285	SP	06	GR	733.424
30/08/2007 14:19	WD00049972	2258680	37.856	0.938	SP	01	GR	733.424
30/08/2007 14:19	WD00049972	2258680	4.227	0.079	SP	99	GR	733.424
18/09/2007 13:29	WE00107277	2278626	8.965	0.016	SP	06	GR	690.157
18/09/2007 13:29	WE00107277	2278626	0.737	0.006	SP	99	GR	690.157
18/09/2007 13:29	WE00107277	2278626	0.075	0.000	F	06	GR	690.157
18/09/2007 13:29	WE00107277	2278626	48.091	0.178	SP	01	GR	690.157
27/09/2007 11:30	U3014906	2289476	1.686	0.022	SP	99	GR	767.822
27/09/2007 11:30	U3014906	2289476	20.562	0.442	SP	06	GR	767.822
27/09/2007 11:30	U3014906	2289476	31.415	0.791	SP	01	GR	767.822
12/11/2007 5:50	U3010931	2337455	0.297	0.000	SP	99	GR	788.022
12/11/2007 5:50	U3010931	2337455	8.310	0.044	SP	06	GR	788.022
12/11/2007 5:50	U3010931	2337455	38.333	1.047	SP	01	GR	788.022
04/12/2007 6:48	WE00107167	2361615	34.347	0.821	SP	01	GR	779.765
04/12/2007 6:48	WE00107167	2361615	9.532	0.215	SP	06	GR	779.765
04/12/2007 6:48	WE00107167	2361615	0.606	0.000	SP	99	GR	779.765
14/01/2008 12:44	WD00042016	2402291	5.980	0.056	SP	99	GR	727.863
14/01/2008 12:44	WD00042016	2402291	26.964	0.404	SP	01	GR	727.863

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
14/01/2008 12:44	WD00042016	2402291	25.077	0.270	SP	06	GR	727.863
30/01/2008 6:17	WE00119944	2425094	0.674	0.000	SP	99	GR	792.368
30/01/2008 6:17	WE00119944	2425094	23.346	0.208	SP	01	GR	792.368
30/01/2008 6:17	WE00119944	2425094	8.804	0.068	SP	06	GR	792.368
31/01/2008 10:40	WE00119987	2426786	0.137	0.000	SP	99	GR	737.138
31/01/2008 10:40	WE00119987	2426786	48.239	0.395	SP	01	GR	737.138
31/01/2008 10:40	WE00119987	2426786	5.739	0.053	SP	06	GR	737.138
01/02/2008 14:45	WE00121059	2428529	51.722	0.616	SP	01	GR	743.346
01/02/2008 14:45	WE00121059	2428529	0.136	0.000	SP	99	GR	743.346
01/02/2008 14:45	WE00121059	2428529	7.215	0.032	SP	06	GR	743.346
07/02/2008 8:38	WD00042240	2436654	9.176	0.052	SP	06	GR	759.799
07/02/2008 8:38	WD00042240	2436654	46.755	0.229	SP	01	GR	759.799
07/02/2008 8:38	WD00042240	2436654	0.300	0.001	SP	99	GR	759.799
07/02/2008 14:16	WE00122621	2436655	6.990	0.001	SP	06	GR	797.501
07/02/2008 14:16	WE00122621	2436655	41.725	0.090	SP	01	GR	797.501
07/02/2008 14:16	WE00122621	2436655	0.028	0.000	SP	99	GR	797.501
07/02/2008 14:51	WD00043532	2436656	0.719	0.004	SP	99	GR	749.715
07/02/2008 14:51	WD00043532	2436656	9.623	0.027	SP	06	GR	749.715
07/02/2008 14:51	WD00043532	2436656	46.236	0.459	SP	01	GR	749.715
13/02/2008 7:58	WD00042324	2443480	0.117	0.000	F	01	GR	820.991
13/02/2008 7:58	WD00042324	2443480	0.067	0.000	F	06	GR	820.991
13/02/2008 7:58	WD00042324	2443480	7.437	0.112	SP	06	GR	820.991
13/02/2008 7:58	WD00042324	2443480	0.328	0.003	SP	99	GR	820.991
13/02/2008 7:58	WD00042324	2443480	42.833	0.703	SP	01	GR	820.991
15/02/2008 8:45	WD00042379	2447754	1.218	0.003	SP	99	GR	747.764
15/02/2008 8:45	WD00042379	2447754	8.390	0.090	SP	06	GR	747.764
15/02/2008 8:45	WD00042379	2447754	43.987	0.290	SP	01	GR	747.764
19/02/2008 12:33	WE00121213	2449872	5.546	0.009	SP	06	GR	795.930
19/02/2008 12:33	WE00121213	2449872	0.298	0.004	SP	99	GR	795.930

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
19/02/2008 12:33	WE00121213	2449872	52.913	0.460	SP	01	GR	795.930
20/02/2008 11:02	WD00042428	2451623	45.321	1.388	SP	01	GR	775.599
20/02/2008 11:02	WD00042428	2451623	9.496	0.472	SP	06	GR	775.599
20/02/2008 11:02	WD00042428	2451623	1.099	0.059	SP	99	GR	775.599
22/02/2008 7:52	WD00042465	2455247	0.275	0.003	SP	99	GR	757.217
22/02/2008 7:52	WD00042465	2455247	33.676	0.477	SP	01	GR	757.217
22/02/2008 7:52	WD00042465	2455247	14.919	0.240	SP	06	GR	757.217
25/02/2008 13:05	WD00042499	2457040	13.198	0.247	SP	06	GR	758.761
25/02/2008 13:05	WD00042499	2457040	1.072	0.014	SP	99	GR	758.761
25/02/2008 13:05	WD00042499	2457040	45.546	0.630	SP	01	GR	758.761
27/02/2008 10:48	WD00044504	2460316	19.907	0.184	SP	06	GR	745.942
27/02/2008 10:48	WD00044504	2460316	34.514	0.486	SP	01	GR	745.942
27/02/2008 10:48	WD00044504	2460316	1.941	0.004	SP	99	GR	745.942
08/03/2008 0:56	WE00121602	2473528	4.442	0.081	SP	99	GR	734.380
08/03/2008 0:56	WE00121602	2473528	33.347	0.439	SP	01	GR	734.380
08/03/2008 0:56	WE00121602	2473528	11.140	0.137	SP	06	GR	734.380
28/06/2007 7:27	WE00101584	2198924	65.225	0.760	SP	01	GR	645.467
19/10/2007 11:45	WE00106388	2315168	5.805	0.016	SP	06	GR	825.355
19/10/2007 11:45	WE00106388	2315168	30.257	0.367	SP	01	GR	825.355
19/10/2007 11:45	WE00106388	2315168	0.354	0.000	SP	99	GR	825.355
11/07/2008 17:24	WD00043162	2520614	54.978	0.883	SP	01	GR	717.614
11/07/2008 17:24	WD00043162	2520614	3.188	0.022	SP	06	GR	717.614
11/07/2008 17:24	WD00043162	2520614	0.040	0.000	SP	99	GR	717.614
24/07/2008 7:20	WD00043395	2527356	21.940	0.050	SP	06	GR	745.194
24/07/2008 7:20	WD00043395	2527356	0.438	0.001	SP	99	GR	745.194
24/07/2008 7:20	WD00043395	2527356	33.237	0.169	SP	01	GR	745.194
08/08/2008 8:01	WE00106212	2536753	6.082	0.067	SP	06	GR	688.262
08/08/2008 8:01	WE00106212	2536753	0.983	0.001	SP	99	GR	688.262
08/08/2008 8:01	WE00106212	2536753	41.307	1.287	SP	01	GR	688.262

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
28/08/2008 6:37	WD00043700	2548292	47.032	0.214	SP	01	GR	697.282
28/08/2008 6:37	WD00043700	2548292	5.796	0.018	SP	06	GR	697.282
28/08/2008 6:37	WD00043700	2548292	0.210	0.001	SP	99	GR	697.282
11/09/2008 17:16	WD00060560	2555652	0.161	0.000	SP	99	GR	714.025
11/09/2008 17:16	WD00060560	2555652	2.321	0.000	SP	06	GR	714.025
11/09/2008 17:16	WD00060560	2555652	50.080	0.491	SP	01	GR	714.025
26/09/2008 13:27	WD00066128	2565015	21.459	0.651	SP	01	GR	686.802
26/09/2008 13:27	WD00066128	2565015	0.770	0.000	SP	99	GR	686.802
26/09/2008 13:27	WD00066128	2565015	36.009	0.307	SP	06	GR	686.802
06/10/2008 9:03	Q135289	2571914	45.848	0.259	SP	01	GR	719.655
06/10/2008 9:03	Q135289	2571914	1.231	0.000	SP	06	GR	719.655
06/10/2008 9:03	Q135289	2571914	0.008	0.000	SP	99	GR	719.655
16/10/2008 17:11	WD00061172	2578548	5.725	0.071	SP	06	GR	723.102
16/10/2008 17:11	WD00061172	2578548	50.866	0.322	SP	01	GR	723.102
16/10/2008 17:11	WD00061172	2578548	0.032	0.000	SP	99	GR	723.102
24/10/2008 16:59	WD00061328	2585269	0.215	0.000	SP	99	GR	732.908
24/10/2008 16:59	WD00061328	2585269	4.430	0.018	SP	06	GR	732.908
24/10/2008 16:59	WD00061328	2585269	45.893	0.541	SP	01	GR	732.908
04/11/2008 8:25	WD00066812	2593536	41.437	0.170	SP	01	GR	721.111
04/11/2008 8:25	WD00066812	2593536	0.265	0.001	SP	99	GR	721.111
04/11/2008 8:25	WD00066812	2593536	9.802	0.051	SP	06	GR	721.111
07/11/2008 6:46	WD00062036	2596170	0.210	0.000	SP	06	GR	678.892
07/11/2008 6:46	WD00062036	2596170	60.645	0.271	SP	01	GR	678.892
27/11/2008 11:49	WD00061887	2611187	0.515	0.001	SP	99	GR	719.210
27/11/2008 11:49	WD00061887	2611187	42.006	0.380	SP	01	GR	719.210
27/11/2008 11:49	WD00061887	2611187	9.562	0.062	SP	06	GR	719.210
09/12/2008 11:11	WD00062403	2620725	32.932	0.160	SP	01	GR	720.437
09/12/2008 11:11	WD00062403	2620725	20.989	0.161	SP	06	GR	720.437
09/12/2008 11:11	WD00062403	2620725	0.048	0.000	SP	99	GR	720.437

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
06/01/2009 6:38	WD00063366	2635878	55.917	0.263	SP	01	GR	686.881
06/01/2009 6:38	WD00063366	2635878	0.196	0.000	SP	99	GR	686.881
06/01/2009 6:38	WD00063366	2635878	7.708	0.039	SP	06	GR	686.881
16/01/2009 13:08	WD00062839	2646413	23.037	0.108	SP	06	GR	812.701
16/01/2009 13:08	WD00062839	2646413	27.570	0.183	SP	01	GR	812.701
16/01/2009 13:08	WD00062839	2646413	5.027	0.009	SP	99	GR	812.701
02/02/2009 15:32	WD00063896	2661357	7.431	0.021	SP	06	GR	723.712
02/02/2009 15:32	WD00063896	2661357	53.806	0.252	SP	01	GR	723.712
02/02/2009 15:32	WD00063896	2661357	0.110	0.000	SP	99	GR	723.712
11/02/2009 16:55	WD00064100	2670592	48.230	0.441	SP	01	GR	725.967
11/02/2009 16:55	WD00064100	2670592	0.133	0.000	SP	99	GR	725.967
11/02/2009 16:55	WD00064100	2670592	12.751	0.078	SP	06	GR	725.967
23/02/2009 12:02	WD00064296	2680785	0.906	0.000	SP	99	GR	734.731
23/02/2009 12:02	WD00064296	2680785	14.957	0.031	SP	06	GR	734.731
23/02/2009 12:02	WD00064296	2680785	39.821	0.245	SP	01	GR	734.731
06/03/2009 10:48	WD00069415	2693006	49.055	0.697	SP	01	GR	735.333
06/03/2009 10:48	WD00069415	2693006	0.115	0.000	SP	99	GR	735.333
06/03/2009 10:48	WD00069415	2693006	7.788	0.028	SP	06	GR	735.333
15/03/2009 22:13	WD00069547	2699432	2.166	0.007	SP	06	GR	745.191
15/03/2009 22:13	WD00069547	2699432	46.587	0.231	SP	01	GR	745.191
15/03/2009 22:13	WD00069547	2699432	0.090	0.000	SP	99	GR	745.191
17/10/2008 9:09	ED00002186	2579687	42.629	0.488	SP	01	GR	653.271
17/10/2008 9:09	ED00002186	2579687	4.029	0.003	SP	06	GR	653.271
17/10/2008 9:09	ED00002186	2579687	0.016	0.000	SP	99	GR	653.271
24/11/2008 15:13	ED00003254	2607459	39.854	0.108	SP	01	GR	734.155
24/11/2008 15:13	ED00003254	2607459	1.707	0.004	SP	06	GR	734.155
16/12/2008 10:30	ED00004086	2626634	33.509	0.047	SP	01	GR	759.976
16/12/2008 10:30	ED00004086	2626634	1.197	0.000	SP	06	GR	759.976
04/02/2009 13:28	WD00067776	2663950	52.681	1.002	SP	01	GR	725.973

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/02/2009 13:28	WD00067776	2663950	6.348	0.022	SP	06	GR	725.973
04/02/2009 13:28	WD00067776	2663950	0.606	0.000	SP	99	GR	725.973
07/08/2009 11:43	WD00065756	2725040	59.620	0.256	SP	01	GR	621.174
07/08/2009 11:43	WD00065756	2725040	0.107	0.003	SP	99	GR	621.174
13/08/2009 10:22	WD00070201	2727183	0.247	0.000	SP	99	GR	655.496
13/08/2009 10:22	WD00070201	2727183	54.049	0.208	SP	01	GR	655.496
13/08/2009 10:22	WD00070201	2727183	5.781	0.067	SP	06	GR	655.496
21/08/2009 16:31	WD00072473	2730969	0.218	0.003	SP	99	GR	682.435
21/08/2009 16:31	WD00072473	2730969	7.322	0.030	SP	06	GR	682.435
21/08/2009 16:31	WD00072473	2730969	51.567	0.138	SP	01	GR	682.435
14/09/2009 14:01	WD00078429	2741970	57.183	0.302	SP	01	GR	686.216
14/09/2009 14:01	WD00078429	2741970	0.377	0.002	SP	99	GR	686.216
28/09/2009 7:39	WD00072886	2750432	53.202	0.441	SP	01	GR	678.094
28/09/2009 7:39	WD00072886	2750432	0.094	0.001	SP	99	GR	678.094
14/10/2009 11:58	WD00073119	2759537	48.040	1.762	SP	01	GR	751.329
27/10/2009 16:55	WD00080088	2765591	55.530	0.260	SP	01	GR	691.214
27/10/2009 16:55	WD00080088	2765591	0.024	0.000	SP	99	GR	691.214
02/11/2009 7:13	WD00080187	2769269	54.551	0.423	SP	01	GR	742.728
02/11/2009 7:13	WD00080187	2769269	0.295	0.002	SP	99	GR	742.728
09/11/2009 13:57	WD00073387	2774121	58.822	0.430	SP	01	GR	702.207
09/11/2009 13:57	WD00073387	2774121	0.152	0.000	SP	99	GR	702.207
26/11/2009 7:32	WD00079161	2789045	49.780	0.085	SP	01	GR	728.486
26/11/2009 7:32	WD00079161	2789045	0.505	0.000	SP	99	GR	728.486
03/12/2009 7:00	WD00079209	2795712	0.064	0.002	SP	99	GR	683.228
03/12/2009 7:00	WD00079209	2795712	58.040	0.376	SP	01	GR	683.228
04/01/2010 7:38	WD00075162	2813856	0.190	0.000	SP	99	GR	718.856
04/01/2010 7:38	WD00075162	2813856	46.542	0.311	SP	01	GR	718.856
18/01/2010 12:25	WD00075454	2828801	57.358	0.465	SP	01	GR	761.800
18/01/2010 12:25	WD00075454	2828801	1.186	0.006	SP	99	GR	761.800

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
01/02/2010 9:55	ED00007213	2845532	47.372	0.464	SP	01	GR	783.662
02/02/2010 14:17	WD00075731	2847087	0.656	0.002	SP	99	GR	734.893
02/02/2010 14:17	WD00075731	2847087	60.178	0.347	SP	01	GR	734.893
11/02/2010 8:14	WD00075898	2856819	0.459	0.000	SP	99	GR	729.146
11/02/2010 8:14	WD00075898	2856819	61.064	0.383	SP	01	GR	729.146
22/02/2010 10:22	WD00007424	2866031	0.313	0.004	SP	99	GR	738.962
22/02/2010 10:22	WD00007424	2866031	58.037	0.684	SP	01	GR	738.962
03/03/2010 8:48	ED00019640	2875325	0.086	0.000	SP	99	GR	709.951
03/03/2010 8:48	ED00019640	2875325	39.138	0.334	SP	01	GR	709.951
08/03/2010 4:58	WD00076403	2879449	52.917	0.298	SP	01	GR	741.612
08/03/2010 4:58	WD00076403	2879449	0.104	0.000	SP	99	GR	741.612
22/06/2010 11:47	WD00076760	2910136	65.201	0.348	SP	01	GR	625.211
22/06/2010 11:47	WD00076760	2910136	0.373	0.000	SP	99	GR	625.211
06/07/2010 12:18	Q159148	2914663	59.313	0.070	SP	01	GR	612.000
06/07/2010 12:18	Q159148	2914663	0.855	0.000	SP	99	GR	612.000
07/07/2010 12:14	U003506621	2915022	58.456	0.566	SP	01	GR	660.933
07/07/2010 12:14	U003506621	2915022	0.136	0.002	SP	99	GR	660.933
12/07/2010 11:27	U3155963	2916823	0.048	0.000	SP	99	GR	599.175
12/07/2010 11:27	U3155963	2916823	63.701	0.462	SP	01	GR	599.175
21/07/2010 6:27	WD00082174	2920479	41.389	1.589	SP	01	GR	788.116
21/07/2010 6:27	WD00082174	2920479	5.086	0.054	SP	06	GR	788.116
21/07/2010 6:27	WD00082174	2920479	0.710	0.003	SP	99	GR	788.116
22/07/2010 13:50	WD00081575	2921051	4.625	0.029	SP	06	GR	753.084
22/07/2010 13:50	WD00081575	2921051	49.362	0.652	SP	01	GR	753.084
22/07/2010 13:50	WD00081575	2921051	0.435	0.002	SP	99	GR	753.084
27/07/2010 8:11	U003506670	2922801	14.804	0.083	SP	06	GR	640.326
27/07/2010 8:11	U003506670	2922801	0.780	0.002	SP	99	GR	640.326
27/07/2010 8:11	U003506670	2922801	29.327	0.130	SP	01	GR	640.326
29/07/2010 9:39	WD00081697	2924109	0.427	0.000	SP	99	GR	735.746

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
29/07/2010 9:39	WD00081697	2924109	10.030	0.225	SP	06	GR	735.746
29/07/2010 9:39	WD00081697	2924109	46.714	2.226	SP	01	GR	735.746
03/08/2010 10:14	WD00076894	2925750	4.814	0.027	SP	99	GR	975.953
03/08/2010 10:14	WD00076894	2925750	22.878	0.082	SP	06	GR	975.953
03/08/2010 10:14	WD00076894	2925750	13.650	0.063	SP	01	GR	975.953
04/08/2010 13:49	U003508799	2926361	3.363	0.016	SP	01	GR	704.871
04/08/2010 13:49	U003508799	2926361	2.534	0.002	SP	99	GR	704.871
04/08/2010 13:49	U003508799	2926361	47.266	0.114	SP	06	GR	704.871
05/08/2010 16:39	WD00082247	2926935	0.130	0.000	SP	99	GR	675.408
05/08/2010 16:39	WD00082247	2926935	61.563	1.063	SP	01	GR	675.408
10/08/2010 8:27	WD00081802	2928855	63.154	2.314	SP	01	GR	656.674
10/08/2010 8:27	WD00081802	2928855	0.278	0.007	SP	99	GR	656.674
16/08/2010 6:26	WD00076947	2931294	12.410	0.145	SP	06	GR	757.788
16/08/2010 6:26	WD00076947	2931294	36.792	0.186	SP	01	GR	757.788
16/08/2010 6:26	WD00076947	2931294	1.823	0.007	SP	99	GR	757.788
17/08/2010 14:47	WD00076982	2931973	37.447	2.289	SP	01	GR	778.650
17/08/2010 14:47	WD00076982	2931973	14.621	0.088	SP	06	GR	778.650
17/08/2010 14:47	WD00076982	2931973	2.006	0.005	SP	99	GR	778.650
20/08/2010 8:48	WD00081927	2934081	0.865	0.000	SP	99	GR	693.511
20/08/2010 8:48	WD00081927	2934081	10.544	0.057	SP	06	GR	693.511
20/08/2010 8:48	WD00081927	2934081	48.840	0.813	SP	01	GR	693.511
29/09/2010 11:21	WD00085068	2951017	46.578	0.402	SP	01	GR	760.326
29/09/2010 11:21	WD00085068	2951017	0.291	0.002	SP	99	GR	760.326
29/09/2010 11:21	WD00085068	2951017	6.515	0.029	SP	06	GR	760.326
08/10/2010 7:22	WD00085225	2957613	37.263	0.451	SP	01	GR	727.906
08/10/2010 7:22	WD00085225	2957613	0.302	0.000	SP	99	GR	727.906
08/10/2010 7:22	WD00085225	2957613	12.332	0.044	SP	06	GR	727.906
29/10/2010 3:45	WD00077200	2970306	6.844	0.084	SP	06	GR	732.968
29/10/2010 3:45	WD00077200	2970306	0.238	0.004	SP	99	GR	732.968

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
29/10/2010 3:45	WD00077200	2970306	46.912	0.493	SP	01	GR	732.968
05/11/2010 4:03	WD00085722	2975291	43.607	0.193	SP	01	GR	768.992
05/11/2010 4:03	WD00085722	2975291	8.099	0.077	SP	06	GR	768.992
05/11/2010 4:03	WD00085722	2975291	0.190	0.000	SP	99	GR	768.992
24/11/2010 5:16	WD00086136	2987760	40.370	0.777	SP	01	GR	787.860
24/11/2010 5:16	WD00086136	2987760	5.885	0.073	SP	06	GR	787.860
24/11/2010 5:16	WD00086136	2987760	0.101	0.003	SP	99	GR	787.860
10/12/2010 6:45	WD00077619	3003602	0.128	0.001	SP	99	GR	772.306
10/12/2010 6:45	WD00077619	3003602	7.072	0.062	SP	06	GR	772.306
10/12/2010 6:45	WD00077619	3003602	41.720	0.832	SP	01	GR	772.306
15/12/2010 6:17	WD00086634	3007429	9.346	0.057	SP	06	GR	765.579
15/12/2010 6:17	WD00086634	3007429	41.682	0.350	SP	01	GR	765.579
15/12/2010 6:17	WD00086634	3007429	0.138	0.000	SP	99	GR	765.579
06/01/2011 7:52	WD00082938	3022565	47.522	0.421	SP	01	GR	781.704
06/01/2011 7:52	WD00082938	3022565	8.754	0.105	SP	06	GR	781.704
26/01/2011 13:36	WD00089328	3041749	47.299	0.918	SP	01	GR	792.678
26/01/2011 13:36	WD00089328	3041749	10.073	0.108	SP	06	GR	792.678
26/01/2011 13:36	WD00089328	3041749	0.748	0.009	SP	99	GR	792.678
08/02/2011 10:21	U003506214	3056372	53.084	0.252	SP	01	GR	768.024
08/02/2011 10:21	U003506214	3056372	0.286	0.000	SP	99	GR	768.024
08/02/2011 10:21	U003506214	3056372	5.516	0.003	SP	06	GR	768.024
14/02/2011 13:21	U003506123	3063380	54.711	0.315	SP	01	GR	765.135
14/02/2011 13:21	U003506123	3063380	0.269	0.000	SP	99	GR	765.135
14/02/2011 13:21	U003506123	3063380	2.802	0.000	SP	06	GR	765.135
23/02/2011 12:22	WD00091159	3074038	12.972	0.034	SP	06	GR	769.441
23/02/2011 12:22	WD00091159	3074038	1.575	0.002	SP	99	GR	769.441
23/02/2011 12:22	WD00091159	3074038	44.351	0.417	SP	01	GR	769.441
26/02/2011 5:29	WD00089998	3077277	13.290	0.056	SP	06	GR	761.440
26/02/2011 5:29	WD00089998	3077277	1.246	0.007	SP	99	GR	761.440

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
26/02/2011 5:29	WD00089998	3077277	44.399	0.325	SP	01	GR	761.440
03/03/2011 17:00	U003506247	3082912	27.464	0.202	SP	06	GR	806.657
03/03/2011 17:00	U003506247	3082912	3.749	0.007	SP	99	GR	806.657
03/03/2011 17:00	U003506247	3082912	25.112	0.231	SP	01	GR	806.657
16/03/2011 13:03	WD00091541	3096758	0.495	0.026	SP	99	GR	769.933
16/03/2011 13:03	WD00091541	3096758	14.377	0.108	SP	06	GR	769.933
16/03/2011 13:03	WD00091541	3096758	41.490	0.340	SP	01	GR	769.933
16/08/2010 7:39	WE00131622	2931293	59.966	0.091	SP	01	GR	632.606
16/08/2010 7:39	WE00131622	2931293	3.074	0.003	SP	06	GR	632.606
04/11/2010 11:34	WE00131981	2974253	4.683	0.011	SP	06	GR	723.286
04/11/2010 11:34	WE00131981	2974253	0.523	0.001	SP	99	GR	723.286
04/11/2010 11:34	WE00131981	2974253	51.389	0.312	SP	01	GR	723.286

Aspen/Poplar Data

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/07/2011 14:04	ED00014540	3132732	42.894	1.022	A	18	GR	808.673
04/07/2011 14:04	ED00014540	3132732	5.242	0.131	A	06	GR	808.673
04/07/2011 14:04	ED00014540	3132732	0.078	0.021	A	99	GR	808.673
04/08/2011 7:02	WE00137135	3144690	0.065	0.000	A	99	GR	777.906
04/08/2011 7:02	WE00137135	3144690	11.231	0.174	A	06	GR	777.906
04/08/2011 7:02	WE00137135	3144690	36.145	2.313	A	18	GR	777.906
09/08/2011 10:30	WE00137905	3147402	5.177	0.134	A	06	GR	791.824
09/08/2011 10:30	WE00137905	3147402	53.250	5.152	A	18	GR	791.824
09/08/2011 10:30	WE00137905	3147402	0.040	0.000	A	99	GR	791.824
15/08/2011 19:10	ED00014228	3150243	33.345	3.817	A	18	GR	903.506
15/08/2011 19:10	ED00014228	3150243	0.065	0.000	A	99	GR	903.506
15/08/2011 19:10	ED00014228	3150243	3.356	0.066	A	06	GR	903.506
29/08/2011 15:10	WE00138168	3158052	48.208	1.732	A	18	GR	797.081

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
29/08/2011 15:10	WE00138168	3158052	3.682	0.039	A	06	GR	797.081
29/08/2011 15:10	WE00138168	3158052	0.039	0.000	A	99	GR	797.081
09/09/2011 7:09	WE00138251	3164879	29.135	0.569	A	18	GR	912.147
09/09/2011 7:09	WE00138251	3164879	0.568	0.006	A	99	GR	912.147
09/09/2011 7:09	WE00138251	3164879	11.533	1.420	A	06	GR	912.147
09/09/2011 7:09	WE00138251	3164879	0.029	0.000	SP	06	GR	912.147
19/09/2011 13:31	WE00138343	3170566	0.068	0.000	A	99	GR	868.817
19/09/2011 13:31	WE00138343	3170566	44.139	3.844	A	18	GR	868.817
19/09/2011 13:31	WE00138343	3170566	5.738	0.165	A	06	GR	868.817
27/09/2011 16:56	WE00138474	3176617	46.822	9.445	A	18	GR	952.022
27/09/2011 16:56	WE00138474	3176617	0.141	0.003	A	99	GR	952.022
27/09/2011 16:56	WE00138474	3176617	0.198	0.052	PB	18	GR	952.022
27/09/2011 16:56	WE00138474	3176617	0.120	0.000	PB	06	GR	952.022
27/09/2011 16:56	WE00138474	3176617	6.436	0.426	A	06	GR	952.022
13/10/2011 10:28	WE00138799	3187175	4.488	0.195	A	06	GR	794.081
13/10/2011 10:28	WE00138799	3187175	43.757	3.042	A	18	GR	794.081
14/10/2011 18:17	WE00139608	3188273	0.029	0.000	A	99	GR	890.047
14/10/2011 18:17	WE00139608	3188273	4.156	0.240	A	06	GR	890.047
14/10/2011 18:17	WE00139608	3188273	49.463	6.770	A	18	GR	890.047
25/10/2011 6:41	WD00039612	3195531	33.245	7.223	A	18	GR	1031.519
25/10/2011 6:41	WD00039612	3195531	4.662	0.526	A	06	GR	1031.519
25/10/2011 6:41	WD00039612	3195531	0.208	0.003	A	99	GR	1031.519
03/11/2011 14:09	WE00139829	3203380	0.052	0.000	PB	06	GR	953.400
03/11/2011 14:09	WE00139829	3203380	1.661	0.153	A	06	GR	953.400
03/11/2011 14:09	WE00139829	3203380	52.232	10.788	A	18	GR	953.400
16/11/2011 16:20	ED00013942	3215624	6.441	0.757	A	06	GR	989.642
16/11/2011 16:20	ED00013942	3215624	38.438	5.388	A	18	GR	989.642
16/11/2011 16:20	ED00013942	3215624	0.078	0.000	A	99	GR	989.642
02/12/2011 15:02	WE00140121	3237034	0.026	0.000	A	99	GR	1044.952

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
02/12/2011 15:02	WE00140121	3237034	41.364	5.771	A	18	GR	1044.952
02/12/2011 15:02	WE00140121	3237034	2.760	0.205	A	06	GR	1044.952
15/12/2011 15:40	WE00139294	3254296	36.928	7.976	A	18	GR	1182.229
15/12/2011 15:40	WE00139294	3254296	0.039	0.000	A	99	GR	1182.229
15/12/2011 15:40	WE00139294	3254296	2.179	0.220	A	06	GR	1182.229
19/12/2011 11:37	ED00012683	3258563	0.216	0.000	A	99	GR	951.561
19/12/2011 11:37	ED00012683	3258563	6.067	0.114	A	06	GR	951.561
19/12/2011 11:37	ED00012683	3258563	35.520	1.019	A	18	GR	951.561
25/01/2012 9:25	WD00098081	3298981	3.397	0.226	A	06	GR	956.206
25/01/2012 9:25	WD00098081	3298981	0.247	0.000	PB	06	GR	956.206
25/01/2012 9:25	WD00098081	3298981	42.466	4.518	A	18	GR	956.206
25/01/2012 9:25	WD00098081	3298981	1.797	0.000	PB	18	GR	956.206
25/01/2012 9:25	WD00098081	3298981	0.039	0.000	A	99	GR	956.206
29/02/2012 14:22	U004023165	3352777	5.114	0.288	A	06	GR	815.234
29/02/2012 14:22	U004023165	3352777	44.070	4.418	A	18	GR	815.234
13/03/2012 4:15	U004024093	3369179	1.421	0.068	A	06	GR	765.055
13/03/2012 4:15	U004024093	3369179	52.385	2.892	A	18	GR	765.055
29/06/2011 8:14	WD00021111	3131547	37.632	0.967	PB	18	GR	811.465
29/06/2011 8:14	WD00021111	3131547	0.117	0.000	PB	99	GR	811.465
29/06/2011 8:14	WD00021111	3131547	15.662	0.008	PB	06	GR	811.465
15/08/2011 16:04	WE00137989	3150244	0.026	0.000	PB	99	GR	875.415
15/08/2011 16:04	WE00137989	3150244	5.971	0.021	PB	06	GR	875.415
15/08/2011 16:04	WE00137989	3150244	1.299	0.000	A	18	GR	875.415
15/08/2011 16:04	WE00137989	3150244	15.771	0.154	PB	18	GR	875.415
27/08/2011 10:12	WE00137355	3157302	3.951	0.003	PB	06	GR	795.949
27/08/2011 10:12	WE00137355	3157302	0.039	0.000	PB	99	GR	795.949
27/08/2011 10:12	WE00137355	3157302	47.258	0.890	PB	18	GR	795.949
23/09/2011 11:09	ED00019071	3174501	37.616	0.849	PB	18	GR	777.098
23/09/2011 11:09	ED00019071	3174501	4.365	0.021	PB	06	GR	777.098

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
23/09/2011 11:09	ED00019071	3174501	0.055	0.000	PB	99	GR	777.098
06/10/2011 11:28	WD00039575	3183066	0.659	0.138	PB	99	GR	1031.487
06/10/2011 11:28	WD00039575	3183066	14.176	0.139	PB	06	GR	1031.487
06/10/2011 11:28	WD00039575	3183066	18.314	0.414	PB	18	GR	1031.487
02/11/2011 12:24	WD00096413	3202417	0.877	0.000	PB	06	GR	994.741
02/11/2011 12:24	WD00096413	3202417	8.958	0.707	PB	18	GR	994.741
22/11/2011 12:11	WE00139148	3222517	0.151	0.095	PB	99	GR	1089.879
22/11/2011 12:11	WE00139148	3222517	0.104	0.000	A	06	GR	1089.879
22/11/2011 12:11	WE00139148	3222517	33.823	2.038	PB	18	GR	1089.879
22/11/2011 12:11	WE00139148	3222517	3.761	0.592	PB	06	GR	1089.879
03/12/2011 9:49	WE00140130	3237035	0.503	0.000	A	06	GR	907.564
03/12/2011 9:49	WE00140130	3237035	0.039	0.000	A	99	GR	907.564
03/12/2011 9:49	WE00140130	3237035	38.310	0.840	PB	18	GR	907.564
03/12/2011 9:49	WE00140130	3237035	1.714	0.021	PB	06	GR	907.564
03/12/2011 9:49	WE00140130	3237035	0.182	0.000	A	18	GR	907.564
12/12/2011 7:21	WE00140273	3248389	1.877	0.045	PB	06	GR	967.856
12/12/2011 7:21	WE00140273	3248389	42.534	2.118	PB	18	GR	967.856
06/01/2012 8:58	ED00015096	3274375	0.047	0.000	PB	99	GR	952.730
06/01/2012 8:58	ED00015096	3274375	31.425	1.154	PB	18	GR	952.730
06/01/2012 8:58	ED00015096	3274375	6.511	0.008	PB	06	GR	952.730
06/01/2012 8:58	ED00015096	3274375	0.039	0.000	A	06	GR	952.730
06/01/2012 8:58	ED00015096	3274375	0.013	0.000	SP	99	GR	952.730
18/01/2012 12:37	WE00140707	3289584	0.339	0.000	PB	99	GR	1014.245
18/01/2012 12:37	WE00140707	3289584	0.026	0.000	A	99	GR	1014.245
18/01/2012 12:37	WE00140707	3289584	34.097	2.200	PB	18	GR	1014.245
18/01/2012 12:37	WE00140707	3289584	0.327	0.000	A	06	GR	1014.245
18/01/2012 12:37	WE00140707	3289584	7.949	0.000	PB	06	GR	1014.245
18/01/2012 12:37	WE00140707	3289584	0.389	0.000	A	18	GR	1014.245
07/02/2012 6:10	WE00141042	3316478	0.047	0.000	PB	99	GR	932.097

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
07/02/2012 6:10	WE00141042	3316478	41.931	0.815	PB	18	GR	932.097
07/02/2012 6:10	WE00141042	3316478	4.371	0.013	PB	06	GR	932.097
22/02/2012 13:30	WE00142178	3341440	36.532	1.357	PB	18	GR	952.721
22/02/2012 13:30	WE00142178	3341440	0.029	0.000	SP	06	GR	952.721
22/02/2012 13:30	WE00142178	3341440	5.203	0.000	PB	06	GR	952.721
22/02/2012 13:30	WE00142178	3341440	0.203	0.000	PB	99	GR	952.721
20/03/2012 9:16	U003945331	3377861	0.403	0.053	A	06	GR	888.186
20/03/2012 9:16	U003945331	3377861	0.094	0.000	PB	99	GR	888.186
20/03/2012 9:16	U003945331	3377861	28.109	1.162	PB	18	GR	888.186
20/03/2012 9:16	U003945331	3377861	0.519	0.042	A	18	GR	888.186
20/03/2012 9:16	U003945331	3377861	6.644	0.071	PB	06	GR	888.186
07/02/2012 18:26	ED00015536	3318668	0.029	0.000	A	99	GR	1034.957
07/02/2012 18:26	ED00015536	3318668	46.992	8.607	A	18	GR	1034.957
07/02/2012 18:26	ED00015536	3318668	2.910	0.646	A	06	GR	1034.957
17/02/2012 7:10	ED00015558	3337080	2.105	0.052	A	06	GR	1040.282
17/02/2012 7:10	ED00015558	3337080	42.903	6.130	A	18	GR	1040.282
24/02/2012 13:44	ED00015915	3345927	0.265	0.000	PB	18	GR	1099.565
24/02/2012 13:44	ED00015915	3345927	0.013	0.000	A	99	GR	1099.565
24/02/2012 13:44	ED00015915	3345927	40.586	8.642	A	18	GR	1099.565
24/02/2012 13:44	ED00015915	3345927	2.515	0.287	A	06	GR	1099.565
21/01/2012 6:48	WE00141701	3293320	46.175	4.306	PB	18	GR	938.446
21/01/2012 6:48	WE00141701	3293320	0.013	0.000	PB	99	GR	938.446
21/01/2012 6:48	WE00141701	3293320	1.722	0.000	PB	06	GR	938.446
09/02/2012 6:41	WE00141972	3322815	43.782	1.684	PB	18	GR	918.022
09/02/2012 6:41	WE00141972	3322815	0.458	0.123	A	18	GR	918.022
09/02/2012 6:41	WE00141972	3322815	0.104	0.000	PB	99	GR	918.022
09/02/2012 6:41	WE00141972	3322815	4.793	0.000	PB	06	GR	918.022
16/02/2012 8:52	WE00141213	3333714	3.865	0.102	PB	06	GR	1060.729
16/02/2012 8:52	WE00141213	3333714	0.138	0.000	PB	99	GR	1060.729

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
16/02/2012 8:52	WE00141213	3333714	37.130	4.047	PB	18	GR	1060.729
29/06/2012 10:05	WD00039820	3430335	44.379	10.107	A	18	GR	950.353
29/06/2012 10:05	WD00039820	3430335	0.778	0.063	A	06	GR	950.353
13/08/2012 7:05	WD00102966	3460878	0.065	0.000	SP	18	GR	935.114
13/08/2012 7:05	WD00102966	3460878	0.052	0.000	SP	06	GR	935.114
13/08/2012 7:05	WD00102966	3460878	43.963	6.645	A	18	GR	935.114
13/08/2012 7:05	WD00102966	3460878	0.161	0.000	PB	18	GR	935.114
13/08/2012 7:05	WD00102966	3460878	2.730	0.117	A	06	GR	935.114
20/08/2012 15:11	ED00017261	3466594	0.178	0.000	PB	06	GR	811.998
20/08/2012 15:11	ED00017261	3466594	44.553	3.878	A	18	GR	811.998
20/08/2012 15:11	ED00017261	3466594	0.172	0.000	A	99	GR	811.998
20/08/2012 15:11	ED00017261	3466594	0.333	0.115	PB	18	GR	811.998
20/08/2012 15:11	ED00017261	3466594	8.284	0.586	A	06	GR	811.998
31/08/2012 15:17	WD00107381	3478764	47.593	4.882	A	18	GR	815.104
31/08/2012 15:17	WD00107381	3478764	2.753	0.071	A	06	GR	815.104
04/09/2012 9:18	WE00143911	3480168	0.162	0.050	PB	18	GR	859.211
04/09/2012 9:18	WE00143911	3480168	45.981	3.936	A	18	GR	859.211
04/09/2012 9:18	WE00143911	3480168	4.200	0.082	A	06	GR	859.211
21/09/2012 16:30	WE00144182	3499076	49.891	7.087	A	18	GR	896.996
21/09/2012 16:30	WE00144182	3499076	0.029	0.000	A	99	GR	896.996
21/09/2012 16:30	WE00144182	3499076	3.708	0.242	A	06	GR	896.996
09/10/2012 7:23	WE00144341	3513068	5.530	0.417	A	06	GR	865.741
09/10/2012 7:23	WE00144341	3513068	47.724	5.120	A	18	GR	865.741
09/10/2012 7:23	WE00144341	3513068	0.034	0.000	A	99	GR	865.741
11/10/2012 12:34	WE00144379	3514522	2.482	0.147	A	06	GR	889.932
11/10/2012 12:34	WE00144379	3514522	51.115	8.087	A	18	GR	889.932
17/10/2012 15:31	WE00144460	3519230	46.452	7.018	A	18	GR	926.198
17/10/2012 15:31	WE00144460	3519230	0.013	0.000	A	99	GR	926.198
17/10/2012 15:31	WE00144460	3519230	2.187	0.185	A	06	GR	926.198

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
24/10/2012 12:46	WD00110133	3525695	49.437	5.382	A	18	GR	886.945
24/10/2012 12:46	WD00110133	3525695	2.226	0.100	A	06	GR	886.945
03/11/2012 14:12	WD00107982	3536635	1.250	0.000	PB	18	GR	1122.763
03/11/2012 14:12	WD00107982	3536635	44.235	10.323	A	18	GR	1122.763
03/11/2012 14:12	WD00107982	3536635	1.392	0.126	A	06	GR	1122.763
23/11/2012 11:43	U004589055	3562203	46.230	5.070	A	18	GR	966.250
23/11/2012 11:43	U004589055	3562203	2.125	0.470	A	06	GR	966.250
11/12/2012 7:50	WD00021441	3582485	2.584	0.309	A	06	GR	959.812
11/12/2012 7:50	WD00021441	3582485	45.875	6.048	A	18	GR	959.812
18/12/2012 15:47	U004589247	3592414	5.176	0.598	A	06	GR	1037.289
18/12/2012 15:47	U004589247	3592414	40.837	9.292	A	18	GR	1037.289
22/12/2012 7:00	U004261722	3597296	0.065	0.000	PB	18	GR	984.971
22/12/2012 7:00	U004261722	3597296	2.983	0.268	A	06	GR	984.971
22/12/2012 7:00	U004261722	3597296	46.876	5.872	A	18	GR	984.971
22/12/2012 7:00	U004261722	3597296	0.052	0.000	PB	06	GR	984.971
22/12/2012 7:00	U004261722	3597296	0.013	0.000	A	99	GR	984.971
22/01/2013 9:14	U004262357	3631506	0.944	0.000	PB	18	GR	1069.481
22/01/2013 9:14	U004262357	3631506	0.050	0.000	PB	06	GR	1069.481
22/01/2013 9:14	U004262357	3631506	2.389	0.144	A	06	GR	1069.481
22/01/2013 9:14	U004262357	3631506	46.129	9.199	A	18	GR	1069.481
07/02/2013 7:13	U004262452	3658682	1.676	0.013	PB	18	GR	944.869
07/02/2013 7:13	U004262452	3658682	2.349	0.181	A	06	GR	944.869
07/02/2013 7:13	U004262452	3658682	0.156	0.000	PB	06	GR	944.869
07/02/2013 7:13	U004262452	3658682	45.014	5.821	A	18	GR	944.869
07/02/2013 7:13	U004262452	3658682	0.117	0.000	B	18	GR	944.869
12/02/2013 6:37	WD00115986	3665572	40.272	6.446	A	18	GR	1080.390
12/02/2013 6:37	WD00115986	3665572	2.808	0.286	A	06	GR	1080.390
16/02/2013 10:11	WE00146732	3674567	0.916	0.042	A	06	GR	1073.192
16/02/2013 10:11	WE00146732	3674567	49.866	10.244	A	18	GR	1073.192

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
27/02/2013 7:30	U004262488	3690118	43.719	6.341	A	18	GR	941.933
27/02/2013 7:30	U004262488	3690118	6.394	0.563	A	06	GR	941.933
19/10/2012 16:24	WE00144505	3521783	5.416	0.168	PB	06	GR	913.764
19/10/2012 16:24	WE00144505	3521783	0.042	0.000	PB	99	GR	913.764
19/10/2012 16:24	WE00144505	3521783	32.441	1.428	PB	18	GR	913.764
19/10/2012 16:24	WE00144505	3521783	1.491	0.052	A	06	GR	913.764
19/10/2012 16:24	WE00144505	3521783	9.798	0.867	A	18	GR	913.764
19/10/2012 16:24	WE00144505	3521783	0.013	0.000	A	99	GR	913.764
02/11/2012 8:30	WE00145635	3536636	0.125	0.000	PB	99	GR	942.462
02/11/2012 8:30	WE00145635	3536636	41.807	1.757	PB	18	GR	942.462
02/11/2012 8:30	WE00145635	3536636	2.804	0.016	PB	06	GR	942.462
02/11/2012 8:30	WE00145635	3536636	0.052	0.000	SP	06	GR	942.462
30/11/2012 9:26	U004261797	3570961	0.323	0.000	PB	99	GR	847.113
30/11/2012 9:26	U004261797	3570961	25.242	0.340	PB	18	GR	847.113
30/11/2012 9:26	U004261797	3570961	12.740	0.107	PB	06	GR	847.113
28/01/2013 13:22	WD00021590	3639973	0.445	0.000	PB	99	GR	1037.282
28/01/2013 13:22	WD00021590	3639973	32.921	1.787	PB	18	GR	1037.282
28/01/2013 13:22	WD00021590	3639973	5.821	0.037	PB	06	GR	1037.282
28/01/2013 13:22	WD00021590	3639973	0.081	0.000	B	06	GR	1037.282
12/02/2013 13:32	WD00115999	3665573	0.091	0.000	PB	99	GR	976.340
12/02/2013 13:32	WD00115999	3665573	0.013	0.000	SP	99	GR	976.340
12/02/2013 13:32	WD00115999	3665573	5.828	0.042	PB	06	GR	976.340
12/02/2013 13:32	WD00115999	3665573	0.029	0.000	SP	06	GR	976.340
12/02/2013 13:32	WD00115999	3665573	34.475	1.299	PB	18	GR	976.340
08/11/2012 6:09	D317556	3542367	2.076	0.326	A	06	GR	1063.434
08/11/2012 6:09	D317556	3542367	0.052	0.000	PB	06	GR	1063.434
08/11/2012 6:09	D317556	3542367	27.545	5.583	A	18	GR	1063.434
08/11/2012 6:09	D317556	3542367	0.531	0.081	PB	18	GR	1063.434
13/11/2012 8:47	D317516	3547723	39.997	9.132	A	18	GR	1215.671

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
13/11/2012 8:47	D317516	3547723	2.255	0.422	A	06	GR	1215.671
02/12/2012 11:57	U004261278	3570960	0.026	0.000	A	99	GR	907.660
02/12/2012 11:57	U004261278	3570960	0.243	0.029	PB	18	GR	907.660
02/12/2012 11:57	U004261278	3570960	41.901	3.085	A	18	GR	907.660
02/12/2012 11:57	U004261278	3570960	5.328	0.321	A	06	GR	907.660
02/12/2012 11:57	U004261278	3570960	0.435	0.021	PB	06	GR	907.660
29/11/2012 10:19	WE00145999	3569078	0.043	0.000	PB	99	GR	985.835
29/11/2012 10:19	WE00145999	3569078	39.218	1.847	PB	18	GR	985.835
29/11/2012 10:19	WE00145999	3569078	4.906	0.102	PB	06	GR	985.835
21/12/2012 7:03	D321352	3597297	0.003	0.000	PB	99	GR	1003.410
21/12/2012 7:03	D321352	3597297	0.029	0.000	A	99	GR	1003.410
21/12/2012 7:03	D321352	3597297	29.199	0.394	PB	18	GR	1003.410
21/12/2012 7:03	D321352	3597297	4.546	1.310	A	18	GR	1003.410
21/12/2012 7:03	D321352	3597297	4.562	0.052	PB	06	GR	1003.410
21/12/2012 7:03	D321352	3597297	0.444	0.073	A	06	GR	1003.410
03/08/2004 12:58	WE055381	28332	0.169	0.013	A	99	GR	819.418
03/08/2004 12:58	WE055381	28332	4.637	0.124	A	06	GR	819.418
03/08/2004 12:58	WE055381	28332	29.955	2.406	A	18	GR	819.418
11/08/2004 16:12	WE055682	35744	35.716	1.298	A	18	GR	769.435
11/08/2004 16:12	WE055682	35744	0.146	0.000	A	99	GR	769.435
11/08/2004 16:12	WE055682	35744	3.095	0.021	A	06	GR	769.435
17/08/2004 6:02	WE055776	43221	24.998	0.386	A	18	GR	824.565
17/08/2004 6:02	WE055776	43221	0.610	0.006	A	99	GR	824.565
17/08/2004 6:02	WE055776	43221	11.618	0.245	A	06	GR	824.565
20/08/2004 13:48	WE056144	48129	8.427	0.029	A	06	GR	787.184
20/08/2004 13:48	WE056144	48129	0.438	0.013	A	99	GR	787.184
20/08/2004 13:48	WE056144	48129	27.005	0.309	A	18	GR	787.184
02/10/2004 6:21	WE00075529	94534	37.761	3.480	A	18	GR	905.780
02/10/2004 6:21	WE00075529	94534	0.068	0.000	A	99	GR	905.780

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
02/10/2004 6:21	WE00075529	94534	4.261	0.168	A	06	GR	905.780
04/10/2004 6:40	WE056953	97171	38.576	2.353	A	18	GR	838.728
04/10/2004 6:40	WE056953	97171	2.477	0.134	A	06	GR	838.728
04/10/2004 6:40	WE056953	97171	0.052	0.000	A	99	GR	838.728
12/10/2004 13:39	WE056948	111741	3.628	0.116	A	06	GR	857.775
12/10/2004 13:39	WE056948	111741	0.102	0.000	A	99	GR	857.775
12/10/2004 13:39	WE056948	111741	30.757	1.845	A	18	GR	857.775
21/10/2004 6:24	WE00075771	128393	2.718	0.074	A	06	GR	909.411
21/10/2004 6:24	WE00075771	128393	0.371	0.000	PB	06	GR	909.411
21/10/2004 6:24	WE00075771	128393	29.419	2.239	A	18	GR	909.411
21/10/2004 6:24	WE00075771	128393	1.079	0.146	PB	18	GR	909.411
21/10/2004 6:24	WE00075771	128393	0.068	0.000	A	99	GR	909.411
27/10/2004 6:10	WE00069696	139008	0.026	0.000	A	99	GR	880.818
27/10/2004 6:10	WE00069696	139008	4.866	0.150	A	06	GR	880.818
27/10/2004 6:10	WE00069696	139008	42.999	2.726	A	18	GR	880.818
31/10/2004 5:10	WE00075925	144751	0.147	0.000	PB	06	GR	977.877
31/10/2004 5:10	WE00075925	144751	34.633	6.498	A	18	GR	977.877
31/10/2004 5:10	WE00075925	144751	0.263	0.003	A	99	GR	977.877
31/10/2004 5:10	WE00075925	144751	6.285	0.293	A	06	GR	977.877
03/11/2004 6:10	WE00075955	152678	0.416	0.000	B	18	GR	847.540
03/11/2004 6:10	WE00075955	152678	0.021	0.000	PB	99	GR	847.540
03/11/2004 6:10	WE00075955	152678	0.117	0.039	PB	18	GR	847.540
03/11/2004 6:10	WE00075955	152678	0.609	0.018	A	99	GR	847.540
03/11/2004 6:10	WE00075955	152678	9.065	0.374	A	06	GR	847.540
03/11/2004 6:10	WE00075955	152678	0.199	0.000	PB	06	GR	847.540
03/11/2004 6:10	WE00075955	152678	31.074	2.004	A	18	GR	847.540
10/11/2004 7:40	WE00076054	168781	7.023	0.508	A	06	GR	906.982
10/11/2004 7:40	WE00076054	168781	28.658	3.046	A	18	GR	906.982
10/11/2004 7:40	WE00076054	168781	0.217	0.006	A	99	GR	906.982

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
21/11/2004 8:39	WE00069987	189721	43.487	2.504	A	18	GR	893.560
21/11/2004 8:39	WE00069987	189721	0.065	0.000	A	99	GR	893.560
21/11/2004 8:39	WE00069987	189721	4.883	0.215	A	06	GR	893.560
22/11/2004 10:36	WE057383	193300	6.218	0.137	A	06	GR	887.635
22/11/2004 10:36	WE057383	193300	24.955	1.036	A	18	GR	887.635
22/11/2004 10:36	WE057383	193300	0.125	0.000	A	99	GR	887.635
25/11/2004 16:57	WE00076344	202286	5.125	0.273	A	06	GR	843.034
25/11/2004 16:57	WE00076344	202286	31.607	1.647	A	18	GR	843.034
25/11/2004 16:57	WE00076344	202286	0.261	0.000	PB	18	GR	843.034
25/11/2004 16:57	WE00076344	202286	0.065	0.003	A	99	GR	843.034
01/12/2004 8:55	WE00076410	215099	0.188	0.003	PB	06	GR	898.492
01/12/2004 8:55	WE00076410	215099	15.359	0.329	A	18	GR	898.492
01/12/2004 8:55	WE00076410	215099	0.013	0.000	PB	99	GR	898.492
01/12/2004 8:55	WE00076410	215099	0.227	0.000	PB	18	GR	898.492
01/12/2004 8:55	WE00076410	215099	13.572	0.377	A	06	GR	898.492
01/12/2004 8:55	WE00076410	215099	0.602	0.003	A	99	GR	898.492
06/12/2004 17:13	WE00070274	224563	46.934	8.273	A	18	GR	1034.509
06/12/2004 17:13	WE00070274	224563	0.013	0.003	A	99	GR	1034.509
06/12/2004 17:13	WE00070274	224563	1.502	0.183	A	06	GR	1034.509
14/12/2004 9:04	WE00072959	245783	10.072	0.497	A	06	GR	1018.671
14/12/2004 9:04	WE00072959	245783	0.216	0.003	A	99	GR	1018.671
14/12/2004 9:04	WE00072959	245783	25.180	3.368	A	18	GR	1018.671
16/12/2004 7:36	WE00073009	254517	29.222	1.623	A	18	GR	948.833
16/12/2004 7:36	WE00073009	254517	0.086	0.003	A	99	GR	948.833
16/12/2004 7:36	WE00073009	254517	2.895	0.108	A	06	GR	948.833
22/01/2005 14:28	WE00070863	350665	0.013	0.000	A	99	GR	1080.614
22/01/2005 14:28	WE00070863	350665	3.574	0.579	A	06	GR	1080.614
22/01/2005 14:28	WE00070863	350665	42.388	6.631	A	18	GR	1080.614
23/01/2005 17:26	WE00070888	350667	45.540	9.324	A	18	GR	1107.385

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
23/01/2005 17:26	WE00070888	350667	2.176	0.221	A	06	GR	1107.385
08/02/2005 19:01	WE00071172	405077	0.581	0.003	PB	06	GR	1056.301
08/02/2005 19:01	WE00071172	405077	9.478	0.797	A	06	GR	1056.301
08/02/2005 19:01	WE00071172	405077	40.536	9.446	A	18	GR	1056.301
08/02/2005 19:01	WE00071172	405077	0.942	0.169	PB	18	GR	1056.301
08/02/2005 19:01	WE00071172	405077	0.336	0.015	A	99	GR	1056.301
08/02/2005 19:01	WE00071172	405077	0.013	0.000	PB	99	GR	1056.301
19/02/2005 6:06	WE058901	448633	0.849	0.052	PB	18	GR	990.242
19/02/2005 6:06	WE058901	448633	6.599	0.427	A	06	GR	990.242
19/02/2005 6:06	WE058901	448633	0.219	0.003	PB	06	GR	990.242
19/02/2005 6:06	WE058901	448633	39.471	4.346	A	18	GR	990.242
19/02/2005 6:06	WE058901	448633	0.013	0.000	A	99	GR	990.242
28/02/2005 13:33	U2333506	478924	3.649	0.477	A	06	GR	966.745
28/02/2005 13:33	U2333506	478924	0.021	0.000	PB	06	GR	966.745
28/02/2005 13:33	U2333506	478924	46.044	3.920	A	18	GR	966.745
05/03/2005 0:42	U2333265	493729	3.511	0.199	A	06	GR	925.947
05/03/2005 0:42	U2333265	493729	25.240	1.585	A	18	GR	925.947
22/03/2005 3:42	WE059780	539671	2.087	0.459	PB	18	GR	922.190
22/03/2005 3:42	WE059780	539671	0.026	0.000	A	99	GR	922.190
22/03/2005 3:42	WE059780	539671	28.842	2.745	A	18	GR	922.190
22/03/2005 3:42	WE059780	539671	0.039	0.003	PB	06	GR	922.190
22/03/2005 3:42	WE059780	539671	2.186	0.131	A	06	GR	922.190
15/04/2005 15:19	WE060449	581139	0.039	0.000	SP	06	GR	962.936
15/04/2005 15:19	WE060449	581139	0.133	0.003	PB	06	GR	962.936
15/04/2005 15:19	WE060449	581139	0.152	0.003	B	06	GR	962.936
15/04/2005 15:19	WE060449	581139	2.486	0.102	A	06	GR	962.936
15/04/2005 15:19	WE060449	581139	0.013	0.000	B	99	GR	962.936
15/04/2005 15:19	WE060449	581139	0.247	0.003	B	18	GR	962.936
15/04/2005 15:19	WE060449	581139	4.619	0.463	PB	18	GR	962.936

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
15/04/2005 15:19	WE060449	581139	0.013	0.000	A	99	GR	962.936
15/04/2005 15:19	WE060449	581139	24.614	1.740	A	18	GR	962.936
05/10/2004 10:07	I085342	100007	40.630	2.563	PB	18	GR	964.429
05/10/2004 10:07	I085342	100007	4.526	0.024	PB	06	GR	964.429
05/10/2004 10:07	I085342	100007	0.078	0.000	PB	99	GR	964.429
12/10/2004 18:13	WE057641	111743	4.754	0.135	PB	18	GR	838.442
12/10/2004 18:13	WE057641	111743	0.013	0.000	PB	99	GR	838.442
12/10/2004 18:13	WE057641	111743	0.933	0.019	PB	06	GR	838.442
20/10/2004 14:08	WE00075757	125654	14.002	0.093	PB	06	GR	1069.923
20/10/2004 14:08	WE00075757	125654	1.011	0.013	PB	99	GR	1069.923
20/10/2004 14:08	WE00075757	125654	0.013	0.000	A	99	GR	1069.923
20/10/2004 14:08	WE00075757	125654	11.853	0.432	PB	18	GR	1069.923
20/10/2004 14:08	WE00075757	125654	0.065	0.000	A	18	GR	1069.923
20/10/2004 14:08	WE00075757	125654	0.166	0.000	A	06	GR	1069.923
07/12/2004 5:58	WE00070279	227546	1.670	0.275	A	18	GR	1021.278
07/12/2004 5:58	WE00070279	227546	5.972	0.022	PB	06	GR	1021.278
07/12/2004 5:58	WE00070279	227546	34.601	1.977	PB	18	GR	1021.278
07/12/2004 5:58	WE00070279	227546	0.013	0.003	A	99	GR	1021.278
07/12/2004 5:58	WE00070279	227546	0.130	0.013	PB	99	GR	1021.278
07/12/2004 5:58	WE00070279	227546	0.278	0.003	A	06	GR	1021.278
18/12/2004 17:00	WE00070452	260282	0.039	0.000	A	06	GR	989.459
18/12/2004 17:00	WE00070452	260282	39.323	1.738	PB	18	GR	989.459
18/12/2004 17:00	WE00070452	260282	0.138	0.000	PB	99	GR	989.459
18/12/2004 17:00	WE00070452	260282	2.745	0.000	PB	06	GR	989.459
19/12/2004 5:33	WE00070456	260283	0.026	0.000	PB	99	GR	1030.691
19/12/2004 5:33	WE00070456	260283	37.060	1.589	PB	18	GR	1030.691
19/12/2004 5:33	WE00070456	260283	0.099	0.000	A	18	GR	1030.691
19/12/2004 5:33	WE00070456	260283	3.875	0.000	PB	06	GR	1030.691
19/12/2004 5:33	WE00070456	260283	0.182	0.000	A	06	GR	1030.691

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/01/2005 14:00	WE00070578	292434	43.863	3.895	PB	18	GR	1000.452
04/01/2005 14:00	WE00070578	292434	2.099	0.016	PB	06	GR	1000.452
04/01/2005 17:42	WE00070583	292435	0.052	0.000	PB	99	GR	974.185
04/01/2005 17:42	WE00070583	292435	2.529	0.006	PB	06	GR	974.185
04/01/2005 17:42	WE00070583	292435	43.906	2.824	PB	18	GR	974.185
12/01/2005 16:18	WE00070751	319681	0.125	0.003	PB	99	GR	1000.000
12/01/2005 16:18	WE00070751	319681	36.917	1.070	PB	18	GR	1000.000
12/01/2005 16:18	WE00070751	319681	8.391	0.020	PB	06	GR	1000.000
21/01/2005 14:19	WE00070845	350668	0.052	0.013	A	06	GR	1025.641
21/01/2005 14:19	WE00070845	350668	0.117	0.003	PB	99	GR	1025.641
21/01/2005 14:19	WE00070845	350668	37.063	1.806	PB	18	GR	1025.641
21/01/2005 14:19	WE00070845	350668	6.314	0.111	PB	06	GR	1025.641
23/01/2005 10:43	WE00070878	350669	2.365	0.020	PB	06	GR	1047.707
23/01/2005 10:43	WE00070878	350669	41.006	3.246	PB	18	GR	1047.707
23/01/2005 10:43	WE00070878	350669	0.078	0.000	PB	99	GR	1047.707
26/01/2005 6:50	WE00070950	366483	0.190	0.000	PB	99	GR	968.585
26/01/2005 6:50	WE00070950	366483	4.800	0.019	PB	06	GR	968.585
26/01/2005 6:50	WE00070950	366483	0.372	0.021	A	18	GR	968.585
26/01/2005 6:50	WE00070950	366483	0.154	0.000	A	06	GR	968.585
26/01/2005 6:50	WE00070950	366483	0.008	0.000	A	99	GR	968.585
26/01/2005 6:50	WE00070950	366483	43.272	3.808	PB	18	GR	968.585
26/01/2005 6:50	WE00070950	366483	0.117	0.000	B	18	GR	968.585
26/01/2005 6:50	WE00070950	366483	0.104	0.000	B	06	GR	968.585
28/01/2005 9:44	WE00071007	376875	0.081	0.003	A	06	GR	1031.755
28/01/2005 9:44	WE00071007	376875	0.021	0.000	B	06	GR	1031.755
28/01/2005 9:44	WE00071007	376875	7.690	0.066	PB	06	GR	1031.755
28/01/2005 9:44	WE00071007	376875	0.065	0.000	A	18	GR	1031.755
28/01/2005 9:44	WE00071007	376875	31.229	2.688	PB	18	GR	1031.755
28/01/2005 9:44	WE00071007	376875	0.078	0.003	PB	99	GR	1031.755

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
31/01/2005 6:22	WE00071023	380177	0.156	0.026	A	06	GR	982.209
31/01/2005 6:22	WE00071023	380177	10.048	0.154	PB	06	GR	982.209
31/01/2005 6:22	WE00071023	380177	36.014	1.918	PB	18	GR	982.209
31/01/2005 6:22	WE00071023	380177	0.013	0.000	A	99	GR	982.209
31/01/2005 6:22	WE00071023	380177	0.104	0.000	PB	99	GR	982.209
03/02/2005 7:09	WE00071089	393268	39.176	1.372	PB	18	GR	953.336
03/02/2005 7:09	WE00071089	393268	0.104	0.000	PB	99	GR	953.336
03/02/2005 7:09	WE00071089	393268	0.289	0.000	A	18	GR	953.336
03/02/2005 7:09	WE00071089	393268	4.637	0.020	PB	06	GR	953.336
03/02/2005 7:09	WE00071089	393268	0.091	0.003	A	06	GR	953.336
24/02/2005 12:48	U2330890	463400	0.196	0.000	PB	99	GR	980.142
24/02/2005 12:48	U2330890	463400	27.272	3.069	PB	18	GR	980.142
24/02/2005 12:48	U2330890	463400	4.409	0.052	PB	06	GR	980.142
24/02/2005 12:48	U2330890	463400	12.877	2.073	A	18	GR	980.142
24/02/2005 12:48	U2330890	463400	0.490	0.066	A	06	GR	980.142
20/03/2005 12:49	U2331501	533321	0.029	0.000	PB	99	GR	977.674
20/03/2005 12:49	U2331501	533321	0.307	0.000	SP	18	GR	977.674
20/03/2005 12:49	U2331501	533321	45.302	6.662	PB	18	GR	977.674
20/03/2005 12:49	U2331501	533321	0.354	0.099	A	18	GR	977.674
20/03/2005 12:49	U2331501	533321	4.170	0.014	PB	06	GR	977.674
20/03/2005 12:49	U2331501	533321	0.052	0.000	SP	06	GR	977.674
20/03/2005 12:49	U2331501	533321	0.052	0.000	A	06	GR	977.674
31/03/2005 7:04	U2154664	559119	0.218	0.017	A	06	GR	1024.993
31/03/2005 7:04	U2154664	559119	0.016	0.000	PB	99	GR	1024.993
31/03/2005 7:04	U2154664	559119	24.175	1.204	PB	18	GR	1024.993
31/03/2005 7:04	U2154664	559119	4.116	0.133	PB	06	GR	1024.993
31/03/2005 7:04	U2154664	559119	0.146	0.029	A	18	GR	1024.993
23/09/2004 9:07	WE055551	77658	2.842	0.195	A	06	GR	893.516
23/09/2004 9:07	WE055551	77658	35.599	4.145	A	18	GR	893.516

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
23/09/2004 9:07	WE055551	77658	0.284	0.000	PB	18	GR	893.516
23/09/2004 9:07	WE055551	77658	0.052	0.000	A	99	GR	893.516
02/11/2004 0:40	WE00066569	149807	1.277	0.000	PB	18	GR	793.292
02/11/2004 0:40	WE00066569	149807	31.960	1.975	A	18	GR	793.292
02/11/2004 0:40	WE00066569	149807	0.458	0.008	PB	06	GR	793.292
02/11/2004 0:40	WE00066569	149807	2.925	0.186	A	06	GR	793.292
02/11/2004 0:40	WE00066569	149807	0.013	0.000	A	99	GR	793.292
07/11/2004 7:20	WE057863	157749	5.605	0.374	A	06	GR	935.559
07/11/2004 7:20	WE057863	157749	0.685	0.000	PB	18	GR	935.559
07/11/2004 7:20	WE057863	157749	28.238	3.268	A	18	GR	935.559
07/11/2004 7:20	WE057863	157749	0.026	0.000	A	99	GR	935.559
09/11/2004 18:32	WE00066652	163893	0.091	0.006	A	99	GR	957.091
09/11/2004 18:32	WE00066652	163893	0.782	0.034	PB	18	GR	957.091
09/11/2004 18:32	WE00066652	163893	0.927	0.013	PB	06	GR	957.091
09/11/2004 18:32	WE00066652	163893	4.723	0.296	A	06	GR	957.091
09/11/2004 18:32	WE00066652	163893	0.013	0.000	PB	99	GR	957.091
09/11/2004 18:32	WE00066652	163893	25.099	1.362	A	18	GR	957.091
15/11/2004 14:09	WE00066669	175414	27.431	3.249	A	18	GR	1061.302
15/11/2004 14:09	WE00066669	175414	2.939	0.404	A	06	GR	1061.302
15/11/2004 14:09	WE00066669	175414	0.052	0.000	A	99	GR	1061.302
23/11/2004 7:56	WE057959	196056	0.026	0.003	A	99	GR	952.989
23/11/2004 7:56	WE057959	196056	29.503	3.636	A	18	GR	952.989
23/11/2004 7:56	WE057959	196056	4.872	0.237	A	06	GR	952.989
29/11/2004 15:36	WE00066760	208249	0.052	0.000	A	99	GR	852.745
29/11/2004 15:36	WE00066760	208249	2.151	0.110	A	06	GR	852.745
29/11/2004 15:36	WE00066760	208249	32.004	2.458	A	18	GR	852.745
06/12/2004 8:14	WE00066804	224561	29.414	1.112	A	18	GR	874.590
06/12/2004 8:14	WE00066804	224561	4.846	0.210	A	06	GR	874.590
06/12/2004 8:14	WE00066804	224561	0.026	0.000	A	99	GR	874.590

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
10/12/2004 10:17	WE00066864	237085	4.237	0.077	A	06	GR	925.846
10/12/2004 10:17	WE00066864	237085	27.398	1.445	A	18	GR	925.846
10/12/2004 10:17	WE00066864	237085	0.162	0.000	A	99	GR	925.846
15/12/2004 7:54	WE058388	250025	0.803	0.000	PB	18	GR	916.835
15/12/2004 7:54	WE058388	250025	2.899	0.181	A	06	GR	916.835
15/12/2004 7:54	WE058388	250025	32.637	3.524	A	18	GR	916.835
17/12/2004 13:57	WE00066944	260279	3.646	0.095	A	06	GR	907.151
17/12/2004 13:57	WE00066944	260279	0.047	0.000	A	99	GR	907.151
17/12/2004 13:57	WE00066944	260279	27.591	1.194	A	18	GR	907.151
18/12/2004 8:20	WE055574	260280	1.829	0.097	A	06	GR	1101.586
18/12/2004 8:20	WE055574	260280	31.099	7.228	A	18	GR	1101.586
18/12/2004 8:20	WE055574	260280	0.060	0.000	A	99	GR	1101.586
29/12/2004 9:13	WE00067012	280928	0.233	0.009	A	99	GR	986.894
29/12/2004 9:13	WE00067012	280928	0.013	0.000	PB	99	GR	986.894
29/12/2004 9:13	WE00067012	280928	7.334	0.453	A	06	GR	986.894
29/12/2004 9:13	WE00067012	280928	0.850	0.000	PB	06	GR	986.894
29/12/2004 9:13	WE00067012	280928	30.548	1.642	A	18	GR	986.894
29/12/2004 9:13	WE00067012	280928	1.124	0.000	PB	18	GR	986.894
10/01/2005 8:53	WE058631	312068	2.722	0.121	A	06	GR	1029.856
10/01/2005 8:53	WE058631	312068	0.039	0.000	PB	99	GR	1029.856
10/01/2005 8:53	WE058631	312068	0.092	0.000	A	99	GR	1029.856
10/01/2005 8:53	WE058631	312068	3.312	0.276	PB	18	GR	1029.856
10/01/2005 8:53	WE058631	312068	29.741	1.879	A	18	GR	1029.856
10/01/2005 8:53	WE058631	312068	0.459	0.026	PB	06	GR	1029.856
12/01/2005 8:00	WE058450	319679	3.693	0.156	A	06	GR	924.144
12/01/2005 8:00	WE058450	319679	37.370	2.333	A	18	GR	924.144
12/01/2005 8:00	WE058450	319679	0.161	0.029	PB	18	GR	924.144
12/01/2005 8:00	WE058450	319679	0.068	0.003	A	99	GR	924.144
17/01/2005 15:28	WE058644	331524	1.429	0.090	A	06	GR	1026.641

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
17/01/2005 15:28	WE058644	331524	38.572	3.319	A	18	GR	1026.641
17/01/2005 15:28	WE058644	331524	0.081	0.000	A	99	GR	1026.641
22/01/2005 19:27	WE00067115	350666	3.472	0.186	A	06	GR	891.596
22/01/2005 19:27	WE00067115	350666	39.894	0.986	A	18	GR	891.596
07/02/2005 14:01	WE058473	401692	0.117	0.003	A	99	GR	1008.495
07/02/2005 14:01	WE058473	401692	0.342	0.000	PB	18	GR	1008.495
07/02/2005 14:01	WE058473	401692	29.553	2.527	A	18	GR	1008.495
07/02/2005 14:01	WE058473	401692	0.302	0.013	PB	06	GR	1008.495
07/02/2005 14:01	WE058473	401692	7.386	0.432	A	06	GR	1008.495
08/02/2005 10:42	WE058835	405076	0.039	0.000	A	99	GR	1035.392
08/02/2005 10:42	WE058835	405076	1.047	0.011	PB	18	GR	1035.392
08/02/2005 10:42	WE058835	405076	32.763	2.270	A	18	GR	1035.392
08/02/2005 10:42	WE058835	405076	0.444	0.000	PB	06	GR	1035.392
08/02/2005 10:42	WE058835	405076	5.548	0.405	A	06	GR	1035.392
16/02/2005 8:19	WE00067268	434346	5.492	0.376	A	06	GR	958.733
16/02/2005 8:19	WE00067268	434346	36.968	3.712	A	18	GR	958.733
16/02/2005 8:19	WE00067268	434346	0.161	0.003	PB	18	GR	958.733
17/02/2005 9:19	WE058867	438630	0.013	0.000	PB	99	GR	1021.683
17/02/2005 9:19	WE058867	438630	1.891	0.223	A	06	GR	1021.683
17/02/2005 9:19	WE058867	438630	0.297	0.000	PB	06	GR	1021.683
17/02/2005 9:19	WE058867	438630	0.039	0.016	A	99	GR	1021.683
17/02/2005 9:19	WE058867	438630	0.677	0.000	PB	18	GR	1021.683
17/02/2005 9:19	WE058867	438630	37.035	3.694	A	18	GR	1021.683
26/02/2005 9:26	WE059746	470212	0.052	0.013	PB	06	GR	996.358
26/02/2005 9:26	WE059746	470212	6.965	0.706	A	06	GR	996.358
26/02/2005 9:26	WE059746	470212	0.549	0.133	PB	18	GR	996.358
26/02/2005 9:26	WE059746	470212	41.855	6.311	A	18	GR	996.358
26/02/2005 9:26	WE059746	470212	0.026	0.000	A	99	GR	996.358
26/02/2005 23:03	WE060064	470213	0.156	0.000	PB	06	GR	1054.107

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
26/02/2005 23:03	WE060064	470213	4.137	0.307	A	06	GR	1054.107
26/02/2005 23:03	WE060064	470213	33.527	4.515	A	18	GR	1054.107
26/02/2005 23:03	WE060064	470213	1.731	0.157	PB	18	GR	1054.107
26/02/2005 23:03	WE060064	470213	0.026	0.000	A	99	GR	1054.107
13/03/2005 1:48	WE059550	510975	33.009	3.258	A	18	GR	944.101
13/03/2005 1:48	WE059550	510975	0.141	0.003	A	99	GR	944.101
13/03/2005 1:48	WE059550	510975	3.264	0.201	A	06	GR	944.101
18/03/2005 3:31	WE00067369	533318	0.360	0.094	PB	18	GR	858.759
18/03/2005 3:31	WE00067369	533318	0.034	0.000	A	99	GR	858.759
18/03/2005 3:31	WE00067369	533318	29.119	2.340	A	18	GR	858.759
18/03/2005 3:31	WE00067369	533318	4.668	0.416	A	06	GR	858.759
18/03/2005 3:31	WE00067369	533318	0.133	0.000	PB	06	GR	858.759
24/03/2005 13:36	WE00067416	549349	0.052	0.000	PB	06	GR	816.347
24/03/2005 13:36	WE00067416	549349	5.613	0.095	A	06	GR	816.347
24/03/2005 13:36	WE00067416	549349	33.419	2.235	A	18	GR	816.347
13/08/2004 10:09	WE055403	38993	9.587	0.077	PB	06	GR	926.860
13/08/2004 10:09	WE055403	38993	0.410	0.000	PB	99	GR	926.860
13/08/2004 10:09	WE055403	38993	22.891	1.091	PB	18	GR	926.860
15/08/2004 13:12	WE055916	38922	0.660	0.013	PB	99	GR	859.702
15/08/2004 13:12	WE055916	38922	13.767	0.523	PB	18	GR	859.702
15/08/2004 13:12	WE055916	38922	14.540	0.167	PB	06	GR	859.702
15/08/2004 13:12	WE055916	38922	0.346	0.013	A	06	GR	859.702
15/08/2004 13:12	WE055916	38922	0.099	0.000	A	18	GR	859.702
17/08/2004 12:18	WE055859	43264	17.956	0.343	PB	18	GR	784.065
17/08/2004 12:18	WE055859	43264	1.063	0.000	PB	99	GR	784.065
17/08/2004 12:18	WE055859	43264	15.393	0.105	PB	06	GR	784.065
07/09/2004 17:31	WE056654	60136	1.965	0.000	PB	99	GR	916.303
07/09/2004 17:31	WE056654	60136	15.815	0.566	PB	18	GR	916.303
07/09/2004 17:31	WE056654	60136	19.028	0.064	PB	06	GR	916.303

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
22/09/2004 8:55	WE056221	76329	0.164	0.000	PB	99	GR	997.298
22/09/2004 8:55	WE056221	76329	4.170	0.196	PB	18	GR	997.298
22/09/2004 8:55	WE056221	76329	4.044	0.040	PB	06	GR	997.298
25/10/2004 6:54	WE00075835	134363	1.071	0.000	PB	99	GR	1042.993
25/10/2004 6:54	WE00075835	134363	0.091	0.000	A	06	GR	1042.993
25/10/2004 6:54	WE00075835	134363	13.202	0.172	PB	06	GR	1042.993
25/10/2004 6:54	WE00075835	134363	13.180	0.906	PB	18	GR	1042.993
25/10/2004 6:54	WE00075835	134363	0.013	0.000	A	99	GR	1042.993
25/10/2004 6:54	WE00075835	134363	0.081	0.021	A	18	GR	1042.993
28/10/2004 2:56	WE00066535	141872	4.489	0.058	PB	06	GR	810.886
28/10/2004 2:56	WE00066535	141872	0.052	0.000	PB	99	GR	810.886
28/10/2004 2:56	WE00066535	141872	28.666	0.925	PB	18	GR	810.886
31/10/2004 2:02	WE00075923	144752	0.529	0.000	PB	99	GR	1034.107
31/10/2004 2:02	WE00075923	144752	0.016	0.000	A	99	GR	1034.107
31/10/2004 2:02	WE00075923	144752	23.050	0.703	PB	18	GR	1034.107
31/10/2004 2:02	WE00075923	144752	0.162	0.021	A	06	GR	1034.107
31/10/2004 2:02	WE00075923	144752	10.093	0.083	PB	06	GR	1034.107
05/11/2004 8:47	WE00076000	157750	0.269	0.000	A	06	GR	1083.916
05/11/2004 8:47	WE00076000	157750	11.866	0.073	PB	06	GR	1083.916
05/11/2004 8:47	WE00076000	157750	0.198	0.000	A	18	GR	1083.916
05/11/2004 8:47	WE00076000	157750	0.584	0.008	PB	99	GR	1083.916
05/11/2004 8:47	WE00076000	157750	14.668	0.334	PB	18	GR	1083.916
15/11/2004 9:55	WE00076246	175415	0.230	0.000	PB	99	GR	1010.478
15/11/2004 9:55	WE00076246	175415	5.031	0.016	PB	06	GR	1010.478
15/11/2004 9:55	WE00076246	175415	0.097	0.000	A	06	GR	1010.478
15/11/2004 9:55	WE00076246	175415	23.351	0.538	PB	18	GR	1010.478
02/12/2004 9:24	WE00076445	218437	16.854	0.625	PB	18	GR	987.840
02/12/2004 9:24	WE00076445	218437	11.267	0.100	PB	06	GR	987.840
02/12/2004 9:24	WE00076445	218437	0.091	0.000	A	06	GR	987.840

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
02/12/2004 9:24	WE00076445	218437	0.395	0.003	PB	99	GR	987.840
07/12/2004 7:46	WE00072863	227547	0.579	0.000	PB	99	GR	996.182
07/12/2004 7:46	WE00072863	227547	19.115	0.834	PB	18	GR	996.182
07/12/2004 7:46	WE00072863	227547	10.345	0.134	PB	06	GR	996.182
15/12/2004 11:54	WE00072989	250028	17.626	0.475	PB	18	GR	996.705
15/12/2004 11:54	WE00072989	250028	0.358	0.000	PB	99	GR	996.705
15/12/2004 11:54	WE00072989	250028	0.065	0.000	A	18	GR	996.705
15/12/2004 11:54	WE00072989	250028	11.258	0.047	PB	06	GR	996.705
15/12/2004 11:54	WE00072989	250028	0.050	0.000	A	06	GR	996.705
14/02/2005 17:55	WE00067254	423888	0.341	0.055	A	06	GR	1013.286
14/02/2005 17:55	WE00067254	423888	2.050	0.034	PB	06	GR	1013.286
14/02/2005 17:55	WE00067254	423888	0.828	0.152	A	18	GR	1013.286
14/02/2005 17:55	WE00067254	423888	7.384	0.315	PB	18	GR	1013.286
14/02/2005 17:55	WE00067254	423888	0.039	0.000	PB	99	GR	1013.286
06/05/2005 5:20	WE062283	613294	1.589	0.222	A	06	GR	885.928
06/05/2005 5:20	WE062283	613294	0.234	0.039	PB	06	GR	885.928
06/05/2005 5:20	WE062283	613294	0.013	0.000	A	99	GR	885.928
06/05/2005 5:20	WE062283	613294	1.755	0.275	PB	18	GR	885.928
06/05/2005 5:20	WE062283	613294	27.112	2.772	A	18	GR	885.928
08/08/2005 12:39	WE00078052	808098	0.026	0.000	A	99	GR	721.343
08/08/2005 12:39	WE00078052	808098	1.488	0.000	A	06	GR	721.343
08/08/2005 12:39	WE00078052	808098	43.095	0.885	A	18	GR	721.343
25/08/2005 10:58	WE00078362	848884	0.224	0.000	PB	06	GR	833.300
25/08/2005 10:58	WE00078362	848884	49.786	3.881	A	18	GR	833.300
25/08/2005 10:58	WE00078362	848884	0.081	0.000	PB	18	GR	833.300
25/08/2005 10:58	WE00078362	848884	0.008	0.000	PB	99	GR	833.300
25/08/2005 10:58	WE00078362	848884	4.404	0.154	A	06	GR	833.300
25/08/2005 10:58	WE00078362	848884	0.222	0.000	A	99	GR	833.300
09/09/2005 9:30	WE00083934	885222	1.207	0.165	PB	18	GR	889.913

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
09/09/2005 9:30	WE00083934	885222	45.818	6.363	A	18	GR	889.913
09/09/2005 9:30	WE00083934	885222	0.130	0.000	PB	06	GR	889.913
09/09/2005 9:30	WE00083934	885222	6.681	0.442	A	06	GR	889.913
09/09/2005 9:30	WE00083934	885222	0.206	0.000	A	99	GR	889.913
19/09/2005 12:37	WE00084075	904962	1.210	0.011	PB	06	GR	896.687
19/09/2005 12:37	WE00084075	904962	34.760	2.011	A	18	GR	896.687
19/09/2005 12:37	WE00084075	904962	1.607	0.092	PB	18	GR	896.687
19/09/2005 12:37	WE00084075	904962	0.483	0.015	A	99	GR	896.687
19/09/2005 12:37	WE00084075	904962	0.117	0.000	PB	99	GR	896.687
19/09/2005 12:37	WE00084075	904962	11.658	0.432	A	06	GR	896.687
01/10/2005 6:21	WE00084328	937918	0.141	0.003	A	99	GR	892.274
01/10/2005 6:21	WE00084328	937918	44.889	4.564	A	18	GR	892.274
01/10/2005 6:21	WE00084328	937918	0.029	0.003	PB	06	GR	892.274
01/10/2005 6:21	WE00084328	937918	7.188	0.214	A	06	GR	892.274
11/10/2005 10:33	WE00084494	958709	0.310	0.000	A	99	GR	899.835
11/10/2005 10:33	WE00084494	958709	8.888	0.399	A	06	GR	899.835
11/10/2005 10:33	WE00084494	958709	41.011	3.157	A	18	GR	899.835
23/10/2005 11:31	WE064934	985223	0.013	0.000	A	99	GR	990.116
23/10/2005 11:31	WE064934	985223	3.225	0.385	A	06	GR	990.116
23/10/2005 11:31	WE064934	985223	31.397	5.617	A	18	GR	990.116
28/10/2005 14:08	WE064244	1006041	0.026	0.000	A	99	GR	917.111
28/10/2005 14:08	WE064244	1006041	1.222	0.052	PB	18	GR	917.111
28/10/2005 14:08	WE064244	1006041	2.169	0.093	A	06	GR	917.111
28/10/2005 14:08	WE064244	1006041	34.306	4.365	A	18	GR	917.111
24/11/2005 14:03	WE00085048	1071811	0.094	0.003	A	99	GR	854.778
24/11/2005 14:03	WE00085048	1071811	0.146	0.000	PB	18	GR	854.778
24/11/2005 14:03	WE00085048	1071811	47.591	5.702	A	18	GR	854.778
24/11/2005 14:03	WE00085048	1071811	0.052	0.013	PB	06	GR	854.778
24/11/2005 14:03	WE00085048	1071811	8.357	0.509	A	06	GR	854.778

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/12/2005 12:18	WE00074145	1095781	6.439	0.457	A	06	GR	968.086
04/12/2005 12:18	WE00074145	1095781	0.143	0.000	PB	06	GR	968.086
04/12/2005 12:18	WE00074145	1095781	43.666	5.889	A	18	GR	968.086
04/12/2005 12:18	WE00074145	1095781	0.185	0.000	A	99	GR	968.086
14/12/2005 17:52	WE00074317	1130685	0.021	0.000	A	99	GR	1048.665
14/12/2005 17:52	WE00074317	1130685	1.548	0.118	B	18	GR	1048.665
14/12/2005 17:52	WE00074317	1130685	0.667	0.060	A	06	GR	1048.665
14/12/2005 17:52	WE00074317	1130685	1.654	0.159	B	06	GR	1048.665
14/12/2005 17:52	WE00074317	1130685	4.484	0.281	A	18	GR	1048.665
14/12/2005 17:52	WE00074317	1130685	0.073	0.000	B	99	GR	1048.665
22/12/2005 14:29	WE0108077	1159254	1.292	0.011	A	06	GR	958.606
22/12/2005 14:29	WE0108077	1159254	35.326	5.322	A	18	GR	958.606
03/01/2006 11:34	WE0090822	1175770	0.060	0.000	A	99	GR	942.777
03/01/2006 11:34	WE0090822	1175770	4.671	0.357	A	06	GR	942.777
03/01/2006 11:34	WE0090822	1175770	42.997	4.137	A	18	GR	942.777
10/01/2006 8:24	WE00074645	1200375	0.180	0.013	PB	18	GR	882.264
10/01/2006 8:24	WE00074645	1200375	51.533	3.986	A	18	GR	882.264
10/01/2006 8:24	WE00074645	1200375	0.107	0.000	A	99	GR	882.264
10/01/2006 8:24	WE00074645	1200375	1.782	0.112	A	06	GR	882.264
10/01/2006 8:24	WE00074645	1200375	0.052	0.000	PB	06	GR	882.264
02/02/2006 17:53	U2549759	1286103	0.115	0.000	PB	06	GR	969.733
02/02/2006 17:53	U2549759	1286103	14.213	0.805	A	06	GR	969.733
02/02/2006 17:53	U2549759	1286103	28.884	4.685	A	18	GR	969.733
02/02/2006 17:53	U2549759	1286103	1.065	0.078	A	99	GR	969.733
02/02/2006 17:53	U2549759	1286103	0.013	0.000	PB	99	GR	969.733
24/02/2006 16:29	WE00086637	1373041	0.240	0.000	A	99	GR	993.049
24/02/2006 16:29	WE00086637	1373041	5.997	0.320	A	06	GR	993.049
24/02/2006 16:29	WE00086637	1373041	36.054	4.712	A	18	GR	993.049
17/03/2006 15:59	U2554028	1446961	7.659	0.901	A	06	GR	1043.535

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
17/03/2006 15:59	U2554028	1446961	32.128	3.830	A	18	GR	1043.535
17/03/2006 15:59	U2554028	1446961	0.069	0.004	A	99	GR	1043.535
24/03/2006 7:19	WE00094714	1470322	0.026	0.000	A	99	GR	984.608
24/03/2006 7:19	WE00094714	1470322	6.860	0.353	A	06	GR	984.608
24/03/2006 7:19	WE00094714	1470322	32.194	3.383	A	18	GR	984.608
15/11/2005 16:12	WE00084886	1046605	1.552	0.006	PB	06	GR	886.448
15/11/2005 16:12	WE00084886	1046605	26.115	0.895	PB	18	GR	886.448
15/11/2005 16:12	WE00084886	1046605	0.094	0.000	PB	99	GR	886.448
28/11/2005 14:00	WE065752	1079462	0.013	0.000	PB	99	GR	904.873
28/11/2005 14:00	WE065752	1079462	24.473	0.414	PB	18	GR	904.873
28/11/2005 14:00	WE065752	1079462	2.238	0.253	A	18	GR	904.873
28/11/2005 14:00	WE065752	1079462	4.980	0.037	PB	06	GR	904.873
28/11/2005 14:00	WE065752	1079462	0.253	0.000	A	06	GR	904.873
24/01/2006 15:33	U2549585	1251950	0.058	0.000	PB	99	GR	1013.354
24/01/2006 15:33	U2549585	1251950	34.758	3.519	PB	18	GR	1013.354
24/01/2006 15:33	U2549585	1251950	0.689	0.094	A	18	GR	1013.354
24/01/2006 15:33	U2549585	1251950	4.918	0.041	PB	06	GR	1013.354
28/02/2006 17:50	WE00075474	1383601	0.242	0.000	PB	99	GR	970.439
28/02/2006 17:50	WE00075474	1383601	0.013	0.000	A	99	GR	970.439
28/02/2006 17:50	WE00075474	1383601	34.089	0.617	PB	18	GR	970.439
28/02/2006 17:50	WE00075474	1383601	0.487	0.000	A	18	GR	970.439
28/02/2006 17:50	WE00075474	1383601	5.141	0.211	PB	06	GR	970.439
28/02/2006 17:50	WE00075474	1383601	0.199	0.000	A	06	GR	970.439
10/03/2006 6:39	WE00087269	1421426	3.919	0.036	PB	06	GR	1016.899
10/03/2006 6:39	WE00087269	1421426	0.052	0.000	PB	99	GR	1016.899
10/03/2006 6:39	WE00087269	1421426	35.846	2.737	PB	18	GR	1016.899
03/05/2005 14:06	WE062181	606863	35.937	1.514	A	18	GR	736.263
03/05/2005 14:06	WE062181	606863	4.155	0.195	A	06	GR	736.263
30/09/2005 18:57	WE064134	937917	0.013	0.000	A	99	GR	816.376

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
30/09/2005 18:57	WE064134	937917	36.024	3.342	A	18	GR	816.376
30/09/2005 18:57	WE064134	937917	4.431	0.317	A	06	GR	816.376
25/10/2005 13:59	WE064167	991256	0.081	0.000	B	18	GR	897.192
25/10/2005 13:59	WE064167	991256	32.021	2.781	A	18	GR	897.192
25/10/2005 13:59	WE064167	991256	0.224	0.013	B	06	GR	897.192
25/10/2005 13:59	WE064167	991256	3.195	0.181	A	06	GR	897.192
27/10/2005 12:11	WE064871	999329	41.112	3.116	A	18	GR	922.345
27/10/2005 12:11	WE064871	999329	0.078	0.000	A	99	GR	922.345
27/10/2005 12:11	WE064871	999329	3.451	0.098	A	06	GR	922.345
03/11/2005 15:10	WE00084740	1019689	0.026	0.000	PB	99	GR	867.128
03/11/2005 15:10	WE00084740	1019689	1.153	0.000	PB	06	GR	867.128
03/11/2005 15:10	WE00084740	1019689	0.363	0.000	A	99	GR	867.128
03/11/2005 15:10	WE00084740	1019689	1.160	0.003	PB	18	GR	867.128
03/11/2005 15:10	WE00084740	1019689	39.257	2.124	A	18	GR	867.128
03/11/2005 15:10	WE00084740	1019689	5.850	0.014	A	06	GR	867.128
15/11/2005 16:04	WE065517	1046599	45.702	6.343	A	18	GR	987.240
15/11/2005 16:04	WE065517	1046599	0.130	0.006	A	99	GR	987.240
15/11/2005 16:04	WE065517	1046599	3.330	0.179	A	06	GR	987.240
25/11/2005 16:46	WE065890	1075940	5.298	0.201	A	06	GR	926.640
25/11/2005 16:46	WE065890	1075940	0.091	0.000	A	99	GR	926.640
25/11/2005 16:46	WE065890	1075940	42.191	3.036	A	18	GR	926.640
19/12/2005 14:58	WE0108237	1144779	0.039	0.000	A	99	GR	978.310
19/12/2005 14:58	WE0108237	1144779	45.382	6.239	A	18	GR	978.310
19/12/2005 14:58	WE0108237	1144779	0.052	0.000	PB	06	GR	978.310
19/12/2005 14:58	WE0108237	1144779	0.052	0.008	B	06	GR	978.310
19/12/2005 14:58	WE0108237	1144779	2.519	0.164	A	06	GR	978.310
12/01/2006 12:57	WE00090935	1209597	0.013	0.000	SP	99	GR	970.785
12/01/2006 12:57	WE00090935	1209597	0.669	0.000	PB	18	GR	970.785
12/01/2006 12:57	WE00090935	1209597	42.161	1.778	A	18	GR	970.785

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
12/01/2006 12:57	WE00090935	1209597	1.447	0.000	A	06	GR	970.785
17/01/2006 8:34	WE00067864	1226927	2.345	0.067	A	06	GR	843.341
17/01/2006 8:34	WE00067864	1226927	45.845	3.390	A	18	GR	843.341
17/01/2006 8:34	WE00067864	1226927	0.065	0.000	A	99	GR	843.341
17/01/2006 16:08	WE00085829	1226929	4.048	0.281	A	06	GR	884.803
17/01/2006 16:08	WE00085829	1226929	0.065	0.000	A	99	GR	884.803
17/01/2006 16:08	WE00085829	1226929	1.758	0.181	PB	18	GR	884.803
17/01/2006 16:08	WE00085829	1226929	33.369	2.972	A	18	GR	884.803
17/01/2006 16:08	WE00085829	1226929	0.208	0.006	PB	06	GR	884.803
19/01/2006 20:15	U2486835	1235973	4.955	0.386	A	06	GR	849.557
19/01/2006 20:15	U2486835	1235973	36.496	4.669	A	18	GR	849.557
19/01/2006 20:15	U2486835	1235973	0.026	0.003	A	99	GR	849.557
25/01/2006 17:50	WE00067950	1258040	0.013	0.000	PB	99	GR	872.879
25/01/2006 17:50	WE00067950	1258040	1.193	0.021	PB	18	GR	872.879
25/01/2006 17:50	WE00067950	1258040	0.052	0.000	A	99	GR	872.879
25/01/2006 17:50	WE00067950	1258040	3.856	0.298	A	06	GR	872.879
25/01/2006 17:50	WE00067950	1258040	1.809	0.024	PB	06	GR	872.879
25/01/2006 17:50	WE00067950	1258040	38.588	5.678	A	18	GR	872.879
31/01/2006 10:49	WE00091691	1277654	1.534	0.087	A	06	GR	931.803
31/01/2006 10:49	WE00091691	1277654	44.281	2.926	A	18	GR	931.803
31/01/2006 10:49	WE00091691	1277654	0.026	0.003	A	99	GR	931.803
31/01/2006 10:49	WE00091691	1277654	1.707	0.102	PB	18	GR	931.803
06/02/2006 18:47	WE00091932	1298310	0.198	0.000	PB	18	GR	1006.866
06/02/2006 18:47	WE00091932	1298310	0.586	0.000	PB	06	GR	1006.866
06/02/2006 18:47	WE00091932	1298310	41.502	4.081	A	18	GR	1006.866
06/02/2006 18:47	WE00091932	1298310	0.026	0.000	A	99	GR	1006.866
06/02/2006 18:47	WE00091932	1298310	3.293	0.595	A	06	GR	1006.866
10/02/2006 17:11	WE00068126	1318314	34.429	2.061	A	18	GR	986.246
10/02/2006 17:11	WE00068126	1318314	0.155	0.004	A	99	GR	986.246

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
10/02/2006 17:11	WE00068126	1318314	8.369	0.391	A	06	GR	986.246
14/02/2006 8:41	WE00068153	1329459	0.833	0.076	PB	18	GR	899.610
14/02/2006 8:41	WE00068153	1329459	41.398	3.567	A	18	GR	899.610
14/02/2006 8:41	WE00068153	1329459	2.584	0.132	A	06	GR	899.610
17/02/2006 11:22	WE00068187	1344901	43.579	4.059	A	18	GR	859.978
17/02/2006 11:22	WE00068187	1344901	3.146	0.405	A	06	GR	859.978
17/02/2006 11:22	WE00068187	1344901	1.317	0.042	PB	18	GR	859.978
18/02/2006 16:16	WE060425	1344905	0.292	0.016	PB	06	GR	1088.856
18/02/2006 16:16	WE060425	1344905	27.478	5.220	A	18	GR	1088.856
18/02/2006 16:16	WE060425	1344905	1.230	0.216	PB	18	GR	1088.856
18/02/2006 16:16	WE060425	1344905	0.078	0.003	A	99	GR	1088.856
18/02/2006 16:16	WE060425	1344905	5.175	0.640	A	06	GR	1088.856
26/02/2006 11:49	WE00091279	1373043	0.429	0.006	PB	06	GR	1073.013
26/02/2006 11:49	WE00091279	1373043	2.684	0.105	A	06	GR	1073.013
26/02/2006 11:49	WE00091279	1373043	0.039	0.000	A	99	GR	1073.013
26/02/2006 11:49	WE00091279	1373043	3.224	0.266	PB	18	GR	1073.013
26/02/2006 11:49	WE00091279	1373043	47.497	10.216	A	18	GR	1073.013
03/03/2006 17:25	WE00093793	1399127	34.375	2.710	A	18	GR	1035.746
03/03/2006 17:25	WE00093793	1399127	0.211	0.046	A	99	GR	1035.746
03/03/2006 17:25	WE00093793	1399127	12.059	1.311	A	06	GR	1035.746
04/03/2006 7:23	WE00091330	1399130	0.356	0.006	PB	06	GR	1031.556
04/03/2006 7:23	WE00091330	1399130	9.615	0.481	A	06	GR	1031.556
04/03/2006 7:23	WE00091330	1399130	36.085	5.634	A	18	GR	1031.556
04/03/2006 7:23	WE00091330	1399130	0.928	0.279	PB	18	GR	1031.556
04/03/2006 7:23	WE00091330	1399130	0.422	0.000	A	99	GR	1031.556
04/03/2006 13:23	WE00093569	1399132	6.146	0.348	A	06	GR	1002.400
04/03/2006 13:23	WE00093569	1399132	0.182	0.013	PB	06	GR	1002.400
04/03/2006 13:23	WE00093569	1399132	32.405	2.406	A	18	GR	1002.400
04/03/2006 13:23	WE00093569	1399132	0.360	0.081	PB	18	GR	1002.400

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/03/2006 13:23	WE00093569	1399132	0.008	0.000	A	99	GR	1002.400
07/03/2006 14:43	WE00094008	1408231	8.146	0.282	A	06	GR	915.991
07/03/2006 14:43	WE00094008	1408231	2.696	0.019	PB	06	GR	915.991
07/03/2006 14:43	WE00094008	1408231	18.674	1.364	A	18	GR	915.991
07/03/2006 14:43	WE00094008	1408231	0.258	0.000	A	99	GR	915.991
07/03/2006 14:43	WE00094008	1408231	10.994	0.369	PB	18	GR	915.991
08/03/2006 5:44	WE00094018	1412091	0.161	0.000	PB	18	GR	1057.388
08/03/2006 5:44	WE00094018	1412091	42.465	6.495	A	18	GR	1057.388
08/03/2006 5:44	WE00094018	1412091	1.634	0.147	A	06	GR	1057.388
08/03/2006 5:44	WE00094018	1412091	0.003	0.000	A	99	GR	1057.388
10/03/2006 8:32	WE00094143	1421423	1.278	0.105	PB	18	GR	923.171
10/03/2006 8:32	WE00094143	1421423	0.060	0.003	A	99	GR	923.171
10/03/2006 8:32	WE00094143	1421423	39.331	4.636	A	18	GR	923.171
10/03/2006 8:32	WE00094143	1421423	0.104	0.008	PB	06	GR	923.171
10/03/2006 8:32	WE00094143	1421423	9.142	0.870	A	06	GR	923.171
12/03/2006 13:40	WE00091942	1421425	7.997	0.856	A	06	GR	819.826
12/03/2006 13:40	WE00091942	1421425	36.556	3.103	A	18	GR	819.826
13/03/2006 10:00	WE00092195	1426434	2.640	0.532	A	06	GR	1039.642
13/03/2006 10:00	WE00092195	1426434	0.029	0.000	PB	06	GR	1039.642
13/03/2006 10:00	WE00092195	1426434	47.856	12.783	A	18	GR	1039.642
13/03/2006 10:00	WE00092195	1426434	0.689	0.136	PB	18	GR	1039.642
16/03/2006 8:23	WE00093828	1440189	29.161	3.418	A	18	GR	1085.495
16/03/2006 8:23	WE00093828	1440189	7.701	0.565	A	06	GR	1085.495
17/03/2006 5:16	U2645319	1446962	7.201	0.772	A	06	GR	928.563
17/03/2006 5:16	U2645319	1446962	0.318	0.041	PB	06	GR	928.563
17/03/2006 5:16	U2645319	1446962	36.038	3.064	A	18	GR	928.563
17/03/2006 5:16	U2645319	1446962	3.018	0.113	PB	18	GR	928.563
17/03/2006 5:16	U2645319	1446962	0.154	0.000	A	99	GR	928.563
17/03/2006 5:16	U2645319	1446962	0.013	0.000	PB	99	GR	928.563

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
17/03/2006 5:16	U2645319	1446962	0.013	0.000	SP	99	GR	928.563
20/03/2006 23:58	WE00094741	1451387	4.480	0.410	A	06	GR	982.884
20/03/2006 23:58	WE00094741	1451387	1.345	0.137	PB	06	GR	982.884
20/03/2006 23:58	WE00094741	1451387	40.224	5.129	A	18	GR	982.884
20/03/2006 23:58	WE00094741	1451387	1.047	0.126	PB	18	GR	982.884
20/03/2006 23:58	WE00094741	1451387	0.013	0.000	PB	99	GR	982.884
22/03/2006 10:51	WE00095306	1460373	1.221	0.087	A	06	GR	944.479
22/03/2006 10:51	WE00095306	1460373	43.290	2.782	A	18	GR	944.479
03/05/2005 11:43	WE061547	606865	0.318	0.037	A	06	GR	979.502
03/05/2005 11:43	WE061547	606865	3.605	0.293	PB	06	GR	979.502
03/05/2005 11:43	WE061547	606865	2.973	0.238	A	18	GR	979.502
03/05/2005 11:43	WE061547	606865	33.933	3.038	PB	18	GR	979.502
26/07/2005 6:08	WE00077823	776059	0.034	0.000	PB	99	GR	879.388
26/07/2005 6:08	WE00077823	776059	6.745	0.188	PB	18	GR	879.388
26/07/2005 6:08	WE00077823	776059	1.525	0.000	PB	06	GR	879.388
26/07/2005 6:08	WE00077823	776059	0.117	0.000	A	18	GR	879.388
02/08/2005 5:48	WE00077907	791565	0.936	0.000	PB	99	GR	844.300
02/08/2005 5:48	WE00077907	791565	18.154	0.256	PB	06	GR	844.300
02/08/2005 5:48	WE00077907	791565	32.771	1.907	PB	18	GR	844.300
05/08/2005 16:11	WE00078015	804996	0.931	0.003	PB	99	GR	928.950
05/08/2005 16:11	WE00078015	804996	14.662	0.217	PB	18	GR	928.950
05/08/2005 16:11	WE00078015	804996	13.342	0.059	PB	06	GR	928.950
13/08/2005 9:09	WE00078121	821193	0.352	0.000	PB	99	GR	800.374
13/08/2005 9:09	WE00078121	821193	39.191	1.513	PB	18	GR	800.374
13/08/2005 9:09	WE00078121	821193	7.040	0.091	PB	06	GR	800.374
21/08/2005 8:27	WE00078214	836713	0.117	0.000	A	18	GR	883.384
21/08/2005 8:27	WE00078214	836713	35.983	0.819	PB	18	GR	883.384
21/08/2005 8:27	WE00078214	836713	9.396	0.038	PB	06	GR	883.384
21/08/2005 8:27	WE00078214	836713	0.326	0.000	PB	99	GR	883.384

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
21/08/2005 8:27	WE00078214	836713	0.089	0.000	A	06	GR	883.384
27/08/2005 6:44	WE00078436	854652	0.099	0.000	A	18	GR	927.225
27/08/2005 6:44	WE00078436	854652	14.229	0.138	PB	06	GR	927.225
27/08/2005 6:44	WE00078436	854652	0.682	0.000	PB	99	GR	927.225
27/08/2005 6:44	WE00078436	854652	31.171	1.218	PB	18	GR	927.225
27/08/2005 6:44	WE00078436	854652	0.094	0.000	A	06	GR	927.225
07/09/2005 8:47	WE00083880	878867	0.013	0.003	A	99	GR	915.941
07/09/2005 8:47	WE00083880	878867	1.028	0.000	PB	99	GR	915.941
07/09/2005 8:47	WE00083880	878867	0.233	0.024	A	06	GR	915.941
07/09/2005 8:47	WE00083880	878867	14.438	0.101	PB	06	GR	915.941
07/09/2005 8:47	WE00083880	878867	0.050	0.000	SP	06	GR	915.941
07/09/2005 8:47	WE00083880	878867	28.210	0.981	PB	18	GR	915.941
21/10/2005 15:11	WE00084548	985224	0.373	0.000	PB	99	GR	990.182
21/10/2005 15:11	WE00084548	985224	17.031	0.218	PB	18	GR	990.182
21/10/2005 15:11	WE00084548	985224	9.228	0.035	PB	06	GR	990.182
28/10/2005 11:28	WE063854	1006042	24.529	0.568	PB	18	GR	987.987
28/10/2005 11:28	WE063854	1006042	1.356	0.022	PB	99	GR	987.987
28/10/2005 11:28	WE063854	1006042	0.034	0.000	A	99	GR	987.987
28/10/2005 11:28	WE063854	1006042	0.618	0.006	A	18	GR	987.987
28/10/2005 11:28	WE063854	1006042	16.459	0.150	PB	06	GR	987.987
28/10/2005 11:28	WE063854	1006042	0.456	0.003	A	06	GR	987.987
31/10/2005 7:04	WE063862	1009094	28.936	0.436	PB	18	GR	926.022
31/10/2005 7:04	WE063862	1009094	16.471	0.068	PB	06	GR	926.022
31/10/2005 7:04	WE063862	1009094	1.168	0.003	PB	99	GR	926.022
08/11/2005 7:19	WE065415	1030855	0.818	0.000	PB	99	GR	1012.826
08/11/2005 7:19	WE065415	1030855	21.569	0.997	PB	18	GR	1012.826
08/11/2005 7:19	WE065415	1030855	7.265	0.042	PB	06	GR	1012.826
15/11/2005 17:49	WE00067685	1046607	32.543	2.355	PB	18	GR	867.405
15/11/2005 17:49	WE00067685	1046607	0.026	0.000	PB	99	GR	867.405

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
15/11/2005 17:49	WE00067685	1046607	1.440	0.054	PB	06	GR	867.405
17/11/2005 13:38	WE00074032	1053024	0.149	0.000	A	06	GR	952.148
17/11/2005 13:38	WE00074032	1053024	0.193	0.000	PB	99	GR	952.148
17/11/2005 13:38	WE00074032	1053024	18.013	1.364	PB	18	GR	952.148
17/11/2005 13:38	WE00074032	1053024	0.065	0.000	A	18	GR	952.148
17/11/2005 13:38	WE00074032	1053024	3.448	0.024	PB	06	GR	952.148
28/11/2005 13:09	WE00085099	1079461	0.225	0.000	PB	99	GR	949.308
28/11/2005 13:09	WE00085099	1079461	37.856	2.127	PB	18	GR	949.308
28/11/2005 13:09	WE00085099	1079461	0.647	0.000	A	18	GR	949.308
28/11/2005 13:09	WE00085099	1079461	7.509	0.257	PB	06	GR	949.308
01/12/2005 10:47	WE00085184	1090991	2.997	0.082	PB	06	GR	875.076
01/12/2005 10:47	WE00085184	1090991	40.675	3.236	PB	18	GR	875.076
01/12/2005 10:47	WE00085184	1090991	0.156	0.000	A	06	GR	875.076
01/12/2005 10:47	WE00085184	1090991	0.073	0.003	PB	99	GR	875.076
01/12/2005 10:47	WE00085184	1090991	0.810	0.045	A	18	GR	875.076
07/12/2005 10:08	WE00067788	1109429	1.504	0.079	PB	06	GR	1027.387
07/12/2005 10:08	WE00067788	1109429	0.042	0.000	PB	99	GR	1027.387
07/12/2005 10:08	WE00067788	1109429	28.193	3.078	PB	18	GR	1027.387
09/12/2005 6:57	WE00085304	1119675	0.094	0.000	PB	99	GR	989.861
09/12/2005 6:57	WE00085304	1119675	42.823	3.418	PB	18	GR	989.861
09/12/2005 6:57	WE00085304	1119675	2.958	0.047	PB	06	GR	989.861
13/12/2005 12:43	WE00074277	1126831	41.021	2.601	PB	18	GR	944.069
13/12/2005 12:43	WE00074277	1126831	0.100	0.000	PB	99	GR	944.069
13/12/2005 12:43	WE00074277	1126831	3.238	0.112	PB	06	GR	944.069
13/12/2005 12:43	WE00074277	1126831	0.120	0.000	B	06	GR	944.069
19/12/2005 8:19	WE00074381	1144780	0.026	0.000	A	99	GR	950.234
19/12/2005 8:19	WE00074381	1144780	30.240	0.941	PB	18	GR	950.234
19/12/2005 8:19	WE00074381	1144780	13.321	0.089	PB	06	GR	950.234
19/12/2005 8:19	WE00074381	1144780	0.820	0.003	PB	99	GR	950.234

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
19/12/2005 8:19	WE00074381	1144780	0.102	0.013	A	06	GR	950.234
21/12/2005 11:26	WE00074435	1153334	41.619	2.113	PB	18	GR	889.876
21/12/2005 11:26	WE00074435	1153334	8.607	0.280	PB	06	GR	889.876
21/12/2005 11:26	WE00074435	1153334	0.331	0.000	PB	99	GR	889.876
29/12/2005 11:59	WE00074497	1167403	4.546	0.160	PB	06	GR	951.651
29/12/2005 11:59	WE00074497	1167403	0.339	0.013	PB	99	GR	951.651
29/12/2005 11:59	WE00074497	1167403	23.317	0.624	PB	18	GR	951.651
04/01/2006 8:42	WE00074559	1181036	4.428	0.181	PB	06	GR	868.085
04/01/2006 8:42	WE00074559	1181036	0.117	0.000	PB	99	GR	868.085
04/01/2006 8:42	WE00074559	1181036	39.362	3.880	PB	18	GR	868.085
04/01/2006 8:42	WE00074559	1181036	0.219	0.008	B	18	GR	868.085
04/01/2006 8:42	WE00074559	1181036	0.621	0.000	A	18	GR	868.085
04/01/2006 8:42	WE00074559	1181036	0.091	0.000	B	06	GR	868.085
04/01/2006 8:42	WE00074559	1181036	0.081	0.013	A	06	GR	868.085
23/01/2006 12:27	WE00074836	1247611	0.262	0.000	PB	99	GR	962.807
23/01/2006 12:27	WE00074836	1247611	45.706	2.891	PB	18	GR	962.807
23/01/2006 12:27	WE00074836	1247611	3.048	0.041	PB	06	GR	962.807
26/01/2006 8:42	WE00074897	1262215	0.203	0.003	PB	99	GR	1112.805
26/01/2006 8:42	WE00074897	1262215	33.953	4.290	PB	18	GR	1112.805
26/01/2006 8:42	WE00074897	1262215	3.472	0.059	PB	06	GR	1112.805
26/01/2006 8:42	WE00074897	1262215	0.201	0.021	A	06	GR	1112.805
28/01/2006 7:46	WE00086024	1267986	2.357	0.038	PB	06	GR	986.377
28/01/2006 7:46	WE00086024	1267986	0.211	0.016	A	18	GR	986.377
28/01/2006 7:46	WE00086024	1267986	39.321	4.295	PB	18	GR	986.377
28/01/2006 7:46	WE00086024	1267986	0.086	0.000	PB	99	GR	986.377
28/01/2006 7:46	WE00086024	1267986	0.259	0.009	A	06	GR	986.377
31/01/2006 11:41	WE00086114	1277656	0.107	0.000	PB	99	GR	1022.959
31/01/2006 11:41	WE00086114	1277656	40.069	3.444	PB	18	GR	1022.959
31/01/2006 11:41	WE00086114	1277656	4.371	0.019	PB	06	GR	1022.959

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
31/01/2006 11:41	WE00086114	1277656	0.120	0.000	B	06	GR	1022.959
03/02/2006 16:14	WE00086236	1292977	41.040	4.403	PB	18	GR	1006.967
03/02/2006 16:14	WE00086236	1292977	3.833	0.028	PB	06	GR	1006.967
03/02/2006 16:14	WE00086236	1292977	0.008	0.000	A	99	GR	1006.967
03/02/2006 16:14	WE00086236	1292977	0.458	0.003	PB	99	GR	1006.967
24/02/2006 9:44	WE00092788	1373045	37.910	3.061	PB	18	GR	993.532
24/02/2006 9:44	WE00092788	1373045	6.218	0.027	PB	06	GR	993.532
24/02/2006 9:44	WE00092788	1373045	0.237	0.000	PB	99	GR	993.532
26/02/2006 16:30	WE00091294	1373047	1.818	0.016	A	06	GR	1022.375
26/02/2006 16:30	WE00091294	1373047	7.333	0.165	PB	06	GR	1022.375
26/02/2006 16:30	WE00091294	1373047	3.261	0.087	A	18	GR	1022.375
26/02/2006 16:30	WE00091294	1373047	0.182	0.000	PB	99	GR	1022.375
26/02/2006 16:30	WE00091294	1373047	33.517	4.234	PB	18	GR	1022.375
09/03/2006 15:55	WE00094135	1416125	0.133	0.003	PB	99	GR	1037.794
09/03/2006 15:55	WE00094135	1416125	0.013	0.000	A	99	GR	1037.794
09/03/2006 15:55	WE00094135	1416125	28.627	4.011	PB	18	GR	1037.794
09/03/2006 15:55	WE00094135	1416125	4.721	0.245	A	18	GR	1037.794
09/03/2006 15:55	WE00094135	1416125	2.317	0.091	A	06	GR	1037.794
09/03/2006 15:55	WE00094135	1416125	4.159	0.112	PB	06	GR	1037.794
15/03/2006 15:07	WE00094654	1434815	14.404	0.401	PB	06	GR	1109.903
15/03/2006 15:07	WE00094654	1434815	0.355	0.003	PB	99	GR	1109.903
15/03/2006 15:07	WE00094654	1434815	24.928	1.577	PB	18	GR	1109.903
20/03/2006 2:09	WE00087398	1451389	0.379	0.032	PB	99	GR	1015.289
20/03/2006 2:09	WE00087398	1451389	0.617	0.206	A	18	GR	1015.289
20/03/2006 2:09	WE00087398	1451389	6.877	0.229	PB	06	GR	1015.289
20/03/2006 2:09	WE00087398	1451389	0.052	0.000	A	06	GR	1015.289
20/03/2006 2:09	WE00087398	1451389	37.505	3.103	PB	18	GR	1015.289
21/03/2006 2:47	WE00087436	1456378	0.151	0.003	PB	99	GR	984.479
21/03/2006 2:47	WE00087436	1456378	6.471	0.066	PB	06	GR	984.479

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
21/03/2006 2:47	WE00087436	1456378	38.373	1.695	PB	18	GR	984.479
23/03/2006 3:03	WE00087023	1464290	38.349	0.964	PB	18	GR	1029.494
23/03/2006 3:03	WE00087023	1464290	3.768	0.158	PB	06	GR	1029.494
23/03/2006 3:03	WE00087023	1464290	0.203	0.003	PB	99	GR	1029.494
25/03/2006 8:11	WE00087087	1470328	0.131	0.000	A	06	GR	1040.214
25/03/2006 8:11	WE00087087	1470328	3.688	0.035	PB	06	GR	1040.214
25/03/2006 8:11	WE00087087	1470328	0.794	0.039	A	18	GR	1040.214
25/03/2006 8:11	WE00087087	1470328	38.643	2.993	PB	18	GR	1040.214
25/03/2006 8:11	WE00087087	1470328	0.120	0.000	PB	99	GR	1040.214
30/06/2006 9:09	WE00096714	1619013	2.988	0.203	A	06	GR	909.716
30/06/2006 9:09	WE00096714	1619013	31.656	2.465	A	18	GR	909.716
30/06/2006 9:09	WE00096714	1619013	0.026	0.003	A	99	GR	909.716
07/07/2006 10:37	WE00094523	1631125	1.551	0.015	A	99	GR	710.187
07/07/2006 10:37	WE00094523	1631125	24.890	1.127	A	18	GR	710.187
07/07/2006 10:37	WE00094523	1631125	27.672	1.393	A	06	GR	710.187
11/08/2006 11:10	WE00087544	1698659	40.062	7.135	A	18	GR	919.604
11/08/2006 11:10	WE00087544	1698659	0.707	0.164	PB	18	GR	919.604
11/08/2006 11:10	WE00087544	1698659	0.472	0.019	A	99	GR	919.604
11/08/2006 11:10	WE00087544	1698659	11.640	0.898	A	06	GR	919.604
11/08/2006 11:10	WE00087544	1698659	0.139	0.013	PB	06	GR	919.604
22/08/2006 11:11	WD00054525	1720184	45.830	3.235	A	18	GR	741.728
22/08/2006 11:11	WD00054525	1720184	0.370	0.003	A	99	GR	741.728
22/08/2006 11:11	WD00054525	1720184	12.772	0.215	A	06	GR	741.728
24/08/2006 7:20	WE00087715	1726636	0.222	0.019	A	99	GR	863.939
24/08/2006 7:20	WE00087715	1726636	5.041	0.104	A	06	GR	863.939
24/08/2006 7:20	WE00087715	1726636	43.355	4.522	A	18	GR	863.939
07/09/2006 16:48	WE00089510	1754677	0.047	0.000	A	99	GR	806.396
07/09/2006 16:48	WE00089510	1754677	37.046	3.185	A	18	GR	806.396
07/09/2006 16:48	WE00089510	1754677	3.005	0.043	A	06	GR	806.396

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
07/09/2006 16:48	WE00089510	1754677	0.671	0.078	PB	18	GR	806.396
28/09/2006 14:10	WE00089721	1792659	15.561	1.180	A	18	GR	769.569
28/09/2006 14:10	WE00089721	1792659	0.039	0.000	A	99	GR	769.569
28/09/2006 14:10	WE00089721	1792659	0.749	0.117	PB	18	GR	769.569
28/09/2006 14:10	WE00089721	1792659	0.052	0.000	PB	06	GR	769.569
28/09/2006 14:10	WE00089721	1792659	0.804	0.003	A	06	GR	769.569
29/09/2006 13:57	WE00089751	1795620	4.685	0.464	A	06	GR	855.230
29/09/2006 13:57	WE00089751	1795620	51.301	6.289	A	18	GR	855.230
29/09/2006 13:57	WE00089751	1795620	0.052	0.000	A	99	GR	855.230
02/10/2006 6:57	WE00096317	1798710	2.907	0.175	A	06	GR	802.487
02/10/2006 6:57	WE00096317	1798710	44.049	4.164	A	18	GR	802.487
02/10/2006 6:57	WE00096317	1798710	0.013	0.000	A	99	GR	802.487
05/10/2006 9:27	WE00089840	1807477	0.871	0.006	PB	18	GR	863.426
05/10/2006 9:27	WE00089840	1807477	0.086	0.000	A	99	GR	863.426
05/10/2006 9:27	WE00089840	1807477	2.437	0.126	A	06	GR	863.426
05/10/2006 9:27	WE00089840	1807477	0.029	0.000	PB	06	GR	863.426
05/10/2006 9:27	WE00089840	1807477	49.332	4.466	A	18	GR	863.426
16/11/2006 16:02	U2647759	1888708	0.988	0.006	PB	06	GR	931.404
16/11/2006 16:02	U2647759	1888708	0.068	0.000	B	06	GR	931.404
16/11/2006 16:02	U2647759	1888708	37.513	8.373	A	18	GR	931.404
16/11/2006 16:02	U2647759	1888708	1.716	0.000	PB	18	GR	931.404
16/11/2006 16:02	U2647759	1888708	0.026	0.000	A	99	GR	931.404
16/11/2006 16:02	U2647759	1888708	5.880	0.696	A	06	GR	931.404
08/12/2006 16:36	WE00097487	1939309	5.753	0.423	A	06	GR	922.975
08/12/2006 16:36	WE00097487	1939309	0.104	0.000	PB	06	GR	922.975
08/12/2006 16:36	WE00097487	1939309	0.198	0.081	PB	18	GR	922.975
08/12/2006 16:36	WE00097487	1939309	0.081	0.000	A	99	GR	922.975
08/12/2006 16:36	WE00097487	1939309	43.983	6.006	A	18	GR	922.975
13/12/2006 11:01	WD00055547	1949174	0.026	0.000	A	99	GR	958.498

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
13/12/2006 11:01	WD00055547	1949174	1.038	0.376	PB	18	GR	958.498
13/12/2006 11:01	WD00055547	1949174	0.052	0.013	PB	06	GR	958.498
13/12/2006 11:01	WD00055547	1949174	4.634	0.329	A	06	GR	958.498
13/12/2006 11:01	WD00055547	1949174	44.921	6.124	A	18	GR	958.498
02/02/2007 18:27	WE00117651	2063191	29.706	1.726	A	18	GR	1050.361
02/02/2007 18:27	WE00117651	2063191	9.370	0.534	A	06	GR	1050.361
02/02/2007 18:27	WE00117651	2063191	0.276	0.000	A	99	GR	1050.361
15/03/2007 8:39	U2976709	2150315	3.797	0.466	A	06	GR	975.776
15/03/2007 8:39	U2976709	2150315	37.937	4.633	A	18	GR	975.776
15/03/2007 8:39	U2976709	2150315	0.185	0.052	PB	18	GR	975.776
15/03/2007 8:39	U2976709	2150315	0.013	0.000	A	99	GR	975.776
24/05/2006 13:44	U2554101	1547682	25.181	2.885	PB	18	GR	850.716
24/05/2006 13:44	U2554101	1547682	0.026	0.000	PB	99	GR	850.716
24/05/2006 13:44	U2554101	1547682	4.708	0.088	PB	06	GR	850.716
25/08/2006 13:54	WD00054598	1729965	0.102	0.000	A	06	GR	779.987
25/08/2006 13:54	WD00054598	1729965	6.080	0.025	PB	06	GR	779.987
25/08/2006 13:54	WD00054598	1729965	10.516	0.224	PB	18	GR	779.987
25/08/2006 13:54	WD00054598	1729965	0.500	0.000	PB	99	GR	779.987
28/02/2007 12:40	WE00101187	2127147	9.384	0.466	PB	18	GR	1021.417
28/02/2007 12:40	WE00101187	2127147	0.279	0.003	A	18	GR	1021.417
28/02/2007 12:40	WE00101187	2127147	1.146	0.145	PB	06	GR	1021.417
28/02/2007 12:40	WE00101187	2127147	0.143	0.032	A	06	GR	1021.417
28/02/2007 12:40	WE00101187	2127147	0.013	0.000	PB	99	GR	1021.417
06/03/2007 12:36	WD00049234	2139148	36.036	1.361	PB	18	GR	1014.364
06/03/2007 12:36	WD00049234	2139148	0.047	0.000	PB	99	GR	1014.364
06/03/2007 12:36	WD00049234	2139148	5.720	0.062	PB	06	GR	1014.364
14/07/2006 14:38	WD00054069	1644261	0.078	0.000	A	99	GR	755.689
14/07/2006 14:38	WD00054069	1644261	52.689	3.263	A	18	GR	755.689
14/07/2006 14:38	WD00054069	1644261	4.465	0.177	A	06	GR	755.689

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
08/08/2006 7:34	WE00096352	1690348	0.377	0.000	PB	18	GR	835.696
08/08/2006 7:34	WE00096352	1690348	47.235	3.447	A	18	GR	835.696
08/08/2006 7:34	WE00096352	1690348	0.081	0.000	B	06	GR	835.696
08/08/2006 7:34	WE00096352	1690348	0.039	0.000	PB	06	GR	835.696
08/08/2006 7:34	WE00096352	1690348	2.832	0.210	A	06	GR	835.696
24/09/2006 12:23	WE00096920	1783025	1.355	0.172	A	06	GR	1005.774
24/09/2006 12:23	WE00096920	1783025	1.115	0.046	PB	06	GR	1005.774
24/09/2006 12:23	WE00096920	1783025	25.626	4.385	A	18	GR	1005.774
24/09/2006 12:23	WE00096920	1783025	6.359	0.581	PB	18	GR	1005.774
19/12/2006 14:59	WD00055641	1964501	43.651	2.164	A	18	GR	905.235
19/12/2006 14:59	WD00055641	1964501	1.386	0.019	A	06	GR	905.235
19/12/2006 14:59	WD00055641	1964501	0.052	0.000	A	99	GR	905.235
12/01/2007 15:45	WD00055875	2004707	12.376	1.300	A	06	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	0.227	0.011	PB	06	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	0.021	0.000	SP	06	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	27.512	2.317	A	18	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	0.081	0.013	PB	18	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	0.021	0.000	SP	99	GR	1050.801
12/01/2007 15:45	WD00055875	2004707	0.216	0.003	A	99	GR	1050.801
22/01/2007 16:32	U2658444	2028030	6.736	0.500	A	06	GR	1009.025
22/01/2007 16:32	U2658444	2028030	42.420	7.919	A	18	GR	1009.025
22/01/2007 16:32	U2658444	2028030	1.269	0.432	PB	18	GR	1009.025
22/01/2007 16:32	U2658444	2028030	0.180	0.015	A	99	GR	1009.025
22/01/2007 16:32	U2658444	2028030	0.143	0.000	PB	06	GR	1009.025
26/01/2007 9:49	WE00100694	2043068	34.837	2.958	A	18	GR	1022.857
26/01/2007 9:49	WE00100694	2043068	0.112	0.000	A	99	GR	1022.857
26/01/2007 9:49	WE00100694	2043068	3.915	0.075	A	06	GR	1022.857
01/02/2007 12:16	WE00100749	2058666	3.089	0.112	A	06	GR	909.810
01/02/2007 12:16	WE00100749	2058666	0.039	0.003	B	06	GR	909.810

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
01/02/2007 12:16	WE00100749	2058666	0.209	0.000	PB	06	GR	909.810
01/02/2007 12:16	WE00100749	2058666	40.578	2.361	A	18	GR	909.810
01/02/2007 12:16	WE00100749	2058666	0.013	0.000	PB	99	GR	909.810
01/02/2007 12:16	WE00100749	2058666	0.130	0.000	A	99	GR	909.810
01/02/2007 12:16	WE00100749	2058666	0.130	0.000	PB	18	GR	909.810
09/02/2007 19:06	WE00101395	2081438	0.026	0.000	PB	99	GR	920.491
09/02/2007 19:06	WE00101395	2081438	34.735	6.185	A	18	GR	920.491
09/02/2007 19:06	WE00101395	2081438	3.183	0.352	PB	18	GR	920.491
09/02/2007 19:06	WE00101395	2081438	0.835	0.003	PB	06	GR	920.491
09/02/2007 19:06	WE00101395	2081438	8.526	0.366	A	06	GR	920.491
09/02/2007 19:06	WE00101395	2081438	0.112	0.000	A	99	GR	920.491
14/02/2007 12:06	WD00056369	2092039	45.545	11.245	A	18	GR	1130.048
14/02/2007 12:06	WD00056369	2092039	1.710	0.256	A	06	GR	1130.048
14/02/2007 12:06	WD00056369	2092039	2.858	1.298	PB	18	GR	1130.048
14/02/2007 12:06	WD00056369	2092039	0.003	0.000	A	99	GR	1130.048
20/02/2007 13:36	WD00056496	2106672	0.162	0.000	PB	18	GR	1175.352
20/02/2007 13:36	WD00056496	2106672	46.660	11.579	A	18	GR	1175.352
20/02/2007 13:36	WD00056496	2106672	0.232	0.000	PB	06	GR	1175.352
20/02/2007 13:36	WD00056496	2106672	0.289	0.013	A	06	GR	1175.352
26/02/2007 8:53	WD00056611	2120683	33.719	10.562	A	18	GR	1203.020
26/02/2007 8:53	WD00056611	2120683	0.008	0.000	A	99	GR	1203.020
26/02/2007 8:53	WD00056611	2120683	0.172	0.029	A	06	GR	1203.020
06/03/2007 8:38	WD00056787	2139146	0.073	0.000	A	99	GR	1027.868
06/03/2007 8:38	WD00056787	2139146	0.993	0.042	A	06	GR	1027.868
06/03/2007 8:38	WD00056787	2139146	7.057	0.366	A	18	GR	1027.868
11/07/2006 16:22	WE059654	1636992	0.542	0.029	A	06	GR	843.348
11/07/2006 16:22	WE059654	1636992	11.732	0.036	PB	06	GR	843.348
11/07/2006 16:22	WE059654	1636992	0.021	0.000	SP	06	GR	843.348
11/07/2006 16:22	WE059654	1636992	0.034	0.000	SP	99	GR	843.348

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
11/07/2006 16:22	WE059654	1636992	0.801	0.003	PB	99	GR	843.348
11/07/2006 16:22	WE059654	1636992	0.013	0.000	A	99	GR	843.348
11/07/2006 16:22	WE059654	1636992	19.448	0.593	PB	18	GR	843.348
11/07/2006 16:22	WE059654	1636992	1.030	0.008	A	18	GR	843.348
24/09/2006 17:09	WE00089613	1783026	0.305	0.000	PB	99	GR	882.484
24/09/2006 17:09	WE00089613	1783026	0.188	0.042	A	06	GR	882.484
24/09/2006 17:09	WE00089613	1783026	34.793	2.150	PB	18	GR	882.484
24/09/2006 17:09	WE00089613	1783026	7.522	0.162	PB	06	GR	882.484
11/10/2006 13:53	WD00055083	1816911	39.585	2.814	PB	18	GR	953.249
11/10/2006 13:53	WD00055083	1816911	4.365	0.159	PB	06	GR	953.249
11/10/2006 13:53	WD00055083	1816911	0.177	0.000	PB	99	GR	953.249
31/10/2006 13:57	WE00089986	1853283	0.190	0.000	PB	99	GR	876.750
31/10/2006 13:57	WE00089986	1853283	4.806	0.067	PB	06	GR	876.750
31/10/2006 13:57	WE00089986	1853283	44.702	2.126	PB	18	GR	876.750
13/11/2006 10:30	WE00090192	1879798	0.029	0.000	A	06	GR	936.807
13/11/2006 10:30	WE00090192	1879798	35.482	3.432	PB	18	GR	936.807
13/11/2006 10:30	WE00090192	1879798	0.473	0.003	PB	99	GR	936.807
13/11/2006 10:30	WE00090192	1879798	9.605	0.235	PB	06	GR	936.807
20/12/2006 16:58	WE00099587	1967562	0.143	0.000	PB	99	GR	931.077
20/12/2006 16:58	WE00099587	1967562	34.104	2.293	PB	18	GR	931.077
20/12/2006 16:58	WE00099587	1967562	13.156	0.286	PB	06	GR	931.077
20/12/2006 16:58	WE00099587	1967562	0.081	0.000	A	18	GR	931.077
09/01/2007 14:35	WE00099639	1995700	0.039	0.000	A	06	GR	849.204
09/01/2007 14:35	WE00099639	1995700	9.594	0.349	PB	06	GR	849.204
09/01/2007 14:35	WE00099639	1995700	0.482	0.042	A	18	GR	849.204
09/01/2007 14:35	WE00099639	1995700	35.666	1.545	PB	18	GR	849.204
09/01/2007 14:35	WE00099639	1995700	0.117	0.000	SP	18	GR	849.204
09/01/2007 14:35	WE00099639	1995700	0.091	0.000	PB	99	GR	849.204
09/01/2007 14:49	WE00099641	1995698	0.232	0.003	PB	99	GR	859.413

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
09/01/2007 14:49	WE00099641	1995698	12.131	0.195	PB	06	GR	859.413
09/01/2007 14:49	WE00099641	1995698	0.065	0.000	A	18	GR	859.413
09/01/2007 14:49	WE00099641	1995698	36.530	0.925	PB	18	GR	859.413
18/01/2007 12:10	WD00055964	2022456	0.680	0.003	PB	99	GR	1098.853
18/01/2007 12:10	WD00055964	2022456	23.744	3.047	PB	18	GR	1098.853
18/01/2007 12:10	WD00055964	2022456	0.450	0.013	A	18	GR	1098.853
18/01/2007 12:10	WD00055964	2022456	15.324	0.284	PB	06	GR	1098.853
18/01/2007 12:10	WD00055964	2022456	0.042	0.000	A	06	GR	1098.853
23/01/2007 12:52	WE00088763	2031457	5.228	0.065	PB	06	GR	909.166
23/01/2007 12:52	WE00088763	2031457	0.211	0.000	PB	99	GR	909.166
23/01/2007 12:52	WE00088763	2031457	46.070	2.984	PB	18	GR	909.166
23/01/2007 12:52	WE00088763	2031457	0.068	0.000	B	06	GR	909.166
31/01/2007 9:53	WE00117576	2055206	2.873	0.033	PB	06	GR	959.523
31/01/2007 9:53	WE00117576	2055206	0.052	0.008	A	06	GR	959.523
31/01/2007 9:53	WE00117576	2055206	0.125	0.000	PB	99	GR	959.523
31/01/2007 9:53	WE00117576	2055206	41.618	1.978	PB	18	GR	959.523
31/01/2007 9:53	WE00117576	2055206	1.772	0.149	A	18	GR	959.523
06/02/2007 18:26	WD00056236	2069130	0.167	0.000	PB	99	GR	902.162
06/02/2007 18:26	WD00056236	2069130	32.855	0.380	PB	18	GR	902.162
06/02/2007 18:26	WD00056236	2069130	11.478	0.170	PB	06	GR	902.162
14/02/2007 11:23	WE00101802	2092042	4.419	0.014	PB	06	GR	911.333
14/02/2007 11:23	WE00101802	2092042	0.117	0.000	A	18	GR	911.333
14/02/2007 11:23	WE00101802	2092042	39.373	0.990	PB	18	GR	911.333
14/02/2007 11:23	WE00101802	2092042	0.065	0.000	PB	99	GR	911.333
19/02/2007 18:34	WE00101170	2106677	38.376	1.767	PB	18	GR	985.595
19/02/2007 18:34	WE00101170	2106677	0.227	0.055	A	18	GR	985.595
19/02/2007 18:34	WE00101170	2106677	1.396	0.061	PB	06	GR	985.595
19/02/2007 18:34	WE00101170	2106677	0.156	0.021	A	06	GR	985.595
05/03/2007 10:51	WD00056766	2137076	40.977	1.850	PB	18	GR	898.306

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
05/03/2007 10:51	WD00056766	2137076	0.743	0.045	A	18	GR	898.306
05/03/2007 10:51	WD00056766	2137076	5.361	0.216	PB	06	GR	898.306
05/03/2007 10:51	WD00056766	2137076	0.545	0.022	A	06	GR	898.306
05/03/2007 10:51	WD00056766	2137076	0.013	0.000	A	99	GR	898.306
05/03/2007 10:51	WD00056766	2137076	0.013	0.000	PB	99	GR	898.306
11/03/2007 11:08	WD00056888	2144279	1.538	0.042	PB	06	GR	935.040
11/03/2007 11:08	WD00056888	2144279	47.121	3.389	PB	18	GR	935.040
15/03/2007 5:13	WD00056961	2150317	0.170	0.016	A	06	GR	955.679
15/03/2007 5:13	WD00056961	2150317	8.084	0.095	PB	06	GR	955.679
15/03/2007 5:13	WD00056961	2150317	0.081	0.000	A	18	GR	955.679
15/03/2007 5:13	WD00056961	2150317	38.535	1.319	PB	18	GR	955.679
15/03/2007 5:13	WD00056961	2150317	0.188	0.006	PB	99	GR	955.679
13/07/2007 12:04	WD00057169	2212176	0.013	0.000	PB	99	GR	849.536
13/07/2007 12:04	WD00057169	2212176	0.207	0.000	PB	06	GR	849.536
13/07/2007 12:04	WD00057169	2212176	6.072	0.096	A	06	GR	849.536
13/07/2007 12:04	WD00057169	2212176	0.279	0.008	PB	18	GR	849.536
13/07/2007 12:04	WD00057169	2212176	0.354	0.003	A	99	GR	849.536
13/07/2007 12:04	WD00057169	2212176	42.082	3.640	A	18	GR	849.536
31/07/2007 14:06	WE00103561	2228553	0.159	0.003	A	99	GR	791.836
31/07/2007 14:06	WE00103561	2228553	8.441	0.110	A	06	GR	791.836
31/07/2007 14:06	WE00103561	2228553	25.217	0.288	A	18	GR	791.836
12/08/2007 13:12	WE00102983	2238483	0.026	0.000	A	99	GR	853.639
12/08/2007 13:12	WE00102983	2238483	0.146	0.000	PB	18	GR	853.639
12/08/2007 13:12	WE00102983	2238483	51.094	4.927	A	18	GR	853.639
12/08/2007 13:12	WE00102983	2238483	3.343	0.352	A	06	GR	853.639
27/08/2007 15:41	WD00057741	2253905	0.065	0.000	PB	18	GR	845.030
27/08/2007 15:41	WD00057741	2253905	1.761	0.019	A	99	GR	845.030
27/08/2007 15:41	WD00057741	2253905	0.013	0.000	PB	99	GR	845.030
27/08/2007 15:41	WD00057741	2253905	0.278	0.000	PB	06	GR	845.030

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
27/08/2007 15:41	WD00057741	2253905	29.517	0.425	A	18	GR	845.030
27/08/2007 15:41	WD00057741	2253905	17.931	0.389	A	06	GR	845.030
06/09/2007 14:10	WD00057901	2266106	1.239	0.035	A	99	GR	804.804
06/09/2007 14:10	WD00057901	2266106	0.026	0.000	PB	99	GR	804.804
06/09/2007 14:10	WD00057901	2266106	0.081	0.000	PB	18	GR	804.804
06/09/2007 14:10	WD00057901	2266106	32.687	2.316	A	18	GR	804.804
06/09/2007 14:10	WD00057901	2266106	0.622	0.000	PB	06	GR	804.804
06/09/2007 14:10	WD00057901	2266106	20.306	0.734	A	06	GR	804.804
10/09/2007 16:24	WD00057966	2269757	0.039	0.003	PB	99	GR	805.758
10/09/2007 16:24	WD00057966	2269757	1.795	0.015	A	99	GR	805.758
10/09/2007 16:24	WD00057966	2269757	21.327	0.794	A	06	GR	805.758
10/09/2007 16:24	WD00057966	2269757	1.097	0.066	PB	06	GR	805.758
10/09/2007 16:24	WD00057966	2269757	28.801	0.872	A	18	GR	805.758
10/09/2007 16:24	WD00057966	2269757	0.328	0.021	PB	18	GR	805.758
23/09/2007 11:47	WE00105213	2283139	36.535	4.723	A	18	GR	944.698
23/09/2007 11:47	WE00105213	2283139	0.112	0.000	A	99	GR	944.698
23/09/2007 11:47	WE00105213	2283139	2.037	0.183	A	06	GR	944.698
04/10/2007 11:17	WE00107682	2298802	0.130	0.013	A	99	GR	848.318
04/10/2007 11:17	WE00107682	2298802	4.808	0.190	A	06	GR	848.318
04/10/2007 11:17	WE00107682	2298802	49.484	5.782	A	18	GR	848.318
24/10/2007 10:51	WD00058728	2320322	46.983	5.811	A	18	GR	948.562
24/10/2007 10:51	WD00058728	2320322	3.236	0.284	A	06	GR	948.562
24/10/2007 10:51	WD00058728	2320322	0.117	0.000	PB	18	GR	948.562
24/10/2007 10:51	WD00058728	2320322	0.026	0.000	A	99	GR	948.562
05/11/2007 13:54	U3015878	2332329	6.901	0.396	A	06	GR	915.562
05/11/2007 13:54	U3015878	2332329	0.977	0.008	PB	06	GR	915.562
05/11/2007 13:54	U3015878	2332329	40.124	4.047	A	18	GR	915.562
05/11/2007 13:54	U3015878	2332329	1.756	0.011	PB	18	GR	915.562
05/11/2007 13:54	U3015878	2332329	0.320	0.000	A	99	GR	915.562

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
05/11/2007 13:54	U3015878	2332329	0.039	0.000	PB	99	GR	915.562
27/11/2007 13:53	WD00059158	2354962	42.336	5.539	A	18	GR	970.739
27/11/2007 13:53	WD00059158	2354962	3.553	0.178	A	06	GR	970.739
27/11/2007 13:53	WD00059158	2354962	0.086	0.000	A	99	GR	970.739
13/12/2007 17:38	U3017029	2374145	2.307	0.316	PB	18	GR	1073.138
13/12/2007 17:38	U3017029	2374145	0.255	0.003	A	99	GR	1073.138
13/12/2007 17:38	U3017029	2374145	34.569	5.391	A	18	GR	1073.138
13/12/2007 17:38	U3017029	2374145	0.026	0.000	PB	99	GR	1073.138
13/12/2007 17:38	U3017029	2374145	7.950	0.628	A	06	GR	1073.138
13/12/2007 17:38	U3017029	2374145	0.313	0.019	PB	06	GR	1073.138
19/12/2007 16:29	U3017247	2380798	0.112	0.000	SP	06	GR	1198.966
19/12/2007 16:29	U3017247	2380798	45.082	14.370	A	18	GR	1198.966
19/12/2007 16:29	U3017247	2380798	0.613	0.000	PB	06	GR	1198.966
19/12/2007 16:29	U3017247	2380798	2.642	0.047	A	06	GR	1198.966
19/12/2007 16:29	U3017247	2380798	0.656	0.000	PB	18	GR	1198.966
19/12/2007 16:29	U3017247	2380798	0.065	0.000	SP	18	GR	1198.966
19/12/2007 16:29	U3017247	2380798	0.052	0.000	A	99	GR	1198.966
07/01/2008 16:23	WD00038731	2390846	0.013	0.000	A	99	GR	945.689
07/01/2008 16:23	WD00038731	2390846	52.197	8.205	A	18	GR	945.689
07/01/2008 16:23	WD00038731	2390846	2.116	0.292	A	06	GR	945.689
14/01/2008 16:55	WD00059785	2402381	0.104	0.000	A	99	GR	1002.637
14/01/2008 16:55	WD00059785	2402381	0.312	0.000	SP	18	GR	1002.637
14/01/2008 16:55	WD00059785	2402381	27.512	2.966	A	18	GR	1002.637
14/01/2008 16:55	WD00059785	2402381	0.240	0.000	SP	06	GR	1002.637
14/01/2008 16:55	WD00059785	2402381	7.547	0.514	A	06	GR	1002.637
16/01/2008 7:15	WD00059827	2406386	1.162	0.044	A	06	GR	1107.096
16/01/2008 7:15	WD00059827	2406386	44.378	10.350	A	18	GR	1107.096
24/01/2008 15:50	WD00059990	2421121	3.856	0.237	A	06	GR	967.459
24/01/2008 15:50	WD00059990	2421121	43.501	7.222	A	18	GR	967.459

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
24/01/2008 15:50	WD00059990	2421121	0.065	0.013	A	99	GR	967.459
12/02/2008 7:01	WE00108113	2441691	37.720	8.870	A	18	GR	1211.819
12/02/2008 7:01	WE00108113	2441691	0.078	0.000	A	99	GR	1211.819
12/02/2008 7:01	WE00108113	2441691	0.008	0.000	SP	99	GR	1211.819
12/02/2008 7:01	WE00108113	2441691	3.565	0.479	A	06	GR	1211.819
12/02/2008 7:01	WE00108113	2441691	0.029	0.000	SP	06	GR	1211.819
03/03/2008 23:54	WE00109516	2466185	32.200	2.303	A	18	GR	953.417
03/03/2008 23:54	WE00109516	2466185	0.013	0.000	A	99	GR	953.417
03/03/2008 23:54	WE00109516	2466185	8.954	0.266	A	06	GR	953.417
13/03/2008 12:30	WE00110428	2479962	36.616	7.451	A	18	GR	1011.129
13/03/2008 12:30	WE00110428	2479962	0.217	0.009	A	99	GR	1011.129
13/03/2008 12:30	WE00110428	2479962	11.514	1.980	A	06	GR	1011.129
18/03/2008 6:27	WE00110485	2484858	5.200	0.235	A	06	GR	1049.991
18/03/2008 6:27	WE00110485	2484858	0.169	0.003	A	99	GR	1049.991
18/03/2008 6:27	WE00110485	2484858	25.855	3.281	A	18	GR	1049.991
13/07/2007 10:21	WD00057167	2212178	15.951	0.184	PB	06	GR	896.758
13/07/2007 10:21	WD00057167	2212178	0.744	0.000	PB	99	GR	896.758
13/07/2007 10:21	WD00057167	2212178	32.398	1.438	PB	18	GR	896.758
10/10/2007 12:06	WE00105817	2303602	0.068	0.003	A	06	GR	851.631
10/10/2007 12:06	WE00105817	2303602	4.653	0.100	PB	06	GR	851.631
10/10/2007 12:06	WE00105817	2303602	47.179	2.378	PB	18	GR	851.631
10/10/2007 12:06	WE00105817	2303602	0.133	0.000	PB	99	GR	851.631
12/12/2007 10:50	WE00107219	2372598	0.401	0.013	PB	99	GR	985.238
12/12/2007 10:50	WE00107219	2372598	0.013	0.003	A	99	GR	985.238
12/12/2007 10:50	WE00107219	2372598	18.387	0.731	PB	18	GR	985.238
12/12/2007 10:50	WE00107219	2372598	9.634	0.089	PB	06	GR	985.238
12/12/2007 10:50	WE00107219	2372598	0.039	0.000	A	06	GR	985.238
07/01/2008 7:42	WE00119047	2390848	48.036	2.320	PB	18	GR	898.662
07/01/2008 7:42	WE00119047	2390848	3.506	0.023	PB	06	GR	898.662

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
07/01/2008 7:42	WE00119047	2390848	0.052	0.000	PB	99	GR	898.662
26/01/2008 7:53	WE00108687	2421125	0.419	0.000	PB	99	GR	994.515
26/01/2008 7:53	WE00108687	2421125	11.060	0.322	PB	06	GR	994.515
26/01/2008 7:53	WE00108687	2421125	28.549	1.235	PB	18	GR	994.515
25/02/2008 4:28	WD00039071	2457115	0.034	0.000	PB	99	GR	1079.509
25/02/2008 4:28	WD00039071	2457115	37.339	5.131	PB	18	GR	1079.509
25/02/2008 4:28	WD00039071	2457115	0.279	0.086	A	18	GR	1079.509
25/02/2008 4:28	WD00039071	2457115	1.969	0.030	PB	06	GR	1079.509
25/02/2008 4:28	WD00039071	2457115	0.162	0.000	A	06	GR	1079.509
25/02/2008 4:28	WD00039071	2457115	0.026	0.000	A	99	GR	1079.509
09/11/2007 9:42	WE00118269	2337513	5.696	0.688	A	06	GR	1120.823
09/11/2007 9:42	WE00118269	2337513	0.328	0.000	PB	06	GR	1120.823
09/11/2007 9:42	WE00118269	2337513	42.204	11.883	A	18	GR	1120.823
09/11/2007 9:42	WE00118269	2337513	0.953	0.011	PB	18	GR	1120.823
09/11/2007 9:42	WE00118269	2337513	0.240	0.000	A	99	GR	1120.823
23/10/2007 15:50	WE00118509	2318837	3.285	0.003	PB	06	GR	863.412
23/10/2007 15:50	WE00118509	2318837	17.901	1.644	PB	18	GR	863.412
23/10/2007 15:50	WE00118509	2318837	0.104	0.000	PB	99	GR	863.412
29/06/2008 9:40	WE00123487	2515002	0.547	0.000	A	99	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.050	0.000	SP	06	GR	858.061
29/06/2008 9:40	WE00123487	2515002	41.689	6.207	A	18	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.013	0.000	SP	99	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.013	0.000	B	99	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.505	0.081	PB	18	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.389	0.006	PB	06	GR	858.061
29/06/2008 9:40	WE00123487	2515002	0.021	0.000	B	06	GR	858.061
29/06/2008 9:40	WE00123487	2515002	10.551	0.471	A	06	GR	858.061
15/08/2008 11:00	ED00000795	2541311	28.665	3.419	A	18	GR	950.640
15/08/2008 11:00	ED00000795	2541311	0.052	0.008	PB	06	GR	950.640

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DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
15/08/2008 11:00	ED00000795	2541311	3.113	0.226	A	06	GR	950.640
15/08/2008 11:00	ED00000795	2541311	0.559	0.008	PB	18	GR	950.640
08/09/2008 13:37	WE00124343	2553698	0.026	0.000	A	99	GR	814.173
08/09/2008 13:37	WE00124343	2553698	0.377	0.042	PB	18	GR	814.173
08/09/2008 13:37	WE00124343	2553698	51.173	2.434	A	18	GR	814.173
08/09/2008 13:37	WE00124343	2553698	3.525	0.216	A	06	GR	814.173
19/09/2008 19:22	ED00002083	2561882	0.013	0.000	A	99	GR	917.735
19/09/2008 19:22	ED00002083	2561882	49.564	4.504	A	18	GR	917.735
19/09/2008 19:22	ED00002083	2561882	2.728	0.066	A	06	GR	917.735
19/09/2008 19:22	ED00002083	2561882	0.013	0.000	PB	99	GR	917.735
30/09/2008 10:44	WE00127115	2567354	1.030	0.117	PB	18	GR	927.039
30/09/2008 10:44	WE00127115	2567354	38.393	1.981	A	18	GR	927.039
30/09/2008 10:44	WE00127115	2567354	0.201	0.000	PB	06	GR	927.039
30/09/2008 10:44	WE00127115	2567354	6.941	0.124	A	06	GR	927.039
30/09/2008 10:44	WE00127115	2567354	0.078	0.000	A	99	GR	927.039
27/10/2008 13:39	ED00001173	2586796	0.042	0.003	A	99	GR	1067.060
27/10/2008 13:39	ED00001173	2586796	2.326	0.223	A	06	GR	1067.060
27/10/2008 13:39	ED00001173	2586796	29.484	5.217	A	18	GR	1067.060
27/10/2008 13:39	ED00001173	2586796	0.328	0.328	PB	18	GR	1067.060
31/10/2008 16:27	WE00127264	2591402	3.464	0.170	A	06	GR	1056.743
31/10/2008 16:27	WE00127264	2591402	48.627	13.145	A	18	GR	1056.743
31/10/2008 16:27	WE00127264	2591402	0.013	0.000	A	99	GR	1056.743
28/11/2008 10:45	WE00127588	2612702	0.346	0.000	PB	18	GR	1103.463
28/11/2008 10:45	WE00127588	2612702	0.104	0.000	A	99	GR	1103.463
28/11/2008 10:45	WE00127588	2612702	44.445	11.683	A	18	GR	1103.463
28/11/2008 10:45	WE00127588	2612702	0.368	0.000	PB	06	GR	1103.463
28/11/2008 10:45	WE00127588	2612702	4.044	0.142	A	06	GR	1103.463
31/12/2008 12:52	WD00067304	2633225	42.295	3.201	A	18	GR	939.124
31/12/2008 12:52	WD00067304	2633225	0.039	0.000	A	99	GR	939.124

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
31/12/2008 12:52	WD00067304	2633225	4.500	0.135	A	06	GR	939.124
08/01/2009 11:58	WD00067363	2638292	0.645	0.000	PB	18	GR	1009.258
08/01/2009 11:58	WD00067363	2638292	4.200	0.220	A	06	GR	1009.258
08/01/2009 11:58	WD00067363	2638292	40.355	3.553	A	18	GR	1009.258
08/01/2009 11:58	WD00067363	2638292	0.283	0.000	PB	06	GR	1009.258
08/01/2009 11:58	WD00067363	2638292	0.013	0.000	PB	99	GR	1009.258
08/01/2009 11:58	WD00067363	2638292	0.091	0.011	A	99	GR	1009.258
26/01/2009 14:38	WD00067628	2654732	0.104	0.000	PB	06	GR	1194.001
26/01/2009 14:38	WD00067628	2654732	0.081	0.000	PB	18	GR	1194.001
26/01/2009 14:38	WD00067628	2654732	50.330	14.950	A	18	GR	1194.001
26/01/2009 14:38	WD00067628	2654732	0.442	0.069	A	06	GR	1194.001
02/02/2009 7:21	ED00004792	2661545	0.029	0.000	SP	06	GR	1127.660
02/02/2009 7:21	ED00004792	2661545	3.261	0.193	A	06	GR	1127.660
02/02/2009 7:21	ED00004792	2661545	0.026	0.000	A	99	GR	1127.660
02/02/2009 7:21	ED00004792	2661545	0.536	0.029	PB	18	GR	1127.660
02/02/2009 7:21	ED00004792	2661545	43.515	11.895	A	18	GR	1127.660
24/02/2009 12:43	U3017682	2682080	32.882	2.185	A	18	GR	1066.634
24/02/2009 12:43	U3017682	2682080	0.039	0.000	PB	99	GR	1066.634
24/02/2009 12:43	U3017682	2682080	0.065	0.000	PB	18	GR	1066.634
24/02/2009 12:43	U3017682	2682080	0.215	0.000	A	99	GR	1066.634
24/02/2009 12:43	U3017682	2682080	9.931	0.476	A	06	GR	1066.634
24/02/2009 12:43	U3017682	2682080	0.199	0.000	PB	06	GR	1066.634
05/03/2009 15:40	WD00065543	2691766	0.640	0.008	A	06	GR	1017.767
05/03/2009 15:40	WD00065543	2691766	45.021	4.229	A	18	GR	1017.767
20/03/2009 10:06	ED00010906	2703116	0.021	0.000	PB	99	GR	1004.392
20/03/2009 10:06	ED00010906	2703116	0.107	0.000	A	99	GR	1004.392
20/03/2009 10:06	ED00010906	2703116	0.302	0.008	PB	18	GR	1004.392
20/03/2009 10:06	ED00010906	2703116	39.233	5.446	A	18	GR	1004.392
20/03/2009 10:06	ED00010906	2703116	0.068	0.000	PB	06	GR	1004.392

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
20/03/2009 10:06	ED00010906	2703116	5.063	0.195	A	06	GR	1004.392
20/03/2009 10:06	ED00010906	2703116	0.013	0.000	SP	99	GR	1004.392
05/09/2008 9:53	WE00124287	2552553	15.157	0.134	PB	06	GR	859.766
05/09/2008 9:53	WE00124287	2552553	0.255	0.000	PB	99	GR	859.766
05/09/2008 9:53	WE00124287	2552553	31.854	0.631	PB	18	GR	859.766
21/10/2008 15:23	ED00002408	2581941	2.521	0.089	PB	18	GR	941.676
21/10/2008 15:23	ED00002408	2581941	0.078	0.000	PB	99	GR	941.676
21/10/2008 15:23	ED00002408	2581941	3.859	0.008	PB	06	GR	941.676
28/11/2008 11:08	WE00127590	2612703	0.013	0.000	PB	99	GR	988.162
28/11/2008 11:08	WE00127590	2612703	39.814	1.588	PB	18	GR	988.162
28/11/2008 11:08	WE00127590	2612703	4.609	0.021	PB	06	GR	988.162
10/12/2008 8:41	WE00127726	2622012	0.081	0.000	A	18	GR	995.579
10/12/2008 8:41	WE00127726	2622012	39.680	2.684	PB	18	GR	995.579
10/12/2008 8:41	WE00127726	2622012	3.292	0.111	PB	06	GR	995.579
16/01/2009 16:21	WE00128219	2646514	0.125	0.000	PB	99	GR	1050.887
16/01/2009 16:21	WE00128219	2646514	0.081	0.000	SP	18	GR	1050.887
16/01/2009 16:21	WE00128219	2646514	3.303	0.216	PB	06	GR	1050.887
16/01/2009 16:21	WE00128219	2646514	39.357	4.330	PB	18	GR	1050.887
30/01/2009 13:48	ED00004790	2659845	23.292	2.359	PB	18	GR	1104.236
30/01/2009 13:48	ED00004790	2659845	0.208	0.003	PB	99	GR	1104.236
30/01/2009 13:48	ED00004790	2659845	0.146	0.050	A	18	GR	1104.236
30/01/2009 13:48	ED00004790	2659845	8.258	0.281	PB	06	GR	1104.236
30/01/2009 13:48	ED00004790	2659845	0.279	0.076	A	06	GR	1104.236
24/03/2009 5:20	ED00010777	2703746	0.003	0.000	SP	99	GR	967.166
24/03/2009 5:20	ED00010777	2703746	0.207	0.000	A	06	GR	967.166
24/03/2009 5:20	ED00010777	2703746	0.325	0.013	PB	99	GR	967.166
24/03/2009 5:20	ED00010777	2703746	24.472	0.821	PB	18	GR	967.166
24/03/2009 5:20	ED00010777	2703746	0.198	0.000	A	18	GR	967.166
24/03/2009 5:20	ED00010777	2703746	14.395	0.086	PB	06	GR	967.166

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
24/07/2008 13:15	WE00123710	2527415	2.070	0.146	A	06	GR	854.275
24/07/2008 13:15	WE00123710	2527415	54.712	7.214	A	18	GR	854.275
16/12/2008 7:54	WD00067233	2626689	1.078	0.000	A	18	GR	879.247
16/12/2008 7:54	WD00067233	2626689	0.118	0.000	PB	99	GR	879.247
16/12/2008 7:54	WD00067233	2626689	3.954	0.135	PB	06	GR	879.247
16/12/2008 7:54	WD00067233	2626689	0.281	0.000	A	06	GR	879.247
16/12/2008 7:54	WD00067233	2626689	36.893	1.188	PB	18	GR	879.247
11/08/2009 15:08	ED00011162	2726023	0.370	0.021	PB	18	GR	790.222
11/08/2009 15:08	ED00011162	2726023	35.353	2.023	A	18	GR	790.222
11/08/2009 15:08	ED00011162	2726023	0.052	0.000	PB	06	GR	790.222
11/08/2009 15:08	ED00011162	2726023	0.809	0.094	A	06	GR	790.222
14/09/2009 11:23	WE00129223	2742045	3.749	0.097	A	06	GR	924.898
14/09/2009 11:23	WE00129223	2742045	0.013	0.000	A	99	GR	924.898
14/09/2009 11:23	WE00129223	2742045	0.065	0.000	PB	18	GR	924.898
14/09/2009 11:23	WE00129223	2742045	49.291	7.763	A	18	GR	924.898
14/09/2009 11:23	WE00129223	2742045	0.120	0.000	PB	06	GR	924.898
23/09/2009 19:16	WE00129363	2748003	0.156	0.013	PB	06	GR	899.513
23/09/2009 19:16	WE00129363	2748003	5.883	0.756	A	06	GR	899.513
23/09/2009 19:16	WE00129363	2748003	47.168	6.534	A	18	GR	899.513
23/09/2009 19:16	WE00129363	2748003	0.521	0.011	PB	18	GR	899.513
30/09/2009 13:56	WE00129439	2752411	3.776	0.368	A	06	GR	878.056
30/09/2009 13:56	WE00129439	2752411	49.828	6.970	A	18	GR	878.056
30/09/2009 13:56	WE00129439	2752411	0.039	0.003	A	99	GR	878.056
30/09/2009 13:56	WE00129439	2752411	0.039	0.000	PB	06	GR	878.056
03/11/2009 8:05	WE00129707	2770136	40.681	6.824	A	18	GR	1007.218
03/11/2009 8:05	WE00129707	2770136	0.078	0.000	A	99	GR	1007.218
03/11/2009 8:05	WE00129707	2770136	5.853	0.164	A	06	GR	1007.218
09/11/2009 12:10	WE00129821	2774250	0.146	0.000	PB	18	GR	920.342
09/11/2009 12:10	WE00129821	2774250	0.013	0.003	A	99	GR	920.342

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DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
09/11/2009 12:10	WE00129821	2774250	43.909	4.114	A	18	GR	920.342
09/11/2009 12:10	WE00129821	2774250	0.081	0.000	PB	06	GR	920.342
09/11/2009 12:10	WE00129821	2774250	3.935	0.255	A	06	GR	920.342
16/11/2009 6:33	WE00129995	2779522	0.260	0.000	PB	18	GR	896.469
16/11/2009 6:33	WE00129995	2779522	51.272	5.128	A	18	GR	896.469
16/11/2009 6:33	WE00129995	2779522	1.814	0.107	A	06	GR	896.469
24/11/2009 15:47	WD00079122	2787105	36.604	2.013	A	18	GR	956.932
24/11/2009 15:47	WD00079122	2787105	5.847	0.429	A	06	GR	956.932
24/11/2009 15:47	WD00079122	2787105	0.755	0.011	PB	18	GR	956.932
24/11/2009 15:47	WD00079122	2787105	0.081	0.000	PB	06	GR	956.932
24/11/2009 15:47	WD00079122	2787105	0.078	0.000	A	99	GR	956.932
27/11/2009 14:49	U3230162	2790845	1.220	0.421	A	06	GR	1071.873
27/11/2009 14:49	U3230162	2790845	48.674	12.519	A	18	GR	1071.873
03/12/2009 9:46	WE00130269	2795861	15.831	0.946	A	06	GR	985.051
03/12/2009 9:46	WE00130269	2795861	0.029	0.000	B	06	GR	985.051
03/12/2009 9:46	WE00130269	2795861	30.886	4.446	A	18	GR	985.051
03/12/2009 9:46	WE00130269	2795861	0.261	0.000	PB	18	GR	985.051
03/12/2009 9:46	WE00130269	2795861	0.385	0.006	A	99	GR	985.051
03/12/2009 9:46	WE00130269	2795861	0.013	0.000	PB	99	GR	985.051
03/12/2009 9:46	WE00130269	2795861	0.207	0.003	PB	06	GR	985.051
11/12/2009 8:55	WE00130381	2802610	40.149	4.181	A	18	GR	1007.281
11/12/2009 8:55	WE00130381	2802610	0.013	0.003	A	99	GR	1007.281
11/12/2009 8:55	WE00130381	2802610	0.029	0.000	PB	06	GR	1007.281
11/12/2009 8:55	WE00130381	2802610	5.163	0.516	A	06	GR	1007.281
14/12/2009 15:53	WD00080765	2803511	37.472	3.788	A	18	GR	937.763
14/12/2009 15:53	WD00080765	2803511	0.065	0.000	A	99	GR	937.763
14/12/2009 15:53	WD00080765	2803511	0.198	0.000	PB	18	GR	937.763
14/12/2009 15:53	WD00080765	2803511	0.052	0.000	PB	06	GR	937.763
14/12/2009 15:53	WD00080765	2803511	5.878	0.592	A	06	GR	937.763

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
15/12/2009 16:44	WD00080773	2804466	0.589	0.032	PB	18	GR	923.392
15/12/2009 16:44	WD00080773	2804466	35.950	2.044	A	18	GR	923.392
15/12/2009 16:44	WD00080773	2804466	0.428	0.000	PB	06	GR	923.392
15/12/2009 16:44	WD00080773	2804466	2.333	0.165	A	06	GR	923.392
06/01/2010 7:56	ED00012392	2816139	8.996	0.849	A	06	GR	1025.785
06/01/2010 7:56	ED00012392	2816139	34.915	5.679	A	18	GR	1025.785
06/01/2010 7:56	ED00012392	2816139	0.081	0.000	PB	18	GR	1025.785
09/01/2010 9:07	WD00079512	2819617	42.290	3.224	A	18	GR	995.625
09/01/2010 9:07	WD00079512	2819617	4.975	0.380	A	06	GR	995.625
18/01/2010 17:02	ED00005941	2828943	2.063	0.332	A	06	GR	1030.891
18/01/2010 17:02	ED00005941	2828943	43.060	5.718	A	18	GR	1030.891
23/01/2010 14:15	WD00079798	2834929	2.423	0.232	A	06	GR	876.828
23/01/2010 14:15	WD00079798	2834929	48.303	1.522	A	18	GR	876.828
25/01/2010 16:16	ED00005999	2836500	4.305	0.365	A	06	GR	930.103
25/01/2010 16:16	ED00005999	2836500	32.378	2.664	A	18	GR	930.103
25/01/2010 16:16	ED00005999	2836500	0.482	0.000	PB	18	GR	930.103
01/02/2010 13:58	WE00131048	2845675	0.021	0.000	PB	06	GR	985.558
01/02/2010 13:58	WE00131048	2845675	0.065	0.000	A	99	GR	985.558
01/02/2010 13:58	WE00131048	2845675	34.260	3.041	A	18	GR	985.558
01/02/2010 13:58	WE00131048	2845675	9.631	0.705	A	06	GR	985.558
02/02/2010 12:33	ED00006288	2847245	0.013	0.000	A	99	GR	1041.054
02/02/2010 12:33	ED00006288	2847245	41.464	8.056	A	18	GR	1041.054
02/02/2010 12:33	ED00006288	2847245	2.175	0.228	A	06	GR	1041.054
07/02/2010 13:18	WD00007081	2851744	0.039	0.000	A	99	GR	952.628
07/02/2010 13:18	WD00007081	2851744	26.794	3.573	A	18	GR	952.628
07/02/2010 13:18	WD00007081	2851744	6.064	0.446	A	06	GR	952.628
14/02/2010 16:50	ED00003827	2859248	8.407	0.777	A	06	GR	969.894
14/02/2010 16:50	ED00003827	2859248	0.259	0.003	PB	06	GR	969.894
14/02/2010 16:50	ED00003827	2859248	40.720	3.321	A	18	GR	969.894

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
14/02/2010 16:50	ED00003827	2859248	0.261	0.000	PB	18	GR	969.894
14/02/2010 16:50	ED00003827	2859248	0.026	0.000	A	99	GR	969.894
16/02/2010 15:50	WE00131415	2860813	27.976	6.120	A	18	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	1.806	0.429	PB	18	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	0.530	0.008	SP	06	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	0.078	0.003	A	99	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	0.146	0.000	SP	18	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	0.368	0.003	PB	06	GR	1123.649
16/02/2010 15:50	WE00131415	2860813	5.540	0.370	A	06	GR	1123.649
19/02/2010 10:50	U3401188	2864882	42.384	6.888	A	18	GR	1035.944
19/02/2010 10:50	U3401188	2864882	0.138	0.000	PB	18	GR	1035.944
19/02/2010 10:50	U3401188	2864882	2.369	0.064	A	06	GR	1035.944
19/02/2010 10:50	U3401188	2864882	0.013	0.000	A	99	GR	1035.944
19/02/2010 10:50	U3401188	2864882	0.052	0.000	PB	06	GR	1035.944
22/02/2010 0:16	WD00007403	2866213	0.021	0.003	A	99	GR	909.010
22/02/2010 0:16	WD00007403	2866213	46.263	4.341	A	18	GR	909.010
22/02/2010 0:16	WD00007403	2866213	3.109	0.406	A	06	GR	909.010
22/02/2010 0:16	WD00007403	2866213	0.208	0.000	PB	18	GR	909.010
12/03/2010 9:04	WD00076587	2884938	2.795	0.203	A	06	GR	1259.243
12/03/2010 9:04	WD00076587	2884938	44.004	15.529	A	18	GR	1259.243
12/03/2010 9:04	WD00076587	2884938	0.039	0.000	A	99	GR	1259.243
22/03/2010 4:50	ED00019925	2890323	0.099	0.000	A	99	GR	902.176
22/03/2010 4:50	ED00019925	2890323	4.120	0.016	A	06	GR	902.176
22/03/2010 4:50	ED00019925	2890323	44.713	3.825	A	18	GR	902.176
10/11/2009 12:38	WE00129859	2775694	0.253	0.003	A	06	GR	971.340
10/11/2009 12:38	WE00129859	2775694	7.973	0.043	PB	06	GR	971.340
10/11/2009 12:38	WE00129859	2775694	0.091	0.000	PB	99	GR	971.340
10/11/2009 12:38	WE00129859	2775694	33.270	0.798	PB	18	GR	971.340
10/11/2009 12:38	WE00129859	2775694	0.324	0.000	A	18	GR	971.340

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
12/11/2009 6:54	WE00129922	2776872	0.229	0.000	PB	99	GR	1046.334
12/11/2009 6:54	WE00129922	2776872	0.560	0.008	A	06	GR	1046.334
12/11/2009 6:54	WE00129922	2776872	7.995	0.144	PB	06	GR	1046.334
12/11/2009 6:54	WE00129922	2776872	0.081	0.000	A	18	GR	1046.334
12/11/2009 6:54	WE00129922	2776872	16.688	0.495	PB	18	GR	1046.334
26/11/2009 10:44	WE00130153	2789179	7.366	0.111	PB	18	GR	932.307
26/11/2009 10:44	WE00130153	2789179	1.689	0.073	PB	06	GR	932.307
26/11/2009 10:44	WE00130153	2789179	0.091	0.008	A	06	GR	932.307
26/11/2009 10:44	WE00130153	2789179	0.013	0.000	PB	99	GR	932.307
10/12/2009 13:39	WE00130363	2801453	0.052	0.003	PB	99	GR	1035.632
10/12/2009 13:39	WE00130363	2801453	34.035	1.209	PB	18	GR	1035.632
10/12/2009 13:39	WE00130363	2801453	5.390	0.153	PB	06	GR	1035.632
16/12/2009 15:59	ED00006680	2805453	0.169	0.000	PB	99	GR	961.634
16/12/2009 15:59	ED00006680	2805453	20.141	2.034	PB	18	GR	961.634
16/12/2009 15:59	ED00006680	2805453	1.583	0.396	A	18	GR	961.634
16/12/2009 15:59	ED00006680	2805453	0.188	0.029	A	06	GR	961.634
16/12/2009 15:59	ED00006680	2805453	8.659	0.027	PB	06	GR	961.634
23/12/2009 11:55	ED00012257	2810467	29.419	1.916	PB	18	GR	1037.327
23/12/2009 11:55	ED00012257	2810467	13.745	0.122	PB	06	GR	1037.327
23/12/2009 11:55	ED00012257	2810467	0.211	0.000	PB	99	GR	1037.327
13/01/2010 8:00	WE00130694	2823421	45.482	4.924	PB	18	GR	982.649
13/01/2010 8:00	WE00130694	2823421	0.850	0.021	PB	06	GR	982.649
13/01/2010 8:00	WE00130694	2823421	0.052	0.000	SP	06	GR	982.649
18/01/2010 9:08	WE00130740	2828944	0.842	0.008	PB	06	GR	971.950
18/01/2010 9:08	WE00130740	2828944	44.680	3.732	PB	18	GR	971.950
20/01/2010 7:25	WE00130791	2831621	40.967	3.655	PB	18	GR	992.298
20/01/2010 7:25	WE00130791	2831621	0.039	0.000	SP	06	GR	992.298
20/01/2010 7:25	WE00130791	2831621	3.863	0.083	PB	06	GR	992.298
20/01/2010 7:25	WE00130791	2831621	0.026	0.000	PB	99	GR	992.298

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
22/01/2010 9:26	WE00130852	2835062	0.271	0.000	PB	99	GR	958.313
22/01/2010 9:26	WE00130852	2835062	37.829	0.810	PB	18	GR	958.313
22/01/2010 9:26	WE00130852	2835062	8.461	0.077	PB	06	GR	958.313
23/01/2010 10:34	WE00130885	2835063	0.013	0.000	PB	99	GR	922.944
23/01/2010 10:34	WE00130885	2835063	41.178	1.171	PB	18	GR	922.944
23/01/2010 10:34	WE00130885	2835063	2.595	0.079	PB	06	GR	922.944
23/01/2010 10:34	WE00130885	2835063	0.079	0.000	A	06	GR	922.944
23/01/2010 10:34	WE00130885	2835063	0.237	0.000	A	18	GR	922.944
25/01/2010 13:58	WD00080990	2836501	3.306	0.118	PB	06	GR	1070.843
25/01/2010 13:58	WD00080990	2836501	0.081	0.000	A	18	GR	1070.843
25/01/2010 13:58	WD00080990	2836501	37.076	3.163	PB	18	GR	1070.843
25/01/2010 13:58	WD00080990	2836501	0.013	0.000	PB	99	GR	1070.843
02/02/2010 13:56	ED00007019	2847246	0.927	0.094	A	18	GR	1007.842
02/02/2010 13:56	ED00007019	2847246	3.849	0.069	PB	06	GR	1007.842
02/02/2010 13:56	ED00007019	2847246	0.052	0.000	A	06	GR	1007.842
02/02/2010 13:56	ED00007019	2847246	22.430	1.337	PB	18	GR	1007.842
03/02/2010 8:59	WD00076080	2848657	0.013	0.000	PB	99	GR	981.536
03/02/2010 8:59	WD00076080	2848657	22.915	3.283	PB	18	GR	981.536
03/02/2010 8:59	WD00076080	2848657	0.909	0.034	A	18	GR	981.536
03/02/2010 8:59	WD00076080	2848657	3.577	0.104	PB	06	GR	981.536
11/02/2010 9:14	WE00131302	2856925	41.212	3.653	PB	18	GR	980.568
11/02/2010 9:14	WE00131302	2856925	3.757	0.026	PB	06	GR	980.568
11/02/2010 9:14	WE00131302	2856925	0.063	0.000	PB	99	GR	980.568
11/02/2010 9:14	WE00131302	2856925	0.021	0.000	A	06	GR	980.568
16/02/2010 13:55	WE00131407	2860814	0.326	0.000	A	18	GR	1082.668
16/02/2010 13:55	WE00131407	2860814	6.876	0.041	PB	06	GR	1082.668
16/02/2010 13:55	WE00131407	2860814	28.855	1.505	PB	18	GR	1082.668
16/02/2010 13:55	WE00131407	2860814	0.013	0.000	A	99	GR	1082.668
16/02/2010 13:55	WE00131407	2860814	0.351	0.011	A	06	GR	1082.668

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
16/02/2010 13:55	WE00131407	2860814	0.216	0.000	PB	99	GR	1082.668
18/02/2010 15:00	ED00006993	2863148	2.027	0.097	PB	06	GR	1047.055
18/02/2010 15:00	ED00006993	2863148	0.104	0.000	SP	06	GR	1047.055
18/02/2010 15:00	ED00006993	2863148	41.933	4.206	PB	18	GR	1047.055
18/02/2010 15:00	ED00006993	2863148	0.065	0.000	PB	99	GR	1047.055
22/02/2010 10:24	WE00131501	2866216	0.112	0.000	PB	99	GR	1005.470
22/02/2010 10:24	WE00131501	2866216	39.399	2.085	PB	18	GR	1005.470
22/02/2010 10:24	WE00131501	2866216	3.244	0.082	PB	06	GR	1005.470
01/03/2010 9:43	ED00007470	2873388	0.201	0.003	A	06	GR	959.934
01/03/2010 9:43	ED00007470	2873388	4.814	0.102	PB	06	GR	959.934
01/03/2010 9:43	ED00007470	2873388	0.065	0.000	A	18	GR	959.934
01/03/2010 9:43	ED00007470	2873388	8.537	0.199	PB	18	GR	959.934
01/03/2010 9:43	ED00007470	2873388	0.115	0.000	PB	99	GR	959.934
04/03/2010 6:38	ED00019674	2876508	0.117	0.000	PB	99	GR	940.438
04/03/2010 6:38	ED00019674	2876508	0.389	0.087	A	06	GR	940.438
04/03/2010 6:38	ED00019674	2876508	3.982	0.069	PB	06	GR	940.438
04/03/2010 6:38	ED00019674	2876508	39.725	2.155	PB	18	GR	940.438
04/03/2010 6:38	ED00019674	2876508	0.700	0.058	A	18	GR	940.438
06/03/2010 1:07	WD00076296	2878673	5.619	0.075	PB	06	GR	1073.348
06/03/2010 1:07	WD00076296	2878673	31.392	2.225	PB	18	GR	1073.348
06/03/2010 1:07	WD00076296	2878673	0.273	0.000	PB	99	GR	1073.348
07/03/2010 1:00	ED00019165	2878674	41.970	3.564	PB	18	GR	961.243
07/03/2010 1:00	ED00019165	2878674	1.886	0.042	PB	06	GR	961.243
07/03/2010 1:00	ED00019165	2878674	0.052	0.000	PB	99	GR	961.243
08/03/2010 10:51	ED00019248	2879699	2.804	0.009	PB	06	GR	1003.191
08/03/2010 10:51	ED00019248	2879699	0.003	0.000	B	99	GR	1003.191
08/03/2010 10:51	ED00019248	2879699	27.100	2.721	PB	18	GR	1003.191
08/03/2010 10:51	ED00019248	2879699	0.086	0.000	PB	99	GR	1003.191
11/03/2010 6:53	WE00133065	2882769	1.280	0.040	PB	06	GR	934.570

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DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
11/03/2010 6:53	WE00133065	2882769	0.013	0.000	PB	99	GR	934.570
11/03/2010 6:53	WE00133065	2882769	40.884	1.926	PB	18	GR	934.570
12/03/2010 2:42	WD00076565	2885119	0.026	0.000	PB	99	GR	893.133
12/03/2010 2:42	WD00076565	2885119	43.730	1.355	PB	18	GR	893.133
12/03/2010 2:42	WD00076565	2885119	0.666	0.029	A	18	GR	893.133
12/03/2010 2:42	WD00076565	2885119	3.386	0.042	PB	06	GR	893.133
12/03/2010 2:42	WD00076565	2885119	0.955	0.011	A	06	GR	893.133
12/03/2010 2:42	WD00076565	2885119	0.013	0.000	A	99	GR	893.133
13/03/2010 8:46	WD00076621	2885120	43.679	1.640	PB	18	GR	901.237
13/03/2010 8:46	WD00076621	2885120	0.279	0.060	A	18	GR	901.237
13/03/2010 8:46	WD00076621	2885120	4.235	0.035	PB	06	GR	901.237
13/03/2010 8:46	WD00076621	2885120	0.130	0.000	B	06	GR	901.237
13/03/2010 8:46	WD00076621	2885120	0.279	0.052	A	06	GR	901.237
13/03/2010 8:46	WD00076621	2885120	0.065	0.000	PB	99	GR	901.237
15/03/2010 4:59	WE00133144	2886255	1.461	0.071	PB	06	GR	1101.019
15/03/2010 4:59	WE00133144	2886255	40.767	4.213	PB	18	GR	1101.019
15/03/2010 4:59	WE00133144	2886255	0.039	0.000	PB	99	GR	1101.019
18/03/2010 10:56	ED00007306	2888308	2.789	0.029	PB	06	GR	902.677
18/03/2010 10:56	ED00007306	2888308	45.649	2.780	PB	18	GR	902.677
18/03/2010 10:56	ED00007306	2888308	0.013	0.000	PB	99	GR	902.677
21/03/2010 9:17	WE00133262	2889583	3.876	0.059	PB	06	GR	936.099
21/03/2010 9:17	WE00133262	2889583	38.716	1.626	PB	18	GR	936.099
21/03/2010 9:17	WE00133262	2889583	0.125	0.000	PB	99	GR	936.099
12/05/2010 12:58	U003633175	2901782	2.386	0.535	PB	18	GR	1056.019
12/05/2010 12:58	U003633175	2901782	3.604	0.257	A	06	GR	1056.019
12/05/2010 12:58	U003633175	2901782	0.669	0.027	PB	06	GR	1056.019
12/05/2010 12:58	U003633175	2901782	29.132	7.209	A	18	GR	1056.019
12/05/2010 12:58	U003633175	2901782	0.052	0.003	A	99	GR	1056.019
18/06/2010 8:39	ED00007542	2909296	0.026	0.000	A	99	GR	958.130

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
18/06/2010 8:39	ED00007542	2909296	6.001	0.257	A	06	GR	958.130
18/06/2010 8:39	ED00007542	2909296	34.890	2.768	A	18	GR	958.130
18/06/2010 8:39	ED00007542	2909296	1.046	0.060	PB	18	GR	958.130
18/06/2010 8:39	ED00007542	2909296	0.052	0.000	PB	06	GR	958.130
22/06/2010 15:29	ED00008480	2910211	0.099	0.000	A	99	GR	893.946
22/06/2010 15:29	ED00008480	2910211	46.011	6.943	A	18	GR	893.946
22/06/2010 15:29	ED00008480	2910211	5.486	0.355	A	06	GR	893.946
30/06/2010 8:12	WE00133271	2912649	0.065	0.065	PB	18	GR	788.195
30/06/2010 8:12	WE00133271	2912649	0.117	0.000	A	99	GR	788.195
30/06/2010 8:12	WE00133271	2912649	40.679	3.618	A	18	GR	788.195
30/06/2010 8:12	WE00133271	2912649	0.029	0.000	SP	06	GR	788.195
30/06/2010 8:12	WE00133271	2912649	0.052	0.000	PB	06	GR	788.195
30/06/2010 8:12	WE00133271	2912649	7.517	0.320	A	06	GR	788.195
20/07/2010 8:32	WE00133446	2919925	0.013	0.000	PB	99	GR	842.329
20/07/2010 8:32	WE00133446	2919925	0.039	0.000	A	99	GR	842.329
20/07/2010 8:32	WE00133446	2919925	48.432	4.083	A	18	GR	842.329
20/07/2010 8:32	WE00133446	2919925	0.404	0.050	PB	18	GR	842.329
20/07/2010 8:32	WE00133446	2919925	4.476	0.090	A	06	GR	842.329
20/07/2010 8:32	WE00133446	2919925	0.329	0.000	PB	06	GR	842.329
20/07/2010 11:29	WE00133450	2919927	47.457	2.456	A	18	GR	754.208
20/07/2010 11:29	WE00133450	2919927	0.130	0.000	A	99	GR	754.208
20/07/2010 11:29	WE00133450	2919927	6.258	0.183	A	06	GR	754.208
27/07/2010 15:52	WE00133587	2922880	0.052	0.000	PB	99	GR	696.289
27/07/2010 15:52	WE00133587	2922880	38.775	1.452	A	18	GR	696.289
27/07/2010 15:52	WE00133587	2922880	18.850	0.600	A	06	GR	696.289
27/07/2010 15:52	WE00133587	2922880	0.383	0.000	A	99	GR	696.289
27/07/2010 15:52	WE00133587	2922880	0.549	0.000	PB	06	GR	696.289
04/08/2010 16:56	WE00133721	2926468	6.621	0.254	A	06	GR	744.866
04/08/2010 16:56	WE00133721	2926468	0.322	0.000	PB	18	GR	744.866

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/08/2010 16:56	WE00133721	2926468	0.104	0.000	A	99	GR	744.866
04/08/2010 16:56	WE00133721	2926468	52.232	2.733	A	18	GR	744.866
07/08/2010 9:38	WE00131590	2927662	0.039	0.000	PB	06	GR	802.179
07/08/2010 9:38	WE00131590	2927662	8.748	0.361	A	06	GR	802.179
07/08/2010 9:38	WE00131590	2927662	42.347	3.006	A	18	GR	802.179
07/08/2010 9:38	WE00131590	2927662	0.117	0.029	PB	18	GR	802.179
07/08/2010 9:38	WE00131590	2927662	0.052	0.000	A	99	GR	802.179
11/08/2010 18:10	ED00008909	2929726	0.058	0.000	PB	06	GR	983.688
11/08/2010 18:10	ED00008909	2929726	33.714	6.159	A	18	GR	983.688
11/08/2010 18:10	ED00008909	2929726	0.065	0.000	PB	18	GR	983.688
11/08/2010 18:10	ED00008909	2929726	0.078	0.000	A	99	GR	983.688
11/08/2010 18:10	ED00008909	2929726	6.659	0.329	A	06	GR	983.688
17/08/2010 10:09	ED00008915	2932060	3.077	0.136	A	06	GR	936.428
17/08/2010 10:09	ED00008915	2932060	45.655	7.233	A	18	GR	936.428
17/08/2010 10:09	ED00008915	2932060	0.039	0.000	A	99	GR	936.428
30/08/2010 10:56	WE00133969	2937245	5.885	0.328	A	06	GR	806.848
30/08/2010 10:56	WE00133969	2937245	0.104	0.008	PB	06	GR	806.848
30/08/2010 10:56	WE00133969	2937245	41.671	2.225	A	18	GR	806.848
30/08/2010 10:56	WE00133969	2937245	0.513	0.050	PB	18	GR	806.848
30/08/2010 10:56	WE00133969	2937245	0.060	0.000	A	99	GR	806.848
02/09/2010 14:42	WE00131710	2939516	0.161	0.000	PB	18	GR	779.760
02/09/2010 14:42	WE00131710	2939516	0.224	0.000	A	99	GR	779.760
02/09/2010 14:42	WE00131710	2939516	23.358	1.534	A	06	GR	779.760
02/09/2010 14:42	WE00131710	2939516	32.626	1.652	A	18	GR	779.760
06/09/2010 15:00	U003508256	2940206	8.843	0.302	A	06	GR	877.421
06/09/2010 15:00	U003508256	2940206	39.692	2.246	A	18	GR	877.421
06/09/2010 15:00	U003508256	2940206	0.117	0.003	A	99	GR	877.421
24/09/2010 9:55	WE00131749	2948483	0.206	0.000	A	99	GR	910.202
24/09/2010 9:55	WE00131749	2948483	8.842	0.229	A	06	GR	910.202

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
24/09/2010 9:55	WE00131749	2948483	0.344	0.021	PB	06	GR	910.202
24/09/2010 9:55	WE00131749	2948483	40.328	2.779	A	18	GR	910.202
24/09/2010 9:55	WE00131749	2948483	0.771	0.000	PB	18	GR	910.202
04/10/2010 12:55	ED00008153	2953894	0.039	0.000	A	99	GR	994.121
04/10/2010 12:55	ED00008153	2953894	0.234	0.008	PB	18	GR	994.121
04/10/2010 12:55	ED00008153	2953894	16.364	2.498	A	18	GR	994.121
04/10/2010 12:55	ED00008153	2953894	0.143	0.021	PB	06	GR	994.121
04/10/2010 12:55	ED00008153	2953894	5.255	0.627	A	06	GR	994.121
18/10/2010 13:09	ED00008242	2962697	0.104	0.000	A	99	GR	951.360
18/10/2010 13:09	ED00008242	2962697	0.003	0.000	SP	99	GR	951.360
18/10/2010 13:09	ED00008242	2962697	31.182	3.773	A	18	GR	951.360
18/10/2010 13:09	ED00008242	2962697	8.703	0.775	A	06	GR	951.360
29/10/2010 11:34	WD00085625	2970555	0.541	0.042	PB	18	GR	1196.665
29/10/2010 11:34	WD00085625	2970555	37.161	4.781	A	18	GR	1196.665
29/10/2010 11:34	WD00085625	2970555	1.830	0.202	A	06	GR	1196.665
29/10/2010 11:34	WD00085625	2970555	0.052	0.013	PB	06	GR	1196.665
03/11/2010 8:13	WE00134682	2973470	0.060	0.000	A	99	GR	955.611
03/11/2010 8:13	WE00134682	2973470	4.741	0.460	A	06	GR	955.611
03/11/2010 8:13	WE00134682	2973470	45.065	6.941	A	18	GR	955.611
17/11/2010 8:22	WD00084707	2982059	38.655	2.997	A	18	GR	888.211
17/11/2010 8:22	WD00084707	2982059	8.691	0.789	A	06	GR	888.211
17/11/2010 8:22	WD00084707	2982059	0.247	0.000	PB	06	GR	888.211
17/11/2010 8:22	WD00084707	2982059	0.541	0.081	PB	18	GR	888.211
17/11/2010 8:22	WD00084707	2982059	0.013	0.000	A	99	GR	888.211
26/11/2010 7:23	WE00134945	2990487	0.224	0.000	PB	06	GR	930.536
26/11/2010 7:23	WE00134945	2990487	38.908	4.357	A	18	GR	930.536
26/11/2010 7:23	WE00134945	2990487	0.039	0.000	A	99	GR	930.536
26/11/2010 7:23	WE00134945	2990487	7.256	0.682	A	06	GR	930.536
26/11/2010 7:23	WE00134945	2990487	2.626	0.351	PB	18	GR	930.536

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
04/12/2010 6:42	WD00086416	2997052	29.438	5.524	A	18	GR	1175.363
04/12/2010 6:42	WD00086416	2997052	0.620	0.006	PB	06	GR	1175.363
04/12/2010 6:42	WD00086416	2997052	6.209	0.465	PB	18	GR	1175.363
04/12/2010 6:42	WD00086416	2997052	0.026	0.000	A	99	GR	1175.363
04/12/2010 6:42	WD00086416	2997052	1.666	0.110	A	06	GR	1175.363
15/12/2010 12:05	WE00135247	3007531	0.715	0.149	A	06	GR	1196.094
15/12/2010 12:05	WE00135247	3007531	48.211	14.365	A	18	GR	1196.094
21/07/2010 10:23	ED00008470	2920560	32.492	2.265	PB	18	GR	972.612
21/07/2010 10:23	ED00008470	2920560	0.068	0.000	PB	99	GR	972.612
21/07/2010 10:23	ED00008470	2920560	4.000	0.047	PB	06	GR	972.612
22/10/2010 16:34	WE00134529	2966428	0.177	0.000	PB	99	GR	920.284
22/10/2010 16:34	WE00134529	2966428	9.339	0.161	PB	06	GR	920.284
22/10/2010 16:34	WE00134529	2966428	36.358	2.259	PB	18	GR	920.284
01/11/2010 6:58	WE00134630	2971613	28.933	2.107	PB	18	GR	1010.321
01/11/2010 6:58	WE00134630	2971613	0.466	0.013	PB	99	GR	1010.321
01/11/2010 6:58	WE00134630	2971613	0.324	0.000	A	18	GR	1010.321
01/11/2010 6:58	WE00134630	2971613	0.282	0.013	A	06	GR	1010.321
01/11/2010 6:58	WE00134630	2971613	11.331	0.156	PB	06	GR	1010.321
09/12/2010 11:15	WE00135171	3002223	25.083	3.472	PB	18	GR	1132.170
09/12/2010 11:15	WE00135171	3002223	0.039	0.000	PB	99	GR	1132.170
09/12/2010 11:15	WE00135171	3002223	2.409	0.052	PB	06	GR	1132.170
10/01/2011 15:28	U003767029	3025220	0.104	0.000	PB	99	GR	1001.745
10/01/2011 15:28	U003767029	3025220	41.840	2.889	PB	18	GR	1001.745
10/01/2011 15:28	U003767029	3025220	7.549	0.175	PB	06	GR	1001.745
11/02/2011 11:46	ED00017666	3061190	3.949	0.033	PB	06	GR	1000.822
11/02/2011 11:46	ED00017666	3061190	2.379	0.021	SP	06	GR	1000.822
11/02/2011 11:46	ED00017666	3061190	0.107	0.000	PB	99	GR	1000.822
11/02/2011 11:46	ED00017666	3061190	0.013	0.000	SP	99	GR	1000.822
11/02/2011 11:46	ED00017666	3061190	24.070	2.448	PB	18	GR	1000.822

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
11/02/2011 11:46	ED00017666	3061190	5.175	0.328	SP	18	GR	1000.822
18/02/2011 11:59	U003578824	3070644	0.615	0.045	A	06	GR	1059.853
18/02/2011 11:59	U003578824	3070644	27.378	2.729	PB	18	GR	1059.853
18/02/2011 11:59	U003578824	3070644	0.052	0.000	PB	99	GR	1059.853
18/02/2011 11:59	U003578824	3070644	12.393	2.407	A	18	GR	1059.853
18/02/2011 11:59	U003578824	3070644	5.731	0.171	PB	06	GR	1059.853
09/03/2011 11:57	ED00018437	3089033	0.047	0.000	PB	99	GR	949.198
09/03/2011 11:57	ED00018437	3089033	41.704	1.505	PB	18	GR	949.198
09/03/2011 11:57	ED00018437	3089033	4.229	0.048	PB	06	GR	949.198
15/03/2011 7:15	WE00136439	3095475	0.065	0.000	PB	99	GR	946.897
15/03/2011 7:15	WE00136439	3095475	42.193	3.132	PB	18	GR	946.897
15/03/2011 7:15	WE00136439	3095475	1.211	0.048	A	18	GR	946.897
15/03/2011 7:15	WE00136439	3095475	3.440	0.017	PB	06	GR	946.897
15/03/2011 7:15	WE00136439	3095475	0.052	0.000	A	06	GR	946.897
21/03/2011 12:29	WE00137010	3100660	34.514	1.985	PB	18	GR	1038.869
21/03/2011 12:29	WE00137010	3100660	4.233	0.024	PB	06	GR	1038.869
21/03/2011 12:29	WE00137010	3100660	0.052	0.000	PB	99	GR	1038.869
29/11/2010 10:22	WE00132259	2991595	0.136	0.000	PB	06	GR	964.867
29/11/2010 10:22	WE00132259	2991595	0.013	0.000	A	99	GR	964.867
29/11/2010 10:22	WE00132259	2991595	38.462	4.870	A	18	GR	964.867
29/11/2010 10:22	WE00132259	2991595	3.607	0.203	A	06	GR	964.867
01/12/2010 14:52	WE00135015	2994443	41.513	4.495	A	18	GR	976.959
01/12/2010 14:52	WE00135015	2994443	0.042	0.000	A	99	GR	976.959
01/12/2010 14:52	WE00135015	2994443	6.536	0.585	A	06	GR	976.959
12/01/2011 9:01	WE00135514	3027631	0.065	0.000	A	99	GR	924.469
12/01/2011 9:01	WE00135514	3027631	41.626	4.706	A	18	GR	924.469
12/01/2011 9:01	WE00135514	3027631	0.104	0.013	PB	06	GR	924.469
12/01/2011 9:01	WE00135514	3027631	1.384	0.160	PB	18	GR	924.469
12/01/2011 9:01	WE00135514	3027631	6.156	0.593	A	06	GR	924.469

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
30/01/2011 7:12	WE00135794	3045058	42.589	7.529	A	18	GR	1036.988
30/01/2011 7:12	WE00135794	3045058	3.324	0.534	A	06	GR	1036.988
31/01/2011 16:20	WE00135816	3047471	1.418	0.084	PB	18	GR	1091.565
31/01/2011 16:20	WE00135816	3047471	0.065	0.003	A	99	GR	1091.565
31/01/2011 16:20	WE00135816	3047471	33.587	5.844	A	18	GR	1091.565
31/01/2011 16:20	WE00135816	3047471	0.897	0.032	PB	06	GR	1091.565
31/01/2011 16:20	WE00135816	3047471	8.503	1.102	A	06	GR	1091.565
17/02/2011 7:15	WE00136105	3068263	45.060	16.002	A	18	GR	1363.384
17/02/2011 7:15	WE00136105	3068263	1.659	0.080	A	06	GR	1363.384
11/11/2010 15:52	WE00134719	2980288	2.895	0.000	PB	06	GR	978.466
11/11/2010 15:52	WE00134719	2980288	41.592	1.663	PB	18	GR	978.466
11/11/2010 15:52	WE00134719	2980288	0.039	0.000	PB	99	GR	978.466
21/01/2011 7:31	WE00135668	3037476	0.428	0.000	PB	06	GR	932.443
21/01/2011 7:31	WE00135668	3037476	47.905	3.837	PB	18	GR	932.443
28/01/2011 12:05	WE00135763	3045059	0.722	0.009	PB	06	GR	977.676
28/01/2011 12:05	WE00135763	3045059	46.465	3.503	PB	18	GR	977.676
21/02/2011 13:48	WE00136544	3070645	38.234	1.900	PB	18	GR	982.929
21/02/2011 13:48	WE00136544	3070645	1.303	0.026	PB	06	GR	982.929
21/02/2011 13:48	WE00136544	3070645	0.272	0.003	A	06	GR	982.929
21/02/2011 13:48	WE00136544	3070645	1.292	0.217	A	18	GR	982.929

Birch Data

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
10/08/2011 9:09	WE00137180	3148166	1.538	0.076	B	06	GR	940.323
10/08/2011 9:09	WE00137180	3148166	26.415	3.768	B	18	GR	940.323
10/08/2011 9:09	WE00137180	3148166	0.021	0.000	B	99	GR	940.323
08/11/2011 15:11	WE00139087	3207199	8.238	0.330	B	06	GR	1028.461

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
08/11/2011 15:11	WE00139087	3207199	33.233	2.655	B	18	GR	1028.461
08/11/2011 15:11	WE00139087	3207199	0.081	0.081	PB	18	GR	1028.461
08/11/2011 15:11	WE00139087	3207199	0.164	0.000	B	99	GR	1028.461
28/02/2012 12:55	WE00142240	3350547	31.405	2.801	B	18	GR	1031.162
28/02/2012 12:55	WE00142240	3350547	10.612	0.418	B	06	GR	1031.162
28/02/2012 12:55	WE00142240	3350547	0.352	0.000	B	99	GR	1031.162
08/03/2012 3:08	WE00141459	3363718	1.849	0.000	B	99	GR	969.299
08/03/2012 3:08	WE00141459	3363718	14.626	0.455	B	18	GR	969.299
08/03/2012 3:08	WE00141459	3363718	0.159	0.000	PB	06	GR	969.299
08/03/2012 3:08	WE00141459	3363718	24.417	0.402	B	06	GR	969.299
13/02/2012 9:23	WE00141151	3327412	23.597	0.381	B	06	GR	993.243
13/02/2012 9:23	WE00141151	3327412	12.397	0.218	B	18	GR	993.243
13/02/2012 9:23	WE00141151	3327412	2.048	0.000	B	99	GR	993.243
27/09/2012 6:56	WD00104047	3504661	0.052	0.000	B	99	GR	968.979
27/09/2012 6:56	WD00104047	3504661	5.891	0.204	B	06	GR	968.979
27/09/2012 6:56	WD00104047	3504661	38.832	3.631	B	18	GR	968.979
25/10/2012 8:41	WD00111337	3526933	40.893	2.821	B	18	GR	933.021
25/10/2012 8:41	WD00111337	3526933	4.626	0.024	B	06	GR	933.021
25/10/2012 8:41	WD00111337	3526933	0.026	0.000	B	99	GR	933.021
26/10/2012 16:55	WD00111365	3528988	0.039	0.000	B	99	GR	1080.661
26/10/2012 16:55	WD00111365	3528988	32.181	2.387	B	18	GR	1080.661
26/10/2012 16:55	WD00111365	3528988	6.918	0.116	B	06	GR	1080.661
12/11/2012 11:31	WE00145379	3546191	10.053	0.084	B	06	GR	1030.103
12/11/2012 11:31	WE00145379	3546191	14.853	1.370	B	18	GR	1030.103
12/11/2012 11:31	WE00145379	3546191	0.167	0.000	B	99	GR	1030.103
03/12/2012 5:32	WD00115253	3572399	3.780	0.095	B	06	GR	1010.313
03/12/2012 5:32	WD00115253	3572399	35.747	2.196	B	18	GR	1010.313
05/03/2013 11:44	WE00146894	3701495	0.013	0.000	A	99	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	5.047	0.097	B	06	GR	1026.826

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
05/03/2013 11:44	WE00146894	3701495	0.120	0.000	SP	06	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	0.013	0.000	SP	99	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	0.203	0.003	B	99	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	11.164	1.154	B	18	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	3.160	1.098	A	18	GR	1026.826
05/03/2013 11:44	WE00146894	3701495	0.152	0.000	A	06	GR	1026.826
16/03/2013 14:08	WD00021939	3717865	0.013	0.000	SP	99	GR	1012.642
16/03/2013 14:08	WD00021939	3717865	0.929	0.000	B	99	GR	1012.642
16/03/2013 14:08	WD00021939	3717865	0.150	0.000	SP	06	GR	1012.642
16/03/2013 14:08	WD00021939	3717865	11.547	0.029	B	06	GR	1012.642
16/03/2013 14:08	WD00021939	3717865	3.277	0.225	B	18	GR	1012.642
30/01/2013 8:05	D323814	3644218	0.585	0.000	B	99	GR	1097.796
30/01/2013 8:05	D323814	3644218	0.243	0.000	PB	18	GR	1097.796
30/01/2013 8:05	D323814	3644218	15.213	0.143	B	06	GR	1097.796
30/01/2013 8:05	D323814	3644218	0.331	0.000	PB	06	GR	1097.796
30/01/2013 8:05	D323814	3644218	5.794	0.243	B	18	GR	1097.796
23/12/2004 16:33	WE00076777	273668	8.039	0.070	B	06	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.172	0.000	PB	06	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.463	0.021	A	18	GR	1113.282
23/12/2004 16:33	WE00076777	273668	8.225	0.776	B	18	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.110	0.000	A	06	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.372	0.000	B	99	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.008	0.000	A	99	GR	1113.282
23/12/2004 16:33	WE00076777	273668	0.405	0.040	PB	18	GR	1113.282
10/01/2005 10:56	WE00070694	312070	23.697	0.173	B	06	GR	858.812
10/01/2005 10:56	WE00070694	312070	0.029	0.000	SP	06	GR	858.812
10/01/2005 10:56	WE00070694	312070	25.325	0.922	B	18	GR	858.812
10/01/2005 10:56	WE00070694	312070	0.146	0.013	B	99	GR	858.812
10/01/2005 10:56	WE00070694	312070	0.208	0.021	SP	18	GR	858.812

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
03/02/2005 13:34	WE00071099	393267	1.224	0.013	B	99	GR	989.350
03/02/2005 13:34	WE00071099	393267	17.498	0.567	B	18	GR	989.350
03/02/2005 13:34	WE00071099	393267	25.723	0.392	B	06	GR	989.350
21/08/2013 9:24	WD00116669	3825663	0.182	0.000	B	99	GR	917.102
21/08/2013 9:24	WD00116669	3825663	30.899	3.068	B	18	GR	917.102
21/08/2013 9:24	WD00116669	3825663	0.130	0.000	A	18	GR	917.102
21/08/2013 9:24	WD00116669	3825663	13.524	0.134	B	06	GR	917.102
17/11/2005 10:12	WE00067691	1053023	0.081	0.000	A	18	GR	873.760
17/11/2005 10:12	WE00067691	1053023	0.068	0.000	A	06	GR	873.760
17/11/2005 10:12	WE00067691	1053023	18.059	0.262	B	06	GR	873.760
17/11/2005 10:12	WE00067691	1053023	0.120	0.000	SP	06	GR	873.760
17/11/2005 10:12	WE00067691	1053023	13.677	0.299	B	18	GR	873.760
17/11/2005 10:12	WE00067691	1053023	1.420	0.019	B	99	GR	873.760
17/11/2005 10:12	WE00067691	1053023	0.013	0.000	SP	99	GR	873.760
30/11/2005 20:30	WE064258	1087089	0.300	0.000	B	99	GR	912.105
30/11/2005 20:30	WE064258	1087089	18.101	0.650	B	18	GR	912.105
30/11/2005 20:30	WE064258	1087089	13.670	0.350	B	06	GR	912.105
30/12/2005 10:55	WE00090694	1171187	22.504	0.884	B	06	GR	1093.442
30/12/2005 10:55	WE00090694	1171187	15.134	1.393	B	18	GR	1093.442
30/12/2005 10:55	WE00090694	1171187	0.629	0.021	B	99	GR	1093.442
07/02/2006 16:54	WE00091422	1303060	0.026	0.000	SP	99	GR	1092.416
07/02/2006 16:54	WE00091422	1303060	0.542	0.006	B	99	GR	1092.416
07/02/2006 16:54	WE00091422	1303060	14.537	1.251	B	18	GR	1092.416
07/02/2006 16:54	WE00091422	1303060	0.060	0.000	SP	06	GR	1092.416
07/02/2006 16:54	WE00091422	1303060	27.868	1.085	B	06	GR	1092.416
07/02/2006 16:54	WE00091422	1303060	0.081	0.000	A	06	GR	1092.416
10/02/2006 7:42	WE00086372	1318316	36.645	2.835	B	18	GR	1071.988
10/02/2006 7:42	WE00086372	1318316	0.320	0.003	B	99	GR	1071.988
10/02/2006 7:42	WE00086372	1318316	6.106	0.046	B	06	GR	1071.988

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
14/03/2006 13:49	WE00086931	1430424	1.352	0.024	B	18	GR	758.621
14/03/2006 13:49	WE00086931	1430424	0.341	0.000	B	99	GR	758.621
14/03/2006 13:49	WE00086931	1430424	5.342	0.051	B	06	GR	758.621
21/12/2006 11:24	WD00055677	1971388	21.009	0.210	B	18	GR	953.326
21/12/2006 11:24	WD00055677	1971388	23.351	0.172	B	06	GR	953.326
21/12/2006 11:24	WD00055677	1971388	1.358	0.000	B	99	GR	953.326
24/01/2007 18:38	WE00116498	2035512	0.081	0.000	SP	18	GR	982.910
24/01/2007 18:38	WE00116498	2035512	0.169	0.000	SP	06	GR	982.910
24/01/2007 18:38	WE00116498	2035512	4.424	0.109	B	18	GR	982.910
24/01/2007 18:38	WE00116498	2035512	0.008	0.000	A	99	GR	982.910
24/01/2007 18:38	WE00116498	2035512	6.601	0.036	B	06	GR	982.910
24/01/2007 18:38	WE00116498	2035512	0.389	0.000	B	99	GR	982.910
01/02/2007 14:02	WE00117611	2058669	0.081	0.000	SP	06	GR	1048.309
01/02/2007 14:02	WE00117611	2058669	10.379	0.152	B	18	GR	1048.309
01/02/2007 14:02	WE00117611	2058669	1.576	0.012	B	99	GR	1048.309
01/02/2007 14:02	WE00117611	2058669	27.627	0.293	B	06	GR	1048.309
14/02/2007 8:08	WE00116552	2092040	4.431	0.122	B	18	GR	986.612
14/02/2007 8:08	WE00116552	2092040	0.237	0.000	B	99	GR	986.612
14/02/2007 8:08	WE00116552	2092040	11.622	0.184	B	06	GR	986.612
28/02/2007 15:36	WD00056683	2127146	6.039	0.247	B	18	GR	830.408
28/02/2007 15:36	WD00056683	2127146	0.368	0.008	B	99	GR	830.408
28/02/2007 15:36	WD00056683	2127146	6.455	0.071	B	06	GR	830.408
04/07/2007 10:33	WE00102946	2203056	11.566	0.232	B	18	GR	961.869
04/07/2007 10:33	WE00102946	2203056	0.355	0.003	B	99	GR	961.869
04/07/2007 10:33	WE00102946	2203056	5.826	0.046	B	06	GR	961.869
14/12/2007 9:12	WD00059345	2375824	19.966	0.158	B	06	GR	937.219
14/12/2007 9:12	WD00059345	2375824	1.387	0.003	B	99	GR	937.219
14/12/2007 9:12	WD00059345	2375824	22.256	1.206	B	18	GR	937.219
05/03/2008 12:09	WE00122981	2469870	7.756	0.275	B	06	GR	941.862

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
05/03/2008 12:09	WE00122981	2469870	0.399	0.019	B	99	GR	941.862
05/03/2008 12:09	WE00122981	2469870	12.640	0.583	B	18	GR	941.862
28/07/2008 18:06	WE00123762	2529575	0.099	0.000	B	99	GR	857.498
28/07/2008 18:06	WE00123762	2529575	14.018	0.836	B	18	GR	857.498
28/07/2008 18:06	WE00123762	2529575	8.697	0.273	B	06	GR	857.498
28/07/2008 18:06	WE00123762	2529575	0.021	0.000	A	06	GR	857.498
09/12/2008 13:49	WD00068642	2620813	15.199	0.168	B	18	GR	924.834
09/12/2008 13:49	WD00068642	2620813	28.122	0.226	B	06	GR	924.834
09/12/2008 13:49	WD00068642	2620813	0.484	0.000	B	99	GR	924.834
09/12/2008 13:49	WD00068642	2620813	0.013	0.000	SP	99	GR	924.834
04/02/2009 10:47	U3018152	2664125	1.260	0.000	B	99	GR	1116.327
04/02/2009 10:47	U3018152	2664125	21.545	1.984	B	18	GR	1116.327
04/02/2009 10:47	U3018152	2664125	0.029	0.000	SP	06	GR	1116.327
04/02/2009 10:47	U3018152	2664125	17.333	0.694	B	06	GR	1116.327
18/02/2009 11:02	WD00069192	2676695	5.639	0.046	B	06	GR	994.043
18/02/2009 11:02	WD00069192	2676695	0.382	0.117	A	18	GR	994.043
18/02/2009 11:02	WD00069192	2676695	1.781	0.032	B	18	GR	994.043
18/02/2009 11:02	WD00069192	2676695	0.454	0.003	B	99	GR	994.043
25/11/2009 9:19	ED00005526	2788083	0.013	0.000	A	99	GR	980.532
25/11/2009 9:19	ED00005526	2788083	2.012	0.000	B	99	GR	980.532
25/11/2009 9:19	ED00005526	2788083	31.407	0.177	B	06	GR	980.532
25/11/2009 9:19	ED00005526	2788083	0.058	0.000	A	06	GR	980.532
25/11/2009 9:19	ED00005526	2788083	8.814	0.109	B	18	GR	980.532
09/12/2009 11:42	WE00130336	2800300	2.813	0.006	B	99	GR	949.693
09/12/2009 11:42	WE00130336	2800300	29.518	0.120	B	06	GR	949.693
09/12/2009 11:42	WE00130336	2800300	0.029	0.000	PB	06	GR	949.693
09/12/2009 11:42	WE00130336	2800300	0.029	0.000	SP	06	GR	949.693
09/12/2009 11:42	WE00130336	2800300	9.880	0.125	B	18	GR	949.693
09/12/2009 11:42	WE00130336	2800300	0.527	0.026	A	06	GR	949.693

DATE_IN	WS_TICKET	LOADID	GROSS_VOLUME	CULL_VOLUME	SP	PR	CD	KG_M3
17/02/2010 18:57	ED00006377	2861970	32.297	4.081	B	18	GR	1209.033
17/02/2010 18:57	ED00006377	2861970	2.362	0.066	B	06	GR	1209.033
04/11/2010 10:50	ED00008683	2974386	0.047	0.000	PB	99	GR	808.278
04/11/2010 10:50	ED00008683	2974386	0.871	0.000	B	99	GR	808.278
04/11/2010 10:50	ED00008683	2974386	0.281	0.000	SP	18	GR	808.278
04/11/2010 10:50	ED00008683	2974386	0.505	0.021	PB	18	GR	808.278
04/11/2010 10:50	ED00008683	2974386	0.052	0.000	A	06	GR	808.278
04/11/2010 10:50	ED00008683	2974386	0.211	0.000	SP	06	GR	808.278
04/11/2010 10:50	ED00008683	2974386	1.030	0.000	PB	06	GR	808.278
04/11/2010 10:50	ED00008683	2974386	24.237	0.137	B	06	GR	808.278
04/11/2010 10:50	ED00008683	2974386	12.120	0.348	B	18	GR	808.278
21/01/2011 6:28	WD00089218	3037474	32.502	1.359	B	18	GR	1052.085
21/01/2011 6:28	WD00089218	3037474	8.467	0.175	B	06	GR	1052.085
21/01/2011 6:28	WD00089218	3037474	0.039	0.000	B	99	GR	1052.085
22/01/2011 13:30	WD00089255	3039464	17.124	0.338	B	18	GR	1047.997
22/01/2011 13:30	WD00089255	3039464	7.264	0.090	B	06	GR	1047.997
24/01/2011 15:53	WE00135722	3039109	0.343	0.029	A	18	GR	1140.262
24/01/2011 15:53	WE00135722	3039109	3.057	0.050	B	06	GR	1140.262
24/01/2011 15:53	WE00135722	3039109	38.405	5.539	B	18	GR	1140.262
24/01/2011 15:53	WE00135722	3039109	0.117	0.000	PB	18	GR	1140.262
24/01/2011 15:53	WE00135722	3039109	0.021	0.000	B	99	GR	1140.262

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File: 06332-R01-01

December 10, 2014

Mr. Paul Scott, RPF
Strategic Planning Coordinator
Weyerhaeuser Company Limited
Pembina Timberlands
2509 Aspen Drive
Edson, Alberta T7E 1S8

Subject: AGREEMENT-IN-PRINCIPLE: WEYERHAEUSER COMPANY LIMITED, PEMBINA TIMBERLANDS MILL SCALE CULL PERCENTAGE PROPOSAL FOR USE IN THE 2016 FOREST MANAGEMENT PLAN

Dear Mr. Scott:

Thank you for the November 1, 2013 proposal to apply mill scaled cull to the 2016 Forest Management Plan (FMP) yield curves as follows:

Table 1. Proposed cull deduction by species and stand type for FMP 2016 *(November 1, 2013 proposal).*

Species Group	Species	Natural Stands		Managed Stands
		<=130 years	>130 years	
Deciduous	Aw	10.0%	17.4%[1]	7.0%
	Pb	5.3%		
	Bw	4.6%		
Coniferous	All	1.2%		1.2%

The department has completed a review of the documentation and data submitted.

Agreement-in-principle is provided subject to the following:

1. Section 4 of the November 1, 2013 proposal identifies cull will be deducted at the volume compilation stage of the local plot data. Please be advised that document requirements identified in Section 4.2.7 (d) of the Alberta Forest Management Planning Standard Annex 1 are as follows: *The technique used to account for cull deductions. Cull deductions are applied to yield projections rather than in the form of reduction to the harvest level in the timber supply analysis. The method of application and the magnitude of reductions must be documented.* Please ensure this requirement is addressed in your yield determination procedures.

[1] *Implemented as part of the deciduous stand decline function.*

The observed and agreed upon cull in this agreement-in-principle is a portion of the total cull to be applied in the 2016 FMP. The unaccounted for field operational cull will be addressed under separate cover and will be in addition to the cull percentages identified in this letter.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager, Forest Resource Management

cc: Dave Hugelschaffer, Approvals Manager, Upper Athabasca Region (Edson)
Daryl Price, Senior Manager, Forest Resource Analysis Section

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May 4, 2015

Mr. Paul Scott, RPF
Strategic Planning Coordinator
Weyerhaeuser Company Limited
Pembina Timberlands
2509 Aspen Drive
Edson, Alberta T7E 1S8

Subject: AGREEMENT-IN-PRINCIPLE: WEYERHAEUSER COMPANY LIMITED, PEMBINA TIMBERLANDS FIELD CULL PERCENTAGE PROPOSAL FOR USE IN THE 2016 FOREST MANAGEMENT PLAN

Dear Mr. Scott:

Thank you for the March 25, 2015 proposal to apply 1.9% deciduous and 1.2% coniferous field cull to the 2016 Forest Management Plan (FMP) yield curves.

Cull deductions agreed to in principle for the 2016 FMP are as follows:

Table 1. Total field cull deductions by species and stand type.

Species/Curves	Natural Stands	Managed Stands
All Deciduous	1.9%	1.9%
All Coniferous	1.2%	1.2%

Table 2. Total scale cull deductions by species and stand type[1].

Species Group	Species	Natural Stands		Managed Stands
		<=130 years	>130 years	
Deciduous	Aw	10.0%	17.4%[2]	7.0%
	Pb	5.3%		
	Bw	4.6%		
Coniferous	All	1.2%		1.2%

The department acknowledges Weyerhaeuser Company Ltd. (Pembina Timberlands) incorporated operational merchandizing in the field cull study. Please be advised that all requirements of the Weyerhaeuser Pembina Timber Harvesting and Operating Ground Rules and Scaling Regulation apply. These percentages do not imply approval of operational merchandizing (e.g. butt flare, forks, etc.).

[1] *Agreement-in-principle provided on December 10, 2014.*
[2] *Implemented as part of the deciduous stand decline function.*

.../2

Thank you for your diligence in addressing field cull per the December 10, 2014 agreement-in-principle.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager, Forest Resource Management

cc: Dave Hugelschaffer, Approvals Manager, Upper Athabasca Region (Edson)
Doug Schultz, Senior Manager, Timber Production, Auditing and Revenue Section
Glenn Dobransky, Provincial Scaling Supervisor
Daryl Price, Senior Manager, Forest Resource Analysis Section

Appendix XI: GY-002 Yield Curve Adjustment Methodology

This Appendix includes the proposed Yield Curve Adjustment Methodology as well as the Agreement-in-Principle letter obtained on May 4, 2015.

Issue Number: GY - 002

Yield Curve Adjustment Methodology

Type: ✓ Requires Resolution ☐ Discussion Item

1 Background

Weyerhaeuser Company Ltd. (Weyerhaeuser) is required to complete a Forest Management Plan (FMP) for the Pembina Timberlands (FMA # 0900046) by April 1, 2016.

This document outlines the proposed approach to developing multiple-utilization yield curves in support of the next FMP. Technical details regarding specifics of the actual yield curve development will be submitted as required in the FMP Yield Curve document.

The proposed methods intend to follow the procedures published in the 2006 Alberta Forest Management Planning Standard version 4.1 and additional supporting documentation released over the past 9 years.

2 Objectives

The main objective is to obtain agreement-in-principle from Alberta Environment and Sustainable Resource Development (ESRD) regarding the proposed approach to developing multiple-utilization yield curves so that changes can be made early in the process without jeopardizing the timelines of the Plan.

3 Methods

The proposed approach will be based on the following steps:

1. Identify the baseline utilization for the FMP yield curves.
2. Develop the FMP utilization matrix.
3. Develop FMP baseline yield curves (not discussed in detail in this document).
4. Compile gross merchantable volumes from the plot data based on the utilization limits.
5. Develop utilization adjustment equations by yield stratum and age.
6. Apply adjustment equations to the FMP baseline yield curves as required.
7. Calculate utilization adjustments that can be applied post-hoc to the AAC.

The general process is shown in

Figure 1; detailed discussion of each step is presented below.

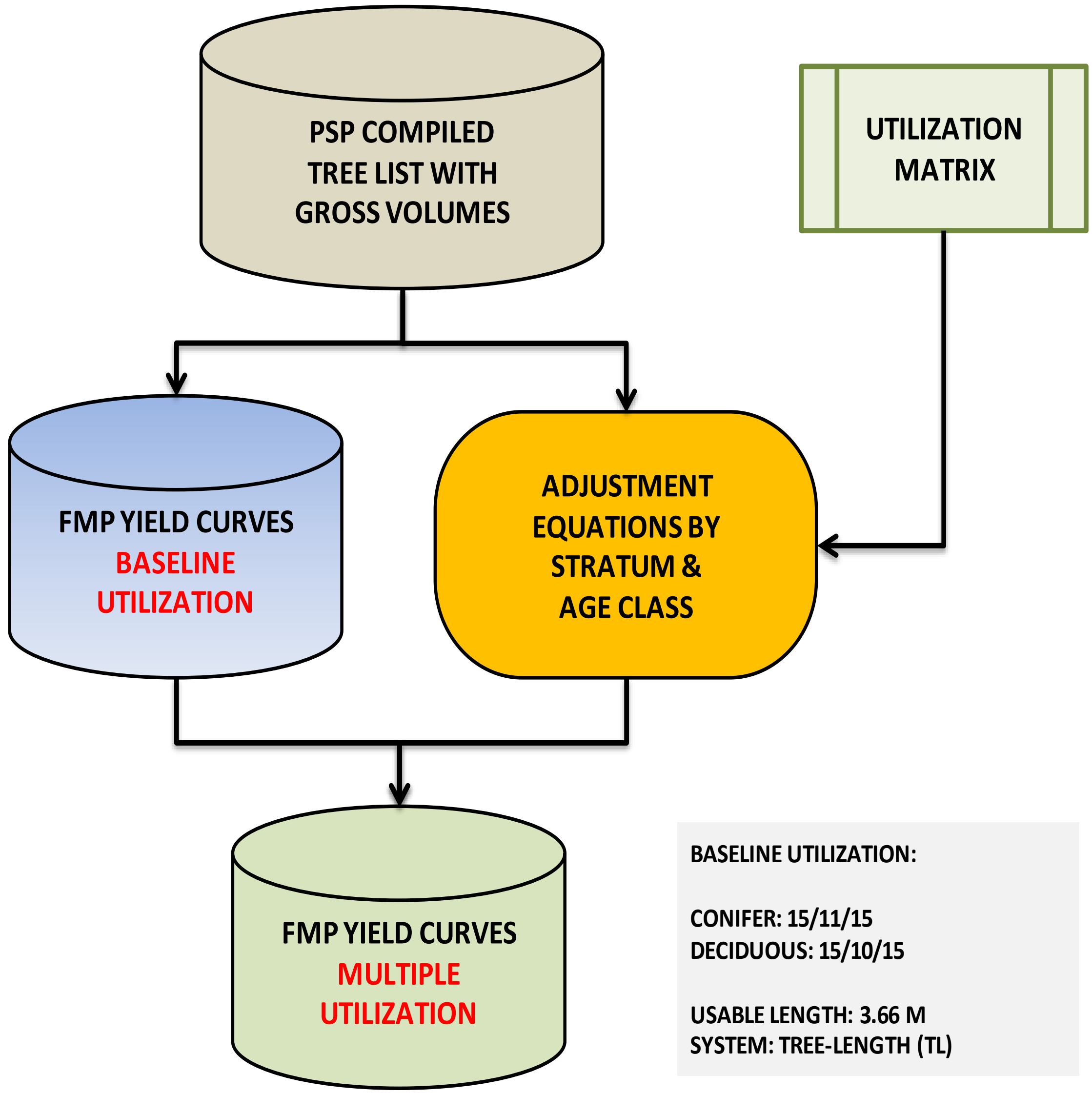


Figure 1. The proposed general approach to developing multiple-utilization yield curves

The proposed method avoids a number of issues that might be encountered by explicitly refitting the yield curves to different utilization standards and it is also necessary due to some inherent limitations of the GYPSY model as discussed in the next sections.

3.1 Identify baseline utilization for FMP yield curve development

The Growth & Yield Projection System (GYPSY) will be used for yield curve development in the FMP. The GYPSY model is capable of predicting gross merchantable[1] volumes from plot data. The modeler needs to provide the following utilization parameters:

- minimum stump diameter outside bark (STUMPDOB);
- top diameter inside bark (TOPDIB); and
- stump height from the ground (STUMPHT).

GYPSY gross merchantable volumes are compiled and projected based on a 3.66 m usable length (also known as minimum merchantable length - MML - measured from the stump) using the tree-length (TL) system where the volume is fully utilized to the specified merchantable TOPDIB.

Weyerhaeuser therefore proposes to develop FMP baseline yield curves using the following utilization limits:

Conifer:

STUMPDOB=15 cm, TOPDIB=11 cm, STUMPHT=15 cm, MML=3.66 m, SYSTEM=TL

Short notation: 15/11/15/366/TL

Deciduous:

STUMPDOB=15 cm, TOPDIB=10 cm, STUMPHT=15 cm, MML=3.66 m, SYSTEM=TL

Short notation: 15/10/15/366/TL

All FMP baseline yield curve volumes will be projected to the proposed utilization limits above. The short notation of the utilization limit will be used in the rest of this document.

In GYPSY, the modeler cannot specify alternate usable lengths, minimum log length, short logs, a mixture of different log sizes, trim allowance or other parameters. Development of adjustment factors to allow for different MML's and/or top diameter will have to be done outside of GYPSY.

3.2 Develop the FMP utilization matrix

The Weyerhaeuser Pembina Timberlands FMA operating ground rules and embedded quota holders require the projection of both conifer and deciduous gross merchantable volumes to various utilization limits and systems.

[1] No allowances for form (e.g. sweep or crook), breakage or decay are included in the merchandizing process. Net volumes will be derived based on an analysis of cull based on bush bucking from production studies and the analysis of scale data.

For example, Weyerhaeuser will utilize conifer volumes based on 3.66 m usable length.[2] Table 1 shows the utilization limits that will be needed for gross merchantable volume projection by operator in the FMA.

Table 1. FMP utilization matrix

COMPANY/OPERATOR	FOREST MANAGEMENT UNIT	CONIFER UTILIZATION	DECIDUOUS UTILIZATION
FMP BASELINE		*15/11/15/366**	*15/10/15/366*
WEYERHAEUSER	R12, E15, E2, W5, W6	15/11/15/366	15/10/15/488
BLUE RIDGE LUMBER	W6	15/11/15/366	NA
ALBERTA NEWSPRINT	W6	15/10/15/366	NA
MILLAR WESTERN	W6	15/10/15/366	NA
EDFOR COOPERATIVES	E2	15/11/15/366	NA
BRISCO WOOD	E15	15/11/15/366	NA
CTPP	R12, E2, W5, W6	15/11/15/366	15/10/15/488
LTP (MISC TIMBER USERS)	R12, E15, E2, W5, W6	15/11/15/366	15/10/15/488
DALE HANSEN	R12	15/11/15/366	NA
TALL PINE TIMBER	R12	15/11/15/366	NA
*RSA***	*ALL*	*15/10/30/366*	*15/10/30/366*

** Annual Allowable Cut (AAC) will be established based on tree-length (TL) processing. Cut-to-length (CTL) and other processing systems will not be considered in the context of FMP yield curves and AAC calculations.*
***Regeneration Standard of Alberta yield curves can be used to calculate the target MAIs for ARIS.*

3.3 Develop FMP baseline yield curves

GYPSY (v.2009 May) will be used for the development of FMP yield curves.[3] Weyerhaeuser's PSP data will provide the main source of input to develop yield curves for the natural landbase.[4] Plots will be stratified based on the most recent AVI (photo year 2012). Volume projections will be based on the FMP baseline utilization. Details on the curve development will be provided in the FMP Yield Curve document.

3.4 Compile gross merchantable volumes by utilization limit

As a guiding principle, gross merchantable volumes will be compiled for the same set of plot data used to develop the FMP baseline yield curves. Utilization limits will include all of those presented in Table 1. Additional utilization limits may be added in the future.

[2] Current Operating Ground Rules specify 4.88 m for the conifer which will be changed to 3.66 m in the next FMP.
[3] We may also explore the potential use of the Mixedwood Growth Model (MGM) for certain yield strata.
[4] We may also utilize the 73 PSPs provided by ESRD (LFS plots) that are located in the FMA area.

3.5 Develop adjustment equations by yield stratum and age

Adjustment equations will be developed using the stratification applied in the development of FMP baseline yield curves. The proposed approach avoids a number of the complications that might be encountered by explicitly refitting yield curves to different utilization limits and will also enable the accommodation of other utilization limits in the future.

$$GMV_{UTIL} = GMV_{BASE} * \left(1 - e^{-a*AGE^{b}}\right)$$

where

GMV_{UTIL}: observed gross merchantable volume (conifer or deciduous) based on the new utilization limit in the plot (m^3/ha)

GMV_{BASE}: observed gross merchantable volume (conifer or deciduous) based on the FMP baseline utilization limit in the plot (m^3/ha)

AGE: stand age

a, b: equation coefficients

e: base of the natural logarithm

The approach effectively models the differences observed by major stratum and age class based on the modified Weibull equation. [5]

3.6 Apply adjustment equations to the FMP baseline yield curves

Multiple-utilization yield curves will be developed by applying the adjustment equations by stratum to the FMP baseline yield curve conifer and deciduous predicted gross merchantable volumes.

$$Adjusted\ Yield_{New\ Util} = Predicted\ Yield_{FMP\ Baseline} * \left(1 - e^{-a*AGE^{b}}\right)$$

An example of the calculations and application methods is presented in the Appendix.

3.7 Calculate post-hoc AAC adjustment

Current protocols require that AAC calculation in the timber supply analysis is based on one set of yield curves as per the FMP baseline utilization.

Based on the proposed FMP utilization matrix (Table 1), we will need to calculate a utilization adjustment percentage for:

- Projected conifer AAC for Millar Western and Alberta Newsprint to accommodate the 10 cm merchantable top and
- Projected deciduous AAC to accommodate the 4.88 m useable length.

[5] Other equation forms will also be explored but the general form of adjustment will stay the same.

The adjustment will be calculated as follows:

1. Use the 20-year spatial harvest sequence (SHS) of the FMP as the basis for the calculations.
2. Use the FMP baseline utilization yield curves to calculate projected volumes in SHS cutblocks.
3. Use the 15/10/15/366 adjusted conifer yield curve and the 15/10/15/488 adjusted deciduous curve to calculate projected volumes in SHS cutblocks.
4. Calculate the percentage difference in projected conifer volumes in SHS cutblocks in timber dispositions for Millar Western and Alberta Newsprint.
5. Calculate the percentage difference in projected deciduous volumes in SHS cutblocks (all deciduous operators).

4 Important Notes

There are a number of important points that are summarized below:

- The proposed adjustment process will apply to both natural and managed stand yield curves. As managed stand yields will be based on the RSA process and data, the FMP baseline utilization could be set as 15/10/30/366/TL (conifer and deciduous) to mimic RSA compilation standards.
- Age will be based on the AVI stand age that is the link of the yield curves to the landbase. Obviously we need to develop the adjustment equations based on the same age.
- Most major strata in the FMP might be split by natural subregion and some definition of site. We anticipate for this purpose to use the SiteLogix based site class definitions used in the previous DFMPs in Edson and Drayton Valley as opposed to the AVI Timber Productivity Class.
- Adjustment equations will be based on the exact same set of plots and stratification scheme that the FMP baseline yield curves are based on. No further splitting will be made. (**Q: Are PSP measurements treated as independent observations for the adjustment process?**)
- We anticipate that most conifer utilization will be based on an 11 cm top and all deciduous will be based on 10 cm top diameter inside bark. This means that most of the differences will be because of top diameter (conifer) and useable length (deciduous). These differences will likely be minor and in a data driven adjustment process illogical cross-overs may occur. We will make an attempt to constraint the adjustment equations, if necessary for all major strata.
- Non-merchantable species such as larch (Lt) will be included in the adjustment process as GYPSY modeling also included larch in the PL species group. All GYPSY modeling includes larch as it takes up growing space. The larch content in the merchantable strata will be very small as most stands with larch will be removed from the productive forest landbase.
- The adjustment process described above will handle the utilization differences in gross merchantable volume but piece size differences will need to be addressed elsewhere.
- The data and modeling will be a transparent and repeatable process so that new utilization limits can be added in the future, if necessary.

APPENDIX - EXAMPLE CALCULATIONS FOR VOLUME ADJUSTMENT

The following examples intend to demonstrate the process of developing and applying volume adjustment in the Pembina Timberlands FMA. The main goal is to show the proof of concept using real data based on the following caveats:

- We used natural stand PSP measurement data from the FMA; however the data was not thoroughly cleaned or screened yet for FMP yield curve development. No plots were netted out. PSP re-measurements were treated as independent observations.
- Stratification was based on the "old" AVI using the ESRD 10 base strata. We picked Pl-VIII (Pure pine or pine leading conifer) and Hw-I (Pure deciduous) to demonstrate the concept.
- For the purpose of this demonstration, the stratification did not include any further break-down by natural subregion grouping, productivity or crown closure.
- Draft yield curves were developed from 245 Pl-VIII and 261 Hw-I PSP measurements using GYPSY with the FMP baseline utilization projections. These yield curves are by no means finalized for the FMP and are subject to change. Further adjustments may also be applied, such as a deciduous decline function.

The tree measurements were compiled to the following utilization limits:

Conifer baseline: 15/11/15/366/TL

Deciduous baseline: 15/10/15/366/TL

Conifer adjusted: 15/**10**/15/366/TL

Deciduous adjusted: 15/10/15/**488**/TL

Gross merchantable volumes were summarized at the plot measurement level. The adjusted utilization limits will result in higher plot volumes for conifer and the same or lower plot volumes for deciduous when compared to the FMP baseline utilization (Figure 2):

1. Conifer trees are utilized to the 10 cm merchantable top which results in a longer merchantable length when compared to the baseline utilization of 11 cm. The increased length will cause full trees to be included that were shorter than 3.66 m useable length at 11 cm top utilization which will be more prevalent in younger stands with smaller trees. There is also a minor increase in merchantable volume at the tree-level due to the additional gain in length to the 10 cm top.
2. Deciduous trees that are longer than 3.66 m usable length but shorter than 4.88 m will have no merchantable volume at the adjusted utilization. This will result in full trees being dropped. Therefore, stands that are younger with more small stems are expected to show higher proportions of loss in merchantable volume. The 4.88 m useable length will have minimal impact on merchantable volume in mature stands.

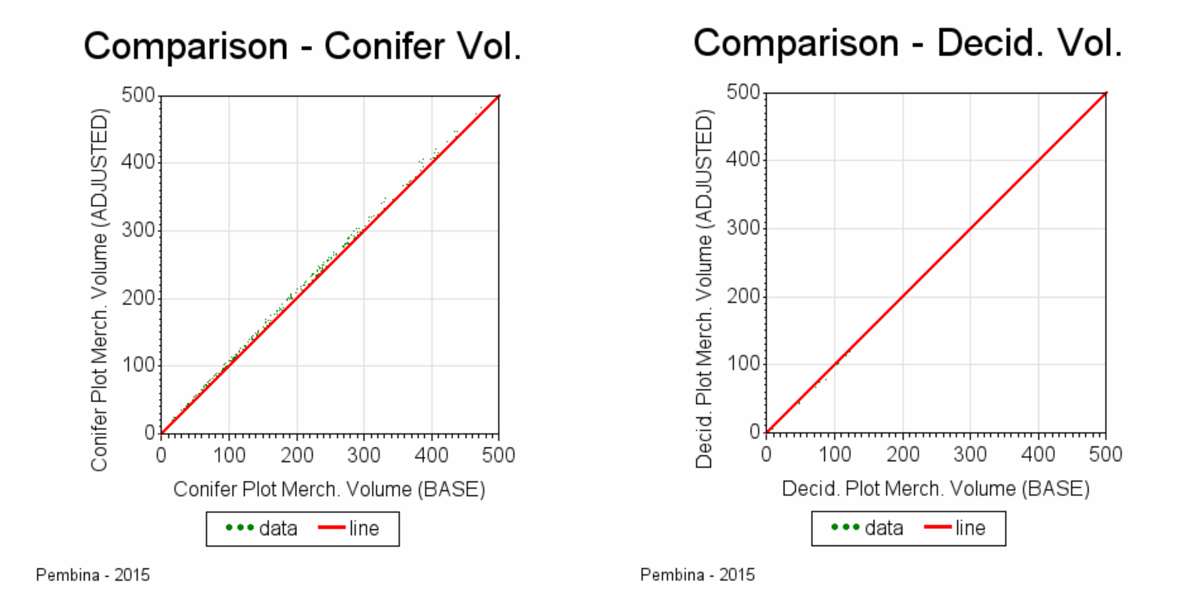


Figure 2. Merchantable volumes check by plot measurement for conifer (left panel) and deciduous

We fit utilization adjustment equations by stratum and species group (conifer and deciduous) using the modified Weibull model form. All non-linear regression equations converged successfully and were highly significant at the 95% confidence level.

The regression coefficients (a, b) were all significant at the 95% confidence level (Table 2). Bias distributions by strata are shown in Figure 3 (Hw-I) and Figure 4 (Pl-VIII).

Table 2. Utilization adjustment equation coefficients

Stratum	Species Group	N	a	b
Hw-I	Conifer	261	0.577398	0.426102
	Deciduous	261	0.194185	0.819945
Pl-VIII	Conifer	245	1.014013	0.269994
	Deciduous	245	0.604225	0.511076

Conifer utilization adjustment equation:

$$GMV_{ADJ} = \frac{GMV_{BASE}}{\left(1 - e^{-a*AGE^{b}}\right)}$$

Deciduous utilization adjustment equation:

$$GMV_{ADJ} = GMV_{BASE} * \left(1 - e^{-a*AGE^{b}}\right)$$

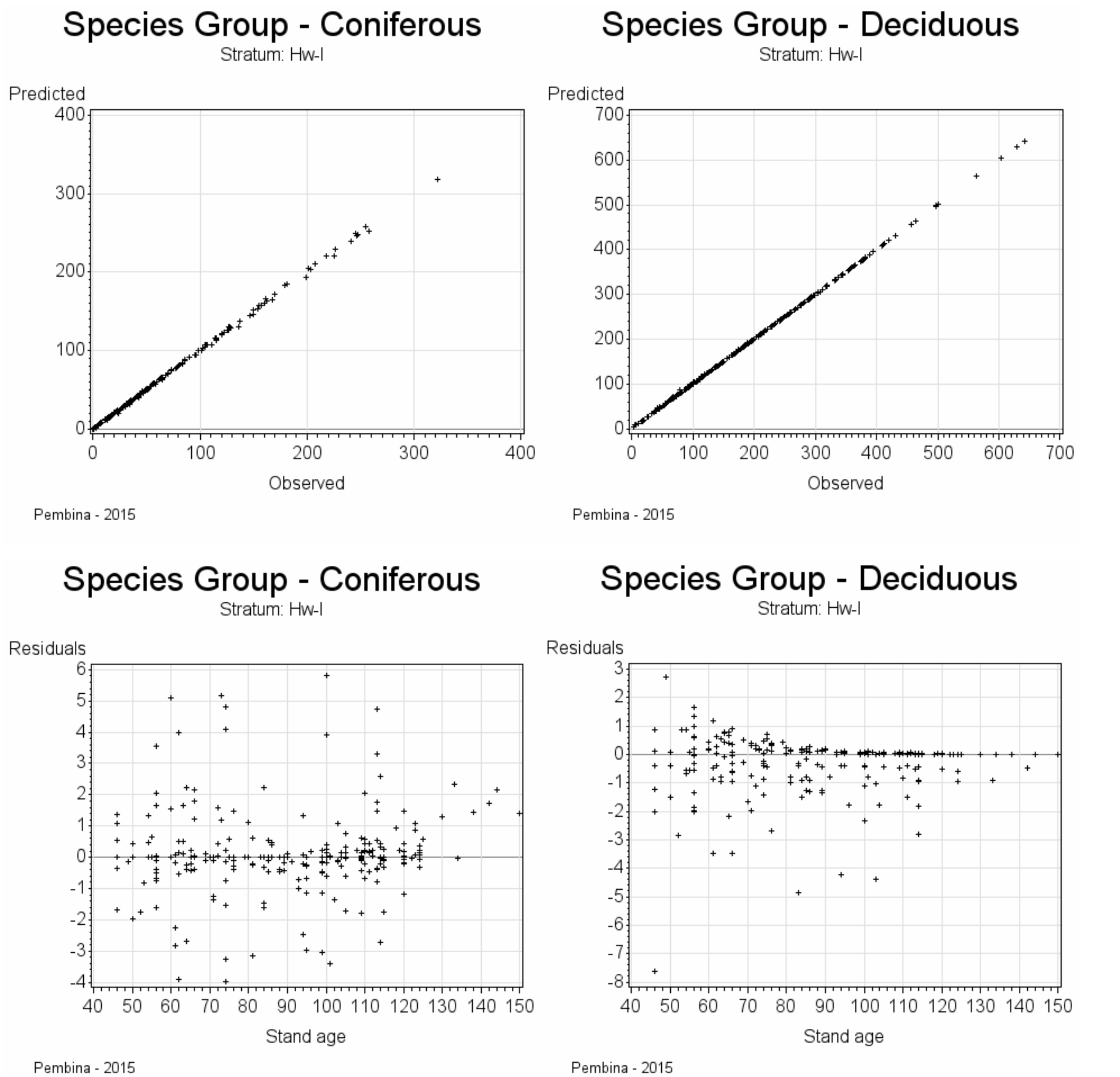


Figure 3. Bias distribution plots for stratum: Hw-I (unit of vertical axis is in m^3/ha)

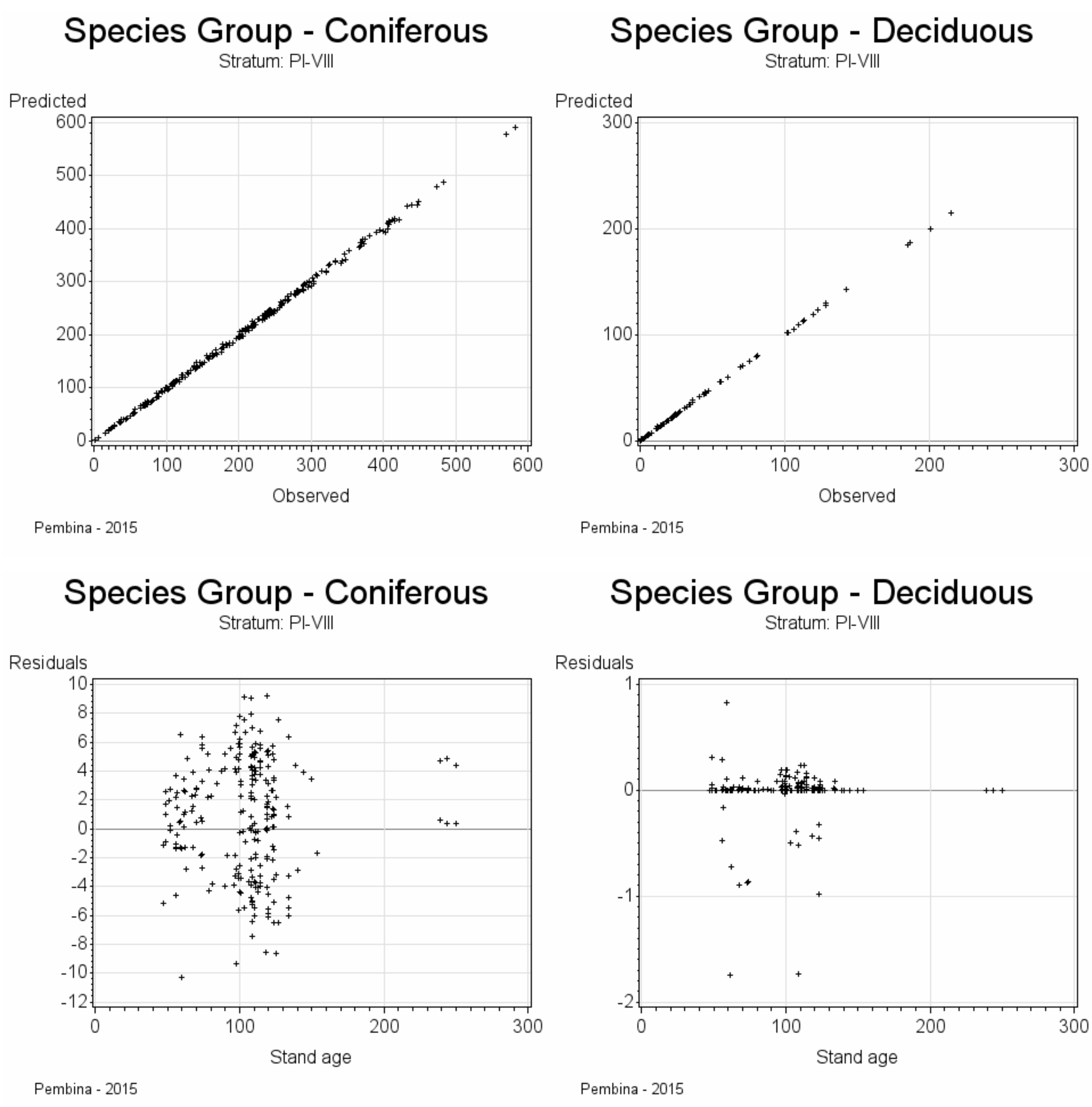


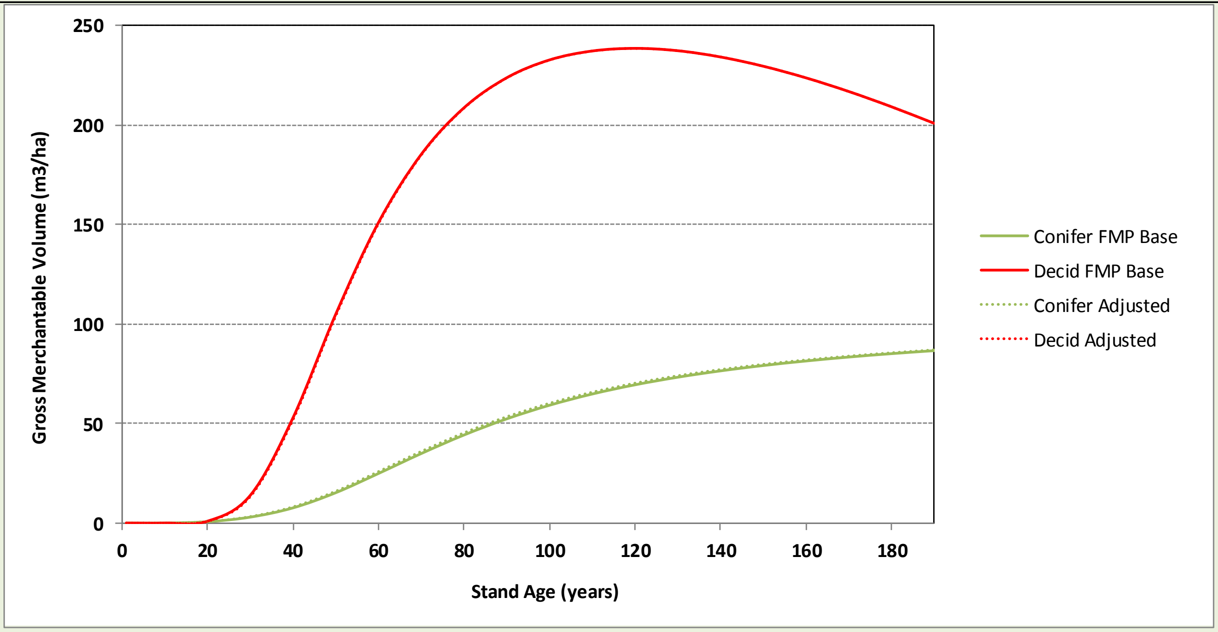
Figure 4. Bias distribution plots for stratum: Pl-VIII (unit of vertical axis is in m^3/ha)

The utilization adjustment equations were used to adjust the FMP baseline conifer and deciduous draft yield projections and derive the adjusted utilization based draft yield curves.

Figure 5 and Figure 6 show the FMP baseline and adjusted curves for the Hw-I and the Pl-VIII stratum, respectively. We included the percentage volume gain/loss numbers by 10-year age class for reference.

As expected, there is proportionally more gain/loss at younger age classes due to whole trees being included due to the increased merchantable length to 10 cm top (conifer) or trees being dropped due to the increased minimum useable length requirement of 4.88 m (deciduous).

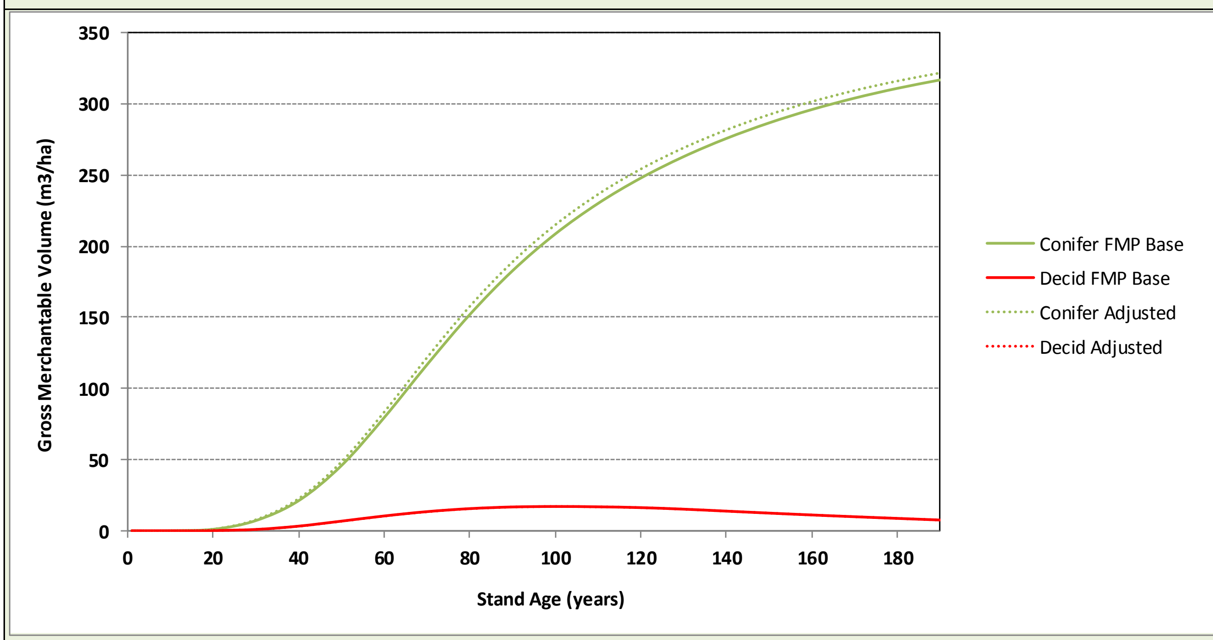
STRATUM: Hw-I



Stand Age	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
Conifer Gain %	9.34%	6.61%	4.93%	3.81%	3.02%	2.44%	2.01%	1.67%	1.41%	1.19%	1.02%	0.88%	0.76%	0.67%	0.58%	0.51%	0.45%
Decid Loss %	-4.25%	-1.84%	-0.82%	-0.38%	-0.18%	-0.09%	-0.04%	-0.02%	-0.01%	-0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Figure 5. FMP baseline (solid lines) and adjusted (dashed) draft yield curves for stratum Hw-I

STRATUM: Pl-VIII



Stand Age	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
Conifer Gain %	8.56%	6.86%	5.73%	4.90%	4.28%	3.79%	3.39%	3.06%	2.79%	2.55%	2.35%	2.17%	2.02%	1.88%	1.76%	1.65%	1.55%
Decid Loss %	-3.22%	-1.87%	-1.15%	-0.75%	-0.50%	-0.34%	-0.24%	-0.17%	-0.13%	-0.09%	-0.07%	-0.05%	-0.04%	-0.03%	-0.02%	-0.02%	-0.01%

Figure 6. FMP baseline (solid lines) and adjusted (dashed) draft yield curves for stratum Pl-VIII

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May 4, 2015

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Strategic Planning Coordinator
Weyerhaeuser Company Limited
Pembina Timberlands
2509 Aspen Drive
Edson, Alberta T7E 1S8

Dear Mr. Scott:

Subject: AGREEMENT-IN-PRINCIPLE: WEYERHAEUSER COMPANY LIMITED, PEMBINA TIMBERLANDS GY-002 YIELD CURVE ADJUSTMENT METHODOLOGY

The department has completed its review of the April 9, 2015 GY-002 Yield Curve Adjustment Methodology Issue Document.

Agreement-in-principle is granted for the proposed approach to developing multiple utilization yield curves in support of the 2016 Forest Management Plan.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager, Forest Resource Management

cc: Dave Hugelschaffer, Approvals Manager, Upper Athabasca Region (Edson)
Daryl Price, Senior Manager, Forest Resource Analysis Section

Appendix XII: GY-004 Estimating Stand Decline in Deciduous Stands

Issue Number: GY - 04

Estimating Stand Decline in Deciduous Stands

Type: ✓ Requires Resolution ☐ Discussion Item

1 Problem Statement

When field sampled TSPs or PSPs are used to estimate yield, losses due to mortality are reflected because dead trees are removed from the volume compilations. However, in some stands deciduous mortality accelerates as stands get older. Due to a lack of plots in the older age classes (few plots are older than 140 years) it is possible the empirical[1] yield curves under-represent the mortality loss to deciduous volumes.

There are 2 main questions with regards to deciduous mortality that are discussed in this paper:

1. **Can we identify certain stand types/locale where deciduous volume decline is more prevalent?**

   Deciduous volume decline does not occur evenly across all stand types. Knowing where there is a higher probability of deciduous volume decline and targeting and scheduling those stands will be important for deciduous operators in the DFA.

2. **Can we develop a volume decline function that better reflects deciduous mortality in the DFA?**

   In addition to stand age, there may be other factors that could be used to quantify the proportion of volume lost due to mortality.

2 Methods

There have been several approaches to implementing deciduous stand decline in empirical yield curves. In 2006, the DFMP yield curves used an age-based mortality constant (Huang 1999) that was applied to the deciduous volumes in an attempt to more fully capture volume loss. Deciduous volumes were reduced by an estimated percentage volume loss due to mortality (Table 1).

Table 1. Deciduous live gross merchantable volume proportion by stand age (Source: DFMP 2006)

Stand Age	100	105	110	115	120	125	130	135	140	145	150
Live Vol %	100.0%	98.0%	94.1%	88.4%	81.4%	73.2%	64.4%	54.4%	46.5%	38.2%	30.5%

Stand Age	155	160	165	170	175	180	185	190	195	200	205
Live Vol %	23.8%	18.1%	13.4%	9.6%	6.8%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%

[1] Current methods projecting PSP measurements using the GYPSY model and averaging the projections by AVI-based yield strata may be considered a semi-empirical approach where the curve-shape is largely pre-determined by GYPSY but the average volumes in the projections still resemble empirical curve fitting techniques.

Volume reduction due to mortality was applied to deciduous species only, therefore the more deciduous volume predicted in a stand the greater the decrease in projected total volume as a stand ages (Figure 1).

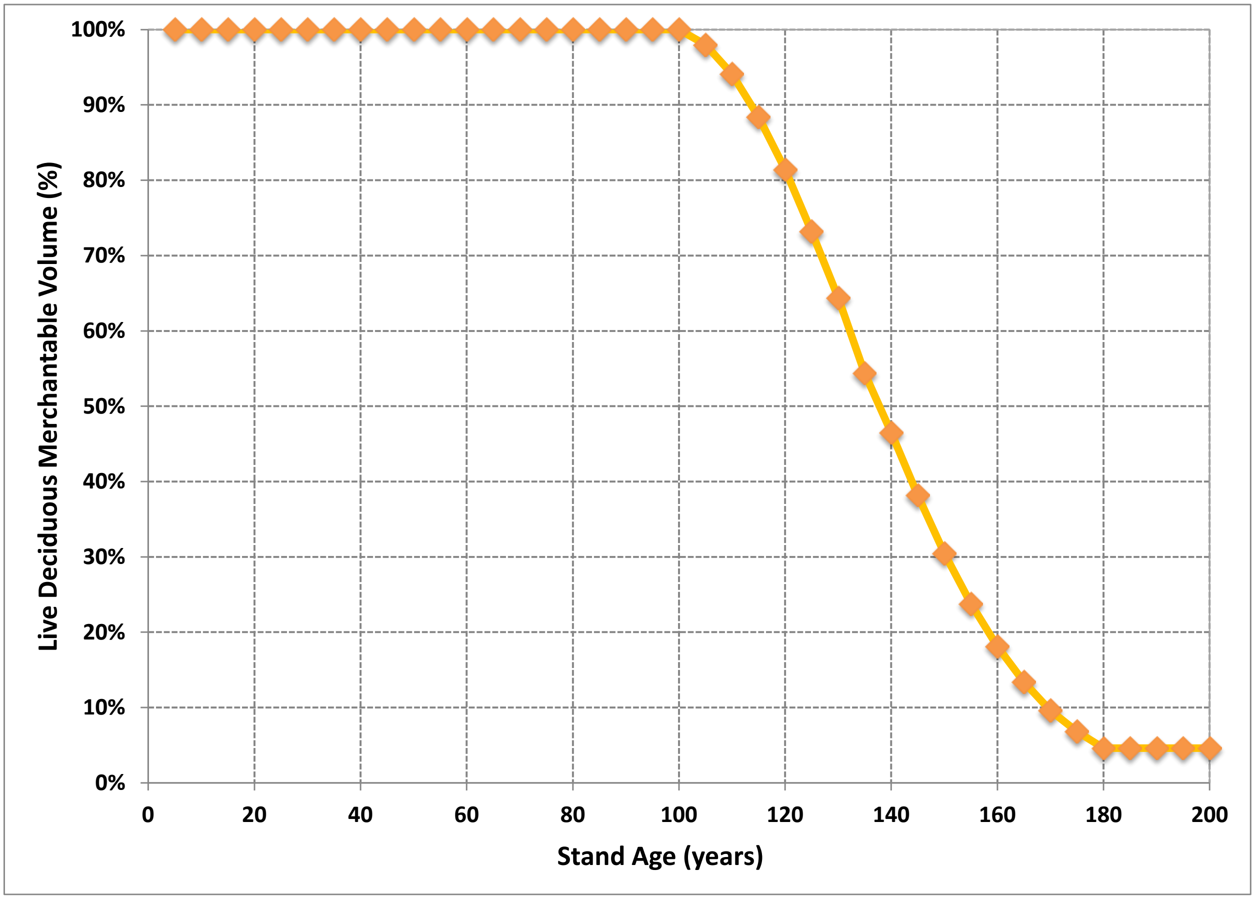

Figure 1. Estimated rate of deciduous volume retention versus stand age

After applying the mortality constants it might be expected that deciduous volumes will be more accurate. However, losses in volume due to mortality are to some extent offset by ingrowth (often of the coniferous species) and growth release of surviving trees (Husch *et al*. 2003). Currently, no information is available to reliably estimate the rate of ingrowth and release. As these potential volume variables are not included it must be acknowledged that after applying the mortality constant, it is quite possible that total volumes at older ages (especially 125+ years) are underestimated (Edson DFMP 2006).

Another approach to deciduous volume decline in current FMPs employs the concept of a maximum age where the volume is flat-lined, a break-up age where the volume starts to gradually decline and a termination age where the volume reaches 0 or some arbitrary volume (for example 75 m^3/ha). For deciduous dominated stands the maximum age is usually set at 100-110 years, the break-up age at 120-130 years and the termination age at 160-180 years.

All these methods however lack any analytical approach generally due to the shortage of data. Given the large amount of older pure deciduous stands in the Pembina DFA that are subject to volume declines, it is important to 1) identify the type of stands that are potentially at higher risk and 2) develop a volume decline function, if at all possible.

Weyerhaeuser has a relatively large number of PSPs in pure deciduous stands and deciduous-dominated mixedwood due to the amount of deciduous stands in the DFA (Table 2).

Table 2. The distribution of PSPs in deciduous stands in the DFA

Stratum	Plot Locations	Plot Measurements		Gross Area (ha)
		All	w/o 1st	
D-HW	131	324	193	157,177
DC-PL	20	44	24	16,954
DC-SX	18	43	25	21,412
Total	169	411	242	195,543

In these PSPs gross merchantable deciduous volumes were compiled to the DFA baseline utilization standard (15/10/15/366/TL) and summarized at the plot-measurement level. Periodic annual deciduous volume increment (PAI) was calculated for each plot measurement (not available for the 1^{st} measurements):

$$PAI\ (m^3 ha^{-1} year^{-1}) = \frac{GMV_{t2} - GMV_{t1}}{AGE_{t2} - AGE_{t1}}$$

where

GMV_{t1}: gross merchantable deciduous volume at time 1 (m^3/ha);

GMV_{t2}: gross merchantable deciduous volume at time 2 (m^3/ha);

AGE_{t1}: Stand AVI overstorey age at time 1 (years); and

AGE_{t2}: Stand AVI overstorey age at time 2 (years).

The use of PAI enables the investigation of volume losses on a comparable relative scale[2]. Our exploratory analysis included statistical tests using contingency tables and Fisher's exact test and XY scatter plots and regression analysis once the main factors and potential confounding factors were identified[3]. All analysis was done using the SAS™ 9.4 analytical software and the detailed output is presented under separate cover.

[2] Although mean annual increment (MAI) captures the slowing and change in growth rates, it does not reflect actual volume losses (such as negative growth rates).

[3] Fisher's exact test of independence works well with rxc contingency tables, where sample sizes are relatively small. The 2-directional test reveals if there are significant differences amongst the variables; however it does not provide further insight into the nature of those differences. Scatter plots and regression analyses were used to quantify the relationships using the original continuous scale variables.

Given that the contingency tables were used for exploratory analysis of the data and that these tables are better suited to categorical variables, we created a number of class variables. For example, we created an AGECLS variable for identifying plot measurements below 80 years (AGECLS=0), 80-110 years (AGECLS=1) and over 110 years (AGECLS=2). Similarly, the response variable deciduous PAI was also split into zero or positive growth rates (DPM=0) and negative growth rates (DPM=1). Overstorey height was put into 3 categories (HTCLS) : <18m, 18-25m and 25+m.

Note that all of the original continuous variables were retained and used in the subsequent regression analysis and XY scatter plots.

3 Results

The results of the exploratory analysis using two-way contingency tables for deciduous PAI as a binary categorical variable (DPM=0 for positive growth rates and DPM=1 for negative growth rates/volume losses) versus several other factors are presented in Table 3.

Table 3. Results of the 2-way contingency tables for DPM

Variable	Description	p-value
FMA	DV or ED	0.1997
NSR2005	CM=1, UF=10, LF=11	0.2629
FMU	**E15, E2, W5, W6, R12**	**0.0077**
FMU2	**E (E15, E2), W (W5, W6), R (R12)**	**0.0019**
FMU3	**X (E15, E2, R12), W (W5, W6)**	**0.0024**
TPR	F, G, M	0.5439
AGECLS	**0 (<80), 1 (80-110), 2 (110+)**	**0.0005**
HARDPCT	AVI O/S hardwood % (5-10)	0.8934
ESRD10	AVI O/S stratum (D-HW, DC-PL, DC-SX)	0.6142
DENCLS	AVI O/S density (AB, CD)	1.0000
HTCLS	0 (<18m), 1 (18-25m), 2 (25m+)	0.1047
USSP	AVI U/S softwood % 0 (<80%), 1 (80%+)	0.4206

Note: highlighted variables are highly significant (alpha=0.05)

Based on the exploratory analysis, the following general observations can be made:

- There are significant differences in growth rates by FMU. Further analysis showed that volume losses are more prevalent in Drayton Valley (R12) and FMUs E15 and E2 in Edson, while W5/W6 does not appear to show great deciduous volume declines.
- There are significant differences in growth rates by age class. This is of course not surprising and expected. As stands age, there is a higher degree of deciduous volume loss, which is more prevalent in stand over 100-110 years.

- There is no apparent effect of overstorey hardwood percent (based on AVI) in these pure deciduous and deciduous dominant mixedwood stands. This is also confirmed by the analysis of the overstorey strata (ESRD10).
- AVI overstorey height shows a weak but not significant association with volume loss (p=0.1047)
- Neither AVI overstorey density[4] nor understorey conifer content showed a significant relationship with deciduous volume loss/growth rates.
- TPR was also non-significant based on the data.

While the 2-way contingency tables provide a high-level overview of variables that appear to be associated with deciduous volume loss, further analysis was needed to identify potential confounding factors or variables that maybe affected by the underlying distribution of the data. For example:

- TPR may not show a significant impact on deciduous volume losses, but we need to also review if this is also the case when the influence of distribution by FMA/FMU is removed (e.g. what if more good sites are present in the sample from Drayton Valley?).
- AVI overstorey height is obviously correlated to stand age (and to some degree to TPR) but we may need to investigate the effect.
- AVI overstorey hardwood percent and stratum do not appear to be associated with deciduous volume losses. But this may also be related to the overwhelming presence of the pure deciduous (D-HW) stands in the sample (Table 2). This is not a major problem as there is only a limited amount of mixedwood stands in the DFA as per the currently completed AVI.

The results of the 2-way contingency tables of several categorical variables are presented in Table 4.

Table 4. Results of the 2-way contingency tables of categorical variables

Variables	FMU3	TPR	AGECLS	HTCLS	DENCLS	ESRD10	NSR2005
FMU3							
TPR	**0.0025**						
AGECLS	0.0582	0.8387					
HTCLS	0.1424	**0.0000**	**0.0000**				
DENCLS	0.4456	0.2320	0.2414	0.1181			
ESRD10	0.5398	**0.0153**	0.4205	0.3834	0.7732		
NSR2005	0.8449	0.8113	**0.0017**	0.0512	0.1957	0.1621	

Note: highlighted variables are highly significant (alpha=0.05)

- FMU and FMA are closely correlated and therefore only FMU was tested.
- As expected AVI overstorey height is not independent of TPR and age class.

[4] Stand overstorey density of the current AVI may not reflect actual densities of the PSP and due to the development of older deciduous stands; current AVI density may differ from the stand density at the time of the plot measurement. Therefore AVI overstorey density is likely a poor predictor of stand decline as also shown by the statistics.

- AVI overstorey stratum (ESRD10) is associated with TPR; however the majority of the sample plots are in the D-HW stratum, with very low representation of the mixedwood strata (DC-SX, DC-PL) and virtually no representation of fair sites.
- Natural subregion (NSR2005) is strongly associated with age class; however the majority of the sample plots are in lower foothills, with very low representation of central mixedwood and as expected, virtually no representation of the upper foothills subregion.

Based on the results, we can identify that age class and FMU are strongly associated with deciduous volume decline, while many of the other variables such as AVI height class are closely associated with age class. The impact of FMU on age class and TPR[5] were further investigated as shown in Table 5.

Table 5. The impact of age class and TPR on deciduous volume loss by FMU3

Variable	FMU3 Level	p-value
AGECLS	W (W5, W6)	0.8202
	X (E15, E2, R12)	**0.0000**
TPR	W (W5, W6)	0.1062
	X (E15, E2, R12)	0.5031

Note: highlighted variables are highly significant (alpha=0.05)

The results in Table 5 suggest that deciduous growth rates are strongly associated with age class in FMUs E15, E2 and R12. This is important because we also know from Table 4 that the proportion of age classes is not associated with FMU (i.e. the sample does not suggest a statistically significant distortion of age class proportions by FMU).

Given that FMU and stand age are strongly associated with deciduous growth rates, we developed a simple adjustment equation that can be used to:

1. Identify the average stand age where deciduous growth rates turn negative, i.e. the deciduous volume decline starts (growth of surviving mature trees and in-growth is outpaced by mortality).
2. Quantify the average rate of deciduous volume loss.
3. Implement different deciduous decline functions for W5/W6 and the rest of the DFA.

Due to the strategic nature of the FMP Timber Supply Analysis, yield curves represent average stand conditions and volume projections by AVI strata in natural stands. The accuracy of volume predictions will vary stand by stand; however it is important to identify the groups of stands that may be at risk of higher levels of mortality and volume loss so that the timber supply model can address priority setting and harvest scheduling not only based on age (oldest first) but also by minimizing growth loss, where applicable.

The preliminary investigation indicated that deciduous mortality is more prevalent in Drayton Valley (FMU=R12) and in the northern part of Edson (FMUs E15 and E2). Significant stand decline starts around 90-100 years as shown in Figure 2. There is minimal volume loss observed in deciduous stands in the W5 and W6 FMUs.

[5] TPR was selected for the analysis over height class as inventory variables that are assumed to be static over time are preferred and we also know that height class and age class are strongly associated.

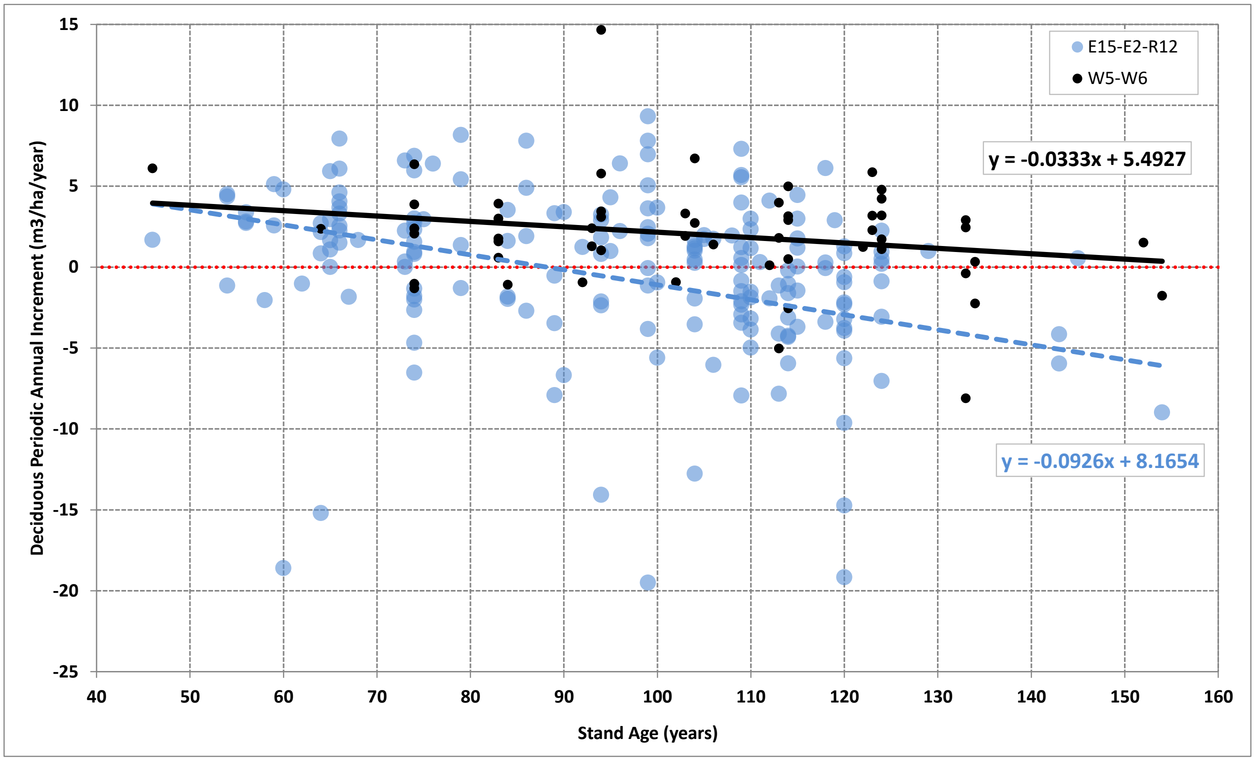

Figure 2. Deciduous volume loss by FMU area

Deciduous yield estimates can be adjusted for mortality by reducing the yields by the predicted deciduous PAI average until yield predictions reach zero. Volume declines are implemented only after the PAI growth rates turn negative (the prediction line crosses the X axis).

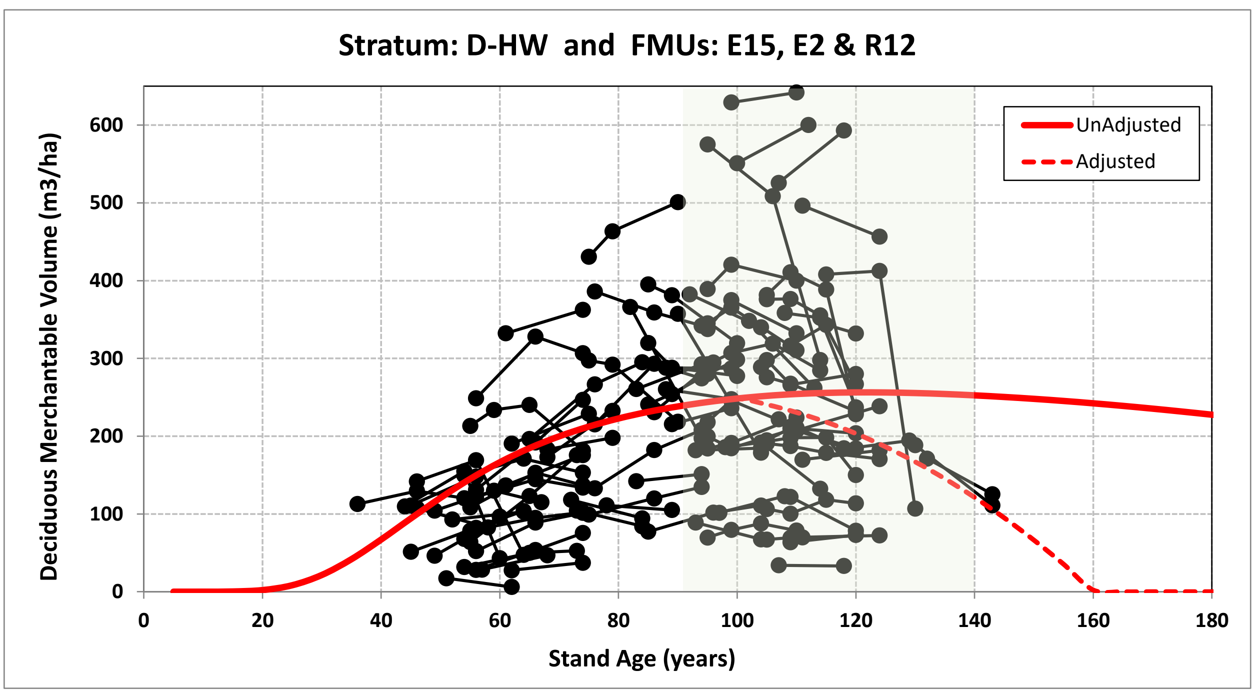

Figure 3. FMP draft deciduous yields - E15, E12 & R12 FMUs (yield curves are subject to change)

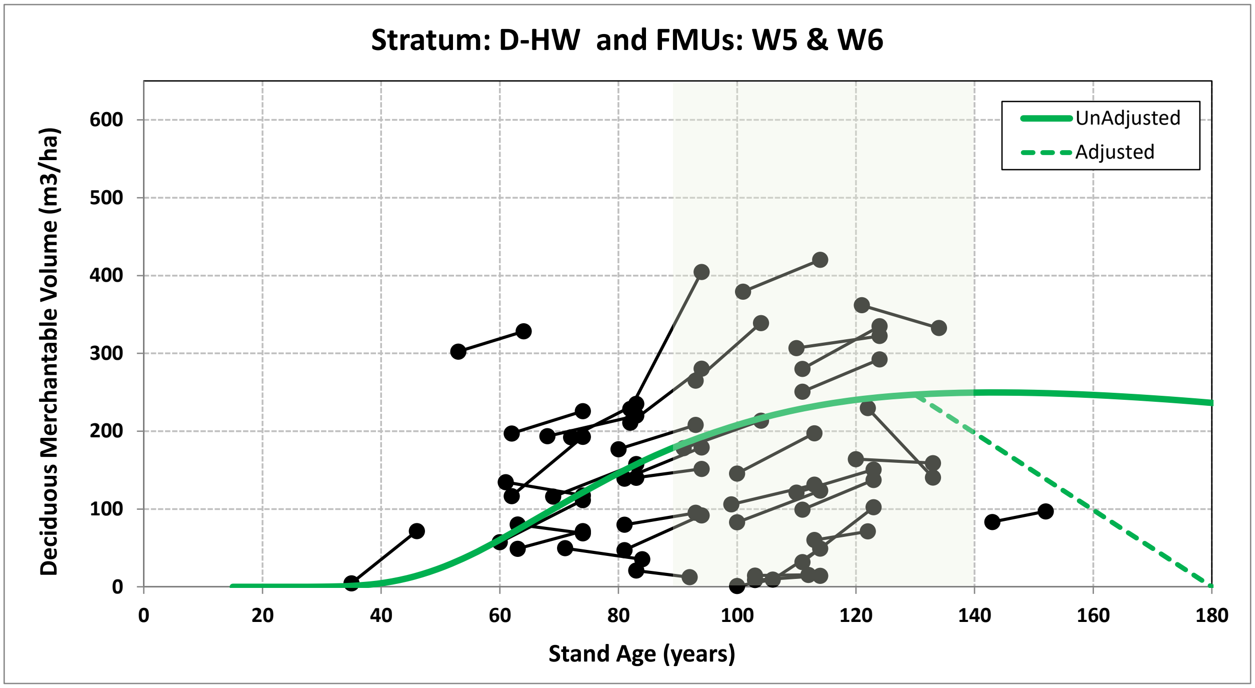

Figure 4. FMP draft deciduous yields - W5 & W6 FMUs (yield curves are subject to change)

We constructed preliminary FMP draft yield curves from the natural stand PSP data for the D-HW stratum and implemented the volume loss predictions for the E15-E2-R12 FMUs (Figure 3).

The deciduous yield curve for the W5/W6 FMU draft yield curve was artificially adjusted by gradually declining the deciduous yields from 130 years to 180 years where volumes reach zero (Figure 4). Unlike in the E15-E2-R12 FMUs, the shaded area does not appear to suggest major stand declines in W5 & W6. The main reason is that there is no data available beyond 155 years which may indicate that many of these stands in W5 and W6 have been harvested or were subject to declines and natural succession (and therefore may already show as mixedwood stands in the current AVI).

4 Discussion

There is very little known about the growth and yield and development of older stands in the western boreal forests. These stand types are generally poorly represented and in the absence of reliable information, growth and yield model developers usually assume that merchantable volume in these stands gradually drops to zero as the trees senesce.

Under natural conditions and in the absence of stand replacing disturbance, the complete loss of merchantable volume is highly unlikely. It is more probable that as the overstorey of the stand collapses, a mid-canopy layer is formed through seeding and layering and eventually will replace the original stand. Conditions of the ‘new’ stand will be a vertically diverse structure of living and standing dead trees and abundant coarse woody debris.

There is a reasonable argument that merchantable volume will always be present in these stands, although it is likely that the volumes will be lower than those found in fully stocked even-aged stands

(LeBlanc 2014). Consideration should be given to the additional adjustment of these volume decline functions in the timber supply analysis model (Moore 2016).

5 Recommendations

Based on our analysis we make the following recommendations:

Natural Stands:

1. D and DC strata - E2/E15/R12 FMUs: Implement a deciduous volume stand decline function in as proposed starting at 100 years stand age using a linear adjustment of predicted PAI.
2. D and DC strata - Rest of the DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.
3. C and CD strata - Entire DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.

Managed Stands:

4. All strata - Entire DFA: Implement a continuous deciduous volume stand decline starting at 130 years (maximum age) targeting zero volume at 180 years.

6 Resolution

<*to be added*>

7 References

LeBlanc, P. 2014. Incorporating multi-cohort old aspen and mixedwood dynamics into a long-term forest management plan. The Forestry Chronicle 90:50-58.

Moore, T. 2016. Succession analysis for the 2015 TSA. Alberta-Pacific. Unpublished draft paper. p.14.

Huang, S. 1999. Interim mortality models for white spruce and aspen grown in boreal mixed-species stands. Forest Management Division, Lands and Forest Service. Alberta Environment. Presented at the WESBOGY Annual Meeting, September 1999.

Husch, B., Beers, T., and Kershaw, J. 2003. Forest Mensuration – 4th edition. John Wiley & Sons, Inc., Hoboken, New Jersey. pp 443.

Weyerhaeuser Company Limited. 2005. Determining the AAC for the Weyerhaeuser Edson FMA Component#1: Yield Projections. Forest Management Agreement Area #9700035. pp 255.

Agreement In Principle – May 20, 2016

Appendix XIII: GY-005 Application of the Results of the Regenerated Stand Productivity Study in FMP Yield Curve Development

This Appendix contains the methodology for applying the Regenerated Stand Productivity (RSP) results to yield curve development as well as Agreement-in-Principle obtained on January 23, 2015.

Weyerhaeuser

Issue Number: GY - 005

Application of the Results of the Regenerated Stand Productivity Study in FMP Yield Curve Development

Type: ✔ Requires Resolution ☐ Discussion Item

1 Background

The Regenerated Stand Productivity (RSP) study documentation was submitted to Alberta Environment and Sustainable Resource Development (ESRD) for review on October 7, 2014. Liana Luard (ESRD) requested further information regarding the general methodology of implementing the results of the RSP study in FMP yield curve development.[1]

2 Objectives

The main objective is to obtain an agreement-in-principle from ESRD regarding the proposed approach to implementing the RSP study results in the development of FMP yield curves so that changes can be made early in the process without jeopardizing the timelines of the Plan.

3 Methods

Weyerhaeuser will use the site productivity results of the RSP study in the development of existing managed stand yield curves for **stands harvested prior to March 1, 1991**. The data collected in the RSP study is the best available on the ground site productivity information that is available for the Pembina FMA for existing managed stands harvested prior to 1991.

Weyerhaeuser's on-going growth and yield monitoring program in post-harvest regenerated stands will provide data to validate age-height trajectories and other managed stand attributes in the future.

Two documents were reviewed that provided guidance regarding the application of RSP study results:

1. *Weyerhaeuser Grande Prairie FMA 2011 Detailed Forest Management Plan Yield Tables document (Appendix III - Calculation of site index seeds using results from the Regenerated Stand Productivity Study)*
2. *Canfor Grande Prairie FMA 2012 Forest Management Growth & Yield document (Sections 3.4.1 & 5.2.1)*

[1] As per email from Liana Luard (ESRD) to Paul Scott (Weyerhaeuser) on November 27, 2014.

Given that the Pembina FMP 2016 yield curve development has not started yet, some guiding principles and a general methodology will be followed:

- The RSP study results will only be applied to existing managed stands in the Timber Harvesting Landbase (THLB) that were harvested prior to March 1, 1991 (target population) that have an ARIS opening number assigned to them. Those blocks that do not have an ARIS opening number will be assigned a natural stand yield curve based on AVI interpretation.
- The RSP study sampling frame included only areas in the Lower Foothills and Upper Foothills natural subregions hence the results will not be applied in other minor subregions in the FMA.
- Any area outside the RSP study sampling frame will be assigned with natural stand yield curves.
- RSP study samples were selected by species, natural subregion and ecosite but that was not proportional to the target population; therefore the results will need to be area-weighted.
- RSP study results were calculated separately for the Edson and Drayton Valley; however Weyerhaeuser may need to combine results by yield groups for the entire Pembina FMA using proper area-weighting.
- Stratification will be based on the latest AVI information (based on ESRD 10 base yield groups).
- Yield curve methodology will be identical to the method used for natural stands. We anticipate using FMA-specific natural stand PSP data and averaging GYPSY projections by yield group.
- Adjustments will be made for pine (PL) and white spruce (SW), no adjustment will be made to black spruce (SB). In the GYPSY projections we only have a deciduous species group (AW) but we have RSP site index results for poplar (PB) and aspen (AW). For each PSP, we will need to apply the proper deciduous site index based on the deciduous species present in the plot.

The following general steps are proposed:

1. Calculate the average natural stand site index (NSSI) by species, yield group and natural subregion from the last measurement of the PSP data.
2. Calculate the average managed stand site index (MSSI) by species, yield group and natural subregion based on the RSP study results and the target population areas.
   - We will need to properly weight the site index based on the area distribution of ecosites within the target population.
   - Any natural subregion/ecosite combination with area in the target population but no site index result will default to the minimum site index within the natural subregion.
3. Calculate the ratio of MSSI/NSSI by species, yield groups and natural subregion. If any missing, the ratio of 1 will be applied (no adjustment).
4. Apply the ratio to the PSP measurements site index by species, yield group and natural subregion.
5. Re-run the exact same process used in the development of natural yield curves but with the adjusted site index values.

Alberta Environment and Sustainable Resource Development

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January 23, 2015

Mr. Paul Scott, RPF
Strategic Planning Coordinator
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Pembina Timberlands
2509 Aspen Drive
Edson, Alberta T7E 1S8

Subject: AGREEMENT-IN-PRINCIPLE: WEYERHAEUSER COMPANY LIMITED, PEMBINA TIMBERLANDS REGENERATED STAND PRODUCTIVITY IN CENTRAL ALBERTA

Dear Mr. Scott:

Thank you for the October 2014 Regenerated Stand Productivity in Central Alberta proposal with subsequent follow up documentation submitted on December 31, 2014.

The proposal and follow up documentation have been reviewed and agreement-in-principle for use in the 2016 Forest Management Plan is granted.

If you have any questions, or require further information please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Senior Manager, Forest Resource Management

cc: Dave Hugelschaffer, Approvals Manager, Upper Athabasca Region (Edson)
Daryl Price, Senior Manager, Forest Resource Analysis Section

Appendix XIV: GY-006 RSA linework – resolution of overlaps/slivers

Weyerhaeuser

Issue Number: GY - 006

RSA linework - resolution of overlaps/slivers

Type: ✓ Requires Resolution ☐ Discussion Item

1 Background

Performance survey data collected to the Regeneration Standard of Alberta (RSA) since 2009 will play an important role in the development of yield curves for the regenerating landbase. This document identifies a minor issue regarding overlaps in the RSA linework of sampling units in aerial programs and proposes an approach to resolve the issue.

2 Issue

Minor overlaps/slivers were identified in the RSA sampling unit linework of Weyerhaeuser's aerial programs from 2009 to 2013 (Table 1).

Table 1. Minor overlaps/slivers in Weyerhaeuser's aerial RSA programs (2009-2013)

LAYER 1				LAYER 2				OVERLAP
UNIQUE_ID	YEAR	AREAHA	SAMPLED	UNIQUE_ID	YEAR	AREAHA	SAMPLED	(HA)
5140442101A_1	2009	18.96	N	5140442122A_1	2010	12.98	N	0.0139
5150440131A_1	2009	7.05	N	5150440131B_2	2010	11.50	N	0.3160
5150440131A_1	2009	7.05	N	5150440131B_1	2010	7.82	N	0.2873
5140441158A_2	2010	20.64	N	5140441408_1	2013	13.76	N	0.0189
5140441158A_2	2010	20.64	N	5140441408_3	2013	69.33	N	0.0401
5140441119A_1	2010	11.26	N	5140441408_3	2013	69.33	N	0.0154
5100401743A_1	2010	0.92	N	5100400867A_1	2012	0.28	N	0.0031
5120432166_1	2013	4.87	Y	5120432852A_1	2012	7.12	N	0.0024
5120432166_1	2013	4.87	Y	5120432852A_5	2012	103.05	N	0.0224
5160512693A_2	2010	3.90	N	5160512692_1	2012	0.27	Y	0.0202
5160510171A_1	2010	14.74	N	5160510172_2	2012	0.15	Y	0.0085
5160510171A_1	2010	14.74	N	5160503639_1	2012	0.52	Y	0.2554
5160503659A_1	2010	20.01	N	5160503638_1	2012	0.83	Y	0.7374
5160503659A_1	2010	20.01	N	5160503669_1	2012	0.40	Y	0.2079
5160503659A_1	2010	20.01	N	5160503657_1	2012	1.72	Y	1.4936
5160513462A_4	2010	6.86	N	5160513471_1	2012	0.97	Y	0.7758
5160513462A_2	2010	1.54	N	5160513471_1	2012	0.97	Y	0.0035
5160512788A_1	2010	18.97	N	5160512769_1	2012	0.80	Y	0.7035
5160512788A_2	2010	5.35	N	5160512769_1	2012	0.80	Y	0.0001
5110431874B_1	2010	4.43	N	5110431934B_1	2010	2.06	N	0.0230
TOTAL								4.9485

These overlaps exist within a program year and also across program years as presented in Figure 1.

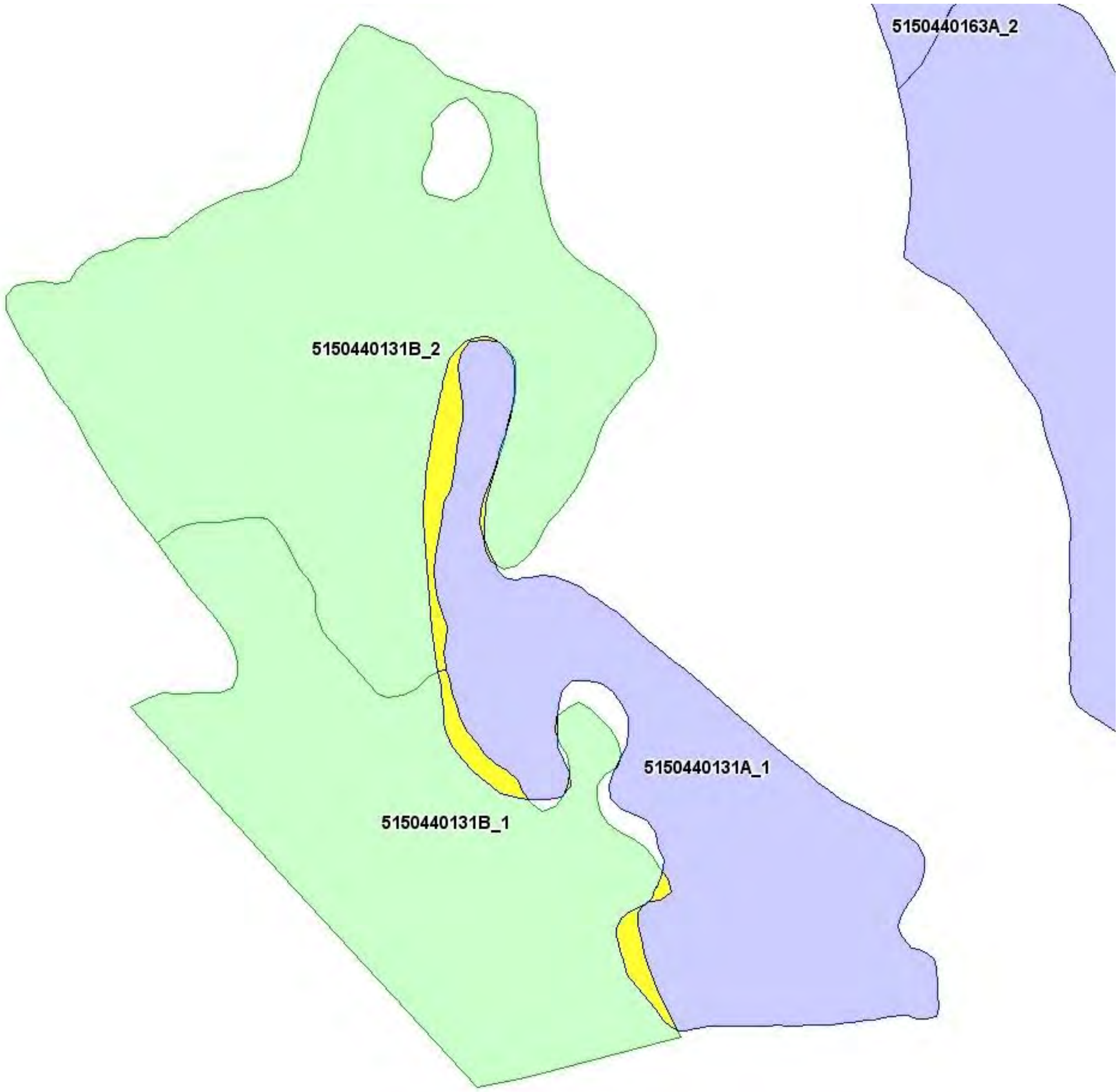

Figure 1. Example of overlaps across RSA program years

3 Objective

The main objective is to seek approval from Alberta Environment and Sustainable Resource Development (ESRD) regarding the proposed approach to resolving overlaps/slivers in the RSA linework.

4 Proposed Approach

Of the 12,934 ha of Weyerhaeuser's RSA sampling unit population between 2009-2013, there is less than 5 ha of area affected by the overlaps/slivers (Table 1). Nevertheless, we need to resolve the issue so that we can build an integrated RSA layer for the aerial programs. These issues may also be present in the Quota Holders' aerial RSA programs.

The following guiding principles will apply:

- During the development of RSA-based yield curves for the regenerating landbase we will use the sampling unit areas as included in the original submissions. This is needed to ensure that proper weights and the original selection probabilities are maintained.
- The RSA linework will be cut into the landbase and will be used to assign the proper RSA strata.

We propose the following rules to resolving the overlaps/slivers in order of priority:

1. Use the linework of the more recent program.
2. Use the linework of the ground sampled SU.
3. Use the linework of the larger SU.

5 Resolution

Email received on February 19, 2015 from Liana Luard to Paul Scott reads:

"*I have received input from our Resource Analysis Section subject matter experts on the RSA Linework overlap issue.*

There are no objections to the proposal dated October 20, 2014 (attached). The previous discussions about weighting have been incorporated and the hierarchy for resolving overlaps is reasonable.

The reviewers did provide an optional recommendation that I believe is worth putting forward. If the overlaps in the data are created by uncertainty in the borders of two adjacent openings, the gaps created by the same process could also be resolved and associated with one opening or the other. There is acknowledgement that there is a risk that this might alter the harvested area field enough to influence the ARIS NLB Reconciliation exercise. It would however, lead to a much cleaner net landbase."

PDT agreement, February 25, 2015

Appendix XV: GY-010 Managed Stand Yield Curve Development

Issue Number: GY - 010

Managed Stand Yield Curve Development

Type: ✓ Requires Resolution ☐ Discussion Item

1 Background

Weyerhaeuser Company Ltd. (Weyerhaeuser) is required to complete a Forest Management Plan (FMP) for the Pembina Timberlands (FMA # 0900046) by April 1, 2016.

This document outlines the proposed approach to developing managed stand yield curves in support of the next FMP. Technical details regarding specifics of the actual yield curve development will be submitted as required in the FMP Yield Curve document.

The proposed methods intend to follow the procedures published in the 2006 Alberta Forest Management Planning Standard version 4.1 and additional supporting documentation released over the past 9 years.

2 Objectives

The main objective is to obtain agreement-in-principle from the Government of Alberta (GoA) regarding the proposed approach to developing managed stand yield curves so that changes can be made early in the process without jeopardizing the timelines of the Plan.

3 Methods

Managed stands are defined as any post-harvest regenerated (PHR) stands that are identified with an Alberta Regeneration Information System (ARIS) record and have been reconciled with ARIS either during the preparation of the inventory (AVI) and/or through the development of the Net Land Base (NLB).

This document is organized around the three major types of managed stands that will be required to project growth and yield for in the net landbase:

1. Existing managed stands harvested before March 1, 1991 (M91)
2. Existing managed stands harvested on or after March 1, 1991 (MGD)
3. Future managed stands (FUT)

For each managed stand type the following are discussed:

- Stratification;

- Model development;
- Available data; and
- Other items (cull, genetic gain etc.).

The following sub-sections provide some detail on each of these managed stand types.

3.1 Pre-1991 Existing Managed Stands (M91)

All PHR stands that were harvested prior to March 1, 1991 will be projected using M91 yield curves[1].

Stratification

The stratification will be based on the new AVI and will follow the same stratification rules applied to the natural fire-origin stands.

The proposed stratification method should be based on the following guiding principles:

- Use the latest AVI for natural stand stratification (available by the fall of 2015).
- Use broad cover group and major species-group as part of the strata.
- Use the GoA extended strata as building blocks for the FMP yield strata.
- Ensure that the strata "can be collapsed on different scales" with considerations given to the size of the resulting strata.
- Assign strata based on one layer only (Storey of Primary Management).
- Have a clearly documented, transparent and repeatable process.

For the upcoming FMP, in pre-91 stands Weyerhaeuser intends to use the GoA "minimum 10" base strata as outlined in the Forest Management Planning Standard, Version 4.1 (Table 1) using the new AVI currently being completed for the Pembina FMA. There are approximately 32,000 ha of pre-1991 cutblocks on the FMA.

Table 1. GoA base 10 strata

Broad Cover Type	Stratum #	Stratum Name	Stratum Label
D	I	Deciduous	Hw
DC	II	Hardwood/Pine	HwPl
	III	Hardwood/Spruce	HwSx
CD	IV	White Spruce/Hardwood	SwHw
	V	Pine/Hardwood	PlHw
	VI	*Blackspruce/Hardwood*	*SbHw*
C	VII	White Spruce	Sw
	VIII	Pine	Pl
	IX	Blackspruce	Sb
	X	*Douglas-fir*	*Fd*

[1] The Alberta Forest Management Planning Standard, Section 3.11ii, Annex 1, requires that "…areas harvested prior to March 1, 1991 shall be assigned to a yield stratum based on the vegetation inventory in place on the effective date of the inventory…".

Model Development

Weyerhaeuser will be using the same methodology[2], model and data used for the natural stand yield curves with the following notable change:

- Managed stand site index estimates will be obtained from the Regenerated Stand Productivity (RSP) study conducted in 2007 for aspen, balsam poplar, lodgepole pine and white spruce.
  - The vast majority of the RSP study areas were in pre-1991 cutblocks.
  - Finalized RSP project report with the proposed site index values was submitted to GoA for approval in October 2014.
  - Methodology on how to incorporate the RSP site index values was submitted for approval in December 2014.
  - The project report and proposed methods received GoA agreement-in-principle on January 23, 2015[3].
- Any yield strata without RSP site index adjustment will default to the natural stand yield curve.

Available Data

Weyerhaeuser will use the natural stand PSPs and the approved RSP site index information to develop yield curves for the pre-1991 cutblocks.

Other Items

- Cull and deciduous mortality will follow the same approach used for the natural stand yield curves.
- The proposed scale and field cull percentages for managed stands already received GoA agreement-in-principle[4,5].

3.2 Post-1991 Existing Managed Stands (MGD)

All existing PHR stands that were harvested on or after March 1, 1991 will be projected using MGD yield curves.

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[2] The methodology for natural stand yield curve development is not yet developed; however we anticipate projecting the natural stand PSP data using the GYPSY model (May 2009) as the general process of application.

[3] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands Regenerated Stand Productivity in Central Alberta. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated January 23, 2015.

[4] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands Mill Scale Cull Percentage Proposal for Use in the 2016 Forest Management Plan. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated December 10, 2014.

[5] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands Field Cull Percentage Proposal for Use in the 2016 Forest Management Plan. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated May 4, 2015.

Stratification

The Alberta Forest Management Planning Standard, Section 3.11i, Annex 1, requires that areas harvested on or after March 1, 1991[6] be assigned to a yield stratum as defined in ARIS and the most current information on the harvest area and its associated regeneration stratum in ARIS.

The new AVI will incorporate a link to ARIS and the skid clearance date via the cutblock reconciliation process described in "ARIS Net Landbase Reconciliation Procedures" dated February 10, 2015.

All openings are assigned to a yield group consistent with the most recent of the following ARIS data:

- declared stratum[7];
- stratum resulting from an establishment survey finding; or
- stratum resulting from a performance survey finding.

Strata will be based on the GoA 10 base strata (Table 1). ARIS declaration and silviculture records will be used to assign openings to species-specific yield strata where RSA performance survey stratum is not available.

If an RSA performance survey stratum is available, the SU linework will be retained and yield strata will be assigned at the SU-level. Aerial programs use the photo-interpreted species class label (SP_CL) as the basis for the yield stratum assignment.

Given that ground-interpreted labels are sometimes inaccurate[8] when compared to observed ground data and that ground-based labels are at coarser resolution than aerial program labels (e.g., MxPl); we propose that non-photo programs be re-assigned based on the ground survey information. Ground survey based densities would be used following the rules of aerial stratum assignment as per the RSA survey manual (GoA, 2015).

Model Development

Weyerhaeuser will be using the GYPSY 2009 model as per current RSA protocols. For managed stands, this will ensure that the linkage between regeneration targets (derived from yield curves) and assessment of regeneration success (derived from GYPSY model projections) is as tight as possible.

The process is proposed as follows:

1. Assemble RSA compiler data for all programs that were submitted to May 2015.
2. Verify compiled information against original submissions.
3. Verify populations of openings against ARIS within the Define Forest Area (DFA).
4. Convert RSA compiler data to SAS 9.4 for analysis.

The main data is in the GYPSY_INPUT table which provides SU-level density, basal area, site index and age by species group. Although the RSA compiler stores actual yield table outputs, these data are compiled in 10-year increments only which is not suitable for timber supply analysis purposes. Compiled RSA data will be re-projected using SAS GYPSY to obtain 5-year yield outputs.

[6] The document states "after March 1"; however the intent was to include March 1 in the post-1991 population of blocks.
[7] If a harvest area is less than 2 years old and has not received a stratum declaration (reforestation target), use the harvest stratum assignment.
[8] Early non-photo programs tend to have some discrepancies between ground interpreted labels and observed ground data.

5. Project all sampling units to age 300 using SAS GYPSY.

6. Aerial programs: calculate the average yield for each aerial program by sampling stratum using the composite weights for the specific RSA program to roll-up individual SU projections to the aerial program/sampling stratum level.

Where sampling strata represent more than one yield stratum, e.g. a combined SwHw/SbHw sampling stratum, separate yield curves will be created for each stratum with identical yields. The total population area will be assigned to each yield stratum within its respective program[9].

7. Non-photo programs: Each sampling unit will its own yield stratum assignment (based on the re-assigned stratum as per our proposal), yield projection, and area. Selection weights are all 1 for non-photo programs, therefore SU area alone defines the composite weights.

8. Yield curves will be generated by calculating area-weighted averages across all yield strata, combining program-level averaged yields from aerial programs and individual SU-level yields from non-photo programs.

Available Data

Weyerhaeuser will use all RSA survey data that were submitted to the Forest Management Branch by May 15, 2015[10]. This includes all Weyerhaeuser and Quota Holder cutblocks where aerial or non-photo RSA programs have been completed since 2009.

The use of the RSA information for all existing cutblocks will allow Weyerhaeuser to develop yield projections from observed performance survey data that is based on consistent data collection protocols, sound statistical sampling design and stratification scheme. The summary of the RSA data to date is presented in Table 2 and Table 3.

Data sources for yield curve validation will include 90 Growth and Yield Monitoring (GYM) plots; 89 of which have been remeasured to date (Table 4).

Table 2. RSA Aerial Programs in the Pembina Timberlands FMA by Survey Year

Data Source	Survey Year					
	2009	2010	2011	2012	2013	2014
Edson		2,322.4		211.6	1,153.0	
Drayton Valley	1,266.9	3,516.3		1,315.6	2,234.6	
Chip Lake burnt over blocks				511.1		
ANC W6		931.1		1,248.3		1,404.9
Blue Ridge W6						893.9
FRIAA - edfor 12-04			1,046.3			
Population Area (ha)	*1,266.9*	*6,769.9*	*1,046.3*	*3,286.5*	*3,387.6*	*2,298.8*
2013 Edson includes FRIAA						*18,055.9*

[9] Starting in 2014, the RSA sample selection protocols switched the a stratified random sampling approach, resulting in the selection weights equal to 1 for all Sus therefore composite weights in newer programs will be based on the SU area.
[10] The effective date of the landbase is May 1, 2015. Any RSA survey submitted by May 15, 2015 would include programs where the photo interpretation and ground survey were completed in the 2014 calendar year.

Table 3. RSA Non-Photo Programs in the Pembina Timberlands FMA by Survey Year

Data Source	Survey Year					
	2009	2010	2011	2012	2013	2014
Edson			45.8		82.0	16.8
Drayton Valley					17.1	
ETPL	24.7					
Tall Pine					268.0	127.4
Millar Western		99.3				
FRIAA - edfor 11-03		4.3				
FRIAA - edfor 10-05		307.9				
FRIAA - tsuga 10-03	28.0					
FRIAA - tsuga 11-07		381.6				
Population Area (ha)	*52.7*	*793.1*	*45.8*	*0.0*	*367.2*	*144.2*
ASRD Deciduous survey 2011 - 312.9 ha non-legislated - not included						*1,403.0*

Other Items

- Cull and deciduous mortality will follow the same approach used for the natural yield curves.
- The proposed scale and field cull percentages for managed stands already received GoA agreement-in-principle.
- Regeneration lag will not be explicitly defined as it is incorporated into the RSA protocols and yield curves by design.

Table 4. GYM Plot Summary

MYEAR	M1	M2
2005	6	
2006	29	
2007	20	
2008	19	
2009	9	
2010		
2011	7	33
2012		2
2013		33
2014		
2015		21
TOTAL	**90**	**89**

3.3 Future Managed Stands (FUT)

All future PHR stands that will be harvested under the regime of the new FMP will be projected using the FUT yield curves.

Stratification

Strata will be based on the silviculture matrix (strata transitions) that will be developed for the next FMP. Strata transitions (i.e. changes in the yield stratum after an area is harvested) will need to be supported by evidence from performance analyses of past silvicultural treatments in the FMA. Strata will be based on the GoA base 10 strata.

Available Data

Weyerhaeuser plans to use the RSA surveys and GYM plots to analyze historic silviculture performance and stratum transitions.

Model Development

Weyerhaeuser will use the MGD stand yield curves that were developed from RSA survey data. These curves will be based on the GYPSY 2009 model.

Other Items

- Cull and deciduous mortality will follow the same approach used for the NAT yield curves.
- The proposed scale and field cull percentages for managed stands already received GoA agreement-in-principle.
- Regeneration lag will not be explicitly defined as it is incorporated into the RSA protocols and yield curves by design.
- RSA performance surveys to date did not consider natural subregion boundaries (for example, LFH vs. UFH). Weyerhaeuser will examine the yield differences based on available data and may opt to develop separate future yield projections for some regenerating strata[11].

PDT agreement in principle Nov 18, 2015

[11] Weyerhaeuser understand that such split would also result in the introduction of higher level RSA strata and potentially increased RSA sampling and balancing requirements.

Appendix XVI: GY-010a Natural Stand Yield Curve Development

Issue Number: GY - 010a

Natural Stand Yield Curve Development

Type: ✓ Requires Resolution ☐ Discussion Item

1 Background

Weyerhaeuser Company Ltd. (Weyerhaeuser) is required to complete a Forest Management Plan (FMP) for the Pembina Timberlands (FMA # 0900046) by April 1, 2017. The FMP also includes the area which is outside the FMA but within the timber producing landbase of Forest Management Units (FMU) E2, E15, R12, W5 and W6 (referred to as the Defined Forest Area or DFA).

This document outlines the proposed approach to developing natural fire-origin stand yield curves in support of the next FMP. Technical details regarding specifics of the actual yield curve development will be submitted as required in the FMP Yield Curve document.

The proposed methods intend to follow the procedures published in the 2006 Alberta Forest Management Planning Standard version 4.1 and additional supporting documentation released over the past 9 years.

2 Objectives

The main objective is to obtain agreement-in-principle from the Government of Alberta (GoA) regarding the proposed approach to developing natural stand yield curves so that changes can be made early in the process without jeopardizing the timelines of the Plan.

3 Methods

Natural stands are defined as all fire-origin stands in the Pembina Timberlands DFA that are within the net landbase. Growth and yield projections will be developed using natural stand yield curves (NAT).

The following sub-sections provide some detail for natural stand yield curve development regarding:

- Stratification;
- Model development;
- Available data; and
- Other items (cull, utilization standards, stand decline etc.).

3.1 Stratification

For their last DFMP, Weyerhaeuser developed a series of yield strata that took into account broad cover group, AVI conifer percent, crown closure class and timber productivity rating (TPR). Species or major species groups were not part of the stratification scheme.

The proposed new stratification will be based on the latest AVI attributes applied at the polygon-level and will be based on the following guiding principles:

- Use the latest AVI for natural stand stratification.
- Use broad cover group (BCG) and major species-group as part of the strata.
- Use the GoA extended strata as building blocks for the FMP yield strata.
- Ensure that the strata "can be collapsed on different scales" with considerations given to the size of the resulting strata. Do not combine strata across BCG.
- Assign strata based on the overstorey (O/S) or understorey (U/S). Management intent must be clearly stated based on the storey of primary management (SoPM).
- Have a clearly documented, transparent and repeatable process.

For the upcoming FMP, Weyerhaeuser intends to use the GoA "minimum 10" strata as outlined in the Forest Management Planning Standard, Version 4.1 as the basis for the stratification (Table 1).

Table 1. Proposed Stratification

O/S BCG	SoPM	O/S Base 10	Stratum Label	Stratum Description	O/S Density	Yield Group #	Yield Group Label
C	O/S	Pl	C-PL	Pure Conifer - Pine leading	AB	1	C-PL-AB
					CD	2	C-PL-CD
	O/S	Sw	C-SW	Pure Conifer -White Spruce leading	AB	3	C-SW-AB
					CD	4	C-SW-CD
	O/S	Sb	C-SB	Pure Conifer - Black Spruce leading	ABCD	5	C-SB-ABCD
CD	O/S	PlHw	CD-PL	Conifer Mixedwood - Pine leading	ABCD	6	CD-PL-ABCD
	O/S	SwHw	CD-SX	Conifer Mixedwood - White Spruce leading	ABCD	7	CD-SX-ABCD
	O/S	SbHw		Conifer Mixedwood - Black Spruce leading			
DC	O/S	HwPl	DC-PL	Deciduous Mixedwood - Pine leading	ABCD	8	DC-PL-ABCD
	O/S	HwSx	DC-SX	Deciduous Mixedwood - Spruce leading	ABCD	9	DC-SX-ABCD
D	O/S	Hw	D-HW	Pure Deciduous	AB	10	D-HW-AB
					CD	11	D-HW-CD

The base 10 strata will be reduced to 9 base strata as there is no landbase in the Fd (Douglas-fir) stratum. The SoPM will be based on the overstorey for all natural stand strata.

Planned subjective deletions will eliminate most of the C-SB stratum. Weyerhaeuser plans to retain only those SB leading conifer stands with a maximum of 60% SB where the second conifer species is PL based on the AVI overstorey. All other C-SB polygons will be subjectively deleted.

There is not enough area and plots to justify a separate SbHw stratum in the FMA therefore it will be aggregated with SwHw to create a CD-SX yield stratum; however the base 10 strata will be retained for the silviculture transitions[1].

Strata will be further divided into crown closure classes for the largest strata groups. The proposed general process for stratification is presented in Appendix I.

3.2 Model Development

Given the general guidelines in the 2006 management planning standards, the new inventory and the new landbase stratification, Weyerhaeuser proposes that the natural stand yield curves should be developed using the current GYPSY model (version: May 21, 2009) in the next FMP.

General direction from GoA is to use the GYPSY 2009 approved version without any change or model coefficient re-calibration to FMA conditions. However, plot data from the FMA must be used thus localizing ("seeding") the GYPSY model for FMA conditions.

Weyerhaeuser proposes the use of their natural stand PSP data for developing natural stand yield curves based on the following general steps:

- Compile existing PSP data to what GYPSY requires as input. Only plots located in the net landbase should be used[2].
- Stratify the plot data based on the AVI attributes for the stand in which it falls.
- Make forecasts for each plot measurement individually.
- Create a stratum average yield curve by averaging the plot-measurement forecasts[3].
- Basal area must be used in the GYPSY forecasts (projections are adjusted to observed basal area).
- Yield curves are linked to the stand via AVI stand age (based on the SoPM) but plot based species age will be used wherever available for the GYPSY projections. Weyerhaeuser made significant efforts in the last 5 years to acquire plot-level species age data for all major stand components in their natural stand PSPs.

[1] Where strata are aggregated, the silviculture transitions, if any, need to be explicit and agreed to in principle by the PDT. Quota Holders who are affected by the aggregation must also agree.

[2] PSPs that have been harvested or lost to fire may be used in the development of the yield curves if 1) the last valid measurement occurred within 10 years of the AVI photo year and 2) previous older AVI shows a valid mature cover type that could be used to assign the plot to a stratum. Validation of the yield curves will still require the use of the last measurements of the plots that are within the net landbase. (Cosmin Tansanu, GoA pers. comm.)

[3] PSPs have a roughly even number of measurements (2-4) and can be treated as independent observations for the development of natural stand yield curves. (Cosmin Tansanu, GoA pers. comm.)

- Piece size calculation for FMP purposes is required. GYPSY will provide this information indirectly (provides merchantable volumes and merchantable stems per hectare).

3.3 Available Data

Weyerhaeuser has an extensive PSP program, with 421 PSPs (944 measurements) in fire origin stands, some measurements dating back to 1994. These plots will be used in developing natural stand yield curves.

In addition, the GoA provided 73 PSPs that are based on the old LFS standards and are located in the Pembina Timberlands FMA. About 35 of these PSPs were measured at least once within 10 years of the AVI photo year of 2012. These plots are based on a different sampling frame and sampling method and their layout also differs from the Weyerhaeuser PSPs. However, they may help with smaller, under-represented strata. The use of these data will be evaluated during the course of the natural yield curve development.

3.4 Other Items

Cull was implemented as an aspatial, flat rate deduction to the calculated harvest levels in the previous DFMP. In the new FMP cull will be applied directly to the yield curves to project net merchantable volumes. The proposed scale and field cull percentages for natural stands (Table 2) already received GoA agreement-in-principle[4,5].

Table 2. Field and Scale Cull Deductions in Natural Stands

Species Group	Species	Field Cull	Scale cull	
			<=130years	>130 years
Deciduous	Aw	1.9%	10.0%	17.4%*
	Pb		5.3%	
	Bw		4.6%	
Coniferous	All	1.2%	1.2%	

** Implemented as part of the deciduous stand decline function*

Deciduous mortality may not be adequately captured in the GYPSY yield curve projections therefore we propose using age-based mortality constants (similar to the approach used in the last DFMP). We will look at the PSP re-measurements in aspen stands to determine the rate of decline and the termination age. Other deductions such as stand retention will be implemented in the timber supply analysis.

[4] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands Mill Scale Cull Percentage Proposal for Use in the 2016 Forest Management Plan. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated December 10, 2014.

[5] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands Field Cull Percentage Proposal for Use in the 2016 Forest Management Plan. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated May 4, 2015.

The FMA baseline utilization (Table 1) will be used to develop the FMP natural stand yield curves. Multiple utilization yield curves will be created using the methods described in the FMP issue document "GY-002: Yield Curve Adjustment Methodology" which received GoA agreement-in-principle in May 2015[6].

Table 3. FMP Baseline Utilization

Description	Coniferous	Deciduous
Top Diameter Inside Bark (cm)	11	10
Stump Diameter Outside Bark (cm)	15	15
Stump Height (cm)	15	15
Minimum Merchantable Length (m)	3.66	3.66

All species present in the FMA are acceptable for the purposes of yield curve development with the exception of larch, which is considered a non-merchantable species. For GYPSY modelling purposes, larch is included in the PL species group. Larch will be dropped during the plot-level compilations before the GYPSY projections but we will assess the amount of larch in the plot level data. Given that all stands that contain larch in the AVI will be removed from the net landbase, the impact of larch trees in the compilations should be minimal.

Natural subregion, if used for stratification purposes will be based on the 2005 Provincial coverage[7]. Alberta taper equations were based on a natural subregion coverage that predates the 2005 coverage and assignments are based on the Alberta Township System (ATS). Taper coefficients use the township based subregion assignment as per generally accepted compilation protocols.

Validation statistics will be derived using the most recent observation from each PSP. Percent bias, root mean squared error (RMSE) and the goodness of fit index (GOFI) will be calculated for 1) the original unadjusted yield curves and 2) yield curves adjusted to account for mortality/stand decline. Formulae are provided in Table 4.

Table 4. Formulae for natural stand validation statistics

$Bias = \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)}{n}$	$Bias\% = \frac{Bias}{\bar{y}} \times 100$
$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n}}$	$GoFI = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$

[6] Agreement-in-principle: Weyerhaeuser Company Limited, Pembina Timberlands GY-002 Yield Curve Adjustment Methodology. File: 06332-R01-01. Robert J. Popowich, Senior Manager, Forest Resource Management, GoA. Letter dated May 4, 2015.
[7] Given the distribution of PSPs and the overwhelming (>80%) presence of the Lower Foothills natural subregion in the FMA, we do not anticipate splitting any natural strata by natural subregion.

4 Preliminary Summaries

The AVI was approved in January 2016. Given that the net landbase is yet to be developed, we used some approximate rules to account for planned subjective deletions.

All cutblocks identified as MOD1=CC and/or an ARIS number were also removed from these summaries to provide a reasonable representation of the net productive natural landbase.

The number of plot locations and associated measurements by last measurement year are presented in Table 5. Five plots that were last measured more than 10 years from the AVI photo year are also highlighted.

Table 5. Distribution of PSPs by Last Measurement Year (net landbase is approximate)

Last Measurement Year	Number of Plots		Number of Measurements	
	All	Net LB	All	Net LB
1999	1	1	1	1
2000	4	2	4	2
2001	3	2	3	2
2004	1	1	2	2
2005	5	3	11	7
2006	8	6	16	12
2008	27	16	54	32
2009	29	24	58	48
2010	66	53	184	148
2012	35	34	70	68
2013	71	64	142	128
2014	168	143	393	336
2015	3	3	6	6
Total	**421**	**352**	**944**	**792**

We also intersected the active Weyerhaeuser PSPs with the AVI to assess the distribution of plots in the approximate net landbase by the proposed preliminary stratification (Table 6). There are only 4 plot measurements in the net landbase for the C-SB stratum. The yields for the C-SB stratum need to be rationalized based on existing data in the C-Sb or other data available for Sb. Note that we expect the final net area of this stratum to be around 1500 ha. Additional PSPs in the C-SB stratum that are likely not part of the net landbase include 22 more plots with 48 measurements.

Table 6. Distribution of PSPs by Yield Group (net landbase is approximate)

Yield Group #	Yield Group Label	Net LB Area		Plots		
		(ha)	(%)	(# of locations)	(%)	(# of meas.)
1	C-PL-AB	54,569	11%	41	12%	84
2	C-PL-CD	110,596	23%	70	20%	146
3	C-SW-AB	62,513	13%	30	9%	66
4	C-SW-CD	25,154	5%	23	7%	50
5	C-SB-ABCD	2,027	0%	2	1%	4
6	CD-PL-ABCD	16,758	3%	8	2%	17
7	CD-SX-ABCD	20,272	4%	22	6%	48
8	DC-PL-ABCD	16,767	3%	20	6%	44
9	DC-SX-ABCD	26,830	6%	17	5%	41
10	D-HW-AB	64,946	14%	52	15%	127
11	D-HW-CD	80,070	17%	67	19%	165
Total		**480,503**	**100%**	**352**	**100%**	**792**

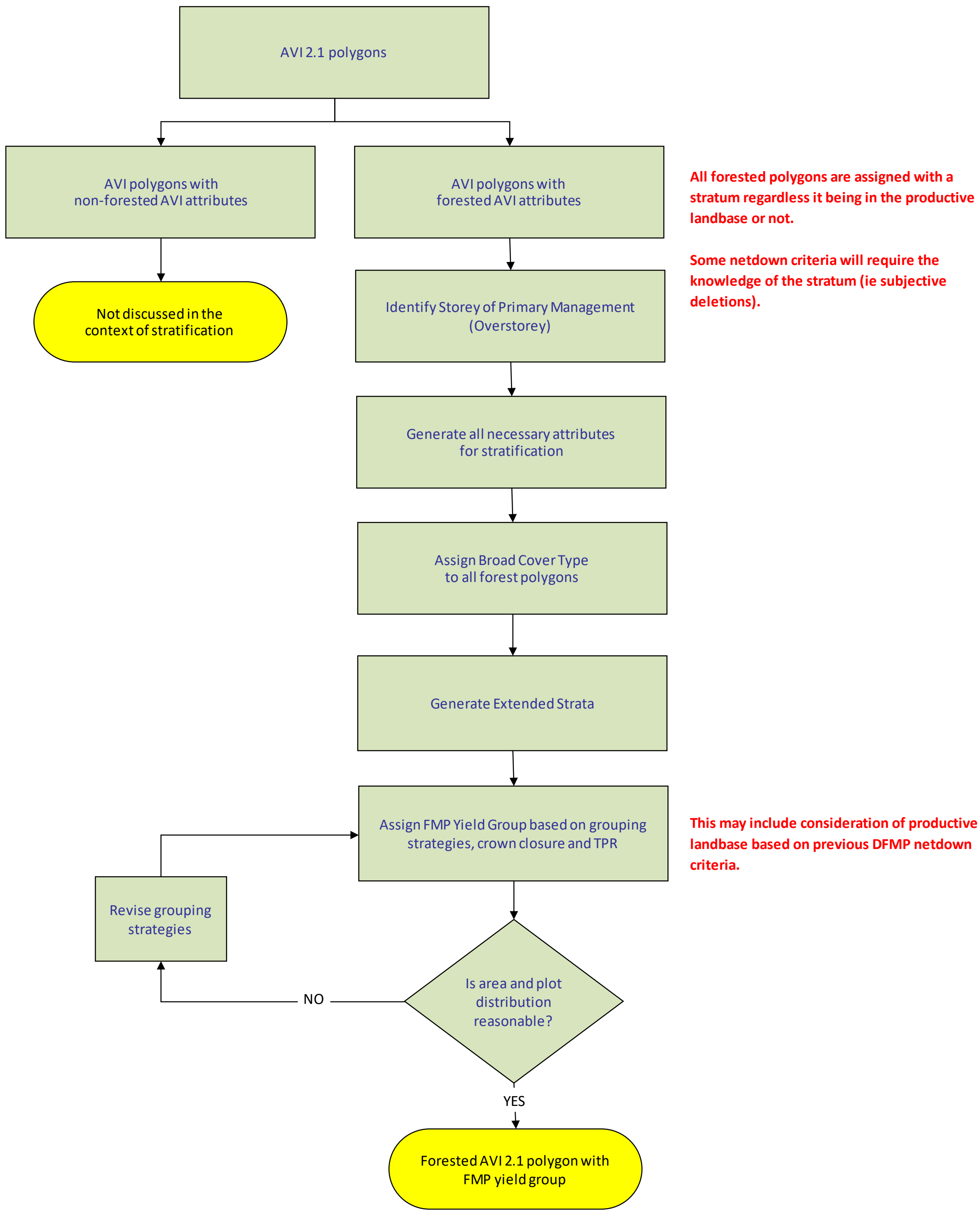
We also intersected the LFS PSPs with the approximate net landbase (Table 7). There are an additional 30 plots that were measured within 10 years of the AVI photo year.

Table 7. Distribution of LFS PSPs by Yield Group and Last Measurement (net landbase is approximate)

Yield Group #	Yield Group Label	Last Measurement Year									Tota l	Post 200 1
		Pre-2001	200 1	200 2	200 3	200 5	200 6	200 7	200 8	200 9		
1	C-PL-AB	3	1					1		2	**7**	**3**
2	C-PL-CD	12	5	3	4			3	1	6	**34**	**17**
3	C-SW-AB		3	1	2						**6**	**3**
4	C-SW-CD		1								**1**	**0**
5	C-SB-ABCD										**0**	**0**
6	CD-PL-ABCD	1						1			**2**	**1**
7	CD-SX-ABCD	1			1						**2**	**1**
8	DC-PL-ABCD	6	1								**7**	**0**
9	DC-SX-ABCD	1			1						**2**	**1**
10	D-HW-AB					1			1		**2**	**2**
11	D-HW-CD	1		1			1				**3**	**2**
Total		**25**	**11**	**5**	**8**	**1**	**1**	**5**	**2**	**8**	**66**	**30**

There are opportunities to add some or all of the LFS PSPs to those yield groups that are under-represented or short on plots from Weyerhaeuser's own natural stand PSP program.

APPENDIX I - STRATIFICATION PROCESS OVERVIEW



PDT Agreement in Principle May 20, 2016

Appendix XVII: GY-011 RSA Survey Information in Hw Stands

Issue Number: GY - 011

RSA Survey Information in Hw Stands

Type: ☐ Requires Resolution ✓ Discussion Item

1 Task

11TT-005: Paul to contact Gyula to determine if RSA data exists to distinguish between regenerating Hw stands from D declaration and the Hw stratum/sampling unit from "failed conifer treatments"[1].

It is expected that managed stand yield curves for the Hw stratum constructed from legislated performance survey data (RSA) will reflect failed conifer treatments and therefore higher than normal conifer content when compared to regenerating Hw in stands from D declaration.

2 Methods

Although the final reconciliation of the RSA data, AVI and ARIS has not yet been completed, we reconciled the ARIS extract provided by GoA[2] with the RSA data sets gathered to date. The summaries provided here will likely change once the AVI/ARIS reconciliation is complete but the changes are expected to be minimal.

We summarized the ARIS information for all openings with RSA performance survey completed before May 1, 2015. RSA data were obtained for all but 7 openings in the DFA (99.5% completion rate).

As per RSA protocols, no deciduous declarations were surveyed as part of the legislated performance survey standard, therefore the presence of Hw strata in RSA sampling units indicate "failed conifer treatment" in C/CD/DC declared openings.

In 2011, the GoA conducted an experimental non-photo RSA performance survey program in 15 openings that were declared as D (pure deciduous). These surveys were not part of the legislated performance surveys and the results were not recorded in ARIS; however they were done in the Pembina Timberland FMA in openings declared as D.

3 Results

The area summary of the Hw strata based on the RSA survey information is presented in Table 1. There were 15 openings surveyed in 2011 by the non-photo program and all openings were declared in ARIS as D and stratified as Hw-H as per RSA standards.

[1] Technical Team Meeting on November 12, 2015 in Edmonton.
[2] Provided by Liana Luard (GoA) on August 18 and 31, 2015 via email to Paul Scott (Weyerhaeuser).

Table 1. RSA Performance Survey Areas in Hw Strata

RSA Performance Surveys (2009-2015)	Program Type		Area (ha)
	Aerial	NP	
Failed Conifer Treatment (C/CD/DC Openings) - Hw SU	489.1	271.1	760.2
GoA 2011 - D Declared Stands (15 Openings)[3]		312.9	312.9

Preliminary yield curves were constructed from the RSA survey data coming from the "failed conifer treatments" in C/CD/DC declared openings. The yield curve construction followed the methodology as described in the GY-010 Issue document.

Figure 1 shows the average yield projections for the Hw stratum in failed conifer treatments. Figure 3 presents the mean annual increment (MAI) for the deciduous and conifer stand component. All yields were compiled to RSA 15/10/30/TL standard for comparison purposes. No stand decline or cull was implemented.

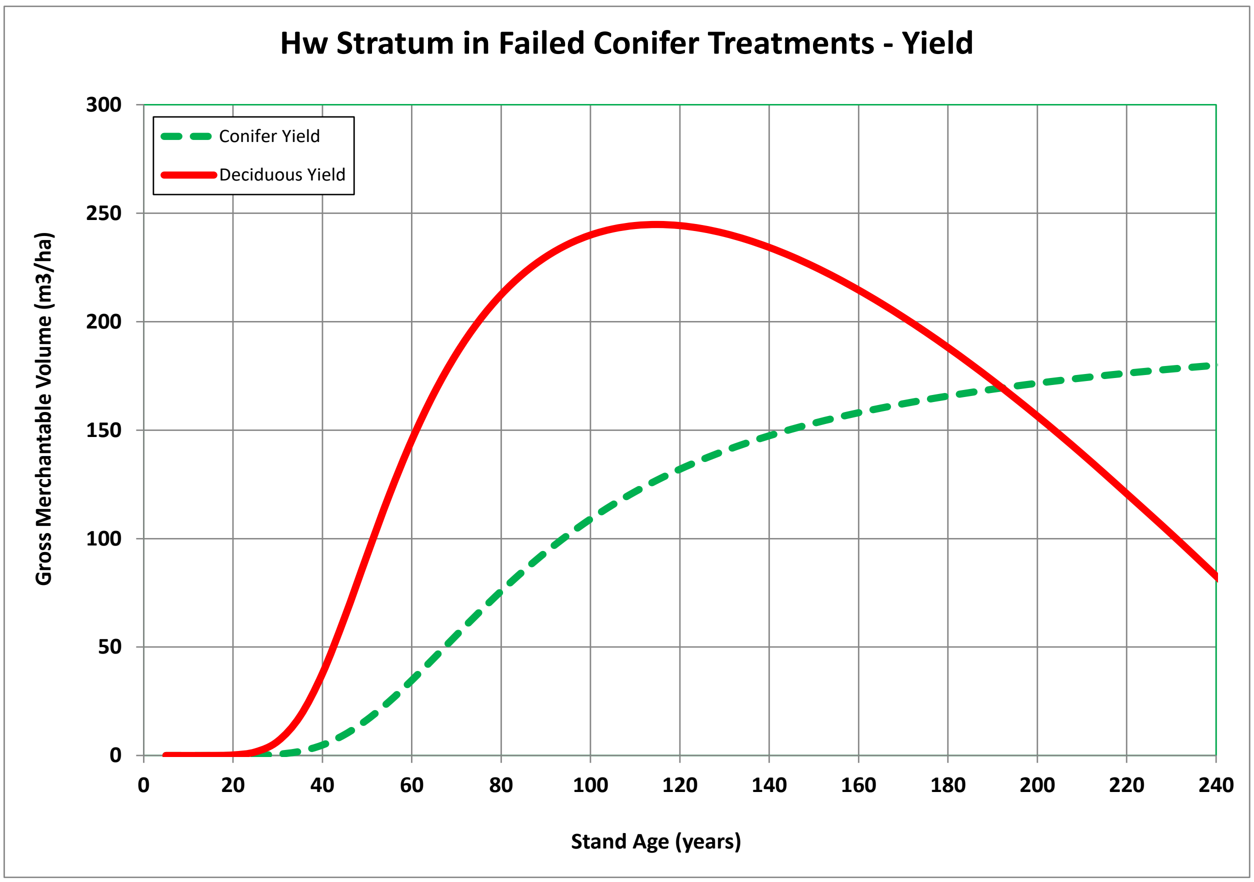


Figure 1. Yield Projection for the Hw Stratum in Failed Conifer Treatments in C/CD and DC Openings

[3] There are approximately 10,500 ha of openings that were declared D between timber years 1996-2002 that overlap with conifer openings in the 2009-2015 RSA survey-window.

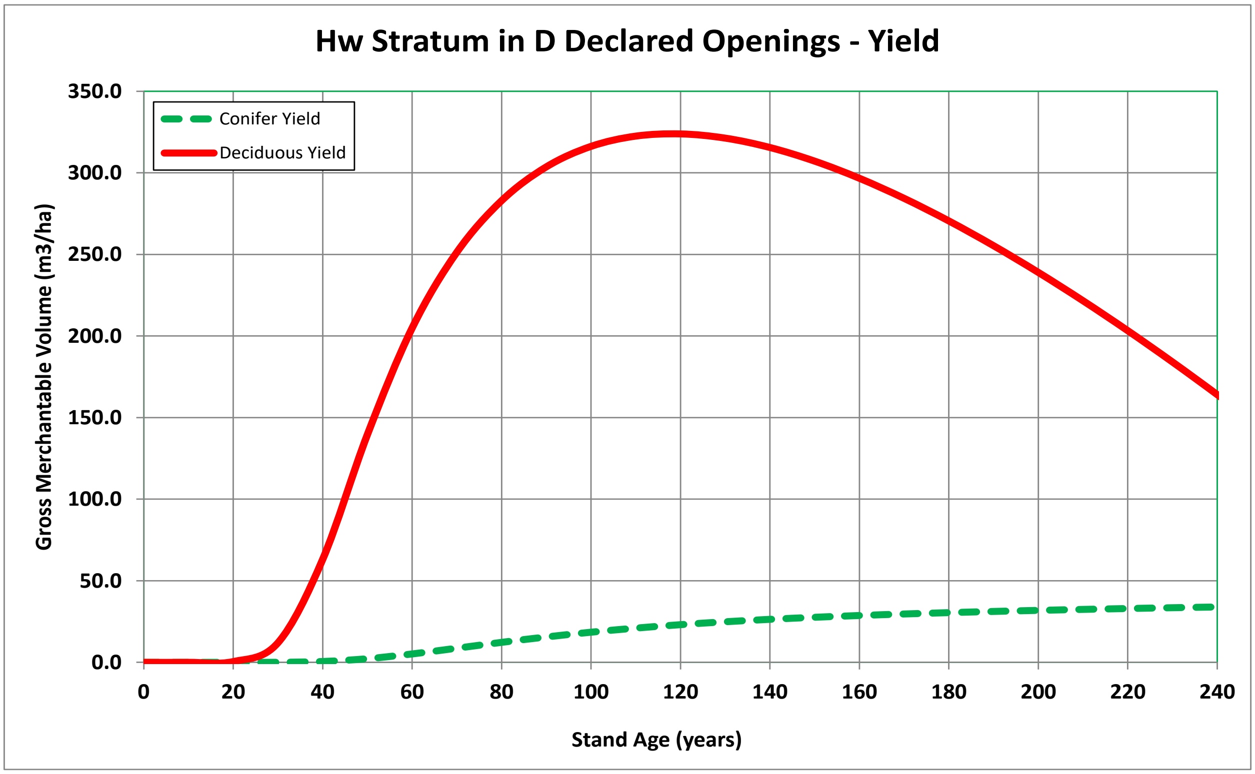


Figure 2. Yield Projection for the Hw Stratum in D Openings

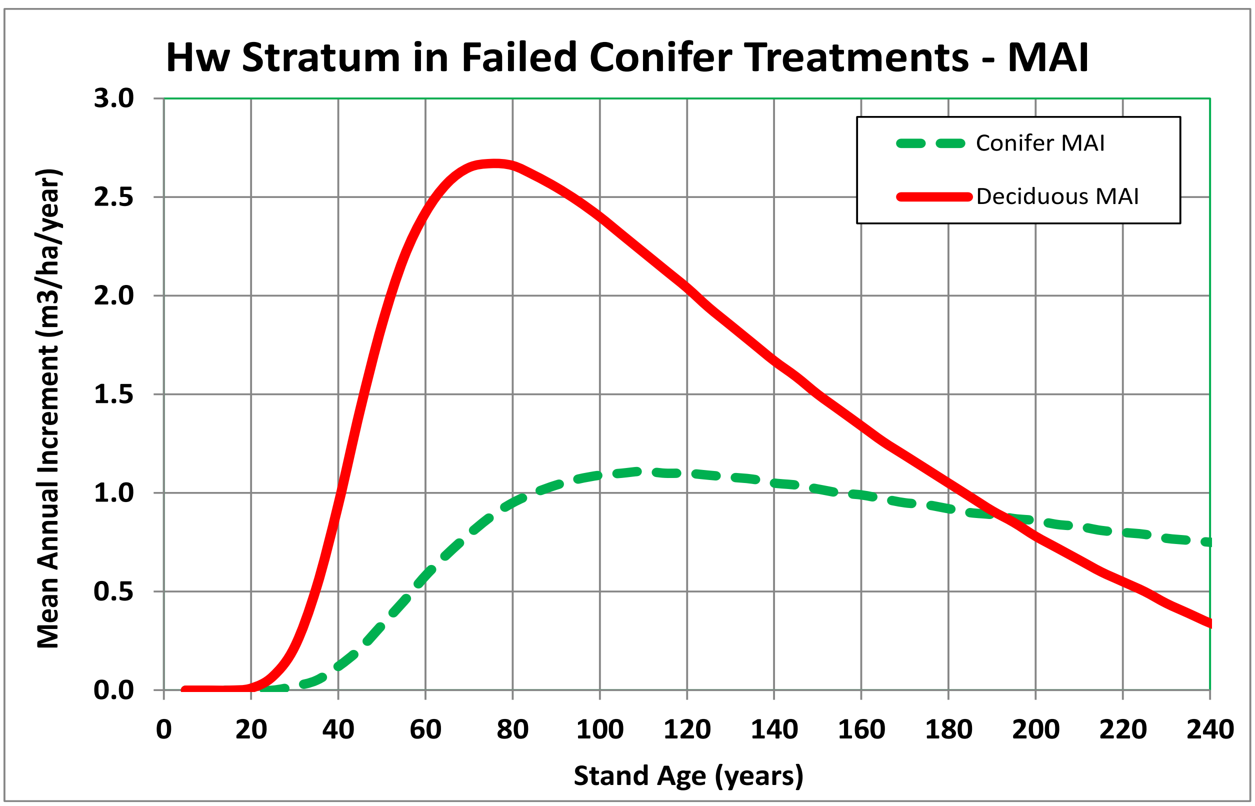


Figure 3. MAI for the Hw Stratum in Failed Conifer Treatments in C/CD and DC Openings

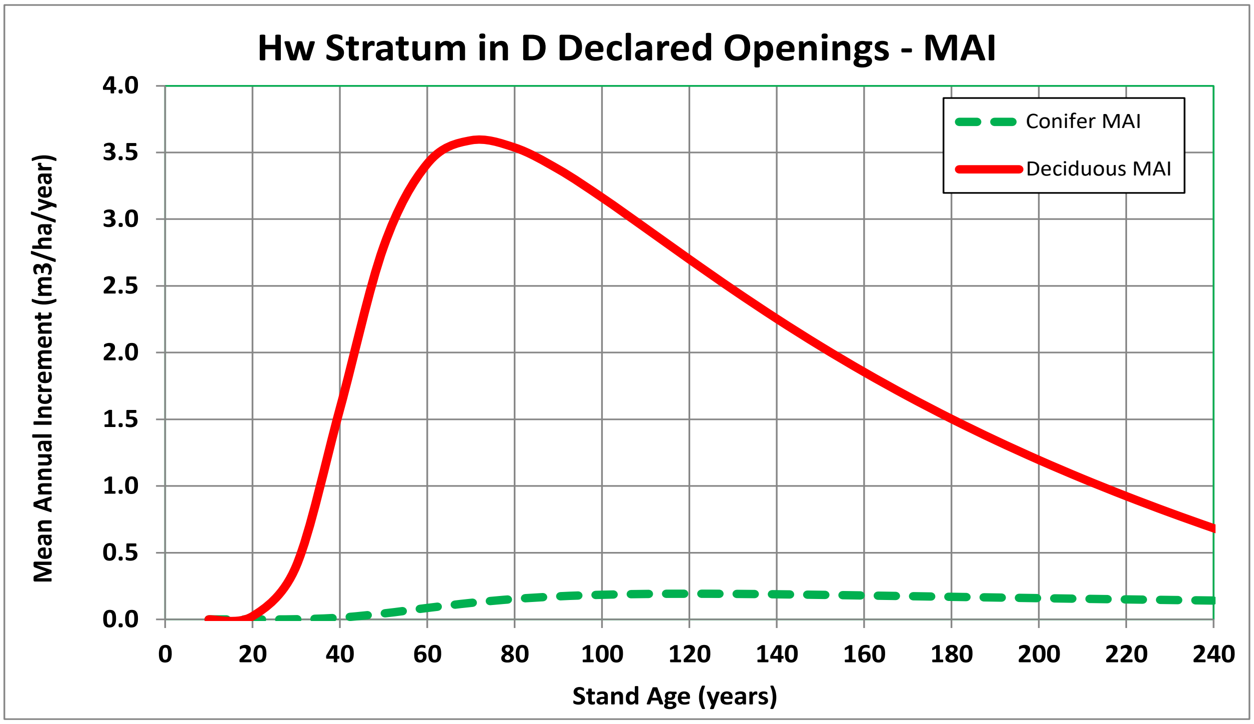


Figure 4. MAI for the Hw Stratum in D Openings

We also constructed preliminary yield curves from the GoA 2011 non-photo RSA survey data coming from the Hw stratum in D declared openings. The yield curve construction followed the methodology as described in the GY-010 Issue document.

Figure 2 shows the average yield projections for the Hw stratum in D declared openings. Figure 4 presents the MAI for the deciduous and conifer stand component. All yields were compiled to RSA 15/10/30/TL standard for comparison purposes. No stand decline or cull was implemented.

4 Discussion

Based on the results, the following points should be considered:

- As expected, the Hw stratum in legislated RSA performance surveys will reflect yield projections that represent failed conifer treatments and therefore will have a relatively high conifer content (more like a DC stand).
- The Hw stratum in legislated RSA performance surveys will be important for assigning the RSA surveyed existing managed stands (SU-level) with an average yield projection.
- However, yield curves constructed from the Hw stratum in legislated RSA performance surveys will not be used to project growth and yield in existing or future regenerating deciduous openings (declared as D).

- Weyerhaeuser is in a unique position of having a number of D declared openings surveyed to the RSA performance survey that could form the basis for projecting the yield for the regenerating Hw strata (existing and future managed). The main question will be about the representation of regenerating Hw using the non-legislated RSA data.
- The preliminary yield curves of the Hw stratum in D declared openings show relatively high deciduous volumes with virtually no conifer content.
- Regenerating Hw stands could also be assigned with the natural stand Hw yield curves as a potential low risk alternative (from GoA approval perspective).
- The deciduous volumes will be somewhat lower than the Hw D declared openings and there will be a larger projected conifer content, albeit a lot less than using the Hw in failed conifer treatments. Figure 5 shows an approximate average yield curve for the natural Hw stratum that was based on the Pembina natural PSPs and the "old" AVI attributes.
- Note that further division of AB versus CD crown closure class in the natural Hw stratum will likely be required and all regenerating Hw stands would be projected on the CD yield trajectory.

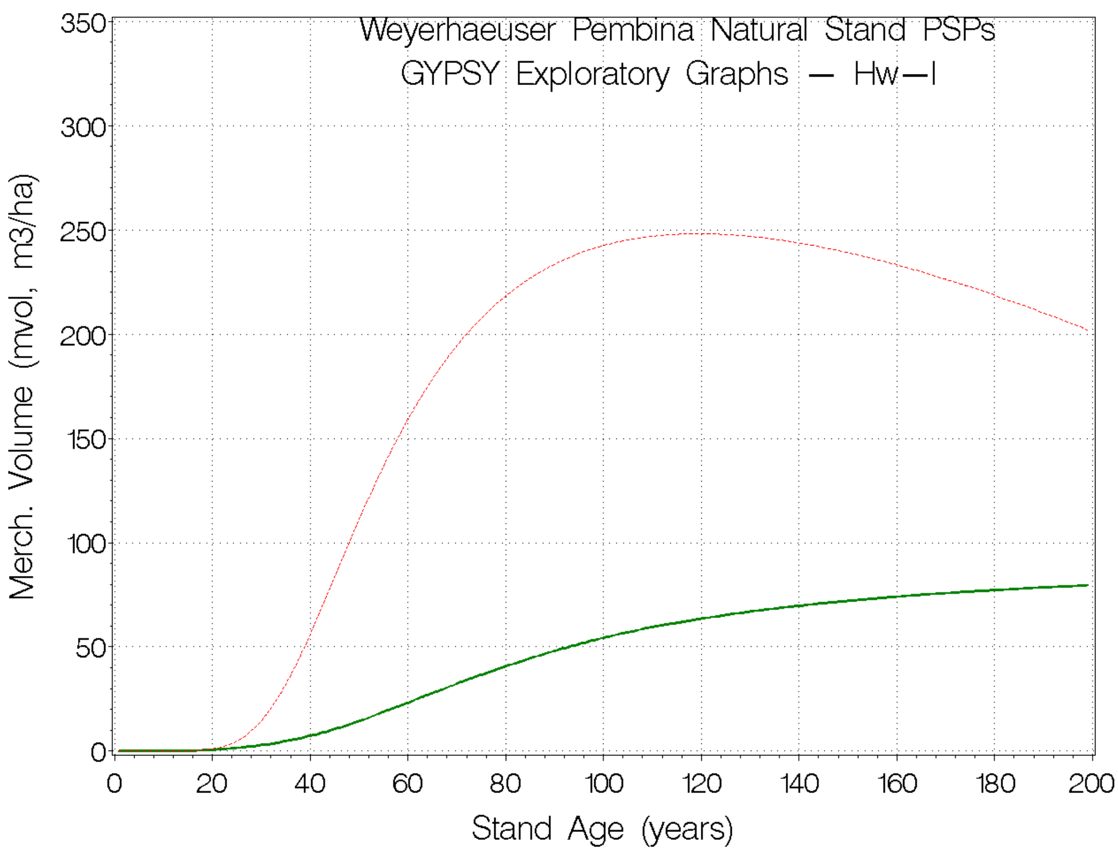


Figure 5. Yield Projection in Natural Stands - Hw Stratum (source: PSPs & old AVI)

AIP – PDT – September 22, 2016

Appendix XVII: Agreement-In-Principle Letter

Alberta Agriculture and Forestry

Forestry Division
Forest Management Branch
7th floor, Forestry Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Canada
Telephone: 780-427-8474
www.agriculture.alberta.ca

File: 06332-R01-01

March 28, 2017

Mr. Paul Scott, RPF
Strategic Planning Co-ordinator
Weyerhaeuser Company Ltd. (Pembina Timberlands)
2509 Aspen Drive
Edson, Alberta T7E 1S8

Dear Mr. Scott:

Subject: AGREEMENT-IN-PRINCIPLE – WEYERHAEUSER COMPANY LTD. (PEMBINA TIMBERLANDS) 2016 FOREST MANAGEMENT PLAN YIELD PROJECTIONS

Thank you for the October 26, 2016 submission of the Weyerhaeuser Company Ltd. (Pembina Timberlands) Classified Landbase and Yield Projections.

The department has reviewed the submission and agreement-in-principle is granted subject to the following conditions being addressed in the Forest Management Plan:

Reforestation Standard of Alberta (RSA) Curves

a. A sensitivity analysis (including all populations, pre and post 91) is required to quantify the impact of the higher RSA yield curves on the annual allowable cut (AAC).

b. A robust growth and yield program is required with a detailed commitment and additional permanent sample plots to ensure growth assumptions incorporated in the AAC are tracked and verified through time.

Silviculture Strategy Table

c. Amend the Silviculture Strategy Table (FMP Yield Strata column) to reflect the current stratification and the proposed strata transitions, similar to Table 5-4 of the Yield Curve Development document.

RSA Tree Improved Yield Curves (SwG)

d. The silviculture prescription in the Silviculture Strategy Table must ensure that cutblocks are planted with 100% improved stock in order to match the assumptions in the yield curves.

e. Ensure the growth and yield program provides detailed documentation on how stands with improved stock will be monitored to ensure the assumed gains are realized.

Additional Comments

f. All outliers removed from the analysis should be presented in tabular format with their coniferous and deciduous volumes, stand/plot age and reason for deletion.

g. Table 5-3 must be updated with the Mean Annual Increment culmination ages.

If you have any questions or require further information, please contact Liana Luard, Lead, Forest Planning and Performance Monitoring at (780) 427-0395.

Yours truly,

Robert J. Popowich, RPF
Director, Forest Resource Management

cc: Kevin Vander Haeghe, Forest Area Manager, Edson Forest Area
Stephen Mills, Area Forester, Edson Forest Area
Trisha Stubbings, Area Forester, Rocky Mountain House Forest Area
Daryl Price, Director, Forest Resource Analysis
Darren Aitkin, Manager, Forest Biometrics
Cosmin Tansanu, Analysis Forester, Forest Biometrics
Lee Martens, Reforestation Specialist, Forest Program Management
Greg Greidanus, Senior Resource Analyst, Forest Resource Analysis
Nadine Pedersen, Senior Resource Analyst, Forest Resource Analysis

Weyerhaeuser

Pembina 2017-2026

Forest Management Plan

Annex VIII: Growth and Yield Program

March 19, 2018

Executive Summary

Weyerhaeuser Company Ltd. (Weyerhaeuser) is assembling a Growth and Yield Program (GYP) as part of the 2017 FMP submission for the Pembina Timberlands Forest Management Agreement Area (FMA #0900046). Weyerhaeuser received agreement-in-principle (AIP) for the FMP Yield Projections on March 28, 2017. In the AIP, the Government of Alberta (GoA) requested the development of a robust GYP to gather key information for use in future timber supply analyses and to monitor the 2017 FMP timber yield assumptions.

The general proposed framework and minimum requirements for the GYP were outlined in AAF's Growth and Yield Guidelines Series in the draft document titled "Growth and Yield Programs" (AAF 2016b).

The GYP needs to address three primary strategic elements:

1. Growth Modelling
2. Yield Curve Development
3. Performance Monitoring

The strategic elements and associated objectives will determine the scope, sampling design and intensity of the data collection programs that may be required.

The summary of the proposed GYP by Weyerhaeuser is provided below:

- Contribute 110 plots, 50 natural stand Permanent Sample Plots (PSPs) and 60 managed stand Growth and Yield Monitoring (GYM) plots to the Provincial Growth and Yield Initiative (PGYI) for the development and recalibration of a new provincial growth model.
- Standardize digital data collection using tablets and data collection software to update the company ORACLE database to be compatible with the PGYI standard.
- Maintain 388 existing PSPs in natural stands. These circular plots are 1000 m^2 in size, located in mature stands and measured on a 10-year cycle. These plots will form the basis for the FMP yield curve development effort in 2027. The last measurement of the natural stand PSPs will be used for performance monitoring in the Forest Stewardship Report in 2022. Then they will be added to the next FMP yield curve modelling data set.
- Collect additional Temporary Sample Plot (TSP) data in natural stands for FMP yield curve development, as required by strata sample size considerations and due to the potential impact of Mountain Pine Beetle (MPB) in the northern part of the Pembina FMA.
- Maintain 29 existing GYM plots in pre-1991 openings, measured on a 5 or 10-year cycle depending on stand age. The square plots are 400 m^2 in size with a nested sapling plot (100 m^2) and a nested regeneration plot (50 m^2). All of the GYM plots will be re-measured at least once before 2027. It is expected that a decision will be made regarding this population of stands after the next FMP.
- Collect additional Temporary Sample Plot (TSP) data in larger yield strata in pre-1991 openings for performance monitoring and FMP yield curve development, as required by strata sample size considerations. Weyerhaeuser will establish 120 TSPs in the 4 large strata. Smaller strata do not

need to be sampled as they may default to the natural stand yield curves without any significant risk to the AAC.

- Maintain the 56 existing GYM plots in post-1991 openings under the basic silviculture regime. These historic plots are on a 3.33-km sampling grid. All existing plots will be re-measured to 30 years of stand age on a 5-year cycle and 10 years afterwards. The grid-based sampling frame will be abandoned as it does not allow for the timely accumulation of data, especially regarding the assessment of risk for RSA-based yield curves beyond 14 years of stand age.
    - Twenty of the 56 existing GYM plots that have not reached performance survey age yet and will be surveyed when they are scheduled for RSA performance survey. If the SU the GYM plot is located in is not selected for ground sampling as part of the RSA sample selection process, it will be surveyed independently using RSA performance survey protocols.
    - There are also 14 of the existing GYM plots that are located in openings that were already RSA surveyed, Weyerhaeuser will obtain the RSA submission data. It is possible that the SU was not selected for ground sampling during the RSA performance survey.
- Establish 100 new GYM plots in RSA-surveyed openings 14 years after harvest. Plots will be established yearly based on the population of openings and sampling units (SUs) selected for ground sampling. Basic silviculture and tree improvement (EFM) RSA programs will be sampled separately. These new plots will follow the same layout (400 m^2 main plot size) and field data collection protocol as the original grid-based, PGYI-compatible GYM plots established to date. All newly established plots will be re-measured to 30 years of stand age on a 5-year cycle and 10 years afterwards. Depending on the number of plots accumulated and the potential findings of intermittent analyses during Forest Stewardship Reporting or future FMP yield curve development, it is possible that only a subset of these plots will be measured beyond 30 years.
- Create an integrated RSA database for all performance-surveyed openings since 2009. New survey data for all stakeholders on the FMA area will be added yearly. Over 26,000 ha of RSA survey population data have already been gathered and reconciled with the Alberta Regeneration Information System (ARIS) records. Another 45,000 ha of RSA performance surveys are expected by 2027. The EFM population of openings will be sampled separately as per the RSA standard.
- Participate in the FRIAA-funded Realized Gain Trials (RGT) for the I1 white spruce controlled parentage program (CPP). Weyerhaeuser Pembina is scheduled to have 10 installations as part of the RGT pilot study that started in 2017.
- Explore the opportunity to participate in the FRIAA-funded MPB Rehabilitation Program as a contributing member for the establishment and re-measurement of a PSP network in pine-dominating stands to assess MPB-caused mortality, growth and regeneration post-attack.
- Weyerhaeuser is also an active member of the Forest Growth Organization of Western Canada (FGrOW). Weyerhaeuser will work with FGrOW to shape the vision for growth and yield in Alberta.

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1 Introduction

1.1 Background

Weyerhaeuser Company Ltd. (Weyerhaeuser) is assembling a Growth and Yield Program (GYP) as part of the 2017 FMP submission for the Pembina Timberlands Forest Management Agreement Area (FMA #0900046). Weyerhaeuser received agreement-in-principle (AIP) for the FMP Yield Projections on March 28, 2017 (AAF 2017a). In the AIP, the Government of Alberta (GoA) requested the development of a robust GYP to gather key information for use in future timber supply analyses and to monitor the 2017 FMP timber yield assumptions.

1.2 Report Objectives

This report documents the guiding principles, objectives, sampling design and data collection protocols used in Weyerhaeuser's GYP. The intent is to provide AAF with the information necessary to review and approve the program.

1.3 Guiding Principles

A set of guiding principles provides structure for the objectives of the GYP through all program phases; including sampling design, plot establishment and data collection, analysis and reporting. The GYP is designed so that it will:

1. Be fiscally responsible.
   - Utilize existing G&Y programs and data to reduce overall costs.
   - Collect only the necessary data to maintain cost-effectiveness.
   - Use RSA performance survey data as an important component of the program.
   - Investigate opportunities to utilize emerging technologies such as LiDAR and other remote sensing methods that have the potential for long term cost savings.
2. Be scientifically defensible.
   - Develop an objective-driven sampling design.
   - Ensure sufficient sample size to meet objectives.
   - Collect unbiased, local, representative data for the target populations.
   - Ensure that the collected data is of the highest possible quality.
3. Be efficient.
   - Build upon existing data collection systems and data format standards.
   - Participate in the Provincial Growth and Yield Initiative.
   - Cooperate with others on tree improvement and realized gain trials.
   - Ensure that sampling programs represent the target population over time.
   - Ensure that sampling design allows for the timely accumulation of data.

- Facilitate continuous improvement of the programs.
- Use spatially explicit data systems for referencing and analysis.

4. Be consistent.
   - Ensure that growth and yield program objectives are in agreement with the assumptions made in the timber supply analysis.
   - Stabilize plot configuration and data collection protocols for the FMP cycle.
   - Ensure that compilation and data analysis use generally accepted protocols.

2 Growth and Yield Monitoring Plan 2005

2.1 Overview

As part of the Detailed Forest Management Plan (DFMP) process, Weyerhaeuser developed a joint growth and yield monitoring plan (GYMP) for the Edson and Drayton Valley Forest Management Agreement areas in 2005 (J.S. Thrower & Associates 2005a). This plan established Weyerhaeuser's growth & yield monitoring objectives for the fire-origin and post-harvest regenerated (PHR) stands on the two FMA's.

The primary goal of the plan was to provide data to check growth and yield predictions. The intent was that the GYMP would be robust and provide data to check the different yield projection systems that are developed over time.

The specific objectives were to:

1. Monitor change in volume, species composition, stand top height, site height, and site index in fire-origin stands on the two FMA areas.

2. Provide data on fire-origin stand growth that can be used as a subset of the data to develop new growth and yield models and calibrate or validate existing models.[1]

3. Monitor change in volume, species composition, stand top height, site height, and site index (growth intercept) in PHR stands on the two FMA areas.

4. Provide data on competition and succession in PHR stands that can be used to link early stand performance to late stand conditions, especially in succession-based mixedwood stands.

5. Provide data on stand height and volume growth as well as seedling mortality and ingress that can be used as a subset of the data to develop new growth and yield models or calibrate existing ones for PHR stands.

[1] Note that this program is not intended to develop new growth and yield models, or calibrate and validate existing models. It is not expected that this program will provide all the data required to do this. Rather the data collected could be a subset of the total pool of data used.

6. Provide data that could be used to develop relationships between ecological classification and stand development.

Weyerhaeuser's existing natural stand PSPs were to be used to meet objectives 1, 2, and 6 in fire-origin stands. A gap analysis showed that the PSPs are well distributed across the fire-origin stands on the productive forest land base of the combined FMA areas. They proportionately represent the natural subregions, broad cover groups, site productivity, and crown closure classes.

To meet objectives 3, 4, 5, and 6 Weyerhaeuser were to establish 86 new Growth and Yield Monitoring (GYM) plots on a 3.33 km grid in PHR stands initially. New GYM plots would be established over time as the target population of PHR stands expands.

AAF approved the submitted GYMP in July 2005[2] subject to the following conditions:

- The scope of the plan needs to include a broader objective to collecting data for growth and yield model development to allow for the calibration/fitting of standing timber yield functions.
- Regeneration performance survey data should be an important component of understanding and predicting future yields in managed stands.
- Development of Alternative Regeneration Standards will require increased sampling intensity for growth model development in PHR stands.
- Site productivity assessment in PHR stands must account for bias to top height based individual tree site index models due to crop tree replacement in young and dense stands.
- Detailed field manuals must be submitted prior to any field work commencing.[3]

There have been several key changes regarding growth and yield since 2005:

- The development of the GYPSY growth model for natural and managed stands for lodgepole pine (2006) and for all major species groups in May 2009.
- The emergence of the Reforestation Standard of Alberta (RSA).
- The establishment of the Provincial Growth and Yield Initiative (PGYI) in 2014.
- The amalgamation of the Edson and Drayton Valley FMUs under FMU R15 and the creation of the Pembina Timberlands FMA area (#0900046).

These changes played a role in shaping Weyerhaeuser's growth and yield data collection and modeling efforts related to the commitments made in the 2005 GYMP.

As required, Weyerhaeuser continued with the re-measurement of the 421 natural stand PSPs in fire-origin stands on a 5-10 year schedule depending on stand age. Historic plot measurements of these PSPs were also provided to AAF for development and validation of the GYPSY model in 2009.

Weyerhaeuser developed a GYM plot program in 2005 where a 3.33-km grid was overlaid on the FMA area. When a block is harvested on the FMA area and overlaps a 3.33-km grid point, Weyerhaeuser establishes a GYM plot to measure and monitor the performance of Weyerhaeuser's silviculture practices. These plots provide detailed site specific information on the success and effectiveness of

[2] Approval - Draft Growth and Yield Monitoring Plan for the Edson and Drayton Valley FMA Areas. Letter by Robert Stokes RPF, Senior Manager, Forest Planning Section, ASRD on July 14, 2005.
[3] This condition was met in November 2005 with the submission of the field manuals the G&Y program.

planted stock, natural ingress, site preparation, and vegetation management practices to assess growth and yield performance on the FMA area as well as to monitor the success of operational practices.

Between 2005 and 2015, Weyerhaeuser established 90 plots[4] in its GYM plot program. The GYM plots are re-measured every 5 years until the cutblock reaches age 30, after which time they are re-measured on a 10-year cycle.

Weyerhaeuser also began surveying according to the RSA (AAF 2017b) in 2009, which provides a tool to measure and report the growth predictions of reforested stands in comparison to the yield predictions of the TSA.

2.2 Changes Based On the 2017 FMP

Weyerhaeuser reviewed their 2005 GYMP, data collection efforts based on the 2017 FMP and considered the following broad modifications:

1. Review the PSPs that are outside of the current natural stand active landbase.

   Weyerhaeuser excluded 63 PSPs that were outside of the active landbase[5] in the 2017 FMP. There was considerable amount of investment made in the collection of this data without return. Data collection efforts will focus on plots that are either currently in the natural stand active landbase or potentially will be included in the next FMP. Weyerhaeuser will keep some of the operational and subjective deletions, operational buffers, and potentially some of the less pure larch stands (10-30%). Natural stand PSPs on steep slopes, in DIDs deletions, non-forested, unproductive (TPR=U) or disturbed (in harvested cutblocks, or subject to windthrow, fire or other natural disturbance) would be dropped. Additional plot data for natural stand FMP yield curve development will be supplemented via a Temporary Sample Plot (TSP) program, if required.

2. Revise the sampling design of the GYM plot program.

   While the current 3.33-km sampling grid provides an unbiased sample of managed stands, it does not allow for the timely accumulation of representative plot data. This is especially true regarding the validation and monitoring of growth and yield of RSA-based yield curves beyond 14 years of stand age. The existing GYM plots will be maintained, but the 3.33-km grid based sampling frame will be abandoned. New GYM plots will be established in RSA-surveyed openings. Plots will be established yearly based on the population of openings and sampling units (SUs) selected for ground sampling. Basic silviculture and tree improvement (EFM) RSA programs will be sampled separately. These new plots will follow the same layout (400 m^2 main plot size) and field data collection protocol as the original grid-based, PGYI-compatible GYM plots established to date (Weyerhaeuser 2017).

3. Reconcile and organize all spatial and aspatial RSA performance survey data in the FMA area.

   It took considerable effort to assemble the RSA plot data for the 2017 FMP yield curve development. Given the importance of this data in developing managed stand yield curves in the next FMP,

[4] One plot (50511536) was destroyed by the expansion of the Wolf Lake road ROW in 2014.
[5] There were 22 additional PSPs that were black spruce deletions that were added to the yield modeling data set due to the loss of most plots in the Sb yield stratum as per subjective deletions rules.

Weyerhaeuser will need to ensure that the information is readily available. Given the number of Quota Holders in the FMA, it may be necessary to do a one-time MOU with all companies so ARIS extract and submitted RSA data can be requested directly from AAF on a yearly basis.

3 Current Growth and Yield Program

3.1 Proposed Framework

The general proposed framework and minimum requirements for the GYP are outlined in AAF's Growth and Yield Guidelines Series in the draft document titled "*Growth and Yield Programs*" (AAF 2016b).

The basic objective of a GYP is to provide data for model development, monitoring and the localization and validation of FMP yield estimates in natural fire-origin and PHR stands.

In addition, there may also be a number of other company-specific objectives that must be met such as developing volume estimates for operational planning purposes, localization of taper coefficients, calibration of a new photo inventory or the collection of information necessary to support silviculture decision making.

The GYP needs to address three primary strategic elements:

1. Growth Modelling
2. Yield Curve Development
3. Performance Monitoring

The strategic elements and associated objectives will determine the scope, sampling design and intensity of the data collection programs that may be required. The following sections provide detailed discussion of these strategic elements and associated objectives in Weyerhaeuser's GYP.

3.2 Growth Modeling

Forest growth modeling is the development of statistical models that help quantify change in forest attributes over time. In Alberta, growth models are primarily used for creating yield curves in support of FMP development. These models are also used for assessing silviculture performance under the RSA.

Objective: *to collect data suitable for the calibration of existing growth models (e.g., GYPSY and MGM) and/or the development of new growth models that work in both natural fire-origin and PHR managed stands.*

Growth modeling requires repeated measures of individual trees over time, therefore Permanent Sample Plots (PSP) that cover a wide array of stand conditions across the entire age range of forest stands are required. This is problematic in PHR stands where sampling historically has been less intensive (less area was available for sampling), age range of stands is limited and stands are subjected to evolving silviculture treatment regime (site preparation, planting densities, stock types and tending). Empirical modelling is not an option in PHR stands due to the lack of representative data in the older, merchantable age range.

Forestry companies and AAF recognized that a collaborative effort was needed. The Provincial Growth and Yield Initiative (PGYI) program under the Alberta Forest Growth Organization (AFGO)[6] was formed in 2011 to build a system of PSPs across Alberta that is maintained by member companies based on a set of minimum standards and best practices. Weyerhaeuser signed the memorandum of understanding (MOU) in June 2014 (AFGO 2014). The collected PGYI data was submitted to the PGYI on-line database system in a set of comma-delimited (CSV) files.

The objective of PGYI is to collectively obtain data on tree growth through repeated measurements of PSPs to develop, calibrate and validate growth models for FMP yield curve development. FGrOW published guidelines for minimum standards for PGYI plot establishment and measurement (AAF 2015).

The main focus of the PGYI data collection is to fill the gap in PHR stands based on a plot allocation matrix and thus enable the calibration of growth models that will help quantify and link early stand performance and future productivity under a variety of silviculture regimes and resulting stand conditions.

Weyerhaeuser's PGYI commitments are shown in Table 3-1.

Table 3-1. Weyerhaeuser's PGYI Plot Allocation Matrix

Strata	Natural		Managed	
	Target	Established	Target	Established
Pl	10	10	7	10
Sw	6	5	7	8
PlMx	13	13	0	0
HwPl	0	0	5	2
PlHw	0	0	6	4
SwMx	5	6	0	0
HwSw	0	0	2	3
SwHw	0	0	2	3
Sb	7	7	1	0
Hardwood	9	8	30	29
Total	50	49	60	59

The AAF will assume the role of growth modeling and the development of approved growth models for Alberta using the PSP data collected under PGYI. Validation, re-calibration and individual company testing of the approved growth models will not be needed; however the validation of FMP yield curves using these approved growth models is still required.

3.2.1 Natural Stands

3.2.1.1 Current Status

Weyerhaeuser has contributed 49 natural stand PSPs to PGYI. All historic measurements were converted to the PGYI-format and submitted to the PGYI database in March 2016. Weyerhaeuser used AAF-

[6] The organization is now known as Forest Growth Organization of Western Canada (FGrOW).

approved[7] conversion for historic tree condition codes (Appendix I). Based on the required plot allocation, there is one additional new plot[8] that needs to be established in natural stands in the Weyerhaeuser Pembina Timberlands FMA area for PGYI.

Weyerhaeuser began establishing permanent sample plots (PSPs) in natural stands on their FMA areas in 1994 in Drayton Valley and in 1998 in Edson. The PSP field procedures were based, to some extent, on the Land and Forest Services PSP program (LFS 1994). The plot configuration was changed to simplify establishment and re-measurement. Additional changes to the procedure were also necessary to facilitate measurement of primarily hardwood and/or mixedwood stands. The majority of Weyerhaeuser's natural stand PSPs were established between 1995 and 2001 in Drayton Valley and between 1999 and 2003 in Edson.

The sampling frame for natural stand PSP establishment included all natural stands in the timber harvesting landbase at the time. The intent of the PSP design was to ensure that the plots established were representative of stands being sampled (Figure 3-1).

PSPs established by Weyerhaeuser area are 1000 m^2 (0.1 ha) circular plots contained within a 2.25 ha buffer (150 m by 150 m). The main plot, which is used to record the tagged tree information, was established using a radius of 17.84 m. Height and height to live crown were measured on a subsample of the trees within the main plot. All trees with a diameter at breast height (DBH) of 7.1 cm or greater were considered part of the tree strata and were numbered and tagged.

Nested within the main plot, four 10 m^2 subplots were established to record information regarding the saplings (untagged, tallied 1 to 7 cm DBH) and regenerating stems (<1cm DBH to 30 cm height dot tallied by species and height class) within the subplots. These subplots were established in each of the four cardinal directions (north, east, south and west). The subplots are circular, with a radius of 1.78 m.

A 10 m radius zone is established around the main plot to facilitate any destructive sampling that was done in conjunction with the PSP program to record tree age. For example, any sectioning of stems could not be conducted within the PSP and would be done outside the main plot, from within the buffer. Eight age trees were sampled for each species with a substantial presence in the main plot (i.e., which account for at least 30% of the overstorey crown closure, based on the AVI field type within the plot). Age trees had to be dominant or codominant trees with no restriction to exclude veteran trees. In addition, two trees of the dominant species on a PSP were to be selected and measured as site trees. If the plot was located in a mixedwood stand, then two of the dominant conifer and two of the dominant deciduous stems had to be selected. All site trees were selected from the same area as the aged trees (i.e., 10 m radius around the outside of the main plot).

Further details can be found in the *Permanent Sample Plot Field Procedures Manual* (Weyerhaeuser 1998).

[7] Weyerhaeuser has been using the Land and Forest Service PSP Master Tree Condition Codes (LFS 1994) that were mapped to PGYI codes and reviewed by Katrina Froese (AAF) on February 11, 2016.

[8] Natural PSP DV238 was closed in 2012. This plot was originally selected as a PGYI plot in the Sw stratum 121+ age class located in the Sub-Alpine natural subregion.

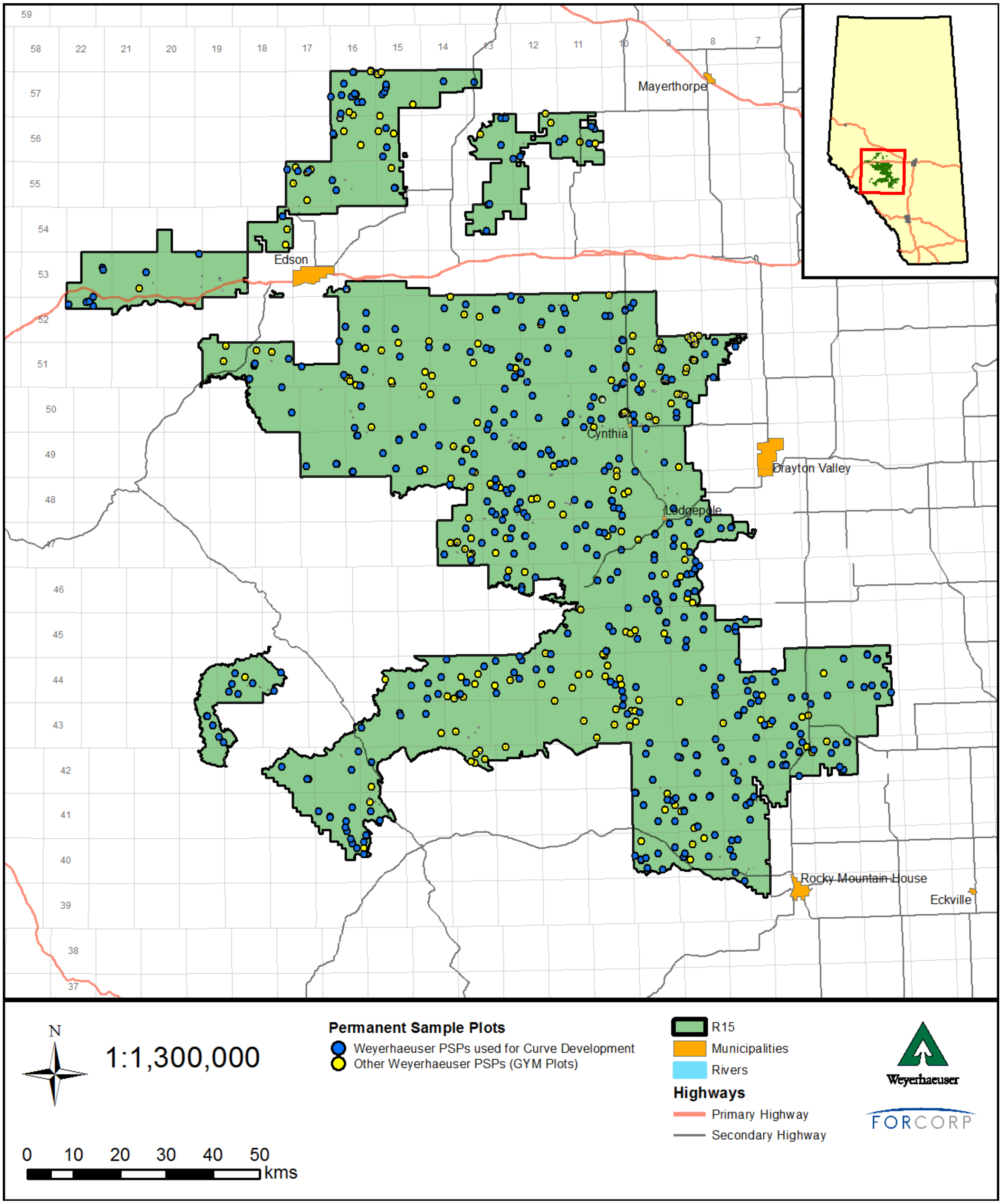

Figure 3-1. Weyerhaeuser Pembina Growth and Yield Program Plots (Source: FORCORP)

Weyerhaeuser's PSP program has a number of outages when compared to the PGYI minimum standards (AAF 2015):

- Saplings were not numbered and tagged in the four nested sapling plots ($4x10m^2$) but all live saplings were measured for species and DBH, while height was sub-sampled.
- Saplings included trees <7.1 cm DBH and >=1.1 cm DBH only. Trees above 130 cm but below 1.1 cm DBH were dot tallied as part of the regeneration.
- DBH was not consistently recorded for trees that were found standing dead at the first time.
- Cause and severity describing tree condition were not collected.
- There was no stem mapping of trees in the main plot.
- There was no crown width information measured. Height to live crown was recorded on a subset of trees also marked for height measurement.
- Vegetation percent cover, elevation and field ecosite information were not collected or measured to the PGYI standard. Ecosite and phase must be derived using the provincial natural subregion layer (2005) based on a field assessment of vegetation and soil in the area surrounding the plot.

3.2.1.2 Future Commitments

Weyerhaeuser decided to make changes to the natural stand PSP program for all plots to meet the PGYI minimum standards as follows:

1. Redefine saplings as all trees >130 cm height to <7.1 cm DBH. This change will result in some trees between 0.1 and 1.1 cm DBH that are currently defined and dot-tallied as regeneration to be identified as saplings.

2. Tag and number all saplings in the four nested subplots.

3. Record DBH and species for trees that are found standing dead at the first time.

4. Continue with the current practice of tree condition codes and use the approved tree condition code mapping at the time of conversion to PGYI standards.

5. Collect and maintain the plot header information required by PGYI (ecosite phase, vegetation cover, slope position and elevation).

6. Collect site tree/age tree information outside the main plot area in the 10 m radius buffer as per current protocol. However, use the NNW segment ($1/8^{th}$ of the donut) which is approximately 180 m^2 in size and pick the 2 largest DBH site trees per main species group (present in the main plot area) so that selection is repeatable and can be associated with a fixed area. If no suitable site tree is found, the next segment should be selected counter-clock-wise.

7. Stem-map 10% of the PGYI-selected PSPs as per minimum standard. Every year randomly designate 10% of the plots scheduled for re-measurement.

8. Measure height to live crown to the bottom of live foliage, rather than to the point where the last live branch attaches to the bole.

9. Designate an existing natural PSP or establish one new PSP in the Sw stratum, 121+ age class in the Sub-Alpine natural subregion to meet PGYI plot allocation target of 50 natural stand plots.

10. Implement changes in the company's ORACLE database and FileMaker Pro application used to collect field data on iPad tablets. This includes minor data updates that were identified during the PGYI historic data conversion.

11. Establish a streamlined data conversion process for data submission to the PGYI database.

12. Update natural stand PSP field manuals to reflect the proposed changes.

3.2.2 Managed Stands

3.2.2.1 Current Status

Weyerhaeuser has contributed 59 managed stand GYM plots to PGYI. All historic measurements of these plots were converted to PGYI standard and submitted to the PGYI database in March 2016. Weyerhaeuser used an AAF-approved conversion for historic tree condition codes (Appendix I). Based on the required plot allocation, there is one additional new plot[9] that needs to be established in managed stands in the Weyerhaeuser Pembina Timberlands FMA area.

As part of the approved DFMP in 2006, Weyerhaeuser committed to developing a GYMP to validate projected regenerated yields and associated assumptions (J.S. Thrower & Associates 2005a). As part of this program, Weyerhaeuser were to initially establish 86 new GYM plots on a 3.33 km grid in PHR stands. Initial establishment included cut blocks from 1960 onwards. New GYM plots would be established over time as the target population of PHR stands expands. GYM plots will be established 2 years after reforestation of the block and re-measured at a 5-year interval.

GYM plots consist of a 400 m^2 large 20x20 m square tree plot (>=5 cm DBH), a 100 m^2 10x10 m nested square sapling plot (>=1.3 m in height to <5 cm DBH) and a 50 m^2 7.07x7.07 m nested square regeneration plot (10 cm to 1.3 m height). The sapling and regeneration plots are located in the NW corner of the main tree plot. DBH and height measurements are recorded for all trees and saplings. All trees are tagged once they reach 1.3 m height.

Site tree data are collected on the 400 m^2 main plot. Site index estimates are derived from the four largest diameter suitable trees of each species in the main plot.

Existing oil and gas cut lines crossing the PHR stands are included in the target population for sampling. If a cutline crosses a portion of the GYM plot, it is included in the plot; however the cutline is to be mapped by placing posts along the edges and recording sufficient distances and bearings so that the area of the cutline can be calculated. A detailed description of Weyerhaeuser's GYM plot program and field protocols can be found in the *Edson & Drayton Valley GYM Field Manual* (J.S. Thrower & Associates 2005b).

Weyerhaeuser's GYM plot program has a number of outages when compared to the PGYI minimum standards (AAF 2015):

[9] Weyerhaeuser is required to establish one managed stand plot in the Sb stratum in the Lower Foothills natural subregion.

- Tree origin was not consistently collected. There was a tendency to over-use the U (unknown origin) code in early plot measurements.
- DBH was not consistently recorded for trees that were found standing dead at the first time.
- Cause and severity describing tree condition were not collected.
- There was no stem mapping of trees in the main plot.
- There was no crown width information measured for any of the trees.
- Vegetation percent cover, elevation and field ecosite information were not collected or measured to the PGYI standard. Ecosite and phase must be derived using the provincial natural subregion layer (2005) based on a field assessment of vegetation and soil in the area surrounding the plot.

3.2.2.2 Future Commitments

Weyerhaeuser decided to make changes to the managed stand GYM plot program to meet the PGYI minimum standards as follows:

1. Collect and maintain the plot header information required by PGYI (ecosite phase, vegetation cover, slope position and elevation).
2. Record DBH and species for trees that are found standing dead at the first time.
3. Record tree origin as Planted (P) or Natural (N) and stop using the Unknown (U) code.
4. Introduce the Veteran (V) tree origin code for all trees that are remnants from the previous stand and that are not expected to be present at harvest.
5. Introduce a separate origin code for planted genetic (G) origin white spruce seedlings (I1 breeding region). Maintain the current planted (P) code for wild seed origin seedlings.
6. Continue with the current practice of tree condition codes and use the approved tree condition code mapping at the time of conversion to PGYI standards.
7. Stem-map 10% of the PGYI-selected GYM plots as per minimum standard.
8. Measure height to live crown to the bottom of live foliage, rather than to the point where the last live branch attaches to the bole.
9. Establish one new GYM plot in the Sb stratum in the Lower Foothills natural subregion to meet PGYI plot allocation target of 60 managed stand plots.
10. Review the status of 4 PGYI-designated plots (50400917, 50511608, 50551704 and 50561111) that appear to have GPS location and other potential issues.
11. Ensure that RSA performance survey and ARIS silviculture data are linked to each existing GYM plot.
12. Verify - where possible, if the ARIS block-level treatment information occurred at the plot level (i.e. fill planting, stand tending or herbicide treatment etc.).

13. Identify any PGYI-selected plots in openings planted predominantly with genetic stock. These plots currently should not be part of the PGYI modeling data sets.

14. Implement changes in the company's ORACLE database and FileMaker Pro application used to collect field data on iPad tablets. This includes minor data updates that were identified during the PGYI historic data conversion.

15. Establish a streamlined data conversion process for data submission to the PGYI database.

16. Update managed stand GYM plot field manuals to reflect the proposed changes.

3.3 FMP Yield Curve Development

Yield curve development for the next FMP timber supply analysis will follow different methodologies depending on the available data, growth model and stand types in the defined forest area (DFA).

Weyerhaeuser's intent is to follow the guiding principles for the GYP, specifically:

- Build upon the existing network of plots wherever possible.
- Make use of the RSA performance survey data, if deemed suitable.
- Ensure that local, unbiased data are available that represent the target population.

3.3.1 Natural Stands

Objective: *to develop unbiased yield estimates for natural stands that are representative of the mean current yields by stratum and age class that are observed on the current active landbase.*

3.3.1.1 Target population

All fire-origin (natural) stands within the Weyerhaeuser Pembina Timberlands FMA active landbase.

3.3.1.2 Growth Model

Weyerhaeuser is planning to use the growth model initiation method in the next FMP where plots located in natural stands are stratified based on AVI and projected by the GYPSY[10] model.

3.3.1.3 Stratification

In the 2017 FMP Weyerhaeuser used the AAF "base 10" strata as outlined in the Planning Standard (ASRD 2006), as the basis for the stratification of natural stands using the overstorey layer as the Storey of Primary Management (SoPM). There were not enough plots (and landbase area) to justify a separate SbHw stratum in the DFA therefore it was aggregated with SwHw to create a CD-SX yield stratum The strata were further divided into yield groups based on inventory overstorey density and old FMU boundaries where the distribution and number of PSPs allowed for it as shown in Table 3-2.

[10] Current version of GYPSY (Huang *et al*. 2009a, 2009b); however it is anticipated that a new version will be available by the time Weyerhaeuser's next FMP is due.

Table 3-2. Natural Stand Yield Groups

O/S BCG	O/S Base 10	Description	O/S Density	Old FMU	Yield Group Label
C	Pl	Pure Conifer - Pine leading	AB	ALL	C-PL-AB
			CD		C-PL-CD
	Sw	Pure Conifer -White Spruce leading	ALL	ALL	C-SW
	Sb	Pure Conifer - Black Spruce leading*	ALL	ALL	C-SB
CD	PlHw	Conifer Mixedwood - Pine leading	ALL	ALL	CD-PL
	SwHw	Conifer Mixedwood - White Spruce leading	ALL	ALL	CD-SX
	SbHw	Conifer Mixedwood - Black Spruce leading			
DC	HwPl	Deciduous Mixedwood - Pine leading	ALL	ALL	DC-PL
	HwSx	Deciduous Mixedwood - Spruce leading	ALL	ALL	DC-SX
D	Hw	Pure Deciduous	ALL	W5 & W6	D-HW-W
				REST	D-HW-X

** Only includes areas with Sb<=60% and where the second conifer species is Pl.*

The main requirement for natural stand yield curve development is to have local, unbiased and representative plot data of the active landbase stratified by the latest AVI. In the 2017 FMP yield curve development, Weyerhaeuser was required to drop 63 natural stand PSPs that were outside the active landbase.

For GYP planning purposes, Weyerhaeuser proposes the use of the 10 yield groups as per the 2017 FMP stratification rules and methods. However, as shown in Table 3-2 the stratification may be converted to the Base 10 strata for yield curve development in the future, if needed. Further splits by natural subregion or site productivity could be achieved by additional sampling via a TSP program subject to sample size considerations.

3.3.1.4 Current Status

Weyerhaeuser will maintain 388 PSPs in natural stands. There are 331 PSPs within the 2017 FMP active landbase and there are 57 PSPs located in the passive landbase but will be retained. After careful review of all available information, Weyerhaeuser decided to drop 33 PSPs[11] that are outside the current active landbase and will not likely be part of the natural harvestable landbase in the next FMP. The reason for deletion includes plots that are outside the FMA area; in permanent deletions; non-forested; on steep slopes; in unproductive stands (TPR=U, with significant larch content); harvested; with access issues; closed or destroyed (burn, oil and gas activities, pipelines or windthrow). The list of the dropped plots is provided in Appendix II.

All 49 PGYI-designated PSPs in natural stands were included in the retained set so that the last measurements can be used in yield curve development efforts as long as they do not bias the overall sample. The retained PSPs in natural stands are listed in Appendix III.

The plot and area[12] distributions by yield group are presented in Table 3-3 and Figure 3-2.

[11] Plots that are outside the 2017 FMP active landbase and are dropped are being kept as “dormant”. No tags are removed, nails pulled or Industrial Sample Plot (ISP) reservations cancelled until the re-assessment of the status of the plot data for the Forest Stewardship Report in 2022.

[12] The area summaries are based on Landbase Version 8 provided by FORCORP in September 2017.

Table 3-3. Distribution of PSPs and Net Area by Yield Group

Yield Group	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
C-PL_AB	44,589	39	20	59	11	12
C-PL_CD	89,070	62	4	66	23	19
C-SB	2,137	2	13	15	1	1
C-SW	61,414	41	10	51	16	12
CD-PL	14,327	7	1	8	4	2
CD-SX	16,605	21		21	4	6
D-HW_W	44,526	38	2	40	11	11
D-HW_X	84,284	85	5	90	21	26
DC-PL	14,203	19	1	20	4	6
DC-SX	22,759	17	1	18	6	5
TPR_U*	254				0	0
Total	394,167	331	57	388	100	100

* the net area includes some TPR=U areas that are in planned cutblocks

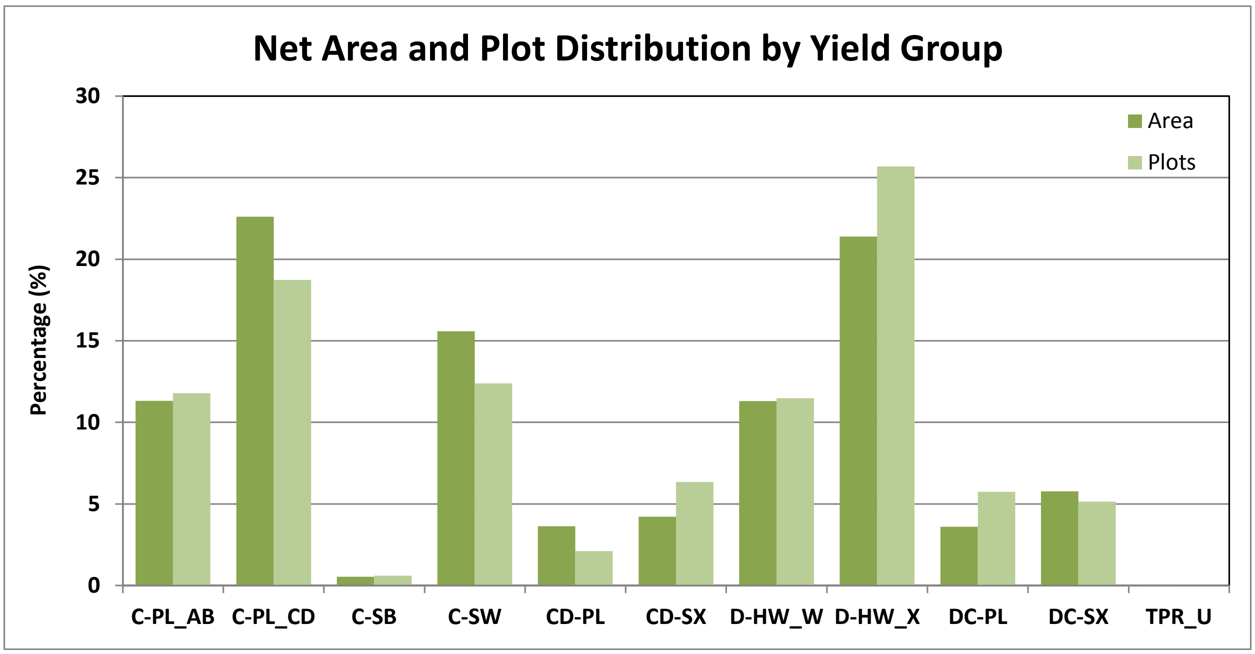

Figure 3-2. Area and Plot Distribution by Yield Group in Natural Stands

The distribution of natural stand PSPs by yield group follows reasonably well the distribution of area in the active landbase. There is a slight under-representation of the C-PL_CD and C-SW strata; however there are some additional plots that are currently located outside the active landbase that may be inside at the next FMP in 2027. There is also a slight over-representation of the D-HW_X (pure deciduous stands outside of the old W5/W6 FMUs) by the natural stand PSPs.

The distributions of plots and area by natural subregion are presented in Table 3-4 and Figure 3-3. The distribution of plots is in good agreement with the distribution of the active landbase. The large majority of the area and plots are located in the Lower Foothills natural subregion.

Table 3-4. Distribution of PSPs and Net Area by Natural Subregion

Natural Subregion	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
CMW	19,445	24	1	25	5	7
DMW	36				0	0
LF	319,343	275	54	329	81	83
SA	16,442	11	1	12	4	3
UF	38,901	21	1	22	10	6
Total	394,167	331	57	388	100	100

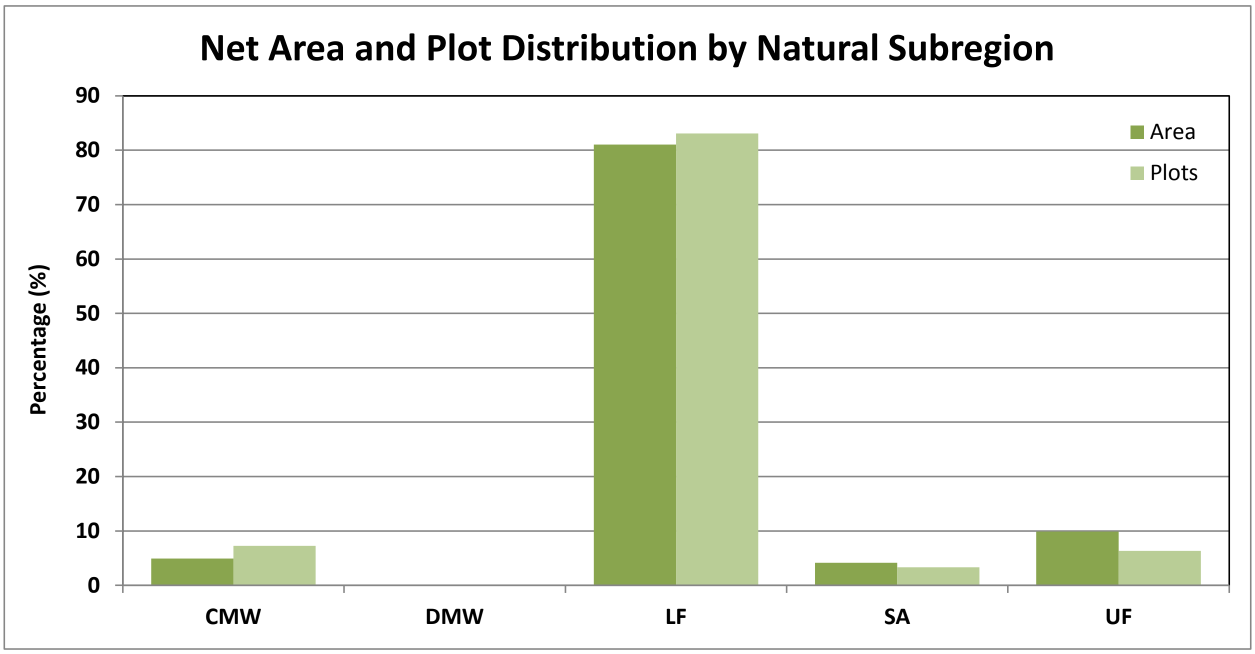

Figure 3-3. Area and Plot Distribution by Natural Subregion in Natural Stands

There is a good representation of the active landbase area by 20-year age class as shown in Table 3-5 and Figure 3-4. There is a slight over-sampling by PSPs in the 61-80 and 121-140 age classes while some more plots may be needed in the 101-120 age class. Over 50% of the net area is in stands 100-140 years old and 36 % of the area is 121 years old or older.

There are several plots that currently reside outside the active landbase that may become available at the next plan. We will reassess the plot and area distributions in 2022 in the Forest Stewardship Report.

Table 3-5. Distribution of PSPs and Net Area by 20-Year Age Class

Age Class	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
1-20	902				0	0
21-40	3,317				1	0
41-60	18,209	10	1	11	5	3
61-80	61,069	61	6	67	15	18
81-100	65,675	53	9	62	17	16
101-120	102,870	79	16	95	26	24
121-140	111,624	103	20	123	28	31
141-160	20,440	16	2	18	5	5
160+	10,058	9	3	12	3	3
NA	3				0	0
Total	394,167	331	57	388	100	100

* the net area includes some minor areas with no valid age assignment

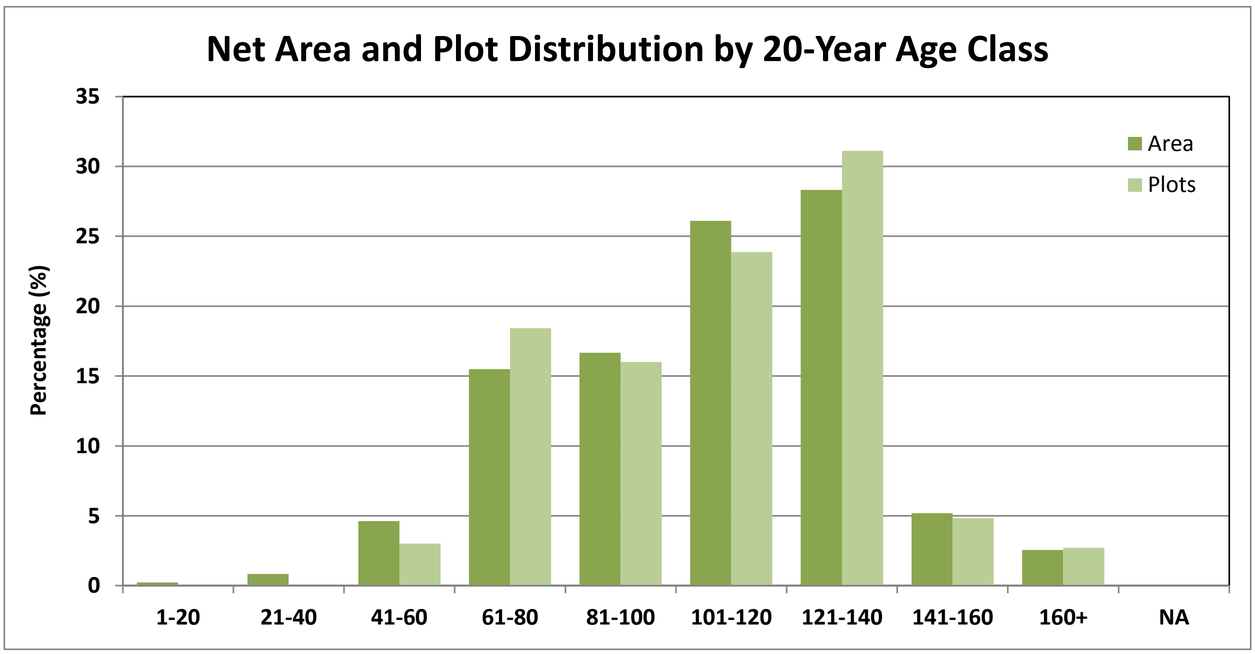

Figure 3-4. Area and Plot Distribution by 20-Year Age Class in Natural Stands

3.3.1.5 Sample Size

The determination of a robust sample size in support of the GYP is influenced by several factors such as the size and variability of a stratum, geography, influence of the stratum on Allowable Annual Cut (AAC), its relative proportion within the DFA and associated costs.

Weyerhaeuser calculated the sample size by the proposed strata using statistical considerations based on different levels of allowable errors and stratum variability expressed as the coefficient of variation in total gross merchantable volume of the natural stand PSPs.

Given the number of strata and the proportional representation of the active landbase, the suggested target minimum sample sizes (AAF 2016b) for major and minor strata were also included (Table 3-6).

Table 3-6. Sample Size by Proposed Yield Group in Natural Stands

Yield Group	Net Area (ha)	Net Area (%)	CV (%)	Plots Have	Plots Needed 15% AE	10%AE	Min	Proposed	Diff
C-PL_AB	44,589	11	52	39	35	75	60	45	-6
C-PL_CD	89,070	23	37	62	19	40	60	90	-28
C-SB	2,137	1	99	2	120	267	20	20	0
C-SW	61,414	16	35	41	17	35	60	45	-4
CD-PL	14,327	4	46	7	28	59	20	20	-13
CD-SX	16,605	4	53	21	37	80	20	20	1
D-HW_W	44,526	11	52	38	35	76	60	45	-7
D-HW_X	84,284	21	39	85	21	44	60	90	-5
DC-PL	14,203	4	29	19	13	25	20	20	-1
DC-SX	22,759	6	28	17	12	23	60	30	-13
TPR_U	254	0							
Total	394,167	100	41	331	337	724	440	425	-76

Notes
Coefficient of variation (CV) estimate for total gross merchantable volume in stratum.
Allowable error (AE) at 90% confidence level.
Target minimum (Min): major strata (>=5%) 60 PSPs, minor strata (<5%) 20 PSPs.
Difference (Diff) reported between current net plot count and the proposed sample size.
Negative numbers indicate a deficit.
C-SB stratum is mostly netted out in current FMP and will use the existing 20 plots outside the active landbase.

As discussed earlier, statistics alone cannot properly capture sampling design, plot size, number of plots per stand and other significant contributing factors. For example, C-SW that appears to be short of plots (-19) has relatively low CV (35%) which indicates low variability of the stratum. Any stratum with lower variability generally requires less sample plots so the 41 plots currently available might be enough to meet the minimum sample size at 10% AE (35 plots). On the other hand, D-HW_W may require additional sample plots if one wants to meet the 10% sampling error requirement given the higher variability of the stratum. Having said that, the variability in total merchantable volume might be a good indicator, but it will not capture other aspects such as geography or growth differences by natural subregion.

The sample size calculations indicate that at the proposed stratification, Weyerhaeuser may need to supplement the natural stand PSP program with some additional plots. This could be achieved through the implementation of a TSP program[13] that could also support the interpretation in the next AVI. Any

[13] The TSP program is meant to complement the existing PSP program in natural stands and will be implemented, if necessary with the new AVI closer to the next FMP date. This will help ensure that sample locations fall into the active landbase and the plot attributes collected are fully compatible with the re-calibrated growth model that will be developed as part of the PGYI program.

additional sampling must ensure that the overall plot distribution and representation of the strata remain unbiased.

3.3.1.6 Scheduling

Weyerhaeuser's natural stand PSPs are protected from harvesting activities. All natural stand PSPs will be scheduled for a measurement before the new FMP in 2027 (Table 3-7). There will also be some sample years (2021 and 2025) that may provide for some flexibility in the schedule, if needed.

Table 3-7. Natural Stand PSP Measurement Schedule by Yield Group

Yield Group	Measurement Year								Total
	2018	2019	2020	2022	FSR	2023	2024	2025	
C-PL_AB	7	4	4	4	19	8	31	1	59
C-PL_CD	9	6	9	9	33	4	28	1	66
C-SB	6	1	3		10	1	4		15
C-SW	4	5	12	8	29	15	7		51
CD-PL				2	2	4	2		8
CD-SX	1	1	3	3	8	10	3		21
D-HW_W				4	4	13	23		40
D-HW_X	6	7	29	2	44	3	42	1	90
DC-PL		2	1	2	5	5	10		20
DC-SX	3	1	1	1	6	4	8		18
Total	36	27	62	35	160	67	158	3	388

Based on the plot measurement schedule, we may need to shift some of the PSPs in the D-HW_W yield group from 2023 and 2024 to have better representation by the time of the Forest Stewardship Report in 2022. Re-scheduling plots should only be done, if necessary using non-PGYI designated plots where the measurement cycle for growth model development should stay at 10 years. The long-term goal is to have about 40 PSPs re-measured per year providing stability for budgeting and the planning and availability of field crews.

3.3.1.7 Potential Impact of the Mountain Pine Beetle

In the northern part of the Pembina FMA, the mountain pine beetle (MPB) is quickly advancing out of the Hinton Wood Products FMA area which will result in harvest prioritization of pine dominated stands in the first two decades of the Spatial Harvest Sequence (SHS) of the 2017 FMP. The potential impact of the proposed harvest from 2017 to 2026 on the active landbase and PSP distribution is shown in Table 3-8.

Table 3-8. Impact of SHS on the Active Landbase and Natural Stand PSPs (2017-2026)

Yield Group	Area			Plots		
	FMP 2017 Net (ha)	SHS (ha) (2017-2026)	% of Net	FMP 2017 Net (#)	SHS (#) (2017-2026)	% of Net
C-PL_AB	44,589	15,296	34	39	12	31
C-PL_CD	89,070	26,082	29	62	14	23
C-SB	2,137	569	27	2		0
C-SW	61,414	4,318	7	41	5	12
CD-PL	14,327	5,320	37	7	1	14
CD-SX	16,605	1,591	10	21	1	5
D-HW_W	44,526	8,224	18	38	7	18
D-HW_X	84,284	7,548	9	85		0
DC-PL	14,203	4,251	30	19	3	16
DC-SX	22,759	2,816	12	17	2	12
TPR_U	254	223	88			
Total	394,167	76,237	19	331	45	14

Harvesting activities will focus on the pine-dominated yield groups (C-PL_AB, C-PL_CD, CD-PL and DC-PL) and 45 natural stand PSPs might be impacted as a result.

3.3.1.8 Future Commitments

Weyerhaeuser will drop 33 plots from the natural stand PSP program that are outside of the FMA natural stand active landbase and will not likely be part of the natural harvestable landbase in the next FMP (Appendix II).

Weyerhaeuser will maintain the remaining natural stand PSPs on a 10-year measurement cycle subject to the following considerations:

- Given the unbalanced nature of harvesting in the next two decades due to MPB, we propose that PSPs in pine dominated strata <u>not be protected from harvesting activities</u>. This is done 1) to avoid MPB-hazard and windthrow damage that these plots would pose to operations; 2) to maintain the proportions of the yield strata that represent the remaining active landbase and 3) many of these PSPs would have to be excluded from FMP yield curve development efforts in the future due to their last measurement potentially done prior to the MPB-attack and thus not fully capturing mortality.
- Weyerhaeuser will maintain a number of these PSPs for research purposes of pine-regeneration post-MPB. Although the FMP yield curve development in natural stands is focusing on yield rather than growth, Weyerhaeuser's network of remeasured PSPs can provide valuable information regarding the rate of MPB-caused mortality, the subsequent growth rates of remaining stems and the regeneration of lodgepole pine and other coniferous species. This requires a collaborative effort that maintains a network of untreated pine-dominated PSPs that are reserved from harvest. Weyerhaeuser will explore the opportunity to becoming a contributing member of the FGrOW project titled "Establishment of PSP Network to Monitor Stand Dynamics and Establish Yield Curves for Stands Killed by MPB" (FGrOW 2016).
- Weyerhaeuser will introduce a natural stand TSP program, after the re-evaluation of plot distributions and sample sizes in 2022 as part of the Forest Stewardship Report. This will also provide an opportunity to evaluate the impact of the spread of MPB.

A new forest inventory will be developed prior to the next FMP. TSP establishment[14] for the purpose of natural stand FMP yield curve development will be coordinated with the new AVI delineation and attribute capture using the proposed stratification. TSPs will be allocated to natural strata based on the new AVI and landbase development to achieve the proposed sample size. This will also help in the best possible assessment of observed mortality due to MPB. The TSP field manual will be developed prior to the commencement of any field work.

The last measurement of all natural PSPs collected no later than 3 years prior to the submission of the next FMP will also be used in the yield estimation. This will include the last measurement of all PGYI plots in natural stands.

3.3.2 Managed Stands

Objective: *to develop FMP yield estimates for managed stands that are representative of expected future yields.*

The major challenge for the development of yield curves for managed stands is that there are practically no stands that are in the merchantable age range. Empirical curve fitting techniques are therefore not feasible.

Yield curve validation must use independent data that was collected in managed stands in the active landbase. The primary validation will be the comparison of the average projection of the plots against the FMP yield curves as data is not available in the merchantable age range.

An additional challenge is that the openings come from different silviculture regimes and eras. It is imperative that major changes in silviculture practices are considered in the development of yield curves based on specific target populations.

3.3.2.1 Pre-1991 Openings

3.3.2.1.1 Target Population

All PHR stands that were harvested prior to March 1, 1991 within the Weyerhaeuser Pembina Timberlands FMA active landbase.

3.3.2.1.2 Growth Model

Weyerhaeuser is planning to use the growth model initiation method for the next FMP whereas plots located in pre-1991 openings are stratified based on the photo-inventory and projected by GYPSY.

3.3.2.1.3 Stratification

For pre-1991 openings Weyerhaeuser proposes to use the same 10 yield groups used in the natural forested landbase as shown in Table 3-2. Stratification of these openings will be based on the AVI as per the *Alberta Forest Management Planning Standard* requirements (ASRD 2006). The source of the strata will be based on the overstorey as the SoPM, with the exception of A density aspen leading stands with the understorey of B, C or D density where the understorey will be used to assign the yield stratum.

[14] The number of TSPs will be based on gap analysis of the available PSP data. The reported numbers in this document always reference stands. One TSP may include a triangular cluster of 3 plots which are considered one observation.

3.3.2.1.4 Current Status

Weyerhaeuser currently maintains 29 GYM plots in pre-1991 openings. All 23 PGYI-designated plots[15] in pre-1991 openings are included so that the last measurement can be potentially used in yield curve development efforts as long as they do not bias the overall sample. The plot and area distribution by yield group is presented in Table 3-9. The GYM plots in pre-1991 openings are listed in Appendix IV.

Table 3-9. Distribution of Plots and Area by Yield Group in Pre-1991 Openings

Yield Group	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
C-PL_AB	1,021				3	0
C-PL_CD	5,337	6		6	15	21
C-SB	191				1	0
C-SW	2,585	2		2	7	7
CD-PL	1,795	2		2	5	7
CD-SX	900	1		1	3	3
D-HW_W	4,860	3		3	14	10
D-HW_X	14,036	12		12	41	41
DC-PL	1,964	3		3	6	10
DC-SX	1,879				5	0
TPR_U*	52				0	0
Total	34,622	29	0	29	100	100

* the net area includes some TPR=U areas that are in planned cutblocks

The distribution of plots follows reasonably well the distribution of area in the active landbase. However, the large majority of the area reside in pure pine, pure spruce and aspen stands with limited amount of plots. Yield groups with small areas (<5%) could default to natural stand yield curves, if necessary but larger strata will require additional sampling via a TSP program.

Table 3-10. Distribution of Plots and Area by Natural Subregion in Pre-1991 Openings

Natural Subregion	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
CMW	1,304	2		2	4	7
LF	31,654	24		24	91	83
SA	590	2		2	2	7
UF	1,074	1		1	3	3
Total	34,622	29	0	29	100	100

The distribution of GYM plots and area by natural subregion is presented in Table 3-10. Over 90% of harvest took place in the Lower Foothills natural subregion prior to 1991.

There is a slight over-representation of pre-1991 openings harvested after 1987 while the older age classes are under-represented (Table 3-11)

[15] There is one additional plot 50511608 that is a PGYI plot in opening 5160510212; however this plot appears to have location issues and will have to be reviewed.

Table 3-11. Distribution of Plots and Area by 10-Year Age Class in Pre-1991 Openings

Age Class	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
21-30*	23,337	24		24	67	83
31-40	7,152	4		4	21	14
41-50	3,704	1		1	11	3
51-60	282				1	0
60+	148				0	0
Total	34,622	29	0	29	100	100

* there were some small areas with age classes 1-10 and 11-20 that were assigned to the 21-30 age class

3.3.2.1.5 Sample Size

The net area of pre-1991 openings is 34,622 ha. As shown in Table 3-9, most of this area is covered by only a few yield groups. About 55% of the area is in pure deciduous (D-HW_W and D-HW_X) and 15% pure pine (C-PL_CD) and 7% pure spruce (C-SW) which make up over three-quarters of the active landbase in pre-1991 openings. Given that pre-1991 openings are represented by a few major yield groups and only a small number of plots; sample size will need to increase for the development of FMP yield curves.

3.3.2.1.6 Scheduling

GYM plots will be re-measured to 30 years of stand age on a 5-year cycle and 10 years afterwards which means that all plots will be scheduled at least for one re-measurement before the next FMP in 2027 (Table 3-12).

Table 3-12. Measurement Schedule for GYM Plots in Pre-1991 Openings

Yield Group	Measurement Year					Total
	2018	2020	2021	2022	2025	
C-PL_CD			1	3	2	6
C-SW				1	1	2
CD-PL	1	1				2
CD-SX	1					1
DC-PL	2			1		3
D-HW_W	3					3
D-HW_X	9		1	2		12
Total	16	1	2	7	3	29

3.3.2.1.7 Future Commitments

Due to the relatively small area under 35,000 ha, we propose a TSP program that will add an additional 30 plots for the four largest strata for a total of 120 TSPs. The plot data will be compiled to provide input to GYPSY as seed values for each GYPSY species group. GYPSY yield projections will be completed for each TSP and averaged by stratum. The TSP program should be implemented no later than 3 years prior to submitting the next FMP or as soon as the inventory is approved for use.[16] The TSP field manual will be developed prior to the commencement of any field work.

In addition, Weyerhaeuser may combine the two CD strata as a CD-Mix and the two DC strata as a DC-Mix and establish an additional 20 TSPs for each in these smaller groups. However, as indicated earlier, smaller strata could default to the natural stand yield groups and associated curves without presenting a significant risk to the AAC determination process.

3.3.2.2 Post-1991 Openings - Basic Silviculture

3.3.2.2.1 Target Population

All PHR stands that were harvested on or after March 1, 1991 within the Weyerhaeuser Pembina Timberlands FMA active landbase and were subject to basic (non-EFM) silviculture treatment.

3.3.2.2.2 Growth Model

Weyerhaeuser will use RSA performance survey data as the main source for the development of post-1991 managed stand yield curves in the next FMP. The RSA process uses the growth model initiation approach where RSA plot and sampling unit data are projected forward and averaged across multiple sample years using the GYPSY model.

3.3.2.2.3 Stratification

The *Alberta Forest Management Planning Standard* (ASRD 2006), *Section 3.11i, Annex 1*, requires that areas harvested on or after March 1, 1991 be assigned to a yield stratum as defined in ARIS and the most current information on the harvest area and its associated regeneration stratum in ARIS.

Post-1991 openings will be assigned to a yield group consistent with the most recent of the ARIS data:

- Declared stratum[17];
- Stratum resulting from an establishment survey finding; or
- Stratum resulting from a performance survey finding.

For post-1991 openings Weyerhaeuser proposes to use the AAF Base 10 strata (Table 3-13). ARIS declaration and silviculture records will be used to assign openings to species-specific yield strata where RSA performance survey strata are not available.

The regenerating yield stratum Hw represents pure deciduous regenerating stands. In the 2017 FMP this stratum was split as Hw_W in the W5/W6 old FMU areas and associated yields and Hw_X represented the rest of the FMA regenerating to pure deciduous stands. This will be monitored using the available GYM plot data and if warranted the split will be revisited. However, it is anticipated that Weyerhaeuser will have 10 years' worth of RSA data in pure deciduous openings that will provide sufficient information for modeling this stand type. If observed mortality in natural stands suggests, Weyerhaeuser may apply different stand decline/breakup assumptions and split the pure deciduous regenerating stratum.

[16] If the imagery is flown in 2022, TSPs could be collected around the summer of 2025 assuming that the inventory takes 2 full years to complete and be audited.
[17] If a harvest area is less than 2 years old Weyerhaeuser will use the harvest stratum assignment.

Table 3-13. Proposed Regenerating Strata for Basic Silviculture

Broad Cover Group	Regenerating Stratum Code	Stand Structure (species proportions)	Limitations to Crop Establishment (site, climate)
D	Hw	AW, PB; Pure deciduous: > or equal to 80% deciduous content by either AW or PB as leading species; conifer component of Sw or PL < or equal to no more than 20%	Poor suckering capacity of root systems; Browsing by ungulates; browsing by domestic animals on grazing dispositions; cold/wet soils
DC	HwPl	AW, PB; Mixedwood deciduous leading: > or equal to 50% deciduous content leading species either AW or PB and < 50% conifer content, PL leading as the primary conifer	Poor suckering capacity of deciduous root systems; Browsing by ungulates; browsing by domestic animals on grazing dispositions; competition of deciduous for conifer natural or planted seedlings
DC	HwSx	AW, PB leading or in combination; Mixedwood deciduous leading: > or equal to 50% deciduous leading by either AW or PB and < 50% conifer content, SW leading as the primary conifer	Poor suckering capacity of deciduous root systems; Browsing by ungulates; browsing by domestic animals on grazing dispositions; deciduous competition for conifer; cooler/wetter soils
CD	SwHw	SW leading conifer mixedwood; conifer content > or equal to 50% or <80%, with SW as species1 and secondary conifer component of PL or FB or SB at times; deciduous content <50% and > 20%, AW or PB or BW leading as the hardwood component;	Poor suckering capacity of deciduous root systems; Browsing by ungulates; browsing by domestic animals on grazing dispositions; cooler/wetter soils
CD	PlHw	PL leading conifer mixedwood; conifer content > or equal to 50% or <80%, with PL as species1 and secondary conifer component of SW or FB or SB at times; deciduous content <50% and > 20%, AW or PB or BW leading as the hardwood component; secondary conifer component of SW at times	Poor suckering capacity of root systems; Browsing by ungulates; browsing by domestic animals on grazing dispositions; dryer soils
C	Sw	SW leading pure conifer: > or equal to 80% conifer content with SW as species1 and secondary conifer component of PL or FB or SB at times, and either AW or PB or BW	cool, wetter soils
C	Pl	PL leading pure conifer: > or equal to 80% conifer content with PL as species1, and either AW or PB or BW or PL or SB	dryer sites

Additional detail on the regenerating strata and associated silviculture strategy can be found in Appendix 7-I of Weyerhaeuser's 2017 FMP.

3.3.2.2.4 Current Status

Weyerhaeuser maintains 56 GYM plots in post-1991 openings with basic silviculture treatment. There are 32 PGYI-designated plots[18] in post-1991 openings that are included so that the last measurement can be used in yield curve development and validation efforts. There are 2 plots that appear to be outside of the current active landbase. The list of plots in post-1991 openings with basic silviculture is presented in Appendix V.

The area and plot distribution by regenerating strata is shown in Table 3-14.

Table 3-14. Distribution of Area and Plots by Regenerating Strata in Post-1991 Openings

Regenerating Stratum	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
Hw	817				1	0
HwPl	2,446	2		2	2	4
HwSx	8,469	5		5	7	9
Hw_W	14,230	11		11	12	20
Hw_X	20,939	10		10	18	19
Pl	44,157	8	1	9	37	15
PlHw	4,153	1		1	3	2
Sb	284				0	0
SbHw	15				0	0
Sw	15,438	10	1	11	13	19
SwG*	238				0	0
SwHw	7,454	7		7	6	13
TPR_U**	34				0	0
Total	118,675	54	2	56	100	100

* summary includes a small area of SwG (WEY openings planted with EFM I1 white spruce)

** the net area includes some TPR=U areas that are in planned cutblocks

The distribution of plots shows that the Pl regenerating stratum is under-represented while the Hw_W, Sw and SwHw strata are over-represented.

Table 3-15. Distribution of Area and Plots by Natural Subregion in Post-1991 Openings

Natural Subregion	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
CMW	5,148	4		4	4	7
LF	104,583	49	1	50	88	91
SA	164				0	0
UF	8,780	1	1	2	7	2
Total	118,675	54	2	56	100	100

[18] Currently there are 3 additional plots that appear to have GPS location and other potential issues. These plots (50400917, 50551704 and 50561111) will have to be reviewed as they are also designated PGYI plots. In addition, plot 50511536 has been destroyed by the expansion of the Wolf Lake Road ROW.

The distribution of plots shows a reasonable agreement with the area distribution by natural subregion (Table 3-15). However, most of the harvested areas are located in the Lower Foothills natural subregion.

Table 3-16. Distribution of Area and Plots by 10-Year Age Class in Post-1991 Openings

Age Class	Net Area (ha)	Number of Plots			Percent (%)	
		Net	Outside	Total	Net Area	Net Plots
1-10*	52,089	17		17	44	31
11-20	47,824	25	1	26	40	46
21-30	18,762	12	1	13	16	22
Total	118,675	54	2	56	100	100

* there were some small areas with missing age that were assigned to the 1-10 age class

The area and plot distribution by 10-year age class are presented in Table 3-16. There is an apparent under-representation of the younger age class (1-10); however this is partially due to the 2-year lag in establishing the plot after planting.

Considerable effort was made in linking the ARIS silviculture information to these plots in post-1991 managed openings. Weyerhaeuser also updated the disturbance information where it was available for all PGYI-designated plots. The next step will be to verify the available ARIS treatment information against Weyerhaeuser silviculture records and spatial location of the treatments where available. New treatments will be added yearly to all PGYI-designated plots.

Weyerhaeuser plans to use RSA performance survey data as the main source for the development of post-1991 managed stand yield curves in the next FMP. RSA performance survey data is currently available from 2009 to 2016 as shown in Table 3-17 and Table 3-18.

Table 3-17. RSA Performance Survey Data by System, Company and Survey Year

Company	Program Year	Program Type	Total # of Openings	Total # of SUs	Sampled SUs	Population Area (ha)
Weyerhaeuser	2009	Aerial	93	105	47	1,266.9
	2010	Aerial	446	559	148	5,838.7
	2011	Non-Photo	6	6	6	45.8
	2012	Aerial	165	221	121	2,059.6
	2013	Aerial	180	259	124	3,409.7
	2013	Non-Photo	4	6	6	107.5
	2014	Non-Photo	1	1	1	16.8
	2015	Aerial	145	198	112	2,859.0
	2015	Non-Photo	39	42	42	578.1
	2016	Aerial	164	217	131	2,605.3
	2016	Non-Photo	1	1	1	39.9
ANC	2010	Aerial	46	69	37	931.1
	2012	Aerial	63	92	46	1,248.3
	2014	Aerial	77	93	30	1,404.9
Blue Ridge	2014	Aerial	36	49	32	893.9
ETPL	2009	Non-Photo	2	2	2	24.7
FRIAA	2009	Non-Photo	3	3	3	28.0
	2010	Non-Photo	85	112	112	910.3
	2011	Aerial	77	99	43	1,046.3

Company	Program Year	Program Type	Total # of Openings	Total # of SUs	Sampled SUs	Population Area (ha)
	2011	Non-Photo	11	15	15	76.9
	2012	Non-Photo	20	26	26	157.2
	2014	Non-Photo	5	5	5	33.4
Hansen	2012	Non-Photo	3	3	3	42.3
	2013	Non-Photo	8	8	8	58.2
	2014	Non-Photo	6	6	6	37.5
Millar Western	2010	Non-Photo	6	7	7	99.3
SFPI	2013	Aerial	2	2	2	14.4
Tall Pine	2013	Non-Photo	24	24	24	268.0
	2014	Non-Photo	9	11	11	127.4
Total			**1,727**	**2,241**	**1,151**	**26,229.4**

* 2015 and 2016 survey year RSA data were only available for Weyerhaeuser openings at the time of this assessment.

Table 3-18. RSA Performance Survey Data by System and Regenerating Stratum

Regenerating Stratum	Aerial		Non-Photo		Total	
	SUs	Area (ha)	SUs	Area (ha)	SUs	Area (ha)
Hw	63	606.5	34	397.8	97	1,004.2
HwPl	51	398.3	19	172.5	70	570.8
HwSx	147	2,308.0	68	638.1	215	2,946.1
Pl	249	11,846.5	49	513.7	298	12,360.2
PlHw	71	783.1	39	295.1	110	1,078.2
Sb	3	5.5	2	15.3	5	20.8
SbHw	1	5.2	2	6.1	3	11.3
Sw	160	5,696.8	28	280.3	188	5,977.1
SwHw	130	1,936.4	35	324.4	165	2,260.8
Grand Total	**875**	**23,586.2**	**276**	**2,643.2**	**1,151**	**26,229.4**

AAF has recently changed the RSA sampling protocols which will result in larger sample sizes by regenerating strata in a given sampling year (AAF 2017b). AAF has also been focusing on improving RSA data quality through the Forest Operations Monitoring Program (FOMP) and revised quality standards for RSA audit protocols.

Weyerhaeuser reconciled the RSA performance survey data against ARIS records of all RSA openings from 2009-2016.

3.3.2.2.5 Scheduling

All 56 GYM plots in post-1991 openings are on a 5-year measurement cycle until they reach 30 years of age. All plots will be measured at least once before the next FMP in 2027 (Table 3-19). There are 14 GYM plots with a completed RSA performance survey, 22 plots are in older openings where a Free-To-Grow (FTG) performance survey or a deciduous stocking survey was completed. The remaining 20 plots are scheduled for an RSA performance survey as shown in Table 3 20.

Table 3-19. Measurement Schedule for GYM Plots in Post-1991 Openings

Regenerating Stratum	Measurement Year			Total
	2018	2020	2022	
Hw_W	9	2		11
Hw_X	1	6	3	10
HwPl	1	1		2
HwSx	4		1	5
Pl	6	3		9
PlHw		1		1
Sw	8	2	1	11
SwHw	5		2	7
Total	34	15	7	56

Table 3-20. RSA Performance Survey Schedule for GYM Plots in Post-1991 Openings

Regenerating Stratum	RSA Performance Survey Year						Total
	2018	2019	2020	2021	2022	2023	
Hw_W		1				2	3
Hw_X	1	1	1	2			5
HwPl			1			1	2
HwSx		1					1
Pl	1	1			1	1	4
PlHw				1			1
Sw	1					1	2
SwHw				1	1		2
Total	3	4	2	4	2	5	20

The amount of area by performance survey year was estimated from the latest ARIS extract provided by AAF (Table 3-21). The summary includes all areas of openings eligible for an RSA performance survey.

Table 3-21. Estimated RSA Performance Survey Areas by Timber Year and Operator

Survey Year	Survey Area (ha)** by ARIS Stakeholder Code										Total
	ANC	BLUE	BRIS	EDFR	FRIA	HANS	MWWC	SUND	TALL	WEYR	
2017*			32		695			3	134	54	918
2018	556	571			237	39	80		31	3,432	4,946
2019	666			178	250	26	41		71	4,781	6,013
2020				247	251		139		153	3,420	4,210
2021	778			136	141		86		134	4,571	5,846
2022	605		19	258	213		37		95	3,233	4,460
2023	452		33	254	235				96	3,622	4,691
2024				184	378				188	4,094	4,843
2025	250		38	135	63		30		311	3,664	4,491
2026	169	396		363	121		140		117	3,474	4,779
Total	3,476	967	121	1,755	2,583	65	554	3	1,330	34,345	45,198
Percent	7.7	2.1	0.3	3.9	5.7	0.1	1.2	0.0	2.9	76.0	100.0

** RSA surveys already completed by Weyerhaeuser are excluded.*

*** Areas are based on the latest ARIS Reconciliation.*

Starting in the 2016 sampling year, openings currently declared to the D stratum that have an establishment survey completed after May 1, 2010, are also subject to an RSA performance survey no sooner than 11 years and no later than 14 years after the end of the Timber Year of harvest or clock re-set date or disturbance date (AAF 2017b).

3.3.2.2.6 Future Commitments

Weyerhaeuser will assemble an integrated RSA performance survey database and associated spatial GIS layer which will be used to add new sampling years and accumulate clean, compiled and reconciled data by the next FMP. This RSA database will include all data from the Quota Holders, as well. Weyerhaeuser proposes that an MOU be signed that allows AAF the opportunity to do an ARIS extract for the entire DFA for all openings by July 15th of each year so that Weyerhaeuser receives it automatically without having to request it each year for the next 10 years.

Weyerhaeuser will revise the sampling design of the GYM plot program. While the current 3.33-km sampling grid provides an unbiased sample of managed stands, it does not allow for the timely accumulation of representative plot data. This is especially true regarding the validation and monitoring of growth and yield of RSA-based yield curves beyond 14 years of stand age. The existing GYM plots will be maintained, but the 3.33-km grid based sampling frame will be abandoned. New GYM plots will be established in RSA-surveyed openings as described under Performance Monitoring in Section 3.4.

There are 20 existing GYM plots yet to be surveyed in an RSA program. Weyerhaeuser will ensure that if the sampling unit (SU) the GYM plots is located in is not selected for ground sampling as part of the RSA sample selection process, it will be surveyed independently using RSA performance survey protocols (Weyerhaeuser 2017).

There are 14 existing GYM plots that are located in openings that were already RSA surveyed, Weyerhaeuser will obtain and link the RSA submission data. It is possible that the SU was not selected for ground sampling during the RSA performance survey.

The remaining 22 existing GYM plots that are located in older post-1991 openings that have been surveyed with the FTG performance surveys (“orange book”) or located in D-declared strata will be remeasured on their established schedule as needed.

3.3.2.3 Post-1991 Openings - Tree Improvement (EFM)

3.3.2.3.1 Target Population

All PHR stands that were harvested on or after March 1, 1991 within the Weyerhaeuser Pembina Timberlands FMA area active landbase where genetic stock was deployed.[19]

3.3.2.3.2 Growth Model

At the present time, the new growth model(s) developed via the PGYI program will only be calibrated using plot data from openings established using Stream 1 (wild seed) growing stock. Current practice for incorporating genetic gain in yield curves is to calculate a percent volume gain by doubling the approved height genetic gain for a breeding program. Then the calculated percent volume gain is applied as a multiplier to the basic silviculture managed stand yield curve.

[19] Openings with an AIC9 genetic classification code where >=50% of the area was bare ground planted and >=70% of seedlings planted are from seed lot(s) deemed improved seed and >2 ha in size will contribute to a separate EFM population (AAF 2017b).

Weyerhaeuser participates in the Region I white spruce (G333 orchard) Controlled Parentage Program (CPP) with growth and yield improvement as a primary objective. According to the Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS), trees selected by a comparison tree method and grafted into the seed orchard are eligible for 2 percent height genetic gain uplift (AAF 2016a).

Weyerhaeuser developed tree improvement (genetic) yield curves for white spruce (Region I) leading regenerated stand yield strata to reflect increases in yield resulting from the deployment of genetically improved stock. Regenerated stands genetic yield curves were developed for all future cutblocks that are located within the approved boundaries of the tree improvement program deployment zones subject to seed availability.

The approach in the 2017 FMP for incorporating genetic gain in the yield curves was to apply a flat 4% volume gain (2 times the approved height gain[20]) to the conifer yields of the RSA Sw managed stand yield curve. This approach is planned for genetic yield curve development in the next FMP.

Genetic worth (GW) of the 2015 Region I Sw (the most recent crop collected) was 2.54%, height at 105 years rotation. This included 25% pollen contamination. With no pollen contamination, it would have been 2.95%. GW will rise to approximately 4%, height at rotation, following planting in 2018[21]. It is anticipated that higher gains will be approved for these orchards that will provide a secure source of seed by the next FMP.

3.3.2.3.3 Stratification

Improved stock is only used in the Region I (white spruce) breeding regions in the Weyerhaeuser Pembina Timberlands FMA. The 2017 FMP Reforestation Strategy identified one regenerating stratum for tree improvement (Table 3-22).

Table 3-22. Regenerating Strata for Tree Improvement

Broad Cover Group	Regenerating Stratum Code	Stand Structure (species proportions)	Comments
C	SwG	SW leading pure conifer: > or equal to 80% conifer content with SW as the leading species and secondary conifer component of Pl or FB or SB at times, and either AW or PB or BW	Blocks to be planted 100% with Tree Improvement Region I SW seedlots only; all NSR eligible other than Upper Foothills and Sub-Alpine; planting on scalped sites/elevated sites with 1400-1800 SW-G; 2000 deciduous

Weyerhaeuser's planting strategy is to plant genetically improved stock within the Region I breeding regions of pure conifer (C-Sw) and also in mixedwood DC-HwSx and CD-SwHw strata that currently recognize no genetic gains, but may in the future if the current policy changes to allow for such gain. No other operators are expected to deploy the stock, however if they do, this will be captured in the next FMP

[20] The Biometrics Unit of in consultation with the Genetics and Forest Improvement Unit recommend that a height-volume gain multiplier not to exceed 2.0 for Pl and Sw tree improvement programs in Alberta (AESRD 2006).
[21] Sally John, *Ph.D*. Isabella Point Forestry Ltd. Personal communication. 2017.

3.3.2.3.4 Current Status

Weyerhaeuser currently has no plots established in post-1991 openings planted with genetic stock. This is due to the small area of the EFM stratum (238 ha in 12 post-1991 openings).

As per the RSA Manual (AAF 2017b), openings with an AIC9 genetic classification code where >=50% of the area was bare ground planted and >=70% of seedlings planted are from seed lot(s) deemed improved seed shall contribute to the EFM tree improvement type population. Weyerhaeuser only started to deploy genetic stock in 2012, therefore RSA performance survey data in EFM strata have not been sampled as its own population in the FMA area as of yet. The population of EFM openings will steadily increase as new blocks reach performance survey age; however there will likely be only minimal amount of RSA survey data in EFM given that deployment only started in 2011/2012.

3.3.2.3.5 Future Commitments

Weyerhaeuser will continue participating in a FRIAA-funded Realized Gain Trial (RGT) pilot project. In the summer of 2017 we contributed 7 installations that were setup to compare Region I improved stock with Stream 1 (wild) stock and elite (Region I) stock.

Operational trials like this are critical for collecting growth and yield data to support and validate TSA growth assumptions as well as for providing data for modeling growth in stands planted with improved stock. The RGT pilot project will incorporate company-specific silviculture systems, site conditions and rates of deployment, therefore providing a more accurate picture of the actual growth rates of these stands (FRIAA 2015).

3.4 Performance Monitoring

Objective: *to assess the risk and uncertainty around the yield assumptions underlying the AAC determination of the current FMP (2017).*

The company needs to evaluate whether the growth and yield assumptions made in the current FMP are being achieved. In a very simplistic sense, observed yield needs to be compared to the predicted yield in the active landbase using unbiased, independent plot data that represents the target population over time. The change in forest attributes in young managed stands need to be monitored where merchantable yields are not yet available.

In the context of the GYP, performance monitoring is restricted to collecting data to validate yield assumptions made in the FMP. Other monitoring requirements (e.g., climate change) at the landscape and landbase level are generally addressed via external programs such as the Alberta Biodiversity Monitoring Institute (ABMI), Values Objectives, Indicators and Targets (VOITs), NFI and others.

Monitoring results will be compiled and reported in 2022 as part of the Forest Stewardship Report. Depending on the outcome, Weyerhaeuser will be able to adjust their strategy to obtain the data necessary for the development of yield curves in the next FMP in 2027.

Although forest inventories, FMP yield curve development and TSA are only completed periodically, the maintenance of an effective GYP requires on-going effort and support from all stakeholders of the DFA.

3.4.1 Natural Stands

The target population includes all fire-origin stands in the active landbase in the Pembina Timberlands FMA area. Natural stand yield monitoring can be achieved by directly comparing the observed yields with the predicted yields from the FMP natural yield curves.

3.4.1.1 Assessment of Current Growth Rates

Weyerhaeuser maintains 331 PSPs in natural stands in 10 yield groups that represent the distribution of the FMA active landbase very well (Table 3-3). These plots meet the criteria of being unbiased, representative and located in the active landbase.

Weyerhaeuser will compare the average PSP rate of growth over the active landbase by yield group and at the forest-level to the estimate of volume per hectare as predicted from the FMP yield curves. It provides an estimate of annual growth and total growing stock and allows for a useful comparison to the AAC. It also helps with the overall validation of the FMP yield prediction.

3.4.1.2 Validation of FMP Yield Curves

In addition to calculating average growth rates, Weyerhaeuser will also calculate the average volume per hectare by 20-year age class based on the last measurement of the natural stand PSPs. The information will be compared to FMP yield curve predictions by yield group on a series of scatterplots for the conifer and deciduous gross merchantable volumes.

There will be approximately 160-180 plot measurements by 2022 that also meet the important criterion of being independent from the modeling data set used in the development of the 2017 FMP yield curves (Table 3-7).

These plot measurements will be added to the modeling data set of the next FMP provided that they are eligible for inclusion (i.e., inside the active landbase based on the new forest inventory and netdown methodology).

3.4.1.3 Comparison of Projected to Delivered Volumes

Volumes will be validated on a regular basis to ensure that actual yields are comparable to predicted yields. Actual deliveries will be compared to planned volumes annually on a block-by-block basis. Due to the strategic nature of the FMP yield curves, yearly fluctuation is normal. Over time however, it is expected that the delivered volume per hectare is comparable to the yield predictions for each yield group. Given the importance of secondary volumes in a single landbase, comparisons will have to be made for the deciduous and conifer volumes separately. An assessment of the 5-year period from 2017-2022 will be included in the next Forest Stewardship Report.

Weyerhaeuser is also using AFRIDS™ which is a web-based forest inventory management system developed by Lim Geomatics.[22] In addition to developing merchantable volume estimates using LiDAR and geo-referenced plot data, Weyerhaeuser is currently incorporating piece size into the system. It is expected that using these new remote sensing technologies will improve prediction accuracy at the sub-strata level.

[22] http://www.limgeomatics.com/afrids/

3.4.1.4 Assessment of Deciduous Stand Decline

Due to the strategic nature of the TSA, yield curves represent average stand conditions and volume projections by AVI-based strata in natural stands. The accuracy of volume predictions will vary stand by stand; however it is important to identify the groups of stands that may be at risk of higher levels of mortality and volume loss so that the timber supply model can address priority setting and harvest scheduling not only based on age (oldest first) but also by minimizing growth loss, where applicable.

Weyerhaeuser submitted an analysis in May 2016 regarding deciduous stand decline in the Pembina FMA (Weyerhaeuser 2016). The analysis indicated that deciduous mortality is more prevalent in Drayton Valley and in the northern part of Edson. Significant stand decline starts around 90-100 years of stand age.

There are 123 PSPs located in pure deciduous stands (Table 3-3). Over 80 of these plots are in stands that are 100 years or older that will provide the basis for the continued monitoring of mortality and stand decline. The current split in FMP yield curves due to different mortality rates (D-HW_X and D-HW_W) will be re-evaluated once these plots have been remeasured.

3.4.2 Managed Stands

Managed stand growth and yield monitoring will involve the projection of plot data and then the comparison of the average yield trajectories with the FMP managed stand yield curves for each regenerating stratum. The change in forest attributes will also need to be monitored in young managed stands where merchantable yields are not yet available.

3.4.2.1 Pre-1991 Openings

The target population includes all openings that were harvested prior to March 1, 1991 in the Pembina Timberlands FMA active landbase.

Weyerhaeuser has 29 PSPs in pre-1991 openings in 10 yield groups (Table 3-9). The 2017 FMP yield curve development for these stands was based on the natural stand PSP modeling data set with a site index ratio adjustment for pine, white spruce and aspen in the c, d, e, f, h and j ecosites in the LF and UF natural subregions. The site index ratio was calculated based on the results of the Regenerated Stand Productivity Study that was conducted in 2010 (Weyerhaeuser 2014).

The net area of pre-1991 openings is 34,622 ha. As shown in Table 3-9, most of this area is covered by only a few yield groups. About 55% of the area is in pure deciduous (D-HW_W and D-HW_X) and 15% pure pine (C-PL_CD) and 7% pure spruce (C-SW). These 4 strata make up over three-quarters of the active landbase in pre-1991 openings.

As proposed in Section 3.3.2.1.7, Weyerhaeuser will establish a TSP program that will add 30 plots for the 4 major strata. However, given the relatively low risk these stands represent to the AAC and the logistics of acquiring the new inventory, it is likely that the TSP program will not be implemented by 2022 for inclusion in the Forest Stewardship Report. The TSP program will be implemented no later than 3 years prior to submitting the next FMP or as soon as the new AVI is approved for use. The TSP field manual will be developed prior to the commencement of any field work.

The 120 TSPs will be used combined with the 29 PSPs to assess the current set of FMP yield curves. The plot data will be compiled to provide input to GYPSY as seed values for each GYPSY species group. GYPSY yield projections will be completed for each TSP and averaged by stratum. Weyerhaeuser will also be reporting the observed site index information for lodgepole pine, white spruce and aspen in the LF and UF natural subregions. The youngest of these openings will be over 30 years old by 2022 and many will be over 35 years old. Site index estimates are expected to stabilize after about 25 years (Dempster and Huang 2004) which will provide significant insight into the productivity of these stands when compared to the natural landbase.

These TSPs will then be used to develop the new set of pre-1991 managed stand yield curves for the major yield groups. It is anticipated that for the smaller yield strata Weyerhaeuser will default to the natural stand yield curves of the next FMP. However, Weyerhaeuser may combine the smaller CD and DC strata and establish an additional 20 TSPs for each mixedwood strata group.

3.4.2.2 Post-1991 Openings - Basic Silviculture

The target population includes all PHR stands that were harvested on or after March 1, 1991 within the Weyerhaeuser Pembina Timberlands FMA area active landbase and were subject to basic (non-EFM) silviculture treatment.

The adoption of RSA by the Province provided a mechanism to establish a quantitative link between reforestation outcome and growth and yield. The on-going development and calibration of growth models using PGYI re-measurement data from PHR stands allows for the forecast of mean annual increment (MAI) for each opening in a performance survey program. The collection of RSA performance survey data is a legislative requirement and these data will be fully utilized to quantify and monitor the growth and yield of regenerating forests in the FMA area.

The emphasis for post-1991 managed stands is the assessment of growth and risk factors associated with using RSA-based yield curves. RSA-based managed stand yield curves increase the long run sustained yield (LRSY) by as much as 33% for conifer and 17% for deciduous[23] over and above the current (2017) status (Table 3-23).

Weyerhaeuser reviewed the risks as they relate to growth and yield assumptions and uncertainties associated with the 2017 FMP managed stand yield curves.

The main focus of the GYP is to have a robust long-term monitoring program for the managed stands population. There are three main questions that must be answered via monitoring of post-1991 managed stands:

1) Are we on track regarding managed stand growth and other key stand attributes?
2) Do we meet the average input at 14 years after harvest (performance age) that was assumed in the development of RSA-based FMP yield curves?
3) What happens to managed stand growth beyond 14 years of age?

[23] These numbers would be higher, if we assumed that all areas returned to a natural state.

Table 3-23. Long Run Sustained Yield in the Pembina Timberlands FMA Area

YC Type	Yield Group	Net Area (ha)	All Regenerate to Current YC					All Regenerate to RSA Managed YC				
			Culm. Age (years)	Con. MAI (m^3/ha/yr)	Dec. MAI (m^3/ha/yr)	Total Con. (m^3/year)	Total Dec. (m^3/year)	Culm. Age (years)	Con. MAI (m^3/ha/yr)	Dec. MAI (m^3/ha/yr)	Total Con. (m^3/year)	Total Dec. (m^3/year)
NAT	C-PL_AB	44,589	120	1.94	0.22	86,502	9,810	90	3.60	0.55	160,519	24,524
NAT	C-PL_CD	89,070	100	2.55	0.32	227,129	28,502	90	3.60	0.55	320,652	48,989
NAT	C-SB	2,137	130	1.04	0.06	2,222	128	90	3.60	0.55	7,692	1,175
NAT	C-SW	61,414	120	1.73	0.63	106,246	38,691	100	2.70	0.82	165,817	50,359
NAT	CD-PL	14,327	90	1.90	0.81	27,222	11,605	90	2.74	1.29	39,257	18,482
NAT	CD-SX	16,605	130	1.54	0.57	25,571	9,465	100	2.08	1.57	34,538	26,069
NAT	D-HW_W	44,526	100	0.49	2.03	21,818	90,387	100	0.25	2.05	11,131	91,278
NAT	D-HW_X	84,284	70	0.35	2.79	29,499	235,153	70	0.19	3.01	16,014	253,696
NAT	DC-PL	14,203	130	0.90	1.41	12,782	20,026	90	2.42	1.77	34,371	25,139
NAT	DC-SX	22,759	140	0.95	1.12	21,621	25,490	100	1.83	1.89	41,649	43,015
NAT	TPR_U	254	0	0.00	0.00	0	0	0	0.00	0.00	0	0
M91	C-PL_AB_B	297	120	1.94	0.22	577	65	90	3.60	0.55	1,070	163
M91	C-PL_AB_E	724	110	2.25	0.28	1,629	203	90	3.60	0.55	2,606	398
M91	C-PL_CD_B	312	100	2.55	0.32	795	100	90	3.60	0.55	1,123	172
M91	C-PL_CD_E	5,025	100	2.80	0.36	14,071	1,809	90	3.60	0.55	18,091	2,764
M91	C-SB_B	35	130	1.04	0.06	36	2	90	3.60	0.55	125	19
M91	C-SB_E	156	120	1.17	0.07	183	11	90	3.60	0.55	563	86
M91	C-SW_B	335	120	1.73	0.63	580	211	100	2.70	0.82	905	275
M91	C-SW_E	2,250	110	1.82	0.71	4,095	1,597	100	2.70	0.82	6,075	1,845
M91	CD-PL_B	16	90	1.90	0.81	29	13	90	2.74	1.29	43	20
M91	CD-PL_E	1,780	90	2.17	0.81	3,862	1,441	90	2.74	1.29	4,876	2,296
M91	CD-SX_B	89	130	1.54	0.57	137	51	100	2.08	1.57	185	140
M91	CD-SX_E	811	120	1.63	0.72	1,322	584	100	2.08	1.57	1,688	1,274
M91	D-HW_W_B	402	100	0.49	2.03	197	816	100	0.25	2.05	100	824
M91	D-HW_W_E	4,459	100	0.50	2.05	2,229	9,140	100	0.25	2.05	1,115	9,140
M91	D-HW_X_B	860	70	0.35	2.79	301	2,399	70	0.19	3.01	163	2,588
M91	D-HW_X_E	13,177	70	0.37	3.01	4,875	39,662	70	0.19	3.01	2,504	39,662
M91	DC-PL_B	123	130	0.90	1.41	111	174	90	2.42	1.77	299	218
M91	DC-PL_E	1,841	120	0.97	1.61	1,786	2,964	90	2.42	1.77	4,455	3,258
M91	DC-SX_B	57	140	0.95	1.12	54	63	100	1.83	1.89	104	107
M91	DC-SX_E	1,822	140	0.96	1.10	1,750	2,005	100	1.83	1.89	3,335	3,444
M91	TPR_U	52	0	0.00	0.00	0	0	0	0.00	0.00	0	0
RSA	Hw	817	70	0.85	2.73	694	2,229	100	0.25	2.05	204	1,674
RSA	HwPl	2,446	90	2.42	1.77	5,920	4,330	90	2.42	1.77	5,920	4,330
RSA	HwSx	8,469	100	1.83	1.89	15,497	16,006	100	1.83	1.89	15,497	16,006
RSA	Hw_W	14,230	100	0.25	2.05	3,557	29,171	100	0.25	2.05	3,557	29,171
RSA	Hw_X	20,939	70	0.19	3.01	3,978	63,027	70	0.19	3.01	3,978	63,027
RSA	Pl	44,157	90	3.60	0.55	158,965	24,286	90	3.60	0.55	158,965	24,286
RSA	PlHw	4,153	90	2.74	1.29	11,380	5,358	90	2.74	1.29	11,380	5,358
RSA	Sb	284	90	3.67	0.31	1,043	88	90	3.60	0.55	1,023	156
RSA	SbHw	15	110	1.70	1.16	25	17	100	2.08	1.57	31	24
RSA	Sw	15,438	100	2.70	0.82	41,684	12,659	100	2.70	0.82	41,684	12,659
RSA	SwG	238	100	2.81	0.82	669	195	100	2.81	0.82	669	195
RSA	SwHw	7,454	100	2.08	1.57	15,504	11,702	100	2.08	1.57	15,504	11,702
RSA	TPR_U	34	0	0.00	0.00	0	0	0	0.00	0.00	0	0
Total		547,464		1.57	1.28	858,148	701,637		2.08	1.50	1,139,477	820,008
											133%	117%

Weyerhaeuser will need to validate the yield assumptions for regenerating openings that have been surveyed under RSA. The projected yields for these stands in the 2017 FMP were estimated using data from RSA surveys completed at performance age in areas surveyed between 2009 and 2014.

Weyerhaeuser currently has 14 GYM plots in openings with a completed RSA performance survey. An additional 20 GYM plots are scheduled for an RSA performance survey in the next 5 years (Table 3-20). Weyerhaeuser will ensure that if the sampling unit (SU) the GYM plots is located in is not selected for ground sampling as part of the RSA sample selection process, it will be surveyed independently using RSA performance survey protocols.

These plots are relatively young; the oldest being less than 25 years old which means that observed merchantable volumes are not going to be available for the direct assessment of growth and yield. Plot measurements will be projected using the GYPSY model and will be compared to the managed stand 2017 FMP yield curves.

Weyerhaeuser plans to sample post-1991 managed stands to gather plot data in addition to the available GYM plots and RSA performance survey data for developing managed stand yield curves for the next FMP. Although the RSA standards are based on consistent data collection protocols and a scientifically defensible and statistically sound sampling design, there is significant risk associated with model-based projections of these data. It is not known whether model projections beyond 14 years are accurate representation of expected future yields.

Currently, Weyerhaeuser's GYM plot data is collected on a 3.33-km grid where a plot is established at a grid point within 2 years after harvest. The current sampling frame does not allow for the timely accumulation of data, especially regarding the assessment of risk beyond 14 years of stand age.

In order to address these potential concerns, Weyerhaeuser proposes the following:

A. Abandon the current grid-based sampling frame where a GYM plot is established at a 3.33-km grid point within 2 years after harvest;

B. Establish new GYM plots in RSA-surveyed cutblocks 14 years after harvest; and

C. Maintain the current GYM plot layout (20mx20m main plot size) and field data collection protocols that are compatible with the minimum standards of the Provincial Growth and Yield Initiative (PGYI).

Weyerhaeuser proposes to establish 20 GYM plots per RSA program sampling year[24] in sampling units (SUs) selected for ground sampling in Weyerhaeuser and Quota Holder openings. It is anticipated that there will be 100 plots established by 2026, some with an additional measurement. These post-RSA GYM plots will be re-measured on a 5-year cycle until they reach 30 years stand age and on a 10-year cycle afterwards. Depending on the number of plots accumulated and the potential findings of intermittent analyses during Forest Stewardship Reporting or future FMP yield curve development, it is possible that only a subset of these plots will be measured beyond 30 years. The proposed methodology for the post-RSA GYM plot program was submitted to AAF in June 2017 and received agreement-in-principle on July 26, 2017 (Appendix VI).

In addition to the GYM plot data; there will be a 5-year roll-up assessment[25] of the RSA survey data for all regenerating strata in 2022. There are approximately 6,100 ha of openings assessed between 2015 and 2017 (Table 3-17) altogether[26] with an additional 22,000 ha of openings due for a performance survey by 2022 (Table 3-21).

[24] Weyerhaeuser is currently conducting aerial RSA performance surveys every 2 years which translates to 10 post-RSA GYM plots per year. The goal is to have a stable program for plot establishment that does not fluctuate with the size of the RSA program.

[25] There may be considerable yearly fluctuation due to historic harvest patterns; however it is expected that an assessment of 5 years RSA performance survey data will provide significant insight into actual (observed) and expected (FMP yield curves) growth performance.

[26] RSA data collected since 2015 can be considered independent of the 2017 FMP yield curve development.

Comparison can be made for the average stand attributes such as age, site index (top height), density, percent stocking by species group against those assumed during the development of 2017 FMP yield curves. In addition, mean annual increment (MAI) will be compared to the reported MAI targets and yield projections.

3.4.2.3 Post-1991 Openings - Tree Improvement (EFM)

The target population includes all PHR stands that were harvested on or after March 1, 1991 within the Pembina Timberlands FMA active landbase and were planted with genetic stock.

Weyerhaeuser participates in the Region I white spruce (G333 orchard) CPP in the FMA area. White spruce Region I genetic stock was first deployed in 2012 and has been steadily increasing ever since. As tree improvement programs develop elite seedlots and the company deploys genetic stock on larger areas, a refined approach to verifying and monitoring the gains become increasingly critical. The white spruce Region I height gain of 2.0% at 105 years was used in 2017 FMP.

Currently, there is very little area (238 ha as per Table 3-14) planted with genetic stock. AAF anticipates that there will be collaborative ways for Weyerhaeuser to work with industry partners to satisfy monitoring needs related to tree improvement (EFM).

Weyerhaeuser is committed to monitoring genetic gain in yield curves and also assumptions made in the FMP regarding deployment strategies:

- Weyerhaeuser follows and is in compliance with the GoA's *Forest Genetic Resource Management and Conservation Standards* (FGRMS) (GoA 2016b).
- Genetically improved stock is being planted in the appropriate breeding region in the FMA area and planting stock records are reported in ARIS.
- As per the GoA's *Spatial Data Directives* (GoA 2016a), spatial planting records of tree improvement planting are maintained.
- As per RSA performance survey requirements, Weyerhaeuser will separate eligible openings that contribute to the EFM tree improvement type population; however the first openings are expected to show around 2025.
- Monitoring and reporting of predicted (planned) vs actual deployment is done as part of the Forest Stewardship Report in 2022.
- Weyerhaeuser will establish post-RSA GYM plots in the EFM sampling program. All seedlings of genetic origin will be identified and tagged. Wild seed planting and natural ingress will also be identified. Again, this is not expected to occur until 2025 when the first genetic openings are due for performance survey.
- Gain estimates of the Region I breeding program are being monitored and quantified in a realized gain trials (RGTs) as a cooperative effort funded by the Forest Resource Improvement Association of Alberta (FRIAA).[27] These trials are necessary to determine and partition the amount of improvement in growth and volume on an area basis that is attributable to improved stock vs that grown from wild seed in an operational setting via a controlled experiment (FRIAA 2015). Weyerhaeuser established 7 installations in the summer of 2017 as part of the RGT.

[27] Establishment of Realized Gain Trials - Conifer. FRIP Funds Initiative. FFI_15_011. FRIAA approval date: November 4, 2015.

4 Next Steps

Upon AAF approval of this GYP, Weyerhaeuser will develop a detailed work schedule listing all necessary steps to achieve project goals and objectives. The current high-level list of tasks and approximate completion dates are shown in Table 4-1.

Table 4-1. GYP High-Level Work Schedule and Deliverables

Actions & Deliverables	Calendar Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Revise PSP data collection protocols & update field manual	■									
Revise GYM plot data collection protocols & update field manual	■									
Update company plot databases and data collection software	■	■								
Establish streamlined data conversion to PGYI format	■	■								
Create integrated RSA layer and database (2009-2018)	■									
Rationalize PSP and GYM Plot measurement schedules	■									
Acquire ARIS extract for FMA	■	■	■	■	■	■	■	■	■	■
Add new RSA data sets	■	■	■	■	■	■	■	■	■	■
Participate in FGrOW MPB Rehabilitation Program plot installations	■									
Update SILVACOM online spatial plot layer (PGYI/Dormant/ISP)	■									
Establish 1 new natural stand PSP for PGYI		■								
Conduct RSA survey on 20 GYM plots not yet completed	■	■	■	■	■	■				
Establish/remeasure 100 post-RSA GYM plots	■		■		■		■		■	
Prepare TSP field manual (natural and pre-1991)					■					
Field data collection for Realized Gain Trial Project (Region I Sw)					■					■
RSA roll-up assessment				■	■					
Prepare Forest Stewardship Report - G&Y monitoring and analysis					■					
Collect TSP data in natural stands						■	■			
Collect TSP data in pre-1991 openings (120 plots)						■	■			
Revised GYP workplan based on performance monitoring results						■				
AVI effort				■	■	■	■			
Re-measurement of existing plots (PSP and GYM plot)	■	■	■	■	■	■	■	■	■	■
Submit PGYI measurement data	■	■	■	■	■	■	■	■	■	■
FMP Yield curve development								■	■	
FMP estimated submission year										■

Measurement schedules for all plot types are summarized in Appendix VII; the schedules will be rationalized and balanced to meet available resources (crews/contractors/budgets) on a yearly basis.

Data analysis and the summary of findings will be reported in the *Growth & Yield Performance Monitoring and Analysis* section of the Forest Stewardship Report in the fall of 2022.

5 References

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Appendix I – Tree Condition Code Mapping to PGYI

Weyerhaeuser tree condition codes were mapped to the PGYI standards which include cause and severity as part of the tree condition code definition. AAF approved the condition code mapping on February 11, 2016.

Table 5-1. Tree Condition Code Mapping to PGYI Standards

Code	Description	Condition	Cause	Severity
01	01: Insects	11	20	9
02	02: Disease	11	21	9
03	03: Rabbit Browsing	11	11	9
04	04: Shepherd's Crook	11	7	9
05	05: Browsing (Other Animal)	11	11	9
06	06: Fire	4	15	9
07	07: Mechanical	11	16	9
08	08: Windthrow	11	12	9
09	09: Climate	11	22	9
10	10: Flooding	11	22	9
11	11: Poor Planting	11	17	9
12	12: Suppression	5	19	9
13	13: Frost Heaving	11	13	9
14	14: Erosion	11	22	9
15	15: Missing	14	99	9
16	16: Dead Top/Dieback	3	99	9
17	17: Poor Seedbed	11	18	9
18	18: Herbicide	11	23	9
19	19: Western Gall Rust	4	10	9
20	20: Armillaria Root	6	6	9
21	21: Moldy Planting Stock	11	17	9
22	22: Multiple Leader	9	99	9
23	23: Poor Form	11	99	9
24	24: Broken Top (DBH<9.1)	3	99	9
25	25: Standing Dead (No CC)	1	99	9
26	26: Snow Press (No CC)	4	13	9
27	27: Dead top w New Leader	7	99	9
28	28: Sucker/Fork below BH	0	99	9
29	29: Cut Down	13	23	9
30	30: Terminal Weevil	3	5	9
31	31: SW Gall Adelgid	5	20	9
32	32: Tent Caterpillar	5	2	9
33	33: Root Collar Weevil	6	4	9
34	34: J-Root	8	17	9
35	35: Leaning (no CC)	10	99	2
36	36: Same Stump	12	99	9
37	37: Unknown	11	99	9
38	38: Pitch Moth	11	20	9
39	39: DBH Taken on New Leader	7	99	9
40	40: Nutrient Deficiency	5	18	9
41	41: Mouse (Feeding)	4	11	9
42	42: Ungulate Damage	4	11	9
43	43: Livestock Damage	4	11	9
44	44: Nest	0	99	9
45	45: Other Mammal Damage	11	11	9

Code	Description	Condition	Cause	Severity
46	46: Sweep/Bow/Bend	8	99	9
47	47: Witch's Broom	5	21	9
48	48: Frost Crack	4	13	9
49	49: Dying	11	99	9
50	50: Not Used			
51	51: Conks	4	9	9
52	52: Open Scars	4	99	9
53	53: Burls/Galls	4	99	9
54	54: Fork	9	99	9
55	55: Pronounced Crook	7	99	3
56	56: Broken Top (DBH > 9.1)	3	99	9
57	57: Limby	11	99	9
58	58: Severe Lean	10	99	3
59	59: Broken Stem (DBH> 9.1)	3	99	3
60	60: Woodpecker Feeding	4	11	9
61	61: Dead & Down (No CC)	2	99	9
62	62: Stem Insects	4	20	9
63	63: Stem Disease	4	21	9
64	64: Foliar Insects	5	2	9
65	65: Foliar Disease	5	21	9
66	66: Stem Form Defect	11	99	9
67	67: Closed Scars	4	99	9
68	68: Atropellis Canker	4	9	9
69	69: Comandra Blister Rust	4	9	9
70	70: Elytroderma Needle Cast	5	21	9
71	71: Hypoxylon Canker	4	9	9
72	72: Spruce Cone Rust	5	21	9
73	73: Stalactiform Blister Rust	4	9	9
74	74: Tomentosus Root Rot	6	21	9
75	75: Spruce Spanworm	5	2	9
76	76: Spruce Cone Maggot	5	20	9
77	77: Spruce Cone Worm	5	2	9
78	78: Eastern Spruce Budworm	5	2	9
79	79: Mountain Pine Beetle	4	3	9
80	80: Spruce Beetle	4	20	9
81	81: Spruce Needle Rust	5	21	9
82	82: Spruce Sawfly	5	2	9
83	83: Large Aspen Tortix	5	2	9
84	84: Woodpecker Excavations	4	11	9
85	85: Sapsucker Feeding	4	11	9
86	86: Small Mammal Feeding	4	11	9
87	87: Small Cavity	4	11	9
88	88: Large Cavity	4	11	9
89	89: Hollow tree/bole	4	99	9
90	90: Beaver	4	11	9
91	91: Mistletoe Rating 1	5	8	1

Code	Description	Condition	Cause	Severity
92	92: Mistletoe Rating 2	5	8	1
93	93: Mistletoe Rating 3	5	8	2
94	94: Mistletoe Rating 4	5	8	2
95	95: Mistletoe Rating 5	5	8	3
96	96: Mistletoe Rating 6	5	8	3
97	97: Not used	15	99	9
98	98: Data changed by office	0	99	9
99	99: Do not look for tree	15	99	9
00	00: No Defect	0	99	9

Appendix II – List of Dropped Natural Stand PSPs

Weyerhaeuser will drop 33 PSPs that are outside the current active landbase and will not likely be part of the natural harvestable landbase in the next FMP. The reason for deletion includes plots that are outside the FMA area; in permanent deletions; non-forested; on steep slopes; in unproductive stands (TPR=U, significant larch content); harvested; with access issues; closed or destroyed (burn, oil and gas activities, pipelines or windthrow).

These plots will be "dormant" as no tags are removed, nails pulled or Industrial Sample Plot (ISP) reservations cancelled until the re-assessment of the status of the plot data for the Forest Stewardship Report in 2022.

Table 5-2. List of Dropped Natural Stand PSPs

PLOT ID	DROP REASON	LAST MEAS	OPENING
DV011	non-forested	2010	
DV041	non-forested	2014	
DV047	steep slope	2014	
DV049	DIDs	2006	
DV066	not in FMA	2006	
DV072	Sb7Lt3 - TPR-U	2008	
DV076	Lt10	2005	
DV099	DIDs	2008	
DV101	Lt9	2010	
DV110	cut around, donut, windthrow potential	2009	5150433001
DV113	harvested	2009	5130440698
DV129	TPR-U, park	2010	
DV157	burned in 2003/last measurement in 1999	1999	
DV167	Lt8	2014	
DV180	steep slope	2010	
DV184	Lt8Sb2	2014	
DV210	not in FMA	2000	
DV226	harvested	2001	5100422968
DV234	TPR-U	2014	
DV237	access issues	2006	
DV238	TPR-U	2001	
DV239	TPR-U	2006	
DV240	access issues	2006	
ED008	access issues, behind private land	2013	
ED009	access issues, behind private land	2014	
ED034	harvested	2013	5110490735
ED043	harvested	2000	5150490688
ED071	harvested	2001	5160500531
ED099	harvested	2014	5160508027
ED107	Burn, LT 90%	2014	
ED122	Lt7Sb3	2013	
ED126	harvested	2013	5210530019
ED138	Lt4Sb4	2014	

Appendix III – List of Natural Stand PSPs

Weyerhaeuser will maintain 388 natural stand PSPs which include 49 PGYI plots. Column naming follows the Landbase Version 8 database naming conventions and field values.

Table 5-3. List of Natural Stand PSPs

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
DV001	X	LF	2014	NAT	D-HW_X	75		
DV002	X	LF	2010	NAT	D-HW_X	74		
DV003	X	LF	2010	NAT	D-HW_X	125		
DV004	X	LF	2010	NAT	D-HW_X	105	Y	
DV005	X	LF	2010	NAT	D-HW_X	115		
DV006	X	LF	2010	NAT	DC-SX	125		
DV007	X	LF	2010	NAT	D-HW_X	125		
DV008	X	LF	2010	NAT	D-HW_X	115		
DV009	X	LF	2010	NAT	C-SW	65		
DV010	X	LF	2010	NAT	D-HW_X	125		
DV012	X	LF	2010	NAT	D-HW_X	135		
DV013	WATERBUF	LF	2010	NAT	D-HW_X	125		
DV014	X	LF	2014	NAT	D-HW_X	95		
DV015	X	LF	2010	NAT	D-HW_X	105		
DV016	X	LF	2010	NAT	D-HW_X	125		
DV017	WATERBUF	LF	2010	NAT	D-HW_X	95		
DV018	X	LF	2010	NAT	D-HW_X	115		
DV019	X	LF	2010	NAT	D-HW_X	125		
DV020	X	LF	2014	NAT	D-HW_X	125		
DV021	WATERBUF	LF	2006	NAT	D-HW_X	65		
DV022	X	LF	2014	NAT	D-HW_X	75		
DV023	X	LF	2010	NAT	D-HW_X	115		
DV024	X	LF	2010	NAT	D-HW_X	115		
DV025	X	LF	2010	NAT	D-HW_X	125		
DV026	X	LF	2014	NAT	D-HW_X	115		
DV027	X	LF	2010	NAT	D-HW_X	125		
DV028	X	LF	2010	NAT	DC-PL	125		
DV029	X	CM	2014	NAT	D-HW_X	115		
DV030	X	LF	2014	NAT	D-HW_X	75		
DV031	X	LF	2014	NAT	D-HW_X	125		
DV032	X	LF	2009	NAT	C-PL_CD	115		
DV033	X	CM	2014	NAT	D-HW_X	115		
DV034	X	LF	2010	NAT	D-HW_X	105		
DV035	X	LF	2010	NAT	C-SW	95	Y	
DV036	X	LF	2010	NAT	D-HW_X	95	Y	
DV037	X	LF	2010	NAT	D-HW_X	115		
DV038	X	LF	2010	NAT	CD-SX	95		
DV039	X	LF	2014	NAT	D-HW_X	74	Y	
DV040	X	LF	2014	NAT	DC-PL	74		
DV042	X	LF	2010	NAT	CD-SX	75	Y	
DV043	X	LF	2014	NAT	D-HW_X	75		
DV044	X	LF	2014	NAT	D-HW_X	74		
DV045	X	LF	2014	NAT	D-HW_X	105		
DV046	X	CM	2005	NAT	DC-SX	115		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
DV048	X	CM	2010	NAT	D-HW_X	115		
DV050	X	LF	2014	NAT	D-HW_X	95		
DV051	X	LF	2014	NAT	D-HW_X	65		
DV052	X	LF	2014	NAT	D-HW_X	85		
DV053	X	LF	2014	NAT	CD-SX	75		
DV054	X	LF	2014	NAT	D-HW_X	55	Y	
DV055	X	LF	2014	NAT	DC-SX	75		
DV056	X	LF	2014	NAT	D-HW_X	68	Y	
DV057	X	LF	2014	NAT	D-HW_X	74		
DV058	X	LF	2014	NAT	D-HW_X	65		
DV059	X	CM	2014	NAT	D-HW_X	95	Y	
DV060	X	LF	2014	NAT	D-HW_X	95		
DV061	X	LF	2014	NAT	DC-SX	75		
DV062	X	LF	2009	NAT	C-PL_AB	125		
DV063	X	LF	2014	NAT	D-HW_X	75		
DV064	X	LF	2014	NAT	D-HW_X	75		
DV065	X	LF	2014	NAT	D-HW_X	75		
DV067	PINE	LF	2006	NAT	C-PL_AB	74	Y	
DV068	X	LF	2008	NAT	D-HW_X	125		
DV069	X	LF	2008	NAT	DC-SX	125		
DV070	X	LF	2004	NAT	C-PL_CD	145		
DV071	X	LF	2014	NAT	C-PL_CD	125		
DV073	X	LF	2008	NAT	C-PL_AB	85		
DV074	X	LF	2008	NAT	D-HW_X	125		
DV075	LARCH	LF	2008	NAT	C-PL_AB	85		
DV077	UNPRODUCTIVE	LF	2008	NAT	C-SB	95	Y	
DV078	UNPRODUCTIVE	LF	2005	NAT	C-SB	185		
DV079	UNPRODUCTIVE	LF	2008	NAT	C-SB	125		
DV080	X	LF	2008	NAT	C-PL_CD	115		
DV081	X	LF	2008	NAT	C-PL_CD	115		
DV082	X	LF	2008	NAT	C-PL_CD	125		
DV083	X	LF	2008	NAT	D-HW_X	75		
DV084	PINE	LF	2008	NAT	C-PL_AB	125		
DV085	X	LF	2008	NAT	C-PL_CD	74		
DV086	UNPRODUCTIVE	LF	2010	NAT	C-SB	105		
DV087	X	LF	2014	NAT	DC-PL	74		
DV088	PINE	LF	2014	NAT	C-PL_AB	135		
DV089	X	LF	2008	NAT	C-SW	135		
DV090	X	LF	2008	NAT	C-SB	75		
DV091	X	LF	2008	NAT	C-PL_CD	74	Y	
DV092	X	LF	2008	NAT	C-PL_AB	125		
DV093	X	LF	2005	NAT	C-SW	95		
DV094	UNPRODUCTIVE	LF	2008	NAT	C-SB	135		
DV095	X	LF	2008	NAT	CD-SX	115		
DV096	PINE	LF	2008	NAT	C-PL_AB	125		
DV097	X	LF	2008	NAT	D-HW_X	125	Y	

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
DV098	UNPRODUCTIVE	LF	2008	NAT	C-SB	125		
DV100	PINE	LF	2008	NAT	C-PL_AB	125		
DV102	LARCH	LF	2008	NAT	C-SW	125		
DV103	X	CM	2008	NAT	D-HW_X	115	Y	
DV104	X	UF	2009	NAT	C-PL_AB	125		
DV105	X	LF	2014	NAT	DC-SX	105		
DV106	X	CM	2014	NAT	DC-SX	115		
DV107	X	CM	2009	NAT	C-SW	105		
DV108	X	LF	2014	NAT	C-PL_AB	145		
DV109	X	LF	2014	NAT	DC-PL	155		
DV111	X	UF	2009	NAT	C-SW	95		
DV112	X	UF	2009	NAT	C-PL_AB	125		
DV114	X	LF	2009	NAT	CD-SX	105		
DV115	X	CM	2010	NAT	D-HW_X	45		
DV116	X	CM	2009	NAT	D-HW_X	85		
DV117	X	LF	2009	NAT	DC-PL	115		
DV118	X	LF	2009	NAT	DC-SX	125		
DV119	X	LF	2009	NAT	D-HW_X	85		
DV120	X	LF	2009	NAT	D-HW_X	95	Y	
DV121	X	LF	2009	NAT	C-SW	95		
DV122	X	LF	2009	NAT	D-HW_X	105		
DV123	X	LF	2009	NAT	D-HW_X	105		
DV124	X	LF	2009	NAT	DC-PL	115		
DV125	X	LF	2009	NAT	C-PL_CD	125		
DV126	X	LF	2014	NAT	C-PL_CD	135	Y	
DV127	X	LF	2009	NAT	D-HW_X	135		
DV128	X	SA	2009	NAT	C-PL_CD	125		
DV130	X	UF	2014	NAT	C-PL_AB	125		
DV131	X	UF	2009	NAT	C-SW	125	Y	
DV132	X	UF	2009	NAT	C-SW	125		
DV133	X	UF	2009	NAT	C-PL_CD	135		
DV134	X	UF	2009	NAT	C-PL_CD	125		
DV135	X	UF	2009	NAT	C-PL_CD	115		
DV136	PPA	UF	2009	NAT	C-SB	125		
DV137	X	SA	2010	NAT	C-SW	295		
DV138	X	SA	2010	NAT	C-SW	295		
DV139	X	SA	2010	NAT	C-SW	295		
DV140	X	SA	2010	NAT	C-SW	255		
DV141	UNPRODUCTIVE	LF	2010	NAT	C-SB	145		
DV142	X	CM	2010	NAT	D-HW_X	115		
DV143	X	CM	2009	NAT	D-HW_X	105		
DV144	X	LF	2010	NAT	D-HW_X	125		
DV145	X	LF	2010	NAT	D-HW_X	125	Y	
DV146	X	LF	2010	NAT	C-PL_AB	125		
DV147	X	LF	2010	NAT	C-PL_CD	125		
DV148	X	LF	2010	NAT	C-PL_AB	125	Y	

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
DV149	X	LF	2010	NAT	C-SW	95		
DV150	X	LF	2005	NAT	DC-SX	125		
DV151	X	LF	2010	NAT	C-SW	85		
DV152	WATERBUF	LF	2014	NAT	C-SW	95		
DV153	X	LF	2010	NAT	CD-SX	85		
DV154	X	LF	2014	NAT	CD-PL	135		
DV155	BLKSPRUCE	LF	2010	NAT	C-SB	165		
DV156	WATERBUF	LF	2010	NAT	C-SW	85		
DV158	WATERBUF	LF	2010	NAT	C-SW	115		
DV159	X	LF	2010	NAT	D-HW_X	65		
DV160	LARCH	LF	2010	NAT	C-PL_AB	75	Y	
DV161	X	LF	2010	NAT	C-PL_CD	74		
DV162	X	LF	2010	NAT	C-SW	74		
DV163	X	LF	2014	NAT	C-PL_CD	55		
DV164	X	LF	2009	NAT	C-PL_AB	75		
DV165	X	LF	2014	NAT	C-PL_CD	75		
DV166	X	LF	2014	NAT	C-PL_CD	75	Y	
DV168	X	LF	2010	NAT	D-HW_X	125		
DV169	X	UF	2010	NAT	C-PL_CD	95	Y	
DV170	SLOPE	SA	2010	NAT	C-PL_CD	125	Y	
DV171	X	UF	2010	NAT	C-PL_CD	125		
DV172	X	LF	2010	NAT	D-HW_X	125		
DV173	X	SA	2010	NAT	C-PL_CD	155		
DV174	X	UF	2010	NAT	C-PL_AB	125		
DV175	X	LF	2014	NAT	C-SW	155		
DV176	X	UF	2010	NAT	C-PL_CD	125		
DV177	X	UF	2010	NAT	C-PL_CD	255		
DV178	X	SA	2010	NAT	C-PL_CD	255		
DV179	X	SA	2010	NAT	C-SW	195		
DV181	X	LF	2012	NAT	CD-PL	115	Y	
DV182	X	LF	2014	NAT	DC-PL	115		
DV183	UNPRODUCTIVE	LF	2014	NAT	C-SB	95		
DV185	X	LF	2000	NAT	C-PL_CD	125		
DV186	X	LF	2012	NAT	D-HW_X	115		
DV187	X	LF	2000	NAT	C-PL_CD	125	Y	
DV188	X	LF	2014	NAT	C-PL_AB	145		
DV189	X	LF	2012	NAT	CD-SX	115		
DV190	X	LF	2014	NAT	C-PL_CD	125		
DV191	SHS	LF	2014	NAT	C-PL_CD	125		
DV192	X	LF	2012	NAT	C-PL_CD	125		
DV193	X	LF	2012	NAT	C-PL_CD	145	Y	
DV194	X	LF	2012	NAT	C-PL_AB	155		
DV195	X	LF	2012	NAT	C-SW	95		
DV196	X	LF	2014	NAT	C-PL_CD	145		
DV197	X	LF	2013	NAT	D-HW_X	145		
DV198	X	LF	2012	NAT	C-PL_AB	135		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
DV199	X	LF	2014	NAT	C-PL_CD	115		
DV200	X	LF	2014	NAT	D-HW_X	125		
DV201	PINE	LF	2013	NAT	C-PL_AB	125		
DV202	ISO	LF	2012	NAT	C-PL_CD	135		
DV203	X	LF	2013	NAT	C-SW	95		
DV204	LARCH	LF	2014	NAT	C-PL_AB	85		
DV205	X	LF	2014	NAT	D-HW_X	105		
DV206	X	LF	2012	NAT	C-PL_CD	125		
DV207	X	LF	2012	NAT	C-SW	85	Y	
DV208	X	LF	2014	NAT	C-PL_AB	165		
DV209	X	SA	2014	NAT	C-PL_CD	125		
DV211	X	CM	2012	NAT	CD-SX	105	Y	
DV212	X	LF	2014	NAT	C-PL_CD	115		
DV213	PINE	LF	2014	NAT	C-PL_AB	125		
DV214	X	LF	2001	NAT	C-PL_CD	74		
DV215	X	LF	2012	NAT	C-SW	74	Y	
DV216	X	LF	2013	NAT	C-PL_CD	115		
DV217	X	LF	2012	NAT	C-PL_CD	155		
DV218	X	LF	2014	NAT	C-PL_CD	65		
DV219	X	CM	2014	NAT	C-PL_CD	135	Y	
DV220	X	LF	2014	NAT	D-HW_X	125		
DV221	WATERBUF	LF	2012	NAT	C-SW	115		
DV222	X	LF	2014	NAT	D-HW_X	75	Y	
DV223	X	LF	2014	NAT	C-PL_AB	125		
DV224	X	LF	2014	NAT	C-PL_AB	115		
DV225	X	LF	2014	NAT	D-HW_X	75		
DV227	X	LF	2012	NAT	CD-PL	125	Y	
DV228	PINE	LF	2014	NAT	C-PL_AB	115	Y	
DV229	X	LF	2014	NAT	C-PL_CD	155		
DV230	X	LF	2014	NAT	C-SW	95		
DV231	X	LF	2014	NAT	D-HW_X	125		
DV232	X	LF	2012	NAT	C-PL_CD	115		
DV233	X	LF	2012	NAT	D-HW_X	65		
DV235	X	SA	2006	NAT	C-SW	155		
DV236	X	SA	2014	NAT	C-SW	105		
ED001	X	LF	2013	NAT	D-HW_W	85		
ED002	X	LF	2013	NAT	CD-PL	115		
ED003	X	LF	2013	NAT	CD-SX	115		
ED004	ISO	LF	2013	NAT	C-PL_CD	115		
ED005	X	LF	2013	NAT	C-PL_AB	74		
ED006	WATERBUF	LF	2013	NAT	C-SW	115		
ED007	PINE	LF	2013	NAT	C-PL_AB	95		
ED010	X	LF	2013	NAT	D-HW_W	85		
ED011	X	LF	2014	NAT	CD-SX	105		
ED012	X	LF	2013	NAT	C-PL_AB	145		
ED013	X	LF	2013	NAT	C-PL_AB	125		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
ED014	X	LF	2014	NAT	C-PL_CD	74	Y	
ED015	X	LF	2013	NAT	D-HW_W	115		
ED016	X	LF	2013	NAT	C-PL_CD	115		
ED017	X	LF	2014	NAT	C-PL_CD	105	Y	
ED018	X	LF	2013	NAT	C-SW	125		
ED019	X	LF	2013	NAT	CD-PL	165		
ED020	X	LF	2013	NAT	D-HW_W	125		
ED021	X	LF	2013	NAT	D-HW_W	95		
ED022	X	LF	2014	NAT	C-SW	85		
ED023	OPDEL	LF	2013	NAT	D-HW_W	115		
ED024	WATERBUF	LF	2013	NAT	C-SW	125		
ED025	WATERBUF	LF	2013	NAT	C-SW	95		
ED026	BLKSPRUCE	LF	2014	NAT	C-SB	185		
ED027	X	LF	2013	NAT	D-HW_W	135	Y	
ED028	X	LF	2014	NAT	D-HW_W	115	Y	
ED029	X	LF	2014	NAT	C-PL_CD	105		
ED030	X	CM	2013	NAT	DC-SX	135		
ED031	X	LF	2014	NAT	D-HW_W	74		
ED032	X	LF	2014	NAT	CD-PL	74		
ED033	X	LF	2014	NAT	D-HW_W	115		
ED035	X	LF	2013	NAT	C-PL_AB	125		
ED036	X	LF	2013	NAT	C-SW	115		
ED037	X	LF	2014	NAT	C-PL_AB	125		
ED038	X	LF	2014	NAT	C-PL_AB	125		
ED039	X	LF	2014	NAT	C-PL_AB	115	Y	
ED040	X	LF	2015	NAT	C-PL_CD	85	Y	
ED041	X	LF	2014	NAT	C-PL_CD	135		
ED042	X	LF	2014	NAT	D-HW_W	125		
ED044	X	UF	2014	NAT	C-PL_AB	125		
ED045	PINE	LF	2014	NAT	C-PL_AB	115		
ED046	X	UF	2014	NAT	C-PL_CD	105		
ED047	X	LF	2013	NAT	DC-PL	115		
ED048	OPBUFFER	LF	2013	NAT	CD-PL	115		
ED049	X	LF	2014	NAT	DC-PL	105		
ED050	X	CM	2014	NAT	D-HW_W	95		
ED051	X	CM	2013	NAT	C-SW	95		
ED052	X	CM	2013	NAT	CD-SX	95		
ED053	X	LF	2014	NAT	C-PL_AB	74		
ED054	X	LF	2014	NAT	C-SW	135		
ED055	X	LF	2014	NAT	C-PL_AB	95	Y	
ED056	X	LF	2014	NAT	CD-SX	125		
ED057	PINE	LF	2014	NAT	C-PL_AB	74		
ED058	X	LF	2014	NAT	DC-SX	125		
ED059	X	LF	2014	NAT	C-PL_AB	74		
ED060	X	LF	2013	NAT	D-HW_W	125		
ED061	X	LF	2014	NAT	D-HW_W	74		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
ED062	X	LF	2013	NAT	DC-SX	105		
ED063	X	LF	2014	NAT	D-HW_W	125		
ED064	X	LF	2014	NAT	D-HW_W	115		
ED065	PINE	LF	2014	NAT	C-PL_AB	125		
ED066	X	LF	2014	NAT	DC-SX	125		
ED067	X	LF	2014	NAT	C-PL_AB	125	Y	
ED068	X	LF	2013	NAT	D-HW_W	125		
ED069	X	LF	2014	NAT	C-PL_AB	74		
ED070	X	LF	2015	NAT	C-PL_AB	125		
ED072	X	LF	2014	NAT	C-PL_CD	59		
ED073	X	LF	2014	NAT	C-PL_CD	105		
ED074	X	LF	2014	NAT	D-HW_W	95		
ED075	X	LF	2013	NAT	C-SW	135		
ED076	ISO	LF	2013	NAT	C-PL_AB	105		
ED077	X	CM	2013	NAT	CD-SX	115	Y	
ED078	X	CM	2013	NAT	CD-SX	95		
ED079	WATERBUF	CM	2014	NAT	D-HW_W	105	Y	
ED080	LARCH	LF	2014	NAT	C-SB	125		
ED081	X	CM	2013	NAT	CD-SX	115		
ED082	X	CM	2013	NAT	D-HW_W	95	Y	
ED083	X	LF	2013	NAT	CD-SX	135		
ED084	X	LF	2014	NAT	DC-PL	115		
ED085	X	LF	2014	NAT	D-HW_W	125		
ED086	X	LF	2014	NAT	D-HW_W	95		
ED087	X	LF	2014	NAT	D-HW_W	135		
ED088	X	LF	2014	NAT	D-HW_W	85		
ED089	X	LF	2013	NAT	C-SW	135		
ED090	X	LF	2013	NAT	C-SW	135		
ED091	X	LF	2013	NAT	DC-PL	85		
ED092	PINE	LF	2014	NAT	C-PL_AB	135		
ED093	X	LF	2013	NAT	DC-PL	135		
ED094	X	LF	2014	NAT	DC-PL	135	Y	
ED095	X	LF	2013	NAT	DC-PL	115		
ED096	X	LF	2013	NAT	C-SW	125	Y	
ED097	X	LF	2014	NAT	C-PL_CD	77		
ED098	BIRCH	LF	2014	NAT	D-HW_X	59		
ED100	PINE	LF	2014	NAT	C-PL_AB	105		
ED101	X	LF	2014	NAT	C-PL_CD	59		
ED102	X	LF	2014	NAT	C-PL_AB	59		
ED103	X	LF	2013	NAT	DC-PL	105		
ED104	X	LF	2013	NAT	C-PL_CD	65		
ED105	X	LF	2014	NAT	DC-PL	115		
ED106	X	LF	2013	NAT	D-HW_W	66		
ED108	X	LF	2014	NAT	D-HW_W	95		
ED109	X	LF	2014	NAT	D-HW_X	95		
ED110	X	LF	2013	NAT	CD-SX	125		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
ED111	X	LF	2013	NAT	D-HW_W	85	Y	
ED112	X	LF	2013	NAT	D-HW_W	135		
ED113	X	LF	2013	NAT	C-SW	95		
ED114	X	LF	2013	NAT	DC-SX	85		
ED115	LARCH	LF	2014	NAT	C-PL_AB	75		
ED116	X	LF	2013	NAT	CD-SX	135		
ED117	X	LF	2013	NAT	CD-SX	115		
ED118	X	LF	2014	NAT	D-HW_W	75		
ED119	X	LF	2014	NAT	C-PL_CD	75		
ED120	X	LF	2013	NAT	CD-SX	135		
ED121	X	LF	2014	NAT	D-HW_W	75		
ED123	LARCH	LF	2013	NAT	C-SB	115		
ED124	X	LF	2014	NAT	C-PL_AB	75	Y	
ED125	X	LF	2014	NAT	C-PL_AB	115		
ED127	X	LF	2013	NAT	C-PL_AB	85		
ED128	X	LF	2015	NAT	D-HW_X	75		
ED129	X	UF	2014	NAT	D-HW_X	75		
ED130	X	LF	2014	NAT	C-SB	75		
ED131	X	LF	2014	NAT	D-HW_X	65		
ED132	X	LF	2013	NAT	CD-PL	135		
ED133	X	LF	2014	NAT	D-HW_X	85		
ED134	X	LF	2013	NAT	C-SW	115		
ED135	X	LF	2013	NAT	C-SW	105		
ED136	WATERBUF	LF	2013	NAT	D-HW_X	115		
ED137	X	LF	2013	NAT	DC-SX	115		
ED139	X	LF	2013	NAT	D-HW_X	145		
ED140	X	LF	2014	NAT	D-HW_X	105		
ED141	X	LF	2013	NAT	C-SW	125		
ED142	X	LF	2014	NAT	D-HW_X	105		
ED143	X	LF	2014	NAT	D-HW_W	47	Y	
ED144	X	LF	2012	NAT	D-HW_W	115		
ED145	X	LF	2012	NAT	CD-SX	95		
ED146	X	LF	2012	NAT	DC-PL	95		
ED147	X	LF	2014	NAT	D-HW_W	75		
ED148	X	LF	2012	NAT	C-SW	75		
ED149	X	LF	2012	NAT	C-PL_AB	105		
ED150	X	LF	2014	NAT	DC-PL	75		
ED151	X	LF	2012	NAT	D-HW_W	95		
ED152	X	LF	2014	NAT	C-PL_AB	65		
ED153	X	LF	2012	NAT	C-PL_AB	135		
ED154	X	LF	2014	NAT	D-HW_X	95		
ED155	X	LF	2014	NAT	C-PL_AB	135		
ED156	X	UF	2012	NAT	C-PL_CD	125		
ED157	WATERBUF	LF	2012	NAT	C-SW	125		
ED158	OPBUFFER	LF	2014	NAT	C-PL_AB	115		
ED159	X	UF	2014	NAT	DC-PL	59		

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
ED160	X	UF	2014	NAT	C-PL_CD	95		
ED161	X	LF	2014	NAT	C-PL_CD	135		
ED162	X	LF	2012	NAT	DC-SX	105		
ED163	WATERBUF	LF	2012	NAT	C-SW	65		
ED164	X	UF	2014	NAT	C-SW	95		
ED165	X	LF	2012	NAT	C-SW	125		
ED166	X	CM	2014	NAT	D-HW_W	95		
ED167	X	LF	2014	NAT	D-HW_W	105		
ED168	X	LF	2014	NAT	D-HW_W	115		
ED169	X	LF	2014	NAT	D-HW_X	95		
ED170	LARCH	LF	2014	NAT	DC-SX	155		
ED171	X	LF	2014	NAT	C-PL_CD	125		
ED172	X	LF	2012	NAT	D-HW_W	125		
ED173	X	LF	2012	NAT	C-PL_CD	125	Y	
ED174	OPBUFFER	LF	2012	NAT	DC-PL	115		
ED175	X	LF	2014	NAT	DC-SX	125		
ED176	X	LF	2014	NAT	D-HW_X	105		
ED177	X	LF	2012	NAT	C-PL_CD	125		
ED178	X	LF	2014	NAT	D-HW_X	59		
ED179	X	LF	2014	NAT	C-PL_CD	59		
ED180	X	CM	2012	NAT	D-HW_W	155		
ED181	X	LF	2014	NAT	D-HW_W	75		

Appendix IV – List of GYM Plots in Pre-1991 Openings

Weyerhaeuser will maintain 29 GYM plots which include 23 PGYI plots. All of these plots are located in pre-1991 openings. Column naming follows the Landbase Version 8 database naming conventions and field values.

There is one additional plot 50511608 that is a PGYI plot in opening 5160510212; however this plot appear to have location issues and will be reviewed before the final decision is made.

Table 5-4. List of GYM Plots in Pre-1991 Openings

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
50401630	X	SA	2015	M91	C-SW	33	Y	5160400015
50421605	X	UF	2015	M91	C-PL_CD	41	Y	5160420004
50430818	X	LF	2017	M91	D-HW_X	29	Y	5080430003
50430932	X	LF	2015	M91	CD-PL	27	Y	5090433250
50431018	X	LF	2017	M91	DC-PL	28	Y	5100430061
50431030	X	LF	2017	M91	D-HW_X	26	Y	5100430073
50431126	X	LF	2017	M91	C-SW	29	Y	5110430023
50431233	X	LF	2017	M91	C-PL_CD	26	Y	5120430008
50441211	X	LF	2017	M91	C-PL_CD	27	Y	5120440135
50441218	X	LF	2011	M91	D-HW_X	26	Y	5120440161
50441922	X	SA	2015	M91	C-PL_CD	38	Y	5190440015
50451205	X	LF	2017	M91	C-PL_CD	25	Y	5120450049
50470909	X	CM	2011	M91	D-HW_X	29	Y	5090470106
50471016	X	LF	2011	M91	D-HW_X	25	Y	5100470046
50471123	X	LF	2011	M91	D-HW_X	27		5110470069
50481202	X	LF	2011	M91	D-HW_X	29		5120481004
50481402	X	LF	2011	M91	DC-PL	29		5140480009
50491203	X	LF	2013	M91	D-HW_W	28	Y	5120490005
50491401	X	LF	2011	M91	CD-PL	20	Y	5140490123
50500917	X	CM	2011	M91	CD-SX	25	Y	5090502012
50501535	X	LF	2013	M91	DC-PL	27		5150500116
50511827	X	LF	2011	M91	C-PL_CD	37	Y	5180510004
50511921	X	LF	2011	M91	D-HW_X	30	Y	5190510003
50521209	X	LF	2011	M91	D-HW_W	27	Y	5120520121
50532110	X	LF	2011	M91	D-HW_X	31	Y	5210530059
50541801	X	LF	2011	M91	D-HW_X	29	Y	5180548073
50551727	X	LF	2013	M91	D-HW_X	26		5170550019
50551732	X	LF	2011	M91	D-HW_X	26		5170550027
50561225	X	LF	2011	M91	D-HW_W	29	Y	5120560037

Appendix V – List of GYM Plots in Post-1991 Openings

Weyerhaeuser will maintain 56 GYM plots which include 32 PGYI plots. All plots are located in post-1991 openings with basic silviculture. Column naming follows the Landbase Version 8 database naming conventions and field values.

Currently there are 3 additional plots that appear to have GPS location and other potential issues. These plots (50400917, 50551704 and 50561111) will have to be reviewed as they are also designated PGYI plots. In addition, plot 50511536 has been destroyed by the expansion of the Wolf Lake Road ROW.

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Table 5-5. List of GYM Plots in Post-1991 Openings

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
50400929	X	LF	2015	RSA	Pl	15	Y	5090402982A
50410904	X	LF	2015	RSA	Hw_X	8		5090410415
50410918	X	LF	2015	RSA	PlHw	8		5090411884
50411035	X	LF	2017	RSA	Hw_X	18	Y	5100412679A
50411629	X	UF	2015	RSA	Sw	11		5160412954
50431104	X	LF	2017	RSA	Sw	24	Y	5110430426A
50431114	X	LF	2017	RSA	HwSx	23	Y	5110431425
50431119	X	LF	2012	RSA	Sw	22		5110431934A
50431512	X	LF	2015	RSA	Pl	10		5150431342
50440616	X	LF	2015	RSA	HwPl	9	Y	5060441614
50441113	X	LF	2017	RSA	Hw_X	19		5110441325A
50441115	X	LF	2013	RSA	HwSx	17	Y	5110441539A
50441120	X	LF	2017	RSA	Hw_X	19		5110442021A
50441316	X	LF	2017	RSA	SwHw	24	Y	5130441665
50441614	X	LF	2015	RSA	Sw	17	Y	5160441429A
50451018	X	LF	2013	RSA	SwHw	20	Y	5100451848A
50460920	X	LF	2017	RSA	SwHw	20		5090460082A
50461025	X	LF	2011	RSA	SwHw	24	Y	5100462553
50461326	X	LF	2011	RSA	Pl	6		5130463561
50461333	X	LF	2015	RSA	Pl	11		5130463361
50471308	X	LF	2011	RSA	HwPl	6		5130470894
50471415	DIDs	UF	2013	RSA	Pl	18	Y	5140472251A
50481020	X	LF	2013	RSA	Hw_W	19	Y	5100482032A
50481124	X	LF	2015	RSA	Hw_W	17		5110482448A
50490904	X	CM	2015	RSA	Hw_W	10	Y	5090490404
50501007	X	LF	2013	RSA	Hw_W	24	Y	5100500807
50501034	X	CM	2013	RSA	Sw	14	Y	5100503436
50501603	X	LF	2012	RSA	HwSx	13	Y	5160500363
50510907	X	CM	2013	RSA	HwSx	14	Y	5090510701A
50510914	X	CM	2013	RSA	Sw	17	Y	5090511457A
50511028	X	LF	2011	RSA	Hw_W	6		5100512159
50511101	X	LF	2013	RSA	SwHw	8		5100510611
50511313	X	LF	2011	RSA	Hw_W	6		5120510718
50511413	X	LF	2011	RSA	Hw_W	21		5140512471A
50511505	X	LF	2013	RSA	Pl	20	Y	5150510514A
50511512	X	LF	2011	RSA	Pl	7	Y	5150511258
50511625	X	LF	2013	RSA	Sw	19	Y	5160512568A
50511627	X	LF	2013	RSA	Sw	20	Y	5160513462A
50511818	X	LF	2011	RSA	Sw	6		5180511888
50511829	X	LF	2011	RSA	SwHw	7	Y	5180512906
50511934	X	LF	2013	RSA	HwSx	10		5190513423
50521004	X	LF	2013	RSA	Sw	22	Y	5100520481A
50521132	X	LF	2013	RSA	Hw_W	13		5110523206
50521319	X	LF	2013	RSA	Hw_W	15		5130521849

PLOTID	F_DEL	NSRCODE	LASTM	YCTYPE	F_YC	F_AGE	ISPGYI	OPENING
50521423	X	LF	2011	RSA	Hw_W	21		5140522384A
50521433	X	LF	2013	RSA	SwHw	12		5140523301A
50541813	ARISRECON	LF	2013	RSA	Sw	24	Y	5180548221
50551720	X	LF	2013	RSA	Pl	22	Y	5170551911
50561116	X	LF	2013	RSA	Hw_W	22	Y	5110561502A
50561336	X	LF	2013	RSA	Pl	22	Y	5130563617A
50561519	X	LF	2015	RSA	Hw_X	11	Y	5150561938
50561521	X	LF	2015	RSA	Hw_X	10	Y	5150561789
50561531	X	LF	2015	RSA	Hw_X	14		5150563159
50561615	X	LF	2015	RSA	Hw_X	8	Y	5160561561
50571511	X	LF	2015	RSA	Hw_X	9		5150571204
50571604	X	LF	2013	RSA	Hw_X	17	Y	5160570423A

Appendix VI – Post-RSA GYM Plot Program Sampling Design

In June 2017 Weyerhaeuser submitted a discussion paper titled "*GY-012: Post-RSA G&Y Monitoring Plot Installations* ". Agreement-in-principle was obtained on July 26, 2017 in an email from Liana Luard (AAF).

Issue Number: GY - 012

Post-RSA G&Y Monitoring Plot Installations

Type: ✓ Requires Resolution □ Discussion Item

1. Problem Statement

Weyerhaeuser Company Ltd. (Weyerhaeuser) is assembling their Growth and Yield Program (GYP) as part of the 2017 FMP submission.

As part of the performance monitoring and yield validation components of the GYP, Weyerhaeuser needs to assess the risk and uncertainty around managed stand (RSA) yield assumptions that underlie the AAC determination of the 2017 FMP.

2. Objectives

The main objective of this document is to propose a sampling design that will enable Weyerhaeuser to assess the risk associated with RSA yield projections in their FMA area and setup long term monitoring that represents the target population over time.

3. Guiding Principles

The goal is to have a GYP that is fiscally responsible, scientifically defensible and efficient. We can achieve this by:

- Utilizing the existing Growth and Yield Monitoring (GYM) plot field data collection protocols to maintain linkages to historic measurements.
- Developing an objective-driven sampling design.
- Collecting unbiased, local and representative plot data with a sufficient sample size.
- Ensuring that the sampling program represents the target population over time.
- Meeting all criteria for validation of managed yield forecasts.
- Aligning field data collection with the minimum standards of the Provincial Growth and Yield Initiative (PGYI).
- Using spatially-explicit data systems for referencing and analysis.
- Facilitating continuous improvement of the program.

4. Methods

Weyerhaeuser used RSA data collected from 2009-2014 to develop managed stand yield curves in the 2017 FMP. The RSA-based yield curves projected stand attributes observed 14 years after harvest using the GYPSY model. Stand projections were averaged by regenerating strata based on the proper sample weights by RSA program and sampling year.

Although the RSA data collection protocols are based on consistent data collection protocols and a scientifically defensible and statistically sound sampling design, there is significant risk associated with model-based projections of these data. It is not known whether model projections beyond 14 years are accurate representation of expected future yields.

Weyerhaeuser's GYM plot data is collected on a 3.33-km grid where a plot is established at a grid point within 2 years after harvest. Ninety GYM plots have been established since the start of the program in 2005. The current sampling frame does not allow for the timely accumulation of data, especially regarding the assessment of risk beyond 14 years of stand age.

In order to address these potential concerns, Weyerhaeuser proposes the following:

A. Abandon the current grid-based sampling frame where a GYM plot is established at a 3.33-km grid point within 2 years after harvest;

B. Establish new GYM plots in RSA-surveyed cutblocks 14 years after harvest; and

C. Maintain the current GYM plot layout (20mx20m main plot size) and field data collection protocols that are compatible with the minimum standards of the Provincial Growth and Yield Initiative (PGYI).

Target population: Openings scheduled for an RSA performance survey each sampling year.

Proposed steps for new GYM plot installations:

1) Each year identify the list of sampling units (SUs) selected for ground sampling during the RSA sample selection process.
2) Randomly select SUs from the list by regenerating strata and RSA program (e.g. regular vs tree improvement).
3) Establish a GYM plot in the selected SUs at a randomly selected detailed plot location.
   - Pre-selected detailed plot location should be marked with a re-bar or pigtails during the RSA performance survey.
   - GYM plot establishment should occur after the RSA performance survey is completed and in the same growing season. This will help linking SU-level stand attributes such as percent stocking to plot-level observations.
   - New GYM plots will follow the same layout (20mx20m main plot size) and field data collection protocol as the original grid-based, PGYI-compatible GYM plots established to date.
   - The selected GYM plot location should be representative of the SU sampled and must fit fully within the SU.
   - The selected detailed plot location is unsuitable if a road passes through the plot or its buffer, it is intersected by anthropogenic disturbance (pipelines, well sites etc.), or falls into natural deletions (e.g., residual timber patch).
4) Assemble RSA submission data for all selected SUs (new GYM plot locations), as well as silviculture history and associated spatial GIS layers (skid clearance date, planting and treatment records, location of all detailed and basic plots in the SU etc.).
   - Spatial treatment records and silviculture history (confirmed at the plot-level) will play a key role in the analysis of the data.

- Key observed stand attributes 14 years after harvest will be available at the SU-level from the official RSA performance survey submissions. This includes an accurate, consistent and representative assessment of percent stocking for each major species group which is difficult to assess in a 400 m^2 plot.

These post-RSA GYM plots will be re-measured on a 5-year cycle until they reach 30 years stand age and on a 10-year cycle afterwards. Depending on the number of plots accumulated and the potential findings of intermittent analyses during Forest Stewardship Reporting or future FMP yield curve development, it is possible that only a subset of these plots will be measured beyond 30 years.

5. Discussion

There are 20 existing GYM plots that have not reached performance survey age yet and will be surveyed when they are scheduled for RSA performance survey. If the SU the GYM plot is located in is not selected for ground sampling as part of the RSA sample selection process, it will be surveyed independently using RSA performance survey protocols.

There are 11 existing GYM plots that are located in openings that were already RSA surveyed, Weyerhaeuser will obtain the RSA submission data. It is possible that the SU was not selected for ground sampling during the RSA performance survey.

The remaining existing GYM plots that are located in older openings that have been surveyed with the free-to-grow performance surveys ("orange book") or located in D-declared strata or harvested prior to 1991 will be remeasured on their established schedule as needed.

6. Resolution

Agreement-in-Principle obtained on July 26, 2017 in email from Liana Luard (AAF).

Appendix VII – Plot Measurement Schedule Summary

Current plot measurement and establishment schedules are summarized in this section. The schedules will have to be balanced and rationalized to ensure that resources are available on a yearly basis without significant spikes.

Table 5-6. Plot Measurement Schedule by Plot Type

Year	Natural Stand			Pre-1991		Post-1991		Genetic		Total		
	PSP		TSP	GYM	TSP	GYM		RGT		PSP/GYM		TSP
	Meas	Est	Est	Meas	Est	Meas	Est	Meas	Est	Meas	Est	Est
2018	36			16		34	20		3	86	23	0
2019	27	1								27	1	0
2020	62			1		15	20			78	20	0
2021				5						5	0	0
2022	35			7		7	20	7		56	20	0
2023	67		100		60	54		3	3	124	3	160
2024	158		100		60		20			158	20	160
2025	3			3		35				41	0	0
2026				10			20			10	20	0
2027				1		7		7		15	0	0
	388	1	200	43	120	152	100	17	6	600	107	320

** natural stand TSPs are estimates only*

The planned distribution of monitoring plots that will be installed in openings that are passing the RSA survey in the next 10 years is presented in Table 5-7. Weyerhaeuser currently has 29 existing GYM plots in the population of interest and will install an additional 100 plots (10/year) by 2026. The distribution is shown by FMP yield group which is based on the RSA strata for those plots located in openings already RSA surveyed. Once the RSA survey is completed on the rest of the openings, the plots will be reassigned to match the actual RSA survey stratification.

The proposed measurement schedule that includes the remeasurement of existing plots and the installation of new plots in post-RSA openings is shown in Table 5-8. Plots will be remeasured on a 5-year cycle until they reach 30 years of age (3 measurements) and some plots will be remeasured every 10 years afterwards.

Table 5-7. The Proposed Distribution of Post-RSA PSPs by Yield Group (2018-2027)

Yield Group	Area (ha)	Area (%)	Have			Need/ Target	Deficit
			No RSA Yet	RSA	Total		
Hw	817	1%			0	0	0
HwPl	1,454	2%	2		2	10	8
HwSx	5,279	8%	1	1	2	10	8
Hw_W	6,836	10%	3		3	14	11
Hw_X	8,451	12%	5		5	15	10
Pl	29,672	43%	4	2	6	40	34
PlHw	2,759	4%	1		1	10	9
Sb	168	0%			0	0	0
SbHw	15	0%			0	0	0
Sw	8,435	12%	2	4	6	20	14
SwHw	4,867	7%	2	2	4	10	6
Total	**68,753**	**100%**	**20**	**9**	**29**	**129**	**100**

Table 5-8. Measurement Schedule for Post-RSA PSPs

Meas. Year	Number of plots		
	Established	Remeasured	Total
2018	10	16	26
2019	10	0	10
2020	10	13	23
2021	10	0	10
2022	10	0	10
2023	10	26	36
2024	10	10	20
2025	10	23	33
2026	10	10	20
2027	10	10	20
Total	**100**	**108**	**208**

Weyerhaeuser

Pembina 2017-2026

Forest Management Plan

Annex IX: Timber Supply Analysis

March 19, 2018

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1 Overview

As part of the Forest Management Plan (FMP) development, forecasting, or Timber Supply Analysis (TSA), was conducted to aid in development of the Preferred Forest Management Scenario (PFMS). The forecasting process involved the evaluation of a number of assumptions and management alternatives leading to the selection of a PFMS scenario, with an associated sustainable harvest level or annual allowable cut (AAC).

The Preferred Forest Management Scenario was created with the support of computer based forecasting. Forecasting describes the management actions to be undertaken in detail for the next 20 years and with a lower level of detail for the following 180 years. Forecasting also predicts, under the proposed management actions, what the condition of the forest will be over the 200-year planning horizon. Computer based modeling is part of the adaptive forest management process that is required for sustainable forest management and was undertaken to ensure that the proposed forest management actions did not compromise forest sustainability.

The Canadian Standards Association defines a forecast as: “an explicit statement of the expected future condition of an indicator”. Forecasting in the context of the 2017-2027 FMP, is the process that creates the predicted future condition of FMP indicators. Indicators describe the condition of the forest, the products derived from the forest and the values present in the forest.

Examples of indicators are patches of old growth forest and the amount of timber harvested. These example indicators are non-complementary in that increasing levels of old growth will decrease the amount of timber that can be harvested. This highlights the essence of forecasting within the forest management planning context; it is necessary to make tradeoffs between the desired amounts of each indicator in order to achieve a preferred scenario. Usually it is not possible to obtain everything that is desired and often undesirable outcomes are predicted for some of the indicators no matter what actions are proposed. Forecasting is a complex process and was used by Weyerhaeuser and the Plan Development Team (PDT) to predict the outcomes of specific forest management activities and to assist Weyerhaeuser in deciding what activities and what level of activities should be proposed in a PFMS that best meet forest management objectives.

This annex describes the forecasting process and sensitivity analysis undertaken for the development of the 2017-2027 Forest Management Plan. It details the forecasting assumptions, methods and results, the knowledge gained, and the application of the results leading up to the development of the PFMS. A description of the data files supporting the TSA and the PFMS is included here. The PFMS is described in detail in *Chapter 6: Preferred Forest Management Scenario*.

2 Forecasting Methods

Forecasting is a complex process requiring numerous inputs and assumptions. This section describes the 2017-2027 FMP forecasting process including a description of the modeling tools, inputs, assumptions, outcomes, and tradeoffs required to develop the PFMS.

2.1 Objective

The objective of forecasting is to create a reasonable prediction of the forest attributes and non-timber values over the long-term using timber harvesting as the main agent of change. The intent is to create a PFMS that best achieves all forest management objectives.

2.2 Process

Developing a forecast involves combining data, in the form of spatial landbases and yield curves, with management assumptions to create a coherent spatial model that is capable of both fine and coarse scale analysis. Following a structured approach, scenarios were developed to explore the impacts of the options available, guided by existing operability limitations and the 2006 Alberta Forest Management Planning Standard[1] (Planning Standard) specifications to balance the social, economic and ecological forest management objectives.

The development of landbases and yield curves, the refinement of indicators and goals, and the process of evaluating scenario output to derive new scenarios are all iterative processes and are interdependent. Figure 1 outlines the process involved in developing the PFMS. Any one of the cycles shown can be repeated as many times as necessary to ensure the best possible solution is achieved.

2.2.1 Development of the Model Dynamics

The forecasting process begins with the development of the model inputs *i.e*. the landbase, yield curves, and initial indicators and goals. These inputs were then used to construct the model within the forecasting tools framework. Model results were analyzed to ensure the indicators correctly represent the metrics to be evaluated and that the model dynamics are realistic. If any metric or assumption was deemed to be inaccurate or insufficient, it was re-worked and the model was rebuilt.

[1] Alberta Forest Management Planning Standard. Version 4.1, April 2006. Alberta Sustainable Resource Development, Public Lands and Forest Division, Forest Management Branch.

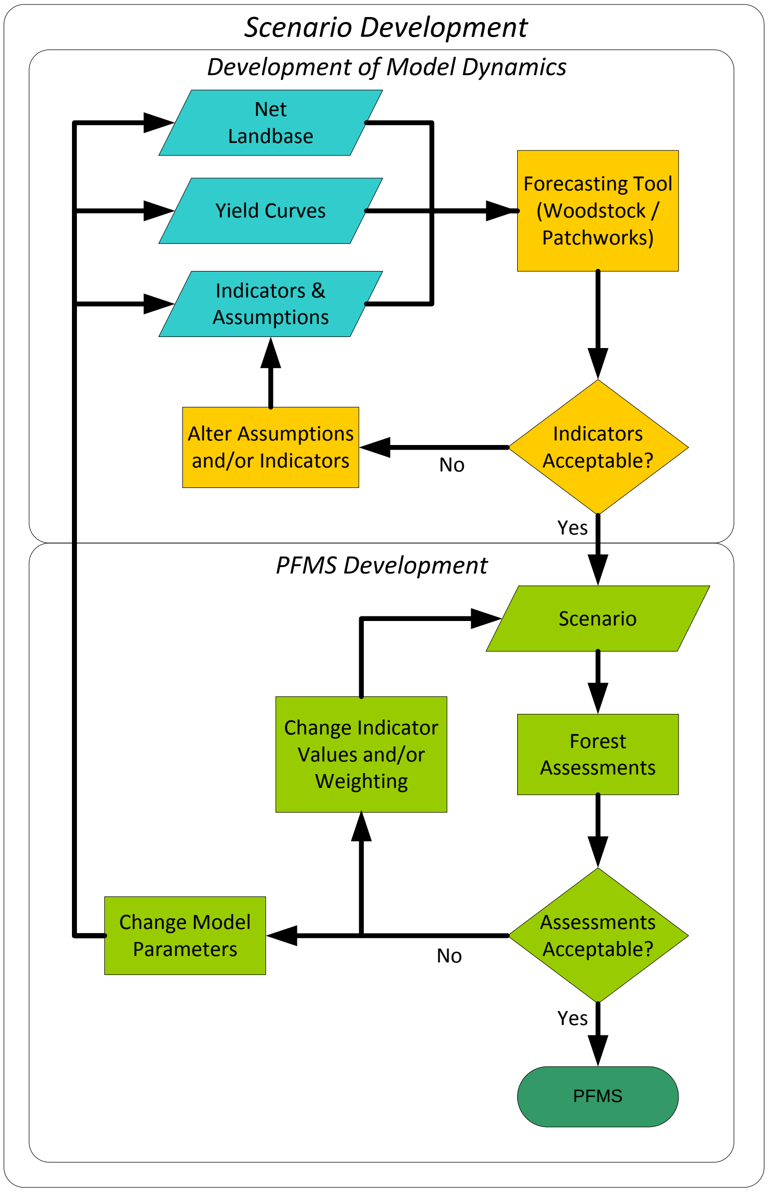

Figure 2-1. Forecasting planning process

2.2.2 Scenario Development

Scenarios were developed to test the implications of specific management strategies. Each scenario's impact on the forest and its associated values was examined, as well as differences between scenarios. By altering the types, locations and levels of management actions in a scenario, or by altering the desired future forest condition, the long-term forest dynamics, desirable activities and forest management tradeoffs could be assessed.

Scenarios were developed within a structured process. Weyerhaeuser and/or PDT identified forest management issues that could be addressed through forecasting. Scenarios were created to address identified issues and results were summarized for review and action. Through this process primary trade-off decisions such as old growth level and timber yield assumptions were resolved.

2.2.3 PFMS Development

After the management issues were resolved, a series of scenarios were generated to work towards the PFMS. These scenarios were primarily focused on changes to the Spatial Harvest Sequence (SHS) to ensure operability and that the proposed harvest blocks met the social and ecological objectives.

2.3 Limitations

There are limitations in any forecasting process. The primary limitations related to the development of the PFMS are the generalization of inputs and the inability to directly address stochastic events, such as wildfire, in the timber supply models.

2.3.1 Landbase

The landbase is built with the best information available, but it is a snapshot of the current status of many attributes such as forest fires, roads, towns and oil and gas activity. Any changes to the landbase post the landbase effective date (May 1, 2015) resulting from disturbances such as fire, landuse activities or other industrial infrastructure development were not incorporated into the modelling.

2.3.2 Yield curves

Timber yield curves were created by projecting the growth of individual plot-level data using the GYPSY model and averaging the projections for each yield strata. Adjustments were applied to the average projections to address bias and growth elements such as stand decay and breakup which are not accounted for in GYPSY. The resulting yield curves represent averages across the landscape. While this approach produces reasonable results for strategic planning, the variation between individual polygons of the same strata can be large. This is especially true of any incidental volume predictions. Large variations will be observed in recovered individual block level volumes compared to volumes predicted from the yield curves. However, over large areas the harvested volumes should be close to the predicted volumes.

2.3.3 Stochastic events

Stochastic, or random, events such as fire or insect outbreaks are not explicitly modeled in this TSA process. Stochastic events by their very nature are unpredictable and even less predictable when spatial location is required as it is for the development of the SHS. For these reasons, stochastic events were excluded from the forecasting. The FMP process addresses stochastic events through re-planning when unplanned events cumulatively impact more than 2.5% of the net landbase.

2.4 Modeling Tools

Two forecasting modeling tools were used for this analysis: Woodstock for non-spatial analysis and Patchworks for spatial analysis. The Patchworks interface allows the conversion of Woodstock models into Patchworks format, permitting common datasets to be used between scenarios and to ensure continuity and meaningful comparison of results.

Woodstock was used for strategic analysis to test and compare non-spatial management assumptions. Patchworks was used to address spatial issues and to develop the PFMS. Where possible, sensitivity analyses were completed using Woodstock because Woodstock optimization provides the 'best' solution possible, so there is no difference attributable to a sub optimal solution and secondly, Woodstock achieves a result in less time than Patchworks.

The recommended harvest level, associated SHS and the treatment regime were derived from the PFMS created with a Patchworks scenario.

2.4.1 Woodstock

Woodstock, version 2017.01, is a strategic forest estate-modeling tool developed and serviced by Remsoft®. It was used for strategic analysis of timber supply and comparisons of alternative strategies and formulations. This strategic analysis provided insight for the resolution of specific issues including growing stock, minimum harvest age and harvest flow.

Woodstock is non-spatial; every unique type is rolled up into forest classes (TSA themes by age class). The model applies treatments to all or a portion of that unique forest class. Post-treatment transitions can be one-to-many relationships defined as percentages. The optimizer selects the optimal combination of treatments throughout the entire planning horizon to solve for the objective function.

Woodstock uses a mathematical technique called linear programming to quickly determine the optimum answer to the management assumptions. Linear programming is a commonly used mathematical tool for forest management because of its speed and accuracy in finding the 'optimal' solution with regards to a single objective and several constraints. Davis et al. (2001) describes linear programming as: "Problems that are linear with respect to the relationships between the decision variables can be solved by a technique called linear programming. By linear, we mean the operators are restricted to plus or minus."

Woodstock can be formulated as either basic optimization, where there is one modeling objective with rigid constraints, or goal programming, where the modeling objective is to minimize deviations from a goal. Goal programming requires the identification of a weighting, which is the penalty for deviating from the goal, to allow the model to rank the goals. Typically, a high weighting results in a small deviation from the goal.

A structured, progressive approach was used in the development and analysis of Woodstock scenarios. Increasing levels of constraints were applied in successive scenarios to meet forest management objectives and to answer specific management questions and issues. The end result of the Woodstock stage of modelling were scenarios that met the non-spatial key objectives. For this analysis, Woodstock runs and reports in 5-year periods.

The linear programming solver used in this analysis is Mosek version 4.0.

2.4.2 Patchworks

Patchworks, version 1.3[2], is a spatially-explicit forest estate modeling tool developed and serviced by Spatial Planning Systems. It is designed to provide the user with operational-scale decision-making

[2] Version 1.3 (2017-09-11 01:39:21 master-b058a)/218). Java Version: 1.8.0_131.

capacity within a strategic analytical environment. Trade-off analysis of alternative operational decisions are quickly determined and visually displayed.

Patchworks operates at the polygon level. In Patchworks terminology, polygons are the smallest element, which in this case, are the subdivided Alberta Vegetation Inventory (AVI) stands in the modelling landbase. The treatments applied to each polygon are an all or nothing decision for the model. There is only one post-treatment transition for each polygon.

Patchworks has the functionality to create “patches” by aggregating adjacent polygons that meet specific criteria. This facilitates the development and control of patch targets, such as opening patches, old growth, interior old forest and patches required for wildlife habitat.

The tool is fully spatial through time and the impact on an adjacent polygon 200 years into the future is considered in the first year of the simulation. Patchworks decision space can be thought of as a matrix consisting of each polygon and each potential outcome for every time slice in the planning horizon.

Patchworks is a heuristic model that provides close to an optimal solutions for the defined goals or targets (similar to the goal-programming in Woodstock) by applying simulated annealing and generic algorithms. In this analysis, a variety of goals were included such as harvest levels, minimum growing stock levels, minimum old seral stage areas and a range of regeneration patch sizes by period.

Goals or targets are represented by different features (elements present on the landscape) or products (something produced from the landscape, e.g. cubic meters of timber or hectares of habitat) and multiplied by weighting factors, which rank the importance and contribution of each feature or product towards the modeling objective. The value of the weighting applied impacts the model’s ability to achieve the desire target values. Greater weighting, relative to another targets weighting, increases the probability that the target will be achieved. Target weightings are constantly adjusted in an attempt to achieve the desired balance between timber and non-timber values and other objectives being modelled. The relative weighting between targets does not reflect their relative importance but simply the weighting required to achieve the desired outcome.

Patchworks solves in annual periods, however, it was set up to model and report in 40 five-year periods. There was a two-year period at the start of the simulation to advance the landbase (effective date May 1, 2015) to the beginning of the planning horizon, May 1, 2017. The model covers the entire 200 year planning horizon, beginning in 2017 and ending in 2217. Patchworks scenarios were developed from Woodstock, to ensure identical assumptions, including landbase, yield curves, treatments and responses.

3 Timber Supply Analysis

This section outlines the scenarios and sensitivity analysis examined in the lead up to the PFMS scenario. It includes scenarios completed in both Woodstock and Patchworks.

3.1 Modelling Inputs and Assumptions

This section briefly describes the standard modelling assumptions and parameters used in both the non-spatial and spatial analyses. Any variations from these assumption are noted when changes were made for specific scenarios for sensitivity analysis purposes. Additional spatial parameters used in the spatial modeling are discussed in section 3.3. For more detail on the assumptions see *Chapter 6: Preferred Forest Management Scenario.*

3.1.1 Sustained Yield Unit

For the 2017 FMP Weyerhaeuser has amalgamated their previous five FMU's (E15, E2, W5, W6 and R12) into one new one (R15). The R15 FMU now represents a single SYU. As the Pembina Timberlands FMA does not cover the entire FMU area, final harvest levels will be divided between FMA and non-FMA areas.

3.1.2 Landbase

The net landbase is a spatial representation of FMU R15 developed from the latest Alberta Vegetation Inventory (AVI) and many other spatial layers with the goal of determining those areas that will contribute to harvesting activity (active or contributing landbase) and those that cannot be harvested over the life of the plan (passive or non-contributing landbase). The landbase contains all the stand level attributes required to complete the TSA, such as stand age and yield stratum. The landbase reflects conditions on the ground as at May 1, 2015, the landbase effective date.

Development of the net landbase for use in the TSA process is described in detail in *Annex VI: Net Landbase Development*. Agreement-In-Principle for the net landbase was obtained on March 28, 2017.

For harvest level determination, Weyerhaeuser decided to use a single combined landbase. This means that there is no distinction between coniferous and deciduous landbases and consequently no distinction between primary and secondary volumes. The final coniferous and deciduous harvest levels will comprise all coniferous and deciduous volumes emanating from the entire contributing landbase.

3.1.3 Yield Curves

A total of 32 yield curves were developed to provide input into the TSA process. These yield curves were broken down into three main groups as follows:

Natural stands (NAT): includes all fire-origin stands. Modeling was completed using GYPSY and strata were based on the AVI attributes.

Pre-1991 managed stands (M91): includes all openings that were harvested prior to March 1, 1991. Modeling was based on the natural stand yield curves with additional site index adjustments using results from the Regenerated Site Productivity study conducted in 2007. Stratification was based on the AVI attributes.

Post-1991 managed stands (RSA): represent all exiting openings that were harvested on or after March 1, 1991. Modeling was based on GYPSY projection of RSA performance survey data. Strata were based on the RSA strata at the sampling unit (SU) level for all surveyed openings. Silviculture declaration and treatment information from ARIS were used to stratify the rest of the blocks at the opening level.

Weyerhaeuser also developed tree improvement (genetic) yield curves for Region I white spruce (I1) to reflect yield increases resulting from the deployment of genetically improved stock from the controlled parentage program (CPP). These curves are only applied to white spruce stands within Region I that are harvested and regenerated by Weyerhaeuser.

Gross merchantable tree length volumes were compiled to a utilization standard based on a 15cm stump diameter outside bark, 15cm stump height and a 3.66m minimum merchantable length for both coniferous and deciduous species groups. Top diameter inside bark was 11cm for coniferous and 10cm for deciduous species. Yield curve development is described in detail in *Annex VII: Yield Curve Development*. Agreement-In-Principle for the yield curves was obtained on March 28, 2017.

Yield curves used in the TSA models were adjusted for cull and seismic line reductions.

3.1.4 Other Assumptions

- Planning period. A 200 year planning horizon comprised of 40 5-year periods was used for the TSA modeling process.
- Natural breakup and succession. On the active landbase it is assumed that as stands reach the defined maximum age for the cover type (300 years for C and CD; 200 years for D and DC), the stand breaks up and is replaced by a new young stand. On the passive landbase however, it is assumed that the stands are reset to an age that allows them to continue to contribute as old growth for wildlife habitat and seral stage constraints (171 years for C and CD; 131 years for D and DC). Following harvest or breakup, all stands transition back to the same pre-disturbance stratum. Black spruce (Sb) on a RSA yield stratum is the only exception to this rule.
- Operability. The only criterion used to determine operability is harvest age. The following minimum ages by broad cover group were implemented:
  - C, CD and DC – 81 years, and
  - D - 71 years.
- Seral stage. A minimum constraint of 5% is applied to the old forest seral stage by ecological unit (PL, SW, CX, CD, DC and DX) on the active landbase as a coarse filter approach to maintaining wildlife habitat in the productive forest.
- Sustainability. In order to ensure long-term sustainability of the forest, models are constrained to ensure non-declining operable coniferous and deciduous growing stock levels for the last 50 years (10 periods) of the planning horizon.
- Temporary exclusions. A number of areas within the active landbase to be temporarily excluded from harvest were identified by Weyerhaeuser. An area around Bear Lake was excluded for the first 10 years while areas in the Rodney and Crimson Work Areas, and an area south of the O'Chiese First Nation Reserve were excluded for the first 20 years. In addition to these exclusions, other specific exclusions were introduced in the TSA for specific scenarios, for example :

- R12PureD[3] - harvesting of pure D stands in the southern compartments, i.e., South Canal, Medicine Lake, Baptiste, Nordegg and West Country avoided for the first 3 periods (15 years)
- R12E15Graz[4] - harvesting of grazing dispositions in the old E15 and R12 FMU areas avoided for the first 3 periods (15 years).

- Mountain Pine Beetle. In scenarios where susceptible MPB stands are targeted, the following objectives were applied:
  - Conifer surge cut aimed at reducing the area of operable Rank 1 & 2 stands by 100% after 20 years, and
  - Continue to target any remaining operable Rank 1 & 2 stands after the first 20 years.
- Structure retention. A structure retention factor of 4% is assumed for all species and operators. This reduction is not included in the model but is applied as a reduction factor to calculated volumes.

3.2 Non-Spatial Analysis

Initial analyses were completed in a non-spatial environment using Woodstock. The intent was to test the sensitivity of harvest levels to various assumptions. While many of the scenarios were run with earlier versions of the net landbase, some were re-run with final net landbase (LB_v8_20170824). Most of the inputs and assumptions used in the Woodstock model were carried forward to the Patchworks spatial analysis. Non-timber assessments (NTA), such as songbird habitat and watershed analysis (ECA) as well as other spatial constraints were not included in the non-spatial analysis but are included in Patchworks for the development of the final PFMS.

3.2.1 Harvest Volume Analysis – Even Flow

A summary of the scenarios and the modeling parameters used for each scenario is presented in Table 3-4 at the end of this section.

3.2.1.1 Maximum Harvest Levels

Initial scenarios investigated the potential base harvest levels for the DFA (both FMA and non-FMA areas) under different objectives with the assumption of even flow *i.e.* with no accelerated harvests being applied. With the intent being to explore maximum theoretical harvest levels under two different objectives (maximizing coniferous vs. maximizing total harvest), these scenarios did not include targeting of MPB susceptible stands.

Two scenarios were compared, as follows:

Scenario W8000

- Objective : Maximize coniferous volume.
- Constraints
  - Minimum deciduous harvest of between 550,000 and 600,000 m^3/yr (prior to structure retention deduction)
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years

[3] *R12PureD* identified as follows : compcode in ('NOR', 'SOU', 'BAP', 'MED', 'WES') and F_BCG = 'D' and f_active = 'ACTIVE'
[4] *R12E15Graz* identified as follows : oldfmu in ('R12', 'E15') and grazing in ('GRP','GRR','FGL','GRL') and f_active = 'ACTIVE'

- Minimum 5% old seral stage by ecological unit on active landbase.

Scenario W8100

- Objective : Maximize total volume (coniferous + deciduous).
- Constraints
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
  - Minimum 5% old seral stage by ecological unit on active landbase.

The only differences between these two scenarios is that W8000 maximizes the coniferous harvest level while maintaining a minimum deciduous harvest level, whereas W8100 maximizes the harvest of both coniferous and deciduous.

Average harvest levels for the two scenarios are presented in Table 3-1. Maximizing total coniferous harvest (W8000) produces average annual harvest levels of 1,055,183 m^3/yr and 540,565 m^3/yr for coniferous and deciduous respectively. Maximizing total harvest (W8100) results in a 2% reduction in annual coniferous harvest volume but the deciduous harvest increases by 21% compared to scenario W8000.

Table 3-1. Maximum even flow harvest levels

Scenario		200 year Average Harvest			
		Coniferous		Deciduous	
Number	Description	m^3/yr	% change	m^3/yr	% change
W8000	Maximize Coniferous Harvest	1,055,183		540,565	
W8100	Maximize Total Harvest	1,034,492	-2%	652,958	21%

All volumes are net of 4% structure retention

3.2.1.2 Old Seral Stage Constraint

A requirement to maintain a minimum of 5% of the old seral stage by ecological unit on the active landbase was included in scenarios W8000 and W8100. Maintaining a level of old seral stage is included as a coarse filter indicator for wildlife habitat on the active landbase. In order to assess the impact that the inclusion of this constraint has on harvest levels; two new scenarios were developed where the 5% old seral stage constraint was removed.

Scenario W8001

- Objective : Maximize coniferous volume.
- Constraints
  - Minimum deciduous harvest of between 550,000 and 600,000 m^3/yr (prior to structure retention deduction)
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years

Scenario W8101

- Objective : Maximize total volume (coniferous + deciduous).
- Constraints
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years

Removing the old seral stage constraint increases the coniferous harvest by 5% when maximizing coniferous harvest (W8001) and 4% when maximizing for total harvest (W8101) as shown in Table 3-2. There is, however very little impact on deciduous harvest levels when maximizing coniferous harvest (W8001), but the deciduous harvest increases by 8% when maximizing total harvest (W8101).

Table 3-2. Even flow harvest levels with old seral stage constraint removed

Scenario		200 year Average Harvest					
		Coniferous			Deciduous		
			% change from			% change from	
Number	Description	m^3/yr	W8000	W8100	m^3/yr	W8000	W8100
W8000	Maximize Coniferous Harvest	1,055,183		2%	540,565		-17%
W8001	Maximize Coniferous Harvest - Seral stage constraint removed	1,105,105	5%	7%	543,041	0%	-17%
W8100	Maximize Total Harvest	1,034,492	-2%		652,958	21%	
W8101	Maximize Total Harvest - Seral stage constraint removed	1,080,246	2%	4%	705,066	30%	8%

All volumes are net of 4% structure retention

3.2.1.3 Regenerated Yield Curves

Regeneration standards applied since 1991 are producing stands that are faster growing than fire origin stands. Yields based on RSA performance survey data are producing volume curves that are considerably higher than natural stand curves. When used in TSA, harvest levels can be expected to be much higher than when only natural stand yield curves are used. In the previous scenarios RSA curves were applied to all post-91 cutblocks as well as to all stands harvested by the model into the future. In addition, some pre-91 managed stands (M91) are assigned to yield curves that are based on natural stand yield curves with additional site index adjustments based on results from a Regenerated Site Productivity study conducted in 2007.

As there is a risk that the higher RSA and M91 yields may not materialize in future rotations, scenarios were constructed that assume natural stand yield curves only. All stands harvested pre- and post-91 were placed on natural yield curves and all stands transition to natural yield curves when harvested by the model. The minimum 5% old seral stage constraint was re-implemented for these scenarios.

Scenario W8002

- Objective : Maximize coniferous volume.
- Constraints
  - Minimum deciduous harvest of between 550,000 and 600,000 m^3/yr (prior to structure retention deduction)
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
  - Minimum 5% old seral stage by ecological unit on active landbase.
  - Natural stand yield curves only

Scenario W8102

- Objective : Maximize total volume (coniferous + deciduous).
- Constraints
  - Even flow ± 5% applied to both coniferous and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
  - Minimum 5% old seral stage by ecological unit on active landbase.
  - Natural stand yield curves only

Table 3-3 shows the results for all the even flow scenarios. The average coniferous harvest volume drops by 25%, when only natural yield curves are applied in the TSA while maximizing the coniferous harvest (W8002 vs W8000), while the deciduous volume is only 2% less. When total volumes are maximized, the coniferous harvest is 24% less while the deciduous harvest is 15% lower (W8102 vs W8100). The smaller decrease in the deciduous harvest in W8002 compared to W8102 is due to the fact that not all available deciduous is being harvested in scenario W8000 as the objective is to maximize the coniferous harvest.

Table 3-3. Harvest volumes by scenario – even flow

Scenario		200 year Average Harvest					
		Coniferous			Deciduous		
			% change from			% change from	
Number	Description	m^3/yr	W8000	W8100	m^3/yr	W8000	W8100
W8000	Maximize Coniferous Harvest	1,055,183		2%	540,565		-17%
W8001	Maximize Coniferous Harvest - Seral stage constraint removed	1,105,105	5%	7%	543,041	0%	-17%
W8002	Maximize Coniferous Harvest - Natural Yields only	793,505	-25%	-23%	528,000	-2%	-19%
W8100	Maximize Total Harvest	1,034,492	-2%		652,958	21%	
W8101	Maximize Total Harvest - Seral stage constraint removed	1,080,246	2%	4%	705,066	30%	8%
W8102	Maximize Total Harvestt - Natural Yields only	781,819	-26%	-24%	554,929	3%	-15%

All volumes are net of 4% structure retention

Table 3-4. Summary of model parameters for non-spatial even flow scenarios

Model Parameter	Description	Scenario Number					
		W8000	W8001	W8002	W8100	W8101	W8102
Objective							
Maximize Total Volume	Maximize total coniferous and deciduous harvest levels				✓	✓	✓
Maximize Coniferous Volume	Maximize total coniferous harvest level only	✓	✓	✓			
Constraints							
Minimum deciduous harvest level	Deciduous harvest between 550,000 and 600,000 m^3/yr (prior to structure retention reduction)	✓	✓	✓			
Even flow	Even flow ± 5% on both coniferous and deciduous harvests.	✓	✓	✓	✓	✓	✓
Non-declining yield (NDY)	Non-declining operable coniferous and deciduous growing stock levels for the last 50 years of the 200 year period	✓	✓	✓	✓	✓	✓
Temporary Exclusions	Areas identified as temporary exclusions in Rodney, Crimson and Ochiese excluded from harvest for the first 20 years. Bear Lake exclusion for 10 years only.	✓	✓	✓	✓	✓	✓
Old Seral Stage	Maintain a minimum 5% old seral stage by ecological unit on active landbase	✓		✓	✓		✓
Natural yield curves only	Natural stand yield curves applied to all current and future harvested stands			✓			✓

3.2.1.4 *Additional Sensitivity Analyses*

Early on in the TSA process a number of other sensitivities were investigated. These included:

- Impact of not harvesting in grazing leases in the old E15 and R12 FMUS for the first 20 years;
- Impact of increasing the minimum harvest age for deciduous stands from 70 to 80, 90 and 100 years for the first 20 years;
- Impact of increasing the minimum harvest age for coniferous stands from 80 to 90, 100 and 110 years for the first 20 years; and
- Impact of increasing the minimum harvest age for both deciduous and coniferous stands in 10 year increments to 100 years for deciduous and 110 years for coniferous for first 20 years.

All these scenarios were found to have negligible impact on harvest levels and so have not been included here.

3.2.1.5 Discussion

The non-spatial scenarios examined in this section provide an indication of theoretical maximum long-term harvest levels attainable under the assumption of even flow as well as the other assumptions applied.

With the goal of maximizing coniferous harvest levels for all tenure holders operating on the DFA while maintaining a deciduous harvest level in line with current requirements, scenario W8000 was adopted as the base scenario. This scenario maintains the 5% old seral stage by ecological unit on the active landbase constraint, which is used as a coarse filter for wildlife habitat. Considering that 49% of the total landbase never gets harvested, the extent of the old seral stage on the entire landbase will be significantly higher than this.

The base scenario also utilizes the RSA yield curves for regenerating stands. With the RSA yields being considerably higher than natural curves, long-term harvest levels are increased by up to 25% for coniferous. As companies are required to obtain new inventory and re-run the TSA analysis every 10 years, the degree of this risk will become clearer over time.

The scenarios investigated here did not include the targeting of MPB susceptible stands. This will be examined under the assumption of an accelerated coniferous harvest in the next section.

3.2.2 Harvest Volume Analysis - Accelerated Conifer Harvest

Following the influx of the mountain pine beetle in 2005 from north-western British Columbia, the province of Alberta instituted a MPB Action Plan and Management Strategy in December 2007. This led to a revision of the TSA's for Weyerhaeuser's Edson and Drayton Valley FMA areas in 2008, with the objective to target MPB susceptible pine forests in order to modify their age-class structure and thereby increase their resistance to future MPB infestation. The 2007 MPB addenda for the two FMA areas resulted in an accelerated coniferous harvest for an 18 year period from May 1, 2007 to April 30, 2025.

With the effective date of the current FMP period being May 1, 2017, the accelerated harvest or surge cut agreed to in 2008 has 8 years remaining. Considering that the threat of MPB infestation on the DFA is ongoing, a number of scenarios were developed to test the impact of including an accelerated coniferous harvest on sustainable harvest levels.

Different levels of accelerated coniferous harvest were investigated over the first decade of the 200 year planning horizon, as follows:

- Limiting the surge cut to 125% of the 200 year average even flow harvest (scenario W8000), as outlined in section 5.6(iv) of the Planning Standard,
- Allowing the timber supply model to determine a maximum surge harvest level, and
- Setting the harvest level at the same as the sum of the currently approved coniferous accelerated harvest levels for all FMUs, *i.e*. 1,469,157 m^3/yr net of structure retention.

The above scenarios together with a few additional variations are outlined in more detail below. A summary of the scenarios and the modeling parameters used for each is also presented in Table 3-5.

Scenario W8010

- Objective : Maximize coniferous volume.
- Constraints
  - Coniferous accelerated harvest (surge cut) for the first 10 years. The harvest level is limited to a maximum of 125% of the 200 year average even flow harvest (scenario W8000)
  - The average 190 year post surge coniferous harvest level may not fall below 90% of the 200 year average even flow harvest (scenario W8000)
  - Minimum deciduous harvest of between 550,000 and 600,000 m^3/yr (prior to structure retention deduction)
  - Even flow ± 5% applied to both coniferous (190 years post surge) and deciduous harvest levels
  - Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
  - Minimum 5% old seral stage by ecological unit on active landbase.
  - MPB susceptible stands targeted as follows:
    - Reduce the area of operable Rank 1 & 2 stands by 100% after 20 years, and
    - Continue to target operable Rank 1 & 2 stands that may remain after the first 20 years.

Scenario W8012

Same as W8010, with the upper limit (125%) on the surge cut removed but the lower limit (90%) retained.

Scenario W8022

Same as W8010, with the upper limit fixed at the currently approved coniferous accelerated harvest level of 1,469,157 m^3/yr (net of structure retention) for the first 10 years. The lower limit (90%) is retained.

Scenario W8024

Same as W8022, with the no targeting of Rank 1 and 2 MPB stands.

Scenario W8030

Same as W8022, with the following changes:

- No harvesting of pure D stands allowed in the southern compartments, *i.e*., South Canal, Medicine Lake, Baptiste, Nordegg and West Country for the first 3 periods (15 years)
- No harvesting of grazing dispositions in the old E15 and R12 FMU areas for the first 3 periods (15 years).

The results for the scenarios are presented in Table 3-6. The results are compared to the base even flow scenario, W8000.

Table 3-5. Summary of model parameters for non-spatial accelerated harvest scenarios

Model Parameter	Description	Scenario Number				
		W8010	W8012	W8022	W8024	W8030
Objective						
Maximize Total Volume	Maximize total coniferous and deciduous harvest levels					
Maximize Coniferous Volume	Maximize total coniferous harvest level only	✓	✓	✓	✓	✓
Constraints						
Minimum deciduous harvest level	Deciduous harvest between 550,000 and 600,000 m^3/yr (prior to structure retention reduction)	✓	✓	✓	✓	✓
Even flow	Even flow ± 5% on both coniferous and deciduous harvests. For accelerated harvest, this is split between the 1st 10 years and the remaining 190 years	✓	✓	✓	✓	✓
Non-declining yield (NDY)	Non-declining operable coniferous and deciduous growing stock levels for the last 50 years of the 200 year period	✓	✓	✓	✓	✓
Temporary Exclusions	Areas identified as temporary exclusions in Rodney, Crimson and Ochiese excluded from harvest for the first 20 years. Bear Lake exclusion for 10 years only.	✓	✓	✓	✓	✓
Old Seral Stage	Maintain a minimum 5% old seral stage by ecological unit on active landbase	✓	✓	✓	✓	✓
10 year accelerated coniferous harvest @ 125%	Accelerated harvest level limited to a maximum of 125% of the 200 year average even flow harvest for the base scenario (W8000)	✓				
10 year accelerated coniferous harvest with no maximum	Accelerated harvest level unconstrained		✓			
10 year accelerated coniferous harvest limited to 1,469,157 m^3/yr	Accelerated harvest limited to the currently approved coniferous accelerated harvest level of 1,469,157 m^3/yr (net of structure retention)			✓	✓	✓
Post surge coniferous harvest level @ 90%	Post surge coniferous harvest level may not fall below 90% of the 200 year average even flow harvest (W8000)	✓	✓	✓	✓	✓
MPB susceptible stands targeted	Rank 1 and 2 stands targeted for 100% reduction over the first 20 years. Stands not harvested in the first 20 years continue to be targeted after the 20 year period.	✓	✓	✓		✓
No harvesting of pure D stands in southernmost compartments fro 15 years (R12PureD)	Pure D stands in South Canal, Medicine Lake, Baptiste, Nordegg and West Country are bypassed for the first 3 periods (15 years)					✓
No harvesting of stands within grazing areas in old FMUs E15 and R12 for 15 years (R12E15Graz)	Stands in grazing dispositions in old FMUs E15 and R12 are bypassed for the first 3 periods (15 years)					✓

Table 3-6. Harvest volumes by scenario – accelerated coniferous harvest

Scenario	Years 1 - 10					Years 11 - 200					Years 1 - 200			
	Coniferous			Deciduous		Coniferous			Deciduous		Coniferous		Deciduous	
Number	m^3/yr	% Chg	% of (a)[1]	m^3/yr	% Chg	m^3/yr	% Chg	% of (a)[1]	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg
W8000	**1,082,288**			**528,000**		**1,053,756**			**541,226**		**1,055,183 (a)**		**540,565**	
W8010	1,318,978	22%	125%	528,000	0%	989,482	-6%	94%	541,912	0%	1,005,957	-5%	541,216	0%
W8012	1,676,175	55%	159%	528,000	0%	949,664	-10%	90%	544,552	1%	985,990	-7%	543,725	1%
W8022	1,469,157	36%	139%	528,000	0%	963,842	-9%	91%	543,722	0%	989,107	-6%	542,936	0%
W8024	1,469,157	36%	139%	528,000	0%	1,026,006	-3%	97%	549,724	2%	1,048,163	-1%	548,638	1%
W8030	1,469,157	36%	139%	528,000	0%	962,778	-9%	91%	544,234	1%	988,097	-6%	543,423	1%

[1] Percentage of the base run (W8000) 200 year average volume
All volumes are net of 4% structure retention

Scenario W8010 produces a coniferous harvest level 22% higher during the first decade than the base scenario (W8000) and 125% of the base 200 year average. Post surge the coniferous harvest level falls by 6% compared to the base over the same period and is 94% of the base 200 year average. Over the entire 200 year period, scenario W8010 produces an average coniferous harvest level 5% lower than the base scenario. When the 125% surge limit is removed, scenario W8012 produces a 10 year harvest 55% higher than the base level or 159% of the base 200 year average. The post surge level remains at 90% of the base 200 year average.

Scenarios W8022 and W8030 produce almost identical results with the surge harvest being 139% of the base 200 year average and 91% post surge. Scenario W8024 was included to investigate the impact of targeting MPB susceptible stands. As far as harvest levels are concerned, the 10 year coniferous surge cut is the same as scenario W8022 but the post surge harvest is 6% higher than W8022. Over the 200 year period targeting MPB susceptible pine stands results in a 5% lower coniferous harvest level. This is the result of delaying the harvest of older non-pine stands while focussing on susceptible pine stands early in the planning horizon. In scenario W8024 the oldest stands are harvested first allowing them to transition to higher yielding RSA curves earlier in the planning horizon, with positive impacts on harvest levels.

Deciduous harvest levels vary very little from the base levels for all scenarios.

Table 3-7 shows the percent reduction in MPB rank 1 and 2 stands over the first 20 years by scenario.

Table 3-7. Rank 1 and 2 MPB stands remaining after 20 years

Scenario Number	Starting Inventory* m^3	Volume Harvested m^3	Volume Remaining m^3	Percent Reduction %
W8000	**127,976**	**57,153**	**70,823**	**45%**
W8010	127,976	103,111	24,865	81%
W8012	127,976	105,495	22,480	82%
W8022	127,976	107,995	19,981	84%
W8024	127,976	48,163	79,812	38%
W8030	127,976	108,435	19,541	85%

* As at May 1, 2015

A 10 year accelerated harvest and targeting of MPB susceptible stands reduces the total inventory of rank 1 and 2 stands by between 81 and 85% over 20 years. An accelerated harvest without targeting MPB stands (scenario W8024) would reduce the inventory of rank 1 and 2 stands by only 38%.

Focusing on reducing the MPB risk also impacts where harvesting takes place on the DFA as well as the type and nature of the timber harvested. The ranking of pine stands includes an assessment of the compartment risk, which is assigned by AAF based on the distance to active MPB populations. With current MPB activity being prevalent to the north and north-west of the DFA, the northern most compartments are assigned the higher compartment risk and, as a result have the greater proportion of rank 1 and 2 stands. Table 3-7 shows the area harvested by compartment in two scenarios where the only difference is that one targets rank 1 and 2 stands (W8022) while the other does not (W8024).

Table 3-8. Area harvested by scenario and compartment during the first decade

Compartment	Risk	1st Decade		
		W8022	W8024	Difference
		Ha	Ha	Ha
Edson	Very High	8,535	4,853	3,682
Beaver Meadows	High	1,481	774	707
Wolf Lake	Very High	18,997	10,444	8,553
Macmillan	Very High	7,868	8,659	-791
North of the Pembina River		**36,881**	**24,730**	**12,151**
Brazaeu	High	11,577	7,516	4,061
South Canal	Moderate	5,858	8,824	-2,966
Medicine Lake	Moderate	3,503	1,320	2,183
Baptiste	Low	7,218	6,626	591
Nordegg	Low	9,181	7,126	2,055
West Country	Low	4,336	17,074	-12,738
South of the Pembina River		**41,673**	**48,487**	**-6,814**
Total		**78,554**	**73,217**	**5,337**

Targeting MPB susceptible stands shifts harvesting away from the lower risk southern compartments, particularly the West Country to the higher risk compartments to the north. Figure 3-1 and Figure 3-2 show the area harvested by stratum and average harvest age of stands harvested for the same two scenarios respectively. Targeting MPB stands results in harvesting younger less productive stands with the older white spruce stands in the south being bypassed for susceptible pine stands.

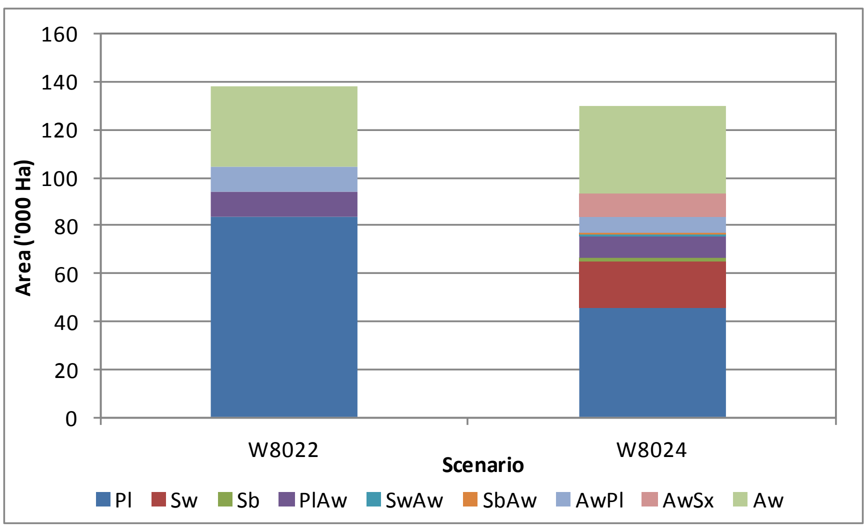

Figure 3-1. Area harvested by scenario and stratum during the first 20 years

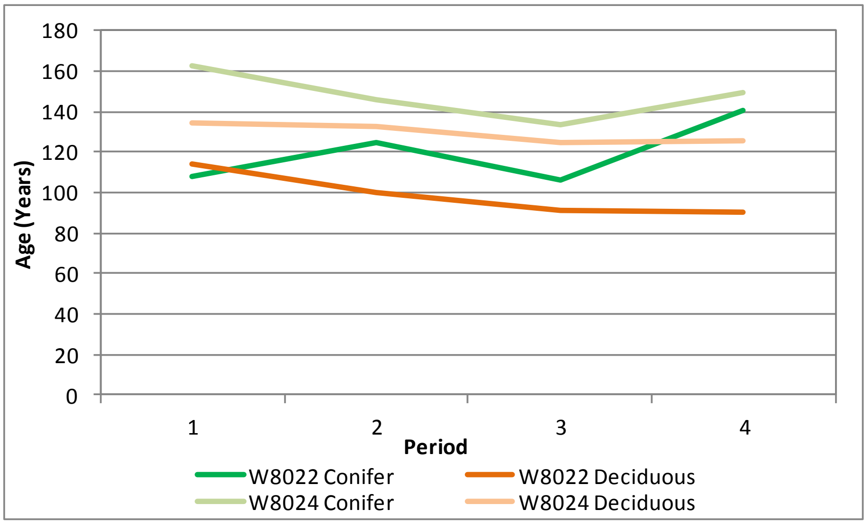

Figure 3-2. Average harvest age by scenario during the first 20 years

The non-spatial scenarios investigated in this section do not include any targets for non-timber values or other spatial constraints but they provide an indication of potential harvest levels and strategies to be incorporated in the spatial analysis leading up to the development of the PFMS.

3.3 Spatial Analysis

The inputs and assumptions applied in the non-spatial modeling were carried forward into the spatial analysis providing continuity between the models. A number of additional spatially explicit targets were then added to the Patchworks model allowing development of the PFMS.

3.3.1 Assumptions and Targets

The spatial assumptions and targets included in the spatial analysis are described in detail in Chapter 6. They include:

- Opening patch targets. Used to encourage the model to group harvesting operations and to provide a desirable range of opening sizes.
- Spheres-of-interest. Historically Quota Holders and Community Timber Permit Programs (CTPP) held licence to operate specific stand types within the old FMU areas. In order to maintain each tenure holder's traditional operating area, they were allocated to areas based on Work Area and broad cover group (BCG) to ensure that spheres-of-interest were maintained. This was applied for the first 20 years only as after that no allocations were made to specific tenure holders.
- Recent harvest activity. Stands harvested between the effective date of the landbase (May 1, 2015) and the start of the modelling period (May 1, 2017), known as PLAN2 blocks, were harvested by Patchworks prior to the first five year period of the planning horizon so that their age could be reset to zero and placed on a trajectory based on the model transition rules.
- Planned blocks. Stands planned for harvest over the next few years were flagged to be harvested within the first decade (PLAN10) or first two decades (PLAN20) so that they would be included in the SHS.

- Temporary Exclusions. In addition to the exclusions applied in the non-spatial analysis, two additional temporary exclusions were introduced in the spatial analysis, *i.e.*:
  - BLKMTN[5] – no harvesting in the Black Mountain Work Area for the first 20 years. This area was excluded because the only way to access it is through the Wapiabi Provincial Recreation Area.
  - CHUNGO[6] – no harvesting in the Chungo Lookout Work Area for the first 20 years. This is based on previous commitments made to Jasper National Park.
- Seed stands. Prior to the finalization of the Alberta Vegetation Inventory (AVI) used for this FMP, Weyerhaeuser ran a number of Patchworks scenarios based on the 2007 MPB amendment spatial harvest sequences and old AVI as a preliminary process to identify stands that would be desirable to include in the 2017 FMP SHS. The intent was that they would be used as “seed” stands in the 2017 FMP TSA process around which other operable stands would be selected by the model to form opening patches. Targets were used to encourage the harvesting of these stands, but they were weighted so as to not override other important objectives, such as the targeting of MPB susceptible pine stands

3.3.2 Non-Timber Values

Alberta Agriculture and Forestry (AAF) recently introduced a number of habitat models for use in FMP development to allow companies to include the assessment of fine-filter species values directly into the forest management planning process and thereby reducing the likelihood that the TSA will need to be redone after submission, or approval delayed. Some of the models, for example songbirds and marten were integrated directly into Patchworks, while the barred owl and grizzly bear models could not be integrated but were processed on the completion of a TSA scenario. Watershed analysis, using the AAF’s equivalent clearcut area (ECA) methodology was also integrated directly into Patchworks.

The objective in the TSA was to limit the impact of harvesting activities on wildlife habitat and water runoff by applying targets where necessary to achieve results within the thresholds required by AAF.

3.3.3 Scenarios and Results

3.3.3.1 Harvest Volume Analysis

Following from the non-spatial analysis, two even flow scenarios and one that included an accelerated coniferous harvest were developed for comparison with the non-spatial results.

Scenario PW70000

This scenario attempts to mimic the non-spatial base scenario (W8000) in the spatial model. No spatial constraints are applied, MPB susceptible stands are not targeted and non-timber value constraints are not enforced in this scenario. Stands were not assigned to operators based on spheres-of-interest and no plan blocks, with the exception of PLAN2 blocks, are assigned for harvest. Targets applied, include the following:

- Even flow ± 5% applied to both coniferous and deciduous harvest levels
- Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
- Minimum 5% old seral stage by ecological unit on the active landbase.

[5] BLKMTN identified by : workcode = ‘BLKMTN’
[6] CHUNGO identified by workcode = ‘CHUNGO’

- PLAN2 blocks *i.e*. stands harvested between 2015 and 2017 were harvested prior to the first five year period.

Scenario PW70003

This scenario is similar to PW70000 but includes spatial constraints such as opening patch and non-timber value targets. MPB susceptible rank 1 and 2 stands are not targeted in this scenario either. Targets applied, include the following:

- Even flow ± 5% applied to both coniferous and deciduous harvest levels
- Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
- Minimum 5% old seral stage by ecological unit on active landbase
- PLAN2 blocks *i.e*. stands harvested between 2015 and 2017 were harvested prior to the first period.
- Opening patch targets applied
- Songbird and ECA targets included as required to ensure that the values remain within the required thresholds.

Scenario PW70006

Non-spatial scenario W8030 (see section 3.2.2) was selected as the preferred scenario to replicate in the spatial Patchworks model towards the development of the Preferred Forest Management Scenario (PFMS). The spatial scenario included the same assumptions as W8030, but with the addition of spatial constraints such as patch targets and non-timber values, stand assignment to timber operators based on spheres-of-interest and the targeting of MPB susceptible stands.

Targets applied, include the following:

- 10 year accelerated coniferous harvest at 1,469,157 m^3/ha (net of structure retention)
- Even flow ± 5% applied to both coniferous and deciduous harvest levels. Coniferous is even flowed during the first 10 years and over the remaining 190 year period.
- Non-declining operable coniferous and deciduous growing stock levels for the last 50 years
- Minimum 5% old seral stage by ecological unit on active landbase
- PLAN2 blocks *i.e*. stands harvested between 2015 and 2017 are harvested prior to the first period.
- Plan blocks (PLAN10 and PLAN20) are harvested within their assigned periods.
- MPB susceptible rank 1 and 2 stands are targeted for reduction as follows:
    - Reduce the area of operable Rank 1 & 2 stands by 100% after 20 years, and
    - Continue to target operable Rank 1 & 2 stands that may remain after the first 20 years.
- Temporary exclusion areas are not harvested within the specified time periods, including grazing areas in the old E15 and R12 FMUs and pure deciduous stands in the southern compartments.
- Opening patch targets applied
- Songbird and ECA targets included as required to ensure that the values remain within the required thresholds.
- Barred Owl patch targets are included to assist in reducing the risk of habitat loss
- Stands are assigned to operators within their spheres-of-interest for the first 20 years.

The assumptions applied to all spatial scenarios are summarized in Table 3-11.

Table 3-9 compares the average harvest levels of the non-spatial even flow base scenario (W8000) with the three spatial scenarios described above.

Table 3-9. Harvest levels by scenario

Scenario	Years 1 - 10					Years 11 - 200					Years 1 - 200			
	Coniferous			Deciduous		Coniferous			Deciduous		Coniferous		Deciduous	
Number	m^3/yr	% Chg	% of (a)[1]	m^3/yr	% Chg	m^3/yr	% Chg	% of (a)[1]	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg
W8000	**1,082,288**			**528,000**		**1,053,756**			**541,226**		**1,055,183 (a)**		**540,565**	
PW70000	1,052,363	-3%	100%	525,349	-1%	1,049,053	0%	99%	529,092	-2%	1,049,218	-1%	528,905	-2%
PW70003	1,034,079	-4%	98%	517,552	-2%	1,034,438	-2%	98%	517,968	-4%	1,034,420	-2%	517,947	-4%
PW70006	1,468,548	36%	139%	523,638	-1%	949,913	-10%	90%	524,033	-3%	975,845	-8%	524,013	-3%

[1] Percentage of the base run (W8000) 200 year average volume
All volumes are net of 4% structure retention

Moving from the non-spatial modelling environment (W8000) to a spatial model with similar inputs and constraints (PW70000), results in 1% and 2% decreases in the 200 year average coniferous and deciduous harvest levels respectively. The addition of spatial constraints such as opening size and non-timber value targets (PW70003) causes a further 1% and 2% drop in the 200 year average coniferous and deciduous harvest levels respectively.

Scenario PW70006 includes a 10 year surge cut that approximates the combined current Healthy Pine Strategy harvest level of 1,469,157 m^3/ha for the existing five FMUs. While the current surge cut ends in 2025, eight years into 2017 FMP, the surge was continued for an additional 2 years to cover the first decade of the new plan. High levels of susceptible pine stands and the ongoing risk of a major MPB infestation on the DFA justify this strategy[7]. As a result, the accelerated harvest is higher than 125% of the even flow harvest level as required in section 5.6(iv) of the Planning Standard. The post surge harvest level is, however within 90% of the even flow harvest level.

Figure 3-3 and Figure 3-4 show the coniferous and deciduous harvest levels respectively for the accelerated harvest scenario (PW70006) compared to the spatial (PW70000) and non-spatial (W8000) even flow scenarios

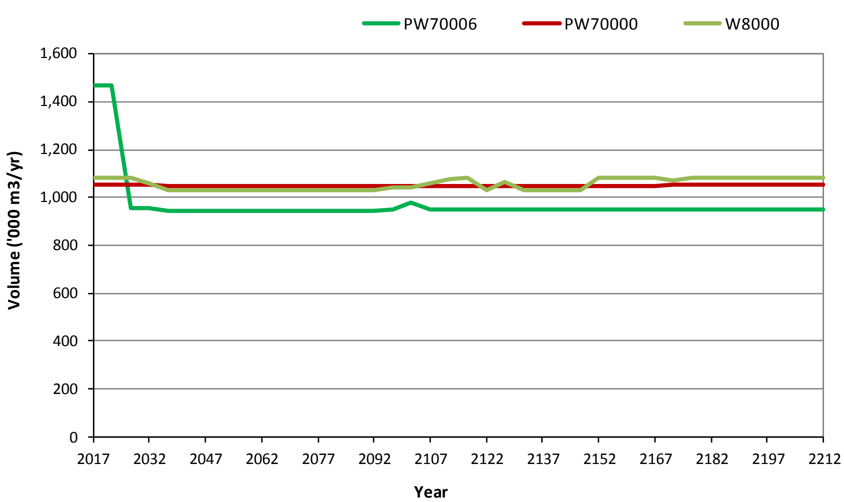

Figure 3-3. Coniferous harvest level by scenario

[7] This strategy is aligned with direction from AAF to "maintain current Prevention (Pine) Strategy, while considering non-timber values" in the approval of Weyerhaeuser's FMP Issues and Management Direction Summary (Annex II).

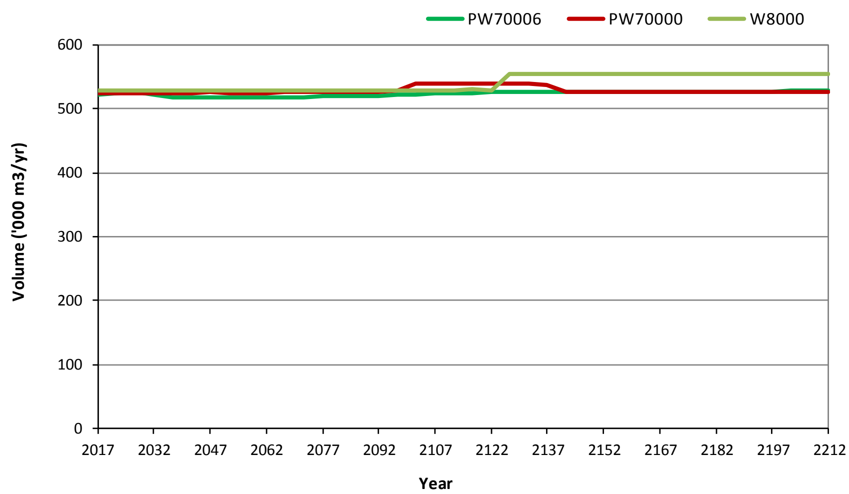

Figure 3-4. Deciduous harvest level by scenario

Scenario PW70006 went though a number of iterations where targets were adjusted and the model re-run to ensure all objectives were being met. In addition timber operators were provided two opportunities to review the 20 year spatial harvest sequence. Scenario PW70006 was finally accepted by Weyerhaeuser and the PDT as the PFMS scenario. The PFMS inputs, assumptions and results are discussed in detail in *Chapter 6: Preferred Forest Management Scenario.*

3.3.3.2 Back to Natural

AAF requires a sensitivity analysis be performed when regenerated yields based on RSA information are used to project future forest growth in the PFMS scenario[8]. The intent of this analysis is to understand yield related risks associated with the use of RSA yield curves.

Two scenarios were created for this analysis:

Scenario PW70010

This scenario is based on the PFMS scenario with the 20 year SHS locked in and all blocks harvested transitioned back to natural stand yield curves. The intent of this scenario is to estimate the cumulative impact of changing course in the future should the higher RSA yields not materialize. The following process was followed:

- The 20 year SHS was locked in and the model was prevented from harvesting any additional stands during the first 20 year period;
- All pre-91 cutblocks on enhanced M91 yield curves and post-91 cutblocks assigned to RSA yield curves in the landbase were re-assigned to natural yield curves based on their strata;
- All future harvests in the model were transitioned back to natural stand yield curves;
- The model was then allowed to generate a new even flow harvest level after year 20.

[8] Proposed Guidelines for Developing the "Back to Natural" Scenario. Government of Alberta. October 13, 2016.

Scenario PW70015

This scenario is similar to PW70010 but the 20 year SHS was not locked in, allowing the model to generate a new even flow scenario based on natural yield curves only. This allows the influence of RSA yield curves on the harvest levels to be quantified.

The assumptions applied to all spatial scenarios are summarized in Table 3-11.

Table 3-10 presents the harvest levels for the back to natural scenarios compared to the PFMS while Figure 3-5 and Figure 3-6 show the trend in the harvest levels over the 200 year period for coniferous and deciduous respectively.

Table 3-10. Harvest levels for back to natural scenarios

Scenario	Years 1 - 20				Years 21 - 200				Years 1 - 200			
	Coniferous		Deciduous		Coniferous		Deciduous		Coniferous		Deciduous	
Number	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg	m^3/yr	% Chg
PW70006	1,212,615		524,279		949,537		523,983		975,845		524,013	
PW70010	1,212,615	0%	524,279	0%	742,496	-22%	427,946	-18%	789,488	-19%	437,505	-17%
PW70015	748,819	-38%	442,601	-16%	732,914	-23%	442,367	-16%	734,505	-25%	442,390	-16%

All volumes are net of 4% structure retention

There is no change in harvest level over the first 20 years for scenario PW70010 as the 20 year SHS was locked in. After the 20 year period, however the coniferous harvest drops by 22% and the deciduous by 18% compared to the PFMS. This indicates the potential drop in future harvest level should the RSA yield projections not be realized.

The even flow scenario (PW70015) indicates that the RSA curves afford an increased long-term harvest level of 25% for coniferous and 16% for deciduous.

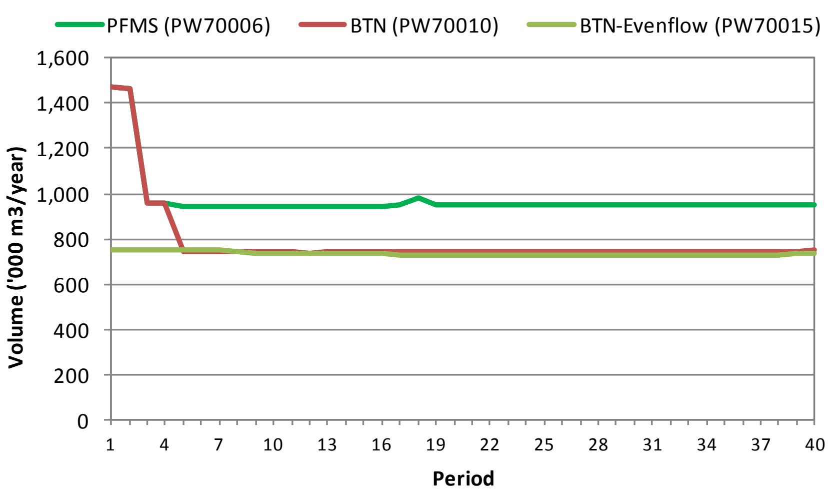

Figure 3-5. Coniferous harvest levels for the PFMS and BTN scenarios

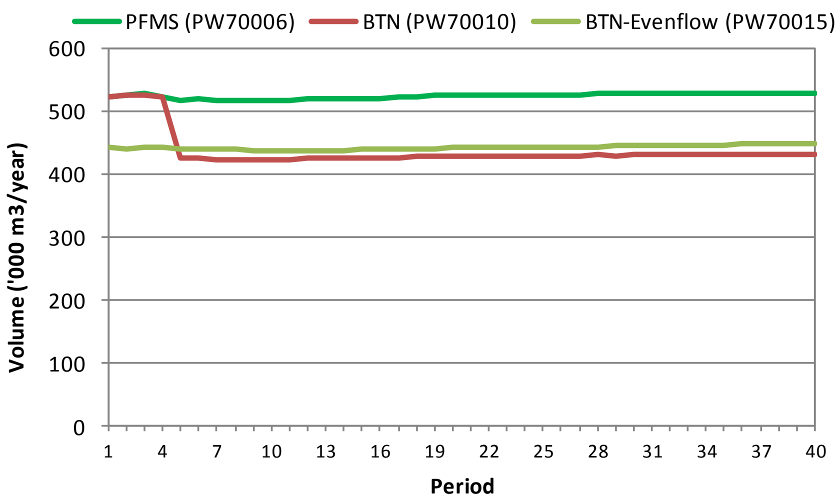

Figure 3-6. Deciduous harvest levels for the PFMS and BTN scenarios

Table 3-11. Summary of assumptions applied in spatial scenarios

Model Parameter	Description	Scenario Number				
		PW70000	PW70003	PW70006	PW70010	PW70015
Assumptions						
Even flow	Even flow ± 5% on both coniferous and deciduous harvests. For accelerated harvest, this is split between the 1st 10 years and the remaining 190 years.	✓	✓	✓	✓	✓
10 year accelerated coniferous harvest limited to 1,469,157 m^3/yr	Accelerated harvest limited to the currently approved coniferous accelerated harvest level of 1,469,157 m^3/yr (net of structure retention)			✓	✓	
Non-declining yield (NDY)	Non-declining operable coniferous and deciduous growing stock levels for the last 50 years of the 200 year period	✓	✓	✓	✓	✓
Temporary Exclusions	Areas identified as temporary exclusions in Rodney, Crimson and Ochiese excluded from harvest for the first 20 years. Bear Lake exclusion for 10 years only.	✓	✓	✓	✓	✓
Old Seral Stage	Maintain a minimum 5% old seral stage by ecological unit on active landbase	✓	✓	✓	✓	✓
MPB susceptible stands targeted	Rank 1 and 2 stands targeted for 100% reduction over the first 20 years. Stands not harvested in the first 20 years continue to be targeted after the 20 year period.		✓	✓	✓	✓
No harvesting of pure D stands in southernmost compartments for 15 years (R12PureD)	Pure D stands in South Canal, Medicine Lake, Baptiste, Nordegg and West Country are bypassed for the first 3 periods (15 years)		✓	✓	✓	✓
No harvesting of stands within grazing areas in old FMUs E15 and R12 for 15 years (R12E15Graz)	Stands in grazing dispositions in old FMUs E15 and R12 are bypassed for the first 3 periods (15 years)		✓	✓	✓	✓
Additional Exclusions	Chungo Lookout (CHUNGO)and Black Mountain (BLKMTN) Work Areas excluded form harvest for 20 years due to previous commitments made to Jasper National Park.		✓	✓	✓	✓
Timber operator assignments and spheres-of-interest.	Each timber operator assigned to Work Areas and stand types based on current spheres-of interest for the first 20 years only.			✓	✓	✓
Block and Harvest Patch targets	Block and harvest patch target size distributions included for the 200 year period, with additional weighting during the first 20 years.			✓	✓	✓
Songbird targets	Songbird targets included where necessary to ensure relative abundance values remain within low risk thresholds over the 200 year period.			✓	✓	✓
ECA targets	Targets included to ensure thae watershed ECA percentages did not fall below the 50% threshold over the 200 year period.			✓	✓	✓

Figures 3-7 to 3-13 provide a comparison of a few key indicators for the PFMS (PW70006) and BTN (PW70010) scenarios.

Scenario PW70006 (PFMS) **Scenario PW70010 (BTN)**

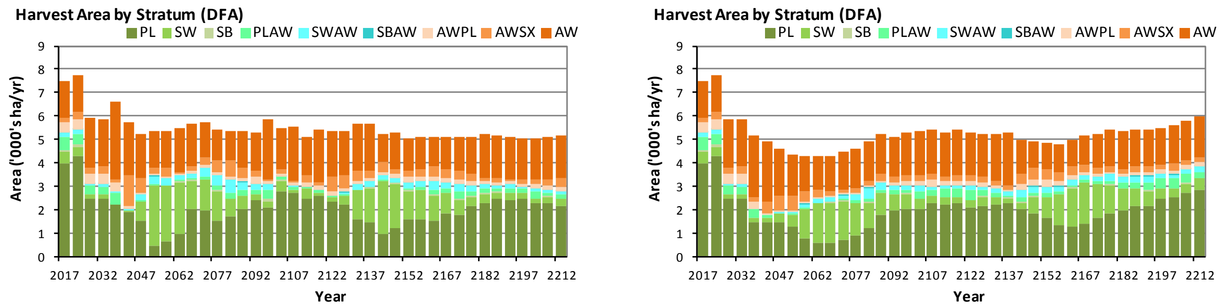

Figure 3-7. Harvest area by stratum – PFMS vs BTN scenarios

Over the 200 year period approximately 4% less area is harvested in the BTN scenario than in the PFMS. The area harvested in the PFMS scenario levels off over the last 70 years of the planning horizon (Figure 3-7) while the area increases steadily in the BTN scenario over the same time period. This corresponds to the lower productivity of the BTN scenario stands harvested over the same time period compared to the PFMS scenario (Figure 3-8).

Scenario PW70006 (PFMS) **Scenario PW70010 (BTN)**

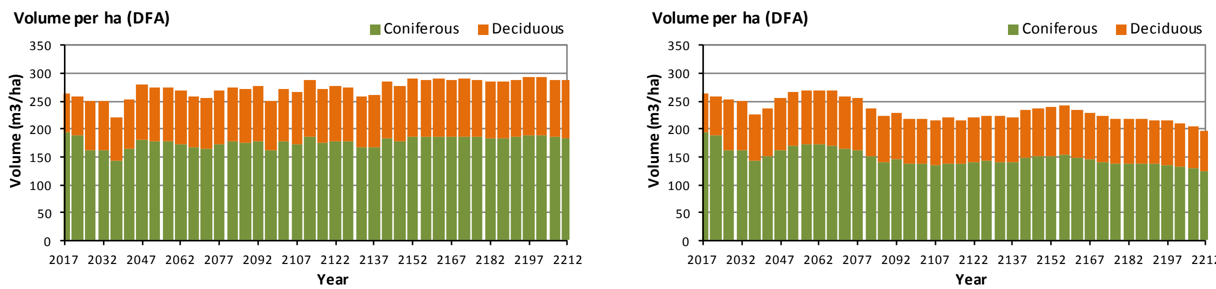

Figure 3-8. Volume per hectare – PFMS vs BTN scenarios

Scenario PW70006 (PFMS) **Scenario PW70010 (BTN)**

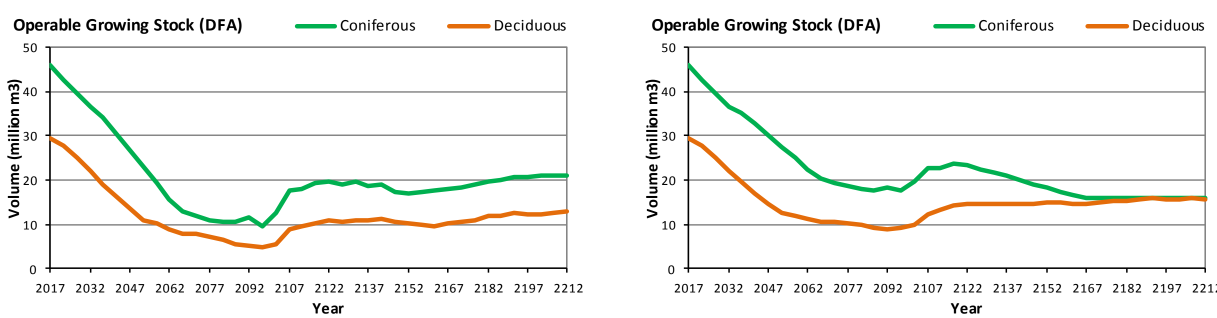

Figure 3-9. Operable growing stock – PFMS vs BTN scenarios

The operable growing stock in the BTN scenario remains higher than the PFMS in the mid-term for both coniferous and deciduous species, but the coniferous stock level drops to a lower level by the end of the 200 year period (Figure 3-9).

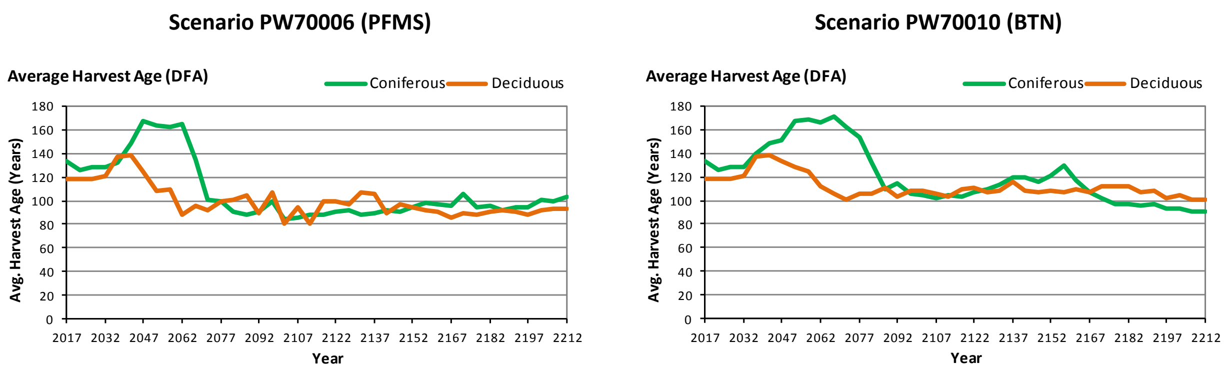

Figure 3-10. Average harvest age – PFMS vs BTN scenarios

The initial trends in average harvest age are similar for both scenarios but the average age for the BTN scenario is higher after the first 70 years (Figure 3-10). The higher yielding RSA curves allow the stands to be harvested a younger age while still being more productive than the lower yielding natural curves.

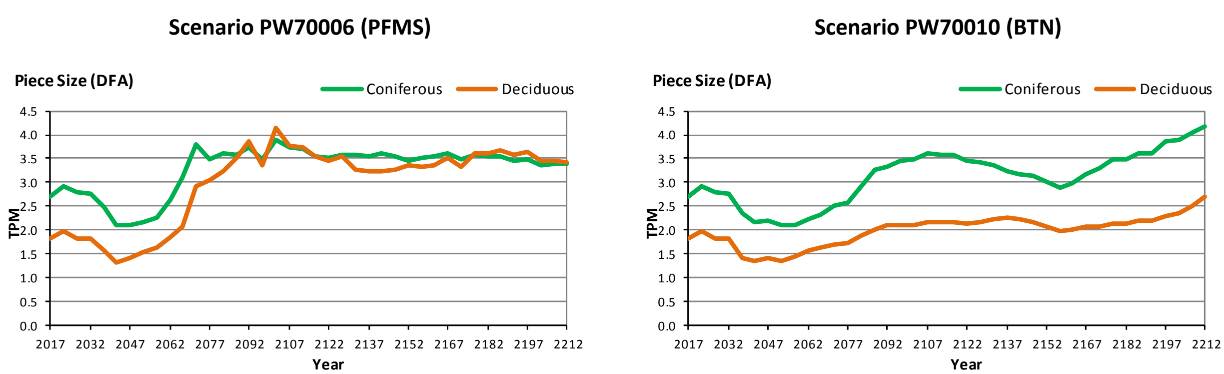

Figure 3-11. Piece size – PFMS vs BTN scenarios

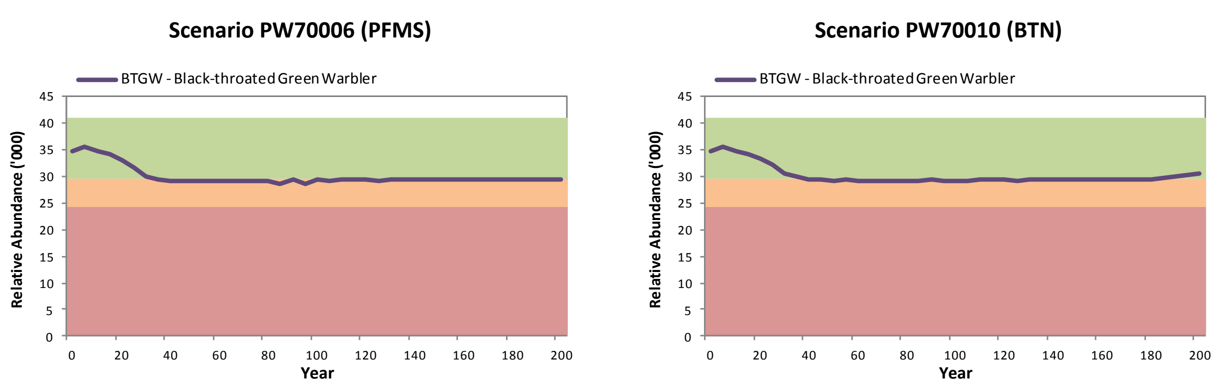

Figure 3-12. Black-throated Green Warbler – PFMS vs BTN scenarios

The Black-throated Green Warbler was the only bird species that was in danger of habitat loss in both scenarios. Targets were used in the models to keep the relative abundance (RA) value from falling and remaining below the moderate risk threshold (Figure 3-12).

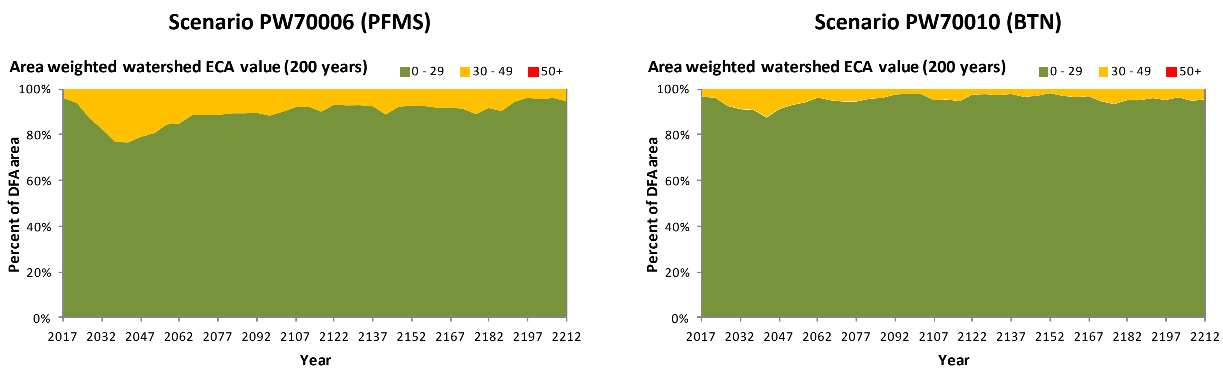

Figure 3-13. Area weighted ECA values – PFMS vs BTN scenarios

No watersheds in either the PFMS or the BTN scenarios fall below the 50% ECA threshold over the 200 year period (Figure 3-13). The watershed area within the moderate risk category (30 – 40%) is lower in the BTN scenario, largely due to less area being harvested in the BTN scenario.

4 PFMS Datasets

The input and output datasets used in the final PFMS Patchworks model are described in this section. The datasets are included on a USB drive which is only provided in the submission to AAF technical review staff.

4.1 Woodstock

The Woodstock model files that were used to create the initial Patchworks model are located in the following directory;

..\ zAnnex9_TSA\PWModel\Round7\Tracks_20170920\Woodstock

In this directory are the Woodstock model components that are required to build a Patchworks model, but do not include an areas file from the final landbase that would allow the creation of a Woodstock scenario. The Landscape, Lifespan, Yields, Actions and Transitions sections are the most important for determining the model dynamics.

R15_PW_TSA_20170920.pri – Main Woodstock control file. Contains links to all other files.

4.2 Patchworks

4.2.1 Pin File

..\zAnnex9_TSA\PWModel\Round7\Analysis_20170920\p744_Rd7_20170921.pin

The pin file controls the formulation of the model. It determines the input files, the patch targets and the length of the planning horizon. It uses the information in the tracks directory.

4.2.2 Tracks

..\ zAnnex9_TSA\PWModel\Round7\Tracks_20170920

The files in the tracks directory contain most of the information needed to open a Patchworks model.

- Accounts information – used to define summary targets
  - Accounts.csv – used by the model, includes manually entered targets
  - Protoaccounts.csv – default of matrix generator
- Base Patchworks files – system files to define the model matrix
  - Blocks.csv
  - Curves.csv
  - Features.csv
  - Products.csv
  - Strata.csv
  - Tracknames.csv
  - Treatments.csv

- Groups files – groups defined to allow finer control of targets
  - groups_fma.csv
  - groups_tpr_u.csv
  - groups_tallpine.csv
  - groups_hgt.csv
  - groups_operator.csv
  - groups_watersheds.csv
- Topology files – define the spatial distance of polygons from each other
  - topology_5_15_lb8_rd7.csv – forested landbase – used for block size patches
  - topology_30_300_lb8_rd7.csv – forested landbase – used for patches defining groups of blocks
- XML files – created from Woodstock model and used to generate base patchworks files
  - wpem_Rd8_20170921.xml – raw file from Patchworks' Woodstock to XML conversion utility

4.2.3 Timing Constraints

..\zAnnex9_TSA\PWModel\Round7\Analysis_20170920\Access_C2.csv

This is the final access constraint file used to lock down the 20 year SHS.

4.2.4 Landbase

..\zAnnex9_TSA\PWModel\Round7\Data\TSA_LB_Foreseted_v8_20170921.shp

The modeling landbase shapefile as used in the final PFMS. A data dictionary is included in Appendix XII. A digital version of the data dictionary (*PatchworksLandbase_DataDictionary.pdf*) is included in the directory.

4.3 Patchworks PFMS Outputs

4.3.1 Standard Patchworks Outputs

..\ zAnnex9_TSA\PWModel\Round7\Analysis_20170920\PW70006\scenario

The standard Patchworks files when a scenario is saved are contained in this directory. These are used when re-loading an existing scenario into Patchworks. The three files that are critical are;

- Schedule.csv – contains the timing and treatment of every action
- TargetStatus.csv – contains a list of targets that are being controlled
- TargetSummary.csv – contains the minimum and maximum values and weightings, as well as the achieved values for each target

Calculation of harvest levels from model outputs can be done from the targetSummary.csv file using the *product.Vol.managed.Con* and *product.Vol.managed.Dec* targets. For each of the 40 periods (periods 2 to 41) divide by 5 to get an annual harvest level for each period. This is the gross harvest level as structure retention (4%) has not been netted out.

4.3.2 Target Files

..\zAnnex9_TSA\PWModel\Round7\Analysis_20170920\PW70006\targets

The files in this directory contain the same information as the targetsummary.csv file, but are split into one data file (.csv) and an image file (.png) for each target.

4.3.3 Future Forest Condition

..\ zAnnex9_TSA\PWModel\Round7\Analysis_20170920\PW70006\Future_Forest_Condition_5_10

The files in this directory describe the future forest condition in every period of the model. These contain the information as required in section 5.10 in the Alberta Forest Management Planning Standard, Version 4.1. The 200 year planning horizon is represented by periods 2 to 41. Period 1 refers to the initial 2 year period (2015 to 2017) used to advance the landbase to the 2017 model start date. Field names are described in the excel spreadsheet *FutureForestFieldDescriptions.xlsx* located in the same directory.

4.3.4 Harvest Schedule

..\zAnnex9_TSA\PWModel\Round7\Analysis_20170920\PW70006\Harvest_Schedule_5_11

The files in this directory describe the harvested stands in every period of the model. These contain the information as required in section 5.11 in the Alberta Forest Management Planning Standard, Version 4.1. The 200 year planning horizon is represented by periods 2 to 41. Period 1 refers to the initial 2 year period (2015 to 2017) used to advance the landbase to the 2017 model start date. Field names are described in the excel spreadsheet *HarvestScheduleFieldDescriptions.xlsx* located in the same directory.

4.3.5 PFMS SHS Shapefiles

..\ zAnnex9_TSA\PWModel\Round7\Analysis_20170920\PW70006\SHS

The final 20 and 70 year SHS shapefiles for the PFMS are located in this direcory. The 20 year SHS includes an alternate volume calculation to account for seismic lines. A data dictionary is included in Appendix XIII. A digital version of the data dictionary (*WPem_SHS_DataDictionary.pdf*) is included in the directory.

5 References

Alberta 2006. Alberta Forest Management Planning Standard. Version 4.1, April 2006. Alberta Sustainable Resource Development, Public Lands and Forest Division, Forest Management Branch. 112 pages.

Weyerhaeuser 1997. Ecologically Based Forest Management: The conservation of biodiversity in Weyerhaeuser Canada Forest Management Areas in Alberta.

Weyerhaeuser 2005. Sustained Yield Unit R12 Detailed Forest Management Plan 2000-2015. December 2005. Weyerhaeuser Company Ltd. Drayton Valley, Alberta.

Weyerhaeuser 2006. Detailed Forest Management Plan 2004-2014. April 2006. Weyerhaeuser Company Ltd. Edson, Alberta.

Weyerhaeuser 2008. Mountain Pine Beetle Addendum. Weyerhaeuser Company Ltd. Edson, Alberta. (FMA # 9700035)

Weyerhaeuser 2008. Mountain Pine Beetle Addendum. Weyerhaeuser Company Ltd. Drayton Valley, Alberta. (FMA # 0500042)

Appendix I – TSA-001 (Revised): FMU Amalgamation – Quota Allocations

Issue Number: TSA-001 (Revised September 2017)

FMU Amalgamation – Quota Allocations

Type: □ Requires Resolution √ Discussion Item

1 Description

In order to streamline the planning process, Weyerhaeuser will amalgamate its existing 5 Forest Management Units (FMUs) in the Edson (E15, E2, W5, W6) and Drayton Valley (R12) areas into a single FMU (R15) for the 2016 Forest Management Plan (FMP). Each of the existing FMUs, however contain one or more quota holders who share the FMU Annual Allowable Cut (AAC) with Weyerhaeuser. In addition, Weyerhaeuser intends to use a single combined landbase for the new FMU as opposed to the separate distinct deciduous and coniferous landbases currently applied in the Edson FMUs. The purpose of this document is to outline a process for determining timber allocation under a new single FMU with a combined landbase that ensures all timber rights are maintained. The Alberta Government and the quota holders will be consulted on the proposed changes prior to implementation in the final TSA process.

The process was repeated to reflect the final net landbase (v8) in September 2017. Tables in this document were updated with the results.

2 Current Tenure Holders and Allocations

Table 1 lists all current holders of tenure on the FMA area, including non-FMA tenure held by Weyerhaeuser on each of the FMUs. The non-FMA deciduous timber allocations (DTA) in FMU's E15, E2, W5 and W6 are currently incorporated in DTAE910001, while the non-FMA coniferous timber quotas (CTQ) in E15, E2, and W6 were never formally issued to Weyerhaeuser.

Table 1. Current tenure holders by FMU

FMU	Volume Sampling Area (VSA)	Tenure Holder Abbr.	Tenure Holder Name	Disposition No. / Tenure
E15	3	WY	Weyerhaeuser	FMA 0900046 DTA E910001 (Non-FMA) CTQ E01000x[3] (Non-FMA)
		BRIS	BRISCO Wood Preservers Ltd.	CTQ E150001[1]
E2	1	WY	Weyerhaeuser	FMA 0900046 DTA E910001 (Non-FMA) CTQ E02000x[3] (Non-FMA)
		EDFOR	Edfor Co-Operative Ltd.	CTQ E020002
		CTPP	Community Timber Permit Program	CTPP
W5	2	WY	Weyerhaeuser	FMA 0900046 DTA E910001 (Non-FMA)
		CTPP	Community Timber Permit Program	CTPP
W6	3	WY	Weyerhaeuser	FMA 0900046 DTA E910001 (Non-FMA) CTQ W06000x[3] (Non-FMA)
		MWI	Millar Western Forest Products Ltd.	CTQ W060002 CTQ W060012[2]
		BRL	Blue Ridge Lumber Inc.	CTQ W060010
		ANC	ANC Timber Ltd.	CTQ W060011
		CTPP	Community Timber Permit Program	CTPP
R12	4	WY	Weyerhaeuser	FMA 0900046 DTA R120001 (Non-FMA) CTQ R120005 (Non-FMA)
		DHL	Dale Hansen	CTQ R120001
		TPTL	Tall Pine Timber Co. Ltd.	CTQ R120002 CTQ R120003 CTQ R120004
		CTPP	Community Timber Permit Program	CTPP

[1] Formerly Edson Timber Products.
[2] Formerly Cold Creek Timber Ltd.
[3] CTQ E01000x, CTQ E02000x and CTQ W06000x were never issued.

While Weyerhaeuser's CTQs and DTAs on each of the FMUs are not included in their FMA agreement, they do form part of the FMU and are, therefore included in FMU AAC calculations.

Current allocations of coniferous and deciduous AACs to the various tenure holders are shown in Table 2 and Table 3 respectively. The tables do not separate out the potential 1% allocation of the FMA AAC for Local Use. The Local Use portion is included with Weyerhaeuser's allocation[1]. The allocations presented in the tables are inclusive of the grazing (non-FMA) dispositions on each FMU.

[1] The assumption is that the Local Use allocation would be clawed back from Weyerhaeuser only.

Table 2. Current coniferous AAC allocation by FMU.

FMU	Tenure Holder	Primary Conifer		Incidental Conifer		Total Conifer	
		Conifer Landbase	Allocation (% or m^3)	Deciduous Landbase	Allocation (% or m^3)	Combined Landbase	Allocation (% or m^3)
E15	WY	C	95.30%	D/DC/CD	100.00%		
	BRIS	C	4.70%	D/DC/CD			
E2	WY	C	14.91%	D/DC/CD	20.00%		
	EDFOR	C	78.60%	D/DC/CD	80.00%		
	CTPP	C	6.49%	D/DC/CD			
W5	WY	C/CD/DC		D			
	CTPP	C/CD/DC	100.0%	D	100.00%		
W6	WY	C/CD/DC	remainder	D	100.00%		
	ANC	C/CD/DC	43.14%	D			
	BRL	C/CD/DC	18.87%	D			
	CTPP	C/CD/DC	18,252m^3	D			
	MWI (02)	C/CD/DC	0.70%	D			
	MWI (12)	C/CD/DC	10,000m^3	D			
R12	WY					C/CD/DC/D	remainder
	DHL					C/CD/DC/D[1]	1.76%
	TPTL (02)					C/CD/DC/D[1]	3.23%
	TPTL (03)					C/CD/DC/D[1]	0.67%
	TPTL (04)					C/CD/DC/D[1]	2.30%
	CTPP					C/CD/DC/D[1]	4,000m^3

[1] DHL, TPTL and CTPP volumes sourced from C and CD stands only.

Table 3. Current deciduous AAC allocation by FMU.

FMU	Tenure Holder	Primary Deciduous		Incidental Deciduous		Total Deciduous	
		Deciduous Landbase	Allocation (% or m^3)	Conifer Landbase	Allocation (% or m^3)	Combined Landbase	Allocation (% or m^3)
E15	WY	D/DC/CD	100.00%	C	100.00%		
	BRIS	D/DC/CD		C			
E2	WY	D/DC/CD	remainder	C	100.00%		
	EDFOR	D/DC/CD		C			
	CTPP	D/DC/CD	1,500m^3	C			
W5	WY	D	remainder	C/CD/DC			
	CTPP	D	4,000m^3	C/CD/DC	100.0%		
W6	WY	D	100.00%	C/CD/DC	remainder		
	ANC	D		C/CD/DC			
	BRL	D		C/CD/DC			
	CTPP	D		C/CD/DC	17,591m^3		
	MWI	D		C/CD/DC			
R12	WY					C/CD/DC/D	100.00%
	DHL					C/CD/DC/D	
	TPTL					C/CD/DC/D	
	CCTP					C/CD/DC/D	

Table 4 shows the final allocations based on the Drayton Valley 2000 FMP and Edson 2006 FMP AACs. The volumes and percentages align with the approval decision allocation tables for each of the FMP's.

Table 4. Net timber allocations by FMU for 2000/2006 FMP data

FMU	Tenure Holder	Conifer						Deciduous					
		Primary		Incidental		Total		Primary		Incidental		Total	
		m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%
E15	WY	62,226	95.30%	24,563	100.00%	86,789	96.58%	22,140	100.00%	11,733	100.00%	33,873	100.00%
	BRIS	3,069	4.70%			3,069	3.42%						
	Total	**65,295**	**100.00%**	**24,563**	**100.00%**	**89,858**	**100.00%**	**22,140**	**100.00%**	**11,733**	**100.00%**	**33,873**	**100.00%**
E2	WY	5,941	14.91%	7,604	20.00%	13,545	17.40%	82,230	100.00%	5,371	78.17%	87,601	98.32%
	EDFOR	31,318	78.60%	30,414	80.00%	61,732	79.28%						
	CTTP	2,586	6.49%			2,586	3.32%			1,500 *	21.83%	1,500	1.68%
	Total	**39,845**	**100.00%**	**38,018**	**100.00%**	**77,863**	**100.00%**	**82,230**	**100.00%**	**6,871**	**100.00%**	**89,101**	**100.00%**
W5	WY							34,107	89.50%			34,107	69.00%
	CTTP	22,116	100.00%	7,878	100.00%	29,994	100.00%	4,000 *	10.50%	11,324	100.00%	15,324	31.00%
	Total	**22,116**	**100.00%**	**7,878**	**100.00%**	**29,994**	**100.00%**	**38,107**	**100.00%**	**11,324**	**100.00%**	**49,431**	**100.00%**
W6	WY	31,409	19.63%	26,656	100.00%	58,065	31.11%	83,889	100.00%	43,555	71.23%	127,444	87.87%
	ANC	69,021	43.14%			69,021	36.98%						
	BRL	30,190	18.87%			30,190	16.17%						
	CTTP	18,252 *	11.41%			18,252	9.78%			17,591 *	28.77%	17,591	12.13%
	MWI (02)	1,120	0.70%			1,120	0.60%						
	MWI (12)	10,000 *	6.25%			10,000	5.36%						
	Total	**159,992**	**100.00%**	**26,656**	**100.00%**	**186,648**	**94.64%**	**83,889**	**100.00%**	**61,146**	**100.00%**	**145,035**	**100.00%**
R12	WY					446,356	91.22%					286,149	100.00%
	DHL					8,600	1.76%						
	TPTL (02)					15,804	3.23%						
	TPTL (03)					3,278	0.67%						
	TPTL (04)					11,254	2.30%						
	CTTP					4,000 *	0.82%						
	Total					**489,292**	**100.00%**					**286,149**	**100.00%**
Total						**873,655**						**603,589**	

* Fixed volume allocations

3 Process for determining new allocations

There are essentially two components to this process, *i.e.*,

- Changing from multiple FMUs (5) to a single FMU means expressing volume allocations for each tenure holder as a percentage of a larger total AAC, and
- Moving from discrete coniferous and deciduous landbases in FMUs E15, E2, W5 and W6 to a single common landbase impacts the calculation and allocation of secondary volumes. The change to a single landbase was implemented in FMU R12 in December 2005.

Determining tenure holder allocations for a single landbase with all FMUs amalgamated will involve the following steps:

1. Determine new baseline AACs for each FMU based on the new landbase (Run 1).

The intent is to calculate new baseline 200 year AACs for each FMU using the new AVI, new net landbase and new yield information. The AACs will be calculated on an even flow basis using divided landbases for the Edson FMUs and a single common landbase for R12. All constraints and assumptions will be consistent among all FMUs to ensure consistency. This step is required as the current AACs are based on MPB surge cuts and the intent is to base tenure allocations on even flow AAC levels.

2. **Apply existing allocation percentages to the FMU AACs calculated in step 1.**

   The second step is to apply the conifer and deciduous allocation percentages presented in Table 2 and Table 3 respectively to the net AACs from step 1. Primary and incidental AACs will be summed by FMU to produce a total percent allocation by operator.

3. **Determine new baseline AACs for each of the Edson FMUs (E15, E2, W5 and W6) based on a single landbase (Run 2).**

   The intent is to calculate new baseline AACs for each of the Edson FMUs as in step 1 but using a single landbase. The AACs will be calculated on an even flow basis with all constraints and assumptions being applied consistently among all FMUs.

4. **Apply allocation percentages from step 2 to the FMU AACs calculated in step 3.**

   Total conifer and deciduous allocations by FMU calculated in step 2 will be applied to the FMU AACs from step 3. FMU R12's allocations will not be affected by this step.

5. **Summarize volume allocations for each tenure holder calculated in step 4.**

   The volume allocations by tenure holder for each FMU calculated in step 4 will be summed to provide new proportional allocations based on one FMU. Fixed allocation volumes will be carried forward with no change. Weyerhaeuser's percent allocations may change as a result of these fixed allocations.

6. **Determine new baseline AAC for a single FMU based on a single landbase (Run 3).**

   The allocations by tenure calculated in the previous step are based on volumes calculated from separate FMUs. This step is necessary to calculate baseline AACs for a single FMU.

7. **Apply the allocation percentages from step 5 to the single FMU AACs calculated in step 6.**

   The allocations by tenure calculated in the previous step are applied to the AACs calculated for the single FMU based on a single common landbase. This step will generate the final combined tenure holder allocation percentages which can be applied to the final PFMS and other timber supply scenarios run during the FMP process.

8. **Apply FMU allocations by tenure to the PFMS.**

   The final step will be to apply the allocations by tenure calculated in the previous step to the final PFMS AACs calculated for the FMU on a single landbase.

Figure 1 provides an illustration of the process described above. The process steps are described in more detail in the following sections.

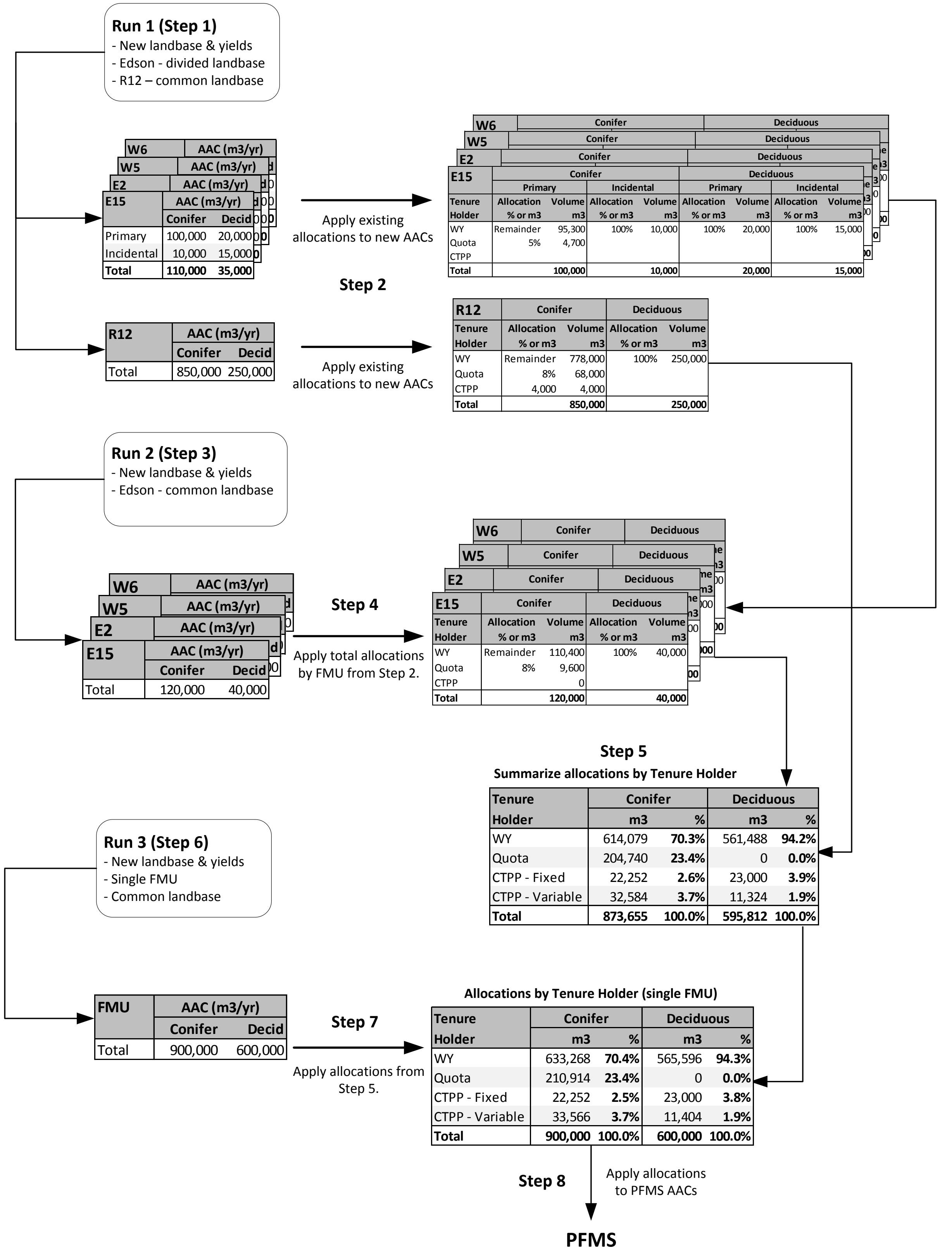

Figure 1. Illustration of process for determining new allocations

Step 1 – Determine new baseline AACs for each FMU based on the new landbase (Run 1).

The first step was to run TSA models[2] to determine revised baseline AACs for each FMU using the new AVI, new net landbase and new yield information. For the Edson FMUs (E15, E2, W5 and W6) a divided landbase based on the same criteria as was applied in the previous TSA was used. In R12 a single common landbase was used to maintain consistency with the previous TSA.

Quota holder volumes are historically based on a percentage of the FMU AAC, ie. including both the FMA and non-FMA portions. In previous submissions, the TSA models included both the FMA and non-FMA portions for each FMU with the non-FMA portion contributing to the total harvest level using the same operability criteria as the FMA portion. While quota holders are entitled to a portion of both the FMA and non-FMA harvests, the quota holder operating areas generally do not extend into the grazing (non-FMA) areas. In practice the non-FMA portion of the harvest that is allocated to quota holders will be part of their total allocation which may be sourced from their traditional areas on the FMA. This suggests that the distinction between FMA and non-FMA portions of the FMU AAC can be ignored for calculating allocations[3].

The following modeling assumptions and inputs were used for the TSA analysis:

- Landbase - Version 8 of the net landbase. Includes minor changes from version 5 that received A-I-P on March 28, 2017.
- Yield Curves - A-I-P received on March 28, 2017. Includes natural (NAT), managed pre-91 (M91) and managed post-91 (RSA) yield curves. Adjustments were made to the yield curves to include cull deductions and seismic line reductions for NAT and M91 curves.
- Objective
  - Run 1
    - E15, E2, W5 and W6 - maximize total primary harvest (coniferous + deciduous)
    - R12 - maximize total harvest (coniferous + deciduous)
  - Runs 2 & 3
    - Maximize total harvest (coniferous + deciduous)
- Constraints
  - Run 1
    - E15, E2, W5 and W6 - even flow (± 5%) on primary volumes
    - E15, E2, W5 and W6 - even flow (± 10%) on incidental volumes
    - R12 - even flow (± 5%) total coniferous and total deciduous harvest levels
  - Runs 2 & 3
    - Even flow (± 5%) total coniferous and total deciduous harvest levels
  - Non-declining operable growing stock for the last 50 years of the planning horizon
  - Minimum 5% old seral stage by ecological unit on the active landbase[4].
    - Old seral stage - > 140 years for PL, SW, CX, CD and > 120 years for DC, D.
- Assumptions
  - 200 year planning horizon (40 5 year periods)
  - Minimum harvest ages; C, CD, DC – 81 years; D – 71 years
  - No targeting of MPB susceptible stands.

[2] Remsoft's Woodstock v.2017.01 was used to determine non-spatial AACs for all timber supply model runs in this analysis.
[3] The distinction between FMA and non-FMA AACs remains relevant for the calculation of Local Use volumes which are prescribed in the FMA agreement at 1% of the FMA AAC. For the purposes of this analysis, Local Use volumes are, however, assumed to be included in Weyerhaeuser's portion of the AAC.
[4] This constraint could not be met in period 1 for a few ecological units in all FMUs in Runs 1 & 2.

- Run 1
  - Coniferous landbase – E2 & E15 : C only, W5 : C, CD & DC, W6 : C, CD, DC & D stands with C, CD or DC understorey with B, C or D understorey density.
  - Deciduous landbase - E2 & E15 : CD, DC & D, W5 : D, W6 : D stands that do not meet the criteria for a coniferous landbase.
- Death ages; C & CD – 300 years; DC & D – 200 years on active landbase
- Succession – based on transition matrix in yield curve development document (pg 93). Transition to RSA curves of the same stratum post harvest. Includes genetic gain for Sw stands within the I1 seed zone.
- No surge cut or unused volumes included.

Table 5 summarizes the AACs for each FMU based on a divided landbase for the Edson FMUs and a common landbase for R12. The calculated AACs were reduced by 4% to allow for structure retention.

Table 5. Net* AACs by FMU (Revised)

FMU	Conifer			Deciduous		
	Primary m3/yr	Incidental m3/yr	Total m3/yr	Primary m3/yr	Incidental m3/yr	Total m3/yr
E15	92,218	16,306	108,524	27,841	11,915	39,756
E2	57,616	32,269	89,885	81,572	8,976	90,548
W5	31,815	7,224	39,039	22,664	12,599	35,262
W6	175,914	15,352	191,266	48,922	71,607	120,529
R12			579,590			304,710
Total	**357,563**	**71,150**	**1,008,304**	**180,999**	**105,097**	**590,805**

* Net of cull and retention (4%) deductions

Step 2 – Apply existing allocation percentages to the FMU AACs calculated in step 1.

The second step applied the conifer and deciduous allocation percentages shown in Table 4 to the net AACs from Step 1. The outcome of this step is summarized in Table 6. No distinction is made between FMA and non-FMA portions as the allocations are based on the total FMU AAC.

Table 6. Net timber allocations based on separate FMUs (Revised)

FMU	Tenure	Conifer						Deciduous					
	Holder	Primary		Incidental		Total		Primary		Incidental		Total	
		m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%	m3/yr	%
E15	WY	87,884	95.30%	16,306	100.00%	104,190	96.01%	27,841	100.00%	11,915	100.00%	39,756	100.00%
	BRIS	4,334	4.70%			4,334	3.99%						
	Total	**92,218**	**100.00%**	**16,306**	**100.00%**	**108,524**	**100.00%**	**27,841**	**100.00%**	**11,915**	**100.00%**	**39,756**	**100.00%**
E2	WY	8,591	14.91%	6,454	20.00%	15,045	16.74%	81,572	100.00%	7,476	83.29%	89,048	98.34%
	EDFOR	45,286	78.60%	25,815	80.00%	71,101	79.10%						
	CTTP	3,739	6.49%			3,739	4.16%			1,500 *	16.71%	1,500	1.66%
	Total	**57,616**	**100.00%**	**32,269**	**100.00%**	**89,885**	**100.00%**	**81,572**	**100.00%**	**8,976**	**100.00%**	**90,548**	**100.00%**
W5	WY							18,664	82.35%			18,664	52.93%
	CTTP	31,815	100.00%	7,224	100.00%	39,039	100.00%	4,000 *	17.65%	12,599	100.00%	16,599	47.07%
	Total	**31,815**	**100.00%**	**7,224**	**100.00%**	**39,039**	**100.00%**	**22,664**	**100.00%**	**12,599**	**100.00%**	**35,262**	**100.00%**
W6	WY	37,346	21.23%	15,352	100.00%	52,698	27.55%	48,922	100.00%	54,016	75.43%	102,938	85.41%
	ANC	75,890	43.14%			75,890	39.68%						
	BRL	33,194	18.87%			33,194	17.36%						
	CTTP	18,252 *	10.38%			18,252	9.54%			17,591 *	24.57%	17,591	14.59%
	MWI (02)	1,231	0.70%			1,231	0.64%						
	MWI (12)	10,000 *	5.68%			10,000	5.23%						
	Total	**175,914**	**100.00%**	**15,352**	**100.00%**	**191,266**	**94.77%**	**48,922**	**100.00%**	**71,607**	**100.00%**	**120,529**	**100.00%**
R12	WY					529,469	91.35%					304,710	100.00%
	DHL					10,187	1.76%						
	TPTL (02)					18,721	3.23%						
	TPTL (03)					3,883	0.67%						
	TPTL (04)					13,331	2.30%						
	CTTP					4,000 *	0.69%						
	Total					**579,590**	**100.00%**					**304,710**	**100.00%**
Total						**1,008,304**						**590,805**	

* Fixed volume allocation
Weyerhaeuser AACs include the 1% Local Use allocation.

Step 3 - Determine new baseline AACs for each of the Edson FMUs (E15, E2, W5 and W6) based on a single landbase (Run 2).

The third step was to run TSA models to determine revised baseline AACs for each of the Edson FMUs using the new AVI, new net landbase and new yield information but using a single landbase. The same inputs and assumptions used in step 1 were used. The objective and harvest flow constraints for the Edson FMUs were however changed to the same as those used for the R12 FMU to be consistent with a single landbase. The calculated AACs are as shown in Table 7.

Table 7. Net AAC by FMU based on a single landbase (Revised)

FMU	Conifer	Deciduous
	Total	Total
	m3/yr	m3/yr
E15	116,040	39,295
E2	93,924	91,400
W5	40,381	44,252
W6	200,841	140,590
R12	579,590	304,710
Total	**1,030,776**	**620,246**

Step 4 – Apply allocation percentages from step 2 to the FMU AACs calculated in step 3.

The percentages calculated for the total of the primary and incidental volumes for both coniferous and deciduous in step 2 (Table 6) is applied to the total conifer and deciduous AACs from run 2 for each FMU, by operator. The results are shown in Table 8.

Table 8. Net timber allocations for separate FMUs using single landbase AACs. (Revised)

FMU	Tenure Holder	Conifer m3/yr	Conifer %	Deciduous m3/yr	Deciduous %
E15	WY	111,406	96.01%	39,295	100.00%
	BRIS	4,635	3.99%		
	Total	**116,040**	**100.00%**	**39,295**	**100.00%**
E2	WY	15,721	16.74%	89,900	98.36%
	EDFOR	74,295	79.10%		
	CTTP	3,907	4.16%	1,500 *	1.64%
	Total	**93,924**	**100.00%**	**91,400**	**100.00%**
W5	WY			24,442	55.23%
	CTTP (F)			4,000 *	9.04%
	CTTP (V)	40,381	100.00%	15,810	35.73%
	Total	**40,381**	**100.00%**	**44,252**	**100.00%**
W6	WY	56,751	28.26%	122,999	87.49%
	ANC	79,689	39.68%		
	BRL	34,856	17.36%		
	CTTP	18,252 *	9.09%	17,591 *	12.51%
	MWI (02)	1,293	0.64%		
	MWI (12)	10,000 *	4.98%		
	Total	**200,841**	**100.00%**	**140,590**	**100.00%**
R12	WY	529,469	91.35%	304,710	100.00%
	DHL	10,187	1.76%		
	TPTL (02)	18,721	3.23%		
	TPTL (03)	3,883	0.67%		
	TPTL (04)	13,331	2.30%		
	CTTP	4,000 *	0.69%		
	Total	**579,590**	**100.00%**	**304,710**	**100.00%**
Total		**1,030,776**		**620,246**	

* Fixed volume allocation
Weyerhaeuser AACs include the 1% Local Use allocation.

Step 5 – Summarize volume allocations for each tenure holder calculated in step 4.

The total volume allocations by FMU calculated in the previous step are summarized to produce proportional allocations by tenure holder for a single undivided landbase for the new FMU. Table 9 shows the allocations by tenure holder for the FMU. As CTTP allocations are specific to volume supply areas[5] and may include both fixed and variable portions, they have been kept separate on this basis so that the geographical allocation of these volumes can be maintained.

[5] Appendix D of the FMA agreement

Table 9. Allocations by tenure based on separate FMUs with single landbases (Revised)

Tenure Holder	Conifer		Deciduous	
	m3/yr	% of FMU AAC	m3/yr	% of FMU AAC
Weyerhaeuser	713,346	69.20%	581,345	93.73%
BRISCO Wood Preservers	4,635	0.45%		
Edfor Co-Operative Ltd.	74,295	7.21%		
Blue Ridge Lumber Inc.	34,856	3.38%		
ANC Timber Ltd.	79,689	7.73%		
Millar Western (CTQ W060002)	1,293	0.13%		
Millar Western (CTQ W060012) - Fixed	10,000	0.97%		
Dale Hansen	10,187	0.99%		
Tall Pine Timber Co. Ltd.(CTQ R120002)	18,721	1.82%		
Tall Pine Timber Co. Ltd.(CTQ R120003)	3,883	0.38%		
Tall Pine Timber Co. Ltd.(CTQ R120004)	13,331	1.29%		
CTTP(VSA1) - Fixed			1,500	0.24%
CTTP(VSA1) - Variable	3,907	0.38%		
CTTP(VSA2) - Fixed			4,000	0.64%
CTTP(VSA2) - Variable	40,381	3.92%	15,810	2.55%
CTTP(VSA3) - Fixed	18,252	1.77%	17,591	2.84%
CTTP(VSA3) - Variable				
CTTP(VSA4) - Fixed	4,000	0.39%		
CTTP(VSA4) - Variable				
Total	**1,030,776**	**100.0%**	**620,246**	**100.0%**

Step 6 - Determine new baseline AAC for a single FMU based on a single landbase (Run 3).

The sixth step was to run the TSA model to determine revised baseline AACs for a single combined FMU (R15) using the new AVI, new net landbase and new yield information and based on a single landbase. The same inputs and assumptions used in step 1 were applied. The calculated AACs are shown in Table 10.

Table 10. Net AACs for a single FMU (R15) and single landbase (Revised)

Species	Volume m^3/yr
Coniferous	1,064,966
Deciduous	633,629

Includes both FMA and non-FMA contributions to AAC.

Step 7 – Apply the allocation percentages from step 5 to the single FMU AACs calculated in step 6.

The allocations by tenure holder calculated in step 5 (Table 9) are applied to the single FMU AACs calculated in the previous step. Table 11 shows the allocations by tenure holder for the FMU based on the AACs from Table 10. Fixed volume allocations are applied first, followed by percentage allocations for all tenure holders except Weyerhaeuser. Weyerhaeuser's allocation is calculated by subtracting the sum of all the other tenure holder volumes from the total AAC. CTTP allocations remain specific to volume supply areas so that the geographical allocation of these volumes can be maintained if necessary.

Table 11. Allocations by tenure based on a single FMU with single landbase (Revised)

Tenure Holder	Conifer		Deciduous	
	m3/yr	% of FMU AAC	m3/yr	% of FMU AAC
Weyerhaeuser	738,076	69.31%	594,678	93.81%
BRISCO Wood Preservers	4,788	0.45%		
Edfor Co-Operative Ltd.	76,760	7.21%		
Blue Ridge Lumber Inc.	36,012	3.38%		
ANC Timber Ltd.	82,332	7.73%		
Millar Western (CTQ W060002)	1,336	0.13%		
Millar Western (CTQ W060012) - Fixed	10,000	0.94%		
Dale Hansen	10,525	0.99%		
Tall Pine Timber Co. Ltd.(CTQ R120002)	19,342	1.82%		
Tall Pine Timber Co. Ltd.(CTQ R120003)	4,012	0.38%		
Tall Pine Timber Co. Ltd.(CTQ R120004)	13,773	1.29%		
CTTP(VSA1) - Fixed			1,500	0.24%
CTTP(VSA1) - Variable	4,037	0.38%		
CTTP(VSA2) - Fixed			4,000	0.63%
CTTP(VSA2) - Variable	41,720	3.92%	16,159	2.55%
CTTP(VSA3) - Fixed	18,252	1.71%	17,591	2.77%
CTTP(VSA3) - Variable				
CTTP(VSA4) - Fixed	4,000	0.38%		
CTTP(VSA4) - Variable				
Total	**1,064,966**	**100.0%**	**633,929**	**100.0%**

1% Local Use included in Weyerhaeuser AACs.

This step is done independently of the final PFMS calculations to ensure that the allocations are based on baseline conditions, *i.e.* even flow harvest and are not influenced by management strategies such as surge cutting which may be included in the PFMS.

Step 8 – Apply FMU allocations by tenure to the PFMS.

The final step will be to apply the allocations by tenure calculated in the previous step to the final PFMS AACs calculated for the FMU on a single landbase.

4 Comments

The process described addresses the calculation of new quota allocations under a single FMU (R15) and a common landbase. However, it does not address;

- the spatial application of each quota holder's AAC, *ie*. what proportion of their allocation may have to come from their traditional operating areas, or
- the specific stand types that quota holder volumes should be sourced from, as defined in Table 2 and Table 3.

This will require negotiation with quota holders to determine how flexible they may or may not be with regard to these issues. Once agreement is reached the TSA process will be managed to ensure that sufficient volume is sequenced for each quota holder in their agreed geographical areas and stand types.

PDT AIP May 11, 2017

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Appendix II – TSA-002: Weyerhaeuser Non-FMA AACs.

Issue Number: TSA-002

Weyerhaeuser Non-FMA AACs

Type: √ Requires Resolution ☐ Discussion Item

1 Background

Weyerhaeuser has Coniferous Timber Quota (CTQ) and Deciduous Timber Allocation (DTA) certificates within each of the 5 FMUs making up the FMA (with the exception of W5 where there is no CTQ). These certificates allow Weyerhaeuser to access timber in grazing dispositions and other areas that fall outside the FMA boundary within each of the FMUs. All other timber operators also have the right to access timber in grazing dispositions that are not within the FMA boundary as timber rights are associated with FMUs, not FMAs. The only exception to this is the Local Use program, which is entitled to 1% of Weyerhaeuser's FMA AAC.

While the landbase netdown process will identify the dispositions that fall within or outside the FMA boundary, all forested dispositions within the FMU will be included in the FMU AAC calculation based on the same operability criteria as used for the FMA. Separate AACs will need to be calculated for the FMA area and for the dispositions that fall outside the FMA boundary but within the FMU.

In the previous FMP (specifically for Edson) separate TSA model runs were completed for the FMA and non-FMA areas and then summed to obtain the total FMU/SYU AAC. This was done in order to even flow the harvest within the grazing dispositions and was a complicated process as many of the model constraints and assumptions, for example old growth, had to be removed in order to allow the model to obtain a solution for such a small area. From a sustainability perspective, the grazing areas form part of the broader FMU/SYU and should be treated the same as any other stand on the FMU.

Although the timber operators are entitled to a portion of both the FMA and non-FMA AAC, in practice their operating areas often do not extend into the grazing areas. For this reason timber operators traditionally obtain their total allocation from the FMA area while Weyerhaeuser operates on the non-FMA areas.

2 Recommendation

For the 2016 FMP it is recommended that the non-FMA AAC be calculated non-spatially based on a baseline model that excludes any potential surge cuts. This will be achieved by completing two TSA model runs to determine the non-spatial AACs for the larger FMU/SYU (including dispositions outside the FMA area) and FMA (excluding dispositions outside the FMA area) areas using the same operability criteria, assumptions and constraints for both; with the difference between the two calculated AACs being the non-FMA AAC, *i.e.*,

Non-FMA AAC = FMU/SYU AAC – FMA AAC

Where :

- *FMU/SYU AAC* includes the FMA area and non-FMA grazing and other dispositions, and
- *FMA AAC* includes the FMA area only.

The PFMS and final SHS development will, however be completed spatially for the entire FMU/SYU area, *i.e.* inclusive of the non-FMA areas. AAC allocations to tenure holders will be based on the spatial FMU/SYU AACs as all Quota Holders and Weyerhaeuser have rights to both the FMA and non-FMA portions of the AAC. All tenure holders will be allocated volumes within their traditional operating areas on the FMU/SYU, which may include non-FMA areas as well. As the non-FMA portion will be scheduled in the PFMS SHS as part of the total SHS development, the SHS volumes from non-FMA areas will vary from the 200 year average AACs calculated for the non-FMA areas.

3 Resolution

At a meeting on Dec 1, 2014, ESRD provided their recommended approach as follows:

- Calculate even flow AAC for the entire FMU/DFA.
- Allocate the cut spatially for 70 years (or longer in Patchworks), including all non-FMA stands.
- Calculate the FMU proposed harvest level based on the average of the harvest schedule.
- Apportion the QHs their volume based off the percentage of the FMU flow, with the remainder of the volume assigned to the FMA holder.
- Assign blocks to Quota Holders across the DFA, to within +/- 5% of the target volume.
- Confirm that the remaining blocks inside the FMA provide adequate volume to the FMA holder.
- If the model didn't provide adequate volume inside the FMA, a minimum volume constraint might be needed.

Revised PDT AIP, September 14, 2017

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Appendix III – TSA-004: Combined Landbases (Edson FMUs)

Weyerhaeuser

Issue Number: TSA-004

Combined Landbases (Edson FMUs)

Type: √ Requires Resolution ☐ Discussion Item

1 Background

In the previous Forest Management Plan (FMP) for the Edson Forest Management Agreement (FMA), Forest Management Units (FMUs) for E15, E2, W5 and W6 were modeled as divided coniferous and deciduous landbases. For each FMU, four different Annual Allowable Cuts (AACs) (primary conifer, secondary conifer, primary deciduous and secondary deciduous) were calculated and had to be monitored for each FMU and each operator on each FMU. The previous Drayton Valley FMP, however used a combined landbase for FMU R12 resulting in only two AACs (total conifer and total deciduous) for the FMA.

With the amalgamation of the Edson and Drayton Valley FMAs into a single Pembina FMA on December 1, 2009, Weyerhaeuser is proposing a standardized approach for modeling and managing all FMU landbases based on a combined landbase approach, consistent with the approach used in R12. This will help to avoid the administrative complexities, such as:

- Managing two distinctly different landbase systems – i.e. R12 as compared to the remaining four FMUs
- Assigning and accounting for secondary AAC volume that fluctuates dramatically year to year, thereby making it difficult to manage the intent of AAC (i.e. quadrant reconciliation)

The purpose of this document is to discuss the potential implications on AAC and timber allocations of changing the Edson FMUs from divided to combined landbases for the 2016 FMP. ESRD requires that Quota Holders be fully informed and in agreement with this change prior to moving forward with the TSA process.

This combined landbase issue is an independent issue from the FMU amalgamation discussion which deals with combining all 5 FMUs into a single FMU/SYU for modeling and AAC determination purposes, nor is it contingent upon the amalgamation of the FMUs. Should both of these issues be approved then a single FMU with a combined landbase will be modeled for AAC calculation.

2 Current Quota Holders and Allocations

Table 1 and Table 2 provide details of current coniferous and deciduous allocations respectively. Only Quota Holders in FMUs E15, E2, and W6 will be impacted by the change from a divided to combined landbase. Quota Holders in R12 will not be impacted as it is already managed as a combined landbase.

In the Edson FMUs, a majority of the coniferous Quota Holders currently have rights to primary coniferous timber only. This includes ETP (E15), ANC (W6), BRL (W6) and MWI/CCTL (W6). Only EDFOR

(E2), CTPP (W5) and Weyerhaeuser (E15, E2 & W6) have rights to both primary and secondary timber volumes.

Only Weyerhaeuser and CTPP have rights to deciduous timber on the FMA. CTPP (E2) has a fixed primary deciduous allocation, CTPP (W5) has a fixed primary allocation and gets all deciduous secondary while CTPP (W6) has a fixed secondary deciduous allocation. Weyerhaeuser holds the rights to all other deciduous.

The tables do not separate out the potential 1% allocation of the FMA AAC to the Local Use program. The Local Use portion is included with Weyerhaeuser's allocation. The allocations presented in the tables are inclusive of the grazing (non-FMA) dispositions on each FMU.

Table 1. Current coniferous AAC allocation by FMU.

FMU	Tenure Holder	Primary Conifer		Secondary Conifer		Total Conifer	
		Conifer Landbase	Allocation (% or m^3)	Deciduous Landbase	Allocation (% or m^3)	Combined Landbase	Allocation (% or m^3)
E15	WY	C	95.30%	D/DC/CD	100.00%		
	ETP	C	4.70%	D/DC/CD			
E2	WY	C	14.91%	D/DC/CD	20.00%		
	EDFOR	C	78.60%	D/DC/CD	80.00%		
	CTPP	C	6.49%	D/DC/CD			
W5	WY	C/CD/DC		D			
	CTPP	C/CD/DC	100.0%	D	100.00%		
W6	WY	C/CD/DC	remainder	D	100.00%		
	ANC	C/CD/DC	43.14%	D			
	BRL	C/CD/DC	18.87%	D			
	CCTL*	C/CD/DC	10,000m^3	D			
	CTPP	C/CD/DC	18,252m^3	D			
	MWI	C/CD/DC	0.70%	D			
R12	WY					C/CD/DC/D	remainder
	DHL					C/CD/DC/D	1.76%
	TPTL					C/CD/DC/D	6.20%
	CTPP					C/CD/DC/D	4,000m^3

* Now part of MWI

Table 2. Current deciduous AAC allocation by FMU.

FMU	Tenure Holder	Primary Deciduous		Secondary Deciduous		Total Deciduous	
		Deciduous Landbase	Allocation (% or m³)	Conifer Landbase	Allocation (% or m³)	Combined Landbase	Allocation (% or m³)
E15	WY	D/DC/CD	100.00%	C	100.00%		
	ETP	D/DC/CD		C			
E2	WY	D/DC/CD	remainder	C	100.00%		
	EDFOR	D/DC/CD		C			
	CTPP	D/DC/CD	1,500m³	C			
W5	WY	D	remainder	C/CD/DC			
	CTPP	D	4,000m³	C/CD/DC	100.0%		
W6	WY	D	100.00%	C/CD/DC	remainder		
	ANC	D		C/CD/DC			
	BRL	D		C/CD/DC			
	CCTL*	D		C/CD/DC			
	CTPP	D		C/CD/DC	17,591m³		
	MWI	D		C/CD/DC			
R12	WY					C/CD/DC/D	100.00%
	DHL					C/CD/DC/D	
	TPTL					C/CD/DC/D	
	CCTP					C/CD/DC/D	

* Now part of MWI

3 Discussion

Table 3 provides a comparison of divided and combined landbases based on a few key topics.

Table 3. Comparison of divided and combined landbases

Topic	Divided Landbase	Combined Landbase
Current Application	Currently used for the Edson FMUs, *i.e.* E15, E2, W5 and W6.	Currently used in R12 (Drayton Valley).
Annual Allowable Cut (AAC)	TSA objective is normally to maximize primary volumes only. In the current Edson FMP, secondary volumes were even flowed with 10% variation allowed.	TSA objective is normally to maximize total volumes (conifer and deciduous separately). Changing to a combined landbase is expected to be AAC neutral for the Edson FMUs. (See Appendix 1 for analysis).
Volume Allocations	Quota Holders may be allocated primary volumes only, secondary volumes only, or both. Current volume allocations for the Edson FMUs are indicated in Table 1 and Table 2 for coniferous and deciduous timber respectively.	Quota Holders are allocated total (primary and secondary) volumes based on species type i.e. coniferous and/or deciduous. The fixed or variable allocations specific to each Quota Holder (Table 1 and Table 2) will be maintained. However, as

Topic	Divided Landbase	Combined Landbase
		there will no longer be any distinction between primary and secondary volumes, existing allocations (primary + secondary) will be summed to determine new total allocations based on a combined landbase.
Stand Type Sequencing	On a divided landbase stands are sequenced based on the landbase type *i.e.* coniferous or deciduous. Quota Holders have been sequenced into stands that define the landbase, as shown in Table 1 and Table 2 for the various FMUs. Quota Holders with rights to primary coniferous AAC, for example, would expect to operate on stand types that identify with the coniferous landbase. They are also expected to harvest the landbase profile.	On a combined landbase Quota Holders will be sequenced into stands based on broad cover group (BCG). The intent of the FMP will be to ensure that each operator is allocated the type of stands that best suits their operational needs, i.e. conifer operators will be sequenced into C/CD stands to fulfill their volume requirements. If, after this has been done, there is insufficient conifer to satisfy the AAC requirements for any operator, some DC stands may also be sequenced in order to meet these requirements. Similarly, some embedded stands (DC) may be sequenced to the conifer operator where it makes operational sense to do so. Deciduous operators will be sequenced in D/DC stands, as well as isolated CD stands consistent with conifer sequencing protocols. Changing to a combined landbase is expected to make little difference to strata sequencing and operability and will be managed during the development of the SHS.
Management of Secondary Volume Production	Primary coniferous and deciduous operators are responsible to integrate with other operators the secondary volumes generated from their operations.	Operators will be responsible to integrate their operations for the secondary volumes generated from their operations.
AAC Chargeability	For the Edson FMUs, separate primary and secondary AACs exist and all volumes are currently chargeable to their respective AACs.	AACs will be determined for total coniferous and deciduous volumes. All harvested volumes will be chargeable to either a coniferous or deciduous operator’s AAC.

4 Summary

Changing from a divided to a combined landbase will have little impact on the AAC or the stand types currently operated by each of the Quota Holders on the Edson FMUs. Administratively, combined landbases bring advantages of:

- Reduced annual tracking and quadrant cut-control calculations as two volume pools (primary and secondary) are reduced to one.
- More accurate estimate and control of total AACs

For Weyerhaeuser specifically, changing to combined landbases will bring consistency to their management and reporting process as R12 is already managed as a combined landbase.

5 Recommendation

Weyerhaeuser is recommending proceeding with the intention to model all FMUs based on a combined landbase approach in the 2016 FMP (Scenario #2 in Appendix 1). On December 23, 2014 this document was sent out to all Quota Holders in the old Edson FMA (Pembina North), with the intent of gaining acceptance of this recommendation. Quota Holders in R12 already operate under a combined landbase.

The following feedback was received:

- ANC – OK if WY is willing to maximize the conifer AAC (see scenario #3)
- BRL – OK with the proposal
- MWI – OK with the proposal
- BRISCO – OK if WY is willing to maximize the conifer AAC (see scenario #3)
- EDFOR – Not in favour of proposal
- CTPP – no feedback requested as per Issues List

6 Resolution

GOA will not provide direction on this issue. It is their position that this is a decision Weyerhaeuser will have to make with input from the affected Quota Holders.

Weyerhaeuser's decision, therefore, is to combine the currently divided landbases into single landbases using scenario #2 to establish the baseline AAC's for each of the old Edson FMA FMU's (E15, E2, W5 and W6), utilizing the new AVI, new yield curves and new net land bases. Alternative scenarios will be discussed as part of the timber supply analysis process leading to the Preferred Forest Management Strategy (PFMS).

Appendix I. Divided vs. Single Landbase - Analysis of AAC Impact.

Background

In order to demonstrate the degree of impact on AAC of moving from a divided to a single landbase on Weyerhaeuser's Edson FMUs (E15, E2, W5 and W6) timber supply model runs were required. As the AVI and net landbase for the new FMP are far from completion, the only timber supply models available for this analysis are those used for the 2007 MPB plan.

Methods

The 2007 MPB plan non-spatial Woodstock models for each of the four FMUs were used as the base for this analysis. Model changes were limited to the OPTIMIZE and LpSCHEDULE sections for each of the models.

OPTIMIZE section changes included:

- The objective was amended to reflect the volume to be maximized depending on the scenario,
- All surge cut constraints were removed,
- Constraints targeting the harvesting of MPB susceptible stands were removed,
- Constraints targeting the harvesting of unscheduled planned blocks were removed.

All other constraints, including seral stage, growing stock and harvest profile remained unchanged.

The LpSCHEDULE section was removed for each FMU, meaning that any planned or pre-blocks were not included in the model runs.

No other changes were made.

Scenarios

Table 4 outlines the assumptions for the four scenarios run for each FMU.

The planning horizon used in the model is 160 years, which is the same as the original MPB plan.

Table 4. Modeled scenarios

Scenario Number	1	2	3	4
Scenario Description	**Divided Landbase**	**Single Landbase**	**Single Landbase – Maximize Conifer**	**Single Landbase – Maximize Deciduous**
Objective	Maximize primary volumes (coniferous and deciduous)	Maximize total volume (coniferous and deciduous)	Maximize total coniferous volume	Maximize total deciduous volume
Constraints				
Volume	None	None	Total deciduous volume maintained at same level as scenario 1.	Total coniferous volume maintained at same level as scenario 1.
Volume flow	Even flow primary volumes. Even flow incidental volumes (10% flow variation allowed).	Even flow total coniferous and deciduous.	Even flow total coniferous and deciduous.	Even flow total coniferous and deciduous.
Growing Stock	Non-declining for the last 40 years, as per the 2007 MPB plan.	Non-declining for the last 40 years, as per the 2007 MPB plan.	Non-declining for the last 40 years, as per the 2007 MPB plan.	Non-declining for the last 40 years, as per the 2007 MPB plan.
Seral Stage	As per 2007 MPB plan	As per 2007 MPB plan	As per 2007 MPB plan	As per 2007 MPB plan
Harvest Profile	As per 2007 MPB plan	As per 2007 MPB plan	As per 2007 MPB plan	As per 2007 MPB plan

Results

Average annual harvest volumes over the 160 year period for each FMU and scenario are summarized in Table 5. Figures 1 to 4 show the annual harvest flows over the planning horizon for each scenario and FMU respectively.

The results indicate that changing to a single landbase (scenario 2) results in a marginal decline in the coniferous AAC for most scenarios, from 0.01% in E2 to 0.9% in E15. W5's conifer cut increases by 0.5%. Deciduous AAC increases in all FMUs, from 1% in E2 to 5% in W6.

When the conifer AAC is maximized on a single landbase while maintaining the deciduous cut at the divided landbase levels (scenario 3), the conifer AAC increases marginally in each FMU, from 0.2% in E15 to 1.6% in W5. Similarly, when the deciduous harvest is maximized (scenario 4), the deciduous AAC increases by between 0.9% in E2 to 3.4% in W6 while the conifer AAC is maintained at the divided landbase level.

In summary, based on the assumptions used in this analysis, it would appear that changing to a single landbase on the Edson FMUs could result in a marginal decline in coniferous harvest levels but may also produce slight increases in the deciduous harvest. These harvest level changes can, however be controlled by maximizing one or other species while maintaining the other at a pre-determined harvest level.

Table 5. Average annual harvest volumes.

FMU			Scenario						
			1. Divided LB Maximize Primary	2. Single LB Maximize Total		3. Single LB Maximize Conifer		4. Single LB Maximize Decid	
			m3/yr	m3/yr	%△	m3/yr	%△	m3/yr	%△
E15	Conifer	Primary	70,524						
		Incidental	16,879						
		Total	**87,403**	**86,623**	**-0.9%**	**87,593**	**0.2%**	**87,400**	**0.0%**
	Deciduous	Primary	28,198						
		Incidental	14,760						
		Total	**42,958**	**44,905**	**4.5%**	**43,000**	**0.1%**	**43,656**	**1.6%**
E2	Conifer	Primary	40,488						
		Incidental	36,605						
		Total	**77,093**	**77,082**	**0.0%**	**77,627**	**0.7%**	**77,100**	**0.0%**
	Deciduous	Primary	93,336						
		Incidental	8,714						
		Total	**102,049**	**103,031**	**1.0%**	**102,000**	**0.0%**	**103,013**	**0.9%**
W5	Conifer	Primary	22,547						
		Incidental	8,472						
		Total	**31,018**	**31,189**	**0.5%**	**31,514**	**1.6%**	**31,000**	**-0.1%**
	Deciduous	Primary	43,336						
		Incidental	10,230						
		Total	**53,567**	**54,972**	**2.6%**	**53,500**	**-0.1%**	**55,077**	**2.8%**
W6	Conifer	Primary	149,216						
		Incidental	22,183						
		Total	**171,399**	**170,426**	**-0.6%**	**171,920**	**0.3%**	**171,400**	**0.0%**
	Deciduous	Primary	94,657						
		Incidental	57,238						
		Total	**151,896**	**159,431**	**5.0%**	**152,000**	**0.1%**	**157,019**	**3.4%**

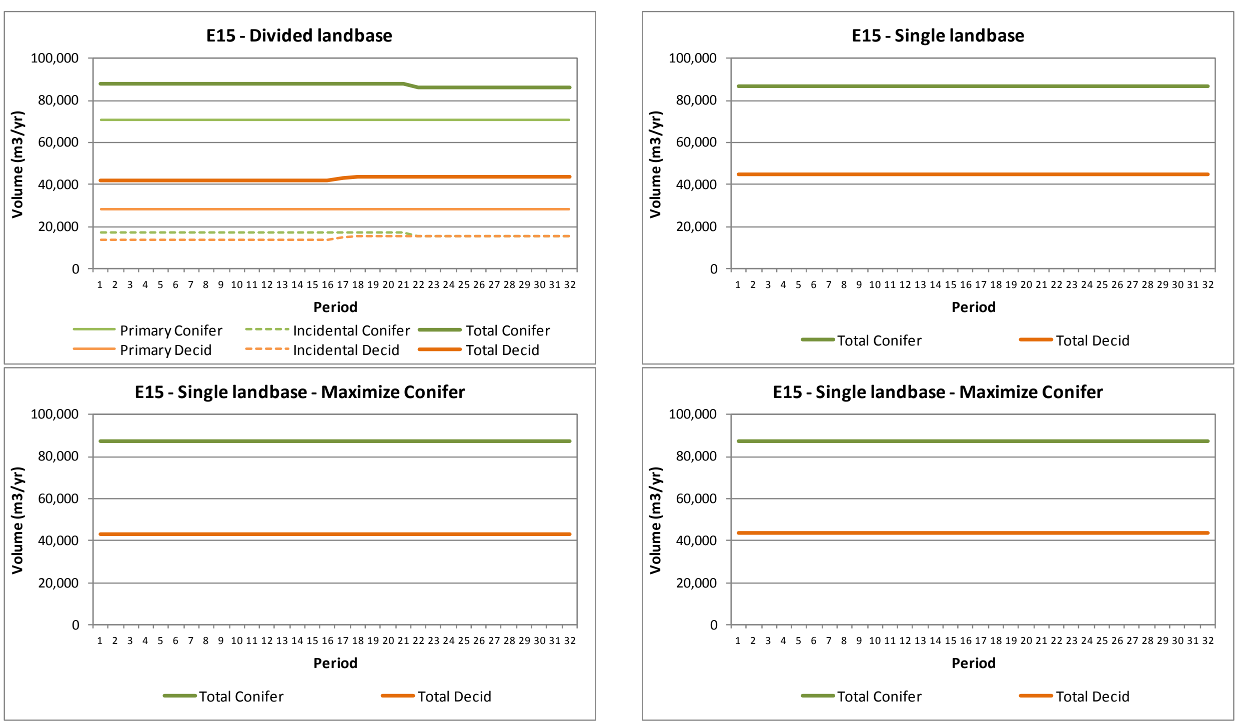

Figure 1. E15 harvest flow by scenario.

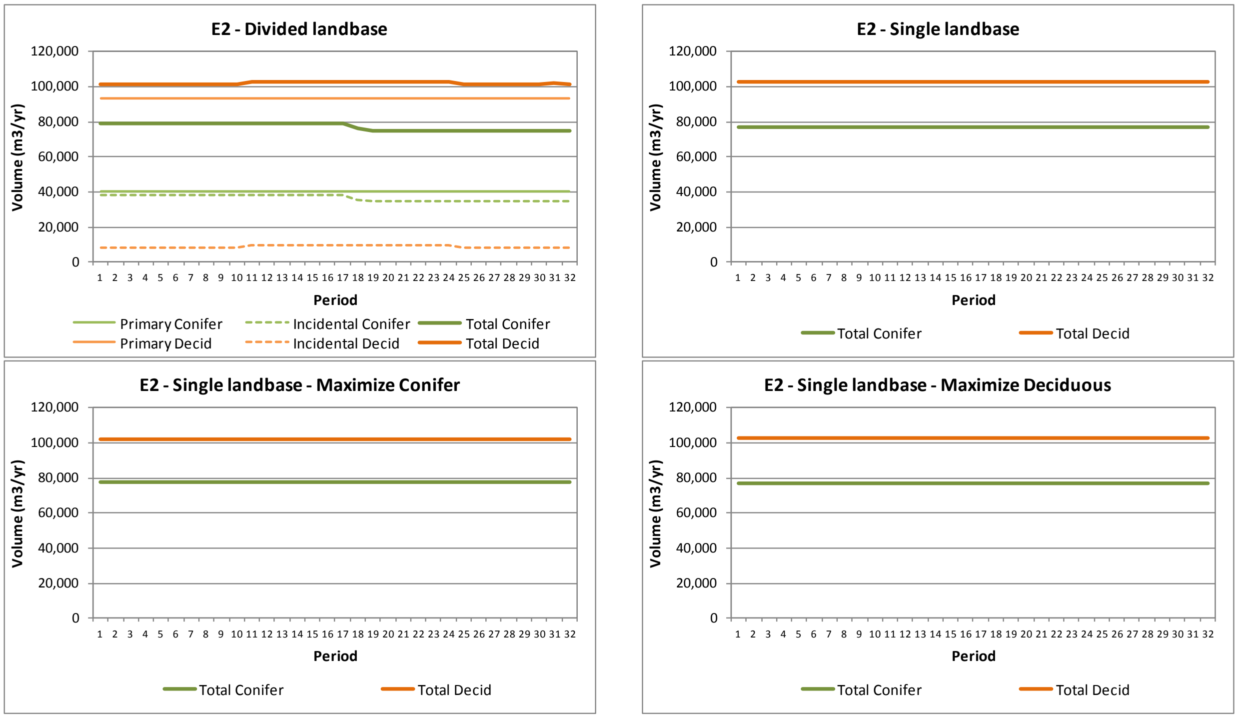

Figure 2. E2 harvest flow by scenario.

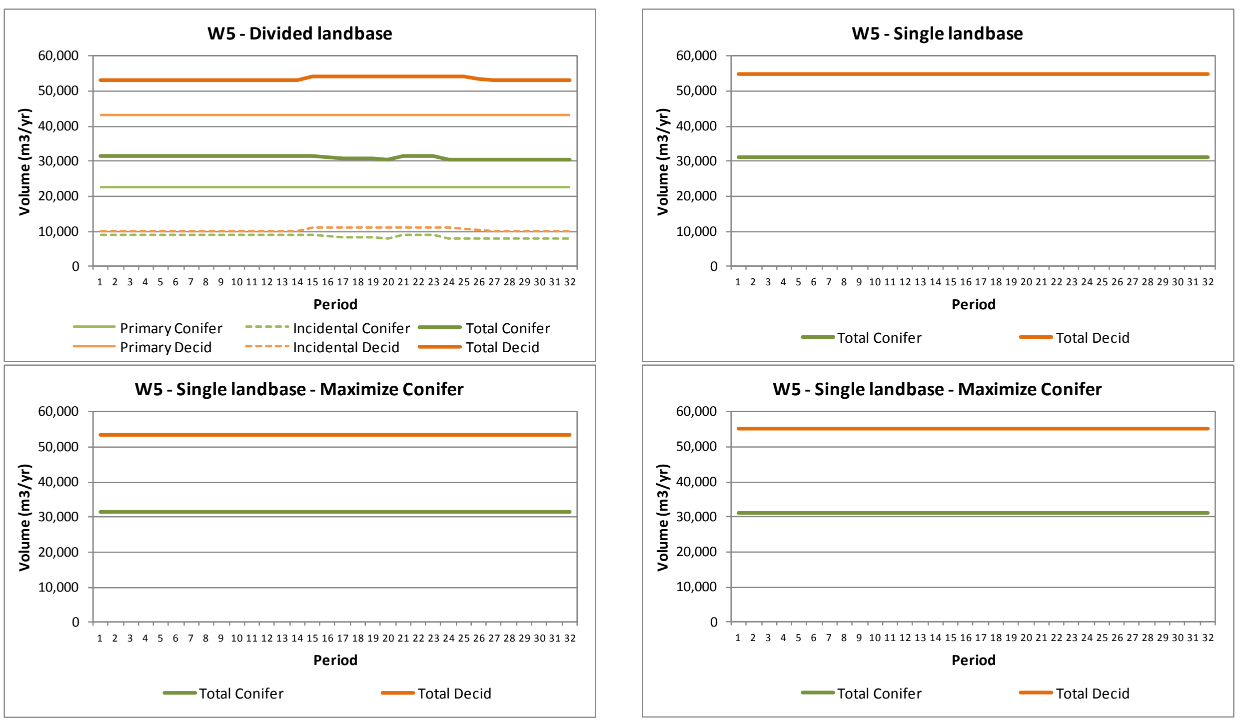

Figure 3. W5 harvest flow by scenario.

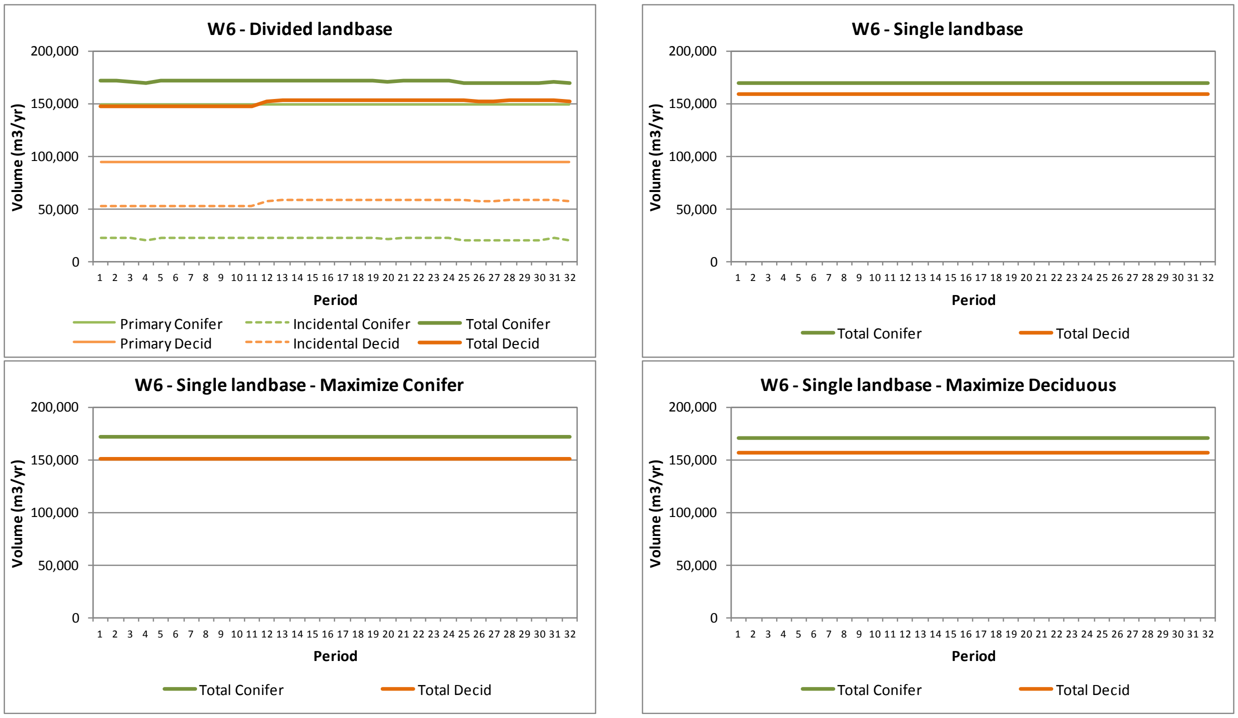

Figure 4. W6 harvest flow by scenario.

Changing from a divided to a single landbase could be expected to impact the type of stand harvested due to the different modeling objectives used, i.e., to maximize primary volumes on a divided landbase to maximizing total volumes on a single landbase. Table 6 presents the average annual area harvested over the 160 year period by broad cover group for each FMU and scenario while Figure 5 shows the results graphically.

The results show a small increase in CD stands being harvested at the expense of most other stand types, but particularly pure coniferous stands (CX).

Table 6. Average annual area harvested by broad cover group.

FMU	BCG	Scenario						
		1. Divided LB Maximize Primary	2. Single LB Maximize Total		3. Single LB Maximize Conifer		4. Single LB Maximize Decid	
		Ha/yr	Ha/yr	%△	Ha/yr	%△	Ha/yr	%△
E15	CX	359	342	-4.7%	342	-4.7%	343	-4.6%
	CD	100	128	27.8%	130	30.2%	130	29.7%
	DC	77	72	-6.3%	65	-14.7%	66	-13.2%
	DX	101	96	-4.5%	88	-12.6%	91	-10.1%
	Total	**636**	**638**	**0.3%**	**626**	**-1.7%**	**629**	**-1.1%**
E2	CX	203	183	-9.8%	188	-7.6%	183	-9.8%
	CD	93	118	27.7%	117	26.3%	118	27.6%
	DC	112	108	-3.0%	102	-8.8%	108	-3.1%
	DX	466	466	-0.1%	467	0.0%	466	-0.1%
	Total	**874**	**875**	**0.2%**	**873**	**-0.1%**	**876**	**0.2%**
W5	CX	84	78	-7.0%	80	-4.4%	77	-7.7%
	CD	44	48	9.6%	48	8.9%	48	9.0%
	DC	44	55	23.9%	48	8.9%	56	26.9%
	DX	247	244	-1.5%	250	1.0%	244	-1.3%
	Total	**420**	**425**	**1.3%**	**426**	**1.6%**	**426**	**1.5%**
W6	CX	618	593	-4.0%	611	-1.1%	607	-1.7%
	CD	242	263	8.6%	266	9.6%	258	6.5%
	DC	160	164	2.3%	150	-6.6%	157	-2.1%
	DX	554	559	0.9%	559	0.9%	573	3.4%
	Total	**1,574**	**1,578**	**0.3%**	**1,585**	**0.7%**	**1,594**	**1.3%**

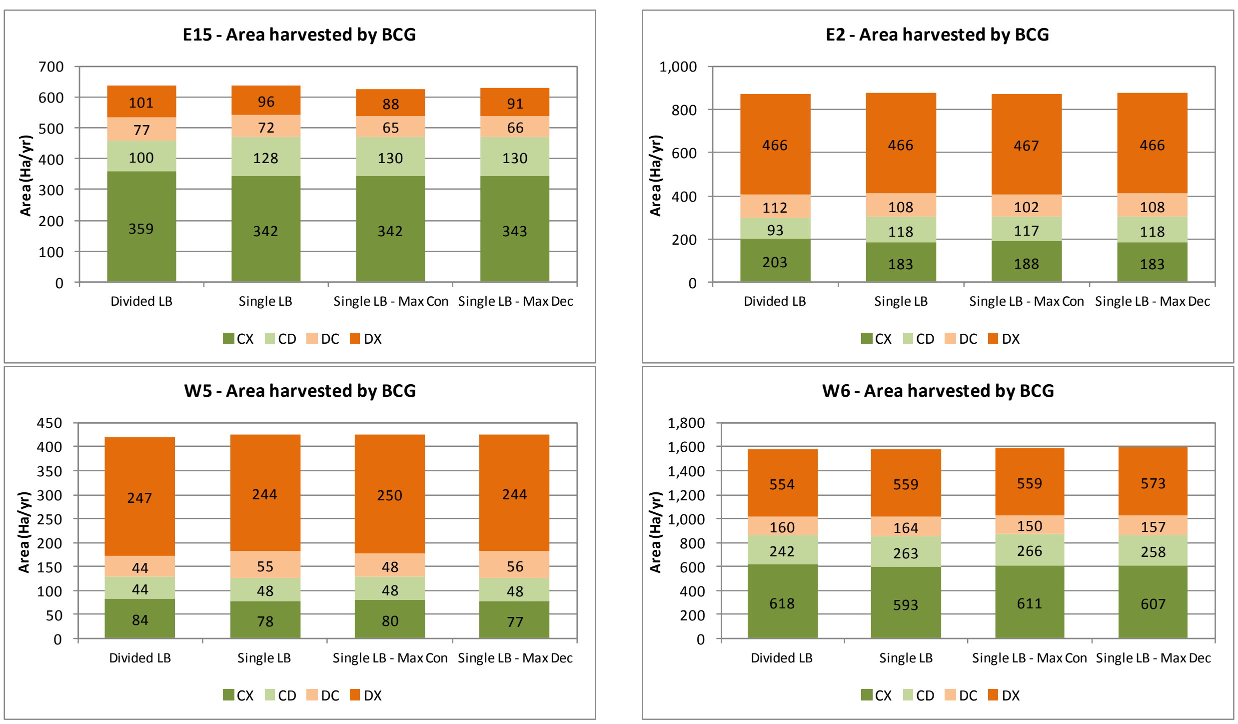

Figure 5. Area harvest by BCG.

Appendix IV – TSA-005: Addressing Seismic Lines in the TSA Process

Issue Number: TSA-005

Addressing Seismic Lines in the TSA process

Type: √ Requires Resolution ☐ Discussion Item

1 Background

This document provides direction to the landbase, yield curves and TSA processes for a consistent application of seismic lines for the 2016 FMP TSA process.

Seismic lines are a disturbance on the landscape and represent a loss of standing timber volumes. ESRD requires that the volume implications of seismic lines be accounted for in the TSA. The disturbances need to be addressed in a consistent manner throughout the three phases of the forecasting process (landbase, yields and TSA).

Seismic lines generally fall into two categories; the older wider seismic lines which are approximately 8 meters in width and the newer “avoidance” lines which can be as little as a meter wide. The latter are considered too small to be included spatially in a landbase file and are generally ignored in TSA processes, as they will be in the Weyerhaeuser 2016-2026 FMP. From here on, recommendations made apply only to existing, identifiable and interpreted seismic lines available in Weyerhaeuser’s seismic line layer.

Seismic lines have been traditionally dealt with in the TSA process using one of two approaches:
1. Cut seismic lines into the landbase files and delete the seismic area. In this approach seismic lines are not sampled during volume sampling and yields are not scaled to account for seismic areas.
2. Seismic line areas are not deleted from the landbase and may be sampled as part of a volume sampling program. Volume predictions are, however reduced to account for seismic area losses.

Both approaches account for seismic volume reductions in the TSA but the first approach has become more common in the spatial planning world and is the approach used in Weyerhaeuser’s previous FMP’s. However, RSA performance surveys do not exclude seismic lines and thus RSA predicted yields inherently account for the impact of seismic lines on regenerated yields. Reducing net areas in the landbase file for seismic would, therefore double count the seismic impact for RSA yield predictions. Carrying two areas for each polygon *i.e.,* a gross area (including seismic area) for regenerated yields and a net area (excluding seismic area) for standing timber yield calculations in the TSA is also not an option as TSA models do not allow polygons to change size after harvesting. Consequently, a single area must be assigned to each polygon to represent it through the life of the planning exercise. The second approach *i.e.* where seismic impacts are accounted for through a reduction in standing yield predictions does not require a change in polygon size and is therefore the recommended approach.

2 Process

The methods described in this section correspond to approach 2 described above and are preliminary, with final details to be worked out as the processes are developed.

2.1 Landbase

While the area occupied by seismic areas will not be deleted from the net landbase, the net area of seismic lines must be determined to derive the percent reduction by yield strata for application in scaling the yield curves. General direction:

- Identify seismic line dataset and seismic lines to be deleted;
- Calculate both the total area (including seismic) and seismic area by stratum;
- Calculate the percent area reduction due to seismic for each stratum; and
- Do not cut in or reduce the net area in the modeling landbase to account for seismic line area.

2.2 Yield Curves

All yield curve sets will account for the loss of area due to seismic lines. Standing timber and blocks harvested prior to March 1, 1991 will have a reduction factor applied to scale yields in proportion to seismic area loss. In both cases we will be applying yield curves developed from the natural stand PSPs which were established avoiding any seismic lines.

RSA based yields, which already account for seismic area, will be applied to blocks harvested on or after March 1, 1991 and future blocks. No yield curve adjustment will be required for these areas. A single set of yield curves will be used for blocks harvested on or after March 1, 1991 up to and including April 30, 2015, as well as all future blocks forecast to be harvested on or after May 1, 2015.

There are two approaches that could be applied to scale standing timber and pre-1991 yield curves to account for seismic line area:

- Apply a polygon specific reduction directly in Patchworks; or
- Apply an area weighted strata based reduction to yield curves before input into the TSA model.

The later approach is preferred for the 2016-2026 FMP as it is computationally simpler and can be applied in both Woodstock and Patchworks models.

2.3 TSA

In the TSA model yield curves will be assigned to landbase polygons based on their assigned strata. No special action will therefore be required for the TSA as the impact of the seismic lines will be reflected in the strata-reduced yield curves. The same area value will be used and reported for both pre and post harvest activity. If the polygon specific area approach was used then each standing timber and pre-1991 yield curve would have to be scaled for each individual polygon with seismic area present.

3 Recommendation

For the purposes of the TSA analysis, it is recommended that area losses due to seismic lines be reflected through yield curve adjustments at the stratum level, as described in the second approach in section 2.2 above.

The implications of incorporating seismic line impacts into the yield curves and not in the area of the stands must be consistently applied in monitoring and reporting processes. The area within seismic lines for each polygon on the TSA landbase is to be carried as an attribute to provide additional information if required for reporting.

4 Resolution

At the PDT meeting held on August 19, 2015, the GoA provided the following recommendations regarding the treatment of seismic lines in the TSA process:

a) For mature (natural) stands and regenerating pre-1991 blocks:
- Apply spatially representative adjustment factors to natural and regenerating stand yields at the SYU and stratum level
- Calculate a strata-based adjustment factor as the sum of the net area of all polygons / sum of gross area of all polygons within each stratum and SYU on the contributing landbase, where; *net area = gross area - seismic area*
- Use the adjustment factor in TSA volume calculations i.e., *gross area x strata-based factor x yield*
- Original yield curves i.e., those presented in yield curve documentation, must not be adjusted.

b) For juvenile (regenerating) stands ie. post-1991 blocks:
- As the RSA sample program used on the Weyerhaeuser Pembina FMA has accounted for seismic area,
  - TSA volume calculations will be based on *gross area x RSA-based yield* by stratum.
  - Plots were not moved if they landed on seismic lines, and will not be in the future.

c) Tracking:
- For each polygon in the first 20 year SHS of the PFMS a comparison will need to be made between the volumes predicted by the application of stratum based averages (point a) and the volumes predicted by applying the actual net area of each polygon ie. *net area x yield*.
- The tracking calculations must be stored in the final SHS file, not just in the summary table containing the total differences.
  - In the SHS, data for strata, age, harvest area, and volume at the time of harvest, in this case, *gross area x strata-based factor x yield,* are already a requirement.
  - To check on the overall accuracy of the strata factor, an additional field that calculates the volume as *net area*[1] *x yield*, will also be required.
  - Final harvest levels, etc, will however be based on the volume field that uses the strata-based adjustment factor.

[1] Where *net area = gross area - seismic area*

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PDT Agreement in Principle – Nov 18, 2015

Appendix V – TSA-006: MPB – Prioritizing Pine Stands

Issue Number: TSA-006 (2nd REVISION)

MPB – Prioritizing Pine Stands

Type: □ Requires Resolution √ Discussion Item

1 Background

The MPB Addendum's completed for both the Drayton Valley and Edson FMA areas in 2008 included a surge cut up to the year 2025 (18 years) to allow the area of MPB susceptible pine stands to be reduced as quickly as possible in order to minimize the risk of a major MPB infestation in the area. With the large area of mature pine still remaining on the DFA, the intent is to include a coniferous surge in the 2017 TSA as well in order to continue targeting MPB susceptible pine stands for harvest as soon as possible.

For the 2007 MPB amendments the Government of Alberta (GoA) provided specific targets and timeframes to reduce the area of susceptible stands, e.g. *The goal (of the Healthy Pine Strategy) is to reduce the area of susceptible pine stands in the Rank 1 and Rank 2 categories in the SYU to 25% of that projected in the currently approved FMP at a point twenty years into the future*.[1]

The 2007 MPB PFMS's for the Edson and Drayton Valley FMAs were unable to achieve the above goals over the surge period ending in 2025, as shown in Table 1. In order to continue reducing the area of Rank 1 and Rank 2 stands beyond 2025, the TSA model was constrained to harvest all operable Rank 1 and Rank 2 stands in the period in which they became operable.

Table 1. Area of Rank 1 and Rank 2 stands in the 2007 MPB PFMS

	Edson	Drayton Valley	Total
Initial[1] inventory	130,140	162,429	292,569
Target inventory[2]	32,536	40,607	73,143
Actual inventory[3]	61,921	67,573	129,494
Inventory surplus	29,385	26,966	56,351
Inventory reduction	52%	58%	56%

[1] Initial area of Rank 1 and Rank 2 stands
[2] 25% of initial inventory
[3] Inventory remaining at the end of the surge period

The Rank 1 and Rank 2 categories referred to here are based on a matrix provided in the interpretive bulletin that considers three factors, i.e. a pine rating (based on the stand susceptibility index (SSI) model[2]), a climate factor and a compartment risk. In September 2016 the GoA provided a revised method for the evaluation of stands for pine strategy stand ranking that utilizes a stand level predicted r-value to estimate relative population success for a stand rather than a climate factor and is described in further detail in the next section.

[1] Interpretive Bulletin. Planning MPB Response Operations (Version 2.6)
[2] Shore, T.L. and Safranyik, L. 1992. Susceptibility and risk rating systems for the mountain pine beetle in lodgepole pine stands.

In the TSA targeting pine stands will, however constitute only one of many potentially conflicting objectives, including timber, non-timber and operational related objectives. The TSA process will attempt to balance all objectives to achieve the best possible management scenario for the FMP time frame.

2 Pine Stand Ranking

The September 2016 update[3] to section 17 of the *Interpretive Bulletin - Planning Mountain Pine Beetle Response Operations* (2016 update) provides a revised method for evaluating stands for pine strategy stand ranking. This method uses the SSI, compartment risk and a stand level predicted R value to rank stand susceptibility to MPB risk.

2.1 Stand Susceptibility Index

The 2016 update defines SSI as t*he physical characteristics of a stand that determines its MPB habitat suitability, without considering the climate, or location of the particular stand.*

The SSI is factor based on the relative abundance of susceptible pine, stand age and density. The higher the factor, the more favourable the stand is to MPB attack and spread. A GIS layer with the SSI calculated for each stand on the DFA was provided by the GoA and incorporated into the net landbase determination process.

2.2 Compartment Risk

Compartment risk is a GOA assessment of the probability that a compartment will be attacked based on existing MPB populations, prevalent wind direction, local knowledge, the likely path of spread due to topography (and resulting barriers to movement), and the connectivity of a given compartment to MPB populations via susceptible pine stands. Since the compartment risk is a general assessment of beetle pressure alone, R value, climate, elevation, and the amount of susceptible pine within the compartment are not considered (2016 update). Risk assessments for the compartments in the Weyerhaeuser DFA (Table 2) have been assigned one of the following criteria:

- Very High – compartment contains active MPB populations, or active population is ≤6 km away (i.e. MPB present or expected within three years);
- High - compartment is >6 and ≤12 km from an active MPB population (i.e. MPB expected within >3 and ≤6 years);
- Moderate - compartment is >12 and ≤20 km from an active MPB population (i.e. MPB expected within >6 and ≤10 years); or
- Low – compartment is >20 km from an active MPB population (i.e. MPB expected in >10 years).

[3] Priority Setting in the Pine Strategy. September 20, 2016.

Table 2. Compartment risk for MPB within the DFA.

Compartment	Compartment Risk
Baptiste	Low
Beaver Meadows	High
Brazeau	High
Edson	Very High
Macmillan	Very High
Medicine Lake	Moderate
Nordegg	Low
South Canal	Moderate
West country	Low
Wolf Lake	Very High

2.3 Stand Level Predicted r-value

r-value is an estimate of relative female MPB productivity for stands that contain at least 20% pine in both the over- and understorey (with mean tree heights of at least 5 metres) as determined by tree size, location, and weather. Modelling variables include mean stand DBH, elevation, latitude, and minimum temperature experienced during the overwintering period. Mean stand DBH was derived from AVI stand height, and minimum temperature was estimated by averaging results from various sources.

Predicted r-values are categorized into Low (0-2), Moderate (2.1 – 4.5), High (4.6 – 5.8), and Very High (5.9 – 9.2) (2016 update).

A raster based grid with predicted r-values was provided by the GoA. This was used to assign r-value categories to each polygon on the net landbase.

2.4 Final Pine Stand Ranking

When combined into a matrix, SSI, compartment risk, and R value form a stand ranking system for Pine Strategy FMP planning and implementation as shown in Table 3 (2016 update). Rank 1

stands are the highest priority, followed by Rank2 and Rank 3.

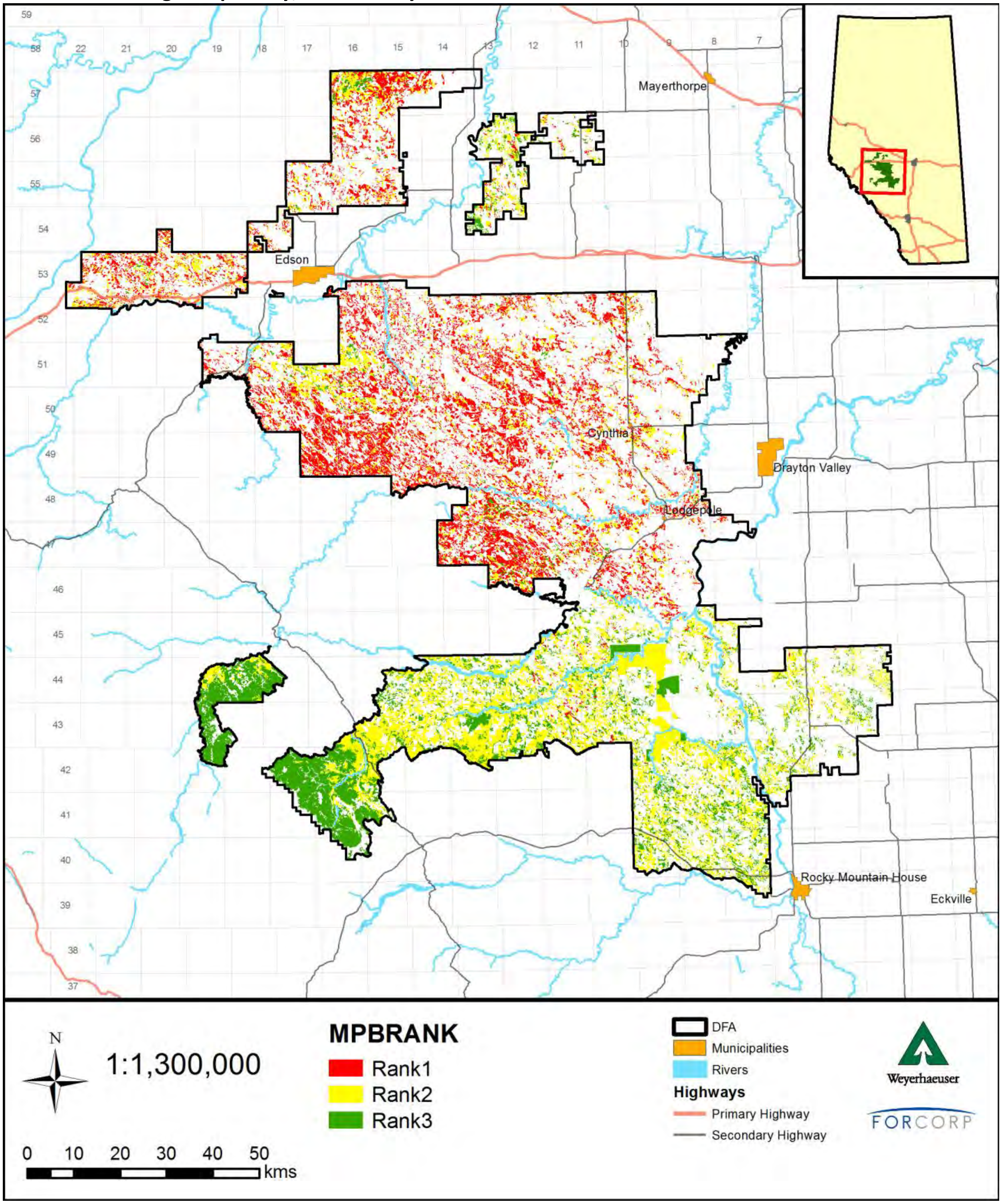

Figure 1 shows the distribution of stands by rank across the DFA.

Table 3. Pine stand ranking

Stand Level Predicted r-value				Compartment Risk
Low	Rank 3	Rank 3	Rank 3	Low
	Rank 3	Rank 3	Rank 3	Moderate
	Rank 3	Rank 3	Rank 2	High
	Rank 3	Rank 2	Rank 2	Very High
Moderate	Rank 3	Rank 3	Rank 3	Low
	Rank 3	Rank 3	Rank 2	Moderate
	Rank 3	Rank 2	Rank 2	High
	Rank 3	Rank 2	Rank 2	Very High
High	Rank 3	Rank 3	Rank 3	Low
	Rank 3	Rank 2	Rank 2	Moderate
	Rank 3	Rank 2	Rank 1	High
	Rank 2	Rank 1	Rank 1	Very High
Very High	Rank 3	Rank 2	Rank 2	Low
	Rank 3	Rank 2	Rank 1	Moderate
	Rank 2	Rank 1	Rank 1	High
	Rank 2	Rank 1	Rank 1	Very High
	1 to 22	23 to 63	64 to 100	
	Stand Susceptibility Index			

Table 4 shows the area on the active landbase assigned to each combination of R value, compartment risk and SSI category.

Table 4. Active landbase area (ha) within each combination of ranking categories

Stand Level Predicted r-value				Compartment Risk
Low	2,458	5,947	2	Low
	0	0	0	Moderate
	0	0	0	High
	0	0	0	Very High
Moderate	1,997	7,589	68	Low
	249	100	3	Moderate
	256	92	0	High
	3,100	397	6	Very High
High	3,273	10,184	147	Low
	3,106	4,423	27	Moderate
	3,190	3,378	46	High
	16,196	22,244	423	Very High
Very High	9,595	40,118	3,597	Low
	6,101	17,018	1,308	Moderate
	5,163	17,969	1,351	High
	12,186	42,269	3,177	Very High
	1 to 22	23 to 63	64 to 100	
	Stand Susceptibility Index			

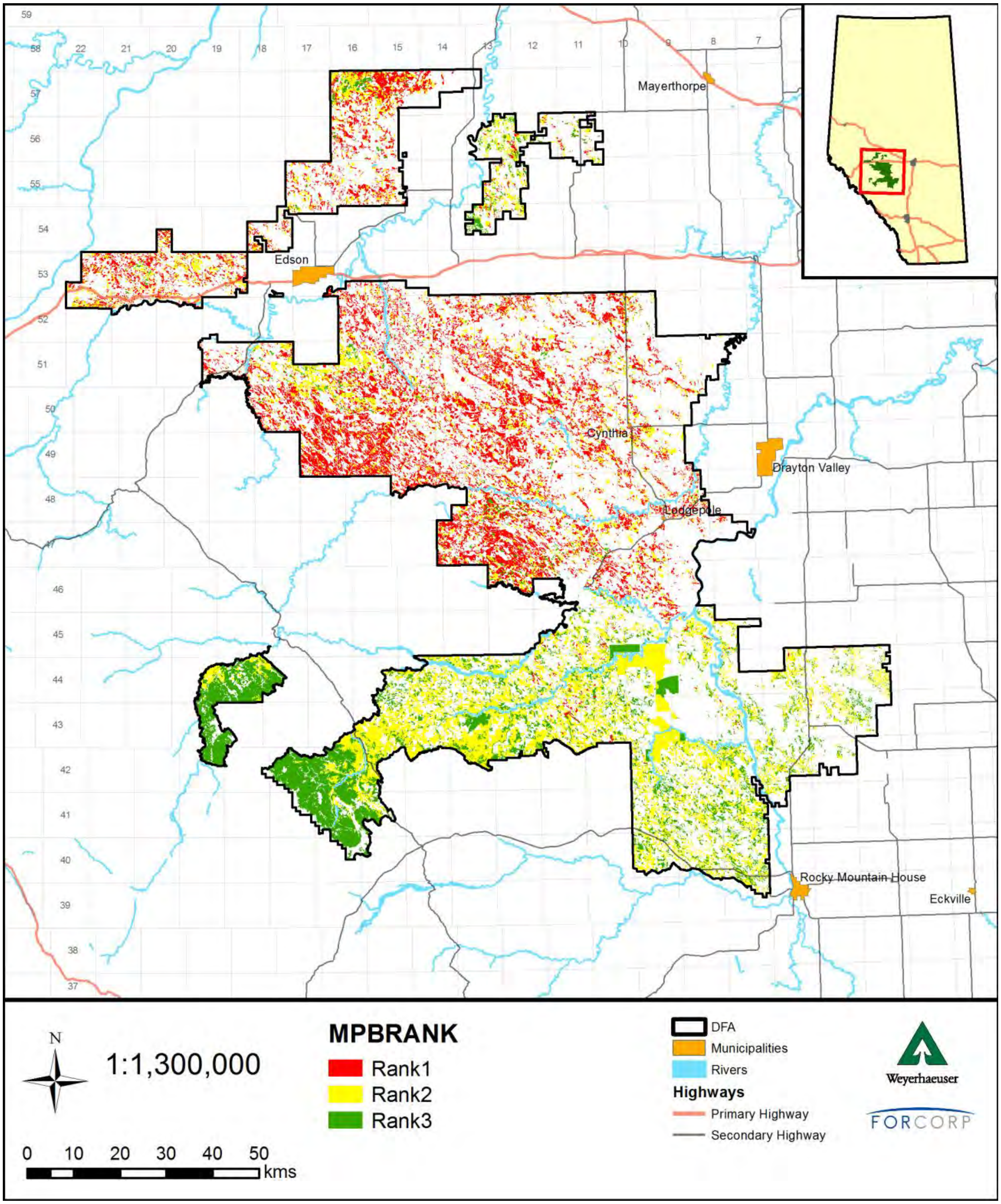

Figure 1. Final pine stand ranking on the DFA

Table 5 shows the area by stratum and rank on the active landbase.

Table 5. Active landbase area by Base 10 stratum and final stand ranking

Stratum	Stand Rank				Total
	None	Rank1	Rank2	Rank3	
Aw	156,367	4,788	13,965	8,870	183,990
AwPl	3,459	5,544	6,764	2,867	18,634
AwSx	25,848	1,713	3,737	1,828	33,127
Pl	45,582	59,707	56,494	23,503	185,287
PlAw	5,197	6,987	6,660	1,490	20,334
Sb	1,274	1,099	468	110	2,952
SbAw	586	81	66	10	742
Sw	42,435	7,088	12,417	17,876	79,816
SwAw	19,642	1,779	2,035	809	24,265
Total	**300,391**	**88,786**	**102,606**	**57,364**	**549,146**

The Healthy Pine Strategy applied in the MPB addendums for the previous FMPs targeted Rank 1 and Rank 2 stands for harvest over a 20 year period. Assuming that the intent is to continue targeting Rank 1 and Rank 2 stands, Table 5 shows that a total of 191,392 ha is to be targeted. This area includes some non-pine strata with over 18,000 ha of pure deciduous (Aw) strata in Rank 1 and Rank 2 stands.

Table 6 shows the area by pine content (based on AVI overstorey) for each stratum within Rank 1 and 2 stands on the active landbase. Almost 6,000 ha (3%) of the Rank 1 and 2 stands have no overstorey pine content and almost 42,000 ha (22%) have less than 30% pine content. It should be noted that the stands with no pine in the overstorey do contain pine in the understorey.

Table 6. Area of Rank 1 & 2 stands on the active landbase by overstorey pine % and stratum

Stratum	Overstorey Percentage Pine					Total
	0	1-30	30-50	50-80	80+	
Aw	3,427	14,920	202	102	101	18,753
AwPl	118	5,391	6,470	187	141	12,308
AwSx	497	4,886	24	21	22	5,450
Pl	143	554	1,456	26,391	87,657	116,202
PlAw	59	96	2,966	10,397	129	13,647
Sb	2	700	825	40		1,567
SbAw	16	93	39			147
Sw	1,322	12,274	5,527	196	187	19,505
SwAw	407	2,682	672	7	46	3,814
Total	**5,990**	**41,596**	**18,182**	**37,342**	**88,283**	**191,392**

Table 7 shows that of the 5,990 ha with zero overstorey pine %, 4,046 ha (68%) have less than 30% pine in the understorey.

Table 7. Area of Rank 1 & 2 stands on the active landbase by understorey pine % where the overstorey pine % = 0.

Stratum	Understorey Percentage Pine					Total
	0	1-30	30-50	50-80	80+	
Aw	4	2,319	540	344	219	3,427
AwPl		75	43			118
AwSx	0	384	75	26	12	497
Pl	0	19	24	68	32	143
PlAw			18	41		59
Sb	0				2	2
SbAw		16				16
Sw	1	912	224	156	30	1,322
SwAw	0	315	32	60		407
Total	**6**	**4,040**	**956**	**694**	**294**	**5,990**

The current minimum harvest ages (MHA) that will be applied in the TSA process are 81 years for coniferous stands. Table 8 shows the distribution of the Rank 1 and 2 stands that contain > 0% pine in the overstorey, by age class. 145,789 ha are 81 years or older and at the start of the modeling process and will be available to harvest in the first period. Over the first 10 years a total of 163,825 ha of Rank 1 and Rank 2 stands will be eligible for harvest. This represents 89% of the total Rank 1 and 2 stands and is the maximum area that could be targeted for harvest over the first 10 years.

Table 8. Area of Rank 1 and Rank 2 stands with > 0% pine in the overstorey by age class and stratum

Stratum	Age Class							Total
	0	1-20	21-49	51-60	61-70	71-80	81+	
Aw	271	524	1,319	1,238	261	1,888	9,824	15,326
AwPl	111	256	306	550	228	843	9,894	12,189
AwSx	112	57	59	50	45	422	4,207	4,953
Pl	1,280	4,070	1,121	5,797	1,621	12,214	89,956	116,058
PlAw	58	427	231	352	220	1,470	10,830	13,588
Sb		4	4	11	24	96	1,427	1,566
SbAw						11	121	131
Sw	44	399	167	77	59	821	16,616	18,183
SwAw	22	85	34	42	39	272	2,913	3,407
Total	**1,897**	**5,823**	**3,241**	**8,117**	**2,498**	**18,036**	**145,789**	**185,402**

Over the second decade an additional 2,498 ha becomes available for increasing the maximum potentially target area to 166,324 ha over the first 20 years.

Table 9 shows the height distribution (from AVI) of the Rank 1 and 2 stands with greater than zero % pine in the overstorey and eligible for harvest over the first 20 years.

Table 9. Area of Rank 1 and Rank 2 eligible for harvest during the first 20 years by height class and stratum

Stratum	Height Class (m)					Total
	0	1-14	15-17	18-20	21+	
Aw		20	384	2,022	9,547	11,974
AwPl		58	409	1,447	9,052	10,965
AwSx		28	200	722	3,725	4,675
Pl		2,541	13,949	29,109	58,192	103,791
PlAw		179	1,129	2,259	8,953	12,521
Sb		313	684	500	50	1,547
SbAw		21	42	30	38	131
Sw		122	1,241	3,613	12,520	17,496
SwAw		48	210	625	2,341	3,224
Total		**3,330**	**18,248**	**40,327**	**104,419**	**166,324**

2% of the eligible Rank 1 and 2 stands are less than 15m in height while 87% are 18m or greater at the effective date of the landbase.

Additional analysis looked at the overstorey white spruce content of the stands eligible for harvest during the first 20 years (Table 10). While the majority of the Rank 1 and 2 stands have little to no Sw content, there are stands with a fairly high spruce % which it may better not to target as these will be salvageable should an infestation occur.

Table 10. Area of Rank 1 and Rank 2 eligible for harvest during the first 20 years by white spruce content.

Stratum	White Spruce Content											Total
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
Aw	9,677	2,296										11,974
AwPl	2,842	6,026	2,097									10,965
AwSx	111	19	2,585	1,702	258							4,675
Pl	59,366	23,173	12,640	5,741	2,771	100						103,791
PlAw	5,694	3,193	2,442	1,192								12,521
Sb	1,036	194	274	43								1,547
SbAw	120	4	7									131
Sw	25	22	42	47	966	2,043	4,074	5,982	3,878	419		17,496
SwAw			0	220	1,387	977	640					3,224
Total	**78,872**	**34,927**	**20,087**	**8,945**	**5,381**	**3,120**	**4,713**	**5,982**	**3,878**	**419**		**166,324**

Under even flow conditions the maximum annual area that could be harvested is approximately 6,000 – 7,000 ha. Under surge conditions this could increase to 8,000 – 10,000 ha annually. Assuming a 10 year coniferous surge cut, the maximum that could be harvested over the first decade will be 90,000 to 100,000 ha. Over the second decade an additional 60,000 to 70,000 ha will be harvested for a combined 20 year harvest of 150,000 to 170,000 ha.

3 Recommendation

The total area assigned a Rank 1 or Rank 2 status on the active landbase is 191,392 ha. From the point of view of focussing harvest on the most susceptible and/or least salvageable of these stands in the event of a major infestation and assuming a 10 year coniferous surge cut, it is recommended that only the Rank 1 and 2 stands that meet the following criteria be targeted for harvest over the first 20 years:

- Greater than 10% overstorey pine content,
- Greater than 60 years of age at the landbase effective date,
- Contain less than 40% Sw content in the overstorey, and
- Fall within the Aw, AwPl, Pl or PlAw strata. Remaining strata have little area remaining once filtered for above Sw content.

128,775 ha meet the above criteria and will be targeted for 100% reduction over the first 20 years of the plan. Any of these stands that are not harvested within the first 20 years will continue to be targeted for harvest as soon as possible after the first 20 years.

4 Discussion

It should be noted that the compartment risk assessment used in the stand ranking process is based on current conditions. The northern compartments are currently considered to be at higher risk of attack, however should the beetle progress through Jasper, the risk could shift to the southern compartments.

The total reduction of the targeted Rank 1 and 2 stands over 20 years would be considered optimistic or the best case scenario as it is based on the assumption that only Rank 1 and 2 stands will be harvested over this period. In reality, multiple and often conflicting objectives have to be balanced in the TSA modelling process, including:

- Non-timber values, such as wildlife habitat, watershed, stakeholder concerns, etc
- Other timber values, such as loss of pure old spruce due to die off while focussing on pine,
- Operational issues, such as piece size, average haul distance and cutblock proximity to other types of stands, and
- Unknown spread of the mountain pine beetle infestation post FMP implementation.

5 Resolution

PDT-AIP May 11, 2017

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Appendix VI – TSA-009: Songbird Habitat Modelling: Time Zero Results and TSA Integration.

Issue TSA-009 - Songbird Habitat Modelling: Time Zero Results and TSA Integration

Type: □ Requires Resolution √ Discussion Item

1 Background

The objective of VOIT 1.2.1.1 of Weyerhaeuser's 2016 FMP is to maintain habitat for identified high value species. These species are identified as being barred owl, grizzly bear, specific songbirds and east slopes cold water fish. For songbird modeling, the GoA has developed a relative abundance (RA) model which uses landbase conditions to classify AVI polygons by relative abundance value for each species at time zero. In addition, the GoA has provided strata based RA curves which can be integrated into TSA models to allow the trend in RA values for each songbird over the TSA planning horizon to be modelled.

Songbirds included in the GoA model are:

BBWA: Bay-breasted Warbler
BRCR: Brown Creeper
BTGW: Black-throated Green Warbler
CAWA: Canada Warbler
OVEN: Ovenbird
VATH: Varied Thrush

Of the above species, Weyerhaeuser is not required to model or report on the Bay-breasted and Canada Warblers. Figure 1 through Figure 4 show the preferred habitat[1] for each of the four songbirds modelled. The figures show that the Black-throated Green Warbler's preferred habitat is older deciduous and mixedwood stands while the Brown Creeper is similar except that its habitat also includes older pine and white spruce stands. In contrast the Ovenbird favours rotation age deciduous while the Varied Thrush prefers older coniferous stands.

This document briefly describes the development of the time zero habitat conditions for the four songbirds as well as the integration of the songbird RA curves into the TSA modelling.

[1] Source : http://species.abmi.ca/pages/species/birds.html

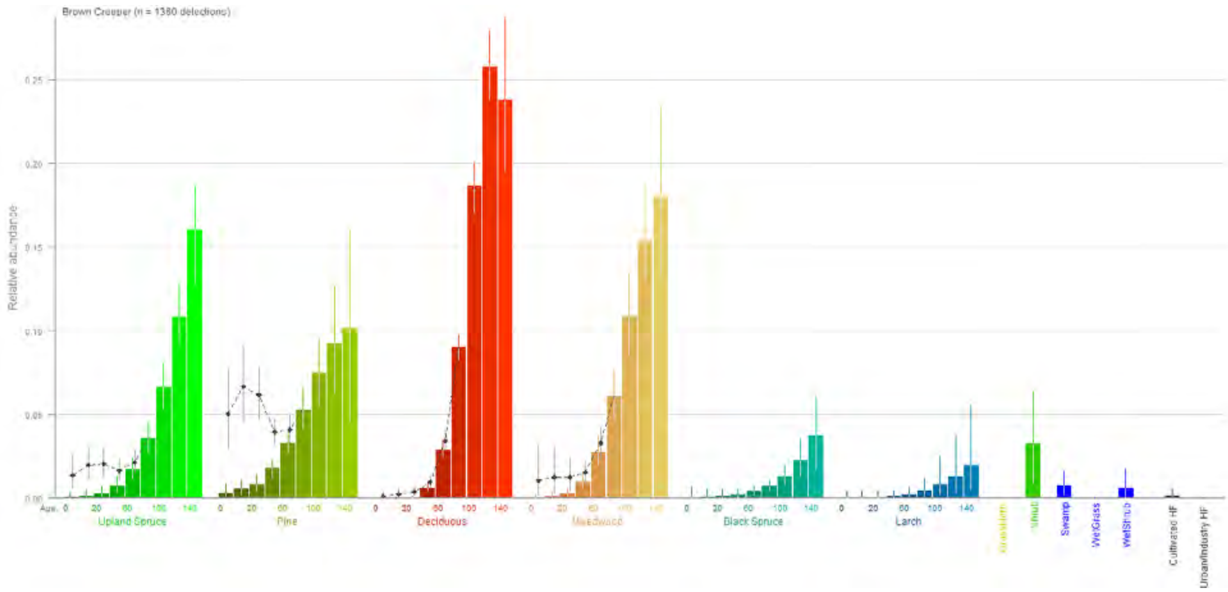


Figure 1. Preferred habitat – Brown Creeper

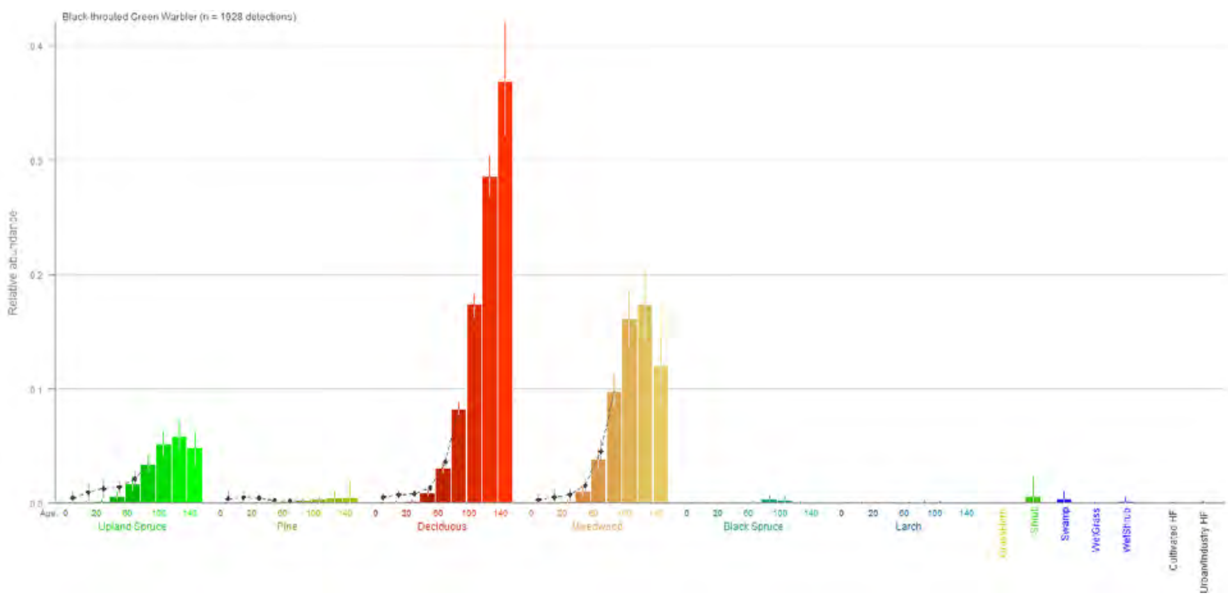


Figure 2. Preferred habitat – Black-throated Green Warbler

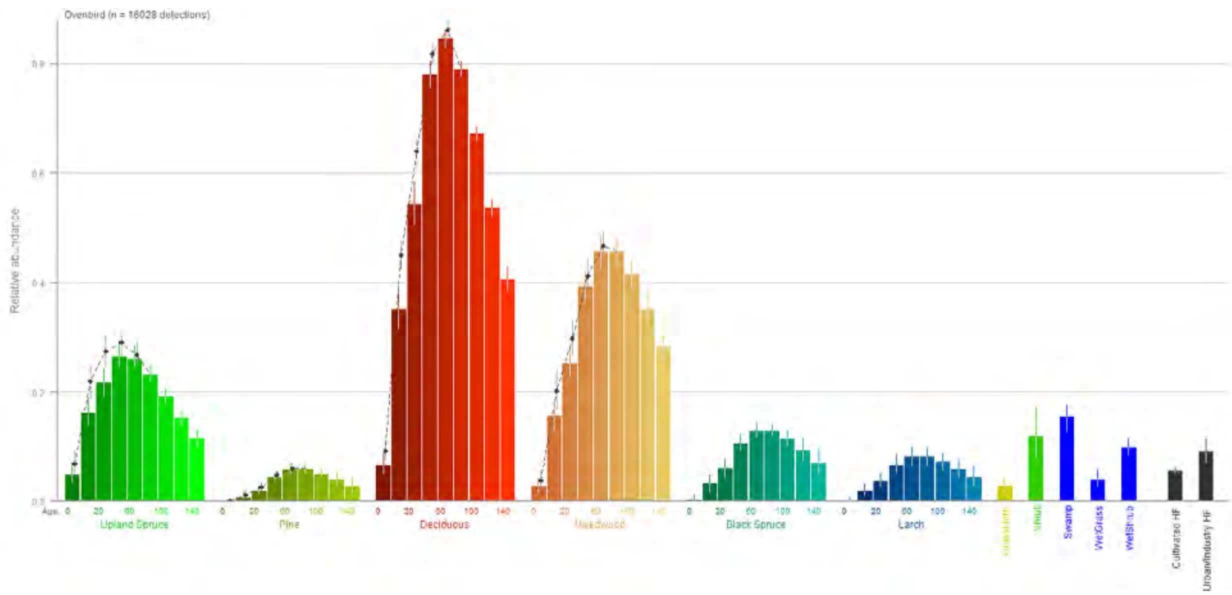


Figure 3. Preferred habitat – Ovenbird

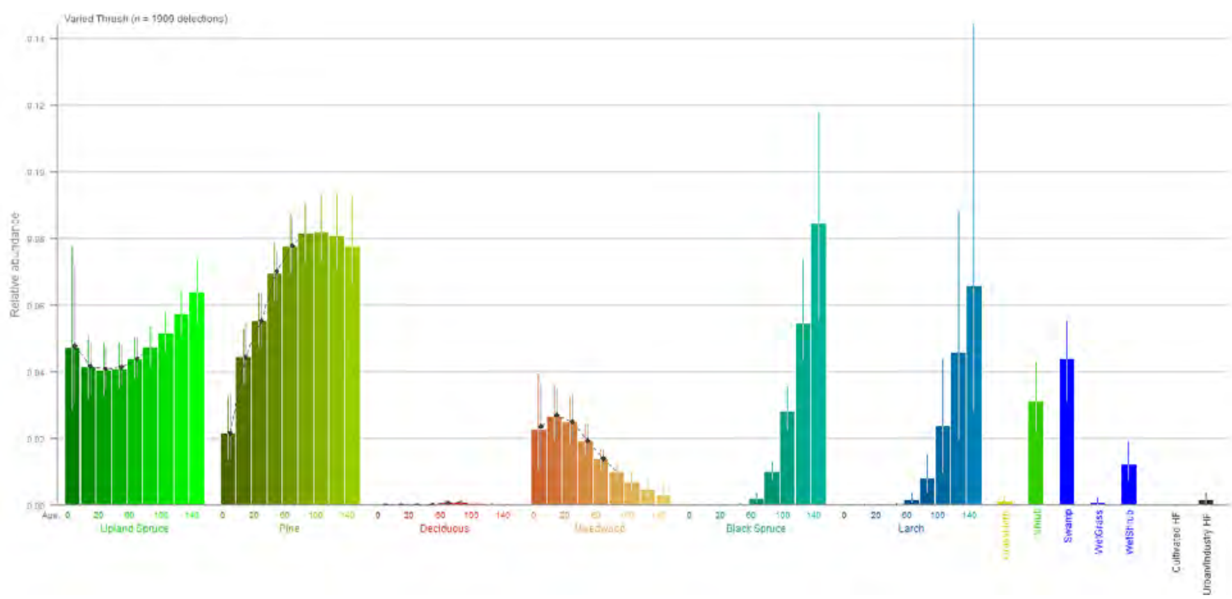


Figure 4. Preferred habitat – Varied Thrush.

2 Modelling

2.1 Time Zero Snapshot

The time zero model used for this analysis was developed by the GoA (version 1.1, December 2016), and all assumptions of that model are applied to this analysis. To create the final output, the model consists of three scripts. The first script overlays a 7 ha grid (~264.6 m sides for each grid cell) over the DFA. This grid is used to calculate the percentage of hard (e.g. roads) and soft (e.g. seismic lines) linear features within each grid cell across the DFA. The second script calculates the percent coverage for each stratum within each AVI polygon. The third script uses the outputs from the first two scripts, along with the buffered seismic lines and compartment layers to calculate the songbird coefficient for each bird species.

The final products include two tables, which show the RA values by stratum within each compartment, and a polygon feature class which contains all of the outputs used to create the tables, and can be used to visualize the table outputs. The tables show two calculations of the RA value, with one output considering the effects of both hard linear (HLIN) *e.g.* roads and soft linear (SLIN) *e.g*. seismic lines features. The second table produced does not include the soft linear features in the RA calculation.

2.2 TSA Integration

Together with the time zero modelling tools the GoA provided RA curves by stratum for each songbird (songbird_curves_03NOV2016.xlsx). Each songbird has two sets of curves;

- a standard curve that assumes no linear features, and
- a curve that assume the existence of hard linear features.

For TSA integration the SLIN features are not used as this would require cutting in the 7ha grid across the entire DFA. In order to identify the HLIN features across the landscape, however the 7ha grid cells that contain 0.5% or more HLIN coverage were dissolved and cut into the landbase [2]. Figure 5 shows the dissolved 0.5% grid that was use to assign polygons the HLIN feature in the landbase.

So as not to introduce additional strata into the TSA modeling, the ABMI strata based RA curves were mapped to the existing Base 10 strata as shown in Table 1.

Table 1. Songbird strata mapping

ABMI Stratum	TSA Stratum
White spruce	Sw
Pine	Pl
Black spruce	Sb (SbSb)*
Larch	Sb (SbLt)*
Mixedwood	PlAw, SbAw, SwAw, AwPl, AwSx
Deciduous	Aw

* For the songbird modelling the Sb stratum was split into SbLt (Lt leading, extended stratum C12) and SbSb (all other Sb).

RA curves for the four songbirds to be integrated into the TSA process are shown in Figure 6. As curves were only provided for 150 years of age, for older stands the value at 150 is maintained until such time as an age resetting event occurs, i.e. harvesting or death. Non-forested areas are assumed to have a value of zero.

The impact of the HLIN features on the RA values is evident from Figure 6. For example for BTGW, the RA value for Aw at 140 years is 92% less in a HLIN stand compared to the standard value. Only the VATH

[2] See TSA-012. While a 0.5% HLIN grid was the initial requirement, this was later changed to 1%. Weyerhaeuser, however chose to remain with a 0.5% grid but used a proxy approach rather than cutting additional linework into the landbase.

shows a preference for HLIN features with the RA value increasing by 54% in Pl stands at 120 years of age.

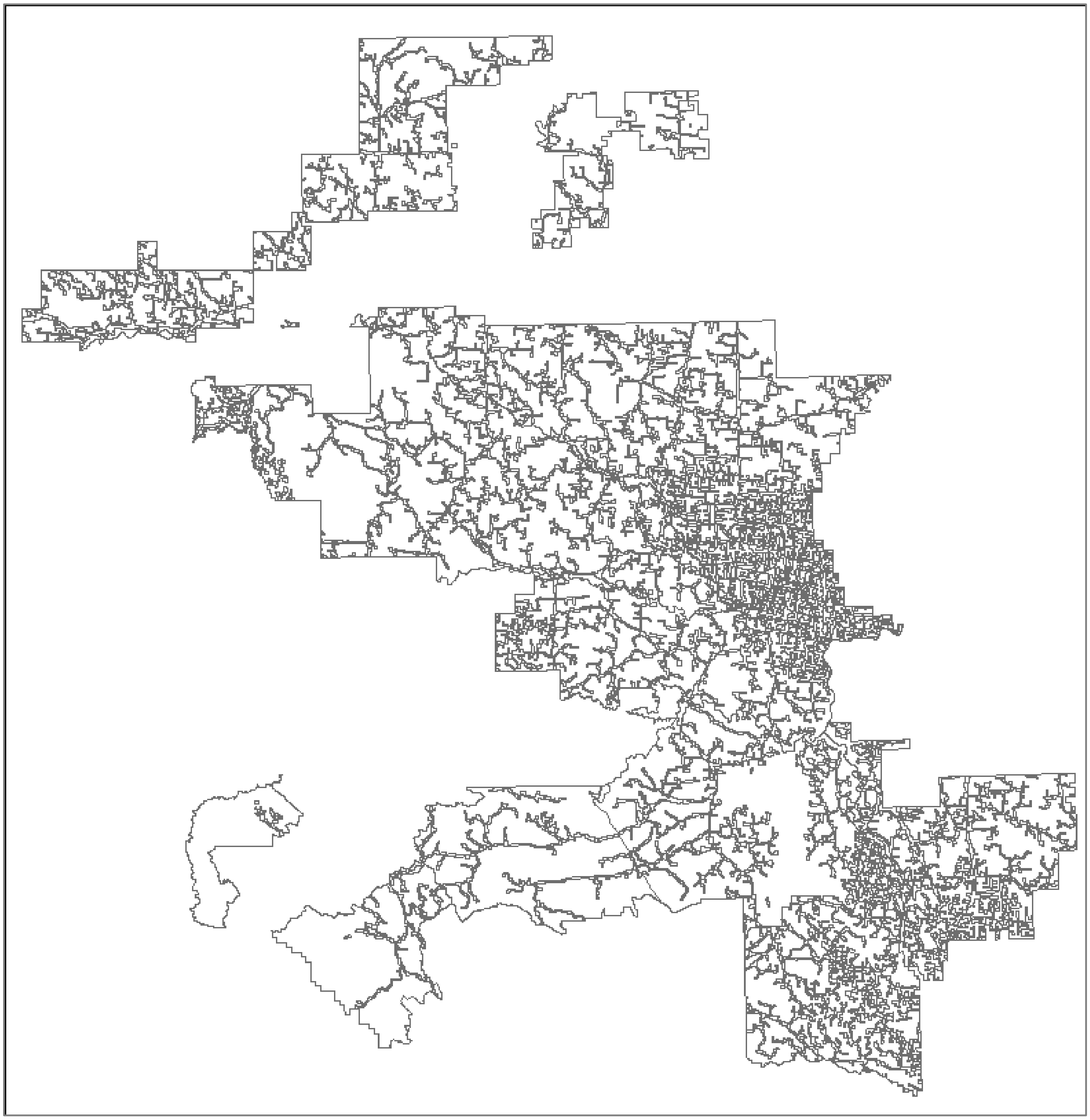


Figure 5. 0.5% HLIN grid used to assign polygons the HLIN feature in the landbase

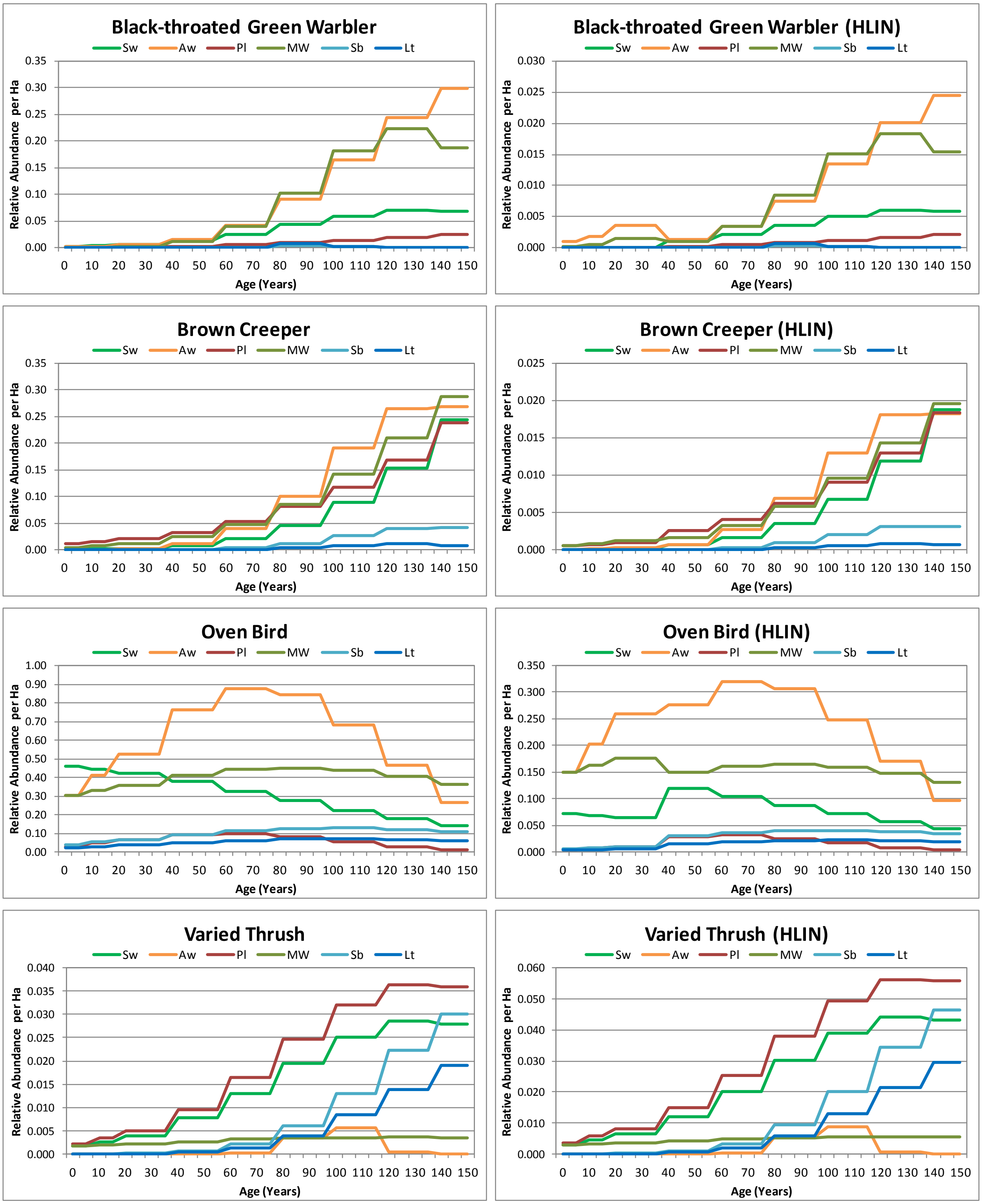


Figure 6. Songird RA curves. Charts on the left are Standard curves and those on the right include hard linear features.

3 Results

3.1 Time Zero Snapshot

The outputs from the snapshot model run at time 0[3] are presented in Table 2 and Table 3. Table 2 presents the calculated RA value with both hard linear (HLIN) and soft linear (SLIN) features included, for each target species by compartment. Table 3 presents a second run using the same data, but with the soft linear features (seismic lines) excluded from the calculations. Figure 12 through Figure 15 present the total RA value per ha at time zero for each species across the DFA and includes both the hard and soft linear features. For each map the legends are based on the values found across the landbase and are based on natural breaks, five colours are used to allow for easy identification of the different regions.

Table 2: Songbird relative abundance values by compartment within the Weyerhaeuser Pembina DFA. Includes HLIN and SLIN.

Compartment	Frequency	Brown Creeper	Black-throated Green Warbler	Ovenbird	Varied Thrush
Baptiste	80,002	3,991	2,390	13,383	964
Beaver Meadows	34,732	1,701	1,328	9,916	250
Brazeau	119,091	6,075	3,669	21,813	1,390
Edson	126,510	5,944	4,172	27,544	1,125
Macmillan	211,699	8,234	6,215	45,203	1,489
Medicine Lake	92,836	2,998	2,420	26,519	479
Nordegg	50,312	4,988	1,577	8,260	1,445
South Canal	95,682	6,370	3,646	20,058	1,370
West Country	34,930	9,521	1,945	5,313	1,879
Wolf Lake	204,058	9,843	4,129	26,376	3,000
R15	1,049,852	59,664	31,491	204,385	13,391

Table 3: Songbird relative abundance values by compartment within the Weyerhaeuser Pembina DFA. Includes HLIN only.

Compartment	Frequency	Brown Creeper	Black-throated Green Warbler	Ovenbird	Varied Thrush
Baptiste	80,002	4,122	2,465	13,661	1,000
Beaver Meadows	34,732	1,752	1,366	10,123	259
Brazeau	119,091	6,346	3,822	22,399	1,460
Edson	126,510	6,205	4,351	28,321	1,178
Macmillan	211,699	8,688	6,553	46,753	1,573
Medicine Lake	92,836	3,078	2,481	27,026	495
Nordegg	50,312	5,082	1,607	8,365	1,477
South Canal	95,682	6,536	3,740	20,430	1,413
West Country	34,930	9,615	1,963	5,348	1,903
Wolf Lake	204,058	10,263	4,302	27,084	3,136
R15	1,049,852	61,687	32,649	209,510	13,893

[3] Based on 0.5% HLIN.

3.2 TSA Integration

The inclusion of the RA curves for each of the four songbirds into the Patchworks TSA model, allows the changes to the each birds habitat values to be monitored over time. If necessary constraints can be included in order to prevent the values from falling below a threshold level.

Table 4 shows the differences in time zero RA values[4] calculated using the snapshot tool (from Table 3) and the TSA model.

Table 4. Time zero values (TSA based on PW70004)

Songbird		Year 0		
		Snapshot	TSA	% Diff
BRCR	Brown Creeper	61,687	66,845	8.4%
BTGW	Black-throated Green Warbler	32,649	34,691	6.3%
OVEN	Ovenbird	209,510	214,443	2.4%
VATH	Varied Thrush	13,894	13,122	-5.6%

There are a number of reasons why these numbers could be different, including:

- The snapshot is based on AVI information updated to 2015, while the TSA time zero is 2017;
- While similar, the forest stratification used in the TSA model is not identical to the ABMI stratification used in the snapshot tool.

Because of the above differences, changes in the RA value over time will be compared to the TSA time zero values and not the snapshot values. Thresholds for the reduction in RA value compared to the time zero value are:

- 0 – 15% - Low risk. Considered acceptable, no further action required.
- 15 – 30% - Moderate risk. Considered outside acceptable limits, constraints will have to be applied in the TSA model.
- > 30% - High risk. Significant impact on habitat suitability, constraints will have to be applied in the TSA model.

As the VOIT 1.2.1.1 indicator refers to the percentage change in RA value at the DFA level only, the TSA results are only tracked at the DFA level, not the compartment level as was the case for the snapshot tool.

Table 5 and Table 6 show the changes in RA value for the four songbirds at 10, 20, 50, 100 and 200 years in the future for two different TSA scenarios. Scenarios PW20004 and PW30004 are set up similarly with the main difference being that the weighting on Brown Creeper and Black-throated Green Warbler habitat constraints was increased in PW30004. This has resulted in the percentage change in the Brown Creeper RA values reducing from a high of 21.8% at year 100 remaining above the 15% threshold for the entire 200 year period. The Black-throated Green Warbler has improved from a high of over 35% to 15% or lower over the 200 year period. No constraints were placed on either the Ovenbird or Varied Thrush in either scenario.

Figure 7 and Figure 8 show the trends for each songbird over the 200 year period for each scenario.

[4] Based on 0.5% HLIN cut into the landbase.

Table 5. Changes in RA value by songbird at specific points in time in the future (Scenario PW20004)

Songbird		Year 0	Year 10		Year 20		Year 50		Year 100		Year 200	
		RA Value	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg
BRCR	Brown Creeper	65,641	66,486	1.3%	67,220	2.4%	53,582	-18.4%	51,334	-21.8%	53,082	-19.1%
BTGW	Black-throated Green Warbler	33,923	33,782	-0.4%	32,457	-4.3%	23,299	**-31.3%**	21,938	**-35.3%**	23,391	**-31.0%**
OVEN	Ovenbird	210,197	202,201	-3.8%	194,838	-7.3%	200,822	-4.5%	207,825	-1.1%	202,381	-3.7%
VATH	Varied Thrush	13,252	12,900	-2.7%	12,923	-2.5%	12,579	-5.1%	13,520	2.0%	13,569	2.4%

Table 6. Changes in RA value by songbird at specific points in time in the future (Scenario PW30004)

Songbird		Year 0	Year 10		Year 20		Year 50		Year 100		Year 200	
		RA Value	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg
BRCR	Brown Creeper	65,645	65,829	0.3%	66,465	1.2%	59,064	-10.0%	58,428	-11.0%	58,451	-11.0%
BTGW	Black-throated Green Warbler	33,925	33,176	-2.2%	31,550	-7.0%	28,821	-15.0%	28,991	-14.5%	28,832	-15.0%
OVEN	Ovenbird	210,185	203,416	-3.2%	198,127	-5.7%	202,305	-3.7%	198,226	-5.7%	198,814	-5.4%
VATH	Varied Thrush	13,252	13,003	-1.9%	13,091	-1.2%	12,587	-5.0%	13,420	1.3%	13,465	1.6%

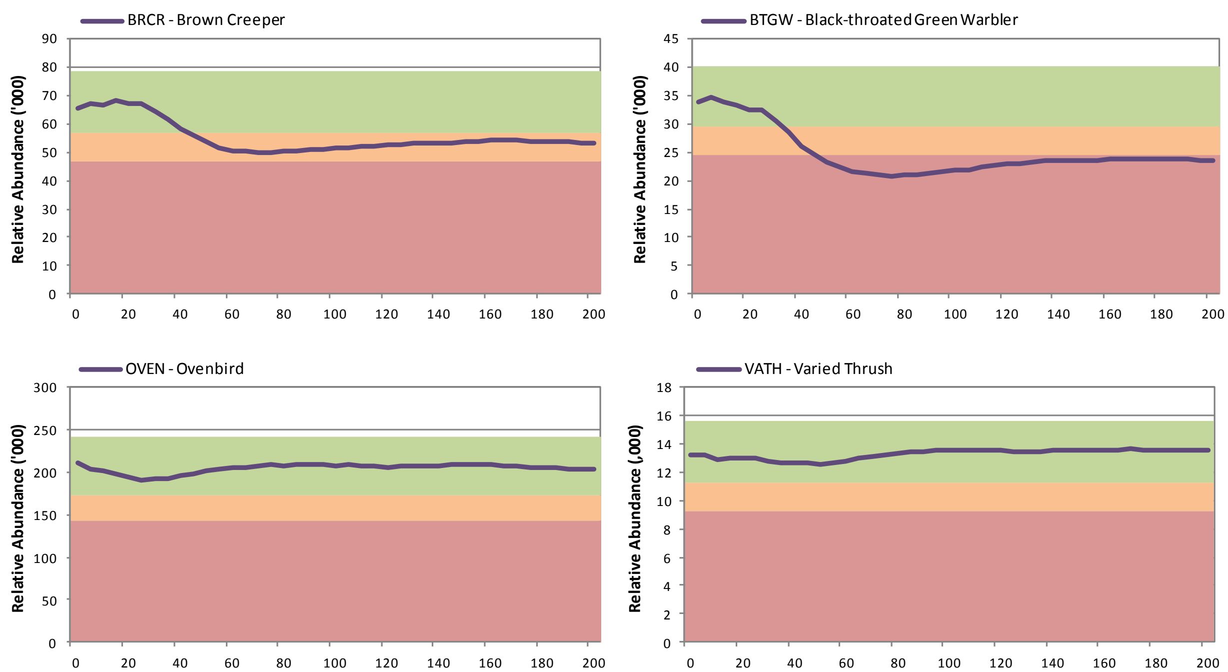


Figure 7. Trends in RA value over time (scenario PW20004). Green shaded area represents < 15% reduction from the time zero value, orange area is 15 – 30%, pink is > 30%.

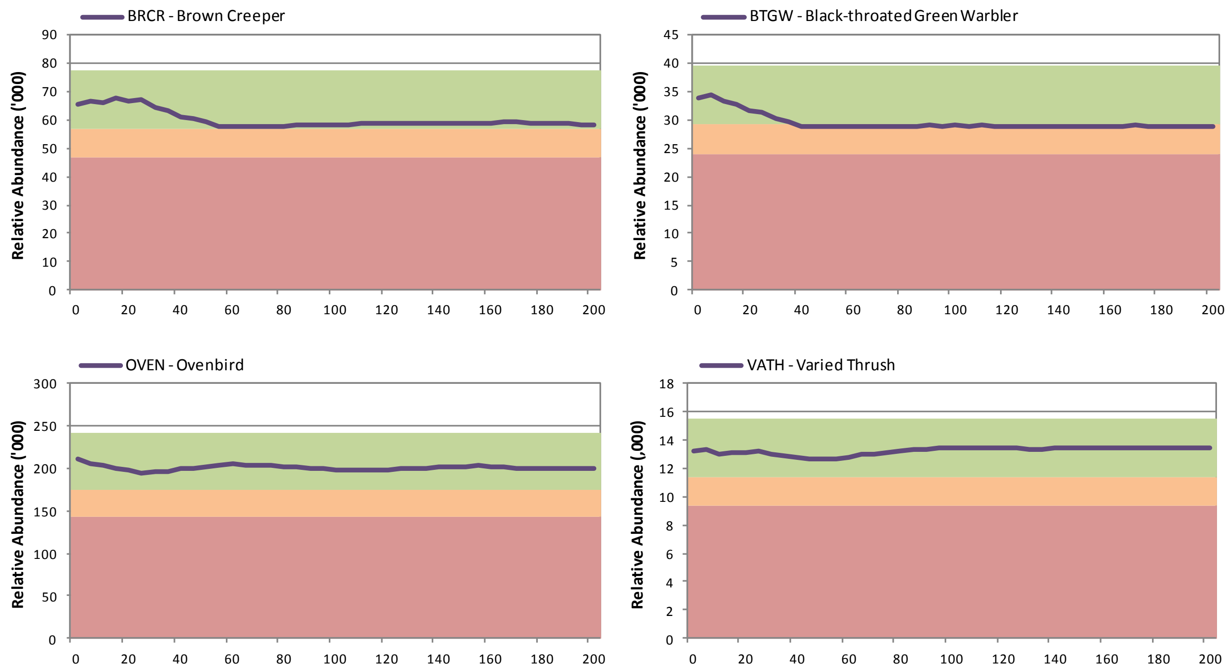


Figure 8. Trends in RA value over time (scenario PW30004). Green shaded area represents < 15% reduction from the time zero value, orange area is 15 – 30%, pink is > 30%.

While constraining the change in RA value for the two songbirds produced the desired result as far as the percent change in RA value is concerned, the impact of these constraints was a small reduction in harvest level. Table 7 shows the change in 200 year average harvest levels for the two scenarios.

Table 7. AAC impacts

Scenario	Conifer m3/yr	Decid m3/yr
PW20004	985,692	514,843
PW30004	985,220	509,182
% change	**-0.05%**	**-1.10%**

In the initial Patchworks scenario (PW20004) two of the four songbirds modelled fall below the 15% threshold over most of the 200 year period. The Brown Creeper falls into the 15 to 30 % range at around year 60 and remains there for the remainder of the 200 year period. Similarly, the Black-throated Green Warbler falls below the 30% threshold at around year 50 and remains just below the threshold for the remainder of the 200 year period. Both of these songbirds prefer old deciduous and mixedwood forests. While the Black-throated Green Warbler's preferred habitat is limited to old deciduous and mixedwoods, the Brown Creeper has a greater variety of favoured habitat, which also includes old pine and white spruce. Increasing the amount of old deciduous and/or mixedwoods on the landbase will be required to keep the percentage change in RA value within acceptable limits.

Figure 9 and Figure 10 show the 200 year trend in the percentage of old seral stage by ecological unit *i.e.* PL, SW, SB, CD, DC and D on the total forested landbase for scenarios PW20004 and PW30004 respectively. While the TSA model is constrained to maintain a minimum of 5% old seral stage by ecological unit on the active landbase, the percentage of old D on the gross landbase (PW20004) starts at around 20%, increases slightly and then starts to drop at around 30 years reaching a low of approximately 16% at year 70. In scenario PW30004 the percent old D increases up to around year 60 and then levels off, remaining at above 25% for the remainder of the 200 year period. The mixedwood (CD and DC) old seral stages show little change between the two scenarios.

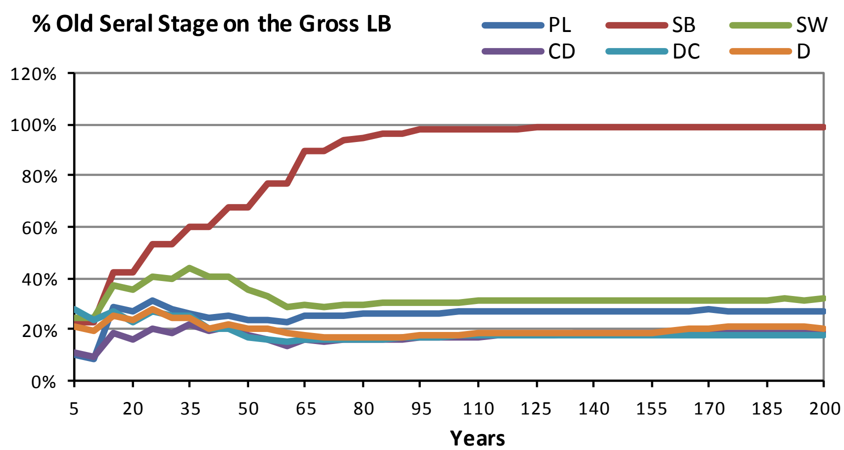


Figure 9. Old seral stage by ecological unit on the gross landbase (scenario PW20004)

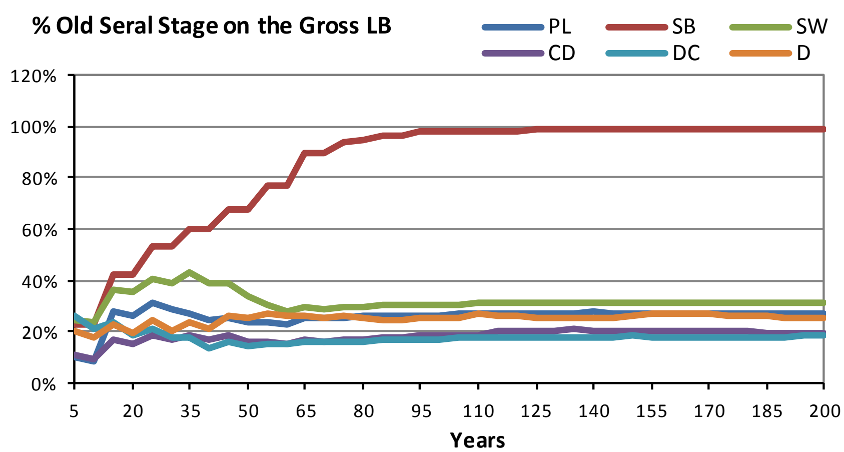


Figure 10. Old seral stage by ecological unit on the gross landbase (scenario PW30004)

Increasing the weighting on the Brown Creeper and Black-throated Green Warbler habitat constraints produced the desired result, however at the cost of a small reduction in deciduous AAC.

3.3 Updated Scenario

On April 25, 2017 new direction from the GoA stated that a 1% HLIN grid could be used in the TSA. Weyerhaeuser opted to apply the HLIN using a proxy approach based on the original 0.5% HLIN grid[5].

Table 8 shows the results from a more recent scenario (PW70004) using the 0.5% grid as proxy, while Figure 11 shows the trends over time. Constraints were placed on the Black-throated Green Warbler in an attempt to keep it above the 15% threshold. Despite this it did fall slightly below 15% level between years 50 and 100, but recovered to remain at the 15% level for the remainder of the 200 year period.

Table 8. Changes in RA value by songbird at specific points in time in the future (Scenario PW70004)

Songbird		Year 0	Year 10		Year 20		Year 50		Year 100		Year 200	
		RA Value	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg	RA Value	% Chg
BRCR	Brown Creeper	66,845	67,022	0.3%	67,602	1.1%	59,110	-11.6%	59,093	-11.6%	60,233	-9.9%
BTGW	Black-throated Green Warbler	34,691	34,704	0.0%	33,163	-4.4%	29,219	-15.8%	29,428	-15.2%	29,488	-15.0%
OVEN	Ovenbird	214,443	205,258	-4.3%	197,131	-8.1%	207,545	-3.2%	201,260	-6.1%	203,070	-5.3%
VATH	Varied Thrush	13,122	12,643	-3.6%	12,729	-3.0%	12,390	-5.6%	13,276	1.2%	13,416	2.2%

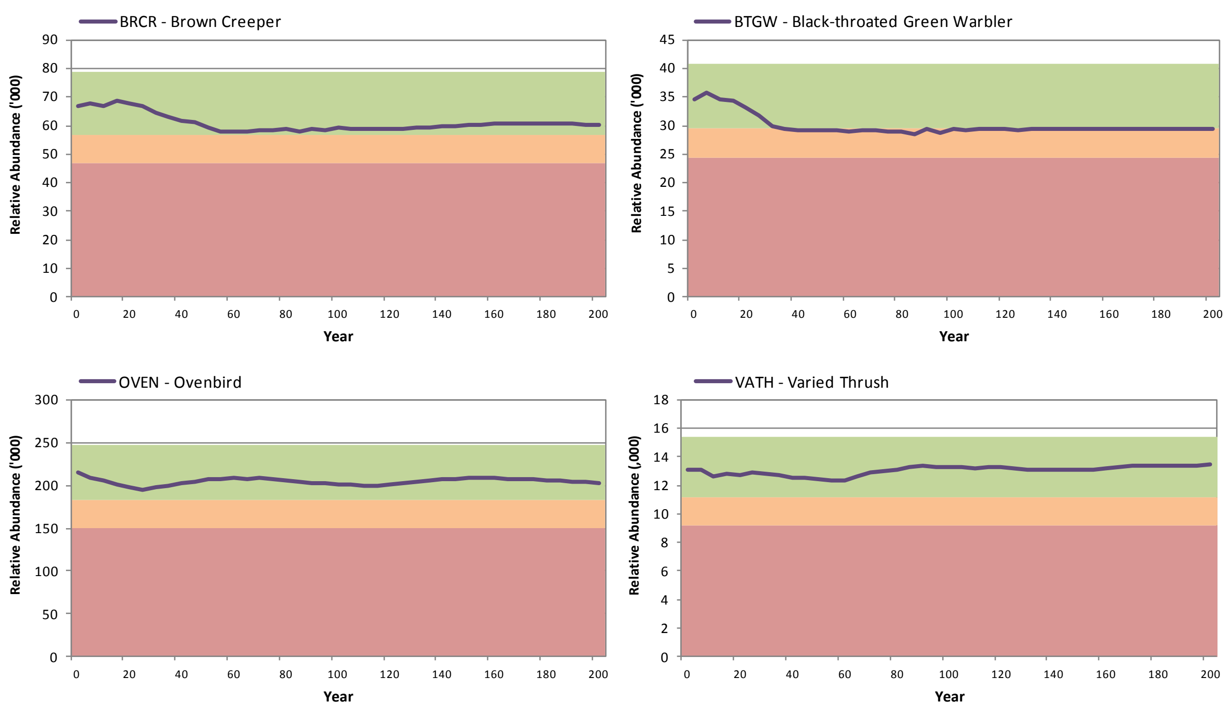


Figure 11. Trend in RA value over time (scenario PW70004).

[5] See TSA-012. While the recommended approach is to use a 1% HLIN grid and cut it into the landbase, a 0.5% grid was selected and the proxy approach used so as to reduce the amount of linework in the modeling landbase. The 1% grid covers an area of 182,160 ha while the 0.5% grid when used as a proxy selects polygons totalling an area of 185,788 ha. The 0.5% proxy therefore closely represents the 1% grid area.

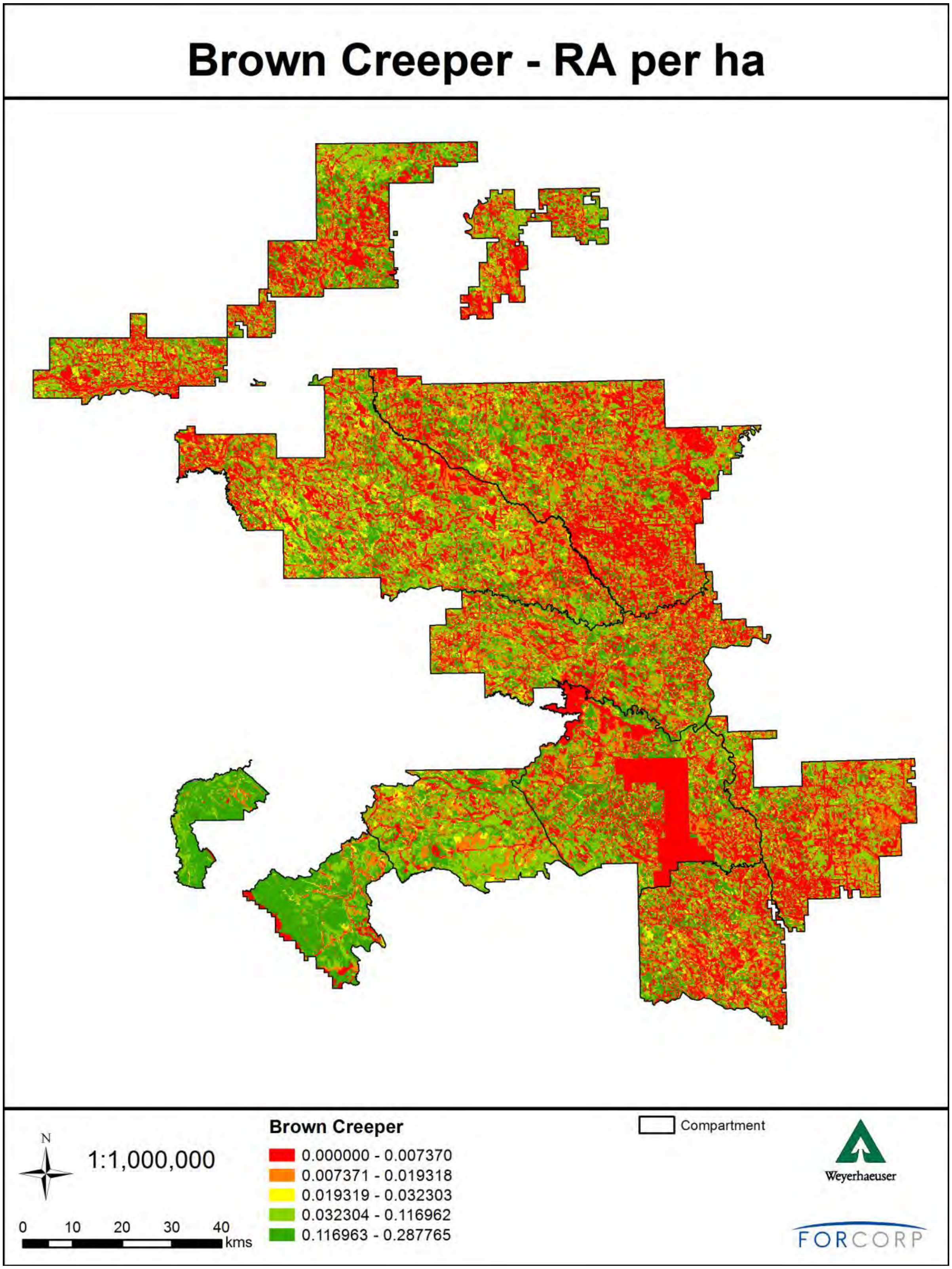


Figure 12: Relative abundance per hectare values - Brown Creeper.

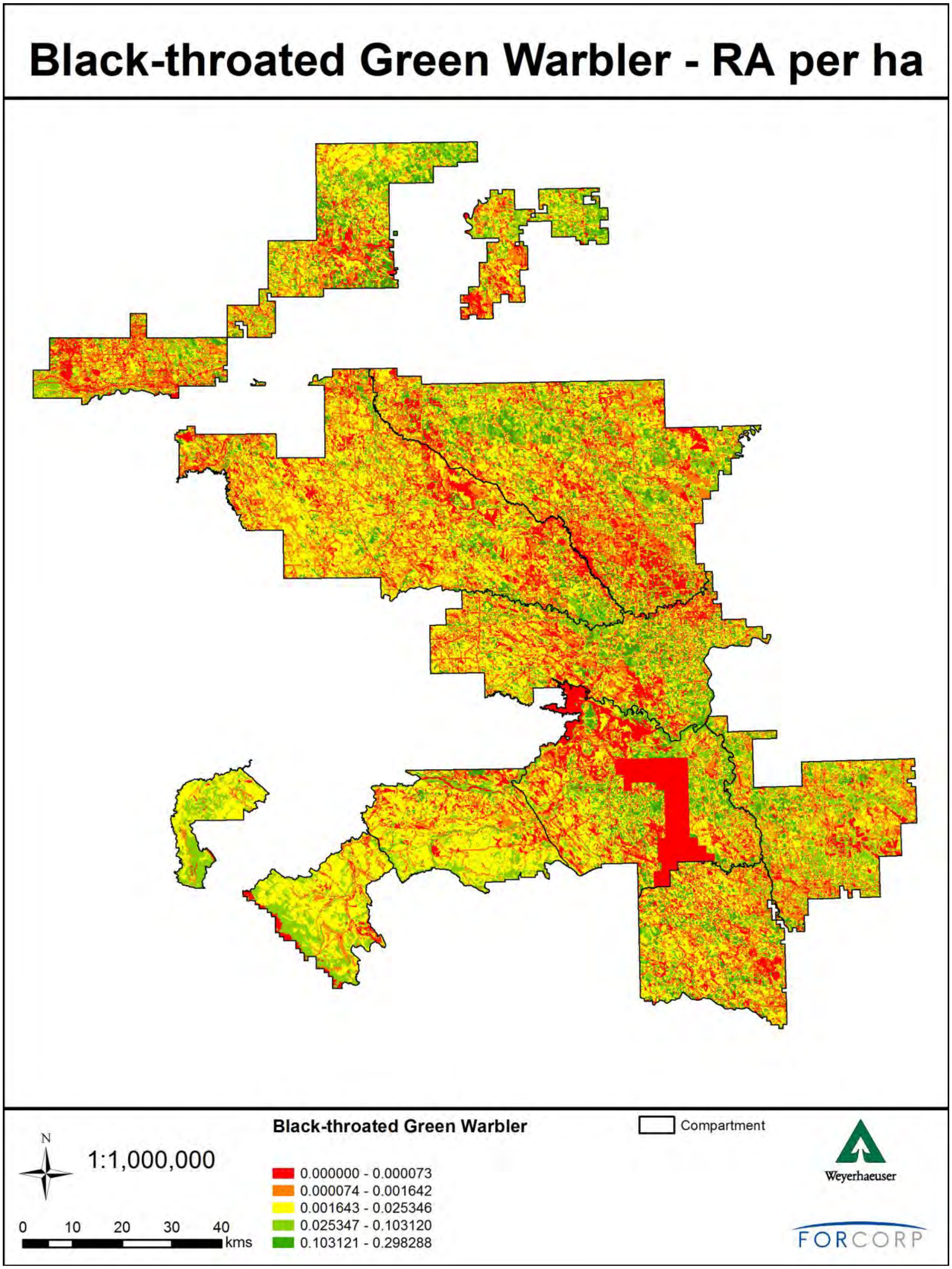


Figure 13: Relative abundance per hectare – Black-throated Green Warbler.

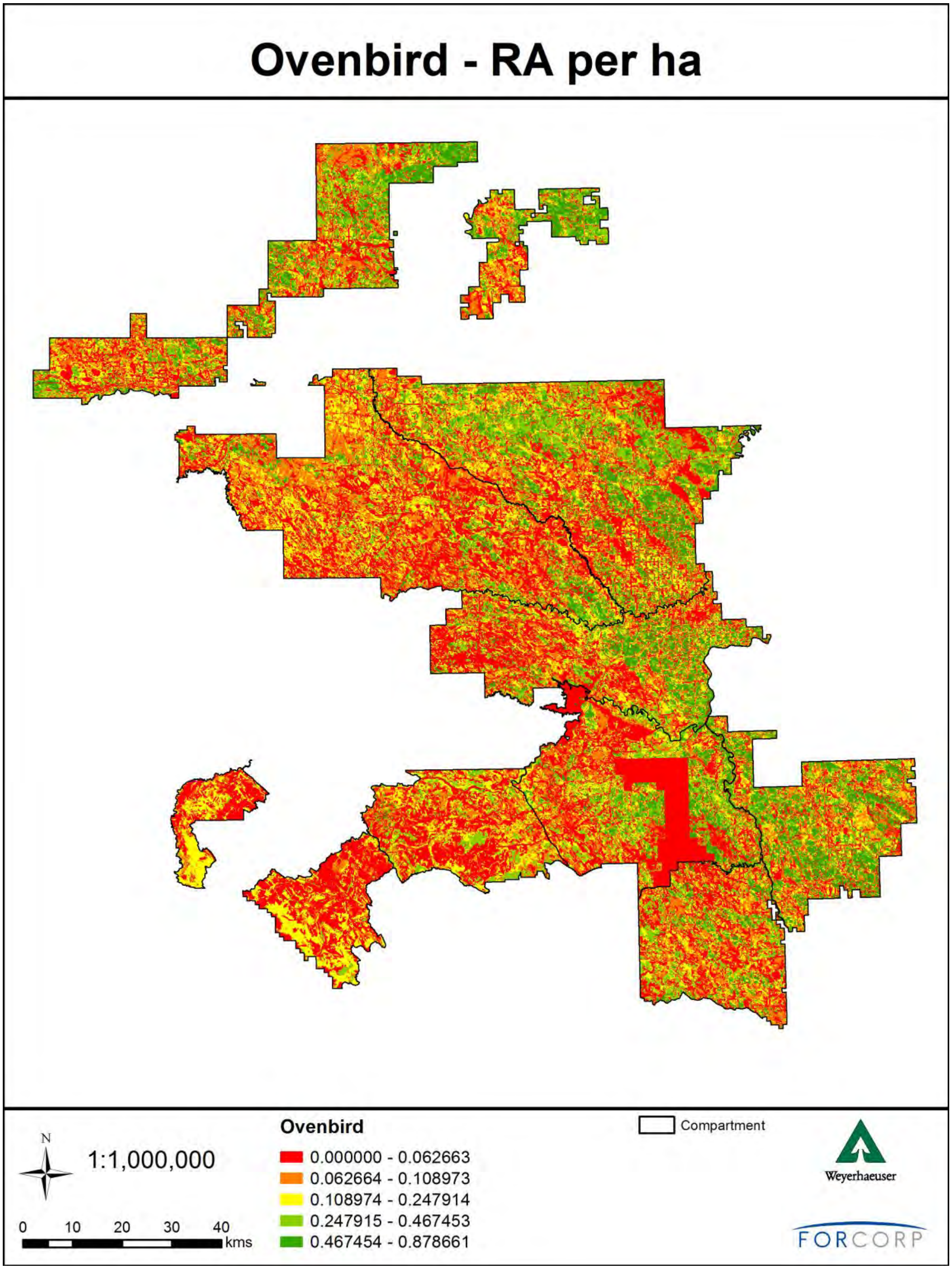


Figure 14: Relative abundance per hectare - Ovenbird.

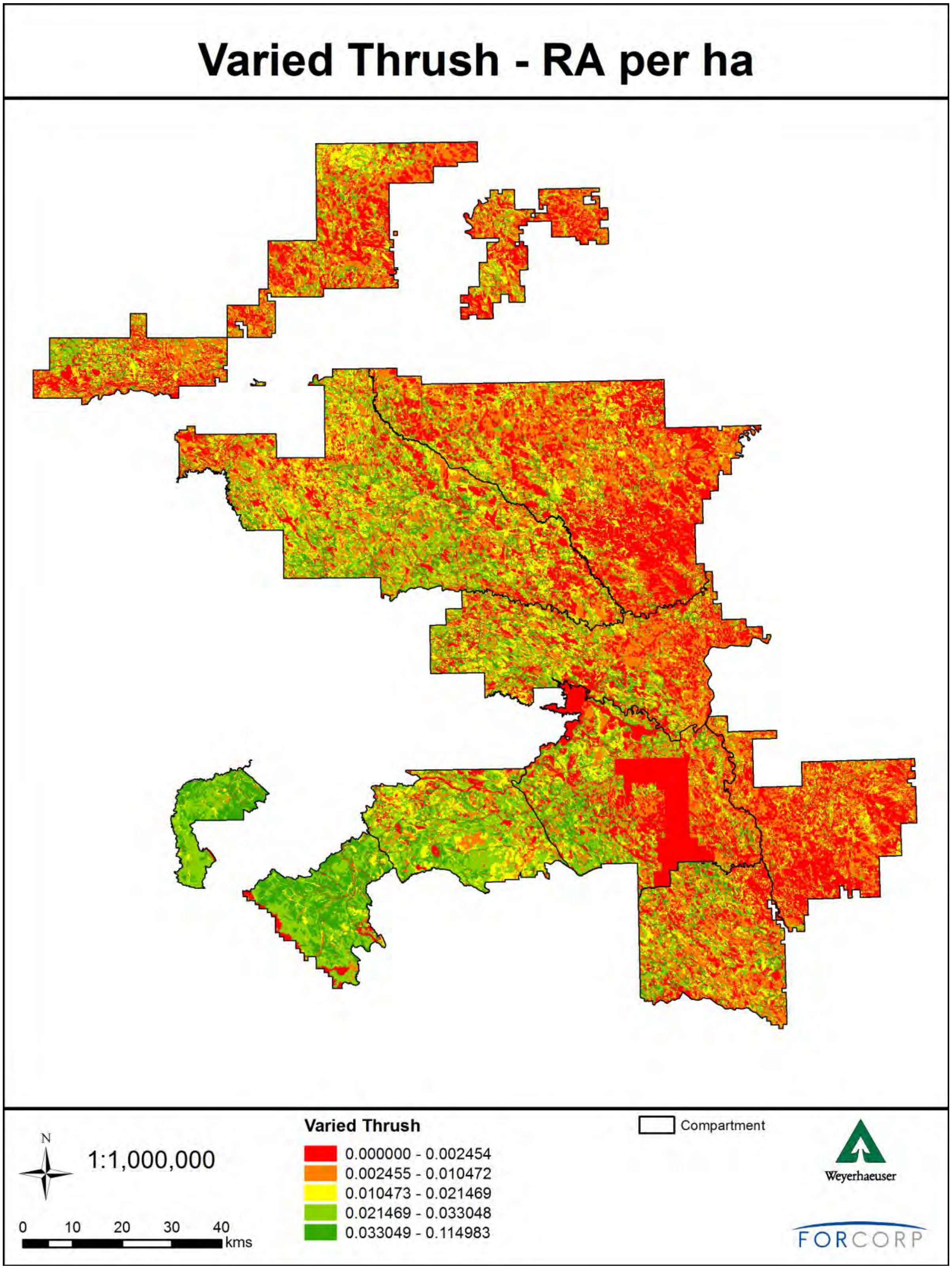


Figure 15: Relative abundance per hectare - Varied Thrush.

Appendix VII – TSA-010: Barred Owl Habitat: TSA Predictive Modelling

Weyerhaeuser

TSA-010 - Barred Owl Habitat: TSA Predictive Modelling

Type: □ Requires Resolution √ Discussion Item

1 Background

The objective of VOIT 1.2.1.1 of Weyerhaeuser's 2016 FMP is to maintain habitat for identified high value species. These species are identified as being barred owl, grizzly bear, old forest warblers and east slopes cold water fish. For assessing changes in barred owl habitat, the GoA has developed models that can be used to describe the habitat at various points in time based on changes to the forest following Timber Supply Analysis modeling. Initial or time zero habitat conditions are set as TSA modelling time 0. This document describes the development of the time zero and predictions for barred owl habitat over the course of the TSA.

2 Model Description

A model was provided by the GoA (December 2016) to estimate the Resource Selection Function (RSF) for barred owl across the Weyerhaeuser Pembina DFA. This model is based off of Master's thesis work by Russell[1] conducted in the Athabasca region of Alberta, and has been adjusted for the foothills of Alberta.

The model uses the following fields from the net landbase as inputs:

1. Anthropogenic vegetated land call (ANTH_VEG)
2. Anthropogenic non-vegetated land call (ANTH_NON)
3. Balsam fir percentage (FB_PCT)
4. Total deciduous percentage (HARD_PCT)
5. Natural non-vegetated land call (NAT_NON)
6. Non-forested land call (NFL)
7. Non-forested land percentage (NFL_PER)
8. Updated stand modifier call (PLB_MOD1)
9. Updated stand origin (PLB_ORIGIN)
10. Lodgepole pine percentage (PL_PCT)
11. White spruce percentage (SW_PCT)
12. Polygon area (Shape_Area)
13. Polygon perimeter (Shape_Leng)

With some field names in the source code being different from those created through the landbase process, the field names in the source code were adjusted where required to ensure the model would run. An additional change in the source code was completed on Line 248 to include the pine component

[1] Russell,M.S., 2008. Habitat selection of barred owls *(Strix varia)* across multiple spatial scales in a boreal agricultural landscape in north-central Alberta. M.Sc. Thesis, University of Alberta.

in the conifer calculation for the foothills region calculations. This inclusion of pine was mentioned in the code comments on Line 247, but the code did not reflect this on Line 248. Additional unique key fields (AVI_UKEY and TSA_UKEY) were also included in the input layer although they are not part of the model calculations. This was done to allow the dataset to be joined to the landbase if further analysis is required.

To run the model the landbase fields mentioned above were entered into the model as the inputFC (Input Feature Class). In addition to this, a polygon layer with the reporting zones was also used. For the purposes of this species, the results are reported at the DFA level. The start year for this model is adjusted to match the year of the input layer. For the landbase, the effective date of 2015 is to be used and for each period in the TSA the effective date is adjusted. Finally the input region was also specified in this model as the “Foothills” region.

Using these input parameters, the model creates a series of raster models of the DFA. These include the percentage of hardwood forest, percentage of white spruce and balsam fir, perimeter to area ratio of each forested and non forested patch, distance to old growth forest, and distance to nearest forest opening. Using the pixel values from each of these derived raster models, a resource selection function (RSF) is then calculated for each pixel across the landbase, and summary statistics of this RSF were calculated for the DFA.

Further to this, the RSF pixel values are aggregated into larger pixels to estimate the habitat suitability for breeding pairs. To determine suitability, the pixels were aggregated to expand the pixel size from 0.02 ha (15 m pixel) to 400 ha (2,000 m pixel). Within these aggregated pixels, the mean RSF value was calculated. Based on this mean RSF value, pixels with a value greater than 0.17054 are considered to have the potential to host a breeding pair and values below this do not have breeding pair potential. The 0.17054 value was set by the GoA.

Based on this breeding pair model, an estimate of the potential breeding pairs that the landbase can support can also be calculated. To calculate the potential breeding pairs, the count of pixels from the attributes table in the breeding pair model is required. This count value refers to the number of 15 x 15 meter pixels that have a value of 0.17054 or greater. By multiplying the pixel count by the hectares per pixel (0.0225 ha) and then dividing that value by the estimated range required to support a breeding pair (568 ha) the potential number of breeding pairs that could be supported across the DFA can be estimated. The 568 ha breeding pair range is presented by Russell (2008). These calculations are summarized in the following formula.

$$Suitable\ Habitat\ (Pixels)\ x\ \frac{0.0225\ ha}{Pixel}\ x\ \frac{1}{568\ ha} = Potential\ Breeding\ Pairs$$

3 Forecasting

With the initial run of the model providing a snapshot at the effective date of the landbase (2015), adjustments to the landbase are required to forecast the habitat states at future periods in the TSA. To do this a period table is generated from the TSA and periods are extracted for the scenario. For the scenario, forecasts at period 0 (2017, TSA effective date), period 2 (2027, 10 years into TSA), period 4

(2037, 20 years into TSA), and period 10 (2067, 50 years into TSA) are conducted. To allow the forecasting, the stand origin (PLB_Origin) is updated for each individual model run. To update the origin, the stand age for each forested polygon in the landbase is required. The stand age is subtracted from the forecast year of each period to determine the updated origin. In doing this, the model is able to update the age of the forest and determine how the mature forested areas have been modified. The results of these runs can then be used to determine how habitat has been affected from period to period. The changes to RSF and breeding pair suitability can both be calculated. Thresholds for the reduction in RSF value compared to the time zero value are:

- 0 – 15% - Low risk. Considered acceptable, no further action required.
- 15 – 30% - Moderate risk. Considered outside acceptable limits, constraints may need to be applied in the TSA model.
- > 30% - High risk. Significant impact on habitat suitability, constraints will have to be applied in the TSA model.

4 Results

The model was run at the DFA level. Table 1 presents the RSF and breeding pair counts over the course of the TSA (scenario PW50005) and compares the projections to the values at time zero of the TSA. The periods reported on are period 2 (2027, 10 years into TSA), period 4 (2037, 20 years into TSA), and period 10 (2067, 50 years into TSA). From these projections, the RSF values stay within the 15% threshold for changes from Period 0 for all periods. For the breeding pair counts, change falls outside of the 15% threshold at Period 10.

Table 1: The mean RSF and estimated breeding pair counts for scenario PW70004. All changes are reported against Period 0.

Period	Year	Mean RSF	% Change from Period 0	Habitat Suitable For Breeding Pairs (Pixels)	Potential Breeding Pair Count	% Change from Period 0
0	2017	0.1346	-	16,875,306	668	-
2	2027	0.1357	0.80	16,592,282	657	-1.7
4	2037	0.1358	0.85	16,786,861	665	-0.5
10	2067	0.1204	-10.58	12,629,946	500	-25.2

The RSF and breeding pair rasters were mapped for each period (Figures 1 through 8). In each RSF map, all pixels were grouped into two values with 0.17054 being the cutoff value between the two categories. This was selected as the critical value as it is used in the breeding pair maps to determine whether the pixel is suitable for breeding pairs. Using these outputs, the breeding pair suitability maps was created (Figures 2, 4, 6, and 8).

5 Discussion

Within the DFA, an RSF function was not calculated for any areas where there was no AVI interpretation (e.g. First Nations Reserves) or where the area was not forested. This is represented by the white space within the map. This has the potential to affect the estimates of breeding pair suitability as the mean values within the large pixels may not have the full 400 ha of area to base the estimate on. Additionally, with the pixel locations being based on the furthest extents of the FMU, some pixels have areas that fall outside of the interpreted area. This also affects the calculated mean of the breeding pair suitability.

As the barred owl model cannot be integrated directly into the TSA model, direct constraints in the TSA model to improve habitat suitability are not an option. As the potential number of breeding pairs falls below the 15% threshold at year 40 and later, the following patch targets based on relevant deciduous and mixedwood strata (Aw, AwSw & SwAw) have been included in the TSA model in an attempt to bring the breeding pair metrics within the 15% threshold:

- The first target attempts to encourage a better area-to-perimeter (ATOP) metric in the above strata over 30 years of age, and
- The second target will encourage larger patches of stands of the above strata greater than 90 years of age.

Patches of 400 ha or greater where stands are no more than 15m apart are targeted in both of the above patch targets.

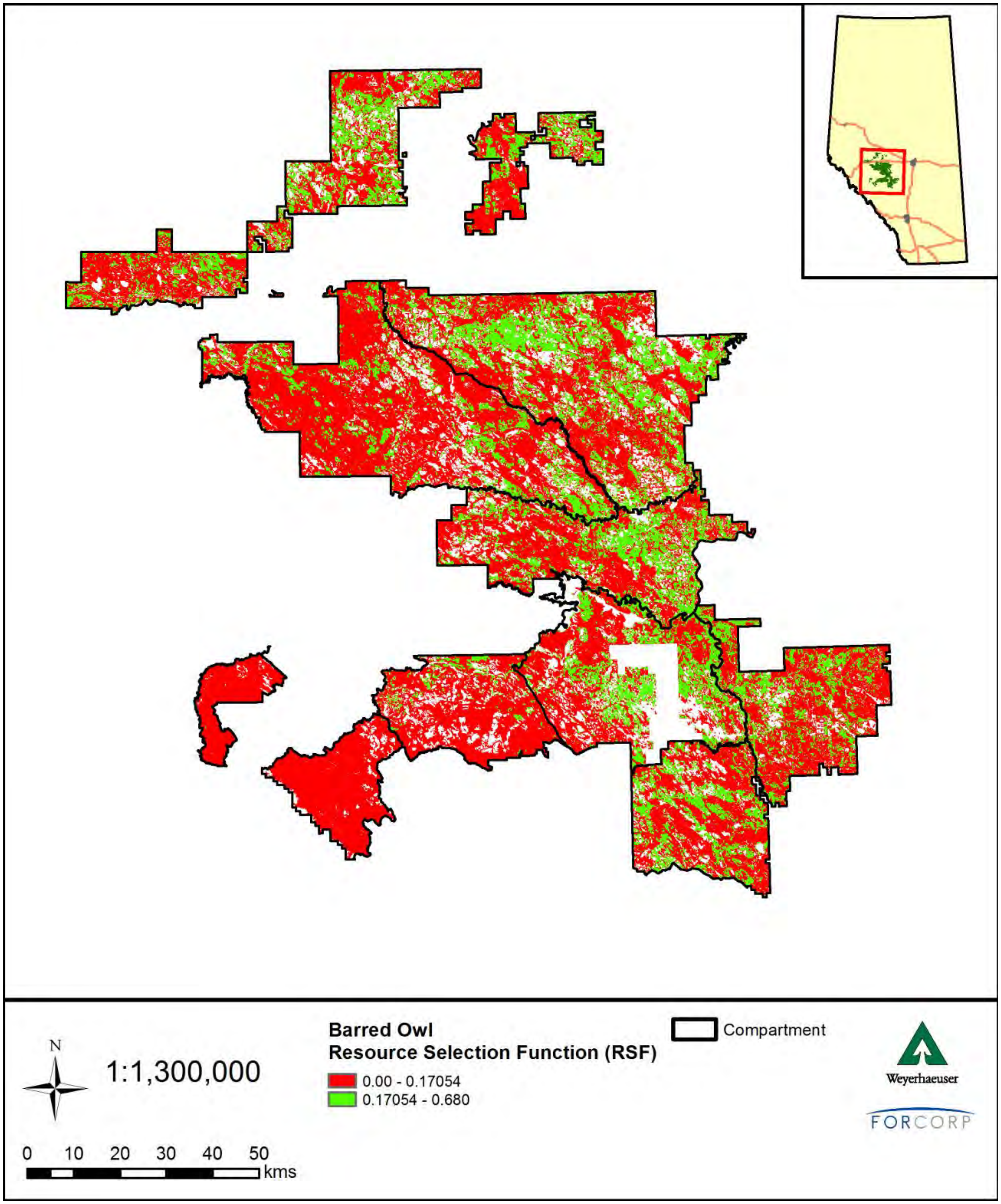


Figure 1: Resource Selection Function (RSF) estimates for barred owl in the Weyerhaeuser Pembina DFA at TSA Period 0 (2017). Pixels are 15 m x 15 m.

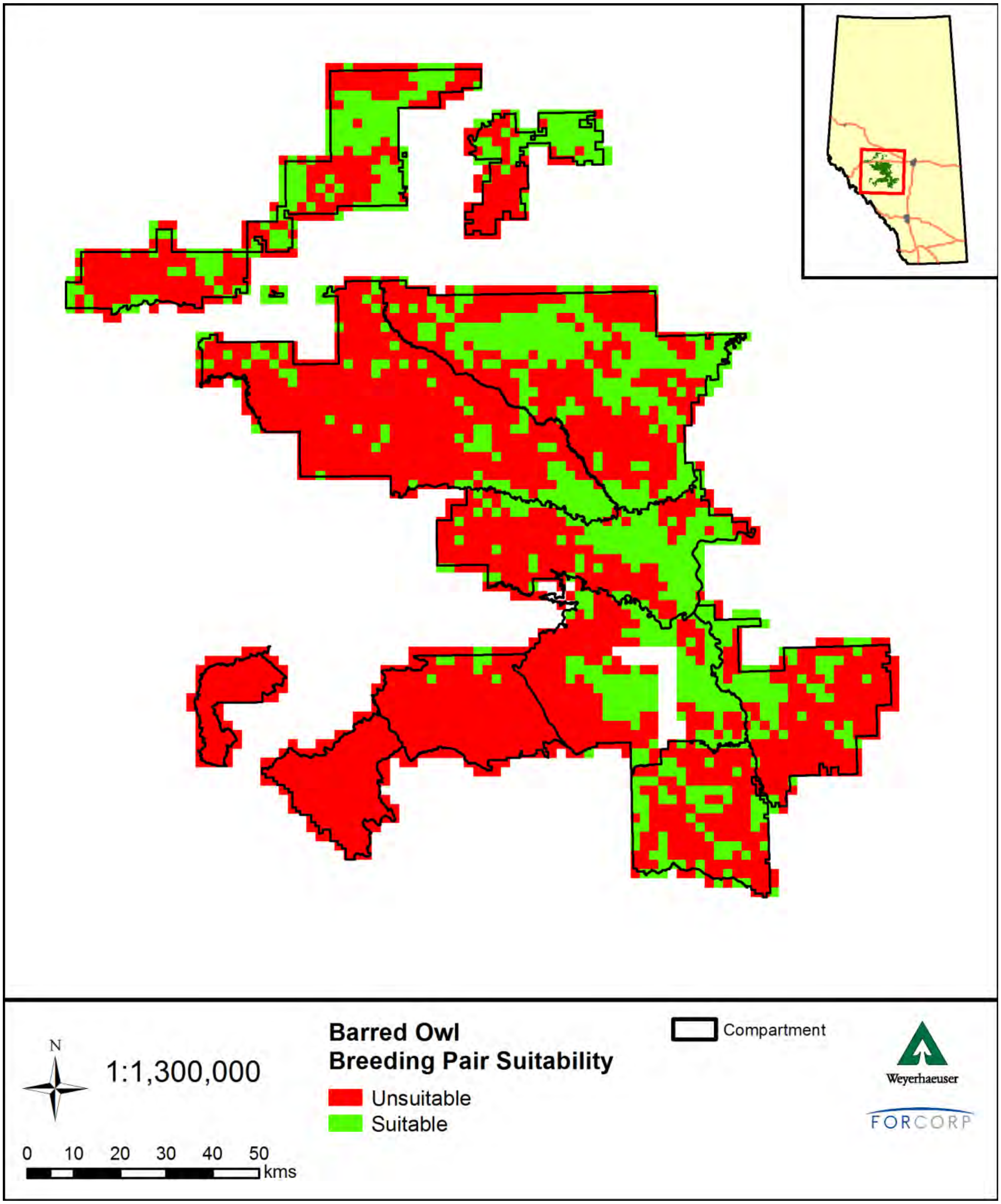


Figure 2: Habitat suitability for breeding pairs of barred owl within the Weyerhaeuser Pembina DFA at TSA Period 0 (2017). Pixels are 2000 m x 2000 m, and the mean RSF value within each pixel must be greater than or equal to 0.17054 to be assigned as suitable.

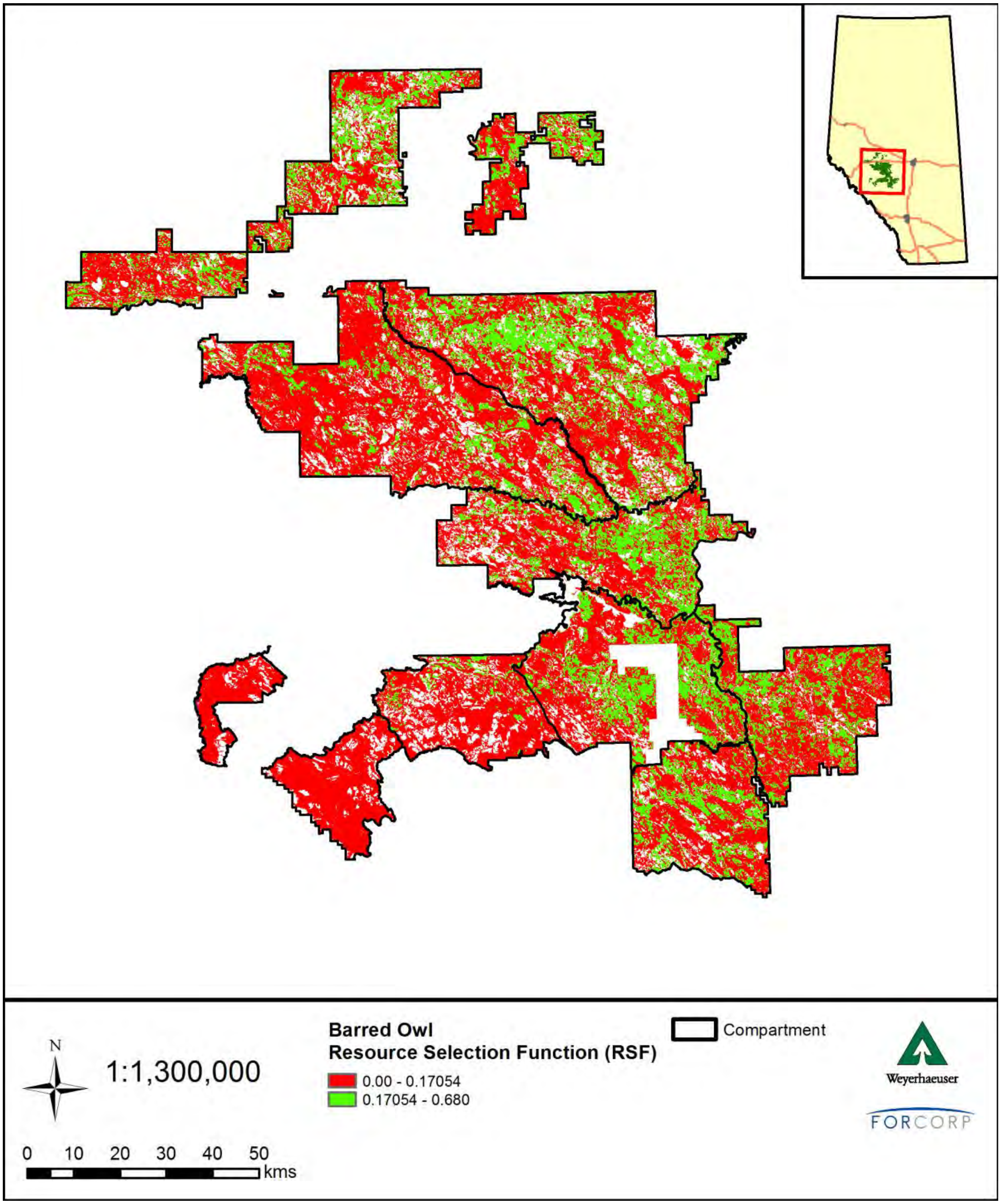


Figure 3: Resource Selection Function (RSF) estimates for barred owl in the Weyerhaeuser Pembina DFA at TSA Period 2 (2027). Pixels are 15 m x 15 m.

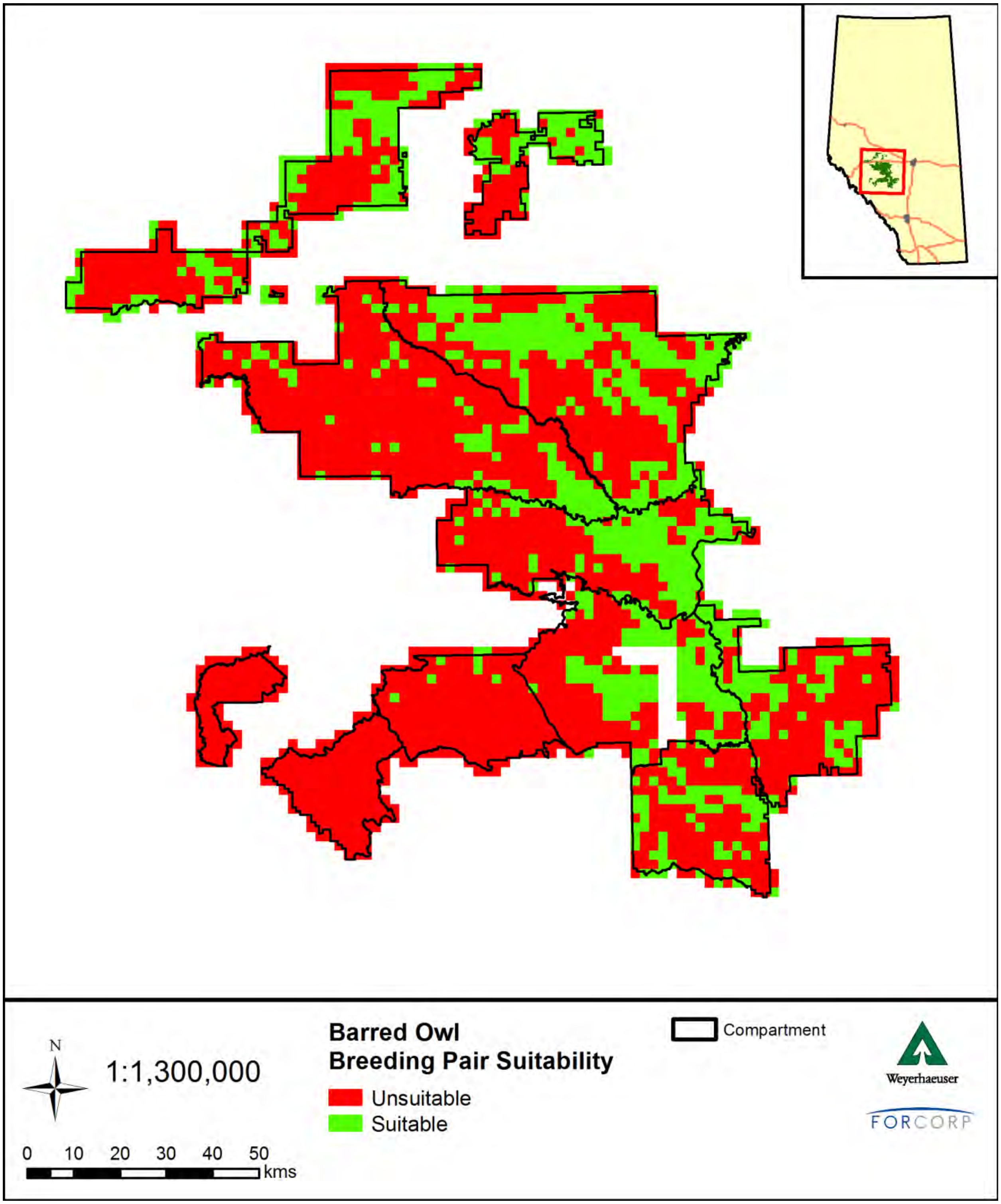


Figure 4: Habitat suitability for breeding pairs of barred owl within the Weyerhaeuser Pembina DFA at TSA Period 2 (2027). Pixels are 2000 m x 2000 m, and the mean RSF value within each pixel must be greater than or equal to 0.17054 to be assigned as suitable.

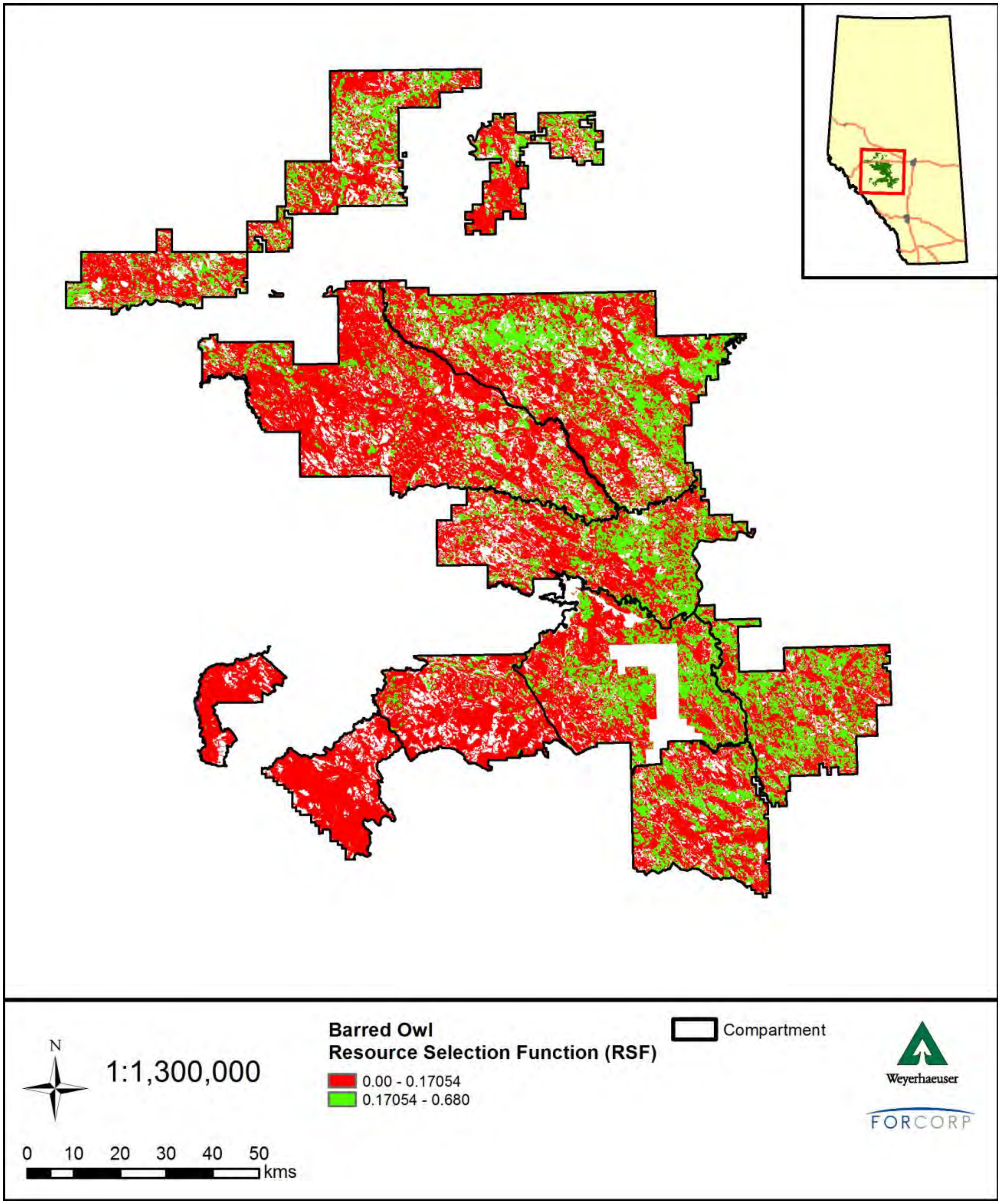


Figure 5: Resource Selection Function (RSF) estimates for barred owl in the Weyerhaeuser Pembina DFA at TSA Period 4 (2037). Pixels are 15 m x 15 m.

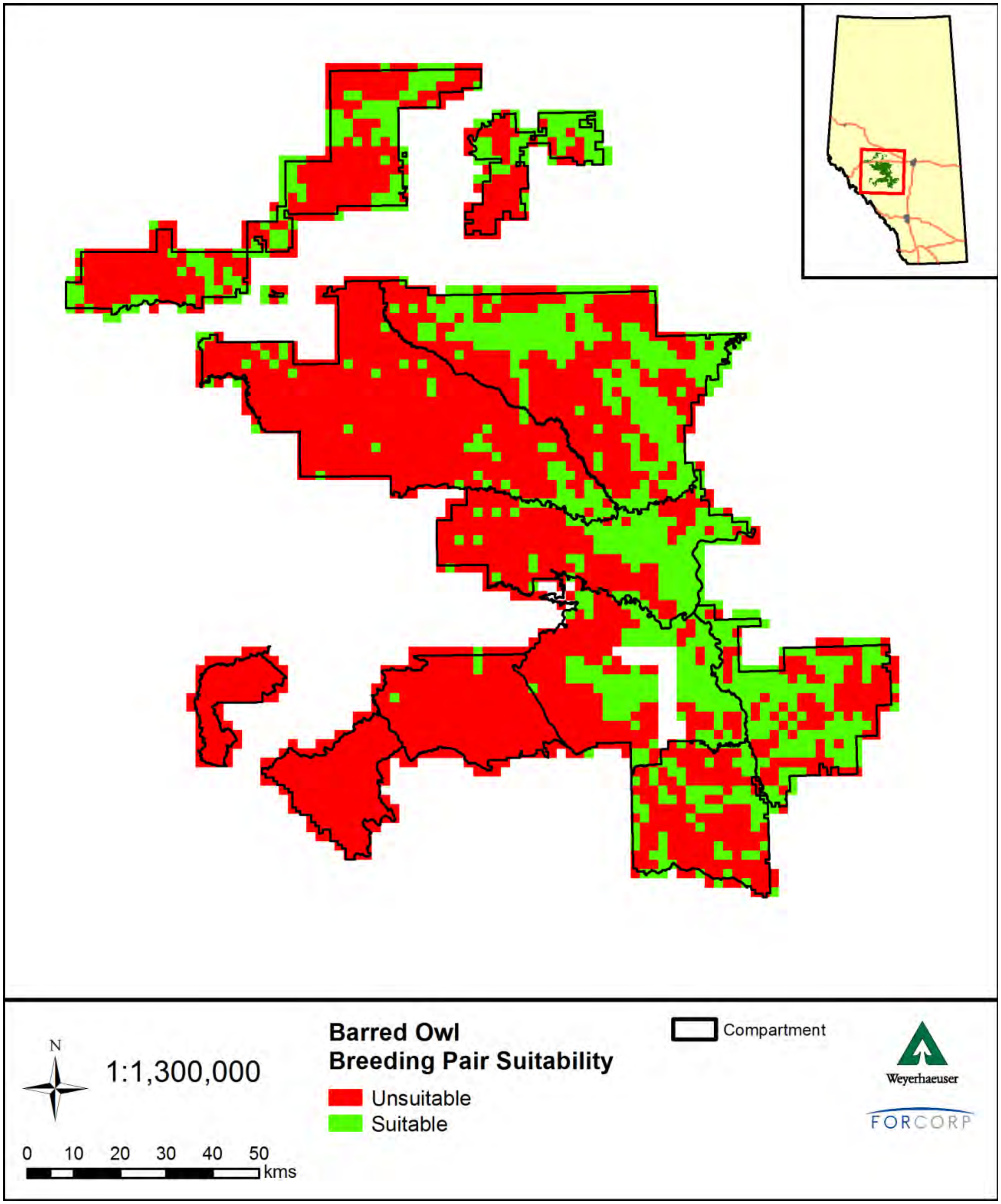


Figure 6: Habitat suitability for breeding pairs of barred owl within the Weyerhaeuser Pembina DFA at TSA Period 4 (2037). Pixels are 2000 m x 2000 m, and the mean RSF value within each pixel must be greater than or equal to 0.17054 to be assigned as suitable.

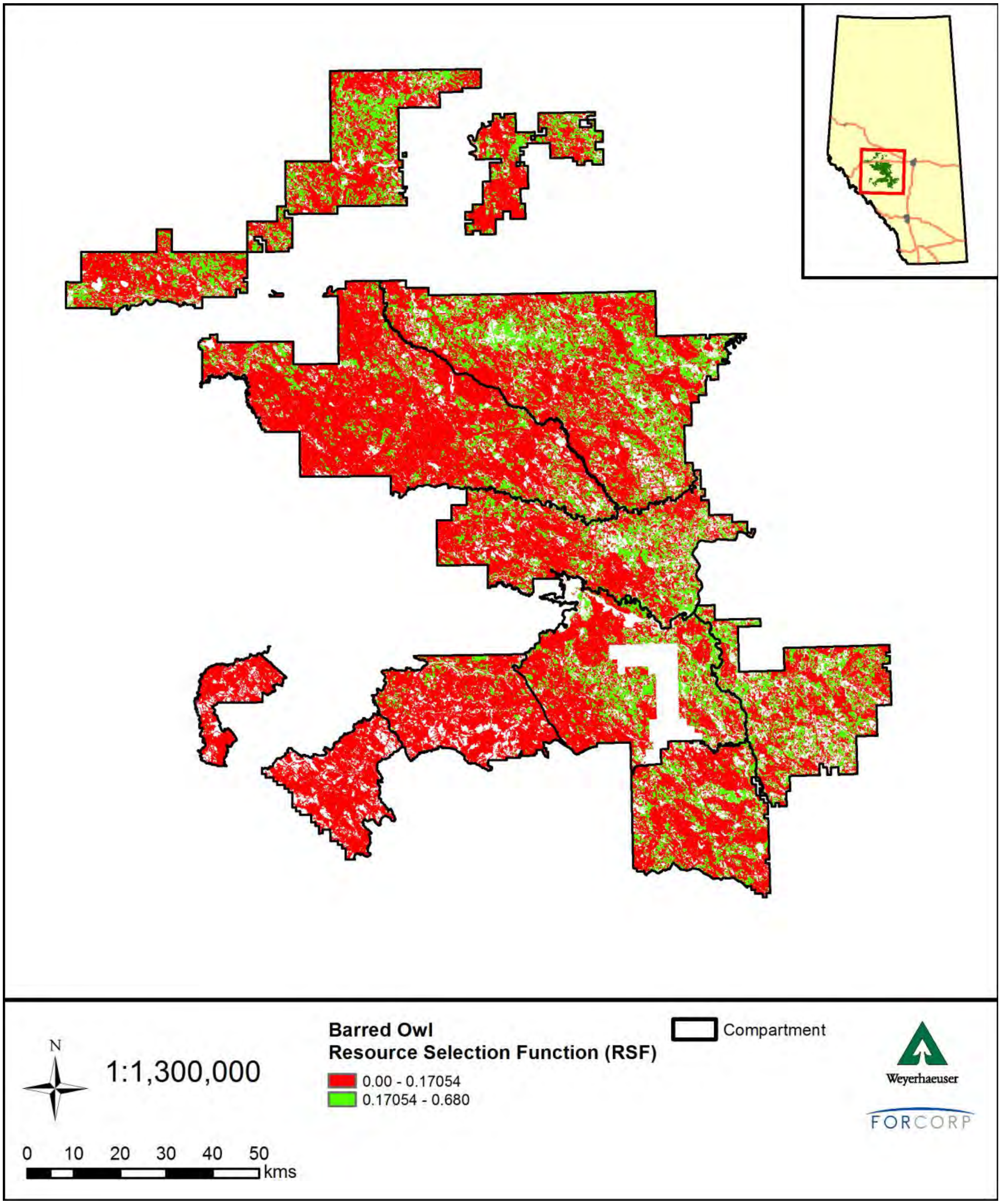


Figure 7: Resource Selection Function (RSF) estimates for barred owl in the Weyerhaeuser Pembina DFA at TSA Period 10 (2067). Pixels are 15 m x 15 m.

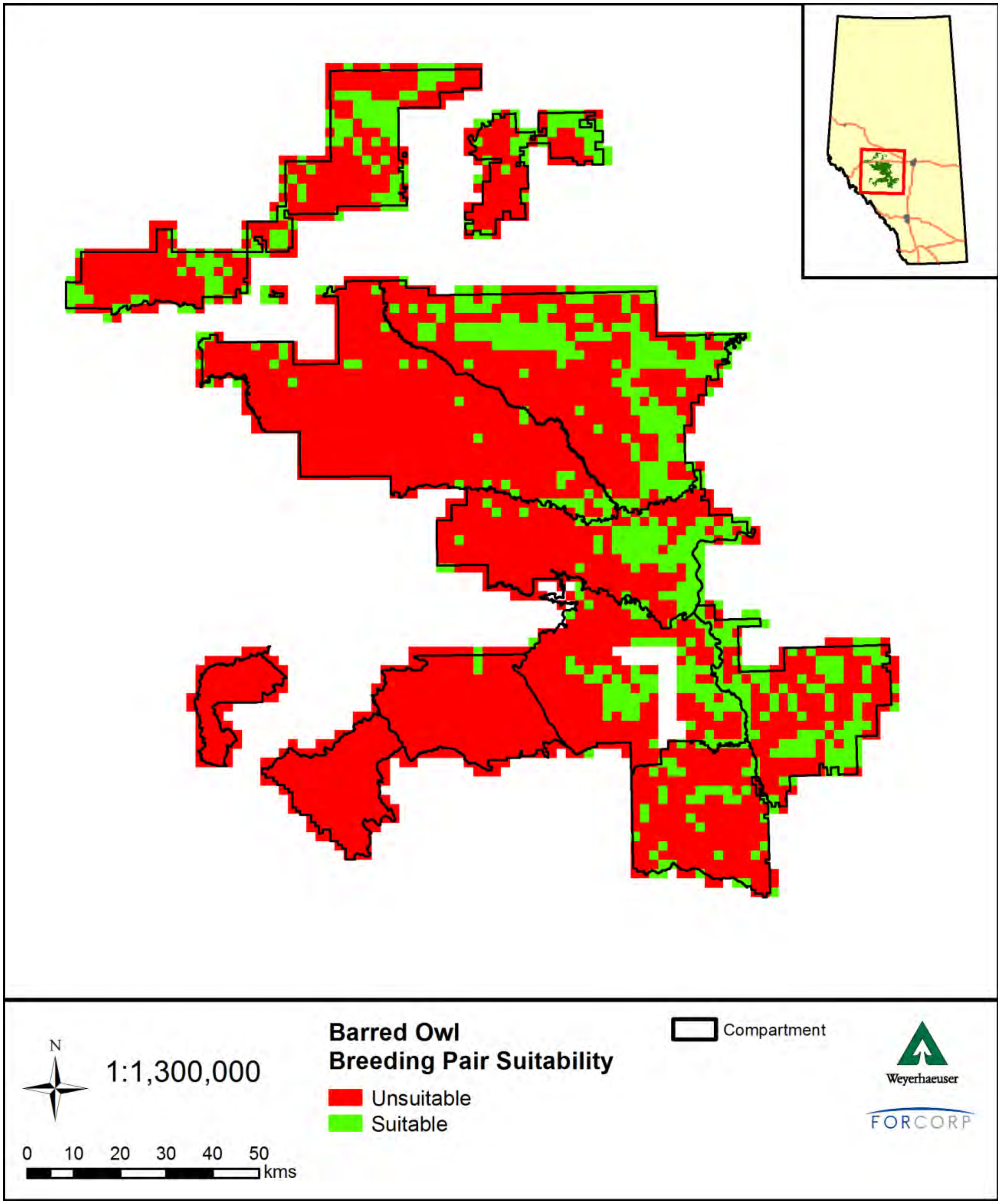


Figure 8: Habitat suitability for breeding pairs of barred owl within the Weyerhaeuser Pembina DFA at TSA Period 10 (2067). Pixels are 2000 m x 2000 m, and the mean RSF value within each pixel must be greater than or equal to 0.17054 to be assigned as suitable.

Appendix VIII – TSA-011: Grizzly Bear Habitat: TSA Predictive Modelling.

TSA-011 : Grizzly Bear Habitat: TSA Predictive Modelling

Type: □ Requires Resolution √ Discussion Item

1 Background

The objective of VOIT 1.2.1.1 of Weyerhaeuser's 2016 FMP is to maintain habitat for identified high value species. These species are identified as being barred owl, grizzly bear, old forest warblers and east slopes cold water fish. For grizzly bears, the target is to maintain the number of hectares of primary and secondary habitat as measured at Time 0. To assess these changes in grizzly bear habitat, the Foothills Research Institute (FRI) has developed a habitat state model which identifies landbase conditions and can forecast habitat state. Initial or time zero habitat conditions are determined from Landsat imagery and are augmented by additional GIS layers which update the Landsat imagery to the FMP effective date. These layers include recent cutblocks, roads, pipelines and other DIDs deletions. This document briefly describes the development of the time zero conditions for grizzly bear habitat state.

2 Model Description

The model used for this analysis was developed by the Foothills Research Institute (September 2015), and all assumptions of that model are applied to this analysis. To run this model for the Pembina Timberlands, model runs for each of the Clearwater, Grande Cache, and Yellowhead grizzly bear populations that intersect the Weyerhaeuser Pembina DFA (Figure 1) were completed.

The base of the model is a landbase created from a 2014 Landsat raster. To further augment this landbase, shapefiles of important landbase deletions that have occurred since the Landsat capture date can also be included. These deletions include:

1. Recent cutblocks (polygon features)
2. Roads (line features)
3. Pipelines (line features)
4. Reclaimed roads (line features)
5. Other DIDs deletions (polygon features)

To build the recent cutblocks polygon features, a methodology was required to ensure that it is applied consistently across all periods. In all cases, conifer dominated cutblocks 30 years old or younger and deciduous dominated cutblocks 20 years old or younger were considered to be recent cutblocks. These numbers are based on the regenerating seral stage as defined in issue document LB-013. For the initial conditions of the landbase, all polygons in the active landbase that fell within the appropriate age ranges were classified as recent cutblocks. For forecasts in the TSA, period tables were used to determine the age ranges of the polygons in the active landbase. For the roads, pipelines and DIDs dispositions, layers were held consistent across all model runs as no forecasts of the growth or reclamation of these features is available.

From these inputs, the model calculates the habitat state for each raster pixel. Each pixel is 0.09 ha (30 m sides) and is assigned an integer value between -2 and 2, with the values referring to:

- -2 : Primary sink
- -1 : Secondary sink
- 0 : Non-critical habitat
- 1 : Secondary habitat
- 2 : Primary habitat

Non-critical habitat refers to area that may be habitable but by grizzly bears. Primary and secondary habitat are areas that grizzly bears will inhabit, while primary and secondary sink areas are habitat areas that also have a high probability of grizzly bear mortality.

3 Forecasting

With the initial run of the model providing a snapshot at the effective date of the TSA (2017), adjustments to the landbase are required to forecast the habitat states at future periods in the TSA. To do this, a period table is generated from the TSA and periods are extracted for the scenario. For the scenario, forecasts at period 0 (2017, TSA effective date), period 2 (2027, 10 years into TSA), and period 4 (2037, 20 years into TSA) are conducted. The results of these runs can be used to determine how habitat has been affected from period to period. The changes to road density and habitat states can both be calculated with thresholds being compared to the time zero value.

4 Results

The results of the model run at Time 0 are presented in Tables 1, 2 and 3, and mapped in Figure 2. Table 1 shows the estimates habitat state areas for each model run at the habitat zone level. With some of these populations only inhabiting a small portion of the DFA, the estimates for the entire habitat zone were also included to aid in assessing the current state of the grizzly bear population. Tables 2 and 3 show summary results that are presented in Table 1. The results for the runs of Period 2 and 4 data are presented in Figures 3 and 4.

With the habitat areas being spread out between a number of Grizzly Bear Watershed Units and three population units it was decided that results should be reported at the landbase level. This ensured that harvest operations within the smaller reporting units did not misrepresent what was happening to the entire habitat area.

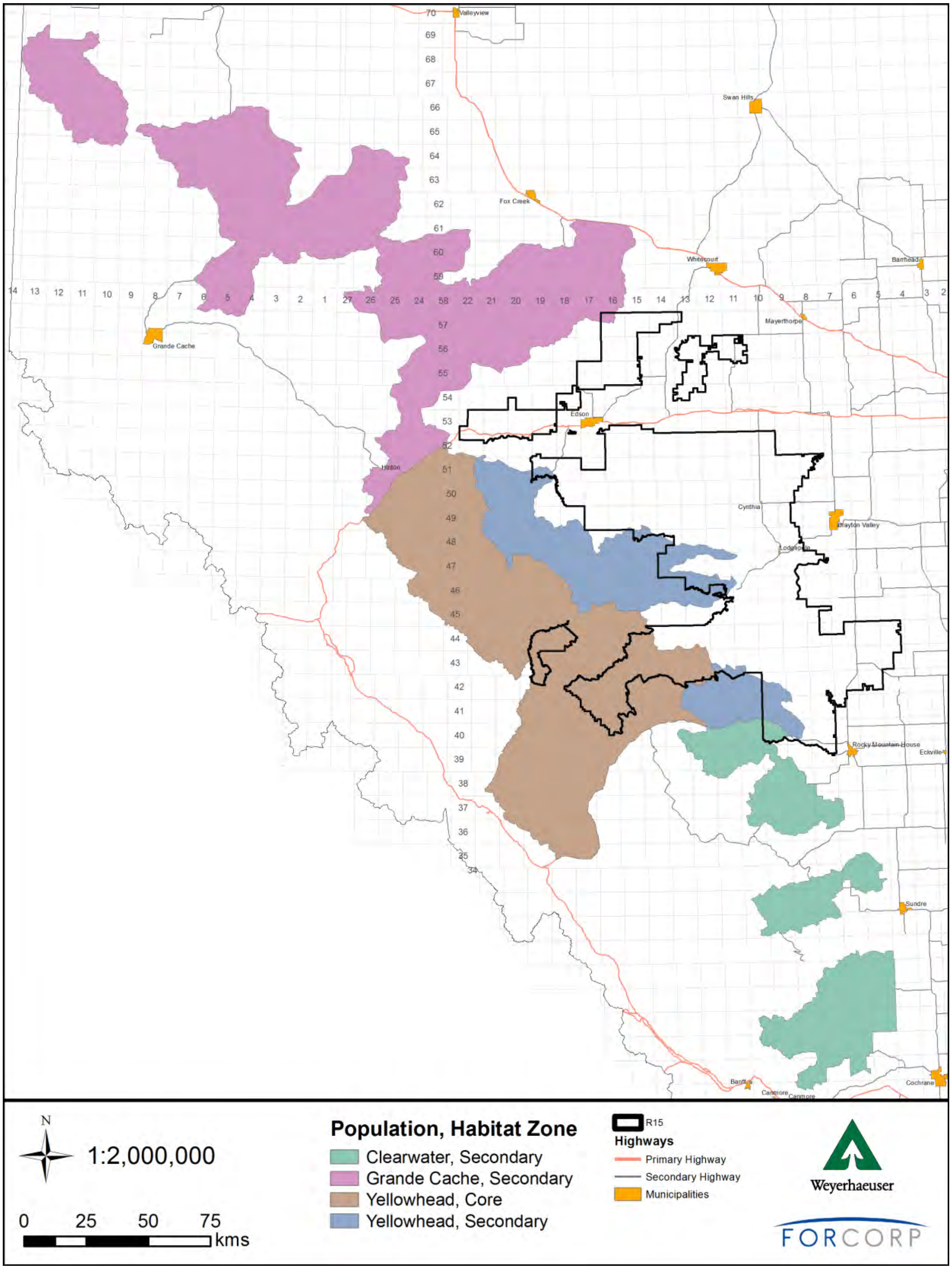


Figure 1: Grizzly bear populations and habitat zones that intersect the Weyerhaeuser Pembina DFA.

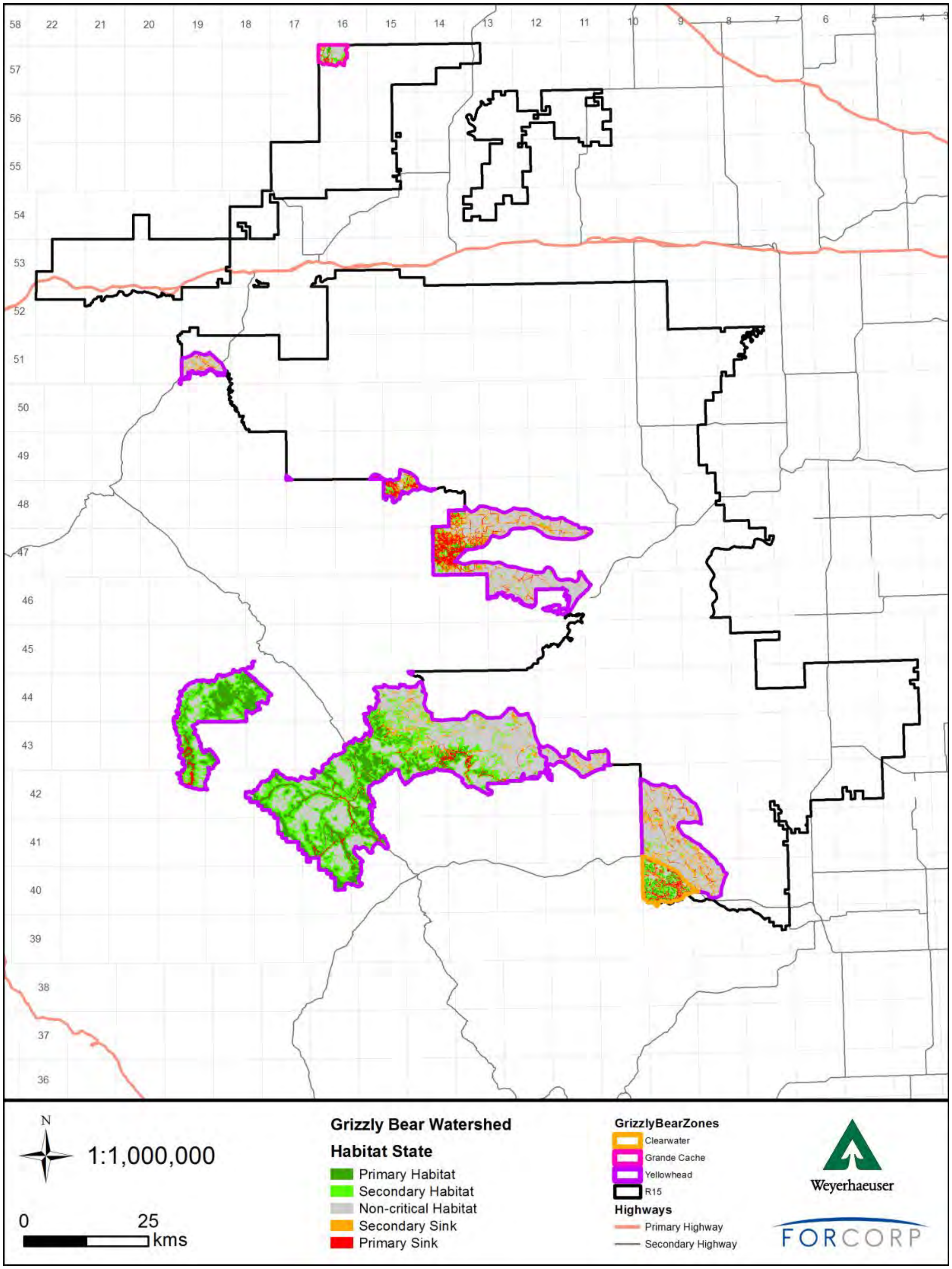


Figure 2: Habitat states at TSA Time 0 (2017) for the three grizzly bear populations within the Weyerhaeuser Pembina DFA.

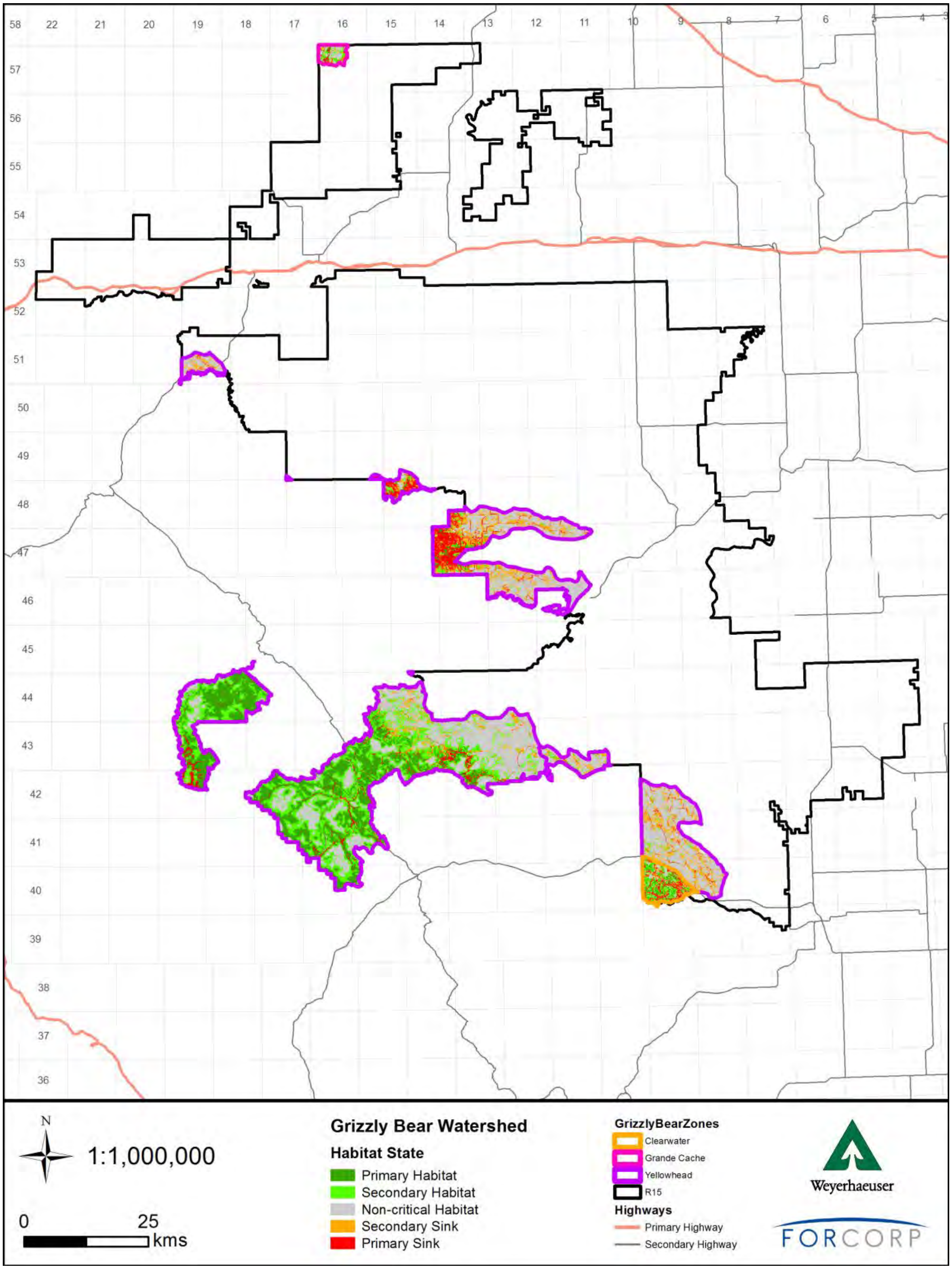


Figure 3: Habitat states at the end of the first decade (2027) of the TSA for the three grizzly bear populations within the Weyerhaeuser Pembina DFA.

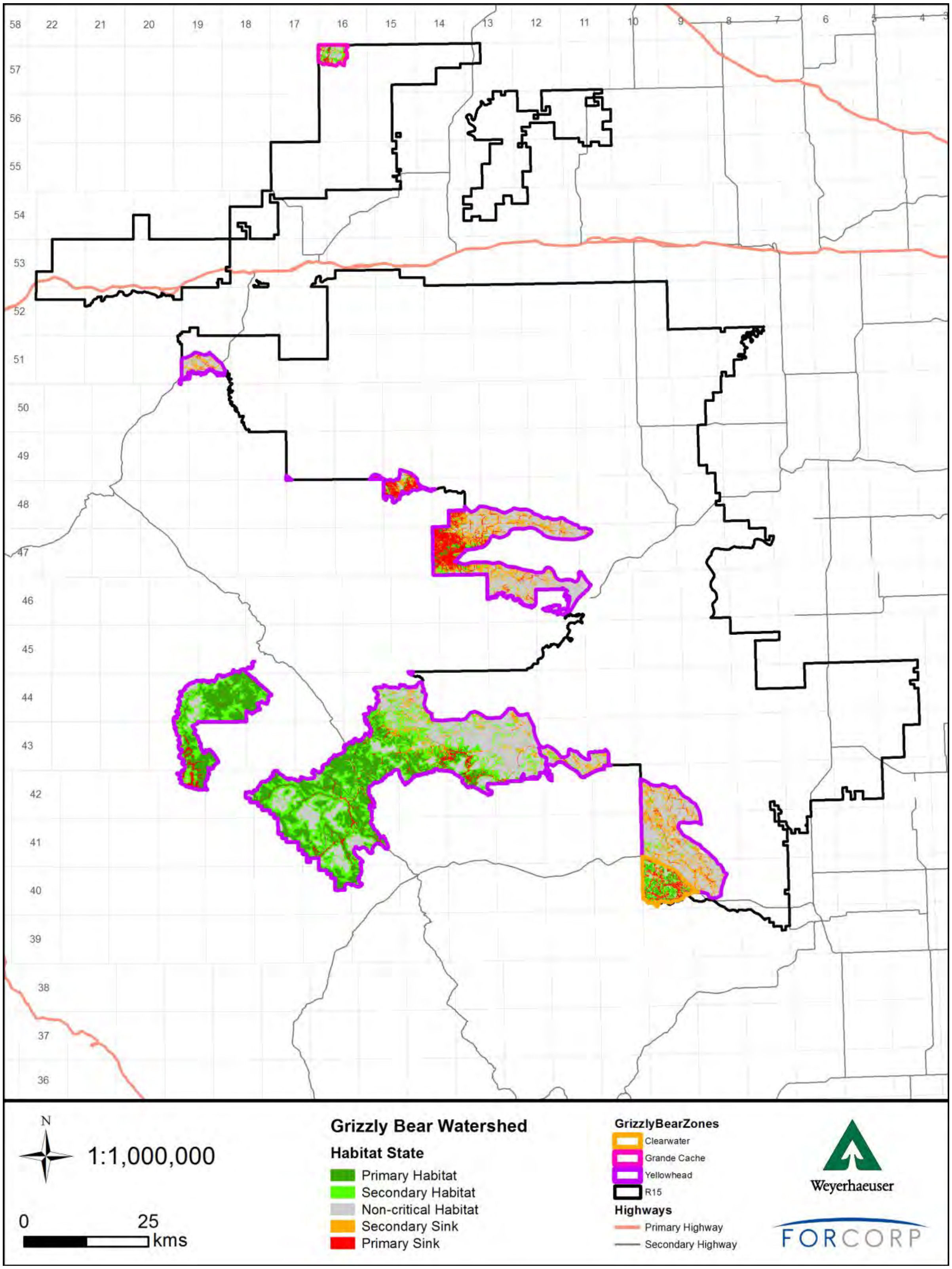


Figure 4: Habitat states at the end of the second decade (2037) of the TSA for the three grizzly bear populations within the Weyerhaeuser Pembina DFA.

Table 1: Grizzly bear habitat state model results for the Weyerhaeuser Pembina DFA separated by population. Runs were conducted on the net landbase at time zero (2017), the end of the first decade (2027) and the end of the second decade (2037). Results are sorted by population and habitat zone.

Grizzly Bear Habitat Indicators for the Weyerhaeuser Pembina DFA									
			Habitat Indicators						
			Time 0 (2017)	First Decade (2027)			Second Decade (2037)		
Population	Habitat Zone	Index	Value for GBWU Area within DFA	Value for GBWU Area within DFA	Difference from Time 0	% Change	Value for GBWU Area within DFA	Difference from Time 0	% Change
Clearwater	Secondary	Primary Habitat (km^2)	10.76	11.29	0.53	4.93	12.22	1.46	13.56
		Secondary Habitat (km^2)	17.94	18.54	0.60	3.37	17.33	-0.61	-3.41
		Non-critical habitat (km^2)	12.46	10.22	-7.71	-17.92	9.81	-8.13	-21.24
		Secondary Sink (km^2)	10.73	10.69	-7.25	-0.38	10.27	-7.67	-4.27
		Primary Sink (km^2)	12.35	13.46	1.12	9.07	14.58	2.24	18.13
Grande Cache	Secondary	Primary Habitat (km^2)	1.68	1.60	-0.08	-4.99	1.68	0.00	-0.27
		Secondary Habitat (km^2)	4.34	5.94	1.60	36.76	5.94	1.60	36.92
		Non-critical habitat (km^2)	10.88	8.33	-2.55	-23.46	8.23	-2.65	-24.37
		Secondary Sink (km^2)	2.00	2.69	0.68	34.04	2.64	0.64	31.85
		Primary Sink (km^2)	1.92	2.28	0.36	18.65	2.33	0.41	21.59
Yellowhead	Core	Primary Habitat (km^2)	244.77	336.79	92.02	37.59	357.85	113.08	46.20
		Secondary Habitat (km^2)	364.97	342.23	-22.75	-6.23	336.32	-28.65	-7.85
		Non-critical habitat (km^2)	441.94	363.17	-78.77	-17.82	346.10	-95.83	-21.68
		Secondary Sink (km^2)	35.15	39.28	4.13	11.76	40.94	5.79	16.47
		Primary Sink (km^2)	34.22	39.58	5.36	15.67	39.84	5.62	16.43
Yellowhead	Secondary	Primary Habitat (km^2)	6.36	9.34	2.98	46.77	9.48	3.12	48.97
		Secondary Habitat (km^2)	25.75	26.84	1.09	4.24	25.98	0.23	0.89
		Non-critical habitat (km^2)	411.61	370.12	-41.49	-10.08	349.91	-61.70	-14.99
		Secondary Sink (km^2)	115.10	141.80	26.70	23.20	157.79	42.69	37.09
		Primary Sink (km^2)	54.92	65.65	10.73	19.54	70.59	15.67	28.54

Table 2: Grizzly bear habitat state model results for the Weyerhaeuser Pembina DFA. Runs were conducted on the net landbase at time zero (2017), the end of the first decade (2027) and the end of the second decade (2037). Results are sorted by population and habitat zone.

Grizzly Bear Habitat Indicators for the Weyerhaeuser Pembina DFA									
			Habitat Indicators						
			Time 0 (2017)	First Decade (2027)			Second Decade (2037)		
Population	Habitat Zone	Index	Value for GBWU Area within DFA	Value for GBWU Area within DFA	Difference from Time 0	% Change	Value for GBWU Area within DFA	Difference from Time 0	% Change
All	Core and Secondary	Primary Habitat (km^2)	263.58	359.02	95.44	36.21	381.23	370.46	44.63
		Secondary Habitat (km^2)	413.00	393.55	-19.46	-4.71	385.57	-27.44	-6.64
		Non-critical habitat (km^2)	876.88	751.84	-125.04	-14.26	714.05	-162.83	-18.57
		Secondary Sink (km^2)	162.98	194.46	31.47	19.31	211.64	48.66	29.86
		Primary Sink (km^2)	103.41	120.98	17.57	17.00	127.35	23.95	23.16

Table 3: The total primary and secondary habitat zone area within the Weyerhaeuser Pembina DFA. Runs were conducted on the net landbase at time zero (2017), the end of the first decade (2027) and the end of the second decade (2037).

Grizzly Bear Habitat Indicators for the Weyerhaeuser Pembina DFA									
			Habitat Indicators						
			Time 0 (2017)	First Decade (2027)			Second Decade (2037)		
Population	Habitat Zone	Index	Value for GBWU Area within DFA	Value for GBWU Area within DFA	Difference from Time 0	% Change	Value for GBWU Area within DFA	Difference from Time 0	% Change
All	Core and Secondary	Primary and Secondary Habitat (km^2)	676.58	752.57	75.99	11.23	766.80	90.21	13.33

Appendix IX – TSA-012: Songbird Habitat Modelling: Incorporating Hard Linear (HLIN) Features into the Modelling Landbase.

IssueTSA-012 - Songbird Habitat Modelling: Incorporating Hard Linear (HLIN) features into the Modelling Landbase

Type: √ Requires Resolution □ Discussion Item

1 Background

Integration of the GoA's songbird models into the TSA model requires that hard linear features be incorporated into the modelling landbase to allow different relative abundance (RA) curves for each species to be applied to stands with or without hard linear features. In order to identify the HLIN features across the landscape, a 7ha grid is overlayed on the landbase and those cells that contain 0.5% or more HLIN coverage (by area) were dissolved and then cut into the landbase. Figure 1 shows the dissolved grid that has been cut into the landbase. The grid covers over 210,326 ha.

2 Impact on TSA Modelling

Cutting the HLIN grid into the landbase results in many AVI polygons being sub-divided into smaller polygons which can negatively impact stand selection for harvest, for example adjacent polygons with identical attributes being selected for harvest over different time periods. In FMAs where the hard linear coverage is not extensive, this issue may be manageable, but in Weyerhaeuser's DFA approximately 20% of the landbase is covered by the HLIN grid. Cutting the grid into the landbase increases the polygon count from 411,227 to 568,715, a 38% increase. Seismic lines were removed from the modeling landbase for the same reason, but we are now re-introducing the issue by cutting in the HLIN layer.

3 Recommendation

Assigning HLIN features to whole polygons in the landbase using the HLIN grid layer as a proxy would allow the sub-division of polygons to be avoided while still allowing the application of the HLIN RA curves. Figures 2 through 4 show a few snapshots over the landbase where the stands selected by proxy can be seen relative to the original HLIN grid. These figures show that the stands assigned with HLIN features align fairly well with the grid. As could be expected with a proxy assignment, there are areas where less than the grid area is selected while in other areas greater than the grid area is selected. Over the entire DFA area, the total HLIN area based on the proxy assignment is 185,788 ha compared to 210,326 ha for the grid area.

Given the strategic nature of the TSA modelling process, it is recommended that Weyerhaeuser apply HLIN features to the landbase using the HLIN grid as a proxy rather than cutting the grid into the landbase.

4 Resolution

Email from Liana Luard to Paul Scott on April 25, 2017, stated:

A review of TSA 012 has been completed. The following recommendations have been provided:

1. Re-select the HLIN grid at 1% in order to be consistent with the scripts (the user guides will be updated accordingly), and

2. Use a proxy approach to use whole polygons to represent the impact of the HLIN feature using the 1% selection.

The closer the amount of area represented by the HLIN curves for the two approaches is, the more comfort we will have in the proxy approach.

In keeping with the above a 1% HLIN grid was selected. The grid covers an area of 182,160 ha compared to 210,326 ha for the original 0.5% grid. With the proxy approach, however the 0.5% grid selects polygons with a total area of 185,788 ha, 2% more than the 1% grid. Weyerhaeuser's request to use the proxy approach with the 0.5% HLIN grid was accepted by the GoA on May 2, 2017.

PDT-AIP – May 11, 2017

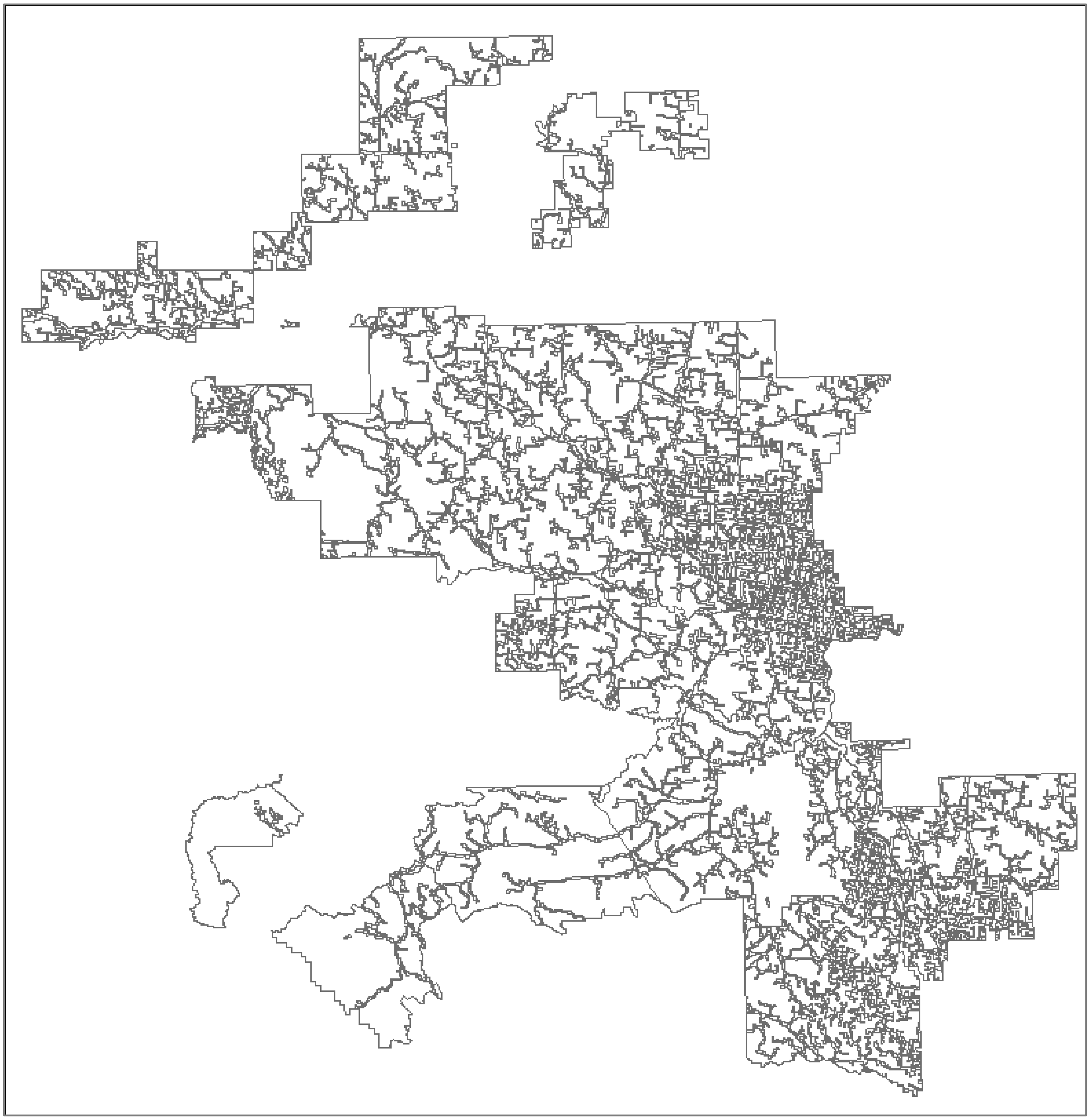
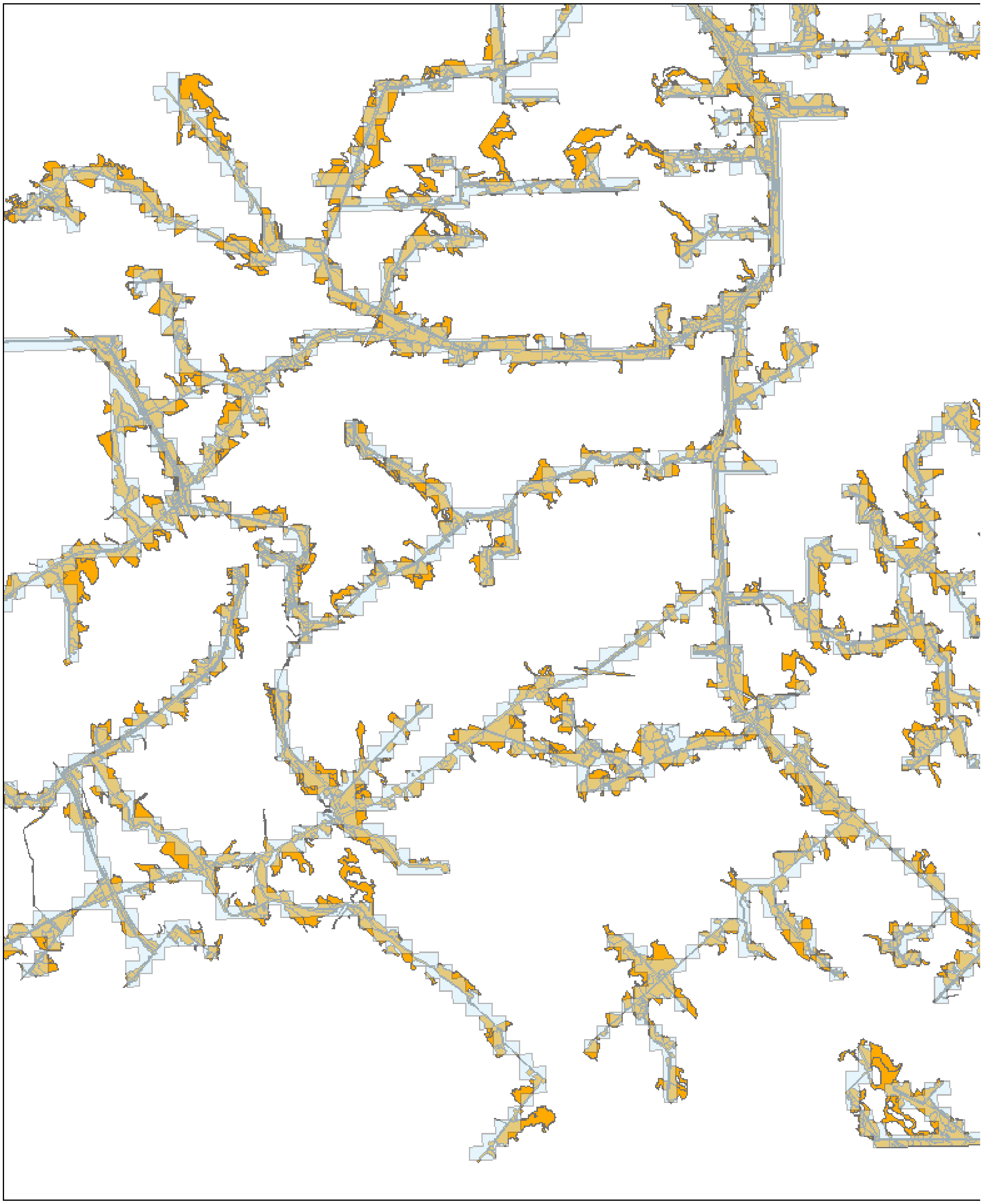


Figure 1. HLIN grid on the DFA

Figure 2. Example 1 – HLIN by proxy vs HLIN grid



HLIN by proxy HLIN Grid

Figure 3. Example 2 – HLIN by proxy vs HLIN grid

Figure 4. Example 3 – HLIN by proxy vs HLIN grid

Appendix X – TSA-013: Marten Habitat Modelling: Time Zero Results and TSA Integration

Issue TSA-013 - Marten Habitat Modelling: Time Zero Results and TSA Integration

Type: ☐ Requires Resolution √ Discussion Item

1 Background

The objective of VOIT 1.2.1.1 of Weyerhaeuser Pembina's 2016 FMP is to maintain habitat for identified high value species. Although not currently listed as a species of concern in the VOITs, American marten (*Martes americana*) is a high value species to several stakeholders that use the DFA. To address any concerns that stakeholders may have, a model developed by the GoA was run to determine current habitat suitability across the landbase.

Figure 1 shows the marten's preferred habitat by forest species and age[1].

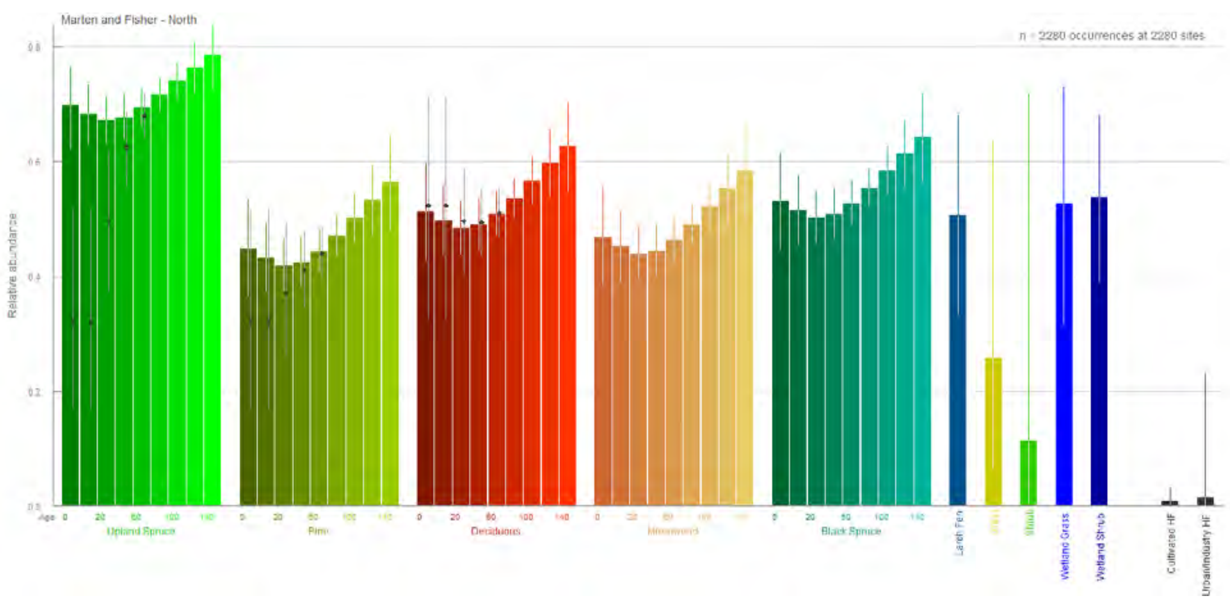


Figure 1. Preferred habitat - Marten

2 Modeling

2.1 Time Zero Snapshot

The model used for the time 0 snapshot was developed by the GoA (last updated in 2015), and all assumptions of that model are applied to this analysis. To run this model for the Pembina Timberlands,

[1] Source : http://species.abmi.ca/pages/species/mammals/MartenFisher.html

the model required a current landbase with fields identifying polygon height, tree species, tree species percentages, and tree density. In addition to these fields, a compartment layer was also used to compile the data for reporting purposes.

The model determines Habitat Suitability Index (HSI) through a formula which requires the total stand density, the combined percentage of spruce and fir, the stand height, and the total conifer percentage. The formula calculated the HSI for each polygon, and from these values a raster model was created. The output raster has a pixel size is 0.25 ha (50 m x 50 m), and values range between 0 (unsuitable habitat) and 1 (high suitability). From this raster, the descriptive statistics for each compartment can then be calculated.

2.2 TSA Integration

Together with the time zero modelling tools the GoA provided HSI curves by stratum (marten_tsa_yield_20160315.csv) for marten. The marten strata are a combination of species, density and TPR value, as follows:

1: SW_BC_G
2: SW_BC_M
3: SW_BC_F
4: PL_BC_SW_AD_G
5: PL_BC_SW_AD_M
6: PL_BC_SW_AD_F
7: AW_BC_PL_AD_G
8: AW_BC_PL_AD_M
9: AW_BC_PL_AD_F
10: AW_AD_G
11: AW_AD_M
12: AW_AD_F

As the species strata align with the strata used in the TSA modeling, a separate theme was added to address the combination of density and TPR, e.g. BC_G refers to B or C density and G TPR rating. Once the strata combination was added to modeling landbase, the marten HSI curves could be treated like any other yield curve to calculate the HSI values over time.

Figure 2 shows the marten HSI curves by stratum as applied in the TSA model.

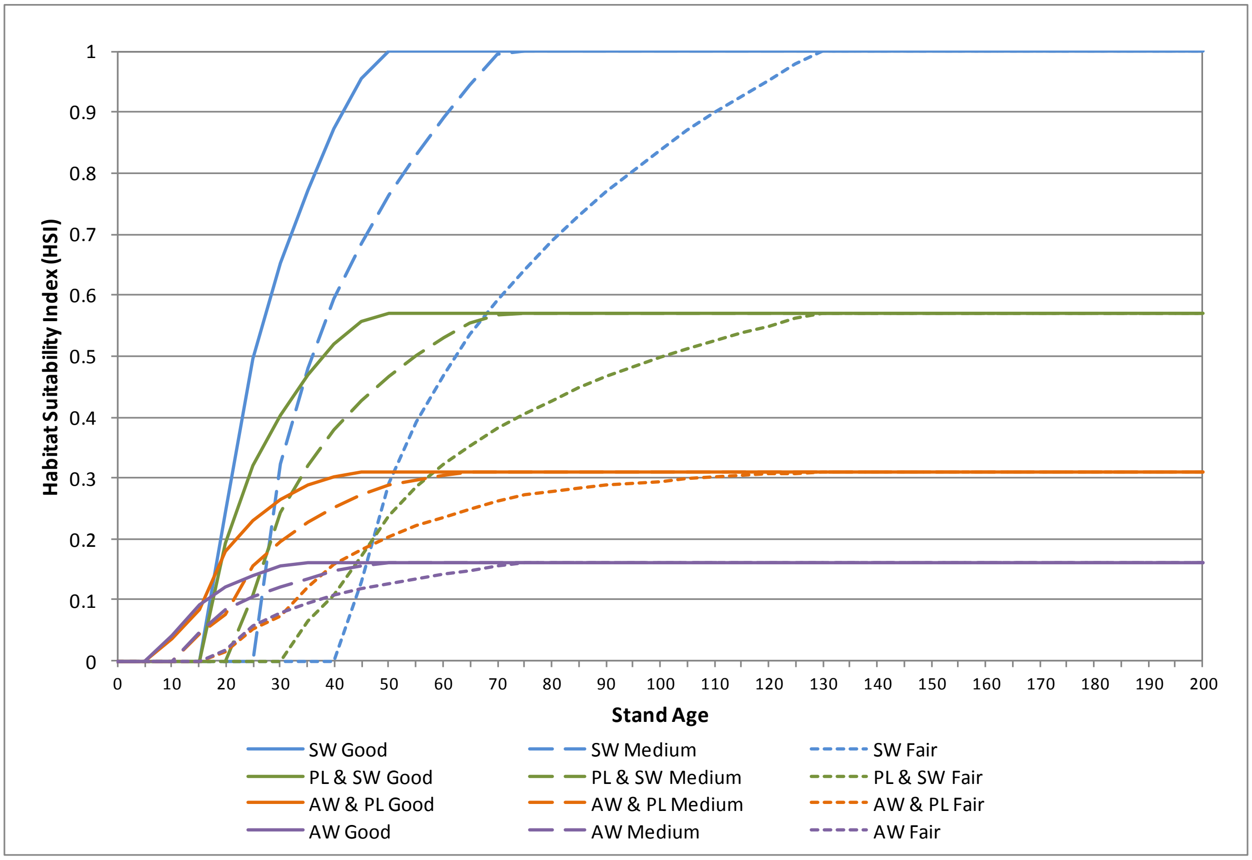


Figure 2. Marten HSI curves by stratum

3 Results

3.1 Time Zero Snapshot

The results of the model run show the HSI for marten across the landbase, and within each compartment. Table 1 presents the descriptive statistics for each compartment and for the entire DFA. These statistics include pixel count and the total area in hectares within each compartment, and the descriptive statistics for the HSI values including the minimum, maximum, range, mean and standard deviation. Figure 1 presents the HSI values across the landbase. The mean HSI value for the DFA is 0.25/ha or a total value of 266,294.

Table 1: Time zero snapshot results

HABITAT SUITABILITY INDEX (HSI)				
MIN	MAX	RANGE	MEAN	STD
0.00	1.00	1.00	0.25	0.30

3.2 TSA

The inclusion of the marten HSI curves into the Patchworks model allows the change to the habitat value to be monitored over the life of the plan. It also allows constraints to be placed on the HSI value if necessary in order to maintain suitable marten habitat over the life of the plan.

The time zero (2017) total HSI value is 207,060. This is approximately 22% lower than the original snapshot value of 266,294. This difference could be due to timing differences ie. the snapshot is based on the 2015 landbase while the TSA model start is 2017, and stratification differences between the snapshot tool and the TSA.

Using the TSA time zero value as the base value, Figure 3 shows the trend in average HSI value over the 200 year period for the entire DFA for scenario PW70004. Thresholds associated with the risk of habitat loss, compared to time 0, are as follows:

- 0 – 15% - Low risk. Considered acceptable, no further action required.
- 15 – 30% - Moderate risk. Considered outside acceptable limits, constraints may have to be applied in the TSA model.
- > 30% - High risk. Significant impact on habitat suitability, constraints will have to be applied in the TSA model.

In Figure 3 the shaded areas represent the above risk categories, with green being low risk, orange moderate risk and red high risk.

The average HSI value remains within the low risk category for the entire 200 year period. No constraints were placed on this value in the TSA scenario.

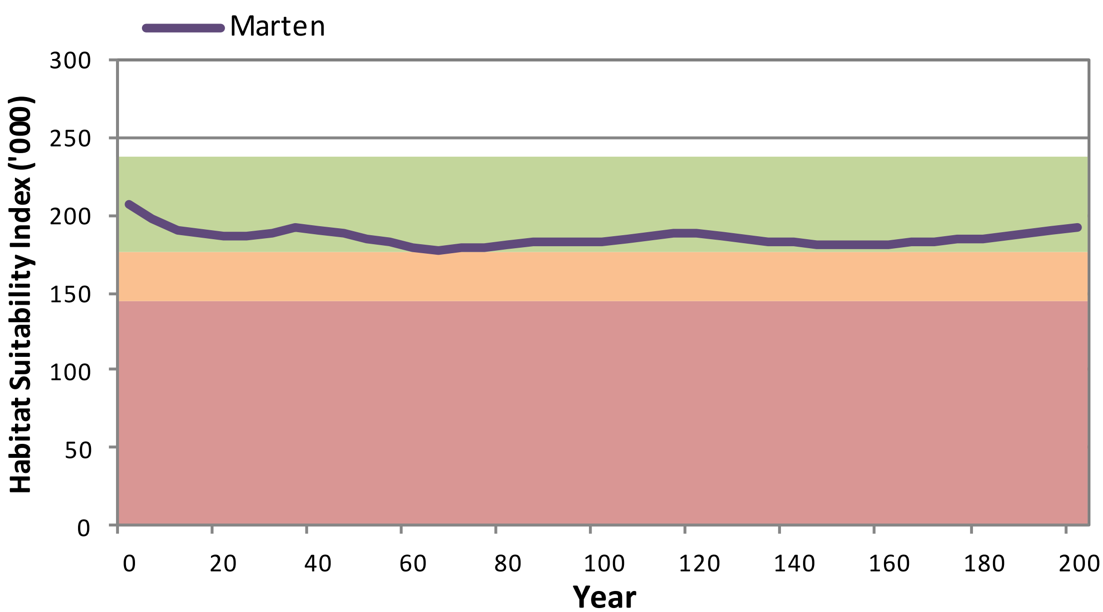


Figure 3. Trend in HSI value over time (scenario PW70004)

4 Discussion

While the marten is not listed as a species of concern in Weyerhaeuser's VOITs, they decided to monitor the impact of harvesting activities on the marten habitat as it is a high value species to a number of stakeholders. Initial results indicate that there is low risk of habitat loss on the DFA due to planned harvesting activities.

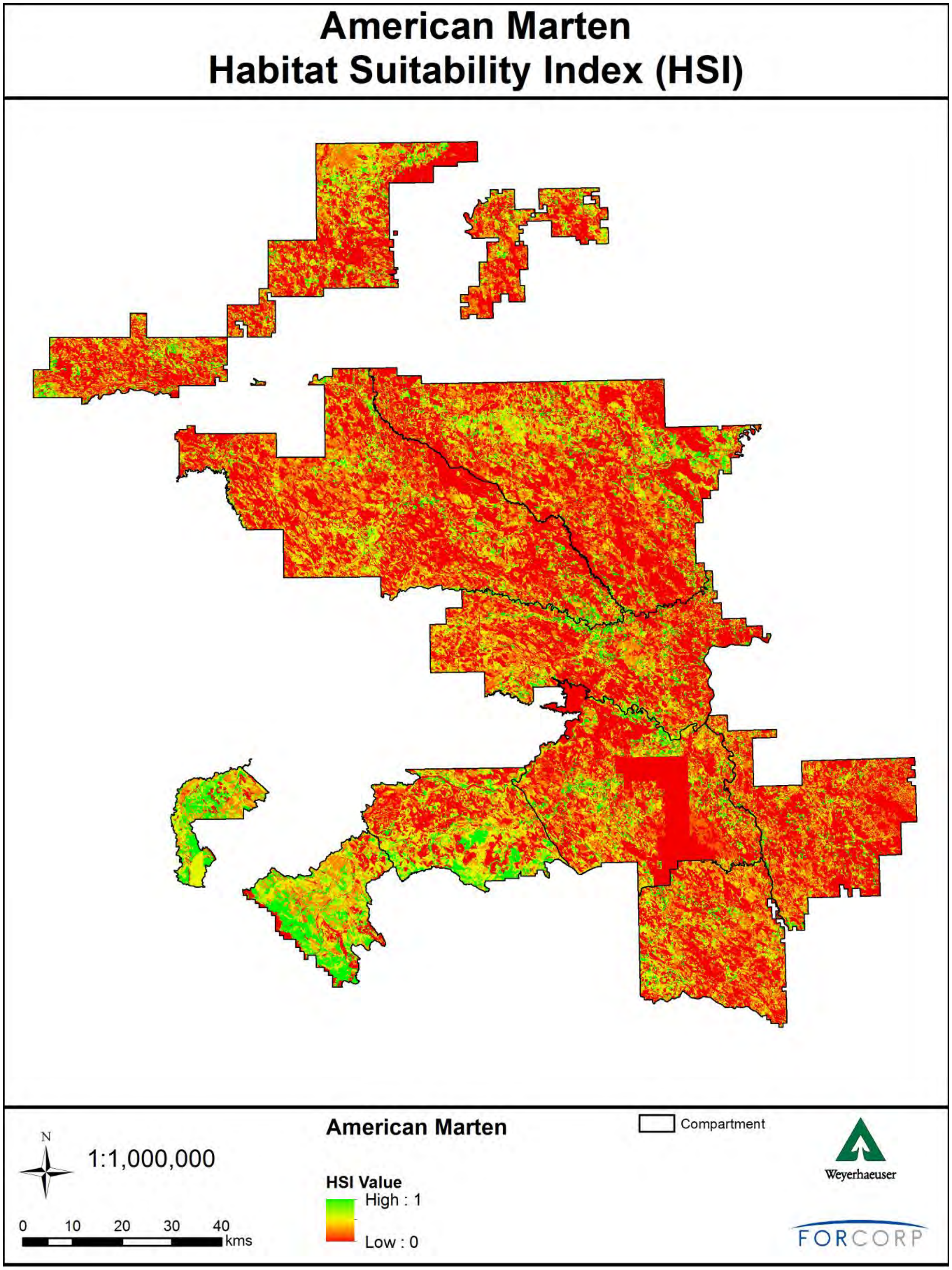


Figure 4: Habitat Suitability Index (HSI) values for American marten across the Weyerhaeuser Pembina DFA.

Appendix XI – TSA-014: Watershed Assessment (ECA): Integrating ECA into the Spatial TSA Modelling.

Issue TSA-014 – Watershed Assessment (ECA): Integrating ECA into the Spatial TSA Modelling

Type: □ Requires Resolution √ Discussion Item

1 Background

Forest harvesting causes a reduction of forest cover which will result in increased water run-off. Conversely, the renewal of forest cover through reforestation and growth of the forest will decrease water run-off. Achieving a balance of forest harvesting and renewal within each watershed on the landscape is the preferred approach to mitigating potential changes to stream flows as a result of harvesting[1].

As a watershed assessment is a requirement under the Planning Standard, the GoA commonly conducts watershed assessments on the SHS using the Equivalent Clearcut Area model (ECA). The ECA model predicts the ECA due to changes in the vegetation condition within the watershed. The predicted ECA is a surrogate for change in water runoff that would result from the change in vegetation cover. For FMPs, the GoA provides the option to incorporate ECA into the timber supply models to provide faster feedback on ECA results, and the ability to apply constraints if necessary to reduce the risk associated with harvesting activities. For the 2017 FMP, Weyerhaeuser chose to build ECA into Patchworks.

2 Methodology

The time it takes for water yields to return to pre-disturbance levels is a function of the rate of stand development and other stand level factors related to precipitation storage capacity. In Alberta, hydrologic recovery has been defined in terms of stand volume accrual (i.e. periodic or current annual increment) and found to be related to maximum leaf area of the stand[1]. Using these relationships, hydrologic recovery coincides with the maximum annual growth rate (current/periodic annual increment) of the stand.

Species-specific volume curves can be converted to hydrologic recovery curves using gross volume (m^3/ha) yield curves and the formula provided below.

$1 - (CAI_n/CAI_{max})$

where;

CAI_n is the current annual increment (of each stratum) in period n and CAI_{max} is the maximum current annual increment for the given stratum.

For all periods past the point of maximum CAI hydrologic recovery is set to zero until another disturbance occurs. Figure 1 shows the relationship between the volume and calculated ECA curve for a single yield stratum. Following disturbance, the ECA value is 1, meaning that the entire harvest area

[1] GoA Non-timber Assessment document - Watershed Assessment Chapter_DRAFT_26Aug2016.docx.

contributes to the ECA area. At approximately 70 years of age (max CAI) the ECA value falls to zero signifying that hydrologic recovery is complete and ECA area will be zero, and will remain zero until the next disturbance. Figures 2 to 4 show the ECA curves for the natural, M91 and RSA yield curves respectively.

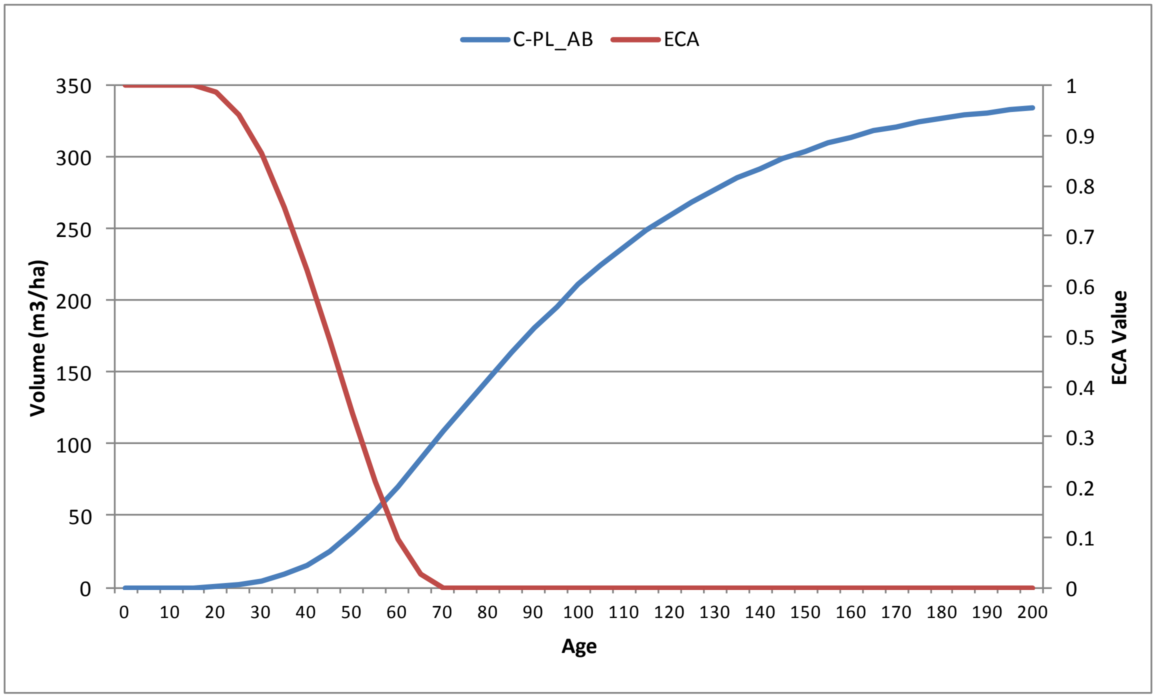


Figure 1. Volume and ECA curves for the natural curve C-PL_AB

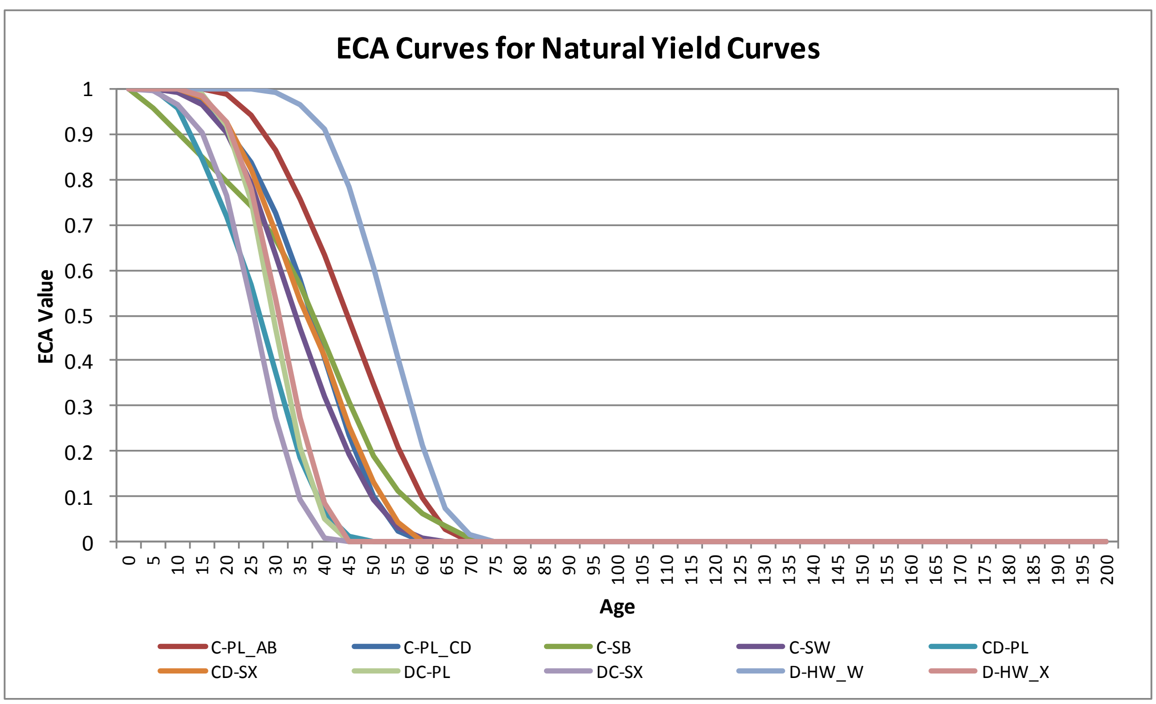


Figure 2. ECA curves for all natural stand (NAT) yield curves

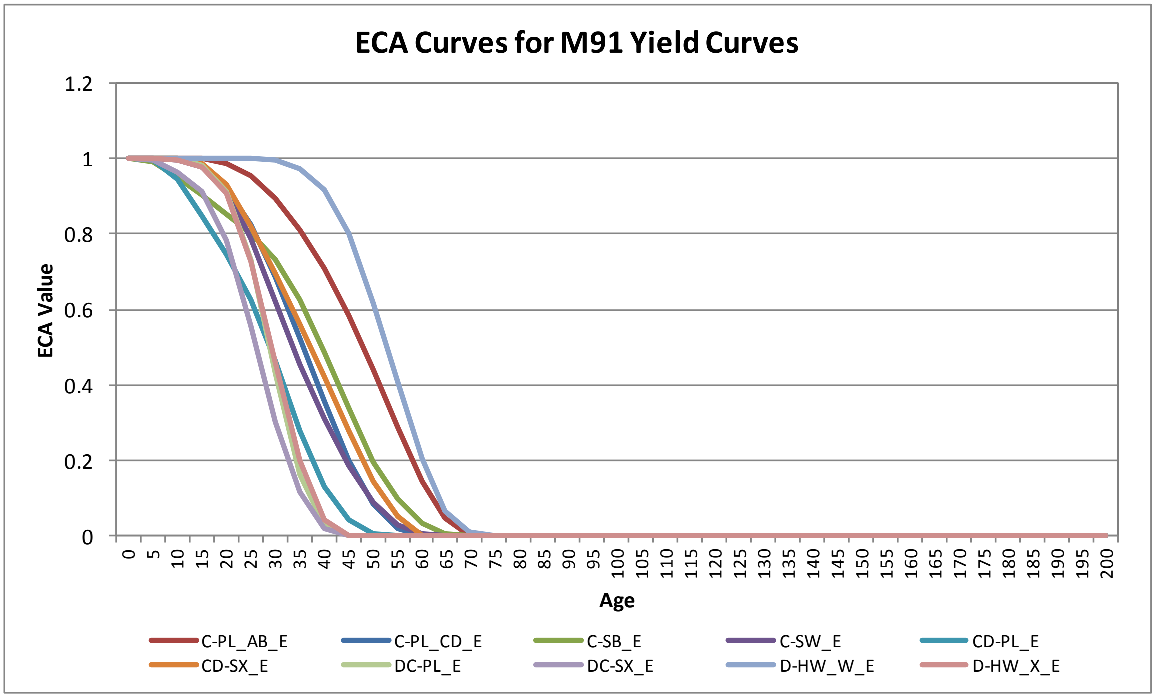


Figure 3. ECA curves for all pre-91 (M91) yield curves

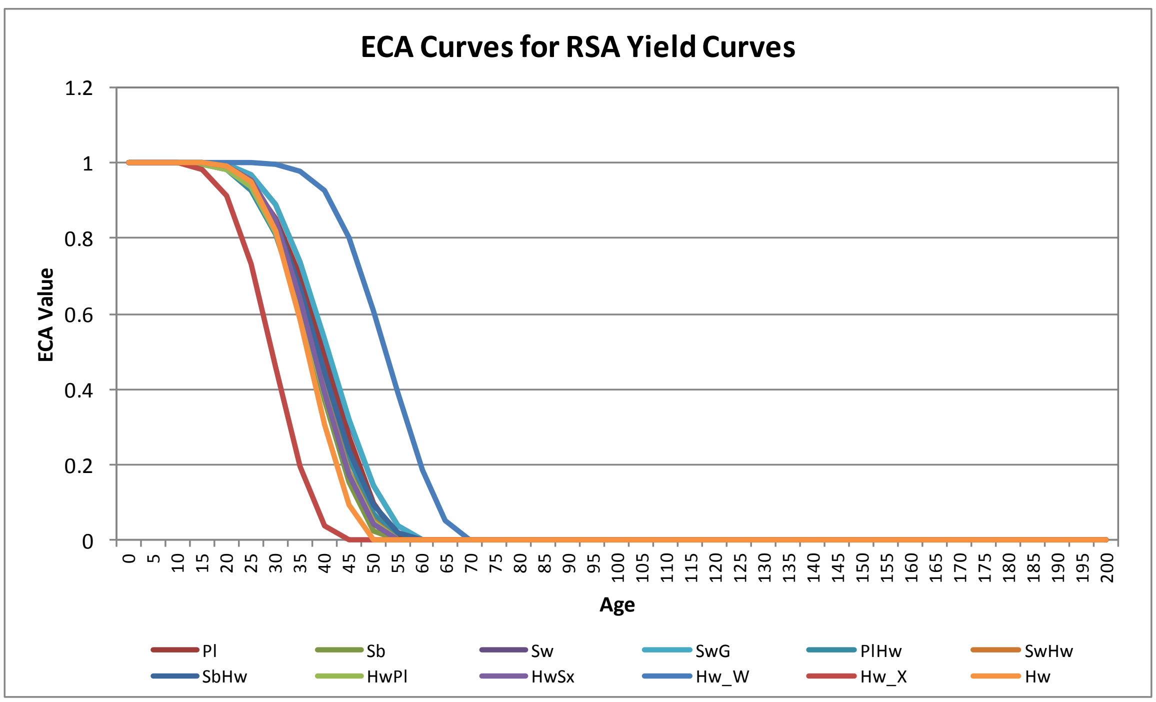


Figure 4. ECA curves for all post-91 (RSA) yield curves

The formula used to calculate the ECA for each watershed, is therefore as follows:

ECA (ha) = Disturbed Area (ha) x (1 – (CAI_n/CAI_{max}))

The following ECA thresholds are used to define the risk levels associated with vegetation removal in each watershed:

- Low risk : ECA < 30%
- Moderate risk : ECA is 30 – 50%
- High risk : ECA > 50%

Only watersheds with a minimum size of 500 ha within the DFA boundary will be assessed.

3 Results

There are a total of 165 watersheds on the Weyerhaeuser DFA, of which 22 are less than 500 ha in size (within the DFA). The percentage ECA at six different points in time for each of the remaining 143 watersheds based on scenario PW70004 are shown in Table 1. Figures 5 to 10 map the ECA % for each watershed over the six time periods.

No watersheds exceed the high risk (>50%) threshold over the 200 year period, while a number do exceed the moderate risk threshold of 30% - 50%.

In future scenarios constraints will be placed on watersheds, where necessary, to keep the ECA below the 50% threshold. Moderate risk watersheds will be reviewed and only those that are:

- identified by a hydrologist as requiring specific attention due to water supply issues, or
- potentially impact fish FSI scores, or
- remain below the 30% threshold for the entire 200 year planning horizon,

will be constrained in order to reduce the risk associated with the specific watershed.

PDT AIP June 15, 2017

Table 1. ECA % of Watershed Area at specific time periods for scenario PW70004

Weyerhaeuser Watershed ECA Analysis									Patchworks Scenario PW70004
		Full Watershed	Area in	Watershed ECA percentage by year					
Watershed		Area	DFA	Year 0	Year 10	Year 20	Year 30	Year 50	Year 100
Number	Name	ha	ha	2017	2027	2037	2047	2067	2117
1	Groat	13,247	3,752	29%	35%	34%	33%	29%	30%
2	Cairn	15,578	2,018	8%	11%	12%	13%	13%	22%
3	Mcleod	17,839	2,946	20%	21%	28%	24%	9%	37%
4	Oldman	14,939	5,526	18%	27%	32%	35%	31%	25%
5	Shinningbank	19,469	6,637	31%	29%	23%	24%	21%	33%
6	Paddle	15,414	1,496	16%	23%	26%	31%	45%	17%
7	Trout	26,296	19,781	26%	30%	30%	26%	16%	32%
8	Hardluck	15,695	9,003	15%	25%	31%	31%	31%	16%
9	Graham	9,443	4,873	21%	32%	44%	43%	44%	17%
10	South Mcloed	13,331	2,513	9%	12%	24%	27%	33%	12%
11	East Poison	34,204	3,747	21%	30%	47%	46%	46%	15%
12	Whitefish	21,913	8,810	21%	23%	25%	21%	13%	25%
13	Middle Poison	6,454	5,487	10%	12%	16%	18%	20%	10%
14	Deer	13,757	5,775	27%	27%	21%	18%	20%	21%
15	Bear	13,890	9,855	13%	23%	30%	28%	11%	27%
17	West Poison	6,496	3,875	9%	14%	17%	18%	17%	10%
19	Edson	37,509	2,975	15%	17%	22%	22%	17%	20%
20	Fairless	8,042	972	13%	19%	20%	18%	13%	20%
21	Lower Carrot	11,503	1,473	18%	8%	3%	6%	10%	6%
22	Prarie	15,083	2,209	11%	14%	22%	20%	15%	16%
23	Mason	11,188	1,502	9%	10%	17%	20%	18%	18%
25	Sundance East	24,444	11,415	5%	18%	25%	24%	14%	21%
26	Obed	13,119	11,306	5%	10%	14%	15%	10%	13%
27	Sundance West	87,943	17,705	8%	14%	19%	19%	15%	15%
28	Athabasca	58,254	1,586	3%	8%	19%	22%	34%	19%
30	Lower Moose	6,274	2,457	2%	13%	16%	16%	15%	12%
33	East Lobstick	6,293	763	33%	45%	49%	43%	27%	45%
34	Lower Sang	13,991	10,033	8%	14%	17%	18%	13%	15%
35	West Lobstick	13,811	4,385	21%	26%	24%	25%	28%	24%
36	Granada	37,648	16,257	13%	18%	24%	32%	36%	18%
37	West Carrot	9,241	7,183	14%	16%	14%	14%	13%	14%
38	Nojack	13,516	13,371	18%	22%	29%	34%	30%	20%
39	East Carrot	7,505	7,488	19%	28%	30%	32%	26%	23%
40	Marsh	8,664	1,287	21%	20%	22%	17%	11%	32%
41	Upper Moose	13,762	10,065	3%	9%	13%	15%	15%	14%
42	Bigoray	27,636	16,171	32%	30%	28%	23%	24%	22%
43	East Fickle	1,838	979	16%	26%	23%	17%	11%	23%
44	West Fickle	14,852	2,584	15%	21%	14%	11%	6%	14%
45	Chip	14,035	14,035	20%	25%	35%	34%	28%	22%
46	Peco	2,010	1,979	19%	16%	12%	11%	15%	18%
47	Upper Sang	8,894	8,894	26%	25%	25%	22%	18%	25%
48	Minnow	15,446	15,447	23%	22%	18%	15%	11%	18%
49	Embarras	7,160	2,141	13%	28%	25%	21%	11%	26%
50	Upper North Rat	10,123	10,123	12%	23%	25%	24%	13%	19%
51	West Eta	5,158	5,159	19%	29%	35%	38%	24%	25%
52	Macmillan	5,310	5,309	17%	23%	29%	32%	29%	13%
53	East Eta	13,417	13,416	24%	30%	33%	35%	25%	24%
54	Rodney	4,156	4,156	11%	16%	15%	15%	14%	14%
55	Bruce	8,343	8,343	26%	37%	33%	31%	30%	26%

Table 1 cont.

Weyerhaeuser Watershed ECA Analysis								Patchworks Scenario PW70004	
		Full Watershed	Area in	Watershed ECA percentage by year					
Watershed		Area	DFA	Year 0	Year 10	Year 20	Year 30	Year 50	Year 100
Number	Name	ha	ha	2017	2027	2037	2047	2067	2117
56	Kathy	15,360	1,999	10%	14%	15%	17%	34%	14%
57	Swartz	24,282	16,419	6%	11%	17%	17%	17%	17%
58	Erith	6,252	2,973	6%	13%	12%	12%	12%	12%
59	Svedberg	11,625	11,625	3%	12%	20%	23%	17%	17%
60	Sinkhole	7,632	7,116	21%	24%	23%	21%	25%	17%
62	Lower North Rat	6,691	6,691	14%	19%	30%	31%	25%	20%
63	Varty	2,493	2,492	5%	12%	18%	19%	21%	10%
64	Tom	1,147	1,147	13%	15%	15%	18%	16%	14%
65	Corser	4,644	605	13%	13%	12%	22%	17%	15%
66	Coyote	26,175	24,216	11%	28%	32%	33%	21%	26%
67	Dzida	5,029	5,029	14%	23%	37%	36%	26%	22%
68	Cynthia	14,652	3,574	19%	16%	14%	16%	28%	24%
69	Paddy	22,877	22,878	12%	16%	23%	24%	22%	14%
70	Keyera	13,909	13,902	9%	13%	17%	19%	22%	14%
71	Half Moon	19,920	19,867	23%	28%	27%	23%	13%	25%
72	Raven	16,442	9,463	14%	25%	29%	34%	19%	24%
73	South Rat	17,467	17,466	20%	24%	25%	24%	23%	17%
74	East Zeta	6,245	6,244	23%	28%	31%	30%	16%	25%
75	West Zeta	13,019	13,019	26%	34%	37%	36%	23%	30%
77	Upper Pembina	33,770	12,987	27%	31%	32%	30%	19%	28%
78	Miiddle Pembina	2,934	2,934	21%	25%	26%	28%	32%	13%
79	Lower Pembina	15,374	14,003	8%	10%	11%	18%	17%	13%
80	Jerry	3,058	3,058	12%	19%	25%	33%	50%	12%
81	Rehn	5,645	5,646	20%	22%	26%	32%	24%	29%
82	Dismal	27,826	17,793	19%	29%	32%	29%	17%	27%
83	Rockyview	13,748	1,160	20%	14%	7%	11%	24%	16%
84	Baker	3,940	3,939	11%	11%	10%	29%	38%	23%
85	Tall Pine	15,812	15,813	12%	24%	29%	29%	20%	22%
86	Reservoir	5,859	5,859	8%	11%	11%	19%	24%	18%
87	Sand	28,596	17,891	17%	10%	9%	23%	30%	30%
89	South Elk	16,445	4,525	15%	33%	35%	36%	25%	34%
90	North Elk	13,459	10,536	12%	27%	27%	26%	16%	25%
91	Lower Saskatchewan	8,858	8,858	16%	18%	14%	18%	20%	22%
92	Brazeau	17,885	17,886	7%	10%	10%	13%	14%	12%
93	Lower Wolf	14,069	882	5%	2%	3%	17%	26%	28%
94	Upper Saskatchwan	3,120	3,120	2%	6%	12%	20%	28%	14%
95	Negraiff	10,090	5,870	10%	11%	12%	15%	11%	12%
97	Mink	11,294	1,772	0%	0%	14%	26%	28%	13%
98	Horseshoe	9,165	2,288	3%	9%	21%	27%	29%	15%
99	Garden	5,249	2,322	1%	1%	11%	14%	21%	9%
100	Broken Arm	10,697	3,496	17%	23%	29%	28%	13%	26%
101	East Nordegg	5,797	5,798	5%	5%	6%	9%	17%	13%
102	Nordegg	33,360	33,360	19%	18%	15%	17%	17%	19%
105	Lower Blackstone	22,181	19,229	24%	30%	28%	23%	17%	28%
106	North Marshybank	15,266	10,622	11%	21%	20%	19%	28%	24%
107	Wilson	5,916	5,787	0%	6%	12%	17%	19%	11%
108	North Open	10,369	10,367	3%	7%	13%	18%	25%	13%
109	Middle Wolf	11,895	4,507	15%	19%	16%	28%	26%	33%
111	North Saskatchewan	32,937	32,081	10%	9%	12%	20%	28%	21%

Table 1 cont.

Weyerhaeuser Watershed ECA Analysis									Patchworks Scenario PW70004
		Full Watershed	Area in	Watershed ECA percentage by year					
Watershed		Area	DFA	Year 0	Year 10	Year 20	Year 30	Year 50	Year 100
Number	Name	ha	ha	2017	2027	2037	2047	2067	2117
112	Middle Blackstone	6,542	1,989	15%	13%	17%	16%	20%	17%
113	Upper Brown	24,866	2,461	1%	13%	12%	11%	49%	13%
114	East Rundell	9,529	9,516	36%	43%	39%	31%	16%	41%
115	Sundre	9,312	556	1%	0%	6%	15%	19%	10%
116	Owl	4,995	4,994	16%	23%	21%	20%	21%	18%
117	North Rapid	1,943	1,943	13%	22%	29%	28%	18%	23%
118	Middle Marshybank	5,002	2,685	0%	1%	1%	1%	35%	5%
119	Middle Open	5,307	3,704	3%	1%	2%	2%	12%	1%
120	North O'Chiese	7,329	7,330	28%	13%	5%	7%	13%	18%
121	North Brewster	8,160	8,161	32%	40%	34%	27%	17%	34%
123	Upper Wolf	18,457	18,429	8%	9%	10%	15%	24%	16%
125	Stephens	14,390	14,379	25%	32%	30%	29%	27%	32%
127	Chiefs	9,040	8,399	24%	26%	21%	20%	19%	24%
128	O'chiese	11,850	11,849	13%	10%	9%	15%	14%	12%
129	Wawa	9,655	9,581	27%	37%	34%	34%	35%	30%
130	Grey Owl	5,128	4,350	6%	13%	18%	19%	24%	14%
131	North Colt	2,674	2,180	40%	39%	35%	30%	24%	31%
132	Rapid	9,437	5,565	27%	27%	25%	24%	31%	25%
133	South Marshybank	10,789	5,185	0%	25%	24%	22%	32%	26%
134	South Open	8,842	3,591	2%	1%	2%	5%	18%	4%
135	Lobstick	6,246	4,829	8%	5%	9%	14%	35%	14%
136	Brewster	17,030	6,859	18%	31%	35%	37%	25%	32%
138	Sutherland	11,430	1,194	12%	30%	28%	31%	35%	28%
139	Sunchild	4,668	4,481	13%	11%	11%	17%	16%	18%
142	Hansen	7,233	6,858	6%	19%	33%	39%	38%	16%
143	Welch	7,571	816	1%	0%	10%	14%	25%	16%
145	Chungo	27,377	11,664	0%	9%	11%	13%	37%	10%
146	Big Beaver	8,706	6,553	2%	6%	17%	25%	30%	15%
147	Baptiste	11,601	11,601	22%	22%	26%	27%	20%	25%
148	East Baptiste	9,328	8,221	5%	5%	12%	19%	25%	14%
149	West Baptiste	4,930	4,930	22%	23%	21%	22%	20%	24%
150	Lower Chambers	1,408	1,408	33%	45%	38%	33%	12%	40%
151	Lookout	6,257	6,040	8%	19%	21%	22%	34%	22%
152	Penti	5,100	4,114	0%	5%	5%	4%	29%	6%
153	Lower Wapiabi	1,443	1,444	0%	0%	0%	3%	17%	4%
154	West Chambers	13,749	1,959	21%	20%	23%	38%	27%	34%
155	South Baptiste	6,265	6,265	9%	16%	23%	29%	18%	24%
157	Noname	9,473	8,588	5%	6%	11%	17%	15%	13%
158	Upper Wapiabi	17,789	3,744	0%	2%	2%	2%	28%	8%
159	Sturrock	5,800	5,549	7%	4%	3%	2%	19%	10%
160	East Chambers	6,526	6,468	16%	20%	19%	18%	8%	20%
162	Upper Chambers	15,848	11,313	21%	26%	26%	29%	21%	26%
164	Rocky	8,048	6,823	11%	18%	19%	23%	14%	20%
166	Highway	14,140	582	20%	30%	24%	26%	13%	23%
167	House	6,127	5,055	3%	5%	13%	18%	15%	9%

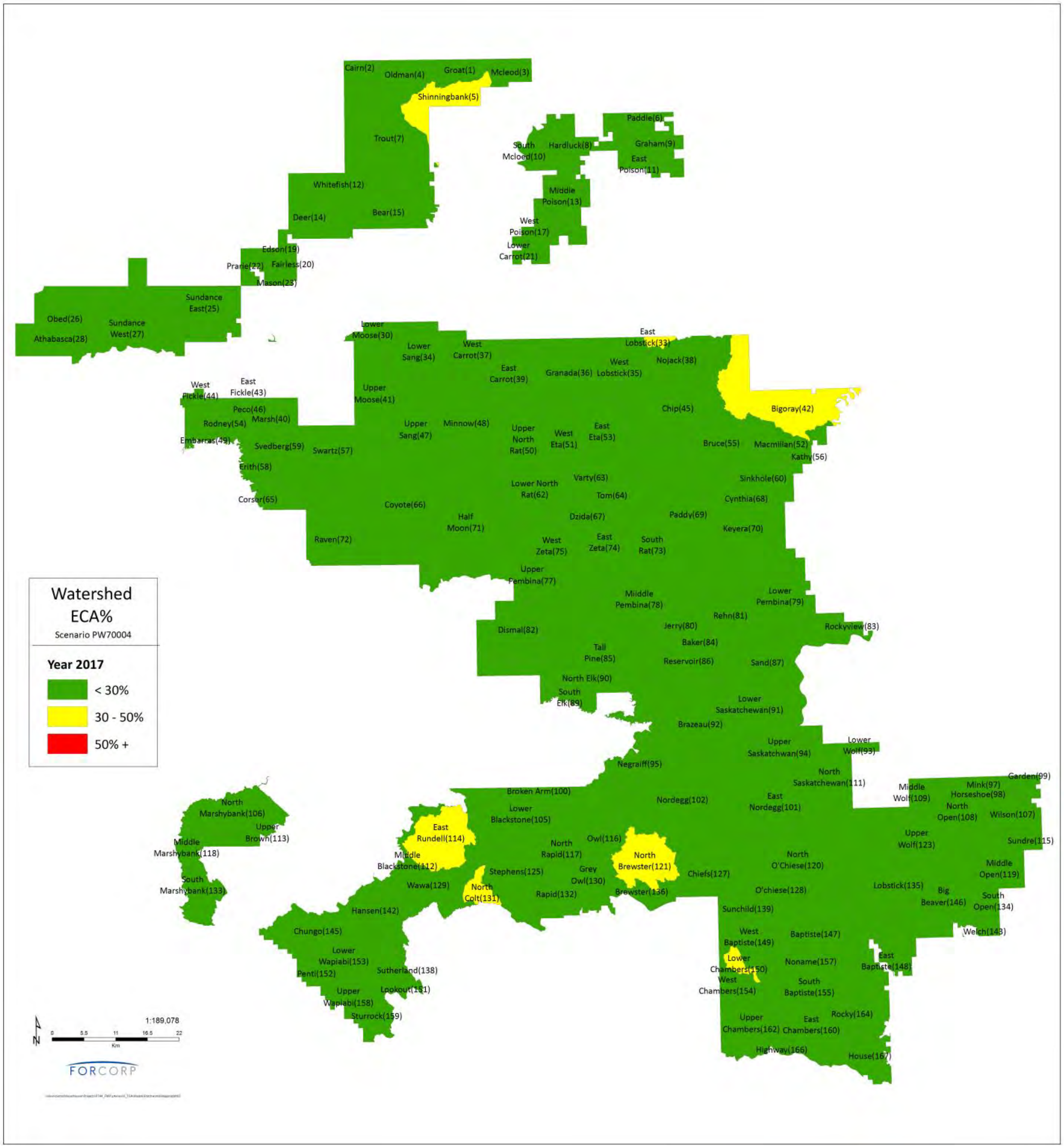


Figure 5. Map of ECA percentage at year 0 (2017) for scenario PW70004

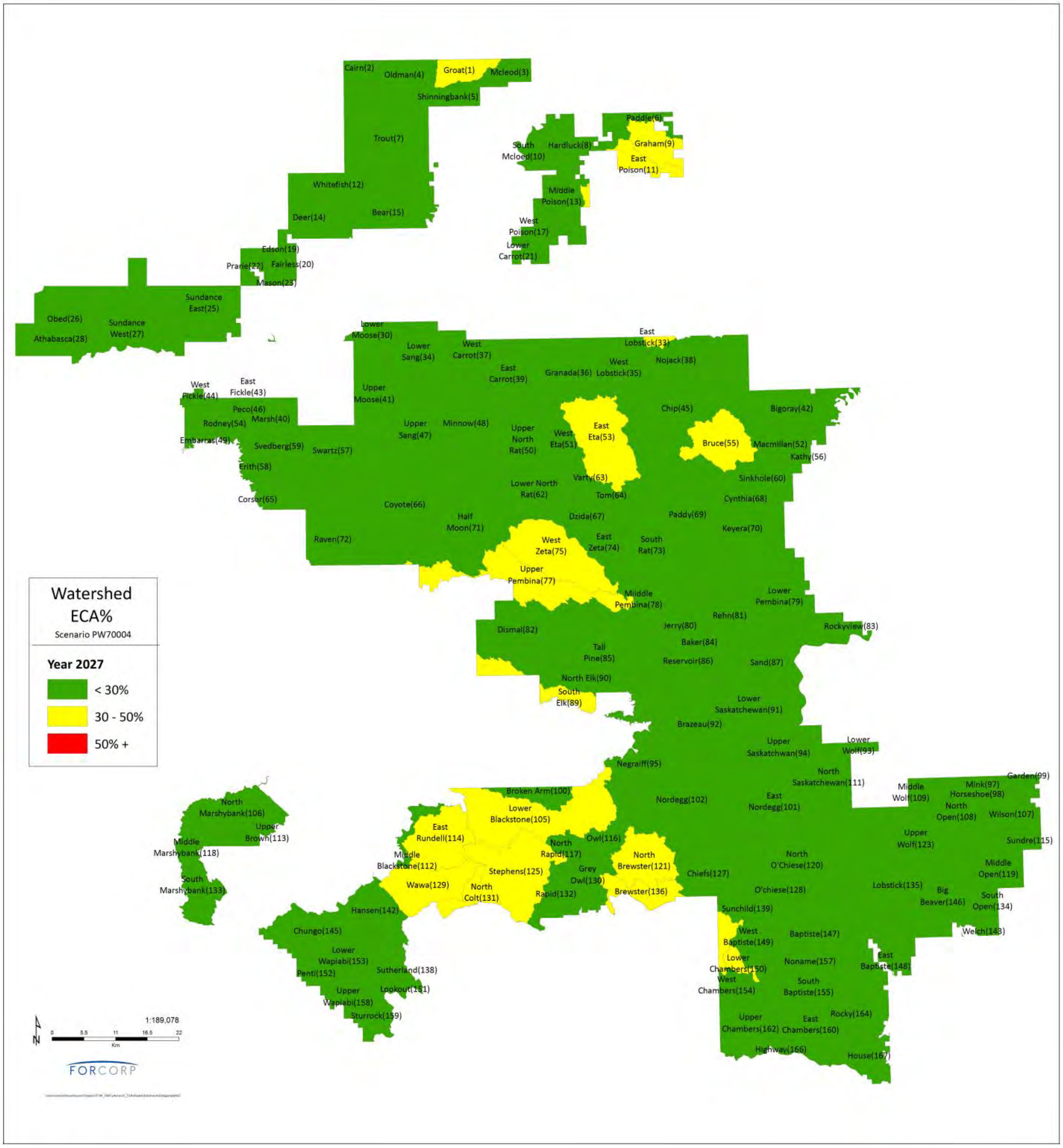


Figure 6. Map of ECA percentage at year 10 (2027) for scenario PW70004

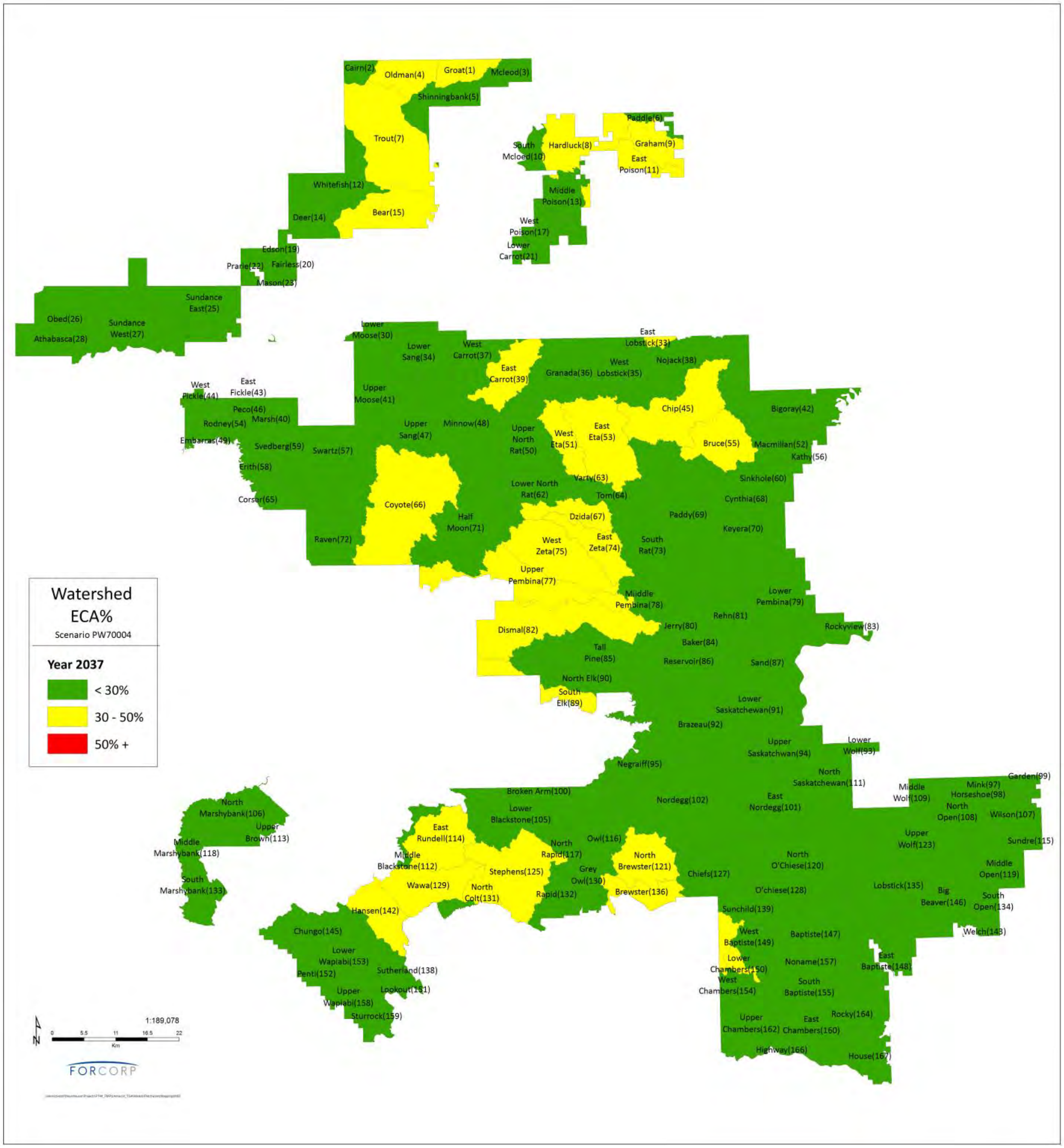


Figure 7. Map of ECA percentage at year 20 (2037) for scenario PW70004

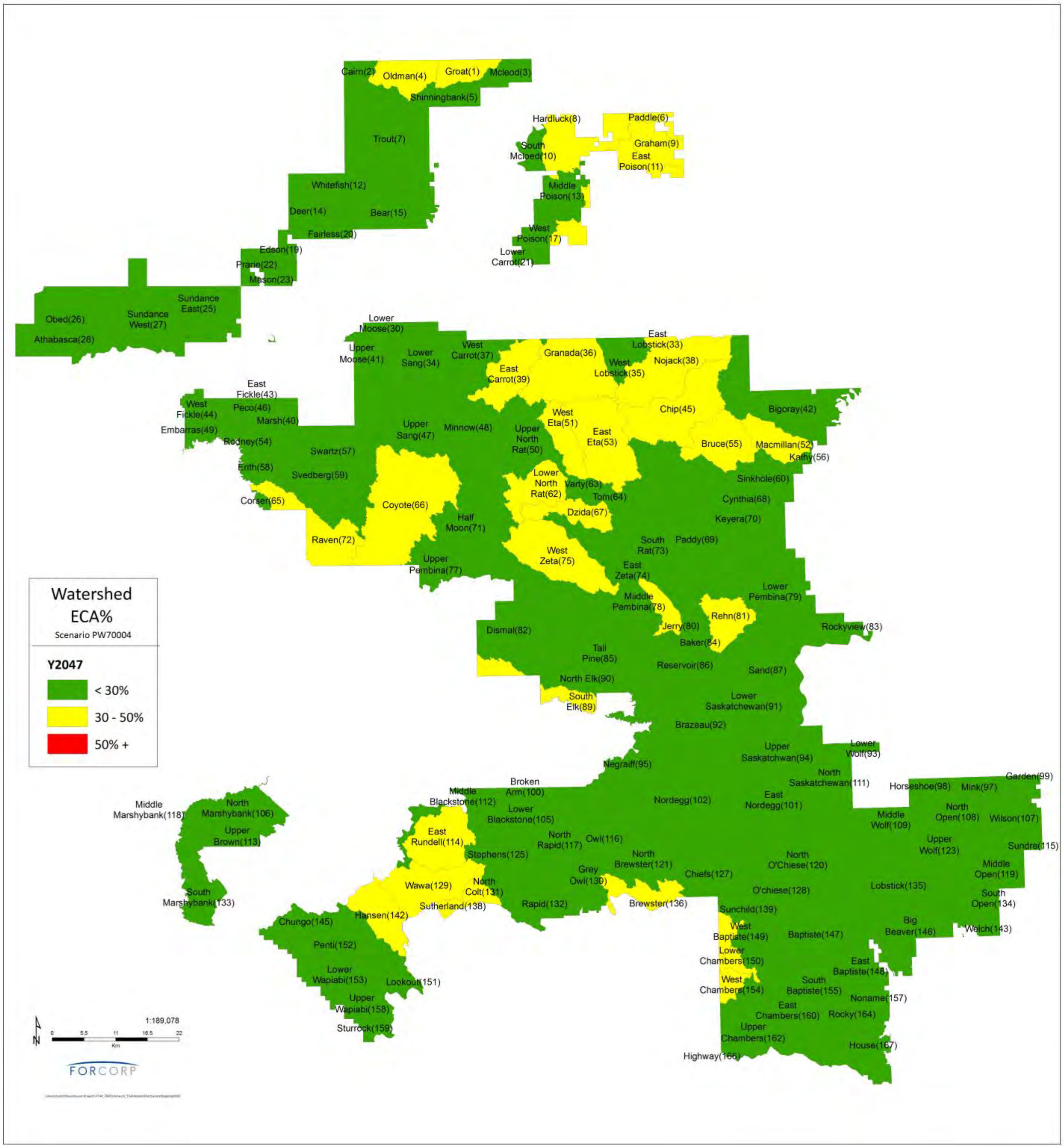


Figure 8. Map of ECA percentage at year 30 (2047) for scenario PW70004

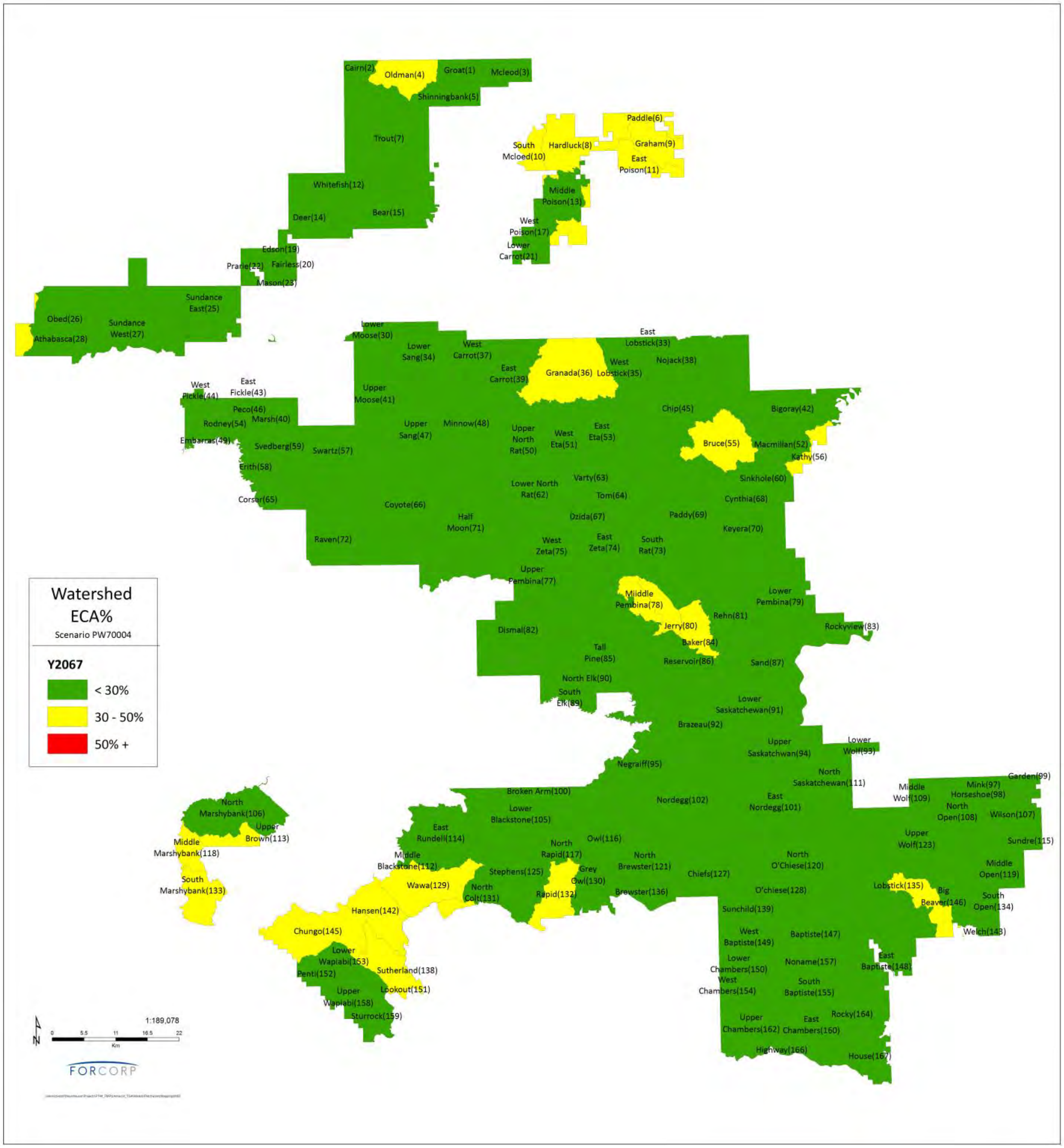


Figure 9. Map of ECA percentage at year 50 (2067) for scenario PW70004

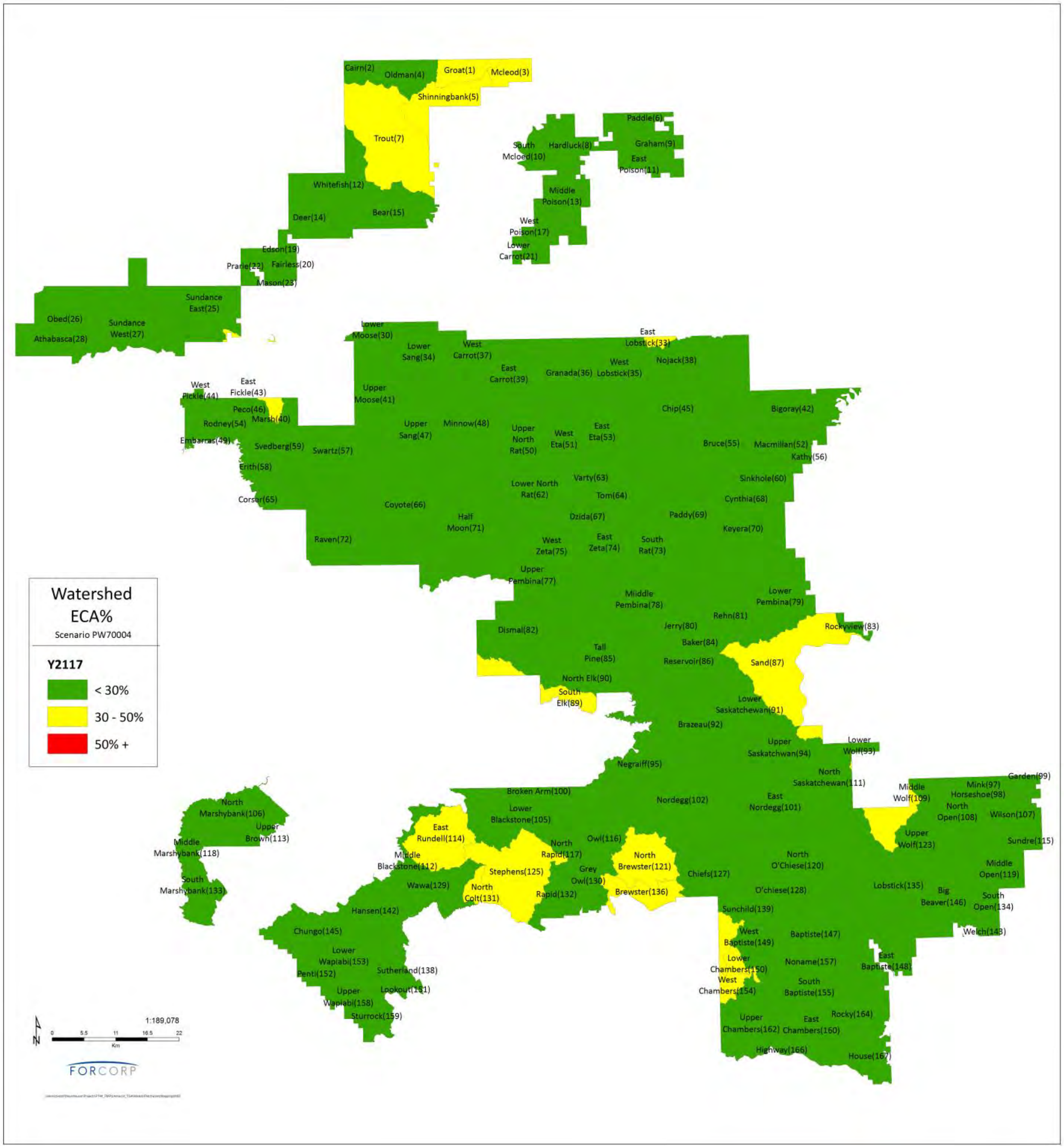


Figure 10. Map of ECA percentage at year 100 (2117) for scenario PW70004

Appendix XII – Data Dictionary – TSA Modelling Landbase

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
ACCESS_C1	Text	20	0	Controls harvest in Patchworks - to either force a planned schedule, or restrict activities in certain areas	BEARLAKE	15 year deferral
					BLKMTN	20 year deferral
					CHUNGO	20 year deferral
					CRIMSON	20 year deferral
					DEFER20	20 year deferral
					DEFER70	70 year deferral
					OCHIESE	20 year deferral
					PLAN10	Plan block for 1st 10 years
					PLAN2	2015 - 2017 cutblock
					PLAN20	Plan block for 1st 20 years
					R12E15Graz	15 year deferral
					R12PureD	15 year deferral
					RODNEY	20 year deferral
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					X	
ACCESS_C2	Text	20	0	Controls harvest in Patchworks - to either force a planned schedule, or restrict activities in certain areas (Used to force final SHS schedule)	BEARLAKE	15 year deferral
					BLKMTN	20 year deferral
					CHUNGO	20 year deferral
					CRIMSON	20 year deferral
					DEFER20	20 year deferral
					DEFER70	70 year deferral
					OCHIESE	20 year deferral
					PLAN2	2015 - 2017 cutblock
					PLAN20	Plan block for 1st 20 years
					R12E15Graz	15 year deferral
					R12PureD	15 year deferral
					RODNEY	20 year deferral
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					SHS	Force SHS schedule
					X	
ACCESS_C3	Text	20	0	Controls harvest in Patchworks	X	No used
ACCESS_C4	Text	20	0	Controls harvest in Patchworks	X	No used
ACCESS_C5	Text	20	0	Controls harvest in Patchworks	X	No used
ACCESS_C6	Text	20	0	Controls harvest in Patchworks	X	No used
AGECL	Double	12	6	Age class in 5 year increments (based on F_Age)	0-73	Variable values
AREA_HA	Double	12	6	Gross Polygon Area (ha)	0 - 9999	Variable values
AVI_UKEY	Long	4	0	Combined AVI Unique Key	0 - X	Variable values
B10_STRATA_CODE	Text	6	0	Base 10 Overstorey Stratum Code	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSw	Aspen leading white spruce mixedwood
					Pl	Lodgepole pine
					PlAw	Pine leading aspen mixedwood
					Sb	Black spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
					X	No call
					<Null>	
B10_USTRATA_CODE	Text	6	0	Base 10 Understorey Stratum Code	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSw	Aspen leading white spruce mixedwood
					Pl	Lodgepole pine
					PlAw	Lodgepole pine leading aspen mixedwood
					Sb	Black Spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
					X	No call
					<Null>	
COMPARTMEN	Text	16	0	Compartment	BAPTISTE	
					BEAVER MEADOWS	
					BRAZEAU	
					EDSON	
					MACMILLAN	
					MEDICINE LAKE	
					NORDEGG	
					SOUTH CANAL	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**
Description: Patchworks Modelling Landbase
Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					WEST COUNTRY	
					WOLF LAKE	
COMPCODE	Text	14	0	Compartment Code	BAP	Baptiste
					BEA	Beaver Meadows
					BRA	Brazeau
					EDS	Edson
					MAC	Macmillan
					MED	Medicine Lake
					NOR	Nordegg
					SOU	South Canal
					WES	West Country
					WOL	Wolf Lake
ECOUNIT	Text	2	0	Ecological Unit	CD	Coniferous dominated mixedwood
					CX	Pure coniferous - Sb or Lt leading
					DC	Deciduous dominated mixedwood
					DX	Pure deciduous
					PL	Pure coniferous - Pl leading
					SW	Pure coniferous - Sw leading
F_ACTIVE	Text	9	0	Final Landbase Assignment	ACTIVE	Active Landbase
					PASSIVE	Passive Landbase
F_AGE	Double	12	6	Final Stand Age at Lanbase Effective Date	1 - 365	Variable values
F_BCG	Text	4	0	Final Broad Cover Group	C	Coniferous
					CD	Coniferous leading mixedwood
					D	Deciduous
					DC	Deciduous leading mixedwood
F_BLOCK	Text	11	0	Final block type assignment	DEFERRAL20	20 Year Deferral
					HARVESTED	Block has been prviously harvested
					PLAN10	Planned blocks to be harvested in the first ten years of the SHS
					PLAN20	Planned blocks to be harvested in the first twenty years of the SHS
					PLAN2	2015 - 2017 cutblock
					X	No call
F_BLOCKERA	Text	8	0	Final Landbase Harvested Block Era	POST91	Cutblock harvested after March 1, 1991
					PRE91	Cutblock harvested on or before March 1, 1991
					X	No call
F_DATA_SRC	Text	8	0	Final Data Source	ARIS	Alberta Regeneration Information System.
					AVI	Alberta Vegetaion Inventory.
					HARVDECL	Harvest Declaration
					RSA	Regeneration Standard of Alberta
F_DEL	Text	14	0	Final stand deletion classification	ANTHNON	Anthropogenic non-vegetated
					ANTHVEG	Anthropogenic vegetated
					AQUATIC	Aquatic polygon
					ARISRECON	Unreconciled cutblock
					AVI	Alberta Vegetaion Inventory.
					BIRCH	Birch Subjective Deletion
					BLKSPRUCE	Black Spruce Subjective Deletion
					BURN	Fire Disturbance
					CABIN	Historic Cabin
					DIDs	Digital Integrated Dispositions
					FLOOD	Flooded areas
					FN	First Nations
					GRAZING	Grazing Lease
					HAMLET	Hamlet
					HORIZONTAL	Horizontal Structure
					HRV	Historic Resource Value
					ISO	Isolated stands
					LARCH	Larch Subjective Deletion
					NNF	Naturally non-forested
					NNV	Naturally non-vegetated
					NSR	Not Sufficiently Restocked
					OPBUFFER	Operational Buffer Deletion
					OPDEL	Operational Deletion
					OTHER_DIST	Other Disturbance
					PINE	Pine Subjective Deletion
					PNT	Protective Notation
					PPA	Park and Protected Area
					PRIVATE	Private land
					PSP	Permanent Sample Plot
					ROAD	Roadway
					SHS	Spatial Harvest Sequence Deletion
					SLOPE	Sloped Areas
					SPECIAL	Provincial Natural Area
					SWAN	Swan buffers

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					TPR	Unproductive timber productivity
					UNPRODUCTIVE	Unproductive ecosite deletion
					WATER	Water polygon
					WATERBUF	Water Buffer
					X	No call
F_DEN	Text	3	0	Final stand density assignment	A	A Density stands
					B	B Density stands
					C	C Density stands
					D	D Density stands
F_FMA	Text	8	0	Final FMA call	FMA	Forest Management Agreement Area
					NONFMA	Non-FMA area
F_HGT	Double	8	38	Final stand height assignment	0 - 36	Variable values
F_LANDBASE	Text	12	0	Final landbase assignment	CONIFEROUS	Coniferous polygon
					DECIDUOUS	Deciduous polygon
					X	No call
F_STRATA	Text	6	0	Final Stratum Assignment	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSx	Aspen leading spruce mixedwood
					Pl	Lodgepole pine
					PlAw	Lodgepole pine leading aspen mixedwood
					Sb	Black Spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
F_TPR	Text	3	0	Final stand timber productivity assignment	F	Fair
					G	Good
					M	Mediun
					U	Unproductive
F_YC	Text	11	0	Final yield curve assignment	C-PL_AB	Pl stratum A/B density natural stand (NAT) yield curve
					C-PL_AB_B	Pl stratum A/B density pre-91 cutblock (M91) yield curve (basic)
					C-PL_AB_E	Pl stratum A/B density pre-91 cutblock (M91) yield curve (enhanced)
					C-PL_CD	Pl stratum C/D density natural stand (NAT) yield curve
					C-PL_CD_B	Pl stratum C/D density pre-91 cutblock (M91) yield curve (basic)
					C-PL_CD_E	Pl stratum C/D density pre-91 cutblock (M91) yield curve (enhanced)
					C-SB	Sb stratum natural stand (NAT) yield curve
					C-SB_B	Sb stratum pre-91 cutblock (M91) yield curve (basic)
					C-SB_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					C-SW	Sw stratum natural stand (NAT) yield curve
					C-SW_B	Sw stratum pre-91 cutblock (M91) yield curve (basic)
					C-SW_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-PL	PlAw stratum natural stand (NAT) yield curve
					CD-PL_B	PlAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-PL_E	PlAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-SX	SwAw & SbAw stratum natural stand (NAT) yield curve
					CD-SX_B	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-SX_E	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					D-HW_W	Aw stratum natural stand (NAT) yield curve in W5 or W6
					D-HW_W_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in W5 or w6
					D-HW_W_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in W5 or w6
					D-HW_X	Aw stratum natural stand (NAT) yield curve in E15, E2 or R12
					D-HW_X_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in E15, E2 or R12
					D-HW_X_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in E15, E2 or R12
					DC-PL	AwPl stratum natural stand (NAT) yield curve
					DC-PL_B	AwPl stratum pre-91 cutblock (M91) yield curve (basic)
					DC-PL_E	AwPl stratum pre-91 cutblock (M91) yield curve (enhanced)
					DC-SX	AwSx stratum natural stand (NAT) yield curve
					DC-SX_B	AwSx stratum pre-91 cutblock (M91) yield curve (basic)
					DC-SX_E	AwSx stratum pre-91 cutblock (M91) yield curve (enhanced)
					Hw	Aw stratum in D declared openings (RSA)
					HwPl	AwPl stratum post-91 cutblock (RSA)
					HwSx	AwSx post-91 cutblock stratum (RSA)
					Hw_W	Aw stratum post-91 cutblock (RSA) yield curve in W5 or W6
					Hw_X	Aw stratum post-91 cutblock (RSA) yield curve in E15, E2 or R12

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**
Description: Patchworks Modelling Landbase
Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Pl	Pl stratum post-91 cutblock (RSA)
					PlHw	PlAw stratum post-91 cutblock (RSA)
					Sb	Sb stratum post-91 cutblock (RSA)
					SbHw	SbAw stratum post-91 cutblock (RSA)
					Sw	Sw stratum post-91 cutblock (RSA)
					SwG	Sw stratum post-91 cutblock (RSA) genetic gain yield curve
					SwHw	SwAw stratum post-91 cutblock (RSA)
					X	No call
FMA	Text	14	0	Forest management agreement	WEYERHAEUSER	
					<Null>	
GRAZING	Text	5	0	Grazing Disposition Type	FGL	Forest Grazing License
					GRL	Grazing Lease
					GRP	Grazing Permit
HUC	Text	10	0	Hydrologic Unit Code 8 Watershed	11010201	
					11010203	
					11010401	
					11010403	
					11010404	
					11010405	
					11010406	
					11020101	
					11020102	
					11020103	
					17010401	
					17010501	
					17020101	
					17020102	
					17020201	
					17020202	
					17020203	
					17020204	
					17030101	
					17030102	
					17030201	
					17030202	
					17030203	
					8010302	
LEAD_CON	Text	4	0	Leading conifer	FB	Balsam Fir
					LT	Larch
					NO	No Species
					PL	Lodgepole Pine
					SB	Black Spruce
					SW	White Spruce
					<Null>	
LUFCODE	Text	4	0	Land Use Framework Code	04	Upper Athabasca
					05	North Saskatchewan
MPBRANK	Text	5	0	MPB Stand Risk Rank	Rank1	
					Rank2	
					Rank3	
					X	No Call
MU_UKEY	Long	4	10	Multi Union Unique Key	0 - X	Variable values
NSRCODE	Text	5	0	Natural subregion code	A	Alpine
					CM	Central Mixedwood
					DMW	Dry Mixedwood
					LF	Lower Foothills
					SA	Subalpine
					UF	Upper Foothills
					<Null>	
NSRNAME	Text	19	0	Natural subregion name	ALPINE	Alpine
					CENTRAL MIXEDWOOD	Central Mixedwood
					DRY MIXEDWOOD	Dry Mixedwood
					LOWER FOOTHILLS	Lower Foothills
					SUBALPINE	Subalpine
					UPPER FOOTHILLS	Upper Foothills
					<Null>	
OLDFMU	Text	5	0	Previous Forest Management Unit	E15	
					E2	
					R12	
					W5	
					W6	
OPENING_ID	Text	13	0	Final Opening Number Assignment	Variable values	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
PLB_ARIS	Text	13	0	Pre-landbase ARIS Opening Number	Variable values	
					<Null>	
PLB_MOD1	Text	4	0	Pre-landbase Mod1 Assignment	BT	Broken Tops
					BU	Burn
					CC	Clear Cut
					CL	Clearing
					DI	Disease
					DT	Discolored/ dead tops
					GR	Developed for grazing domestic livestock
					IK	Insect Kill
					PL	Planted
					SI	Site improved
					SN	Snag
					ST	Scattered Timber
					TH	Thinned
					UK	Unknown Kill
					WF	Windfall
					WT	Weather
					X	No call
					<Null>	
PLB_MOD1_YR	Double	8	38	Pre-landbase Mod1 Year	0 - 2015	Variable values
					<Null>	
PLB_ORIGIN	Double	8	38	Pre-Landbase Origin Year	0 - 2014	Variable values
					<Null>	
PLCC_OPEN	Text	13	0	Planned Cutblock Opening Number	Variable values	
					<Null>	
PLCC_OWNER	Text	6	0	Planned Cutblock Owner	ANC	Alberta Newsprint Company
					BLUE	Blue Ridge Lumber Ltd.
					CTP	Community Timber Permit
					EDF	Edfor Cooperative Ltd.
					EDFR	Edfor Cooperative Ltd.
					ETP	Edson Timber Products
					MWWC	Millar Western Whitecourt Division
					TALL	Tall Pine Timber Co. Ltd.
					TP	Tall Pine Timber Co. Ltd.
					WEYR	Weyerhaeuser Canada Ltd.
					<Null>	
PLCC_STATU	Text	9	0	Planned Cutblock Harvest Status	PLAN10	Planned blocks to be harvested in the first ten years of the SHS
					PLAN20	Planned blocks to be harvested in the first twenty years of the SHS
					PLAN2	Planned blocks to be harvested prior to the model start date (2015 - 2017)
					<Null>	
POLY_NUM	Double	8	38	AVI 2.1 polygon number	0 - X	Variable values
					<Null>	
POTENOPER	Text	9	0	Potential Operator based on Spheres-of-Interest	ANC	Alberta Newsprint Company
					BR	Blue Ridge Lumber Ltd.
					BRIS	BRISCO Wood Preservers
					DHL	Dale Hansen
					E2	E2 CTPP
					EDF	Edfor Cooperative Ltd.
					EDF_E2	Edfor Cooperative Ltd. OR E2 CTPP
					MWI	Millar Western Forest Products
					MWI_W6	Millar Western Forest Products OR W6 CTPP
					R12	R12 CTPP
					TP	Tall Pine Timber
					W5	W5 CTPP
					W6	W6 CTPP
					WEYR	Weyerhaeuser
					WEYR_BRIS	Weyerhaeuser OR BRISCO
					WEYR_DHL	Weyerhaeuser OR Dale Hansen
					WEYR_R12	Weyerhaeuser OR R12 CTPP
					WEYR_TP	Weyerhaeuser OR Tall Pine
					WEYR_W5	Weyerhaeuser OR W5 CTPP
					WEYR_W6	Weyerhaeuser OR W6 CTPP
					X	No assignment
PWSEED	Text	9		Potential seed stands	DEFER20	Defer for 20 years
					SEED11_20	Seed stand for decade 2
					SEED1_10	Seed stand for decade 2
					SEED1_20	Seed stand for decade 1 or 2
					X	No assignment

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**
Description: Patchworks Modelling Landbase
Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
SOPM	Double	8	38	Storey of Primary Management	1	Overstorey
					2	Understorey
SSI	Long	4	10	MPB Stand Susceptibility Index	1-83	Variable values
SSI_CAT	Text	7	0	MPB SSI Category	1 - 22	
					23 - 63	
					64 - 100	
					X	No call
STOCKING	Text	5	0	Not Sufficiently Restocked polygon identifer	NSR50	NSR and <=50% stocked
					NSR80	NSR and >50% and <80% stocked
					X	
STRATA_SRD	Text	6	0	AVI extended strata (Overstory)	C1	Pure White Spruce
					C10	Black Spruce leading with Pine
					C11	Black Spruce leading without Pine
					C12	Larch leading
					C15	Pure Balsam Fir
					C16	Balsam Fir leading with Pine
					C17	Balsam Fir leading without Pine
					C2	White Spruce leading with Pine
					C3	White Spruce leading without Pine
					C4	Pure Pine
					C5	Pine leading with White Spruce
					C6	Pine leading with Black Spruce
					C7	Pine leading with Fir
					C8	Pine leading without Spruce and Fir
					C9	Pure Black Spruce
					CD1	White Spruce/Aspen
					CD10	Fir/Aspen
					CD4	Pine/Aspen
					CD7	Black Spruce/Aspen
					D1	Pure Aspen
					D2	Aspen leading with Poplar
					D3	Aspen leading without Poplar
					DC1	Aspen/White Spruce
					DC2	Aspen/Pine
					DC3	Aspen/Black Spruce
					DC4	Aspen/Fir
					X	No call
TEMPEXCL	Text	10	0	Temporary Exclusion	BEARLAKE	Bear Lake
					CRIMSON	Crimson
					OCHIESE	O'Chiese
					RODNEY	Rodney Creek
					<Null>	
THEME1	Text	8	0	Final FMA call	FMA	Forest Management Agreement Area
					NONFMA	Non-FMA area
THEME2	Text	5	0	Previous Forest Management Unit	E15	
					E2	
					R12	
					W5	
					W6	
THEME3	Text	6	0	Final Stratum Assignment	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSx	Aspen leading spruce mixedwood
					Pl	Lodgepole pine
					PlAw	Lodgepole pine leading aspen mixedwood
					SbLt	Larch
					SbSb	Black Spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
THEME4	Text	11	0	Final yield curve assignment	C-PL_AB	Pl stratum A/B density natural stand (NAT) yield curve
					C-PL_AB_B	Pl stratum A/B density pre-91 cutblock (M91) yield curve (basic)
					C-PL_AB_E	Pl stratum A/B density pre-91 cutblock (M91) yield curve (enhanced)
					C-PL_CD	Pl stratum C/D density natural stand (NAT) yield curve
					C-PL_CD_B	Pl stratum C/D density pre-91 cutblock (M91) yield curve (basic)
					C-PL_CD_E	Pl stratum C/D density pre-91 cutblock (M91) yield curve (enhanced)
					C-SB	Sb stratum natural stand (NAT) yield curve
					C-SB_B	Sb stratum pre-91 cutblock (M91) yield curve (basic)

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri   Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					C-SB_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					C-SW	Sw stratum natural stand (NAT) yield curve
					C-SW_B	Sw stratum pre-91 cutblock (M91) yield curve (basic)
					C-SW_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-PL	PlAw stratum natural stand (NAT) yield curve
					CD-PL_B	PlAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-PL_E	PlAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-SX	SwAw & SbAw stratum natural stand (NAT) yield curve
					CD-SX_B	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-SX_E	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					D-HW_W	Aw stratum natural stand (NAT) yield curve in W5 or W6
					D-HW_W_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in W5 or w6
					D-HW_W_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in W5 or w6
					D-HW_X	Aw stratum natural stand (NAT) yield curve in E15, E2 or R12
					D-HW_X_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in E15, E2 or R12
					D-HW_X_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in E15, E2 or R12
					DC-PL	AwPl stratum natural stand (NAT) yield curve
					DC-PL_B	AwPl stratum pre-91 cutblock (M91) yield curve (basic)
					DC-PL_E	AwPl stratum pre-91 cutblock (M91) yield curve (enhanced)
					DC-SX	AwSx stratum natural stand (NAT) yield curve
					DC-SX_B	AwSx stratum pre-91 cutblock (M91) yield curve (basic)
					DC-SX_E	AwSx stratum pre-91 cutblock (M91) yield curve (enhanced)
					Hw	Aw stratum in D declared openings (RSA)
					HwPl	AwPl stratum post-91 cutblock (RSA)
					HwSx	AwSx post-91 cutblock stratum (RSA)
					Hw_W	Aw stratum post-91 cutblock (RSA) yield curve in W5 or W6
					Hw_X	Aw stratum post-91 cutblock (RSA) yield curve in E15, E2 or R12
					Pl	Pl stratum post-91 cutblock (RSA)
					PlHw	PlAw stratum post-91 cutblock (RSA)
					Sb	Sb stratum post-91 cutblock (RSA)
					SbHw	SbAw stratum post-91 cutblock (RSA)
					Sw	Sw stratum post-91 cutblock (RSA)
					SwG	Sw stratum post-91 cutblock (RSA) genetic gain yield curve
					SwHw	SwAw stratum post-91 cutblock (RSA)
					TPR_U	Unproductive stand (TPR = U)
THEME5	Text	3	0	Final Landbase Assignment	ACT	Active Landbase
THEME6	Text	5	0	Not Sufficiently Restocked polygon identifer	X	Sufficiently stocked
THEME7	Text	7	0	MPB Stand Risk Rank	Rank1	
					Rank2	
					X	
THEME8	Text	2	0	Tree Improvement Zone	TI	Tree Improvement Zone
					X	
THEME9	Text	4	0	Hard Linear Feature	HLIN	Hard linear
					X	Not hard linear
THEME10	Text	11	0	Status	DEFER20	20 year Deferral
					DEFER70	70 year Deferral
					PLAN10	Plan block to be harvested in the first ten years of the SHS
					PLAN20	Plan block to be harvested in the first twenty years of the SHS
					PLAN2	2015 - 2017 cutblock
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					X	
Theme11	Text	4	0	Marten HSI yield identifier	AD_F	A or D density, F TPR
					AD_G	A or D density, G TPR
					AD_M	A or D density, M TPR
					BC_F	B or C density, F TPR
					BC_G	B or C density, G TPR
					BC_M	B or C density, M TPR
					X	
TSA_KEY	Long	4	10	TSA Landbase Unique Key	0 - X	Variable values
VSA	Text	3	0	Volume Supply Area	1 - 4	Volume Supply Area number
					<Null>	
WATERSHED	Text	23	0	Landbase Watershed Assignment	Athabasca	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N

Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Baker	
					Baptiste	
					Bear	
					Big Beaver	
					Bigoray	
					Brazeau	
					Brewster	
					Broken Arm	
					Bruce	
					Cairn	
					Chiefs	
					Chip	
					Chungo	
					Corser	
					Coyote	
					Crimson	
					Cynthia	
					Deer	
					Dismal	
					Dzida	
					East Baptiste	
					East Bear	
					East Carrot	
					East Chambers	
					East Eta	
					East Fickle	
					East Lobstick	
					East Nordegg	
					East Poison	
					East Rundell	
					East Sturrock	
					East Zeta	
					Edson	
					Embarras	
					Erith	
					Fairless	
					Garden	
					Graham	
					Granada	
					Grey Owl	
					Groat	
					Half Moon	
					Hanlan	
					Hansen	
					Hardluck	
					Highway	
					Hoke	
					Horseshoe	
					House	
					Jerry	
					Kathy	
					Keyera	
					Little Grey Owl	
					Lobstick	
					Lookout	
					Lower Blackstone	
					Lower Carrot	
					Lower Chambers	
					Lower Moose	
					Lower North Rat	
					Lower Pembina	
					Lower Sang	
					Lower Saskatchewan	
					Lower Wapiabi	
					Lower Wolf	
					Macmillan	
					Marsh	
					Marshybank Fringe	
					Marshybank Fringe2	
					Mason	
					Mcleod	
					Middle Blackstone	
					Middle Marshybank	
					Middle Open	
					Middle Poison	
					Middle Wolf	
					Miiddle Pembina	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Mink	
					Minnow	
					Negraiff	
					Niton	
					Nojack	
					Noname	
					Nordegg	
					Norht Athabasca	
					North Brewster	
					North Colt	
					North Corser	
					North Elk	
					North Marshybank	
					North O'Chiese	
					North Open	
					North Rapid	
					North Saskatchewan	
					Obed	
					O'chiese	
					Oldman	
					Owl	
					Paddle	
					Paddy	
					Peco	
					Penti	
					Plateau	
					Prarie	
					Rapid	
					Raven	
					Rehn	
					Reservoir	
					Rocky	
					Rockyview	
					Rodney	
					Sand	
					Shinningbank	
					Sinkhole	
					South Baptiste	
					South Bear	
					South Elk	
					South Lobstick	
					South Lookout	
					South Marshybank	
					South Mcloed	
					South Open	
					South Rat	
					Stephens	
					Stephens Fringe	
					Sturrock	
					Sunchild	
					Sundance East	
					Sundance West	
					Sundre	
					Sutherland	
					Svedberg	
					Swartz	
					Tall Pine	
					Tom	
					Trout	
					Upper Blackstone	
					Upper Brown	
					Upper Chambers	
					Upper Chambers Fringe	
					Upper Moose	
					Upper North Rat	
					Upper Pembina	
					Upper Sang	
					Upper Saskatchwan	
					Upper Wapiabi	
					Upper Wolf	
					Varty	
					Wawa	
					Welch	
					West Baptiste	
					West Carrot	
					West Chambers	
					West Chungo	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					West Eta	
					West Fickle	
					West Lobstick	
					West Lower Blackstone	
					West Moose	
					West Negraiff	
					West Poison	
					West Zeta	
					Whitefish	
					Wilson	
WATSHDCODE				Watershed Number	1-169	
WORKAREA	Text	22	0	Working area.	BEAVER FLATS	
					BIG BEND	
					BIG ROCK	
					BIGORAY	
					BLACK MOUNTAIN	
					BOUNDARY	
					BRAZEAU TOWER	
					BREWSTER CREEK	
					BROKEN ARM	
					BROKEN CABIN	
					CANAL	
					CANYON CREEK	
					CATHEDRAL GROVE	
					CHAMBERS CREEK	
					CHIP LAKE	
					CHUNGO LOOKOUT	
					COYOTE CREEK	
					CRICKS CREEK	
					CRIMSON	
					DEER HILL	
					DOCS LAKE	
					DOMINION LAKE	
					EAST BANK	
					EASYFORD	
					ELKE SUMMERS	
					ERITH	
					ETA LAKE	
					FICKLE LAKE	
					GRACE CREEK	
					GRANADA	
					GRAND TRUNK	
					GRANDE PRAIRIE TRAIL	
					HATTONFORD	
					JACK KNIFE	
					KEY HOLE	
					LOBSTICK	
					LODGEPOLE	
					LODGEPOLE DV	
					LOOKOUT CREEK	
					LOST ELK RIDGE	
					LOUIS LAKE	
					MACKAY	
					MCLEOD CROSSING	
					MEDICINE CREEK	
					MEDICINE LODGE	
					MINNOW LAKE	
					NINE MILE	
					NO NAME CREEK	
					NOJACK SOUTH	
					NORMS THROW	
					NORTH BRAZEAU	
					NORTH DISMAL CREEK	
					NORTH FALSE GAP	
					NORTH PEMBINA	
					NORTH RAT CREEK	
					OBED LAKE	
					OLDMAN CREEK	
					PADDY CREEK	
					PEMBINA	
					PIONEER	
					POACHERS CREEK	
					POWER HOUSE	
					RACE CREEK	
					RAPID CREEK	
					RODNEY CREEK	

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**
Description: Patchworks Modelling Landbase
Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					RUNDELL	
					SANG LAKE NORTH	
					SANG LAKE SOUTH	
					SASKATCHEWAN	
					SHININGBANK EAST	
					SINKHOLE LAKE	
					SOUTH BRAZEAU	
					SOUTH DISMAL CREEK	
					SOUTH FALSE GAP	
					SOUTH RAT CREEK	
					SOUTH RESERVOIR	
					STEVENS CREEK	
					STRAWBERRY MOUNTAIN	
					SUNDANCE CREEK	
					SURPRISE LAKE	
					SVEDBERG	
					SWANSON	
					THE GAP	
					TOM HILL	
					TOWER	
					TROUT CREEK	
					TRUNK ROAD	
					WAWA	
					WOLF LAKE EAST	
					WOLF LAKE WEST	
					ZETA LAKE	
WORKCODE	Text	14	0	Working Areas Code	BEVRFL	Beaver Flats
					BIGBND	Big Bend
					BIGORY	Bigoray
					BIGROK	Big Rock
					BLKMNT	Black Mountain
					BOUDRY	Boundary
					BRAZEU	Brazeau Tower
					BREWST	Brewster Creek
					BROARM	Broken Arm
					BROCAB	Broken Cabin
					CANALS	Canal
					CANYON	Canyon Creek
					CATHED	Cathedral Grove
					CHAMBR	Chambers Creek
					CHIPLK	Chip Lake
					CHUNGO	Chungo Lookout
					COYOTE	Coyote Creek
					CRICKS	Cricks Creek
					CRIMSN	Crimson
					DEERHL	Deer Hill
					DOCSLK	Docs Lake
					DOMNLK	Dominion Lake
					EASTBK	East Bank
					EASYFD	Easyford
					ELKESU	Elke Summers
					ERITHX	Erith
					ETALAK	Eta Lake
					FICKLE	Fickle Creek
					FICKLE	Fickle Lake
					GRACEC	Grace Creek
					GRANAD	Granada
					GRANDE	Grande Prairie Trail
					GRANDT	Grand Trunk
					HATTON	Hattonford
					JACKNI	Jack Knife
					KEYHOL	Key Hole
					LGPLDV	Lodgepole DV
					LOBSTK	Lobstick
					LODGEP	Lodgepole
					LOOKOU	Lookout Creek
					LOSTER	Lost Elk Ridge
					LOUISL	Louis Lake
					MACKAY	Mackay
					MCLEOD	McLeod
					MEDICI	Medicine Lodge
					MEDICR	Medicine Creek
					MINNWL	Minnow Lake
					NBRAZU	North Brazeau
					NDISML	North Dismal Creek
					NFLSGP	North False Gap
					NINEML	Nine Mile

Data Dictionary

Dataset Name: **TSA_LB_Foreseted_v8_20170921.shp**

Description: Patchworks Modelling Landbase

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri   Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					NOJACK	Nojack South
					NONAME	No Name Creek
					NORMTH	Norms Throw
					NRATCK	North Rat Creek
					OBEDLK	Obed Lake
					OLDMAN	Oldman Creek
					PADDYC	Paddy Creek
					PEMBIN	Pembina
					PEMBNT	North Pembina
					PIONER	Pioneer
					POACHC	Poachers Creek
					POWERH	Power House
					RACECK	Race Creek
					RAPDCK	Rapid Creek
					RODNEY	Rodney Creek
					RUNDEL	Rundell
					SANGLN	Sang Lake North
					SANGLS	Sang Lake South
					SASKAT	Saskatchewan
					SBRAZU	South Brazeau
					SDISML	South Dismal Creek
					SFLSGP	South False Gap
					SHININ	Shiningbank East
					SINKHL	Sinkhole Lake
					SRATCK	South Rat Creek
					SRESER	South Reservoir
					STRWMN	Strawberry Mountain
					STVNCK	Stevens Creek
					SUNDAN	Sundance Creek
					SURPRI	Surprise Lake
					SVEDBG	Svedberg
					SWANSN	Swanson
					THEGAP	The Gap
					TOMHIL	Tom Hill
					TOWERX	Tower
					TRNKRD	Trunk Road
					TROUTC	Trout Creek
					WAWAWC	Wawa
					WOLFLE	Wolf Lake East
					WOLFLW	Wolf Lake West
					ZETALK	Zeta Lake
YCTYPE	Text	3	0	Yield Curve Type	M91	Yield curve applied to a pre-91 cutblock
					NAT	Yield curve applied to natural stands
					RSA	Yield curve applied to a post-91 cutblock

Appendix XIII – Data Dictionary – Spatial Harvest Sequence

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
ACCESS_C1	Text	20	0	Controls harvest in Patchworks - to either force a planned schedule, or restrict activities in certain areas	BEARLAKE	15 year deferral
					BLKMTN	20 year deferral
					CHUNGO	20 year deferral
					CRIMSON	20 year deferral
					DEFER20	20 year deferral
					DEFER70	70 year deferral
					OCHIESE	20 year deferral
					PLAN10	Plan block for 1st 10 years
					PLAN2	2015 - 2017 cutblock
					PLAN20	Plan block for 1st 20 years
					R12E15Graz	15 year deferral
					R12PureD	15 year deferral
					RODNEY	20 year deferral
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					X	
ACCESS_C2	Text	20	0	Controls harvest in Patchworks - to either force a planned schedule, or restrict activities in certain areas (Used to force final SHS schedule)	BEARLAKE	15 year deferral
					BLKMTN	20 year deferral
					CHUNGO	20 year deferral
					CRIMSON	20 year deferral
					DEFER20	20 year deferral
					DEFER70	70 year deferral
					OCHIESE	20 year deferral
					PLAN2	2015 - 2017 cutblock
					PLAN20	Plan block for 1st 20 years
					R12E15Graz	15 year deferral
					R12PureD	15 year deferral
					RODNEY	20 year deferral
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					SHS	Force SHS schedule
					X	
AGECL	Double	12	6	Age class in 5 year increments (based on F_Age)	0-73	Variable values
AREA_HA	Double	12	6	Gross Polygon Area (ha)	0 - 9999	Variable values
AVI_UKEY	Long	4	0	Combined AVI Unique Key	0 - X	Variable values
COMPARTMEN	Text	16	0	Compartment	BAPTISTE	
					BEAVER MEADOWS	
					BRAZEAU	
					EDSON	
					MACMILLAN	
					MEDICINE LAKE	
					NORDEGG	
					SOUTH CANAL	
					WEST COUNTRY	
					WOLF LAKE	
CONVOL	Double	12	6	Coniferous Volume	0-9999	Variable values
CONVOL_SEIS	Double	12	6	Coniferous Volume based on net area with yield curve unadjusted for seismic	0-9999	Only included in 20 year SHS
DECVOL	Double	12	6	Deciduous Volume	0-9999	Variable values
DECVOL_SEIS	Double	12	6	Deciduous Volume based on net area with yield curve unadjusted for seismic	0-9999	Only included in 20 year SHS
DELTA	Double	12	6	Year Treated	1 - 70	Treatment / Clearcut year
ECOUNIT	Text	2	0	Ecological Unit	CD	Coniferous dominated mixedwood
					CX	Pure coniferous - Sb or Lt leading
					DC	Deciduous dominated mixedwood
					DX	Pure deciduous
					PL	Pure coniferous - Pl leading
					SW	Pure coniferous - Sw leading
F_ACTIVE	Text	9	0	Final Landbase Assignment	ACTIVE	Active Landbase
					PASSIVE	Passive Landbase
F_AGE	Double	12	6	Final Stand Age at Lanbase Effective Date	1 - 365	Variable values
F_BCG	Text	4	0	Final Broad Cover Group	C	Coniferous
					CD	Coniferous leading mixedwood
					D	Deciduous
					DC	Deciduous leading mixedwood
F_BLOCK	Text	11	0	Final block type assignment	DEFERRAL20	20 Year Deferral

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					HARVESTED	Block has been prviously harvested
					PLAN10	Planned blocks to be harvested in the first ten years of the SHS
					PLAN20	Planned blocks to be harvested in the first twenty years of the SHS
					X	No call
F_DEN	Text	3	0	Final stand density assignment	A	A Density stands
					B	B Density stands
					C	C Density stands
					D	D Density stands
F_FMA	Text	8	0	Final FMA call	FMA	Forest Management Agreement Area
					NONFMA	Non-FMA area
F_HGT	Double	8	38	Final stand height assignment	0 - 36	Variable values
F_STRATA	Text	6	0	Final Stratum Assignment	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSx	Aspen leading spruce mixedwood
					Pl	Lodgepole pine
					PlAw	Lodgepole pine leading aspen mixedwood
					Sb	Black Spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
F_TPR	Text	3	0	Final stand timber productivity assignment	F	Fair
					G	Good
					M	Mediun
					U	Unproductive
F_YC	Text	11	0	Final yield curve assignment	C-PL_AB	Pl stratum A/B density natural stand (NAT) yield curve
					C-PL_AB_B	Pl stratum A/B density pre-91 cutblock (M91) yield curve (basic)
					C-PL_AB_E	Pl stratum A/B density pre-91 cutblock (M91) yield curve (enhanced)
					C-PL_CD	Pl stratum C/D density natural stand (NAT) yield curve
					C-PL_CD_B	Pl stratum C/D density pre-91 cutblock (M91) yield curve (basic)
					C-PL_CD_E	Pl stratum C/D density pre-91 cutblock (M91) yield curve (enhanced)
					C-SB	Sb stratum natural stand (NAT) yield curve
					C-SB_B	Sb stratum pre-91 cutblock (M91) yield curve (basic)
					C-SB_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					C-SW	Sw stratum natural stand (NAT) yield curve
					C-SW_B	Sw stratum pre-91 cutblock (M91) yield curve (basic)
					C-SW_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-PL	PlAw stratum natural stand (NAT) yield curve
					CD-PL_B	PlAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-PL_E	PlAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-SX	SwAw & SbAw stratum natural stand (NAT) yield curve
					CD-SX_B	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-SX_E	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					D-HW_W	Aw stratum natural stand (NAT) yield curve in W5 or W6
					D-HW_W_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in W5 or w6
					D-HW_W_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in W5 or w6
					D-HW_X	Aw stratum natural stand (NAT) yield curve in E15, E2 or R12
					D-HW_X_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in E15, E2 or R12
					D-HW_X_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in E15, E2 or R12
					DC-PL	AwPl stratum natural stand (NAT) yield curve
					DC-PL_B	AwPl stratum pre-91 cutblock (M91) yield curve (basic)
					DC-PL_E	AwPl stratum pre-91 cutblock (M91) yield curve (enhanced)
					DC-SX	AwSx stratum natural stand (NAT) yield curve
					DC-SX_B	AwSx stratum pre-91 cutblock (M91) yield curve (basic)
					DC-SX_E	AwSx stratum pre-91 cutblock (M91) yield curve (enhanced)
					Hw	Aw stratum in D declared openings (RSA)
					HwPl	AwPl stratum post-91 cutblock (RSA)
					HwSx	AwSx post-91 cutblock stratum (RSA)
					Hw_W	Aw stratum post-91 cutblock (RSA) yield curve in W5 or W6
					Hw_X	Aw stratum post-91 cutblock (RSA) yield curve in E15, E2 or R12
					Pl	Pl stratum post-91 cutblock (RSA)

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					PlHw	PlAw stratum post-91 cutblock (RSA)
					Sb	Sb stratum post-91 cutblock (RSA)
					SbHw	SbAw stratum post-91 cutblock (RSA)
					Sw	Sw stratum post-91 cutblock (RSA)
					SwG	Sw stratum post-91 cutblock (RSA) genetic gain yield curve
					SwHw	SwAw stratum post-91 cutblock (RSA)
					X	No call
GRAZING	Text	5	0	Grazing Disposition Type	FGL	Forest Grazing License
					GRL	Grazing Lease
					GRP	Grazing Permit
HARVESTAGE	Double	8	38	Stand age at harvest	0 - 999	Variable values
					<null>	
HUC	Text	10	0	Hydrologic Unit Code 8 Watershed	11010201	
					11010203	
					11010401	
					11010403	
					11010404	
					11010405	
					11010406	
					11020101	
					11020102	
					11020103	
					17010401	
					17010501	
					17020101	
					17020102	
					17020201	
					17020202	
					17020203	
					17020204	
					17030101	
					17030102	
					17030201	
					17030202	
					17030203	
					8010302	
MPBRANK	Text	5	0	MPB Stand Risk Rank	Rank1	
					Rank2	
					Rank3	
					X	No Call
NET_AREA	Double	12	6	Polygon Area (ha) net of seismic line area	0 - 9999	Only included in 20 year SHS
OLDFMU	Text	5	0	Previous Forest Management Unit	E15	
					E2	
					R12	
					W5	
					W6	
OPERATOR	Text	30	0	Assigned Timber Operator	ANC	Alberta Newsprint Company
					BRIS	Brisco Wood Preservers
					BRL	Blue Ridge Lumber Ltd.
					DHL	Dale Hansen Lumber
					E2CTP	Community Timber Permit (E2)
					EDF	Edfor Cooperative Ltd.
					MWI	Millar Western Whitecourt Division
					R12CTP	Community Timber Permit (R12)
					TP	Tall Pine Timber Co. Ltd.
					W5CTP	Community Timber Permit (W5)
					W6CTP	Community Timber Permit (W6)
					WEYR	Weyerhaeuser Canada Ltd.
PERIOD	Double	12	6	SHS Period	1 - 14	5 year period
RUN	Text	30	0	Patchworks scenario name	PW70006	Scenario number
SEI_AREA	Double	12	6	Seismic line Area (ha)	0 - 9999	Only included in 20 year SHS
THEME1	Text	8	0	Final FMA call	FMA	Forest Management Agreement Area
					NONFMA	Non-FMA area
THEME2	Text	5	0	Previous Forest Management Unit	E15	
					E2	
					R12	
					W5	
					W6	
THEME3	Text	6	0	Final Stratum Assignment	Aw	Aspen
					AwPl	Aspen leading lodgepole pine mixedwood
					AwSx	Aspen leading spruce mixedwood

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Pl	Lodgepole pine
					PlAw	Lodgepole pine leading aspen mixedwood
					SbLt	Larch
					SbSb	Black Spruce
					SbAw	Black spruce leading aspen mixedwood
					Sw	White spruce
					SwAw	White spruce leading aspen mixedwood
THEME4	Text	11	0	Final yield curve assignment	C-PL_AB	Pl stratum A/B density natural stand (NAT) yield curve
					C-PL_AB_B	Pl stratum A/B density pre-91 cutblock (M91) yield curve (basic)
					C-PL_AB_E	Pl stratum A/B density pre-91 cutblock (M91) yield curve (enhanced)
					C-PL_CD	Pl stratum C/D density natural stand (NAT) yield curve
					C-PL_CD_B	Pl stratum C/D density pre-91 cutblock (M91) yield curve (basic)
					C-PL_CD_E	Pl stratum C/D density pre-91 cutblock (M91) yield curve (enhanced)
					C-SB	Sb stratum natural stand (NAT) yield curve
					C-SB_B	Sb stratum pre-91 cutblock (M91) yield curve (basic)
					C-SB_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					C-SW	Sw stratum natural stand (NAT) yield curve
					C-SW_B	Sw stratum pre-91 cutblock (M91) yield curve (basic)
					C-SW_E	Sb stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-PL	PlAw stratum natural stand (NAT) yield curve
					CD-PL_B	PlAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-PL_E	PlAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					CD-SX	SwAw & SbAw stratum natural stand (NAT) yield curve
					CD-SX_B	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (basic)
					CD-SX_E	SwAw, SbAw stratum pre-91 cutblock (M91) yield curve (enhanced)
					D-HW_W	Aw stratum natural stand (NAT) yield curve in W5 or W6
					D-HW_W_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in W5 or w6
					D-HW_W_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in W5 or w6
					D-HW_X	Aw stratum natural stand (NAT) yield curve in E15, E2 or R12
					D-HW_X_B	Aw stratum pre-91 cutblock (M91) yield curve (basic) in E15, E2 or R12
					D-HW_X_E	Aw stratum pre-91 cutblock (M91) yield curve (enhanced) in E15, E2 or R12
					DC-PL	AwPl stratum natural stand (NAT) yield curve
					DC-PL_B	AwPl stratum pre-91 cutblock (M91) yield curve (basic)
					DC-PL_E	AwPl stratum pre-91 cutblock (M91) yield curve (enhanced)
					DC-SX	AwSx stratum natural stand (NAT) yield curve
					DC-SX_B	AwSx stratum pre-91 cutblock (M91) yield curve (basic)
					DC-SX_E	AwSx stratum pre-91 cutblock (M91) yield curve (enhanced)
					Hw	Aw stratum in D declared openings (RSA)
					HwPl	AwPl stratum post-91 cutblock (RSA)
					HwSx	AwSx post-91 cutblock stratum (RSA)
					Hw_W	Aw stratum post-91 cutblock (RSA) yield curve in W5 or W6
					Hw_X	Aw stratum post-91 cutblock (RSA) yield curve in E15, E2 or R12
					Pl	Pl stratum post-91 cutblock (RSA)
					PlHw	PlAw stratum post-91 cutblock (RSA)
					Sb	Sb stratum post-91 cutblock (RSA)
					SbHw	SbAw stratum post-91 cutblock (RSA)
					Sw	Sw stratum post-91 cutblock (RSA)
					SwG	Sw stratum post-91 cutblock (RSA) genetic gain yield curve
					SwHw	SwAw stratum post-91 cutblock (RSA)
					TPR_U	Unproductive stand (TPR = U)
THEME5	Text	3	0	Final Landbase Assignment	ACT	Active Landbase
THEME6	Text	5	0	Not Sufficiently Restocked polygon identifer	X	Sufficiently stocked
THEME7	Text	7	0	MPB Stand Risk Rank	Rank1	
					Rank2	
					X	
THEME8	Text	2	0	Tree Improvement Zone	TI	Tree Improvement Zone
					X	
THEME9	Text	4	0	Hard Linear Feature	HLIN	Hard linear
					X	Not hard linear
THEME10	Text	11	0	Status	DEFER20	20 year Deferral
					PLAN10	Plan block to be harvested in the first ten years of the SHS

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					PLAN20	Plan block to be harvested in the first twenty years of the SHS
					SEED11_20	Seed block for harvest in Years 11 - 20
					SEED1_10	Seed block for harvest in Years 1 - 10
					SEED1_20	Seed block for harvest in Years 1 - 20
					X	
Theme11	Text	4	0	Marten HSI yield identifier	AD_F	A or D density, F TPR
					AD_G	A or D density, G TPR
					AD_M	A or D density, M TPR
					BC_F	B or C density, F TPR
					BC_G	B or C density, G TPR
					BC_M	B or C density, M TPR
					X	
TMTYEAR				Treatment Year	1 - 70	Year treated / clearcut
TSA_KEY	Long	4	10	TSA Landbase Unique Key	0 - X	Variable values
VSA	Text	3	0	Volume Supply Area	1 - 4	Volume Supply Area number
					<Null>	
WATERSHED	Text	23	0	Landbase Watershed Assignment	Athabasca	
					Baker	
					Baptiste	
					Bear	
					Big Beaver	
					Bigoray	
					Brazeau	
					Brewster	
					Broken Arm	
					Bruce	
					Cairn	
					Chiefs	
					Chip	
					Chungo	
					Corser	
					Coyote	
					Crimson	
					Cynthia	
					Deer	
					Dismal	
					Dzida	
					East Baptiste	
					East Bear	
					East Carrot	
					East Chambers	
					East Eta	
					East Fickle	
					East Lobstick	
					East Nordegg	
					East Poison	
					East Rundell	
					East Sturrock	
					East Zeta	
					Edson	
					Embarras	
					Erith	
					Fairless	
					Garden	
					Graham	
					Granada	
					Grey Owl	
					Groat	
					Half Moon	
					Hanlan	
					Hansen	
					Hardluck	
					Highway	
					Hoke	
					Horseshoe	
					House	
					Jerry	
					Kathy	
					Keyera	
					Little Grey Owl	
					Lobstick	
					Lookout	
					Lower Blackstone	
					Lower Carrot	

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N

Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Lower Chambers	
					Lower Moose	
					Lower North Rat	
					Lower Pembina	
					Lower Sang	
					Lower Saskatchewan	
					Lower Wapiabi	
					Lower Wolf	
					Macmillan	
					Marsh	
					Marshybank Fringe	
					Marshybank Fringe2	
					Mason	
					Mcleod	
					Middle Blackstone	
					Middle Marshybank	
					Middle Open	
					Middle Poison	
					Middle Wolf	
					Miiddle Pembina	
					Mink	
					Minnow	
					Negraiff	
					Niton	
					Nojack	
					Noname	
					Nordegg	
					Norht Athabasca	
					North Brewster	
					North Colt	
					North Corser	
					North Elk	
					North Marshybank	
					North O'Chiese	
					North Open	
					North Rapid	
					North Saskatchewan	
					Obed	
					O'chiese	
					Oldman	
					Owl	
					Paddle	
					Paddy	
					Peco	
					Penti	
					Plateau	
					Prarie	
					Rapid	
					Raven	
					Rehn	
					Reservoir	
					Rocky	
					Rockyview	
					Rodney	
					Sand	
					Shinningbank	
					Sinkhole	
					South Baptiste	
					South Bear	
					South Elk	
					South Lobstick	
					South Lookout	
					South Marshybank	
					South Mcloed	
					South Open	
					South Rat	
					Stephens	
					Stephens Fringe	
					Sturrock	
					Sunchild	
					Sundance East	
					Sundance West	
					Sundre	
					Sutherland	
					Svedberg	
					Swartz	
					Tall Pine	

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					Tom	
					Trout	
					Upper Blackstone	
					Upper Brown	
					Upper Chambers	
					Upper Chambers Fringe	
					Upper Moose	
					Upper North Rat	
					Upper Pembina	
					Upper Sang	
					Upper Saskatchwan	
					Upper Wapiabi	
					Upper Wolf	
					Varty	
					Wawa	
					Welch	
					West Baptiste	
					West Carrot	
					West Chambers	
					West Chungo	
					West Eta	
					West Fickle	
					West Lobstick	
					West Lower Blackstone	
					West Moose	
					West Negraiff	
					West Poison	
					West Zeta	
					Whitefish	
					Wilson	
WATSHDCODE				Watershed Number	1-169	
WORKAREA	Text	22	0	Working area.	BEAVER FLATS	
					BIG BEND	
					BIG ROCK	
					BIGORAY	
					BLACK MOUNTAIN	
					BOUNDARY	
					BRAZEAU TOWER	
					BREWSTER CREEK	
					BROKEN ARM	
					BROKEN CABIN	
					CANAL	
					CANYON CREEK	
					CATHEDRAL GROVE	
					CHAMBERS CREEK	
					CHIP LAKE	
					CHUNGO LOOKOUT	
					COYOTE CREEK	
					CRICKS CREEK	
					CRIMSON	
					DEER HILL	
					DOCS LAKE	
					DOMINION LAKE	
					EAST BANK	
					EASYFORD	
					ELKE SUMMERS	
					ERITH	
					ETA LAKE	
					FICKLE LAKE	
					GRACE CREEK	
					GRANADA	
					GRAND TRUNK	
					GRANDE PRAIRIE TRAIL	
					HATTONFORD	
					JACK KNIFE	
					KEY HOLE	
					LOBSTICK	
					LODGEPOLE	
					LODGEPOLE DV	
					LOOKOUT CREEK	
					LOST ELK RIDGE	
					LOUIS LAKE	
					MACKAY	
					MCLEOD CROSSING	
					MEDICINE CREEK	
					MEDICINE LODGE	

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					MINNOW LAKE	
					NINE MILE	
					NO NAME CREEK	
					NOJACK SOUTH	
					NORMS THROW	
					NORTH BRAZEAU	
					NORTH DISMAL CREEK	
					NORTH FALSE GAP	
					NORTH PEMBINA	
					NORTH RAT CREEK	
					OBED LAKE	
					OLDMAN CREEK	
					PADDY CREEK	
					PEMBINA	
					PIONEER	
					POACHERS CREEK	
					POWER HOUSE	
					RACE CREEK	
					RAPID CREEK	
					RODNEY CREEK	
					RUNDELL	
					SANG LAKE NORTH	
					SANG LAKE SOUTH	
					SASKATCHEWAN	
					SHININGBANK EAST	
					SINKHOLE LAKE	
					SOUTH BRAZEAU	
					SOUTH DISMAL CREEK	
					SOUTH FALSE GAP	
					SOUTH RAT CREEK	
					SOUTH RESERVOIR	
					STEVENS CREEK	
					STRAWBERRY MOUNTAIN	
					SUNDANCE CREEK	
					SURPRISE LAKE	
					SVEDBERG	
					SWANSON	
					THE GAP	
					TOM HILL	
					TOWER	
					TROUT CREEK	
					TRUNK ROAD	
					WAWA	
					WOLF LAKE EAST	
					WOLF LAKE WEST	
					ZETA LAKE	
WORKCODE	Text	14	0	Working Areas Code	BEVRFL	Beaver Flats
					BIGBND	Big Bend
					BIGORY	Bigoray
					BIGROK	Big Rock
					BLKMNT	Black Mountain
					BOUDRY	Boundary
					BRAZEU	Brazeau Tower
					BREWST	Brewster Creek
					BROARM	Broken Arm
					BROCAB	Broken Cabin
					CANALS	Canal
					CANYON	Canyon Creek
					CATHED	Cathedral Grove
					CHAMBR	Chambers Creek
					CHIPLK	Chip Lake
					CHUNGO	Chungo Lookout
					COYOTE	Coyote Creek
					CRICKS	Cricks Creek
					CRIMSN	Crimson
					DEERHL	Deer Hill
					DOCSLK	Docs Lake
					DOMNLK	Dominion Lake
					EASTBK	East Bank
					EASYFD	Easyford
					ELKESU	Elke Summers
					ERITHX	Erith
					ETALAK	Eta Lake
					FICKLE	Fickle Creek
					FICKLE	Fickle Lake
					GRACEC	Grace Creek
					GRANAD	Granada

Data Dictionary

Dataset Name: **WPEM_SHS_20yr_PW70006, WPEM_SHS_70yr_PW70006**

Description: PFMS SHS

Projection: NAD_1983_UTM_Zone_11N   Datum: D_North_Ameri Units: Meters

Column Name	Type	Width	Decimal	Column Description	Item Value	Item Description
					GRANDE	Grande Prairie Trail
					GRANDT	Grand Trunk
					HATTON	Hattonford
					JACKNI	Jack Knife
					KEYHOL	Key Hole
					LGPLDV	Lodgepole DV
					LOBSTK	Lobstick
					LODGEP	Lodgepole
					LOOKOU	Lookout Creek
					LOSTER	Lost Elk Ridge
					LOUISL	Louis Lake
					MACKAY	Mackay
					MCLEOD	McLeod
					MEDICI	Medicine Lodge
					MEDICR	Medicine Creek
					MINNWL	Minnow Lake
					NBRAZU	North Brazeau
					NDISML	North Dismal Creek
					NFLSGP	North False Gap
					NINEML	Nine Mile
					NOJACK	Nojack South
					NONAME	No Name Creek
					NORMTH	Norms Throw
					NRATCK	North Rat Creek
					OBEDLK	Obed Lake
					OLDMAN	Oldman Creek
					PADDYC	Paddy Creek
					PEMBIN	Pembina
					PEMBNT	North Pembina
					PIONER	Pioneer
					POACHC	Poachers Creek
					POWERH	Power House
					RACECK	Race Creek
					RAPDCK	Rapid Creek
					RODNEY	Rodney Creek
					RUNDEL	Rundell
					SANGLN	Sang Lake North
					SANGLS	Sang Lake South
					SASKAT	Saskatchewan
					SBRAZU	South Brazeau
					SDISML	South Dismal Creek
					SFLSGP	South False Gap
					SHININ	Shiningbank East
					SINKHL	Sinkhole Lake
					SRATCK	South Rat Creek
					SRESER	South Reservoir
					STRWMN	Strawberry Mountain
					STVNCK	Stevens Creek
					SUNDAN	Sundance Creek
					SURPRI	Surprise Lake
					SVEDBG	Svedberg
					SWANSN	Swanson
					THEGAP	The Gap
					TOMHIL	Tom Hill
					TOWERX	Tower
					TRNKRD	Trunk Road
					TROUTC	Trout Creek
					WAWAWC	Wawa
					WOLFLE	Wolf Lake East
					WOLFLW	Wolf Lake West
					ZETALK	Zeta Lake
YCTYPE	Text	3	0	Yield Curve Type	M91	Yield curve applied to a pre-91 cutblock
					NAT	Yield curve applied to natural stands
					RSA	Yield curve applied to a post-91 cutblock

Weyerhaeuser

Pembina 2017-2026

Forest Management Plan

Annex X: Spatial Harvest Sequence

March 19, 2018

Table of Contents

1 Timber Operator SHS Sign-off Letters

1.1 ANC Timber Ltd.

October 23, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as **ANC Timber Ltd.** company's support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017, provided that a new license(s) is issued to ANC Timber Ltd. to allow access to all of the SHS identified. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPFT seal and number, and dated this letter for your reference.

Sincerely,

COLLEGE OF ALBERTA PROFESSIONAL FOREST TECHNOLOGISTS
JAMES NORMAN
RPFT # 060029

Operational Planner
ANC Timber Ltd.

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

1.2 Blue Ridge Lumber Inc.

BLUE RIDGE LUMBER INC.
A SUBSIDIARY OF WEST FRASER MILLS LTD.

October 24, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as Blue Ridge Lumber's support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPF(T) seal and number, and dated this letter for your reference.

Sincerely,

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
SHANE W. SADOWAY
RPF 701

Oct 24-17

Shane Sadoway
Planning Superintendent
(780)648-6220
Shane.Sadoway@westfraser.com

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

1.3 Brisco Wood Preservers Ltd.

31 October, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as **Brisco Wood Preservers Ltd.** support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

Sincerely,

Operations Manager
Brisco Wood Preservers Ltd.
PO Box 104
Peers, AB
T0E 1W0

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

1.4 Dale Hansen

October 27, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as **Dale Hansen's** support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPF(T) seal and number, and dated this letter for your reference.

Sincerely,

Co representative and contact information

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

1.5 EDFOR Co-operative Ltd.

EDFOR Co-operative Ltd.

EDFOR Co-operative Ltd.
Box 7107
Edson, Alberta
T7E 1V4

Phone: (780) 723-5808
Fax: (780) 723-5809

Office Location:
207, 124 – 50th Street
Office Hours: Tuesdays and Thursdays
9:30 am to Noon and 1:00 pm to 3:30 pm

October 31, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as EDFOR Cooperative Ltd. support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPF(T) seal and number, and dated this letter for your reference.

Sincerely,

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
DAVID J. COBB
RPF 909

David J. Cobb R.P.F. 909
For EDFOR Cooperative Ltd.

Co representative and contact information

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

1.6 Government of Alberta Community Timber Programs

Alberta Agriculture and Forestry

Ministry of Agriculture and Forestry
Slave Lake Forest Area
Box 390, Suite 100, 101 3rd St SW
Slave Lake, AB
T0G2A0
Telephone: 780-849-7377
Fax: 780-849-7122
www.alberta.ca

October 25, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Department Staff have reviewed the proposed Spatial Harvest Sequence in regards to the wood allocated to the Community Timber Programs based around Edson, Cold Creek and Rocky Mountain House.

On behalf the Community Timber Program, Alberta Agriculture and Forestry staff are in agreement that this will meet the requirements of the program for the next 10 years as shown spatially. Reviews have been undertaken as follows:

FMU E2 – Edson Program

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
COLTON BRIGGS
RPF 1808

Colton Briggs – Area Forester – Edson Forest Area

FMU W5 – Cold Creek Program

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
DANA WILLIAMS
RPF 1001

Dana Williams – Area Forester – Edson Forest Area

FMU W6 – Cold Creek Program

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
Stephen Mills
RPF 820

Stephen Mills – Area Forester – Edson Forest Area

Agriculture and Forestry

Ministry of Agriculture and Forestry
Slave Lake Forest Area
Box 390, Suite 100, 101 3rd St SW
Slave Lake, AB
T0G2A0
Telephone: 780-849-7377
Fax: 780-849-7122
www.alberta.ca

FMU R12 – Rocky Mountain House Program

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
REBECCA HEEMERYCK
RPF 709

Rebecca Heemeryck – Area Forester – Rocky Mountain House Area

On behalf of our clients within the Community Timber Program we are formally endorsing Spatial Harvest Sequence PW70006 Scenario.

Sincerely,

Stephen Mills
Area Forester – Edson Forest Area

Cc Paul Scott - Weyerhaeuser Company Ltd.
cc Liana Luard – Lead, Forest Planning & Performance Monitoring, Forestry Division – Alberta Agriculture and Forestry

1.7 Millar Western Forest Products Ltd.

MILLAR WESTERN

MILLAR WESTERN FOREST PRODUCTS LTD.

Tel: 780.486.8200 Fax: 780.486.8282

October 31, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as **Millar Western Forest Products Ltd's** support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPF seal and number, and dated this letter for your reference.

Sincerely,

Bob Mason

Bob Mason, RPF
Chief Forester

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
ROBERT MASON
RPF 483

16640 – 111 Avenue, Edmonton, Alberta, Canada T5M 2S5

1.8 Tall Pine Timber Co. Ltd.

TALL PINE TIMBER CO. LTD.

PO.BOX 70 LODGEPOLE AB. T0E 1K0

TELEPHONE (780)894-2301 FAX (780)894-2454

October 24, 2017

Weyerhaeuser Company
Pembina Timberlands
2509 Aspen Drive
Edson, AB
T7E 1S8

Attention: Paul Scott, FMP Coordinator

Dear Paul:

Re: 2017-2026 Weyerhaeuser Pembina FMP 20-year Spatial Harvest Sequence PW70006 Scenario

Please accept this letter of sign-off as Tall Pine Timber Co Ltd.'s_ support for our 20-year Spatial Harvest Sequence (SHS) as shown in scenario PW70006 shared with us on September 25, 2017. We have had adequate opportunities to provide input into the SHS supplied by Weyerhaeuser.

I have also signed, applied my RPF(T) seal and number, and dated this letter for your reference.

Sincerely,

COLLEGE OF ALBERTA PROFESSIONAL FORESTERS
PERMANAND SIEUSAHAI
RPF 435

Permanand Sieusahai
Par4Inc Professional Environmental Consultants

3214 Watson Court
Edmonton, Alberta T6K 0P2
Cellular: 780-849-0643
Email: par4inc@telus.net

cc Paul Scott, Weyerhaeuser
cc Liana Luard, AAF

2 Strata Description Tables

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **All**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Baptiste	Aw	157.4	3.6%	1,171.8	23.0%	1,329.2	14.1%
	AwPl	493.1	11.3%	659.2	13.0%	1,152.3	12.2%
	AwSx	94.3	2.2%	75.6	1.5%	169.9	1.8%
	Pl	2,594.1	59.3%	2,513.5	49.4%	5,107.6	54.0%
	PlAw	909.4	20.8%	611.4	12.0%	1,520.8	16.1%
	Sb	4.4	0.1%	0.0	0.0%	4.4	0.0%
	SbAw	0.0	0.0%	0.2	0.0%	0.2	0.0%
	Sw	97.1	2.2%	46.2	0.9%	143.3	1.5%
	SwAw	21.1	0.5%	10.3	0.2%	31.4	0.3%
	Total	**4,371.0**	**100.0%**	**5,088.2**	**100.0%**	**9,459.2**	**100.0%**
Beaver Meadows	Aw	1,521.5	49.6%	2,304.4	63.3%	3,825.9	57.0%
	AwPl	115.1	3.8%	243.7	6.7%	358.9	5.3%
	AwSx	63.7	2.1%	178.2	4.9%	241.9	3.6%
	Pl	902.3	29.4%	657.1	18.0%	1,559.5	23.2%
	PlAw	158.8	5.2%	131.8	3.6%	290.6	4.3%
	Sb	9.1	0.3%	10.7	0.3%	19.8	0.3%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	171.5	5.6%	54.3	1.5%	225.8	3.4%
	SwAw	126.3	4.1%	61.4	1.7%	187.7	2.8%
	Total	**3,068.4**	**100.0%**	**3,641.7**	**100.0%**	**6,710.1**	**100.0%**
Brazeau	Aw	1,155.1	11.5%	1,063.7	22.0%	2,218.8	14.9%
	AwPl	507.5	5.1%	458.2	9.5%	965.8	6.5%
	AwSx	95.5	1.0%	49.0	1.0%	144.5	1.0%
	Pl	7,088.8	70.7%	2,597.7	53.7%	9,686.5	65.2%
	PlAw	847.6	8.5%	358.7	7.4%	1,206.3	8.1%
	Sb	50.5	0.5%	16.7	0.3%	67.1	0.5%
	SbAw	1.8	0.0%	2.4	0.0%	4.1	0.0%
	Sw	189.2	1.9%	228.7	4.7%	418.0	2.8%
	SwAw	90.5	0.9%	59.1	1.2%	149.6	1.0%
	Total	**10,026.5**	**100.0%**	**4,834.4**	**100.0%**	**14,860.9**	**100.0%**
Edson	Aw	4,691.0	45.0%	4,526.1	51.8%	9,217.0	48.1%
	AwPl	743.1	7.1%	655.3	7.5%	1,398.4	7.3%
	AwSx	757.1	7.3%	588.1	6.7%	1,345.3	7.0%
	Pl	2,401.1	23.0%	2,025.1	23.2%	4,426.2	23.1%
	PlAw	902.3	8.7%	470.8	5.4%	1,373.1	7.2%
	Sb	166.8	1.6%	52.4	0.6%	219.1	1.1%
	SbAw	7.3	0.1%	4.6	0.1%	11.9	0.1%
	Sw	427.0	4.1%	153.5	1.8%	580.6	3.0%
	SwAw	327.7	3.1%	259.5	3.0%	587.2	3.1%
	Total	**10,423.3**	**100.0%**	**8,735.4**	**100.0%**	**19,158.7**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **All**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Macmillan	Aw	5,231.5	41.6%	5,878.3	46.3%	11,109.8	44.0%
	AwPl	866.8	6.9%	948.5	7.5%	1,815.3	7.2%
	AwSx	1,252.6	10.0%	1,359.3	10.7%	2,611.8	10.3%
	Pl	3,039.5	24.2%	3,043.6	24.0%	6,083.1	24.1%
	PlAw	660.2	5.3%	782.5	6.2%	1,442.7	5.7%
	Sb	99.6	0.8%	16.4	0.1%	116.0	0.5%
	SbAw	5.2	0.0%	14.3	0.1%	19.4	0.1%
	Sw	642.2	5.1%	358.3	2.8%	1,000.5	4.0%
	SwAw	769.8	6.1%	293.4	2.3%	1,063.2	4.2%
	Total	**12,567.3**	**100.0%**	**12,694.5**	**100.0%**	**25,261.8**	**100.0%**
Medicine Lake	Aw	184.8	6.5%	2,294.8	43.5%	2,479.6	30.5%
	AwPl	37.8	1.3%	184.7	3.5%	222.5	2.7%
	AwSx	17.0	0.6%	29.8	0.6%	46.8	0.6%
	Pl	2,236.0	78.4%	2,303.7	43.6%	4,539.6	55.8%
	PlAw	331.2	11.6%	447.2	8.5%	778.3	9.6%
	Sb	11.3	0.4%	0.0	0.0%	11.3	0.1%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	35.0	1.2%	9.5	0.2%	44.5	0.5%
	SwAw	0.0	0.0%	10.4	0.2%	10.4	0.1%
	Total	**2,853.1**	**100.0%**	**5,280.0**	**100.0%**	**8,133.1**	**100.0%**
Nordegg	Aw	29.1	0.5%	318.5	17.1%	347.5	4.5%
	AwPl	251.6	4.3%	104.6	5.6%	356.2	4.6%
	AwSx	36.2	0.6%	3.6	0.2%	39.8	0.5%
	Pl	4,664.6	79.8%	1,233.9	66.4%	5,898.5	76.6%
	PlAw	212.0	3.6%	155.3	8.4%	367.3	4.8%
	Sb	21.4	0.4%	0.0	0.0%	21.4	0.3%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	603.7	10.3%	27.6	1.5%	631.3	8.2%
	SwAw	26.5	0.5%	14.0	0.8%	40.5	0.5%
	Total	**5,845.0**	**100.0%**	**1,857.5**	**100.0%**	**7,702.4**	**100.0%**
South Canal	Aw	48.0	0.9%	603.8	19.1%	651.8	7.7%
	AwPl	380.5	7.2%	362.6	11.5%	743.1	8.8%
	AwSx	50.8	1.0%	53.4	1.7%	104.1	1.2%
	Pl	4,031.2	76.5%	1,758.7	55.7%	5,789.9	68.7%
	PlAw	443.3	8.4%	304.0	9.6%	747.3	8.9%
	Sb	21.0	0.4%	3.4	0.1%	24.4	0.3%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	260.0	4.9%	60.7	1.9%	320.7	3.8%
	SwAw	36.8	0.7%	10.4	0.3%	47.3	0.6%
	Total	**5,271.6**	**100.0%**	**3,156.9**	**100.0%**	**8,428.5**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **All**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
West Country	Aw	0.0	0.0%	4.7	0.3%	4.7	0.1%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	3,729.3	79.6%	1,637.5	96.5%	5,366.8	84.1%
	PlAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sb	0.1	0.0%	0.0	0.0%	0.1	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	954.4	20.4%	54.8	3.2%	1,009.1	15.8%
	SwAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Total	**4,683.7**	**100.0%**	**1,697.0**	**100.0%**	**6,380.7**	**100.0%**
Wolf Lake	Aw	2,757.1	16.1%	2,845.8	23.9%	5,602.9	19.3%
	AwPl	855.6	5.0%	803.2	6.7%	1,658.8	5.7%
	AwSx	448.5	2.6%	297.7	2.5%	746.2	2.6%
	Pl	10,784.5	62.8%	6,866.4	57.6%	17,650.9	60.7%
	PlAw	866.6	5.0%	432.1	3.6%	1,298.7	4.5%
	Sb	214.0	1.2%	29.3	0.2%	243.3	0.8%
	SbAw	0.0	0.0%	2.1	0.0%	2.1	0.0%
	Sw	1,062.1	6.2%	541.2	4.5%	1,603.3	5.5%
	SwAw	178.3	1.0%	106.1	0.9%	284.5	1.0%
	Total	**17,166.8**	**100.0%**	**11,923.8**	**100.0%**	**29,090.6**	**100.0%**
Total	Aw	15,775.5	20.7%	21,011.8	35.7%	36,787.3	27.2%
	AwPl	4,251.1	5.6%	4,420.1	7.5%	8,671.3	6.4%
	AwSx	2,815.7	3.7%	2,634.7	4.5%	5,450.5	4.0%
	Pl	41,471.3	54.4%	24,637.2	41.8%	66,108.5	48.9%
	PlAw	5,331.4	7.0%	3,693.7	6.3%	9,025.0	6.7%
	Sb	598.2	0.8%	128.8	0.2%	727.0	0.5%
	SbAw	14.2	0.0%	23.6	0.0%	37.8	0.0%
	Sw	4,442.1	5.8%	1,534.8	2.6%	5,976.9	4.4%
	SwAw	1,577.1	2.1%	824.7	1.4%	2,401.8	1.8%
	Total	**76,276.7**	**100.0%**	**58,909.4**	**100.0%**	**135,186.1**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Weyerhaeuser**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Baptiste	Aw	157.4	3.6%	1,171.8	23.0%	1,329.2	14.1%
	AwPl	493.1	11.3%	659.2	13.0%	1,152.3	12.2%
	AwSx	94.3	2.2%	75.6	1.5%	169.9	1.8%
	Pl	2,594.1	59.3%	2,513.5	49.4%	5,107.6	54.0%
	PlAw	909.4	20.8%	611.4	12.0%	1,520.8	16.1%
	Sb	4.4	0.1%	0.0	0.0%	4.4	0.0%
	SbAw	0.0	0.0%	0.2	0.0%	0.2	0.0%
	Sw	97.1	2.2%	46.2	0.9%	143.3	1.5%
	SwAw	21.1	0.5%	10.3	0.2%	31.4	0.3%
	Total	**4,371.0**	**100.0%**	**5,088.2**	**100.0%**	**9,459.2**	**100.0%**
Beaver Meadows	Aw	1,314.6	98.8%	2,105.8	98.8%	3,420.4	98.8%
	AwPl	6.7	0.5%	2.3	0.1%	9.0	0.3%
	AwSx	1.5	0.1%	15.1	0.7%	16.6	0.5%
	Pl	3.2	0.2%	0.0	0.0%	3.2	0.1%
	PlAw	0.0	0.0%	3.5	0.2%	3.5	0.1%
	Sb	0.3	0.0%	0.0	0.0%	0.3	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	3.7	0.3%	3.0	0.1%	6.7	0.2%
	SwAw	0.3	0.0%	1.1	0.1%	1.4	0.0%
	Total	**1,330.3**	**100.0%**	**2,130.8**	**100.0%**	**3,461.0**	**100.0%**
Brazeau	Aw	1,116.0	13.8%	1,057.4	25.8%	2,173.3	17.9%
	AwPl	503.5	6.2%	433.8	10.6%	937.3	7.7%
	AwSx	91.3	1.1%	49.0	1.2%	140.4	1.2%
	Pl	5,462.6	67.6%	2,030.7	49.6%	7,493.3	61.6%
	PlAw	638.4	7.9%	307.4	7.5%	945.8	7.8%
	Sb	37.3	0.5%	0.0	0.0%	37.3	0.3%
	SbAw	1.8	0.0%	2.4	0.1%	4.1	0.0%
	Sw	139.6	1.7%	182.3	4.5%	321.8	2.6%
	SwAw	87.7	1.1%	31.5	0.8%	119.2	1.0%
	Total	**8,078.1**	**100.0%**	**4,094.4**	**100.0%**	**12,172.6**	**100.0%**
Edson	Aw	4,621.5	74.3%	4,480.7	77.8%	9,102.1	76.0%
	AwPl	706.5	11.4%	633.7	11.0%	1,340.1	11.2%
	AwSx	742.4	11.9%	578.1	10.0%	1,320.5	11.0%
	Pl	53.1	0.9%	28.9	0.5%	82.0	0.7%
	PlAw	30.6	0.5%	15.5	0.3%	46.1	0.4%
	Sb	6.3	0.1%	0.0	0.0%	6.3	0.1%
	SbAw	1.9	0.0%	0.0	0.0%	1.9	0.0%
	Sw	51.4	0.8%	11.5	0.2%	62.9	0.5%
	SwAw	8.7	0.1%	10.8	0.2%	19.5	0.2%
	Total	**6,222.4**	**100.0%**	**5,759.1**	**100.0%**	**11,981.5**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Weyerhaeuser**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Macmillan	Aw	4,359.4	57.9%	4,958.5	56.4%	9,317.9	57.1%
	AwPl	711.4	9.5%	857.7	9.8%	1,569.1	9.6%
	AwSx	1,003.3	13.3%	1,199.0	13.6%	2,202.3	13.5%
	Pl	728.2	9.7%	1,188.4	13.5%	1,916.5	11.7%
	PlAw	173.1	2.3%	270.4	3.1%	443.4	2.7%
	Sb	14.8	0.2%	0.0	0.0%	14.8	0.1%
	SbAw	0.0	0.0%	1.7	0.0%	1.7	0.0%
	Sw	254.6	3.4%	127.8	1.5%	382.4	2.3%
	SwAw	281.8	3.7%	181.7	2.1%	463.5	2.8%
	Total	**7,526.5**	**100.0%**	**8,785.1**	**100.0%**	**16,311.6**	**100.0%**
Medicine Lake	Aw	184.8	6.5%	2,294.8	43.5%	2,479.6	30.5%
	AwPl	37.8	1.3%	184.7	3.5%	222.5	2.7%
	AwSx	17.0	0.6%	29.8	0.6%	46.8	0.6%
	Pl	2,236.0	78.4%	2,303.7	43.6%	4,539.6	55.8%
	PlAw	331.2	11.6%	447.2	8.5%	778.3	9.6%
	Sb	11.3	0.4%	0.0	0.0%	11.3	0.1%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	35.0	1.2%	9.5	0.2%	44.5	0.5%
	SwAw	0.0	0.0%	10.4	0.2%	10.4	0.1%
	Total	**2,853.1**	**100.0%**	**5,280.0**	**100.0%**	**8,133.1**	**100.0%**
Nordegg	Aw	29.1	0.5%	318.5	17.1%	347.5	4.5%
	AwPl	251.6	4.3%	104.6	5.6%	356.2	4.6%
	AwSx	36.2	0.6%	3.6	0.2%	39.8	0.5%
	Pl	4,664.6	79.8%	1,233.9	66.4%	5,898.5	76.6%
	PlAw	212.0	3.6%	155.3	8.4%	367.3	4.8%
	Sb	21.4	0.4%	0.0	0.0%	21.4	0.3%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	603.7	10.3%	27.6	1.5%	631.3	8.2%
	SwAw	26.5	0.5%	14.0	0.8%	40.5	0.5%
	Total	**5,845.0**	**100.0%**	**1,857.5**	**100.0%**	**7,702.4**	**100.0%**
South Canal	Aw	35.7	1.0%	603.6	29.5%	639.3	11.5%
	AwPl	354.8	10.1%	345.5	16.9%	700.3	12.6%
	AwSx	47.1	1.3%	53.4	2.6%	100.5	1.8%
	Pl	2,624.2	74.8%	920.3	44.9%	3,544.5	63.8%
	PlAw	211.4	6.0%	100.5	4.9%	311.9	5.6%
	Sb	21.0	0.6%	0.0	0.0%	21.0	0.4%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	213.0	6.1%	25.2	1.2%	238.2	4.3%
	SwAw	0.0	0.0%	1.1	0.1%	1.1	0.0%
	Total	**3,507.3**	**100.0%**	**2,049.5**	**100.0%**	**5,556.8**	**100.0%**
West Country	Aw	0.0	0.0%	4.7	0.3%	4.7	0.1%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	3,729.3	79.6%	1,637.5	96.5%	5,366.8	84.1%
	PlAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sb	0.1	0.0%	0.0	0.0%	0.1	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	954.4	20.4%	54.8	3.2%	1,009.1	15.8%
	SwAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Total	**4,683.7**	**100.0%**	**1,697.0**	**100.0%**	**6,380.7**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Weyerhaeuser**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Wolf Lake	Aw	2,701.7	21.7%	2,833.9	33.6%	5,535.7	26.5%
	AwPl	830.0	6.7%	801.7	9.5%	1,631.7	7.8%
	AwSx	444.9	3.6%	297.7	3.5%	742.6	3.6%
	Pl	6,815.8	54.7%	3,727.5	44.2%	10,543.4	50.5%
	PlAw	424.9	3.4%	230.6	2.7%	655.5	3.1%
	Sb	174.9	1.4%	12.3	0.1%	187.2	0.9%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	939.3	7.5%	442.6	5.3%	1,381.9	6.6%
	SwAw	135.1	1.1%	81.1	1.0%	216.3	1.0%
	Total	**12,466.7**	**100.0%**	**8,427.5**	**100.0%**	**20,894.2**	**100.0%**
Total	Aw	14,520.1	25.5%	19,829.6	43.9%	34,349.7	33.7%
	AwPl	3,895.4	6.8%	4,023.0	8.9%	7,918.5	7.8%
	AwSx	2,478.1	4.4%	2,301.2	5.1%	4,779.4	4.7%
	Pl	28,911.0	50.8%	15,584.4	34.5%	44,495.4	43.6%
	PlAw	2,931.0	5.2%	2,141.7	4.7%	5,072.7	5.0%
	Sb	291.8	0.5%	12.3	0.0%	304.1	0.3%
	SbAw	3.7	0.0%	4.3	0.0%	8.0	0.0%
	Sw	3,291.6	5.8%	930.4	2.1%	4,222.0	4.1%
	SwAw	561.2	1.0%	342.1	0.8%	903.3	0.9%
	Total	**56,883.9**	**100.0%**	**45,169.1**	**100.0%**	**102,053.1**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **ANC**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Wolf Lake	Aw	55.2	1.4%	11.9	0.4%	67.1	1.0%
	AwPl	25.5	0.6%	1.6	0.1%	27.1	0.4%
	AwSx	3.6	0.1%	0.0	0.0%	3.6	0.1%
	Pl	3,454.7	86.2%	2,658.2	90.3%	6,112.9	87.9%
	PlAw	329.0	8.2%	166.3	5.6%	495.3	7.1%
	Sb	30.6	0.8%	14.4	0.5%	45.0	0.6%
	SbAw	0.0	0.0%	2.1	0.1%	2.1	0.0%
	Sw	78.2	2.0%	73.8	2.5%	152.0	2.2%
	SwAw	30.5	0.8%	14.9	0.5%	45.4	0.7%
	Total	**4,007.4**	**100.0%**	**2,943.1**	**100.0%**	**6,950.5**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Blue Ridge Lumber**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Macmillan	Aw	23.1	1.2%	11.5	1.0%	34.6	1.2%
	AwPl	37.9	2.0%	4.2	0.4%	42.1	1.4%
	AwSx	2.7	0.1%	26.4	2.4%	29.1	1.0%
	Pl	1,348.5	71.9%	836.3	74.6%	2,184.8	72.9%
	PlAw	314.7	16.8%	223.9	20.0%	538.6	18.0%
	Sb	65.9	3.5%	0.0	0.0%	65.9	2.2%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	18.8	1.0%	19.2	1.7%	38.0	1.3%
	SwAw	64.4	3.4%	0.0	0.0%	64.4	2.1%
	Total	**1,876.0**	**100.0%**	**1,121.5**	**100.0%**	**2,997.4**	**100.0%**
Wolf Lake	Aw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	166.6	67.2%	280.1	95.5%	446.7	82.5%
	PlAw	74.2	29.9%	13.2	4.5%	87.4	16.1%
	Sb	0.7	0.3%	0.0	0.0%	0.7	0.1%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	6.4	2.6%	0.0	0.0%	6.4	1.2%
	SwAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Total	**247.9**	**100.0%**	**293.3**	**100.0%**	**541.2**	**100.0%**
Total	Aw	23.1	1.1%	11.5	0.8%	34.6	1.0%
	AwPl	37.9	1.8%	4.2	0.3%	42.1	1.2%
	AwSx	2.7	0.1%	26.4	1.9%	29.1	0.8%
	Pl	1,515.2	71.3%	1,116.4	78.9%	2,631.5	74.4%
	PlAw	388.9	18.3%	237.1	16.8%	626.0	17.7%
	Sb	66.6	3.1%	0.0	0.0%	66.6	1.9%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	25.2	1.2%	19.2	1.4%	44.4	1.3%
	SwAw	64.4	3.0%	0.0	0.0%	64.4	1.8%
	Total	**2,123.9**	**100.0%**	**1,414.8**	**100.0%**	**3,538.7**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **BRISCO Wood Preservers**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Wolf Lake	Aw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	218.4	98.4%	155.7	99.4%	374.0	98.8%
	PlAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sb	1.8	0.8%	0.0	0.0%	1.8	0.5%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	1.7	0.7%	1.0	0.6%	2.7	0.7%
	SwAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Total	**221.9**	**100.0%**	**156.7**	**100.0%**	**378.5**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **EDFOR Cooperative**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Edson	Aw	52.9	1.3%	31.6	1.2%	84.5	1.3%
	AwPl	36.6	0.9%	18.2	0.7%	54.8	0.8%
	AwSx	11.1	0.3%	10.0	0.4%	21.1	0.3%
	Pl	2,293.6	57.9%	1,967.2	71.7%	4,260.8	63.5%
	PlAw	774.1	19.5%	387.8	14.1%	1,161.9	17.3%
	Sb	160.5	4.0%	52.4	1.9%	212.8	3.2%
	SbAw	5.4	0.1%	4.6	0.2%	10.0	0.1%
	Sw	355.1	9.0%	117.1	4.3%	472.2	7.0%
	SwAw	275.1	6.9%	155.1	5.7%	430.2	6.4%
	Total	**3,964.3**	**100.0%**	**2,744.0**	**100.0%**	**6,708.3**	**100.0%**
Macmillan	Aw	0.5	0.8%	3.0	4.9%	3.6	2.8%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	45.8	70.4%	55.1	90.0%	100.9	79.9%
	PlAw	0.0	0.0%	2.2	3.6%	2.2	1.7%
	Sb	0.0	0.0%	0.0	0.0%	0.0	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	15.4	23.7%	0.0	0.0%	15.4	12.2%
	SwAw	3.3	5.1%	0.9	1.5%	4.2	3.3%
	Total	**65.1**	**100.0%**	**61.2**	**100.0%**	**126.3**	**100.0%**
Wolf Lake	Aw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	128.9	59.6%	44.9	43.5%	173.8	54.4%
	PlAw	38.5	17.8%	22.0	21.3%	60.4	18.9%
	Sb	6.1	2.8%	2.5	2.4%	8.6	2.7%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	35.8	16.6%	23.8	23.1%	59.7	18.7%
	SwAw	6.9	3.2%	10.1	9.7%	16.9	5.3%
	Total	**216.1**	**100.0%**	**103.2**	**100.0%**	**319.4**	**100.0%**
Total	Aw	53.5	1.3%	34.6	1.2%	88.1	1.2%
	AwPl	36.6	0.9%	18.2	0.6%	54.8	0.8%
	AwSx	11.1	0.3%	10.0	0.3%	21.1	0.3%
	Pl	2,468.3	58.1%	2,067.2	71.1%	4,535.5	63.4%
	PlAw	812.6	19.1%	411.9	14.2%	1,224.5	17.1%
	Sb	166.6	3.9%	54.8	1.9%	221.4	3.1%
	SbAw	5.4	0.1%	4.6	0.2%	10.0	0.1%
	Sw	406.3	9.6%	140.9	4.8%	547.2	7.6%
	SwAw	285.3	6.7%	166.1	5.7%	451.4	6.3%
	Total	**4,245.5**	**100.0%**	**2,908.4**	**100.0%**	**7,154.0**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Millar Western Forest Products**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Macmillan	Aw	9.6	2.0%	5.7	1.1%	15.3	1.5%
	AwPl	3.4	0.7%	0.0	0.0%	3.4	0.3%
	AwSx	5.8	1.2%	0.0	0.0%	5.8	0.6%
	Pl	226.0	46.3%	370.1	71.6%	596.0	59.4%
	PlAw	54.5	11.2%	31.3	6.1%	85.8	8.5%
	Sb	2.5	0.5%	0.0	0.0%	2.5	0.2%
	SbAw	0.0	0.0%	4.7	0.9%	4.7	0.5%
	Sw	150.8	30.9%	74.8	14.5%	225.6	22.5%
	SwAw	35.1	7.2%	30.0	5.8%	65.0	6.5%
	Total	**487.6**	**100.0%**	**516.5**	**100.0%**	**1,004.1**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Tall Pine Timber**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Brazeau	Aw	36.6	2.1%	1.8	0.3%	38.4	1.6%
	AwPl	3.8	0.2%	4.8	0.9%	8.6	0.4%
	AwSx	4.2	0.2%	0.0	0.0%	4.2	0.2%
	Pl	1,525.0	85.9%	477.4	86.4%	2,002.5	86.0%
	PlAw	174.7	9.8%	28.2	5.1%	202.9	8.7%
	Sb	7.6	0.4%	15.4	2.8%	23.0	1.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	23.2	1.3%	17.6	3.2%	40.7	1.7%
	SwAw	0.0	0.0%	7.6	1.4%	7.6	0.3%
	Total	**1,775.1**	**100.0%**	**552.8**	**100.0%**	**2,327.9**	**100.0%**
South Canal	Aw	12.3	1.4%	0.2	0.0%	12.5	0.7%
	AwPl	25.7	2.8%	17.1	2.3%	42.8	2.6%
	AwSx	3.6	0.4%	0.0	0.0%	3.6	0.2%
	Pl	660.1	73.1%	545.0	71.7%	1,205.1	72.4%
	PlAw	121.9	13.5%	150.0	19.7%	271.9	16.3%
	Sb	0.0	0.0%	3.4	0.5%	3.4	0.2%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	43.2	4.8%	35.5	4.7%	78.7	4.7%
	SwAw	36.8	4.1%	9.3	1.2%	46.1	2.8%
	Total	**903.6**	**100.0%**	**760.6**	**100.0%**	**1,664.2**	**100.0%**
Total	Aw	48.9	1.8%	1.9	0.1%	50.8	1.3%
	AwPl	29.5	1.1%	21.9	1.7%	51.4	1.3%
	AwSx	7.8	0.3%	0.0	0.0%	7.8	0.2%
	Pl	2,185.2	81.6%	1,022.4	77.8%	3,207.6	80.3%
	PlAw	296.6	11.1%	178.3	13.6%	474.8	11.9%
	Sb	7.6	0.3%	18.8	1.4%	26.5	0.7%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	66.3	2.5%	53.1	4.0%	119.4	3.0%
	SwAw	36.8	1.4%	17.0	1.3%	53.8	1.3%
	Total	**2,678.7**	**100.0%**	**1,313.4**	**100.0%**	**3,992.1**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **Dale Hansen**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
South Canal	Aw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	746.9	86.8%	293.4	84.6%	1,040.3	86.1%
	PlAw	110.0	12.8%	53.4	15.4%	163.5	13.5%
	Sb	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	3.8	0.4%	0.0	0.0%	3.8	0.3%
	SwAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Total	**860.7**	**100.0%**	**346.8**	**100.0%**	**1,207.5**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **CTPP (E2)**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Edson	Aw	16.6	7.0%	13.8	5.9%	30.4	6.5%
	AwPl	0.0	0.0%	3.4	1.5%	3.4	0.7%
	AwSx	3.7	1.5%	0.0	0.0%	3.7	0.8%
	Pl	54.4	23.0%	29.0	12.5%	83.4	17.8%
	PlAw	97.5	41.2%	67.6	29.1%	165.1	35.2%
	Sb	0.0	0.0%	0.0	0.0%	0.0	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	20.6	8.7%	25.0	10.8%	45.5	9.7%
	SwAw	43.9	18.6%	93.5	40.3%	137.5	29.3%
	Total	**236.6**	**100.0%**	**232.3**	**100.0%**	**468.9**	**100.0%**
Wolf Lake	Aw	0.2	2.2%	0.0	0.0%	0.2	2.2%
	AwPl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	0.0	0.0%	0.0	0.0%	0.0	0.0%
	PlAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sb	0.0	0.0%	0.0	0.0%	0.0	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	0.7	10.4%	0.0	0.0%	0.7	10.4%
	SwAw	5.9	87.4%	0.0	0.0%	5.9	87.4%
	Total	**6.7**	**100.0%**	**0.0**	**0.0%**	**6.7**	**100.0%**
Total	Aw	16.7	6.9%	13.8	5.9%	30.5	6.4%
	AwPl	0.0	0.0%	3.4	1.5%	3.4	0.7%
	AwSx	3.7	1.5%	0.0	0.0%	3.7	0.8%
	Pl	54.4	22.3%	29.0	12.5%	83.4	17.5%
	PlAw	97.5	40.1%	67.6	29.1%	165.1	34.7%
	Sb	0.0	0.0%	0.0	0.0%	0.0	0.0%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	21.3	8.7%	25.0	10.8%	46.2	9.7%
	SwAw	49.8	20.5%	93.5	40.3%	143.4	30.1%
	Total	**243.4**	**100.0%**	**232.3**	**100.0%**	**475.7**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

Strata Description Table

Operator : **CTPP (W5)**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Beaver Meadows	Aw	206.9	11.9%	198.6	13.1%	405.6	12.5%
	AwPl	108.4	6.2%	241.5	16.0%	349.9	10.8%
	AwSx	62.2	3.6%	163.2	10.8%	225.4	6.9%
	Pl	899.2	51.7%	657.1	43.5%	1,556.3	47.9%
	PlAw	158.8	9.1%	128.2	8.5%	287.1	8.8%
	Sb	8.8	0.5%	10.7	0.7%	19.5	0.6%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	167.8	9.7%	51.3	3.4%	219.1	6.7%
	SwAw	126.0	7.2%	60.3	4.0%	186.3	5.7%
	Total	**1,738.2**	**100.0%**	**1,510.9**	**100.0%**	**3,249.1**	**100.0%**
Macmillan	Aw	95.3	8.8%	69.5	10.0%	164.8	9.3%
	AwPl	109.8	10.1%	71.2	10.3%	181.0	10.2%
	AwSx	128.0	11.8%	76.0	11.0%	204.0	11.5%
	Pl	561.2	51.7%	343.3	49.7%	904.5	50.9%
	PlAw	87.0	8.0%	98.3	14.2%	185.3	10.4%
	Sb	11.1	1.0%	16.4	2.4%	27.5	1.5%
	SbAw	0.1	0.0%	0.0	0.0%	0.1	0.0%
	Sw	62.8	5.8%	6.3	0.9%	69.1	3.9%
	SwAw	31.0	2.9%	10.1	1.5%	41.2	2.3%
	Total	**1,086.4**	**100.0%**	**691.1**	**100.0%**	**1,777.4**	**100.0%**
Total	Aw	302.3	10.7%	268.1	12.2%	570.4	11.3%
	AwPl	218.2	7.7%	312.6	14.2%	530.9	10.6%
	AwSx	190.2	6.7%	239.2	10.9%	429.4	8.5%
	Pl	1,460.3	51.7%	1,000.4	45.4%	2,460.7	49.0%
	PlAw	245.8	8.7%	226.5	10.3%	472.4	9.4%
	Sb	19.9	0.7%	27.1	1.2%	47.0	0.9%
	SbAw	0.1	0.0%	0.0	0.0%	0.1	0.0%
	Sw	230.6	8.2%	57.6	2.6%	288.2	5.7%
	SwAw	157.0	5.6%	70.5	3.2%	227.5	4.5%
	Total	**2,824.5**	**100.0%**	**2,202.0**	**100.0%**	**5,026.5**	**100.0%**

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Strata Description Table

Operator : **CTPP (W6)**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Macmillan	Aw	743.7	48.7%	830.1	54.6%	1,573.7	51.7%
	AwPl	4.3	0.3%	15.4	1.0%	19.8	0.6%
	AwSx	112.8	7.4%	57.9	3.8%	170.7	5.6%
	Pl	129.9	8.5%	250.5	16.5%	380.4	12.5%
	PlAw	31.0	2.0%	156.4	10.3%	187.4	6.2%
	Sb	5.3	0.3%	0.0	0.0%	5.3	0.2%
	SbAw	5.0	0.3%	7.8	0.5%	12.9	0.4%
	Sw	139.7	9.2%	130.3	8.6%	270.0	8.9%
	SwAw	354.1	23.2%	70.7	4.7%	424.8	14.0%
	Total	**1,525.9**	**100.0%**	**1,519.0**	**100.0%**	**3,044.9**	**100.0%**

Weyerahaeuser Pembina 2017 FMP

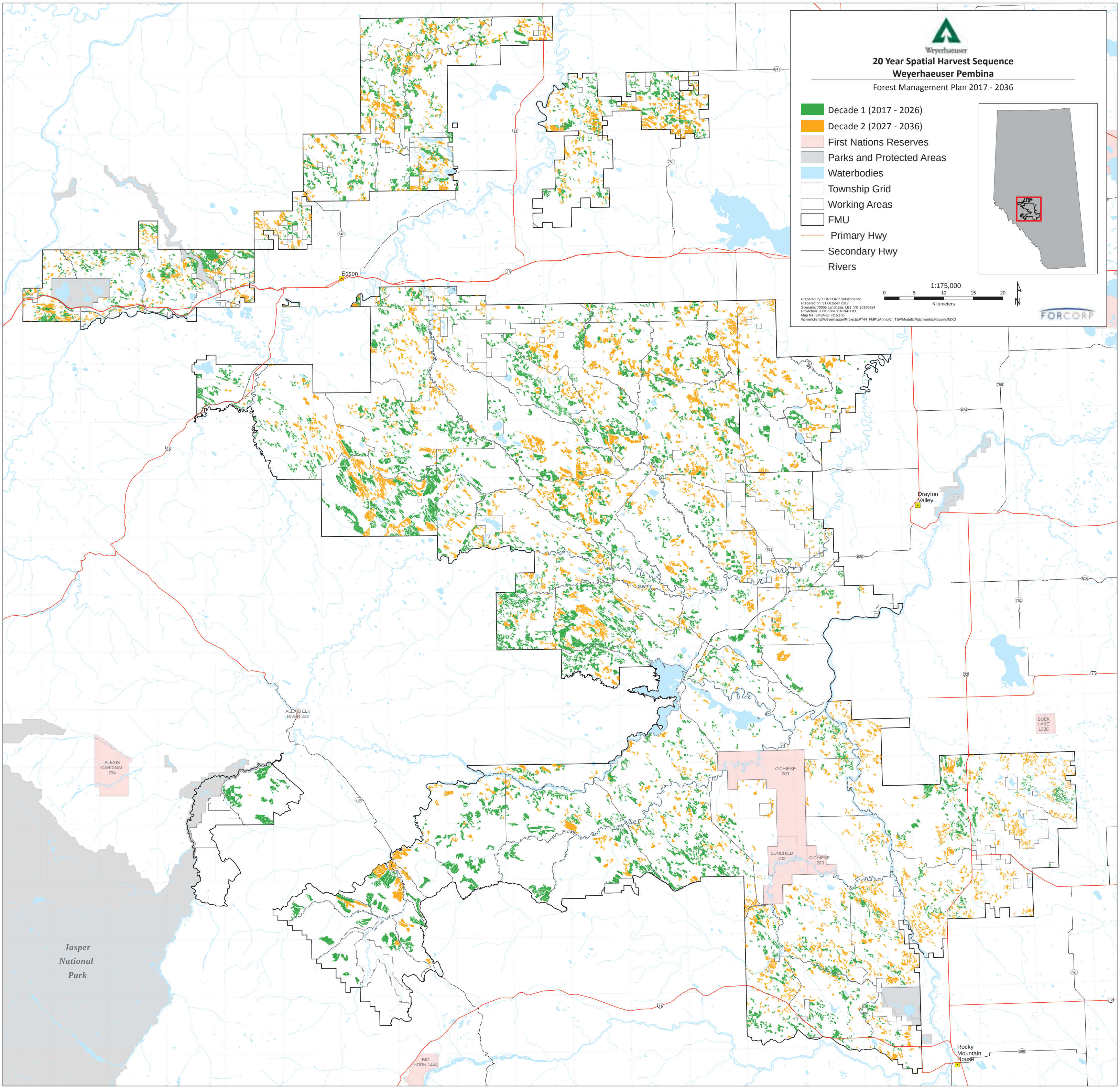
Strata Description Table

Operator : **CTPP (R12)**

Compartment	Stratum	SHS Area					
		Decade 1		Decade 2		Total	
		(Ha)	%	(Ha)	%	(Ha)	%
Brazeau	Aw	2.6	1.5%	4.6	2.5%	7.2	2.0%
	AwPl	0.3	0.2%	19.7	10.5%	20.0	5.5%
	AwSx	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Pl	101.2	58.4%	89.6	47.9%	190.7	52.9%
	PlAw	34.5	19.9%	23.1	12.3%	57.6	16.0%
	Sb	5.5	3.2%	1.3	0.7%	6.8	1.9%
	SbAw	0.0	0.0%	0.0	0.0%	0.0	0.0%
	Sw	26.5	15.3%	28.9	15.5%	55.4	15.4%
	SwAw	2.8	1.6%	20.0	10.7%	22.8	6.3%
	Total	**173.3**	**100.0%**	**187.1**	**100.0%**	**360.4**	**100.0%**

3 20 Year Spatial Harvest Sequence Map

A full size digital map (*SHSMapR15.pdf*) is included in the submission package.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20 Year Spatial Harvest Sequence
Weyerhaeuser Pembina
Forest Management Plan 2017 - 2036
Decade 1 (2017 - 2026)
Decade 2 (2027 - 2036)
First Nations Reserves
Parks and Protected Areas
Waterbodies
Township Grid
Working Areas
FMU
Primary Hwy
Secondary Hwy
Rivers
1:175,000
0 5 10 15 20
Kilometers
N
Prepared by: FORCORP Solutions Inc.
Prepared on: 31 October 2017
Scenario: 70006 Landbase: LB1_V8_20170824
Projection: UTM Zone 11N NAD 83
Map file: SHSMap_R15.shp
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FORCORP
Edson
Drayton Valley
ALEXIS ELK RIVER 233
ALEXIS CARDINAL 234
O'CHIESE 203
SUNCHILD 202
O'CHIESE 203
BUCK LAKE 133C
BIG HORN 144A
Rocky Mountain House
Jasper National Park

4 20 Year Spatial Harvest Sequence By Operator Map

A full size digital map (*SHSMapR15_Operators.pdf*) is included in the submission package.

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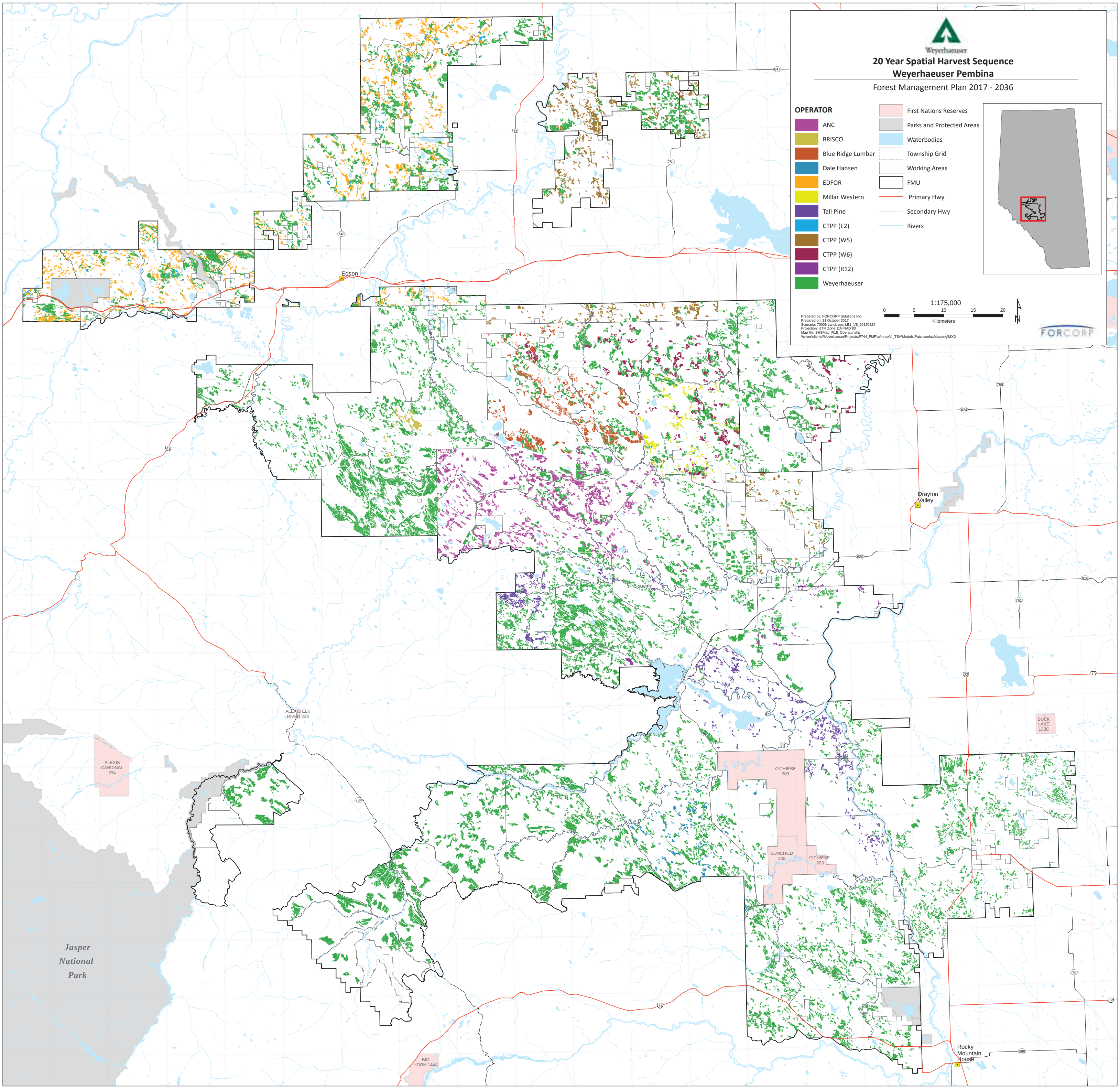
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20 Year Spatial Harvest Sequence
Weyerhaeuser Pembina
Forest Management Plan 2017 - 2036
OPERATOR
ANC
BRISCO
Blue Ridge Lumber
Dale Hansen
EDFOR
Millar Western
Tall Pine
CTPP (E2)
CTPP (W5)
CTPP (W6)
CTPP (R12)
Weyerhaeuser
First Nations Reserves
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Map file: SHSMap_R15_Operator.shp
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FORCORP
Edson
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ALEXIS ELK RIVER 233
ALEXIS CARDINAL 234
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SUNCHILD 202
BUCK LAKE 133C
BIG HORN 144A