# Weyerhaeuser
# Timber Supply Analysis Information Package
# For Management Plan #9 on TFL15

March 28, 2003

(Amended May 23th 2003)

(Revised July 2003, following comments from MoF Timber Supply Analyst)

Prepared by: Sean Curry, RPF 2021

## Table of Contents

## List of Tables

## INTRODUCTION

This information package has been prepared for Tree Farm License #15 (TFL 15) to document the assumptions and modeling procedures to be used in the timber supply analysis process. A key component of management plan approval is the confirmation and validation of these input data and procedures. This document contains the best data, knowledge and information available today. New data will be incorporated into the timber supply analysis, 20-year plan and management plan documents if the data is material and if it will not jeopardize Weyerhaeuser's ability to meet the legal deadlines that accompany the management plan preparation and approval process. Background material and information which guided the assumptions and procedures described in this information package are documented in the appropriate sections.

## GROWTH AND YIELD

The growth and yield data contained within this package will continue to be reviewed by Weyerhaeuser staff during the Timber Supply Analysis portion of the management plan process up to the submission deadline. Where refinements and/or changes are made these will be communicated immediately.

## BASE CASE

**Table 1: Base case description**

| Option Name | Description |
|---|---|
| Base case | This option includes:<br>• Allowances for Enhanced riparian reserves<br>• Adjusted Vegetation Resource Inventory<br>• Old Growth Management Areas as per Okanagan Shuswap OGMA subcommittee placement process<br>• current and future WTP's<br>• requirements from the Forest Practices Code (FPC)<br>• new growth and yield data<br>• current silvicultural practices<br>• current practice regarding rehabilitation of all in-block roads and landings<br>• appropriate forest cover, green-up, maximum allowable disturbance and cut block size limitations<br>• Identified wildlife strategies are not included |

The degree of certainty with data, assumptions and procedures outlined above, will be measured through a series of sensitivity analyses. These have been grouped into three categories of Harvest flow, Biodiversity and Forestry.

**Table 2: Sensitivity and harvest flow analyses descriptions**

| Category | Magnitude of change | Rationale |
|---|---|---|
| **Harvest flow** | | |
| Non declining yield | N/A | A non-declining yield harvest flow policy will identify potential opportunities, that might be masked by a non-declining even flow policy |
| Maximum initial level harvest | N/A | Test stability of a maximum short-term harvest level constrained by a maximum +/-10% per decade change |
| Combined area and volume control | N/A | Test applicability of area-control harvest flow within Drybelt portion and manage remainder of TFL under volume control |
| **Biodiversity** | | |
| Patch size | On/off | Test stability of short-term harvest level to the patch size distributions contained in the Biodiversity guide book |
| Forest cover constraints | +/- 10% | To determine the impact on the harvest forecast of changing forest cover constraints |
| **Forestry** | | |
| Standing volume up/down | +/- 10% | To determine the impact on the harvest forecast of reducing and increasing standing mature volume by 10% |
| Regeneration volume | +/- 10% | To determine the impact on the harvest forecast of increasing and decreasing the regenerated stand volumes by 10% |
| Site index up/down | +/- 3m | To determine the impact on the harvest forecast of changing the regenerated site index values for all species |
| Green-up | +/- 1m | To determine the impact on the harvest forecast of changing green-up requirements |
| Minimum operability | +/- 25m3/ha | To determine the impact on the harvest forecast of changing minimum operability requirements |
| Landbase | +/- 10% | To determine the impact on the harvest forecast of significant changes in landbase |

## MANAGEMENT OPTION

A combination of the sensitivity analyses will be combined to develop a recommended option in the Timber Supply Analysis, while meeting all other constraints.

## MODELS

Weyerhaeuser will use Batch VDYP, VDYP1.1, TIPSY 3.0E, WOODSTOCK 3.0, and COMPLAN 3.2008 during the preparation of the timber supply analysis and development of the 20-year plan. Both VDYP and TIPSY will be used to generate yield curves for the entire landbase. WOODSTOCK and COMPLAN are the forest estate models that will be used to determine potential harvest levels, and the 20yr plan.

### Model Descriptions

WOODSTOCK can be used in one of four different model formulations; inventory projection, binary search inventory projection, Monte Carlo simulation and a generalized Model II linear program. During the preparation of MP9 it will be used in it's linear programming formulation. Details regarding the objective function and constraints will be discussed with the Timber Supply Forester prior to implementation.

COMPLAN is a spatially explicit inventory projection model that schedules harvests at the cutblock or stand level subject to adjacency (green-up) and forest cover constraints. COMPLAN will be used to generate the 20-yr plan. Discussions with the Timber Supply Forester on methodology will occur prior to preparation of the 20-yr plan.

## CURRENT FOREST COVER INVENTORY

The inventory for TFL 15 MP9 is based on the Vegetation Resource Inventory (VRI) Photo-Interpretation standards of the MSRM. Phase one of the VRI was completed in 1997. This inventory was updated for harvesting and silviculture activities to the end of 2002. The original VRI phase one was upgraded in the fall of 2002 to incorporate finer stratification in the dry belt fir areas of the TFL. The current GIS database is loaded into Arc/Info and is on a TRIM (NAD 83) base. The inventory is updated annually to reflect depletion and new silviculture data by processing information with the Ministry of Forests' inventory program, FCAPS 3. Harvest boundaries are updated with GPS traversed locations. The inventory attributes are stored in a relational database that can produce standard FIP-format files.

The BC Ministry of Forests completed a retrofit inventory audit, of the new VRI, in 1999 by superimposing the old 1994/95 TFL audit plots onto the VRI. Differences in volume were noted and in the July 29, 1999 AAC rationale for MP8 it was suggested that Weyerhaeuser initiate a Phase 2 VRI sample program prior to the next AAC determination. A VRI Phase 2 program was initiated in 2000 and seventy-four Phase 2 plots were established through 2002, NVAF plots were not established. The Dry-belt VRI Phase 1 was enhanced in late 2002 to substantially reduce average polygon size and in turn reduce the within polygon variability; the major contributor of observed versus predicted variation. The adjustment analysis[1] was completed in April 2003 and indicated that current VDYP-based inventory volume calculations, overestimate plot volume by 9% on average with an 18% sampling error; 3% higher than what is normally accepted for TSR. A reduction factor of 9% will be applied to all VDYP-based yield curves in the wood supply models.

[1] Tree Farm Licence 15, Vegetation Resources Inventory Statistical Adjustment. JS Thrower & Associates, April 2003. Copy in Appendix 1

## DESCRIPTION OF LANDBASE

### Timber harvesting land base determination

The determination of the timber harvesting landbase is accomplished through a stepwise procedure that identifies all stands excluded from harvest. These stands are removed sequentially to determine the net landbase available for timber harvest. In order to prevent duplication, area removed during one step is not included in a further step. Stands excluded from the timber harvesting landbase do not contribute to potential harvest levels, however their stand attributes are projected and tracked through time as they contribute to achieving other objectives. Table 3 below, summarizes this process.

**Table 3: Timber harvesting landbase determination for base case**

| Category | Area (ha) | | |
|---|---|---|---|
| | Schedule B | Schedule A | Total |
| Total area (incl. fresh water) | 46,304.5 | 64 | 46,368.5 |
| Non forest | 2,764.3 | 9.2 | 2,773.5 |
| Low site productivity forest | 176.0 | 0 | 176.0 |
| Current roads and trails | 654.9 | 1.4 | 656.3 |
| **Total productive forest** | **42,709.3** | **53.4** | **42,762.7** |
| Deciduous | 222.4 | 0 | 222.4 |
| PFT's | 2,847.6 | 0.4 | 2,848.0 |
| Marginally dry sites | 2,627.6 | 0 | 2,627.6 |
| Terrain class 5 and U | 229.2 | 0 | 229.0 |
| Riparian reserves | 152.4 | 0 | 152.4 |
| WTP's | 115.7 | 0 | 115.7 |
| OGMA's | 1,848.2 | 0 | 1,848.2 |
| Total reductions to productive forest landbase | 8,042.9 | 0.4 | 8,043.3 |
| **Timber harvesting landbase** | **34,666.4** | **53.0** | **34,719.4** |

### Total area

The total area of TFL15 in MP8 was 48,448 hectares. The reduction of 2,143.5 hectares is comprised of the Vaseux Canyon Goal 1 and the Shuttleworth Creek Goal 2 Protected Areas (both identified in the Okanagan Shuswap Protected Area Strategy), a "connectivity corridor" with Nature Trust Lands and revised TFL boundaries as a result of MoF Regional height-of-land corrections.

The total area of TFL 15 including fresh water is 46,368.5ha, 64 of which are contained within lot 1690, owned by Weyerhaeuser. For the purposes of this analysis the boundary locations as contained in Weyerhaeuser's GIS files and on the Penticton Forest District inventory maps have been used to determine the total area. This boundary was different than that used during the VRI process and 42.9 hectares of slivers do not contain forest cover information. These slivers were not updated and were netted-out of the process. Weyerhaeuser maintains that stands not removed during the netdown process will be harvested. Stocking class 4 stands will be harvested as they are encountered during normal operations. The table in Appendix 2 shows the distribution of Stocking class 4 stands in the 2002 FDP.

### Forest resource inventories

Table 4 below documents the status for the forest resource inventories. It also identifies the Okanagan Shuswap LRMP Resource Management Zones (RMZ's) that are applicable to TFL15.

**Table 4: Forest Inventory status**

| Forest Resource Inventory | Standard Date Completed | Approval | Status Comments |
|---|---|---|---|
| Forest inventory | VRI phase I completed to RIC standard 1997<br>VRI phase II 2001, 2002<br>VRI enhancements February 2003<br>VRI adjustment pending | MP9 approval letter, July 1999<br>Lloyd Wilson March 2001, 2002<br>Approval pending<br>Approval pending | Approvals pending for VRI enhancements and adjustment |
| Visual inventory | Okanagan Shuswap LRMP identified Visual Management Zones | LRMP adopted as government policy in January 2001 | Zones identified are 1, 2 and 3. |
| Recreation | Okanagan Shuswap LRMP identified the Inkaneep ski trails as an intensive recreation zone | LRMP adopted as government policy in January 2001 | Identified as "cross-country skiing/non-motorized" category |
| Range | Range licencee list updated March 2003 | | |
| Stream, lakes and wetlands | Ongoing operational classification to FPC | Ongoing by MoF staff | |
| Terrain stability mapping | 1998 Vaseux/Shuttleworth drainages, 1999 Vaseux drainage | Tim Giles March 1999 and June 2000 | |
| Terrestrial ecosystem mapping | Level 4, completed in January 2001, to 1998 standards | Quality certificate October 9, 2001 from Dennis Lloyd, Regional Ecologist and accepted for use in MP9 by Mario Di Lucca December 3, 2002 | |
| Archeological overview assessment | Completed in March 1997 | Jerome Jang, December 1997 | AOA completed for Okanagan TSA and TFL15 |

| Forest Resource Inventory | Standard Date Completed | Approval | Status Comments |
|---|---|---|---|
| Osoyoos Archeological Inventory Study 2000 | August 2001 | | |
| General management zone | Okanagan Shuswap LRMP RMZ's adopted as government policy January 2001 | | |
| Mule Deer Winter Range RMZ | | | Further subdivided into planning cells. |
| Big Horn Sheep RMZ | | | |
| Elk Habitat RMZ | | | |
| Mountain Goat Habitat RMZ | | | |
| Moose Winter Habitat RMZ | | | |

**Non-forest**

2,773.5 hectares is removed as non-forest. Table 5 below summarizes the specific categories within the non-forest designation.

**Table 5: Non-forest landbase description**

| Category | Area (ha.) | | |
|---|---|---|---|
| | Schedule B | Schedule A | Total |
| G | 0.5 | 0 | 0.5 |
| Ice | 3.9 | 0 | 3.9 |
| Lakes | 62.4 | 5.0 | 67.4 |
| M | 9.0 | 2.9 | 11.9 |
| Non productive | 1,427.1 | 0 | 1,427.1 |
| Non productive brush | 8.7 | 0 | 8.7 |
| Non treed area | 399.2 | 0 | 399.2 |
| Open range | 165.4 | 0 | 165.4 |
| Rock | 26.1 | 0 | 26.1 |
| Swamp | 359.8 | 0 | 359.8 |
| U | 302.1 | 1.3 | 302.1 |
| **Total** | **2,764.3** | **9.2** | **2,773.5** |

**Low productivity forest**

176.0 hectares are removed as low productivity forest from Schedule B land. Table 6 below summarizes the specific categories. The % rock estimates are contained in the TEM data. The regenerated site index values are derived from the TEM[1]/SIA [2] data and used to determine low site productivity sites.

**Table 6: Low productivity forest description**

| Category | Rational | Area (ha) |
|---|---|---|
| Rock > 50% | TEM-based % rock estimates > 50% | 94.5 |
| Low SI | Sites with site indices lower than 8 | 26.0 |
| ESSFdc102 | High elevation, SI >8 & <10, wet | 10.0 |
| ESSFdc106 | High elevation, SI >8 & <10, wet | 45.1 |
| | **Total** | **176.0** |

**Roads, trails and landings**

***Existing roads***

A combined approach was used to account for existing roads on TFL15. The linear distance of each road class was determined using the GIS, and this was multiplied by the buffer widths in Table 7 below. This 774.9 hectares is the true road footprint on the TFL. A separate process to prepare the database for analysis with WOODSTOCK and spatial analysis with COMPLAN identified a total of 654.9 hectares. The difference of 120.0 is thought to be an artifact of the sliver elimination process and snap tolerance minimums. Slivers were dissolved when the area was less than or equal to 1500m2 unless they contained a portion of the TFL boundary. This 120.0 hectares is assumed to be located within the productive forest landbase without any bias for site series, and translates to 120.0 / 42,762.7 or 0.28% volume reduction and will be applied to all existing stand volume curves.

**Table 7: Road deletions from TFL 15**

| Road | Length | R/W width (m) | Area (ha) |
|---|---|---|---|
| Main | 73.8 | 17 | 125.5 |
| Operational | 493.9 | 9 | 444.5 |
| Trails | 409.9 | 5 | 204.9 |
| Total | 977.5 | | 774.9 |

***Landings***

A volume loss factor for landings was calculated for pre code harvesting. The Information Package for Management Plan 8 identified 361 hectares in landings prior to

[1] Terrestrial ecosystem mapping with wildlife interpretations for Weyerhaeuser TFL15, March 2000, Geowest Environmental Consultants Ltd. Volume 1. Copy in Appendix 3

[2] Site index adjustments using BEC Classification on TFL 15, Final Report, 2000. J.S. Thrower & associates Ltd. Copy in Appendix 4

1996. This represents 0.8% of the productive forest landbase (Table 3). In addition Weyerhaeuser estimates that and additional 1% is in unmapped permanent access structures pre-code. An additional assumption was made that the landings and unmapped permanent access structures were located within the productive forest landbase without any bias for site series, therefore the 1.8% area translates to 1.8% volume reduction. This will be applied to Silviculture Era's 1 and 2 yield curves.

In current Silviculture Prescriptions commitments are made to rehabilitate 100% of all landings and in-block disturbance on an ongoing basis. Site productivity on the majority of landings is successfully restored and the area successfully regenerated. An assumption was made that landings are located within the productive forest landbase without any location bias for site series. Loss estimates from TFL35 indicate a 90% restoration success (10% failure) and 60% productivity recovery (40% recovery loss). Data from post-code silviculture prescriptions identifies 4.2% of each block was declared NP from harvesting activities. This number represents a post-code phase in period during which 50% of rehabilitated landings and trails were included as permanent NP. In addition with the current practice of roadside harvest systems the amount of permanent NP is continuing to drop. While no numbers exist, we estimate this to be 3% on average post-code. Table 8 shows the calculation to determine a landing/temporary structure volume loss factor. This will be applied to Silviculture Era 3, unharvested stands and future regeneration in a similar manner to the non-recoverable loss factor.

**Table 8: Landing volume loss factor calculation**

| Volume factor | Loss | Net loss |
|---|---|---|
| 3% (original estimate) | 10% permanent (90% success) | 0.3% |
| 2.7 (3%-.3%) | 40% loss (60% productivity restored) | 1.08% |
| Combined total | | 1.38% |

***Future roads***

Main access on the TFL is essentially complete and future roads will be in either the operational or trail class. It is assumed that 50% of the existing permanent structures will be required for future harvesting activities so the portion of the TFL that will require new permanent structures is 50% of 3% or 1.5%. As above it is assumed that future permanent structures will be located within the productive forest landbase without any bias for site series, therefore the 1.5% area translates to 1.5% volume reduction. This will be applied to all future regeneration yield curves.

***Within block disturbance***

Within block disturbance is not included as a specific productivity loss. Landbase productivity as measured through site index was sampled during the Site Index Adjustment (SIA) project. Sample plots were established in a cluster of 5 circular subplots (100m2 each): a random point (center subplot) with four satellite subplots in the cardinal directions (at 25 m from the random point). The first random point was offset for two reasons:

1. If the cluster was null (i.e., subplots were established and no suitable site trees were

found), the cluster was offset using a systematic grid. The first random point was moved 25-m to the north (with satellites at 25-m in cardinal directions). Additional clusters were evaluated in a clockwise direction until a suitable cluster was found (8 potential offsets).

2. If random point fell on a mapped road, it was moved off the road. All mapped roads were netted out and therefore were not part of the target and sample populations.

If the random point fell on an unmapped road the cluster was established and satellite subplots were always established wherever they fell. Any site productivity impacts of within-block disturbance were assessed through the site index measurements at each plot.

Of the 53 plots that were assessed, 10 had old skid trails or landings within the sample area, 1 contained significant cattle disturbance and 3 had site preparation disturbance from making windrows or piles. Site indices in the 10 with skid trail / landing disturbance were essentially the same and had the same variability as for non-disturbed, except for three plots where the site index was noticeably lower. This was due to excessive forking which skewed the age/height relationship. The site indices in the other 4 plots with disturbance were not different than the non-disturbed either. The conclusion from this review is that Site indices from these plots are not different than those in the non-disturbed plots and that within plot disturbance does not have an impact on site productivity as measured through site index.

Weyerhaeuser is committed to addressing small/dispersed disturbance through prompt site preparation and planting. Deductions for stocking-related impacts are accounted for in OAF1. Table 9 below summarizes the productivity losses described above. These values will be removed from the yield curves in the wood supply model.

**Table 9: Cumulative RTL reductions for TFL15**

| | Loss by category (%) | | | | |
|---|---|---|---|---|---|
| **Yield curve** | **Landings** | **Future roads** | **Within block disturbance** | **Current road adjustment** | **Total** |
| Silviculture era 1 | 1.8 | na | 0 | 0.28 | 2.08 |
| Silviculture era 2 | 1.8 | na | 0 | 0.28 | 2.08 |
| Silviculture era 3 | 1.38 | na | 0 | 0.28 | 2.89 |
| Future regeneration | 1.38 | 1.5 | 0 | 0 | 2.88 |
| VDYP-based | 1.38 | 1.5 | 0 | 0.28 | 3.16 |

**Environmentally sensitive areas (ESA's)**

Weyerhaeuser will not be using ESA's during this analysis. Reconnaissance level and detailed level Terrain Stability Mapping have been completed and all soil stability related ESA's are replaced by this data. The Okanagan Shuswap LRMP RMZ's replace wildlife and recreation related ESA's and regeneration ESA's are replaced by a combination of TEM and VRI data and the Douglas fir protocols[1].

The Douglas Fir Protocols is a process combining photo interpretation, TEM data and site visits to define site and stand structure codes for the management of Dry-belt stands. The codes define areas that could be managed with similar silviculture objectives. The driest sites (code "A") are non-productive, while site codes "D" to "G" define productive sites from driest to wettest. In general single tree selection is the recommended treatment for the driest sites with larger openings recommended for the wetter sites.

### Inventory-based reductions to productive forest landbase

222.4 ha of deciduous leading mature stands are removed from the productive forest landbase. Approximately 70% of these stands are Trembling Aspen leading and the remaining 30% are Birch leading. Any conifer volume contained within this area is not included in the calculation of the conifer harvest levels.

There are six problem forest types that have been removed from the landbase. These stands are physically operable or will be when older, but due to current stand conditions they are not currently utilized and have or will have marginal timber value. Table 10 below contains the stand definitions for each as well as the area.

**Table 10: PFT definitions**

| PFT | Growth type | Age | Height | Area | | |
|---|---|---|---|---|---|---|
| | | | | Schedule B | Schedule A | Total |
| 1 | A, B, C, D, E, F, G, H, I, J, K | >=121 | <=19.4 | 353.2 | 0.4 | 353.6 |
| 2 | L, M, N | >=81 | <=18.5 | 726.6 | 0 | 726.6 |
| 3 | L, M, N | >=61 | <=12.7 | 1,437.4 | 0 | 1,437.4 |
| 4 | L, M, N | >=41 | <=9.5 | 21.1 | 0 | 21.1 |
| 5 | L, M, N | >=21 | <=5.0 | 48.8 | 0 | 48.8 |
| 6 | L, M, N, stocking class 4, meets age and height criteria for PFT 2,3,4,5 | | | 259.9 | 0 | 259.9 |
| | | | **Total** | **2,847.6** | **0.4** | **2,848.0** |

Recent work completed on TFL15 calibrated the Merritt Douglas fir Protocols to include management prescriptions for Ponderosa Pine and Western Larch and also enhanced the inventory by identifying smaller non-productive areas. Field sampling and VRI data was combined with TEM-based site productivity data to define site codes. These relationships stratify TFL15 and are described in Table 11 below.

[1] Application of Douglas-fir Protocols to Natural Disturbance Type 4 on TFL 15. Final Report, 2003. JS Thrower & Associates, Copy in Appendix 5

**Table 11: Site codes for the Douglas Fir protocols**

| Site Code | Description | Area (ha) |
|---|---|---|
| A | Non-productive, shallow to bedrock, rocky soils, rock outcrops or xeric upper slopes or >30% grassland in the PPxh1 or IDFxh1. May be transitional to rock outcrop or grassland | 1,302.4 |
| D | Hot, Dry but productive sites. Py in the PPxh1, Py and Fd in the IDFxh1 and Fd in the IDFdm1 dominate forest cover | 1,325.2 |
| | **Total** | 2,627.6 |
| E | Sub mesic or mesic sites on mid to upper slopes, or leading Fd and/or Py on lower slopes, more moisture and higher stocking than site code "D" | |
| F | Moister sites than site code "E", usually contains multiple species, does not occur in the PPxh1 and infrequently in the IDFxh1 | |
| G | Mixed species, wettest of productive sites, generally lower slopes | |

Site code A was removed from the landbase as it is currently considered non-productive. Site code D was removed, as the recommended prescription on these sites is single tree or strip shelterwood harvesting. Both of which are not current practices.

Terrain stability mapping is a method to delineate areas of slope stability with respect to stable, potentially unstable, and unstable terrain within a particular landscape. Both reconnaissance and detailed terrain stability mapping techniques have been used on TFL15. For this analysis, reconnaissance level U and detailed level V are considered as 100% out, while detailed level IV is 100% in the landbase. Table 12 below contains the areas for all three classifications.

**Table 12: Potentially unstable slopes**

| Stability mapping class | Description | Area |
|---|---|---|
| U | 100% out | 172.0 |
| V | 100% out | 57.2 |
| | **Total** | **229.2** |
| IV | 100% in | 507.1 |

**Statutory-based reductions to TFL**

***Riparian reserves and management zones***

All streams within TFL 15 have been classified. Reserve and management zone widths are from the FPC Operational Planning Regulations - Part 8 Riparian Management Areas. There is one classified lake within TFL15 and this has a ten-meter reserve and 190-lakeshore management zone. A reserve zone of 10 meters has been applied to all S4 creeks, in conjunction with a smaller management zone of 20 meters. Riparian reserve and management zone boundaries were determined by assigning reserve and management zone widths to each reach/class combination on the GIS.

Riparian reserve and management zone areas were determined by multiplying the stream class length by the appropriate width.

Because streams, lakes and wetlands are physically inter-related an overlap exists with the zonation. A hierarchy for reserve and management zone determination was used: streams 1st, lakes 2nd and wetlands 3rd. The area in Table 13 recognizes the riparian hierarchy, but does not account for the overlaps of land categories higher in the net down process in Table 3. Basal area retention factors shown reflect current practice on TFL15. A discussion regarding current basal area retention factors in Appendix 6.

**Table 13: Riparian management area statistics**

| Riparian Class | Stream Length (km) | Riparian Management Area | | | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | | Reserve zone | | Management Zone | | | | |
| | | Width (m) | Gross Area (ha) | Width (m) | Gross area (ha) | Basal area retention | Width (m) | Area (ha) |
| S2 | 10.9 | 30 | 68.0 | 20 | 46.8 | 50 | 50 | 114.8 |
| S3 | 20.3 | 20 | 85.8 | 20 | 91.3 | 50 | 40 | 177.1 |
| S4 | 21.8 | 10 | 49.9 | 20 | 94.0 | 30 | 30 | 143.9 |
| S5 | 3.8 | na | na | 30 | 24.0 | 25 | 30 | 24.0 |
| S6 large | 88.2 | na | na | 20 | 479.0 | 50 | 20 | 479.0 |
| Total Streams | 175.1 | na | 203.7 | na | 735.1 | na | na | 938.8 |
| B class | na | 10 | 0.3 | 190 | 17.7 | 50 | 200 | 18.0 |
| Total Lakes | na | na | 0.3 | na | 17.7 | na | na | 18.0 |
| 1 | na | 10 | 3.6 | 40 | 14.9 | na | 50 | 18.5 |
| 3 | na | 10 | 1.9 | 30 | 5.8 | 50 | 40 | 7.7 |
| Total wetlands | na | na | 5.4 | na | 20.7 | na | na | 26.1 |

An area-weighted volume reduction was determined for basal area retention and applied to the yield curves across the TFL. This number of 0.56% and will be applied to each yield curve in the wood supply model to account for basal area retention.

***Wildlife habitat reductions***

The 115.7 hectares for WTP's is a net number, the gross area is 118.7 hectares. These patches have been identified in recent Forest Development Plans.

An analysis was undertaken to determine the amount of future WTP's that would be required to meet objectives stated in the Biodiversity Guidebook. A 250 meter buffer (effective WTP area-of-influence) was applied to all forested polygons not in the timber harvesting landbase (WTP, OGMA, riparian reserves, PFT's deciduous). The resulting area outside this buffer is the area that potentially requires a WTP. A GIS-based grid generated 1,281 points, with each point representing the ideal location of all WTP's across the TFL. 887 points fell within the buffered area. The net result of 394 identifies the potential location of future WTP's required to provide uniform coverage. The current average WTP size (both thlb and nthlb) on the TFL is 0.5 hectares which converts into approximately 197 hectares or 0.46% (197 / 42,762.7) of additional forested area. This area reduction will be converted to 0.46% volume reduction and removed from all yield curves in the wood supply model.

***Old Growth Management Areas (OGMA's)***

Target old growth management areas for each Biogeoclimatic variant were established in the Okanagan Shuswap LRMP. The 1,848.2 hectares of OGMA's on TFL15 were identified through a multi-stakeholder group empowered by the Okanagan Shuswap LRMP table. Harvest operations will respect the OGMA locations because these patches have not been given legal protection at this time.

***Enhanced Riparian Reserves***

To apply additional protection to riparian values within the LRMP area, additional area was to be set aside by 2006 as Enhanced Riparian Reserves. Allocation by licence was identified in a February 2001 memo, and TFL15's proportional share is 228 hectares. This 228 hectares is assumed to be located within the productive forest landbase without any bias for site series, and translates to 228 / 42,762.7 or 0.53% volume reduction and will be applied to all yield curves.

## INVENTORY AGGREGATION

### Management zones

The management zones identified within the Okanagan Shuswap LRMP are used to designate an area for a specific management direction. General Resource Management objectives and strategies apply to all Crown land and Weyerhaeuser's private land within the TFL. The objectives and strategies in the specific Resource Management Zones apply to the portion of the TFL covered by the zone in question in addition to the General Resource Management objectives and strategies. Excluding the General Management Zone seven overlapping zones are identified within TFL15. No community watersheds are identified in TFL15.

The LRMP provides direction[1] regarding the forest cover objectives to use when resource management zones overlap. Table 14 below shows the gross (includes overlap) and net (accounts for overlap) area for the zones within TFL15. The net area is that portion of the zone that will be managed for the specific resource management objectives in addition to those described in the General management zone. Both wood supply models have the capability to model overlapping resource management zones and constraints.

[1] Okanagan Shuswap LRMP. See specific resource management zone sections

**Table 14: Management zone summary**

| Zone name | Area gross | Area net | Comments |
|---|---|---|---|
| General management zone | 22,785.0 | 22,785.0 | |
| Mule Deer Winter Range RMZ | 9,949.6 | 5,349.9 | 4,599.7 hectares overlaps with the visual management zone and will be managed in conjunction with respective visual forest cover objectives. 5,349.9hectares will be managed using mule deer forest cover objectives. |
| Big Horn Sheep RMZ | 20,733.1 | 10,909.9 | Defers to Mule Deer winter range objectives when overlap occurs |
| Visual management zone | 9,092.0 | 2,724.0 | 6,368 hectares overlaps with Mule Deer and Big Horn Sheep zones and will managed in conjunction with their respective forest cover objectives. 2,724.0 hectares will be managed using VQO forest cover objectives. |
| Elk Habitat RMZ | 7,005.4 | na | No area outside Mule Deer or Big Horn zones. Defers to Mule Deer winter range objectives when overlap occurs |
| Mountain Goat Habitat RMZ | 2,620.8 | | Have built capability into models to summarize output if necessary |
| Moose Winter Habitat RMZ | 608.3 | | |
| Vaseux drainage fish | 27,069.6 | | |

**Detailed land base information requirements**

When the TFL inventory and analysis process is completed, the Timber Supply Forester will be provided with the detailed inventory file (digital ASCII format) created after the determination of the timber harvesting landbase. This file will include polygon specific information on both the area within the timber harvesting landbase and the area deducted from the total landbase to arrive at the timber harvesting landbase. For the base case, the Timber Supply Forester will be provided with all the resource assessment model input and output files (digital ASCII format), including detailed field descriptors.

## GROWTH AND YIELD

**Site index assignments**

Three broad categories of stands have been identified: existing stands greater than 47 years of age, existing stands less than or equal to 47 years of age and future regeneration.  Yield curve construction utilized a different series of site index curves as follows:

1. For all existing stands outside of greater than 47 years of age, the inventory-based SI was used
2. The adjusted SI's in the SIA report (described in more detail below) for all species in the MSdm1, IDFdm1 and ESSFdc1 <1,820 meters were used for stands less than or equal to 47 years of age
3. The Provincial SIBEC data in the IDFxh1 and PPxh1 for Fdi and Py was used for stands less than or equal to 47 years of age
4. The suggested Provincial SIBEC elevation reduction adjustment for all variants >1,820m (which is one site class - 3m) was applied against the adjusted SI's in the SIA report, for stands less than or equal to 47 years of age

Table 15 summarizes the yield model and site index methodologies for each broad stand category.

**Table 15: Stand categories, yield model and site curve summary**

| Broad stand category | Silviculture era | Yield model | Site index method |
|---|---|---|---|
| Existing regeneration | 1955 to 1974 | TIPSY where applicable | TEM[1], SIA[2] , SIBEC |
| | 1975 to 1995 | TIPSY where applicable | |
| | 1996 + | TIPSY | |
| Future regeneration | 1996+ | TIPSY | |
| Existing non-harvested | NA | VDYP | FCAPS3 process |

The TEM (Terrestrial Ecosystem Mapping) process is RIC (Resource Inventory Committee) sanctioned, with the objective to provide a permanent record of the location and distribution of ecosystems; essentially a site series map.  The SIA (Site Index Adjustment) report provides reliable estimates of potential site index for post-harvested regenerated stands.  Estimates were developed for Lodgepole pIne, Douglas-fir, western larch, interior spruce and subapline fir for the Msdm1, IDFdm1 and ESSFdc1 <1,820m subzones.  The SIA process is accomplished in three phases:

1. Development of preliminary Potential Site Index estimates that reflect the productivity of regenerated stands for each site series
2. Field sampling to determine field-based measurements of site index in a representative sample by site series
3. Generation of final site series based Potential Site index estimates based on the statistical relationship between observed and predicted estimates

The site series based Potential Site index estimates were linked to each TEM polygon and then merged with the forest cover data.  The resulting polygon coverage

[1] Terrestrial ecosystem mapping with wildlife interpretations for Weyerhaeuser TFL15, March 2000, Geowest Environmental Consultants Ltd.  Copy in Appendix 3

[2] Site index adjustments using BEC Classification on TFL 15, Final report, 2000.  J.S. Thrower & associates Ltd.  Copy in Appendix 4.

contained potential site index estimates for all species within the sample population. These estimates were used as regenerated site indices for the existing and future regeneration yield curves.

#### Utilization specifications

The utilization specifications define the minimum dbh, the maximum stump height, the minimum top diameter and the minimum log length by species. These values are used to determine gross merchantable volume. The table below contains the specifications from our licence document. Utilization standards will follow those identified in Schedule C of the TFL15 Licence document. They are reproduced below.

**Table 16: TFL 15 Utilization Standards**

| Species | Maximum Stump Height (cm) | Minimum Log or Slab Length (m) | Minimum Diameter at Stump Height (cm) | Minimum Top Diameter (cm) | Minimum Slab Thickness (cm) |
|---|---|---|---|---|---|
| Lodgepole Pine | 25.0 | 3.0 | 15.0 | 10.0 | 15.0 |
| Alpine fir and spruce | 25.0 | 3.0 | 20.0 | 10.0 | 15.0 |
| All other species | 30.0 | 3.0 | 20.0 | 10.0 | 15.0 |

***VDYP***

The model will use the FIZ “D” factors in the waste and breakage data file associated with VDYP1.1.

***TIPSY***

All yield estimates from TIPSY will be reduced for decay, waste and breakage because the yield estimates are not net of decay. They were derived from the 1976 report “Metric Diameter Class Decay, Waste and Breakage Factors, All Inventory Zones”. The relationships in the report are based on species, diameter and risk class from fire-origin mature and over-mature trees. These values will over-estimate the amount of decay, waste and breakage in managed stands because regenerated stands grow faster, will achieve the same diameters at earlier ages and have less exposure to those events that initiate cull and defect processes.

To determine decay waste and breakage factors for future regeneration strategies, diameters at age 100 (OAF 2 100% age) were reviewed and found to be in the range of 25cm +/- for the majority of the regeneration strategies for total volume and 30cm +/- for the 250 prime trees. Due to the management practices described above, we assumed that 60% of the trees would be in risk group 1 and 40% in risk group 2. Volume distributions at age 100 indicated that approximately 40 to 50% of the trees were in the 250 prime category and fell into the larger diameter class, which has greater loss factors. To develop species specific values for future regeneration, loss factors from risk group 1 were weighted 60% and those from risk group 2 were weighted 40%

for both diameter classes. To reflect the volume distribution these factors were further weighted 50% for the 25cm diameter class and 50% for the 30cm class. The values are shown in Table 17.

**Table 17: DWB Factors for TIPSY**

| Factor by species (%) | | | | |
|---|---|---|---|---|
| Pl | Lw | Py | Fdi | Sx |
| 3.3 | 4.0 | 3.0 | 3.9 | 3.8 |

**Operational adjustment factors for managed stands**

***OAF1***

In conjunction with the Douglas fir protocols and recent VRI enhancement the Drybelt portion (17,575 ha's) of the TFL was re-inventoried to a smaller level of detail than that specified in the VRI standards. The table below shows the distribution of NP by size class for the entire TFL.

**Table 18: NP area distribution**

| Type | >2 Ha | | >1 Ha to <2 Ha | | < 1 Ha | | Total | |
|---|---|---|---|---|---|---|---|---|
| | count | area | count | area | count | area | count | area |
| Total | 327 | 2,500.8 | 217 | 275.0 | 302 | 143.0 | 846 | 2,918.8 |

An additional 108.9 hectares (Table 6) was removed from the operable landbase using the TEM data. This area consisted of those TEM polygons that contained a rock percentage greater than 60%, low site indices (less than or equal to 8), or site series ESSFdc202 and ESSFdc206. The accumulated reductions to the THLB indicate a low NP OAF1, which is supported by the data from Silviculture Prescription data post-1996 that shows an additional 2.5% is mapped as NP. Data was inconclusive pre-1996. To be conservative an OAF1 of 3% for NP will be used in silviculture era 1 and 2 and 2.5% for silviculture era 3.

The current management strategy follows a regime of detailed mapping, immediate site preparation, prompt planting and prompt fill planting when required. The net result is a reduction in "un-stocked" holes. The year 2002 survey results are in Table 19 below and indicate that due to ingress, total trees are consistently higher than Ministry targets.

**Table 19: Survey statistics for 2002**

| Age of stand being surveyed | Area surveyed | Number of blocks | Area-weighted total stems per hectare |
|---|---|---|---|
| 1 | 208.4 | 20 | 1,859 |
| 4 | 22 | 6 | 2,097 |
| 6 | 25 | 3 | 2,982 |
| 7 | 13 | 2 | 11,174 |
| 8 | 36 | 2 | 9,208 |

The area-weighted inventory stems per hectare for Era 1 and 2 stands are 2,647 and 5,094 respectively, significantly higher than target values. This rationale suggests an OAF1 for non-stocked productive holes for Era 3 stands of 2% and for Era 1 and 2 of 3%.

Several formal forest health studies have been conducted on TFL 15. Surveys for Pest Incidence (SPI's) were been conducted between 1997 and 1999, and in 2001. A forest Health Management Plan was completed for TFL15 in 1998, and in 1999 Dwarf Mistletoe strategies and tactics were developed for inclusion in Silviculture Prescriptions. A recent report[1] combined results from a literature review with the summarized SPI data and expert opinion and estimates for forest health losses on existing stands were developed. The estimates are in Appendix 8. Customized TASS runs[2] were used to develop specific OAF's for each forest health agent. Table 20 below summarizes the OAF's.

**Table 20: Forest health losses for regeneration**

| Agent | Silviculture era | Percent loss percent |
|---|---|---|
| Comandra blister rust | 1&2 | 3.1 |
| | 3 & future regen | 0.61 |
| Western gall rust | 1&2 | 1.9 |
| | 3 & future regen | 0.94 |
| Lodgepole pine terminal weevil | 1&2 | 0 |
| | 3 & future regen | 0 |
| Lodgepole pine Dwarf Mistletoe | 1&2 | 1.4 |
| | 3 & future regen | 1.0, includes mistletoe strategy impacts |
| Douglas fir Dwarf Mistletoe | 1&2 | 0.9 |
| | 3 & future regen | 0.9, includes mistletoe strategy impacts |
| Larch Dwarf Mistletoe | 1&2 | 0.4 |
| | 3 & future regen | 0.4, includes mistletoe strategy impacts |

The dwarf mistletoe strategy is expected to significantly reduce mortality losses because stands will be harvested at a younger age than that currently harvested, and because innoculum sources will be significantly reduced. These volume losses are calculated to be 1.0%.

Future losses from Comandra Blister rust and Western gall rust will not be eliminated, however managing to higher densities by encouraging and keeping ingress will create a buffer against future losses. Reduced impacts are expected and a conservative volume loss estimate of 1.55% will be used. Combined, a 2.5% OAF1 estimate for Lodgepole pine pest losses will be used in Silviculture era 3 and with future

[1] Evaluation of Forest Health Volume and Operational Adjustment Factors for TFL15 Timber Supply Modeling, and Identification of Knowledge Gaps – A background Document for Growth and Yield Modeling Endeavors-, March 2003 JCH Forest Pest Management. Copy in Appendix 7.

[2] Forest health adjustment factors, May 2003, JS Thrower and Associates, WCF-034. Copy in Appendix 9.

regeneration. The losses in Table 21 will be applied as OAF1 adjustments for the endemic forest health losses.

**Table 21: Cumulative forest health losses for individual species**

| Silviculture era | Loss by species (%) | | | |
|---|---|---|---|---|
| | Pl | Sw | Fdi | Lw |
| 1,2 | 6.4 | 4 (default) | 0.9 | 0.4 |
| 3 | 2.5 | 4 (default) | 0.9 | 0.4 |

Field-based experience suggests little evidence climate-related losses on regeneration growth and no formal studies have been conducted regarding random risk related growth losses, so the standard OAF1 of 3% will be used. Table 22 summarizes cumulative OAF1 reductions.

**Table 22: Cumulative OAF1 values for TFL15**

| | Loss by species (%) | | | |
|---|---|---|---|---|
| Silviculture era | Pl | Sw | Fdi | Lw |
| 1,2 | 15.4 | 13 | 9.9 | 9.4 |
| 3 | 10 | 11 | 8.4 | 7.9 |

***OAF2***

The OAF2 values are discussed above under decay, waste and breakage.

**Volume deductions**

All mature deciduous leading stands have been removed from the timber harvesting landbase. Deciduous volumes have not been removed from the conifer leading VDYP yield curve estimates, the volume will be removed during the wood supply analysis according to the proportion specified in the species distribution of each curve.

Due to the nature of the sampling process associated with the VRI phase 2 process, any volume losses attributable to Dwarf Mistletoe are accounted for in the field data through height and basal area measurements.

**Yield table development**

***VDYP***

The generalized development of the yield tables for VDYP is described below. Specific procedures are documented in the ACCESS database and related modules used to prepare and analyze the data. A copy of these procedures can be made available. Yield curve summaries are in Appendix 10.

1. Site indices, projected stocking class, projected crown closure, projected age, projected height, species percentages were aggregated into analysis units and area-weighted averages were calculated.

2. Area-weighted site indices for each analysis unit were based on the inventory data file. The potential site indices from the TEM/SIA project were not used.
3. Stocking class “0” was aggregated in with stocking class “1”.
4. Yield curves for each combination of analysis unit were developed.
5. The Phase 2 adjustment ratio of 9%[1] was used to reduce all VDYP volumes. This reduction was applied in the wood supply models.

***TIPSY***

The generalized development of the yield tables for TIPSY is described below. Yield curve summaries for are in Appendix 11.

1. The forest management activities and predominant regeneration strategies from previous Management Plans and annual reports were reviewed and summarized to create Silviculture eras.
2. The inventory data was summarized by Silviculture era, silviculture regime and site series. Site indices, stems per hectare, projected age, projected height, species percentages were aggregated into analysis units and area-weighted averages were calculated. The potential site indices from the TEM/SIA project were used.
3. Yield curves were created for each combination of silviculture era, silviculture regime and site series using an iterative process.
4. The iterative TIPSY process proceeded as follows:
   – A starting yield curve was generated using the appropriate site index, regeneration method and regeneration delay for the silviculture era, species distribution from the inventory and estimates of starting density.
   – For each yield curve, TIPSY output variables of top height, age and stems per hectare were compared to inventory variables of height, age and stems per hectare
   – TIPSY input variables of starting density, regeneration delay, and in one case planting versus natural regeneration, were modified to match as closely as possible TIPSY projections of age, top height and density with corresponding values of age, height and density from the inventory.
   – The process was continued until TIPSY inputs matched the inventory variables.
   – The planting option was only selected once when the inventory density could reasonable include ingress and the stand was in era 2.
   – In some instances the regeneration delay identified for each Silviculture era was lengthened to ensure a closer match between variables. The delay was shortened by one (era2) or two (era1) years when it could be reasonably justified

***Silviculture eras***

A review of all previous Management Plans identified three distinct silviculture eras differentiated by regeneration, harvest system, protection and non-timber resource management strategies. These eras are summarized by dominant silviculture strategy and regeneration delay and reflect the management adaptations associated with changes in utilization and an increase in the managed landbase.

---

[1] Tree Farm Licence 15, Vegetation Resources Inventory Statistical Adjustment. JS Thrower & Associates, April 2003. Copy in Appendix 1

**Era 1: Development, protection, partial harvesting, IU and natural regeneration; 1955 to 1974**

This era is described in Management Plans 1,2 and 3 and is characterized by a focus on road development for wood harvest and protection and a reliance on natural regeneration for both clear cutting and diameter limit cutting silvicultural systems. Experimental planting started late in this era, regeneration delay varied between 5 and 10 years and was summarized to be 7 years.

**Era 2: Planting, reduction of regeneration delay, early IRM; 1975 to 1995**

This era is described in Management Plans 4,5,6 and 7 and is characterized by the emergence of a planting program first in spruce and spruce leading types, gradually expanding to include Pine types. The reliance on natural regeneration diminished with clearcut systems but remained the dominant strategy in diameter limit and fallers' choice systems. Site preparation was used throughout the TFL, NSR was recognized and treated and the Management Plans incorporated early IRM objectives. Regeneration delay varied between 2 and 5 years and was summarized to be 2 years for planted stock and 3 years for natural regeneration.

**Era 3: Full integration of IRM objectives, patch cutting/planting in dry-belt stands, 1996+**

This era is described in Management Plans 7 and 8 and the practices were influenced by the introduction of the Forest Practices Code. It can be characterized by the introduction of a patch cutting/planting program within the drybelt portion of the TFL, and by the incorporation of IRM strategies and tactics into road construction and harvesting practices. Prompt site preparation and planting is the dominant regeneration prescription. Regeneration delay was summarized to be 1 year for planted stock and three years for natural regeneration.

**Table 23: Management Plan summary of key statistics and methods**

| Plan | Period | Gross area (ha) | AAC ($m^3$//yr) (on net area) | Gross landbase productivity ($m^3$/ha/yr) | Era | Regen. delay | |
|---|---|---|---|---|---|---|---|
| | | | | | | Planted | Natural |
| MP1 | 1954-1957 | | 15,237 | | 1 | N/A | 7 |
| MP2 | 1958 - 1968 | | 22,653 | | | | |
| MP3 | 1969 - 1973 | 49,213 | 33,130 | 0.673 | | | |
| MP4 | 1974 - 1975 | 48,669 | 82,827 | 1.702 | 2 | 2 | 3 |
| new inventory | 1976 - 1980 | 48,669 | 73,057 | 1.501 | | | |
| MP5 | 1979 - 1980 | 48,195 | 72,290 | 1.500 | | | |
| MP6 | 1981 - 1990 | 48,195 | 72,300 | 1.500 | | | |
| MP7 | 1994 - 1996 | 48,106 | 78,000 | 1.621 | | | |
| | 1996 - 1999 | 48,106 | 78,000 | 1.621 | 3 | 1 | 3 |
| MP8 | 1999 - 2004 | 48,448 | 70,000 | 1.445 | | | |

*Future regeneration*

Regeneration strategies were developed for various combinations of site series and management zones and reflects the groupings in silviculture era 3. Input details are in Appendix 12.

*Genetic gain*

Weyerhaeuser purchases improved seed from several orchards, depending on species and availability of seedlings. Small amounts of improved stock were planted in 1996 and the program has grown significantly since. Annual numbers and percent of genetically improved stock are shown below. A list of the seedlots and number of trees planted by year is in Appendix 13. Genetic gain numbers in Table 25 are from SPAR.

**Table 24: Percent genetically improved planting stock**

| Year | Total planted | Genetically improved stock | | | | |
|---|---|---|---|---|---|---|
| | | Number of Seedlings | % of total | % Lodgepole pine | % Spruce | % Larch |
| 1996 | 630,549 | 3,200 | 0.5 | 100 | | |
| 1997 | 786,165 | 27,650 | 3.5 | 100 | | |
| 1998 | 477,250 | 0 | 0 | | | |
| 1999 | 482,645 | 76,110 | 15.8 | 21.3 | 78.7 | |
| 2000 | 375,380 | 43,160 | 11.5 | 6.5 | 93.5 | |
| 2001 | 614,475 | 182,320 | 29.7 | 40.4 | 20.3 | 39.3 |
| 2002 | 280,510 | 59,805 | 21.3 | 17.1 | 82.9 | |
| Total | 3,646,974 | 392,245 | 10.7 | 34.1 | 47.6 | 18.3 |

Table 25 shows for each species and orchard, the genetic gain (verified by ***), number of improved seedlings, number of overall seedlings and seedling-weighted genetic gain. Future seedling requirements are not anticipate to be any different than current, so a TFL-based genetic gain was determined by weighting the seedling-based genetic gain by the proportion of genetic improved stock relative to the overall total of planted stock within TFL15.

**Table 25: Seedling-weighted genetic gain calculations**

| Species | Orchard number | Genetic gain | Number of Improved seedlings | Seedling weighted genetic gain | Total number planted | Percent improved stock | TFL-based genetic gain |
|---|---|---|---|---|---|---|---|
| Pl | 308 | 6% | 133,755 | 6% | 2,323,122 | 5.7 % | 0.3% |
| Sw | 303,305, 306 | 12% | 149,707 | 11.2% | 1,021,153 | 18.4 % | 2.1% |
| | 305 | 8% | 37,000 | | | | |
| Lw | 332 | 8% | 71,780 | 8% | 178,701 | 40% | 3.2% |
| Total | | | | | 3,522,976 | | |

To model deployment, the TFL-based genetic gain numbers will be applied to all planting based future regeneration and half of this gain will be applied to silviculture era 3 planting based yield curves. Future planting needs are predicted to remain constant and as nursery production increases, the proportion of improved planting stock is expected to increase as well.

#### *Silviculture regimes*

To model the sensitivity of the harvest flow and several log quality measures to the impact of various juvenile spacing regimes a separate analysis has been undertaken. The scenarios being examined are no spacing and spacing to 1,200, 2,200, 3,200 from initial densities of 15,000, 20, 000 and 35,000 stems per hectare on site indices of 18 and 20. These scenarios correspond to potential treatments on future regeneration yield curves f4 and f10. These scenarios were developed using TASS and if appropriate the results of this analysis will be reviewed and incorporated into the timber supply analysis. The Timber Supply Forester will be kept abreast of any developments and analysis progress, and be involved with yield curve approval.

## PROTECTION

### Unsalvaged losses

The recent TSR for the Okanagan TSA[1] identified 2.8% volume reduction for unsalvaged losses. TFL 15 has an extensive road system allowing for easy access and recovery of salvage timber. Annual monitoring is completed to identify pest infestations and wind thrown timber with follow up salvage operations and an aggressive fire protection program in cooperation with the BC MoF Regional is in place. Given these factors relative to the Okanagan TSA, unsalvaged losses are estimated to be 30% of the TSA, or 0.84%. This will be removed from all mature timber yield curves.

## INTEGRATED RESOURCE MANAGEMENT

### Modeling techniques for specific management objectives

Modeling integrated resource management objectives will be accomplished through the use of forest cover objectives, adjacency restrictions and cutblock size limitations. Table 26 identifies the various modeling techniques that will be used to constrain, monitor and assess the impact within various management zones.

[1] Okanagan Timber Supply Area Analysis Report, July 2000, Ministry of Forests

**Table 26: Modeling techniques for specific management zones**

| Location | Objective | Modeling technique(s) |
|---|---|---|
| Mule Deer Winter Range RMZ | 33% of forested area in the moderate snow pack zone and 15% of forested area in the shallow snow pack zone in snow interception cover | Constrain forest cover in moderate snow pack zones by analysis unit average provided by Grant Furness (December 19, 2001 email). LRMP allows up to 50% on nthlb, so apply 50% of constraint to thlb. Forest cover must be fir greater than 120 years. |
| Big Horn Sheep RMZ | Provide forest cover that is adequate to meet thermal, snow interception and security requirements | Maintain 33% of forested area greater than age 60 |
| All zones except the visual management zone | Adjacency restrictions and three pass harvesting sequence | No more than 33% of the timber harvesting landbase will be less than 2 m |
| Visual management zone | Maintain visual quality | Described in Table 26 below |

**Water**

Impacts of harvest and regeneration activities will be monitored in the Vaseux, Wolfcub, Shuttleworth, Inkaneep and McKinney watersheds during the analysis. To model impacts on hydrology, an area-weighted hydrological green-up height was determined. H60 areas were determined by watershed and these require a 6-meter green-up. The remaining area of each watershed TFL requires a 2-meter green-up. The percent-weighted calculation is (.60 x 6m) + (.4 x 2m) = 4.4m.

**Visual landscape Inventory**

The Okanagan Shuswap LRMP updated the Visual Landscape Inventory. Table 27 summarizes the visually effective greenup height as well as the maximum harvested percent below the visually effective green-up height. Values from each VQO for green-up height and maximum percent harvested were assigned to each VAC, using the values provided in the Okanagan Shuswap LRMP Appendix 6. An area-weighted green-up height and area-weighted maximum percent harvested were determined for each VQO. Slight modifications were made because the majority of the viewing distance is considered to be Background, with smaller portions of Midground. Harvest practices vary depending on local circumstances, but are generally various sized clearcuts with reserves.

**Table 27: Green-up height and maximum height determination for each VQO**

| VQO | Area | | | Green-up | | | Maximum % harvested | | | Area-weighted | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | VAC | | | VAC | | | VAC | | | Green-up | Max. % harvested |
| | L | M | H | L | M | H | L | M | H | | |
| M | 0 | 2,301.1 | 622.1 | 5 | 3 | 3 | 20 | 30 | 30 | 3 | 30 |
| R | 614.4 | 1,051.2 | 0 | 5 | 3 | 3 | 5 | 15 | 15 | 3.7 | 11.3 |
| PR | 0 | 1,609.2 | 3,020.7 | 5 | 3 | 3 | 10 | 20 | 20 | 3 | 20 |
| Total | 614.4 | 4,961.5 | 3,642.8 | | | | | | | | |

#### Recreation

The Okanagan Shuswap LRMP updated the recreation inventory. Most of the recreation within TFL 15 is dispersed except for two designated sites. These do not require any specific modeling techniques and for the purposes of timber supply analysis, existing constraints are assumed to accommodate any impacts.

#### Wildlife management

No additional constraints are required above those in Table 26.

#### Adjacent cutblock greenup

Stands will be eligible for harvest when the adjacent cutblock has attained a stand height of 2 meters in all zones except the Visual Management Zone, where green-up heights are 3 and 3.7 meters. Time to green-up height is determined from height age output data generated from special TIPSY runs for each leading species for each future regeneration table and is shown in Table 28 below.

**Table 28: Green-up ages by leading species for future regeneration tables**

| Future regen table | Site index | Pl | | | Sx | | | Fd, Lw, Py | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 3 | 3.7 | 2 | 3 | 3.7 | 2 | 3 | 3.7 |
| f13h, f14h | 10 | 15 | 20 | 24 | 23 | 30 | 33 | 18 | 23 | 27 |
| f7 | 12 | 13 | 17 | 20 | 20 | 25 | 28 | 16 | 20 | 23 |
| f1 | 13 | 12 | 16 | 18 | 19 | 24 | 26 | 15 | 19 | 21 |
| f10h, f2, f13, f9h | 15 | 11 | 14 | 16 | 17 | 21 | 23 | 13 | 17 | 19 |
| f14, | 16 | 10 | 13 | 15 | 16 | 20 | 22 | 13 | 16 | 18 |
| f3, f4, f5, f9 | 18 | 9 | 12 | 13 | 14 | 18 | 20 | 12 | 14 | 16 |
| f6, | 19 | 9 | 11 | 12 | 14 | 17 | 19 | 11 | 14 | 15 |
| f10, f11, f12 | 20 | 8 | 11 | 12 | 13 | 17 | 18 | 11 | 13 | 15 |
| f8 | 21 | 8 | 10 | 11 | 13 | 16 | 18 | 11 | 13 | 14 |

#### Landscape level biodiversity emphasis

The Okanagan Shuswap LRMP identifies TFL15 as falling completely within the

TFL Anarchist Landscape Unit, which has a low Biodiversity emphasis option.

### Reduction to reflect volume retention within cutblocks

Riparian volume retention is prescribed in Table 13 as basal area retention goals. These will be applied in the wood supply model at the time of harvest. Deletions for WTP's will be made in wood supply model as well. Non-merchantable material will be left on site for coarse woody debris. Patches and stand remnants retained after harvest will be comprised of non-merchantable material in the majority of the cases. Data from post-code silviculture prescriptions indicates that 0.7% of the area is maintained as reserves. This number is assumed to be located within the productive forest landbase without any bias for site series, and translates to 0.7% volume reduction and will be applied to all yield curves.

## TIMBER HARVESTING

### Minimum operability standards

Minimum operability reflects a balance between harvest flow objectives, the impact of constraints on flow and on-the-ground operability. On-the-ground operability is a balance between volume, piece size and diameter distribution and demand for various log products. In future regeneration culmination of mai will be targeted, if stand volume and other merchantability criteria characteristics are acceptable. The Timber Supply Forester will be kept abreast of the development of minimum operability throughout the Timber Supply Analysis.

### Initial harvest rate

Weyerhaeuser wishes to maintain the harvest level of 70,000$m^3$/yr for TFL 15 for as long as possible.

### Harvest rules

Minimum harvest operability criteria are an output from the Timber supply analysis and are a balance of product and harvest flow objectives and land management commitments. The harvesting of merchantable stands within the TFL will be in accordance with the long-term species, terrain and timber type profiles and manufacturing facility requirements, with emphasis towards (not in priority):

- infested, diseased or salvage stands;
- stands susceptible to infestation or loss; and
- mature/overmature stands
- stocking class 4 stands

Harvesting priorities are determined within WOODSTOCK in order to meet the maximum harvest objective. Generally this will be to harvest the oldest first to ensure vigorous stands replace the existing growing stock. However some of the biodiversity constraints will force the harvesting of younger stands in order to meet old seral objectives.

## OPTION ASSUMPTIONS

Weyerhaeuser will test a patch management strategy for TFL 15 during the 20-year plan preparation. Table 29 below contains the data for the patch size target distributions as well as the data for the sensitivity analysis around the testing of seral stage distribution targets.

**Table 29: Patch size distribution targets for natural disturbance types**

| Natural disturbance type | Patch size | Percent |
|---|---|---|
| NDT3 with Fdi | <40 | 20-30 |
| | 40-80 | 25-40 |
| | 80-250 | 30-50 |
| NDT3 without Fdi | <40 | 10-20 |
| | 40-250 | 10-20 |
| | 250-1000 | 60-80 |
| NDT4 | <40 | 30-40 |
| | 40-80 | 30-40 |
| | 80-250 | 20-30 |

**Appendix 1: Tree Farm Licence 15, Vegetation Resources Inventory Statistical Adjustment. JS Thrower & Associates, April 2003**

## Appendix 2: SC4 harvesting performance and FDP plans

| CP | BLOCK | Logged | Plan | Grand Total |
|---|---|---|---|---|
| 215 | 3 | 4.4 | | 4.4 |
| 216 | 4 | 12.6 | | 12.6 |
| 224 | 2,3,4,5,6,9,10,11,12,13 | | 144.0 | 144.0 |
| 226 | 5,6 | 1.8 | 4.4 | 6.2 |
| 227 | 1 | | 3.2 | 3.2 |
| 272 | 3,9 | 0.4 | | 0.4 |
| 292 | 3 | 0.4 | | 0.4 |
| 294 | 1 | 0.0 | | 0.0 |
| 322 | 2,3 | 2.1 | | 2.1 |
| 324 | 1,6,7,8 | 14.0 | 10.2 | 24.2 |
| 47 | 8,9 | 0.3 | | 0.3 |
| 472 | 3 | 0.1 | | 0.1 |
| 473 | 5,9,10,11 | | 24.6 | 24.6 |
| 48 | 8 | 0.0 | | 0.0 |
| 491 | 5,6,7 | 8.1 | | 8.1 |
| 493 | 1,2 | | 2.0 | 2.0 |
| 605 | 2 | 9.2 | | 9.2 |
| 63 | 4,6,7 | 4.7 | 7.5 | 12.2 |
| UNK | SHU003,7,8,9,11,12,13,14,15,18 VAS 14,18 | | 148.7 | 148.7 |
| Total | | 58.1 | 344.6 | 402.7 |

**Appendix 3: Terrestrial ecosystem mapping with wildlife interpretations for Weyerhaeuser TFL15, March 2000, Geowest Environmental Consultants Ltd. Volume 1**

**Appendix 4: Site index adjustments using BEC Classification on TFL 15, Final Report, 2000. J.S. Thrower & Associates Ltd.**

## Appendix 5: Application of Douglas-fir Protocols to Natural Disturbance Type 4 on TFL 15. Final Report, 2003. JS Thrower & Associates, In Press

## Appendix 6: Basal area retention analysis

The intent of the Management Zone is to provide a buffer along the reserve zone that will help protect the integrity of the reserve zone. Current operating practice in the majority of cases is to leave the equivalent area in the management zone as the basal area requirement. For example if the basal area requirement is 50% and the management zone is 20 meters, 10 meters will be harvested and the remaining 10 meters will have 100% basal area retention. The values in Table 13 were converted into an effective basal area retention area, shown in Table 30 below.

**Table 30: Basal area retention calculations**

| Riparian Class | Management Zone | | | Effective basal area retention area |
|---|---|---|---|---|
| | Width (m) | Gross area (ha) | % basal area retention | |
| S2 | 20 | 46.8 | 50 | 23.4 |
| S3 | 20 | 91.3 | 50 | 45.6 |
| S4 | 20 | 94.0 | 30 | 28.2 |
| S5 | 30 | 24.0 | 25 | 6 |
| S6 large | 20 | 479.0 | 50 | 239.5 |
| B class lake | 190 | 17.7 | 50 | 8.9 |
| W3 | 30 | 5.8 | 50 | 2.9 |
| | | | Total | 354.5 |

Riparian zones are required along the complete length of the feature, regardless of the type of landbase that falls within the zone. The net area of TFL15 excluding lakes and marshes is 46,332.1 hectares (46,411.4 – 79.3). The effective basal area retention area of 354.5 hectares factors to a gross landbase reduction of 0.77 % (354.4 / 46,332.1). The timber harvesting landbase of 34,719.4 hectares is 73.0% of the net area excluding lakes, so the 0.77% gross landbase reduction factor reduces to 0.56% (0.73 x 0.77). This 0.56% net thlb reduction factor is assumed to be located within the thlb landbase without any bias for site series, and translates to 0.56% volume reduction and will be applied to all volume curves.

# Appendix 7: Evaluation of Forest Health Volume and Operational Adjustment Factors for TFL15 Timber Supply Modeling, and Identification of Knowledge Gaps

**A background Document for Growth and Yield Modeling Endeavors-**

**March 2003 JCH Forest Pest Management**

## Appendix 8: Volume Loses Due to Forest Health Factors

## Appendix 9: Forest health adjustment factors,

## May 2003, JS Thrower and Associates

## Appendix 10: VDYP yield table inputs

**Table 31: VDYP yield table inputs**

| Analysis unit | Inventory growth type | Site index range | Yield table name | Stocking class | Pl % | Py % | B % | Ep % | Fd % | S % | At % | Ac % | Lw % | Crown closure | Site index | Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F,F(Py),F(S) | A,B | >= 18.6 | 1 | | | 4 | | | 89 | 3 | | | 4 | 35 | 20 | 122.5 |
| F,F(Py),F(S) | A,B | 14.6-18.5 | 2 | | 1 | 3 | | | 90 | 2 | | | 4 | 38 | 16 | 966.2 |
| F,F(Py),F(S) | A,B | 14.6-18.5 | 2R | | | | | | 90 | | | | 10 | 40 | 15 | 1.0 |
| F,F(Py),F(S) | A,B | 8.6-14.5 | 3 | | 1 | 1 | | | 93 | 1 | | | 4 | 27 | 12 | 1,250.3 |
| F,F(Py),F(S) | A,B | 8.6-14.5 | 3R | R | | | | | 98 | | | | 2 | 28 | 13 | 10.8 |
| Py,FPy, FPl | C | >=15.6 | 5 | | 7 | 25 | | | 63 | | | | 5 | 36 | 17 | 740.8 |
| Py,FPy, FPl | C | 12.1-15.5 | 6 | | 5 | 48 | | | 44 | | | | 3 | 24 | 14 | 1,524.2 |
| Py,FPy, FPl | C | 7.0-12.0 | 7 | | 1 | 73 | | | 26 | | | | | 20 | 9 | 1,371.7 |
| Py,FPy, FPl | C | <=6.9 | 8 | | | 66 | | | 34 | | | | | 15 | 7 | 14.8 |
| Py,FPy, FPl | C | <=6.9 | 8R | R | | | | | 39 | 18 | | | 43 | 44 | 21 | 9.6 |
| L, LF, FL | D | >=18.1 | 9 | | 7 | 1 | | | 36 | 3 | | | 53 | 39 | 19 | 896.8 |
| L, LF, FL | D | 13.1-18.0 | 10 | | 6 | 1 | | | 39 | 1 | | | 52 | 34 | 15 | 4,537.1 |
| L, LF, FL | D | 13.1-18.0 | 10R | R | 1 | 5 | | | 35 | 2 | | | 58 | 24 | 14 | 31.2 |
| L, LF, FL | D | 8.0-13.0 | 11 | | 6 | 2 | | | 42 | 1 | | | 49 | 25 | 12 | 1,194.9 |
| L, LF, FL | D | 8.0-13.0 | 11R | R | 4 | 2 | | | 41 | 11 | | | 42 | 20 | 11 | 15.4 |
| L, LF, FL | D | <=7.9 | 12 | | 2 | 1 | | | 62 | | | | 34 | 25 | 8 | 44.4 |
| B, B S, B Pl | H | >=13.1 | 13 | | 15 | | 68 | | | 19 | | | | 37 | 14 | 130.1 |
| B, B S, B Pl | H | 8.0-13.0 | 14 | | 16 | | 60 | | | 23 | | | 1 | 32 | 11 | 502.1 |
| B, B S, B Pl | H | <=7.9 | 15 | | 1 | | 88 | | | 11 | | | | 19 | 3 | 96.5 |
| S | I | >=12.6 | 16 | | 2 | | 3 | | 2 | 91 | 2 | | | 47 | 18 | 137.4 |
| S | I | 7.5-12.5 | 17 | | 3 | | 5 | | | 92 | | | | 36 | 10 | 260.0 |
| S | I | <=7.4 | 18 | | 3 | | 2 | | | 95 | | 1 | | 23 | 6 | 62.9 |
| S | I | <=7.4 | 18R | R | 5 | | | | | 90 | 5 | | | 1 | 7 | 1.0 |

| Analysis unit | Inventory growth type | Site index range | Yield table name | Stocking class | Pl % | Py % | B % | Ep % | Fd % | S % | At % | Ac % | Lw % | Crown closure | Site index | Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SB, SF | J | >=12.6 | 19 | | 6 | | 16 | | 10 | 55 | 1 | 1 | 12 | 38 | 18 | 413.6 |
| SB, SF | J | 7.5-12.5 | 20 | | 8 | | 28 | | | 62 | | | 3 | 36 | 10 | 486.2 |
| SB, SF | J | <=7.4 | 21 | | 10 | | 33 | | 1 | 56 | | | | 31 | 6 | 259.3 |
| SPl, S Decid. | K | >=17.1 | 22 | | 27 | | 5 | 1 | 1 | 60 | 6 | | 1 | 48 | 21 | 93.0 |
| SPl, S Decid. | K | 12.6-17.0 | 23 | | 29 | | 6 | | 1 | 60 | 3 | | 1 | 41 | 15 | 269.8 |
| SPl, S Decid. | K | 7.9-12.5 | 24 | | 26 | | 9 | 1 | 1 | 63 | | | | 40 | 10 | 290.0 |
| SPl, S Decid. | K | <=7.8 | 25 | | 38 | | 8 | | | 54 | | | | 23 | 4 | 299.9 |
| PL | L | >=18.1 | 26 | | 94 | | | | | | | | 6 | 59 | 19 | 415.5 |
| PL | L | 13.6-18.0 | 27 | | 96 | | 1 | | | 1 | | | 2 | 55 | 15 | 4,611.9 |
| PL | L | 13.6-18.0 | 274 | 4 | 100 | | | | | | | | | 57 | 15 | 54.7 |
| PL | L | 7.5-13.5 | 28 | | 97 | | 1 | | | 1 | | | 1 | 53 | 12 | 5,367.3 |
| PL | L | 7.5-13.5 | 284 | 4 | 98 | | 1 | | | 1 | | | | 49 | 10 | 1,565.7 |
| PL | L | <=7.4 | 29 | | 100 | | | | | | | | | 39 | 6 | 55.2 |
| PL | L | <=7.4 | 294 | 4 | 98 | | 1 | | | 1 | | | | 37 | 6 | 145.9 |
| Pl S, Pl S B | M | >=18.1 | 30 | | 71 | | | | 6 | 4 | 1 | | 18 | 52 | 19 | 278.6 |
| Pl S, Pl S B | M | 13.6-18.0 | 31 | | 65 | | 4 | | 4 | 9 | 1 | | 18 | 49 | 15 | 2,008.4 |
| Pl S, Pl S B | M | 7.5-13.5 | 32 | | 65 | | 7 | | 6 | 10 | 1 | | 10 | 43 | 12 | 1,437.4 |
| Pl S, Pl S B | M | 7.5-13.5 | 324 | 4 | 72 | | 6 | | 2 | 11 | | | 9 | 48 | 10 | 123.2 |
| Pl S, Pl S B | M | <=7.4 | 33 | | 60 | | | | | | | | 40 | 60 | 6 | 3.0 |
| Pl S, Pl S B | M | <=7.4 | 334 | 4 | 53 | 1 | 24 | | 3 | 19 | | | | 42 | 5 | 44.9 |
| Pl Decid. | N | >=13.6 | 34 | | 64 | | | | 1 | 5 | 25 | | 5 | 50 | 16 | 85.5 |
| Pl Decid. | N | 9.4-13.5 | 35 | | 64 | | | 3 | | 3 | 26 | | 4 | 39 | 13 | 89.3 |
| Pl Decid. | N | 9.4-13.5 | 354 | 4 | 79 | | | | | | 21 | | | 24 | 10 | 24.0 |
| At | O | All | 36 | | 20 | | | | 2 | 11 | 63 | | 4 | 47 | 18 | 149.2 |
| Ep | P | All | 37 | | | 5 | | 62 | 4 | 4 | 25 | | 5 | 39 | 13 | 124.4 |
| Ac | Q | all | 38 | | | | | | 5 | 5 | | 90 | | 31 | 17 | 3.9 |

## Appendix 11: Existing regeneration yield tables

**Table 32: Existing regeneration yield table inventory summary data**

| Yield table | Pl % | Py % | Ba % | Ep % | Fd % | S % | At % | Ac % | Lw % | SI | Ht | Age | Stems | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1e2 | | | | | 84 | | | | 16 | 15 | 8.1 | 25 | 986 | 18.2 |
| 2e1 | | | | | 85 | 3 | | | 12 | 13 | 10.3 | 37 | 1,313 | 43.4 |
| 2e2 | | 2 | | | 98 | | | | | 17 | 6.7 | 25 | 2,163 | 7.7 |
| 3e1 | 3 | 5 | | | 90 | | | | 2 | 17 | 6.4 | 36 | 386 | 37.4 |
| 3e2 | 9 | 3 | | | 86 | | | | 2 | 17 | 2.6 | 18 | 825 | 7.7 |
| 5e1 | 22 | 10 | | | 55 | | 1 | | 12 | 17 | 11.3 | 40 | 1,684 | 137.8 |
| 5e2 | 29 | 15 | | | 38 | 4 | | | 14 | 19 | 2.8 | 13 | 2,309 | 68.5 |
| 5e3 | 8 | 54 | | | 13 | | | | 21 | 17 | 0.7 | 4 | 1,244 | 69.4 |
| 6e1 | 3 | 71 | | | 24 | | | | 2 | 14 | 8.0 | 35 | 605 | 141.7 |
| 6e2 | 4 | 62 | | | 17 | | | | 18 | 16 | 2.2 | 13 | 959 | 58.5 |
| 6e3 | 4 | 38 | | | 20 | | | | 15 | 17 | 0.7 | 5 | 1,093 | 7.2 |
| 7e1 | 14 | 16 | | | 60 | | | | 10 | 17 | 6.0 | 38 | 1,132 | 75.7 |
| 7e2 | 10 | 20 | | | 60 | 5 | | | 5 | 17 | 4.8 | 28 | 1,022 | 5.1 |
| 8e1 | 38 | | | | 46 | 1 | | | 15 | 19 | 3.6 | 45 | 726 | 15.5 |
| 9e1 | | | | 4 | 57 | | | | 39 | 17 | 14.0 | 38 | 626 | 75.9 |
| 9e2 | 14 | 6 | 1 | | 28 | 2 | | | 48 | 17 | 5.0 | 17 | 2,217 | 110.9 |
| 9e3 | 20 | | | | 6 | 4 | | | 70 | 20 | 0.9 | 5 | 1,444 | 60.5 |
| 10e1 | 6 | | | | 36 | 2 | | | 56 | 17 | 9.3 | 36 | 1,777 | 212.9 |
| 10e2 | 7 | 8 | | | 25 | 2 | | | 58 | 17 | 3.2 | 16 | 1,753 | 305.1 |
| 10e3 | 26 | 5 | | | 17 | | | | 52 | 18 | 0.6 | 4 | 1,348 | 224.4 |
| 11e1 | 6 | | | | 63 | 1 | | | 31 | 19 | 6.4 | 38 | 1,850 | 156.8 |
| 11e2 | | 3 | | | 36 | | | | 61 | 18 | 2.8 | 26 | 591 | 55.5 |
| 13e1 | 21 | | 61 | | | 17 | | | | 13 | 6.5 | 31 | 6,239 | 17.8 |
| 13e2 | 26 | | 57 | | | 13 | | | 4 | 17 | 2.8 | 19 | 4,972 | 234.8 |
| 13e3 | 30 | | 40 | | | 20 | 7 | | 3 | 20 | 0.7 | 6 | 2,840 | 1.4 |
| 14e1 | 20 | | 70 | | | 10 | | | | 13 | 6.6 | 46 | 5,297 | 21.2 |
| 14e3 | 24 | | 52 | | | 24 | | | | 14 | 0.2 | 3 | 4,120 | 7.2 |
| 16e2 | 7 | | 1 | | | 92 | | | | 13 | 2.2 | 18 | 2,681 | 21.8 |
| 17e2 | 13 | | 3 | | | 84 | | | | 16 | 1.1 | 15 | 1,172 | 5.5 |
| 17e3 | 3 | | | | | 97 | | | | 20 | 0.4 | 6 | 567 | 15.7 |
| 19e1 | 3 | | 40 | | 6 | 47 | | | 4 | 19 | 4.7 | 31 | 6,633 | 1.5 |
| 19e2 | 7 | | 17 | | 20 | 51 | | | 5 | 17 | 1.8 | 17 | 2,386 | 8.0 |
| 20e2 | 11 | | 34 | | | 55 | | | | 14 | 1.2 | 16 | 2,091 | 11.7 |
| 22e2 | 30 | | 9 | | | 61 | | | 1 | 20 | 2.2 | 17 | 3,280 | 86.7 |
| 22e3 | 43 | | 9 | | | 47 | | | | 19 | 0.7 | 7 | 1,325 | 20.4 |
| 23e1 | 40 | | | | 6 | 50 | | | 4 | 19 | 4.1 | 29 | 6,633 | 8.4 |

| Yield table | Pl % | Py % | Ba % | Ep % | Fd % | S % | At % | Ac % | Lw % | SI | Ht | Age | Stems | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23e2 | 36 | | 16 | | | 47 | 2 | | | 20 | 1.3 | 13 | 3,143 | 28.0 |
| 24e2 | 18 | | 7 | | | 75 | | | | 13 | 1.2 | 16 | 1,188 | 7.5 |
| 26e1 | 96 | | | | | | | | 4 | 20 | 12.8 | 35 | 1,284 | 8.5 |
| 26e2 | 93 | | 1 | | 1 | 2 | 1 | | 1 | 19 | 4.1 | 14 | 4,046 | 1,908.2 |
| 26e3 | 93 | | 1 | | 1 | 3 | | | 2 | 20 | 1.0 | 6 | 4,001 | 285.3 |
| 27e1 | 97 | | | | | | | | 3 | 18 | 12.9 | 45 | 4,164 | 3.6 |
| 27e2 | 95 | | 1 | | | 2 | | | 2 | 19 | 3.5 | 15 | 3,532 | 1,782.0 |
| 27e3 | 98 | | | | | | | | 2 | 19 | 0.9 | 6 | 1,328 | 56.4 |
| 28e1 | 100 | | | | | | | | | 21 | 6.1 | 33 | 700 | 2.9 |
| 28e2 | 99 | | 1 | | | | | | | 14 | 3.6 | 21 | 3,186 | 347.5 |
| 28e3 | 94 | | 1 | | | 5 | | | | 14 | 0.9 | 6 | 1,473 | 27.0 |
| 30e1 | 60 | | 9 | | 1 | 27 | | | 3 | 17 | 11.7 | 32 | 3,396 | 10.0 |
| 30e2 | 66 | | 9 | | 3 | 12 | 1 | | 9 | 19 | 4.2 | 15 | 3,779 | 964.6 |
| 30e3 | 66 | | 5 | | 2 | 16 | | | 11 | 20 | 0.9 | 5 | 2,592 | 601.3 |
| 31e1 | 68 | | 9 | | | 23 | | | | 19 | 8.3 | 29 | 2,003 | 215.8 |
| 31e2 | 66 | | 10 | | 3 | 7 | 1 | | 12 | 19 | 3.2 | 14 | 3,654 | 1,507.5 |
| 31e3 | 63 | 3 | 4 | | 3 | 12 | | | 14 | 17 | 0.8 | 5 | 1,685 | 376.3 |
| 32e1 | 55 | 12 | | | 27 | 1 | | | 6 | 18 | 8.7 | 43 | 1,203 | 37.0 |
| 32e2 | 66 | | 10 | | 1 | 16 | | | 8 | 18 | 2.7 | 16 | 2,998 | 106.1 |
| 32e3 | 65 | | 12 | | | 22 | | | | 14 | 0.7 | 5 | 1,974 | 170.5 |
| 34e1 | 60 | | | | | 20 | 20 | | | 19 | 17.6 | 42 | 1,298 | 3.3 |
| 34e2 | 71 | | | | 1 | 7 | 19 | | 3 | 19 | 3.9 | 16 | 4,333 | 200.1 |
| 35e2 | 59 | | 1 | | | 10 | 30 | | | 19 | 2.8 | 18 | 2,320 | 1.6 |

## Appendix 12: Future regeneration yield table names and inputs

**Table 33: Future regeneration yield table site series matrix**

<table>
<tr><th rowspan="3">Site series</th><th colspan="6">Future regeneration tables</th></tr>
<tr><th colspan="6">Leading species</th></tr>
<tr><th>Pl</th><th>Sw</th><th>Ba</th><th>Fd</th><th>Py</th><th>Lw</th></tr>
<tr><td>ESSFdc101</td><td>f14</td><td colspan="5" rowspan="6">f14</td></tr>
<tr><td>ESSFdc102</td><td rowspan="2">f13</td></tr>
<tr><td>ESSFdc103</td></tr>
<tr><td>ESSFdc104</td><td rowspan="3">f14</td></tr>
<tr><td>ESSFdc105</td></tr>
<tr><td>ESSFdc106</td></tr>
<tr><td>ESSFdcp100</td><td rowspan="2">f13</td><td colspan="5" rowspan="2">f13</td></tr>
<tr><td>ESSFdcu00</td></tr>
<tr><td>IDFdm101</td><td>f4</td><td colspan="5">f5</td></tr>
<tr><td>IDFdm103</td><td colspan="6">f7</td></tr>
<tr><td>IDFdm104</td><td>f4</td><td colspan="5">f5</td></tr>
<tr><td>IDFdm105</td><td colspan="6" rowspan="2">f8</td></tr>
<tr><td>IDFdm106</td></tr>
<tr><td>IDFdm107</td><td colspan="6">f16</td></tr>
<tr><td>IDFxh101</td><td colspan="6" rowspan="4">f2</td></tr>
<tr><td>IDFxh103</td></tr>
<tr><td>IDFxh104</td></tr>
<tr><td>IDFxh105</td></tr>
<tr><td>IDFxh106</td><td colspan="6" rowspan="4">f3</td></tr>
<tr><td>IDFxh107</td></tr>
<tr><td>IDFxh108</td></tr>
<tr><td>IDFxh109</td></tr>
<tr><td>MSdm101</td><td>f10</td><td>f12</td><td>f12</td><td colspan="3">f11</td></tr>
<tr><td>MSdm102</td><td colspan="6">f15</td></tr>
<tr><td>MSdm103</td><td colspan="6">f11</td></tr>
<tr><td>MSdm104</td><td rowspan="2">f10</td><td colspan="2" rowspan="2">f12</td><td colspan="3" rowspan="2">f11</td></tr>
<tr><td>MSdm105</td></tr>
<tr><td>MSdm106</td><td colspan="6">f9</td></tr>
<tr><td>MSdm107</td><td colspan="6" rowspan="2">f16</td></tr>
<tr><td>MSdm108</td></tr>
<tr><td>PPxh101</td><td colspan="6" rowspan="6">f1</td></tr>
<tr><td>PPxh102</td></tr>
<tr><td>PPxh103</td></tr>
<tr><td>PPxh104</td></tr>
<tr><td>PPxh106</td></tr>
<tr><td>PPxh107</td></tr>
</table>

**Table 34: Future regeneration yield table inputs**

| Yield table | Pl | Fd | S | Py | Lw | B | SI | Regen. delay | Genetic gain | Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | P= planted, I = ingress, N = natural, A= advanced | | | | | | | | | |
| f1 | | P100 | | P700 | | | 13 | 1 | Na | 410.3 |
| f2 | | P200 | | P600 | I200 | | 15 | 1/3 | Na | 4,388.8 |
| f3 | | P600 | P100 | P200 | P100 | | 18 | 1 | 2.1 | 361.2 |
| f4 | N2000 | | | | | | 18 | 3 | Na | 6,326.9 |
| f5 | N400 | N400 | | | N400 | | 18 | 3 | Na | 4,413.8 |
| f7 | P100 | P600 | | P200 | | | 12 | 1 | 0.3 | 451.2 |
| f8 | P600 | P200 | P400 | | P200 | | 21 | 1 | 0.3/2.1 | 653.8 |
| f9 | P1400 | I250 | | | I125 | | 23 | 1/3 | 0.3 | 269.6 |
| f9h[1] | P1400 | | I250 | | | I125 | 15 | 1/3 | 0.3 | 60.2 |
| f10 | N4000 | | | | | | 20 | 3 | Na | 15,512.2 |
| f10h | P600 | | P600 | | | A200 | 18 | 1/3 | 0.3/2.1 | 2.6 |
| f11 | P1200 | I250 | | | I125 | | 19 | 1/3 | 0.3 | 2,600.2 |
| f12 | P1200 | | P/I250 | | | A/I125 | 20 | 1/3 | 0.3 | 1,515.5 |
| f13 | N1500 | | | | | A200 | 14 | 3 | Na | 955.3 |
| f13h | P1200 | | I250 | | I125 | A200 | 9 | 1/3 | 0.3 | 1,732.0 |
| f14 | P800 | | P600 | | | A/I250 | 16 | 1/3 | 0.3/2.1 | 1,942.8 |
| f14h | P800 | | P400 | | | I200 | 11 | 1/3 | 0.3/2.1 | 1,629.0 |
| f15 | P600 | I200 | | | 1200 | A100 | 15 | 1/3 | 0.3 | 17.7 |
| f16 | P600 | | P600 | | | A200 | 17 | 1/3 | 0.3/2.1 | 248.8 |

[1] h denotes a high elevation (> 1,820m) subdivision of the future regeneration strata

**Appendix 13: Seedlot, planting summary for genetically improved seed**

| CP & block | Planting year | Planting unit ID | # Trees | Species | Seedlot # |
|---|---|---|---|---|---|
| 511-3 | 1996 | 1 | 580 | Pli | 60012 |
| 411-14 | | 1 | 2,620 | Pli | 60012 |
| **1996 Total** | | | **3,200** | | |
| 511-2 | 1997 | 2 | 780 | Pli | 60401 |
| 511-6 | | 2 | 6,460 | Pli | 60401 |
| 44-2 | | 1 | 4,620 | Pli | 60401 |
| 44-20 | | 1 | 3,410 | Pli | 60401 |
| 411-10 | | 2 | 850 | Pli | 60401 |
| 411-11 | | 2 | 5,330 | Pli | 60401 |
| 411-4 | | 1 | 6,200 | Pli | 60401 |
| **1997 Total** | | | **27,650** | | |
| MIL-SITE | 1999 | 2 | 7,880 | Pli | 60402 |
| 293-6 | | 1 | 1,080 | Sx | 06845 |
| 46-8 | | 1 | 440 | Sx | 60094-SX |
| 99-13 | | 1 | 1,780 | Sx | 60094-SX |
| 99-9701 | | 3 | 1,620 | Sx | 60094-SX |
| 56-6 | | 1 | 1,880 | Sx | 60094-SX |
| 46-3 | | 3 | 440 | Sx | 60094-SX |
| 46-7 | | 2 | 1,580 | Sx | 60094-SX |
| 46-8 | | 2 | 200 | Sx | 60094-SX |
| 47-8 | | 2 | 300 | Sx | 60094-SX |
| 322-2 | | 4 | 3,510 | Sx | 60094-SX |
| 36-6 | | 2 | 200 | Sx | 60094-SX |
| 293-8 | | 2 | 4,360 | Sx | 60094-SX |
| 38-3 | | 2 | 2,310 | Sx | 60242 |
| 38-7 | | 4 | 1,440 | Sx | 60242 |
| 38-7 | | 5 | 4,435 | Sx | 60242 |
| 38-2 | | 3 | 3,360 | Sx | 60242 |
| 38-2 | | 4 | 2,085 | Sx | 60242 |
| 38-3 | | 2 | 3,550 | Sx | 60242 |
| 292-2 | | 2 | 5,000 | Sx | 60242 |
| 292-3 | | 2 | 5,220 | Sx | 60242 |
| 292-4 | | 3 | 4,200 | Sx | 60242 |
| 292-5 | | 1 | 7,770 | Sx | 60242 |
| 293-2 | | 2 | 180 | Sx | 60242 |
| 293-7 | | 2 | 160 | Sx | 60242 |
| 214-2 | | 1 | 1,050 | Sx | 60242 |
| 222-2 | | 2 | 990 | Sx | 60242 |
| 222-2 | | 3 | 770 | Sx | 60242 |
| 54-2 | | 2 | 1,500 | Pli | 60401 |

| CP & block | Planting year | Planting unit ID | # Trees | Species | Seedlot # |
|---|---|---|---|---|---|
| 322-2 | | 3 | 4,020 | Pli | 60401 |
| 45-10 | | 2 | 90 | Pli | 60402 |
| 47-3 | | 4 | 220 | Pli | 60402 |
| 47-11 | | 1 | 960 | Pli | 60402 |
| 45-10 | | 4 | 130 | Pli | 60402 |
| 45-9 | | 4 | 940 | Pli | 60402 |
| 43-11 | | 2 | 460 | Pli | 60402 |
| **1999 Total** | | | **76,110** | | |
| 56-5 | 2000 | 2 | 1,200 | Sx | 06842 |
| 323-3 | | 1 | 1,300 | Sx | 60242 |
| 228-2 | | 1 | 5,400 | Sx | 60242 |
| 228-4 | | 1 | 6,060 | Sx | 60242 |
| 322-2 | | 1 | 1,540 | Sx | 60242 |
| 491-7 | | 1 | 700 | Sx | 60242 |
| 38-2 | | 1 | 2,680 | Sx | 60242 |
| 481-2 | | 1 | 290 | Sx | 60242 |
| 481-2 | | 2 | 970 | Sx | 60242 |
| 491-5 | | 1 | 3,610 | Sx | 60242 |
| 56-5 | | 1 | 340 | Sx | 60242 |
| 56-5 | | 2 | 1,780 | Sx | 60242 |
| 38-4 | | 1 | 11,290 | Sx | 60242 |
| 293-10 | | 1 | 740 | Sx | 60242 |
| 233-4 | | 1 | 710 | Sx | 60242 |
| 233-4 | | 2 | 1,750 | Sx | 60242 |
| 45-12 | | 1 | 130 | Pli | 60404 |
| 45-12 | | 2 | 2,330 | Pli | 60404 |
| 43-7 | | 1 | 340 | Pli | 60404 |
| **2000 Total** | | | **43,160** | | |
| 51-D2 | 2001 | 1 | 1,650 | Lw | 60708 |
| 51-D2 | | 1 | 21,030 | Lw | 60708 |
| 47-17 | | 1 | 1,211 | Pli | 60404 |
| 241-4 | | 1 | 8,680 | Pli | 60404 |
| 272-6 | | 1 | 15,160 | Pli | 60404 |
| 47-17 | | 1 | 549 | Pli | 60404 |
| 47-14 | | 1 | 1,200 | Pli | 60404 |
| 47-16 | | 1 | 1,600 | Pli | 60404 |
| 47-7 | | 1 | 2,220 | Pli | 60404 |
| 401-4 | | 1 | 21,980 | Pli | 60404 |
| 401-5 | | 1 | 3,700 | Pli | 60404 |
| 401-5 | | 2 | 14,940 | Pli | 60404 |
| 43-16 | | 1 | 1,440 | Pli | 60404 |
| 43-16 | | 2 | 1,000 | Pli | 60404 |

| CP & block | Planting year | Planting unit ID | # Trees | Species | Seedlot # |
|---|---|---|---|---|---|
| 272-8 | | 1 | 2,660 | Sx | 60434 |
| 493-4 | | 1 | 950 | Sx | 60434 |
| 493-4 | | 2 | 450 | Sx | 60434 |
| 493-3 | | 1 | 1,285 | Sx | 60434 |
| 493-3 | | 2 | 2,275 | Sx | 60434 |
| 272-6 | | 1 | 1,880 | Sx | 60434 |
| 493-5 | | 1 | 2,240 | Sx | 60434 |
| 493-5 | | 2 | 2,080 | Sx | 60434 |
| 272-7 | | 1 | 1,250 | Sx | 60434 |
| 272-7 | | 2 | 8,890 | Sx | 60434 |
| 272-11 | | 1 | 1,460 | Sx | 60434 |
| 47-7 | | 1 | 800 | Sx | 60434 |
| 401-2 | | 1 | 1,400 | Sx | 60434 |
| 272-3 | | 1 | 1,620 | Sx | 60434 |
| 228-3 | | 1 | 7,760 | Sx | 60434 |
| 47-5 | | 1 | 1,350 | Lw | 60708 |
| 401-4 | | 1 | 14,580 | Lw | 60708 |
| 43-12 | | 1 | 2,160 | Lw | 60708 |
| 47-11 | | 1 | 2,825 | Lw | 60717 |
| 47-14 | | 1 | 2,400 | Lw | 60717 |
| 47-15 | | 1 | 3,345 | Lw | 60717 |
| 47-16 | | 1 | 1,200 | Lw | 60717 |
| 43-8 | | 1 | 3,615 | Lw | 60717 |
| 401-4 | | 1 | 9,585 | Lw | 60717 |
| 43-14 | | 1 | 4,545 | Lw | 60717 |
| 43-4 | | 1 | 975 | Lw | 60717 |
| 43-4 | | 2 | 1,000 | Lw | 60717 |
| 43-6 | | 1 | 1,380 | Lw | 60717 |
| **2001 Total** | | | **182,320** | | |
| 226-3 | 2002 | 2 | 12,800 | Sx | 60435 |
| 226-6 | | 1 | 5,550 | Sx | 60435 |
| 226-3 | | 1 | 7,300 | Sx | 60435 |
| 226-2 | | 1 | 7,200 | Sx | 60714 |
| 226-4 | | 1 | 2,840 | Sx | 60714 |
| 226-4 | | 2 | 9,520 | Sx | 60714 |
| 226-4 | | 3 | 3,000 | Sx | 60714 |
| 99-0001 | | 1 | 880 | Sx | 60714 |
| 99-9702 | | 1 | 500 | Sx | 60714 |
| 402-5 | | 1 | 6,630 | Pli | 61123 |
| 402-2 | | 1 | 3,585 | Pli | 61123 |
| **2002 Total** | | | **59,805** | | |
| **Grand Total** | | | **392,245** | | |