Integrated Stewardship Strategy for the Invermere TSA

Data Package

Version 1.0

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Project 419-38

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List of Acronyms

AD	Anthropogenic Disturbance
ATC	Access Timing Constraints
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
CMAI	Culmination of Mean Annual Increment
DRM	Rocky Mountain Natural Resource District
ECA	Equivalent Clearcut Area
FAIB	Forest Analysis and Inventory Branch
FMER	Fire Maintained Ecosystems Restoration
FMLB	Forest Management Land Base
FMLB	Forest Management Land Base
FRPA	Forest Range and Practices Act
FSC	Forest Stewardship Council
FTA	Forest Tenure Administration
GIS	Geographic Information System
HCVF	High Conservation Value Forest
IBS	Insect Beetle Spruce (Spruce Beetle)
ISS	Integrated Stewardship Strategy
KBLUP	Kootenay-Boundary Land Use Plan
LMZ	Lakeshore Management Zone
LU	Landscape Units
MAI	Mean Annual Increment
MHA	Minimum Harvest Age
MMA	Mature Management Area
MPB	Mountain Pine Beetle
NRL	Non-Recoverable Losses
NDT	Natural Disturbance Type
OAF	Operational Adjustment Factor
OF	Open Forest
OGMA	Old Growth Management Area
OR	Open Range
PEM	Predictive Ecosystem Mapping
PFT	Problem Forest Type
RESULTS	Reporting Silviculture Updates and Land Status tracking System
RMZ	Resource Management Zone
SFMP	Sustainable Forest Management Plan
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TSA	Timber Supply Area
TSR	Timber Supply Review
UWR	Ungulate Winter Range
VDYP	Variable Density Yield Prediction
VRI	Vegetation Resource Inventory
WHA	Wildlife Habitat Area
WTRA	Wildlife Tree Retention Area

Document Revision History

Version	Date	Notes/Revisions
0.1	Dec 31, 2016	○ Distributed to project team for review and comment. Only included the Base Case Scenario assumptions based on TSR Benchmark.
0.2	Apr 18, 2018	○ Revised to include updated land base definition, growth and yield, ECA target calculation and Silviculture Scenario assumptions
0.3	Aug 15, 2018	○ Incorporated edits and updates throughout the document in preparation for the project team review. ○ Described assumptions applied for the Base Case Scenario plus preliminary assumptions for the Silviculture Scenario.
0.4	Oct 19, 2018	○ Described criteria for the tactics applied in the Silviculture Scenario (section 4).
0.5	Apr 15, 2019	○ Described approach and preliminary assumptions for Wildlife Scenario (section 5).
0.6	Oct 6, 2019	○ Described approach and assumptions applied in the Reserve Scenario (section 6). ○ Described approach and assumptions applied in the Combined Scenario (section 7).
1.0	Nov 28, 2019	○ No further edits at this time. Made available for distribution on website. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silviculture-strategy-areas

1 Introduction

The British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development initiated an Integrated Stewardship Strategy (ISS) – sustainable forest management analysis – in the Invermere Timber Supply Area (TSA). This Data Package describes the information that is material to the analysis including the model used, data inputs, and assumptions.

1.1 Project Area

The Invermere TSA is located in the southeastern corner of British Columbia within the Kootenay-Boundary Natural Resource Region – Rocky Mountain Natural Resource District (Figure 1). It is bordered by the Golden TSA and Tree Farm Licence (TFL) 14 to the north, the Rocky Mountains and Alberta border to the east, the Skookumchuck Valley (and Cranbrook TSA) to the south and the Purcell Mountains to the west. It includes the cities of Invermere, Windermere, Canal Flats, and Edgewater and the smaller communities of Wilmer, Radium Hot Springs, and Parsons. The project (Invermere TSA) covers an area of approximately 1.316 million hectares out of which 151,784 hectares is covered by TFL14.

Plans and strategies in place for the Invermere TSA include:

- East Kootenay Land Use Plan
- Kootenay-Boundary Land Use Plan (KBLUP)
- Kootenay Boundary Higher Level Plan Order
- Southern Rocky Mountain Management Plan
- Cranbrook West Recreation Management Strategy
- Provincial Timber Management Goals and Objectives
- Federal Recovery Strategy for Northern Caribou
- Sustainable Forest Management Plan (Forest Licensees)
- Silviculture Strategies Types 1 and 2
- BC Mountain Pine Beetle Model
- Future Forest Products and Fibre Use Strategy
- Multiple Resource Value Assessment
- Provincial Stewardship/ Timber Harvesting Land Base Stabilization
- Forest Health Strategy
- Ecosystem Restoration
- Whitebark Pine
- Fire and Fuel Management

Many aspects of these plans will have an influence on the development of this Data Package and modeling strategies.

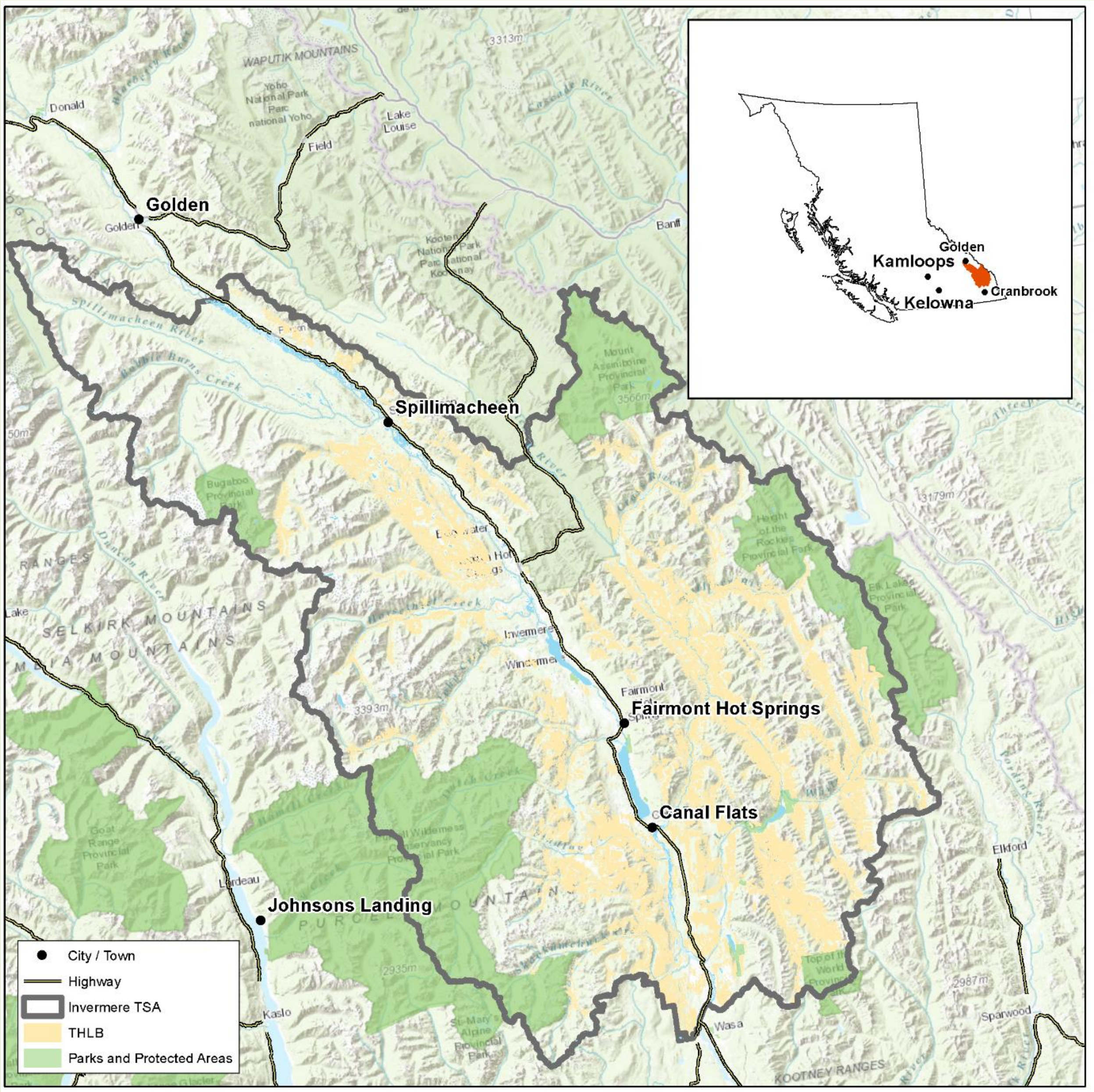


Figure 1   Invermere TSA

1.2 CONTEXT

This document is the third in a series of documents developed through the ISS process.

1) Situation Analysis – describes in general terms the situation for the project area – this could be in the form of a PowerPoint presentation with associated notes or a compendium document.
2) Scenario Development - describes the development of a Combined Scenario based on multiple scenarios explored through forest-level modelling and analysis scenarios.
3) **Data Package** – describes the information that is material to the analysis including the model used, data inputs and assumptions.

4) Analysis Report – provides modeling outputs and rationale for choosing a preferred scenario.
5) Tactical Plan – direction for the implementation of the preferred scenario.
6) Implementation Monitoring Plan – direction on monitoring the implementation of the ISS; establishing a list of appropriate performance indicators, developing monitoring responsibilities and timeframe, and a reporting format and schedule.
7) Final Report – summary of all project work completed.

1.3 MODEL

The PATCHWORKS ™ modeling software was used for forecasting and analysis. This suite of tools is sold and maintained by Spatial Planning Systems Inc. of Deep River, Ontario (Tom Moore - www.spatial.ca).

PATCHWORKS is a fully spatial forest estate model that can incorporate real world operational considerations into a strategic planning framework. It utilizes a goal seeking approach and an optimization heuristic to schedule activities across time and space in order to find a solution that best balances the targets and/or goals defined by the user. Targets can be applied to any aspect of the problem formulation. For example, the solution can be influenced by issues such as mature/ old forest retention levels, young seral disturbance levels, patch size distributions, conifer harvest volume, growing stock levels, snag densities, CWD levels, ECAs, specific mill volumes by species, road building/ hauling costs, delivered wood costs, net present values, etc. The PATCHWORKS model continually generates alternative solutions until the user decides a stable solution has been found. Solutions with attributes that fall outside of specified ranges (targets) are penalized and the goal seeking algorithm works to minimize these penalties, resulting in a solution that reflects the user objectives and priorities. PATCHWORKS' flexible interactive approach is unique in several respects:

- PATCHWORKS' interface allows for highly interactive analysis of trade-offs between competing sustainability goals.
- PATCHWORKS software integrates operational-scale decision-making within a strategic-analysis environment: realistic spatial harvest allocations can be optimized over long-term planning horizons. PATCHWORKS can simultaneously evaluate forest operations and log transportation problems using a multiple-product to multiple-destination formulation. The model can identify in precise detail how wood flows to mills over a complex set of road construction and transportation alternatives.
- Allocation decisions can be made considering one or many objectives simultaneously and objectives can be weighted for importance relative to each other (softer vs. harder constraints).
- Allocation decisions can include choices between stand treatment types (clearcut vs. partial cut, fertilization, rehabilitation, etc.).
- Unlimited capacity to represent a problem – only solution times limit model size.
- Fully customizable reporting on economic, social and environmental conditions over time.
- Reports are built web-ready to share analysis results easily – even comparisons of multiple indicators across multiple scenarios.

1.4 DATA SOURCES

Table 1 lists the spatial data and sources used in the ISS Base Case Scenario.

Table 1 Spatial Data Sources

Spatial Data	Source	Feature Name	Effective
TSA Boundary	WHSE_ADMIN_BOUNDARIES	FADM_TSA	2011
Parks and Protected Areas	WHSE_TANTALIS	TA_PARK_ECORES_PA_SVW	2011
Ownership	Forsite consolidated	own_consolidated	2012
Special Use Permit	WHSE_FOREST_TENURE	FTEN_SPEC_USE_PERMIT_POLY_SVW	2011
Biogeoclimatic Ecosystems (BEC v10)	WHSE_FOREST_VEGETATION	BEC_BIOGEOCLIMATIC_POLY	2016
Landscape Units (LU)	WHSE_LAND_USE_PLANNING	RMP_LANDSCAPE_UNIT_SVW	2011
Old Growth Management Areas (OGMA) Non Legal	WHSE_LAND_USE_PLANNING	RMP_OGMA_NON_ALL_SVW	2014
Fire Management Ecosystem Restoration for DRM	REG_LAND_AND_NATURAL_RESOURCE	FOR_FIRE_MAINT_ECO_RES_DRM_SP	2011
Wildland Urban Interface	BC Wildfire Service, 2015 Wildfire Threat Analysis (PSTA)	Wildland_Urban_Interface_Buffer_Area	2015
Ungulate Winter Ranges (UWR) deer, moose, sheep , goat (u-4-008)	Forsite consolidated	EK_UWR_u_4_008	2015
Ungulate Winter Ranges (UWR) Caribou (u-4-013 and u-4-014)	WHSE_WILDLIFE_MANAGEMENT	WCP_UNGULATE_WINTER_RANGE_SP	2010
Wildlife Habitat Areas (WHA)	WHSE_WILDLIFE_MANAGEMENT	WCP_WILDLIFE_HABITAT_AREA_POLY	2011
Wildlife Management Area	WHSE_TANTALIS	TA_WILDLIFE_MGMT_AREAS_SVW	2011
Community Watersheds	WHSE_WATER_MANAGEMENT	WLS_COMMUNITY_WS_PUB_SVW	2011
Domestic Watersheds	REG_LAND_AND_NATURAL_RESOURCE	DOMESTIC_WATERSHED_KBLUP_POLY	2011
Enhanced Resource Development Zones - Timber	WHSE_LAND_USE_PLANNING	RMP_PLAN_LEGAL_POLY_SVW	2011
Mature Management Areas	WHSE_LAND_USE_PLANNING	RMP_PLAN_NON_LEGAL_POLY_SVW	2011
Water bodies	WHSE_BASEMAPPING.FWA	FWA_water	2011
FSC classified streams	Forsite consolidated	FSC_Streams	2015
Riparian Buffers	Forsite consolidated	FOR_riparian_buffer	2015
Lakeshore Riparian Management Zones	TSR3 coverage	EK_lmz	2004
Environmentally Sensitive Areas	TSR3 coverage	EK_ESA	2004
Terrain Stability	TSR3 coverage	EK_ter	2004
Operability	TSR3 coverage	EK_ope	2004
Slope Class Operability	TRIM/Forsite	slope_3_class_clip_sgl_e2	2016
Visual Landscape Inventory (VLI)	WHSE_FOREST_VEGETATION	REC_VISUAL_LANDSCAPE_INVENTORY	2011
Recreation Polygons	WHSE_FOREST_TENURE	FTEN_RECREATION_POLY_SVW	2011
Forest Inventory –VRI	WHSE_FOREST_VEGETATION	VEG_COMP_LYR_R1_POLY	2014
Forest Inventory – Cut Blocks	WHSE_FOREST_TENURE	FTEN_CUT_BLOCK_POLY_SVW	2016
Forest Inventory – Results Openings	WHSE_FOREST_VEGETATION	RSLT_OPENINGS_SVW	2016
Forest Inventory – Reserves	WHSE_FOREST_VEGETATION	RSLT_FOREST_COVER_RESERVE_SVW	2015
Forest Inventory – Results Forest Cover	WHSE_FOREST_VEGETATION	RSLT_FOREST_COVER_INV_SVW	2016
Forest Inventory – Managed Site Index	FAIB	sprod_09	2015
Seed Planning Units	WHSE_FOREST_VEGETATION	SEED_PLAN_UNIT_POLY_SVW	2015
Wildfires – Historic (1919-2015)	WHSE_LAND_AND_NATURAL_RESOURCE	PROT_HISTORICAL_FIRE_POLYS_SP	2016
Wildfires – Current (2016)	WHSE_LAND_AND_NATURAL_RESOURCE	PROT_CURRENT_FIRE_POLYS_SP	2016
BC Mines	Imageries - Forsite	BC_Mines	2018

1.5 Forest Inventory Updates

The current forest inventory available for the Invermere TSA is based on projects prepared as far back as 1981. Most of the current inventory was completed in 1995 from images captured in 1988. While the Forest Inventory Planning lines and attributes were rolled over to the Vegetation Resources Inventory (VRI) format in 2000, attributes that were not part of 1992 project are missing from the VRI standard (e.g., Basal Area).

More recently, forest cover updates were conducted using the Reporting Silviculture Updates and Land Status tracking System (RESULTS) data up to 2009 and were adjusted for denudation to 2013 using satellite imagery. The latest VRI version acquired from DataBC was projected to January 1, 2016.

Logging

The 2016-projected VRI was updated for logging disturbance to March 2016 using harvest areas identified in the consolidated cutblock layer that includes blocks from the forest tenure administration (FTA) and RESULTS data. Logged areas from FTA were first identified by year of harvest completion (Disturbance_End_Date), and then by year of harvest start (Disturbance_Start_Date). Logged areas using RESULTS openings were identified in the following order: (1) by year of disturbance start, (2) for remaining records by year of harvest completion, (3) for remaining records by year of denudation completion date 1 and (4) for remaining records by year of denudation completion date 2. Finally, the depletions were applied only if the disturbance year determined in the consolidated cutblocks layer was more recent than the VRI field “REFERENCE_YEAR”.

Efforts were made to identify areas that were partially harvested using the silvicultural system codes (DN1_SILSYS), and the RESULTS Forest Cover Inventory and VRI layers to determine the age of partially harvested areas.

Wildlife tree retention areas (i.e., wildlife tree patches) were identified using the RESULTS Forest Cover Reserve layer. The stand ages of these areas were assigned using VRI and RESULTS Forest Cover Inventory layers.

Mountain Pine Beetle

In the Invermere TSA, forest-level damage from the Mountain Pine Beetle (MPB) was relatively little had was quickly managed as licensees proactively logged infested stands. Consequently, no additional forest cover updates were applied for MPB.

Wildfires

Over the summer of 2017, approximately 50,000 ha of forested lands were impacted by wildfire throughout the Cranbrook and Invermere TSAs. The project team elected to incorporate available data from 3 sources:

- Rapid Burn Area Mapping (RBAM) from Hatfield Consultants (~24,800 ha)
- Relativized Burn Ration Index (RBR) from HR GIS Solutions (~24,900 ha)
- Fire Boundaries from Wildfire Management Branch (~200 ha)

These spatial datasets were consolidated and included in the GIS resultant to account for losses due to wildfire (Table 2).

Table 2 Methodology to Accomodate 2017 Wildfires into Inventory and Volume Adjustments

Burn Severity	Stand Percentage Dead	Approach to Adjust Yields and Stand Ages
Unburnt	0%	• No changes to existing stand yields.
Low	50%	• Maintain stand age for assessing forest requirements. • Reduce existing yields by 50%. • Add 50% of existing yields regenerating from stand age of 0.
Moderate & No Data	70%	• Maintain stand age for assessing forest requirements. • Reduce existing yields by 70%. • Add 70% of existing yields regenerating from stand age of 0.
High	100%	• Reset stand age to 0 for assessing forest requirements. • Use 100% existing yields regenerating from stand age of 0.

The ISS Base Case Scenario did not account for wildfires that occurred prior to 2017.

Volume Adjustments

The 1992 inventory was audited in 1997 where it was found that the natural stand volumes in the TSA were overestimated in the inventory by 5%. This difference was deemed to be statistically insignificant.

The following adjustments were made stand yield projections (section 2.4):

- Existing natural stands: in the successive partial cuts regime for open forests within fire maintained ecosystem restoration (FMER) areas, yields were reduced by 49.5% following the first entry; in line with the designed partial cut regime described in the TSR4 data package. No reductions were applied to other yields generated in VDYP for natural existing stands. In contrast, dead MPB and deciduous component yield were deducted in the ISS scenarios.
- Existing managed stands: in the TSR Benchmark scenario, yields were reduced by 5.3% to account for existing roads. This yield reduction was not applied in the ISS scenarios because existing roads were spatially defined and removed from the net harvestable land base.
- Future managed stands: yields for stands harvested and regenerated from the existing natural stands (in both TSR and ISS scenarios), were reduced by 3.8% to account for future roads.

2 Base Case Scenario

This section describes the assumptions used to model the ISS Base Case Scenario that mimics status quo management. Results from this scenario provides the baseline from which to compare other scenarios.

2.1 Land Base Assumptions

Land base assumptions are used to define the forest management land base (FMLB) and the timber harvesting land base (THLB) for the TSA. The THLB is the area identified to support timber harvesting while the FMLB is the area that contributes toward meeting non-timber objectives (e.g., biodiversity).

Table 3 Invermere TSA Land Base Area Summary

Factor		Total Area (ha)	Effective Area (ha)	% of Total Area	% of FMLB
Total Area		**1,315,602**	**1,315,602**	**100.0%**	
Less:	TFL 14	150,911	150,911	11.5%	
	Private	83,704	83,704	6.4%	
	Christmas Trees Permit	6,398	6,398	0.5%	
	Indian Reserves	8,730	8,730	0.7%	

Factor	Total Area (ha)	Effective Area (ha)	% of Total Area	% of FMLB
National Parks	41,275	41,275	3.1%	
Woodlots	9,704	9,704	0.7%	
Misc leases	773	773	0.1%	
Special Permit	84	64	0.0%	
Mines	469	371	0.0%	
Vegetated, non FMLB	0	0	0.0%	
Non-treed	131,184	64,964	4.9%	
Non-vegetated	358,476	328,562	25.0%	
Not typed	9,359	9,178	0.7%	
Factored Roads		5,961	0.5%	
Total Crown Forested Land base (FMLB)	*(in FMLB)*	**605,006**	**46.0%**	**100.0%**
Less: Parks	79,297	79,297	6.0%	13.1%
Inoperable	309,240	235,336	17.9%	38.9%
Steep Slopes (>70%)	65,249	6,767	0.5%	1.1%
Terrain Class V in CWS	4,449	618	0.0%	0.1%
ESA	70,186	5,821	0.4%	1.0%
Non Merchantable	49,819	4,979	0.4%	0.8%
Low Sites	155,746	2,116	0.2%	0.3%
Misc Reserves	94	42	0.0%	0.0%
Crown UREP	800	648	0.0%	0.1%
UWR Caribou	26,421	998	0.1%	0.2%
Wildlife Management Area	6,180	2,586	0.2%	0.4%
WHA	182	107	0.0%	0.0%
OGMA +MMA	73,782	16,075	1.2%	2.7%
Scenic Preservation	211	0	0.0%	0.0%
Recreation Polygons	0	1	0.0%	0.0%
FSC Endangered Forests	37,922	1,969	0.1%	0.3%
FSC Rare/Uncommon Ecosystems	4,397	1,644	0.1%	0.3%
Existing WTRAs	4,399	2,352	0.2%	0.4%
100% In-Block Retention	2,833	2,833	0.2%	0.5%
Gross THLB		**240,817**	**18.3%**	**39.8%**
Less: Partial Removals				
Slopes 40-70% (50%)	223,639	40,227	3.1%	6.6%
Terrain Class V outside CWS (95%)	40,604	1,688	0.1%	0.3%
Terrain Class IV outside CWS (5%)	102,846	2,379	0.2%	0.4%
Terrain Class IV in CWS (95%)	5,094	273	0.0%	0.0%
PFT Pine >80yrs (29%)	34,251	1,270	0.1%	0.2%
PFT Pine 61-80yrs (18%)	11,112	415	0.0%	0.1%
PFT Pine 41-60yrs (35%)	772	57	0.0%	0.0%
PFT Pine <40yrs (80%)	6,989	196	0.0%	0.0%
Isolated Stands	695	695	0.1%	0.1%
In-Block Retention*		20,575	1.6%	3.4%
Effective THLB		**173,042**	**13.2%**	**28.6%**
Less: Future Reductions				
Open Range Conversion	1,829	1,305	0.1%	0.2%
Future Roads (3.8%)		4,369	0.3%	0.7%
Long-term Effective THLB		**167,368**	**12.7%**	**27.7%**

** In-Block Retentions include FSC Rare Ecosystems, (50%), WTRA (6% for existing natural stands and 3.5% for existing managed stands), and Riparian (% determined spatially for each polygon).*

After defining the land base, it was summarized below according to BEC zones and age classes. The area distribution of BEC zones for both the THLB and non-harvestable Land Base (NHLB) – together equalling the FMLB - are shown in Figure 2.

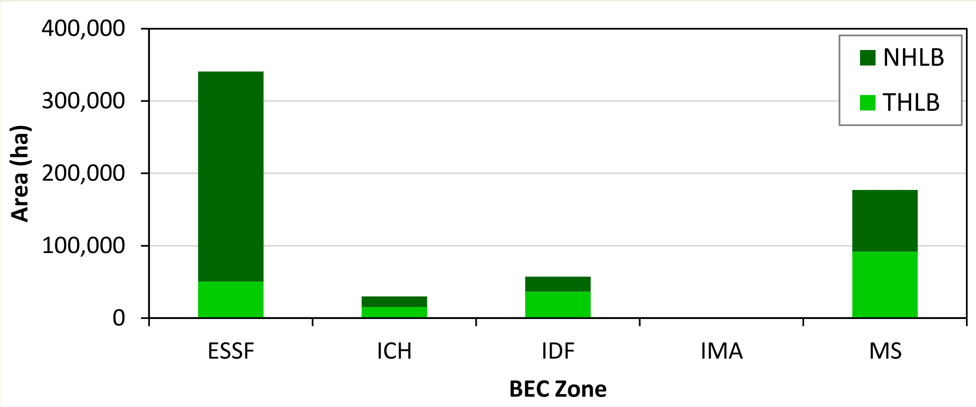


Figure 2 BEC Zone Distribution across the Forest Management Land Base

After applying assumptions to reflect changes in stand age from disturbances (i.e., fire, insects, and harvesting) the current age class distribution on both the THLB and NHLB are shown in Figure 3.

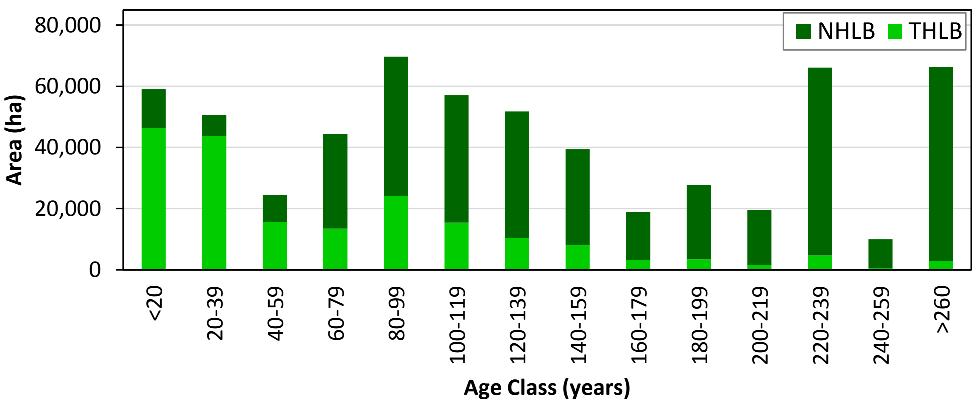


Figure 3 Age Class Distribution across the Forest Management Land Base

<u>**TSR4 approach where different**</u>

The FMLB area was smaller by approximately 28,000 ha due, primarily, to differences with ownership, double-counting TFL14 area, criteria for defining non-forest and non-productive areas, and aspatial road reductions, as detailed in each section below.

2.1.1 Non-TSA Ownership

The FMLB was spatially reduced for all areas identified as tree farm licences, national parks, private land, Indian Reserve, woodlot licences, community forest agreements, Christmas tree permits, miscellaneous leases, special use permits, and non-commercial brush. Forsite also made efforts to consolidate an ownership layer that is divided into ownership codes describing the nature of ownership of a particular parcel of land. The consolidated ownership layer integrated three sources: DataBC ownership layer, TSR3 ownership layer, and FAIB TSR4 resultant. Firstly, the DataBC ownership layer was corrected for ownership schedule for codes 61 and 69 – where area >100 ha, the ownership schedule was changed to “C” instead of “N” to be in line with the ownership and schedule code summary dated March 4, 2016. Secondly, the private lands (40-N, 72-A), Christmas tree permits (75-N), woodlot licenses (77-N), and miscellaneous leases (99-N) were updated from TSR3 ownership layer. Thirdly, the private lands (40-N) from the FAIB TSR4 resultant were updated to the consolidated ownership layer used in the ISS Base Case Scenario.

Visual checks of the ownership layer were conducted by district staff. While not perfect, the DRM staff concluded that the consolidated ownership layer was suitable for the ISS Base Case Scenario.

Table 4 Ownership Classification and FMLB Contribution

Ownership Code and Schedule	Description	Is FMLB	Is THLB	Gross Area (ha)	FMLB Area (ha)	Effective THLB Area (ha)
40-N	Private - Crown grants	N	N	83,617	0	0
51-N	National Parks	N	N	41,275	0	0
52-N	Indian Reserves	N	N	8,730	0	0
60-N	Crown - Ecological Reserves	Y	N	164	139	0
61-C	Crown - UREP	Y	Y	13,527	5,615	2,921
61-N	Crown - UREP	Y	N	1,197	800	0
62-C	Crown - Forest Management Unit (TSA)	Y	Y	502,119	334,360	113,568
63-N	Crown - Provincial Park Class A	Y	N	198,706	79,149	0
65-N	Crown - Wildlife Management Areas	Y	N	13,300	6,178	0
68-N	Crown - BMTA	Y	Y	14,633	5,315	506
69-C	Crown - Miscellaneous Reserves	Y	Y	270,320	173,357	56,048
69-N	Crown - Miscellaneous Reserves	Y	N	141	94	0
72-A	Private - Schedule A Land	N	N	82	0	0
72-B	Crown - Schedule B Land	N	N	150,911	0	0
75-N	Crown - Christmas Tree Permits	N	N	6,398	0	0
77-A	Private - Awarded Woodlot License	N	N	5	0	0
77-B	Crown - Awarded Woodlot license	N	N	1,348	0	0
77-N	Crown - Awarded Woodlot license	N	N	8,356	0	0
99-N	Crown - Miscellaneous leases	N	N	773	0	0
Total				**1,315,602**	**605,006**	**173,043**

According to the ownership and schedule code summary dated on 2016-03-04, the Crown-BMTA (68-N) areas should not contribute to the THLB. However, the district staff reviewing the consolidated ownership layer concluded that 68-N should not be part of the TSA and that there appeared to be errors in the DataBC ownership layer. Thus, 68-N contributed to both the FMLB and THLB.

In addition to the ownership consolidate layer, Forsite referred to a spatial representation for non-road special use permits and mines (FTEN_SPEC_USE_PERMIT_POLY_SVW layer) plus satellite images to identify other mining sites. These areas were also excluded from the FMLB.

TSR4 approach where different

A different source for ownership than the latest dataset available on DataBC. A comparison of ownership data indicated that TSR4 removed approximately 48,000 ha less than the ISS (Table 5). However, the netdown table comparison indicated that TSR4 netted down approximately 104,000 ha less non-Crown area than the ISS (Table 6). The extra difference in the Table 6 is explained by additional ISS exclusions due to special use permits and BC mines.

Note that the non-Crown area of 253,364 ha in Table 5 includes TFL14 (150,939 ha). These same non-Crown area value of 253,364 ha and TFL14 area value of 150,939 ha also appear in the TSR4 netdown table, but as separate netdown factors (September 2016, Invermere Timber Supply Analysis Public Discussion Paper). Thus, the TFL 14 area was double-counted in the TSR4 netdown table.

The TSR4 FMLB should have been the sum of NHLB and THLB in Table 5 less the Non-TSA, Non-Productive, and Existing Roads in Table 6 (i.e., 728,034 ha). The value of 728,034 also equals the TSR4

FMLB area in Table 6 (577,096 ha) plus TFL14 area in Table 6 (150,939 ha). The ISS Non-Crown in Table 5 is lower than in Table 6 because ISS excluded special use permits and BC mines, in addition to the ownership layer information.

Table 5 Ownership Summary Comparison between TSR4 and ISS

Ownership	TSR4 (ha)	ISS (ha)	Difference	
			ha	%
Non-Crown*	253,364	301,496	48,131	16%
NHLB (Schedule N)**	216,337	213,507	-2,831	-1%
THLB (Schedule C)**	845,900	800,599	-45,301	-6%
Total	**1,315,602**	**1,315,602**	**0**	**0%**

**ownership code <60 or >69, any ownership schedule. Non-Crown includes TFL 14.*
***ownership code ≥60 and ≤69.*

Table 6 Netdown Factor Comparison between TSR4 and ISS

Netdown Factor	TSR4 (Net ha)	ISS (Net ha)	Difference	
			ha	%
TFL14	150,939	150,911	-28	0%
Non-Crown	253,364	151,019	-103,887	-69%
Non-TSA	1,542			
Non-Productive	322,602	402,704	80,102	20%
Existing Roads	10,059	5,961	-4,098	-69%
FMLB	577,096	605,006	27,910	5%
Total	**1,315,602**	**1,315,602**	0	0%

2.1.2 Non-Forest and Non-Productive

Non-forest includes areas that are non-vegetated and/or non-productive for commercial timber. Areas were identified using the approach described in Table 7.

Table 7 Non-Forest and Non-Productive Classification

Description	Assumption	Gross Area (ha)	Net area (ha)
Not Typed	No logging history and BCLCS Level 1 = U, or null	9,359	9,178
Not Vegetated	No logging history and BCLCS Level 1 = N	358,476	328,562
Not Treed	No logging history and BCLCS Level 2 = N	130,985	64,819
Alpine	No logging history and BCLCS Level 2 = A	0	0
Vegetated, non FMLB	No logging history and Height <5m and Crown closure (all layers except 'D') ≤10 and inventory Age >120 years	0	0
Water FWA	No logging history and Lakes/Rivers from FWA dataset (if missed by VRI)	199	145
Total		**499,018**	**402,704**

The logging history was determined as follows:

- Valid VRI harvest date
- VRI 'LINE_7B_DISTURBANCE_HISTORY' field starts with character 'L'
- Valid consolidated cutblock id and no wildlife tree retention area

TSR4 approach where different

The FMLB field in the VRI dataset was the only criterion used to determine all non-forest and non-productive areas. By comparison, TSR4 excluded approximately 80,000 ha less of these areas than ISS (Table 6).

2.1.3 Cleared Right-of-Ways

The road network used in the ISS Base Case Scenario was provided by the Provincial Cumulative Effects Team as a consolidated road dataset using provincial data (Digital Road Atlas, Forest Tenure, and RESULTS forest cover inventory) and road data from other industries (oil and gas, and mining). Forsite removed most of the in-block skid trails that were visibly overgrown or within partially treated cutblocks. Road sections were then placed into 5 classes based on fields ROAD_CLASS and ROAD_SURFACE and, since road buffer widths were not described in TSR4, those described in TSR3 were applied (Table 8). Railways, power lines, and pipelines were also consolidated to account for non-forested area.

Table 8 Existing Roads and Non-Forested Widths

Class	Width (m)	ROAD_CLASS	ROAD_SURFACE
Highways	40	'paved'	Not 'local'
Secondary Road	15.9	'paved' 'loose' 'rough'	'local' Not in ['resource', 'unclassified', 'proposed', 'trail'] Not in ['resource', 'unclassified', 'proposed', 'trail', 'skid']
Logging Road	8.5	'loose' 'rough'	In ['resource','unclassified','proposed'] In ['resource','proposed']
In-block	5.0	'rough' 'overgrown' 'unknown' NULL	In ['unclassified', 'skid'] Any Not 'trail' Any
Trail	3.0	'loose' 'rough' 'unknown'	'trail' 'trail' 'trail'
Railway	33.8	NA	NA
Power Line	49.0	NA	NA
Pipeline	30.8	NA	NA

Finally, through a post-processing spatial exercise, the area of existing roads was prorated from resultant polygons that intersect with all buffers in Table 8. Future roads were addressed as a 3.8% reduction on future stand yields.

TSR4 approach where different

Roads were aspatially removed from the FMLB by applying a 5.3% area reduction to each polygon. Thus, TSR4 netted out approximately 4,000 ha more roads than ISS (Table 6).

2.1.4 Provincial Parks and Ecological Reserves

Provincial parks and Ecological Reserves were identified from 2 sources: Consolidated Ownership layer ("60-N", "63-N", "64-N", "67-N") and TA_PARK_ECORES_PA_SVW. These areas are excluded from the THLB but remained in the FMLB to contribute towards non-timber objectives (e.g., biodiversity).

Table 9 Provincial Parks and Ecological Reserves

Reserve Name	Gross FMLB Area (ha)
63-N	8
Bugaboo Park	543
Columbia Lake Ecological Reserve	42
Columbia Lake Park	100
Dry Gulch Park	27
Height Of The Rockies Park	9,701
Mount Assiniboine Park	14,231
Mount Sabine Ecological Reserve	8
Premier Lake Park	758
Purcell Wilderness Conservancy Corridor Protected	1,869
Purcell Wilderness Conservancy Park	45,346
Ram Creek Ecological Reserve	97
Thunder Hill Park	13
Top Of The World Park	4,812
Whiteswan Lake Park	1,687
Windemere Lake Park	54
Total	**79,297**

TSR4 approach where different

In addition to the parks layer, all ownership codes between 60 and 69, where schedule was "N", were considered a provincial park or ecological reserves and removed from the FMLB.

2.1.5 Inoperable/Inaccessible

Physical limitations, such as steep slopes, limited road access, or extreme yarding distance, were considered operational barriers to harvesting. These areas were deemed inoperable and excluded from the THLB remained in the FMLB to contribute towards non-timber objectives. Since operability mapping is not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Two sources were used to identify inoperable areas (Table 10): TSR3 operability layer and the 3-class slope layer derived from the provincial terrain resource information management (TRIM) data using GIS terrain analysis. The operability thresholds and percent reductions were estimated by FAIB using harvest history mapping over the last 10 years. The 50% reduction for cable yarding areas (slope >40% and ≤70%) was applied through a GIS algorithm which considered, in descending order, the proximity to the existing THLB patches >4 ha in size and productivity of the cable yarding areas. Inoperable stands were first selected from polygons without previous netdown factors. This resulted in less than 50% of the net area identified as spatially explicit THLB area exclusions for cable yarding. This was appropriate as these constrained polygons are less likely to be harvested. While this approach serves to spatialize inoperable stands for modelling purposes, it may not be appropriate for operational planning.

Table 10 Description of Inoperable Areas

Description	Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)
Operability (I or N)	100	309,240	235,336
Slope>70% inoperable	100	65,249	6,767
Slope >40% and ≤70% (cable yarding)	50	223,639	40,227
Total		**598,128**	**282,330**

TSR4 approach where different

The 50% reduction was applied aspatially to each FMLB polygon where slope >40% and ≤70%. Inoperable areas with logged history were not reassigned as THLB. The slope layer used appeared to be corrupt as it did not align with TRIM contours. The net area identified as inoperable in TSR4 was approximately 71,000 ha less than the ISS Base Case Scenario with the largest difference being classification of steep slopes.

2.1.6 Unstable Terrain

Forest licensees and BCTS have completed terrain stability mapping over areas of concerns throughout the TSA in a variety of projects and intensities (Level B and D). Areas classified as U (unstable) or class V (high instability) were considered unsuitable for timber harvesting. Class P (potentially unstable) or IV (moderately unstable) are generally suitable for harvesting. Other classes were also considered suitable for timber harvesting. Since terrain mapping is not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Based on licenses and BCTS input, FAIB determined that outside of the community watersheds, 5% of the class P or IV areas are not harvested, while 5% of the class U or V are harvested. Within the community watersheds, 5% of the areas in class P or IV are harvested, while none in the class U or V are harvested.

A GIS algorithm was developed to spatially identify areas to exclude from the THLB in each terrain stability class (Table 11). Polygons were selected to meet each percentage requirement by considering, in a descending order, proximity to the existing THLB, patches >4 ha in size, and productivity of the terrain stability areas. As with the partial netdowns for cable yarding on steep slope, the GIS algorithm prioritized polygons without previous netdown factors as exclusions for terrain stability. While this approach serves to spatialize PFTs for modelling purposes, it may not be appropriate for operational planning.

Table 11 Description of Terrain Stability Mapping

Description	Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)
Class U or V in CWS	100	4,449	618
Class P or IV in CWS	95	5,094	273
Class U or V outside CWS	95	40,604	1,688
Class P or IV outside CWS	5	102,846	2,379
Total		**152,993**	**4,958**

TSR4 approach where different

Reductions were applied aspatially to each FMLB polygon according to Table 11. The terrain stability layer used appeared to be corrupt as large areas of terrain stability mapping were missing attributes, while these polygons appeared to be present in the FAIB resultant. Areas with logged history were not reassigned as THLB. The net area identified as unstable was approximately 3,900 ha less than the ISS Base Case Scenario.

2.1.7 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESA) are a broad classification of areas that indicate sensitivity for unstable soils (E1s), forest regeneration problems (E1p), snow avalanche risk (E1a), and high water values (E1h). Terrain stability mapping provides a more accurate estimate of soil stability than E1s mapping. However, where no terrain mapping exists, E1s mapping takes precedence. While some ESAs are 100% excluded from THLB (Table 12), forested areas can contribute to meeting non-timber objectives. Since ESA mapping is not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Table 12 Environmentally Sensitive Areas

Description	Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)
E1s where no terrain stability mapping exists	100	53,489	3,198
E1p outside FMER-OF/OR	100	14,535	1,789
E1a, E1h	100	2,162	833
Total		**70,186**	**5,821**

TSR4 approach where different

Issues with the terrain stability mapping (section 2.1.6) were related to the application of ESA netdowns, resulting in differences in ESA netdown areas; TSR4 resulted in approximately 600 ha net area less than the ISS Base Case Scenario. Areas with logged history were not specifically reclassified as THLB.

2.1.8 Non-Merchantable Forest Types

Non-merchantable forest types are stands that include tree species currently not utilized, or not economically viable, or low quality timber (i.e., small size and/or low volume). Under certain market conditions, future analyses might include some of these stands (Table 13). These stands are 100% excluded from the THLB. Since stand attributes used to identify non-merchantable forest types are not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Table 13 Non-merchantable forest types

Description	Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)
Decadent (age >200 years) CW, HW, or BL leading	100	23,405	349
Deciduous or PA leading	100	26,414	4,630
Total		**49,819**	**4,979**

TSR4 approach where different

The whitebark pine species code (Pa) appeared to be mistaken by white pine species code (Pw) and the VRI projected age to year 2014 was misapplied for decadent stands. When these differences were adjusted to the correct values, the FAIB resultant produced almost identical results as the resultant used in the ISS Base Case Scenario. However, areas with logged history (deciduous- or Pa-leading) were not reassigned as THLB.

2.1.9 Low Productivity Sites

Low productivity sites are areas with commercial tree species that are not expected to reach minimum volumes to be economically viable. These stands were 100% excluded from THLB.

An important relationship exists between slopes, harvest system employed, minimum harvest criteria (section 0), and low productivity sites. Conventional harvesting systems on slopes <40%, typically require lower timber volume and piece size thresholds than the more expensive cable systems needed to harvest timber on steeper slopes (≥40%). The minimum volume thresholds for timber volume and piece size are higher. These differences in minimum harvest criteria must be incorporated into the definition of low productivity sites. Otherwise, areas classified as THLB will never be harvested because these stands never reach minimum harvest criteria.

The criteria for identifying low productivity sites is summarized in Table 14 and assumes that (1) pine and some Douglas-fir leading stands have a lower threshold for piece size and are more sensitive to increases in piece size with slope, and (2) other species are not differentiated based on slope, but the values reflect a weighted average of all conditions. Since stand attributes used to identify low productivity sites are not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Table 14 Low Productivity Sites

Description					Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)
Leading Species	**Slope**	**Min Volume (m^3/ha)**	**At age (years)**	**Site Index (m)**			
PL	<40%	150	120	<10	100	5,214	1,091
PL	≥40%	200	120	<12	100	23,023	0
F except FS	<40%	100	150	<10	100	874	354
F except FS	≥40%	150	150	<13	100	25,051	0
FS, S, PW	All	150	120	<8	100	33,084	314
All Others	All	150	120	<10	100	68,500	357
Total						**155,746**	**2,116**

<u>TSR4 approach where different</u>

The same criteria were used to identify low productivity sites. However, areas with logged history were not reassigned as THLB.

2.1.10 Problem Forest Types

Stands identified as problem forest types (PFT) have the potential to produce merchantable timber but will not likely be harvested due to marginal merchantability. While opportunities may exist to rehabilitate these stands, they were excluded from the THLB as partial reductions for modelling purposes (Table 15).

A GIS algorithm was developed to spatially identify areas to exclude PFTs from the THLB. The percentage reductions were applied by considering, in descending order, the proximity to the existing THLB patches >4 ha in size and productivity of the PFT stands. As with other partial netdowns described above, the GIS algorithm prioritized PFTs as polygons without previous netdown factors. While this approach serves to spatialize PFTs for modelling purposes, it may not be appropriate for operational planning. Finally, since stand attributes used to identify PFTs are not always accurate at a stand level, areas that were previously logged were reassigned as THLB.

Table 15 Problem Forest Types

Description				Reduction (%)	Gross FMLB Area (ha)	Net Area (ha)	Gross THLB Area (ha)
Leading Species	**Age (years)**	**Site Index (m)**	**Height (m)**				
PL	>40	<16	≤10.4	80	6,989	196	39
PL	41-60	<16	>10.4, ≤19.4	35	772	57	37
PL	61-80	<16	>10.4, ≤19.4	18	11,112	415	340
PL	>80	<16	>10.4, ≤19.4	29	34,251	1,270	902
Total					**53,124**	**1,937**	**1,318**

TSR4 approach where different

While the criteria and reduction percentages were the same, aspatial reductions for PFTs were applied to each FMLB polygon. The VRI projected age to year 2014 was misapplied for PFTs. When these differences were adjusted to the correct values, the TSR4 resultant produced almost identical results as the ISS Base Case Scenario. However, areas with logged history were not reassigned as THLB.

2.1.11 Miscellaneous Reserves

Miscellaneous reserves are areas that are classified by the consolidated ownership layer as 61-N or 69-N. Because of their reserved status denoted by the ownership layer, these areas were 100% excluded from the THLB.

Table 16 Miscellaneous Reserves

Description	Gross FMLB Area (ha)	Net Area (ha)
Crown Miscellaneous Reserves	94	42
Crown UREP	800	648
Total	**895**	**690**

TSR4 approach where different

These miscellaneous reserves were included in the Parks and Reserve netdown category.

2.1.12 Ungulate Winter Ranges and Wildlife Habitat Areas

Ungulate Winter Ranges (UWR) and Wildlife habitat Areas (WHA) with harvest restrictions were 100% excluded from the THLB. With UWRs, 'no harvest' areas were only applied to UWR U-4-013 and U-4-014, which were established for the protection of woodland caribou range. With WHAs, 'no harvest' areas included:

- Long-billed Curlew (WHA 4-066, 4-069, 4-070)
- Flammulated Owl (WHA 4-082, 4-083, 4-084, 4-085)
- Antelope-brush/blue-bunch wheatgrass (WHA 4-117)

Wildlife Management Areas designated under the Wildlife Act were also excluded from the THLB.

Table 17 Wildlife Habitat Areas and Ungulate Winter Ranges in No Harvest Zones

Description	Gross FMLB Area (ha)	Net Area (ha)
UWR Caribou	26,421	998
Wildlife Management Areas	6,180	2,586
WHA	182	107
Total	**32,782**	**3,691**

TSR4 approach where different

It is unclear if the Wildlife Management Areas were explicitly identified and excluded from THLB. The TSR4 only included a net area in the netdown table.

2.1.13 Riparian Zones

The classified stream line features, lakes, and wetlands were spatially identified using a consolidated dataset from TSR3 and updates conducted by licensees in other forest analysis projects related to Forest Stewardship Council (FSC) standards. Stream features were reclassified to Forest Range and Practices Act (FRPA) standards as follows: S1-S4 classes were identical between the two standards, FSC S5a/S5b to FRPA S5, and FSC S6a/S6b to FRPA S6.

Two sets of riparian buffers were developed, one following the FSC standards, and another following the FRPA standards. The FSC standards were applied only to the Canadian Forest Products Ltd. (Canfor) operating areas, while FRPA standards were applied to the rest of the TSA. Effective buffers were applied to the outside shape of the polygon features and on both sides of the line features are shown in In addition, Lakeshore Management Zones (LMZ) were established in TSR3 around some lakes and wetland complexes. The LMZ were also 100% excluded from the THLB regardless the standard (FRPA or FSC).

Table 18 and Table 19. These buffers were 100% excluded from the THLB.

In addition, Lakeshore Management Zones (LMZ) were established in TSR3 around some lakes and wetland complexes. The LMZ were also 100% excluded from the THLB regardless the standard (FRPA or FSC).

Table 18 Riparian Criteria for Streams

Stream Class	Description	FRPA				FSC		
		RRZ (m)	RMZ (m)	RMZ Min BA Retention	Effective Buffer (m)	RRZ Budget/Equivalent Minimums	RMZ Budget/Equivalent Minimums	Effective Buffer (m)
S1-A	>100m in width	0	100	20	20	6 ha/km or ~30m each side	8 ha/km or ~40m buffer each side with 65% BA retention (26m)	56 (30+26)
S1-B	>20 up to 100m in width	50	20	20	54			
S2	5-20 m in width	30	20	20	34			
S3	1.5 – 5 m in width (fish bearing or community watershed)	20	20	20	24	6 ha/km or ~30m each side	4 ha/km or ~20m buffer each side with 65% BA retention (13m)	43 (30+13)
S4	<1.5 m in width (fish bearing or community watershed)	0	30	10	3			
S5 or S5a	>3 m in width (not fish bearing or not in community watershed)	0	30	10	3	4 ha/km or ~20m each side	4 ha/km or ~20m buffer each side with 65% BA retention (13m)	33 (20+13)
S5b NDT 1,2,4	Above AND non-domestic watershed AND >500 m upstream of a fish-bearing stream					n/a	3 ha/km or ~15m buffer each side with 30% BA retention (4.5m)	4.5
S5b NDT 3						n/a	3 ha/km or ~15m buffer each side with 10% BA retention (4.5m)	1.5
S6 or S6a	≤3 m in width (not fish bearing or not in community watershed)	0	20	n/a	0	4 ha/km or ~20m each side	4 ha/km or ~20m buffer each side with 65% BA retention (13m)	33 (20+13)
S6b NDT 1,2,4	Above AND non-domestic watershed AND >250 m upstream of a fish-bearing stream					n/a	3 ha/km or ~15m buffer each side with 30% BA retention (1.5m)	4.5
S6b NDT 3						n/a	3 ha/km or ~15m buffer each side with 10% BA retention (1.5m)	1.5

Note: FSC budget equivalent minimums were calculated by multiplying the 'ha/km' by 5 to get the equivalent width of each zone in metres (e.g., 6ha/km =~30m on each side of a stream). The intent of the flexibility is also to allow limited trade-off between the reserve and management zones and between classes, as long as the "equivalent total retention" is comparable (e.g., 10m of reserve zone is equivalent to 20m of management zone at 50% retention); however, total reserve zone area should never be below 80% of the budget for any specific class (i.e., conversion of all reserve zones to management zones is not acceptable).

Table 19 Riparian Criteria for Wetlands and Lakes

Riparian Class	Description	FRPA				FSC		
		RRZ (m)	**RMZ (m)**	**RMZ Min BA Retention**	**Effective Buffer (m)**	**RRZ Budget/Equivalent Minimums**	**RMZ Budget/Equivalent Minimums**	**Effective Buffer (m)**
Wetlands								
W1	>5 ha in area	10	40	10	14	2 ha/km or ~20m from edge of wetland	1.5 ha/km or ~15m from edge with 30% BA retention	24.5
W2	1-5 ha in area in PP or IDF	10	20	10	12			
W3	1-5 ha in area not in PP or IDF	0	30	10	3			
W4	0.25-1 ha. in area in PP or IDF	0	30	10	3			
W5	2 adjacent wetlands separated by <60 m and both <5 ha, or separated by <80 m if one is <5 ha and the other is >5 ha, or separated by 100 m or less if both are >5 ha.	10	40	10	14			
Lakes								
L1	>5 ha in area	10	Varies	10	Varies	1.5 ha/km or ~15m from edge of lake	1.5 ha/km or ~15m from edge with 30% BA retention	19.5
L2	1-5 ha in area in PP or IDF	10	20	10	12			
L3	1-5 ha in area not in PP or IDF	0	30	10	3			
L4	0.25-1 ha in area	0	30	10	3			
LMZ					200			

Note: FSC budget equivalent minimums were calculated by multiplying the 'ha/km' by 10 to get the equivalent width of each zone in metres (e.g., 2ha/km =~10m along the edge of the feature). The intent of the flexibility is also to allow limited trade-off between the reserve and management zones and between classes, as long as the "equivalent total retention" is comparable (e.g., 10m of reserve zone is equivalent to 20m of management zone at 50% retention); however, total reserve zone area should never be below 80% of the budget for any specific class (i.e., conversion of all reserve zones to management zones is not acceptable).

The area of riparian buffers applied for each standard (FSC and FRPA) was prorated for each intersecting resultant polygon through a post-processing spatial exercise. Then, a final in-block retention percentage was determined for each THLB polygon and for each standard as the maximum percentage between prorated riparian buffer and wildlife tree retention area (WTRA). Recall, the FSC standards only apply to the Canfor operating areas.

TSR4 approach where different

Riparian buffers were aspatially netted out.

2.1.14 Mature and Old Growth Management Areas

Old growth (OGMA) and mature (MMA) management areas were established to meet landscape-level biodiversity requirements for mature and old seral forest types designated in the Kootenay-Boundary Higher Level Plan Order (KBHLPO). The latest OGMAs and MMAs were gathered from licensees (BCTS and Canfor) and consolidated into a spatial layer. These polygons were 100% excluded from THLB.

Table 20 Mature and Old Growth Management Areas

Description	Gross FMLB Area (ha)	Net Area (ha)
MMA	8,476	2,230
OGMA	65,306	13,845
Total	**73,782**	**16,075**

TSR4 approach where different

MMAs were not specifically identified. The gross area for OGMAs was approximately 10,000 ha less than the consolidated OGMA+MMA dataset applied in the ISS Base Case Scenario.

2.1.15 Recreation & Scenic Areas

While attempts were made to exclude from the THLB areas with preservation as the established visual quality objective, none were identified within this TSA.

TSR4 approach where different

It is unclear if TSR4 specifically identified recreation and scenic areas.

2.1.16 FSC High Conservation Value Forests

Under the FSC standard, High Conservation Value Forest areas (HCVF) were previously identified as areas that possess one or more of the following attributes:

- significant concentrations of biodiversity values,
- large landscape level forests,
- rare, threatened or endangered ecosystems,
- provision of basic services of nature in critical situations such as watershed protection or erosion control, or
- significant to the traditional cultural identity for local communities.

HCVF areas are spatially mapped and have management strategies designed to maintain or enhance the values within them. Endangered Forests are a subset of these HCVF areas, where management strategies were developed to reserve the entire area (i.e., no logging or road-building).

This scenario incorporated Canfor's description and spatial data of areas currently identified as Endangered Forests. These areas were completely excluded from the THLB.

TSR4 approach where different

FSC standards for HCVF areas were not applied.

2.1.17 FSC Rare and Uncommon Ecosystems

Rare ecosystems were defined as those groups of site series with less than 0.1% (< 2000 ha) total area within the East Kootenay Conservation Partnership area (Crown and private land in the Rocky Mountain forest district, plus TFL 14, and a portion of the Golden TSA – see Wells et al., 2005 or Canfor's SFMP for details). Uncommon ecosystems were defined as those groups with 0.1% to 0.5% of total area (2,000-9,000 ha).

The ecosystem groupings were originally defined using site series from BEC Version 6. These areas were spatially defined using the latest and most appropriate PEM data (Table 21). In consultation with Kari Stuart-Smith (Canfor), the ecosystems were assigned to one of two retention classes: either 100%

retention (no harvest) or 50% retention (i.e., 50% of the stand retained at the time of harvest). The 100% retention was applied as a THLB netdown while the 50% retention was applied as an in-block retention factor reflected in the long term THLB.

Table 21 Rare and Uncommon Ecosystem Groups

Ecosystem Group	Site Series within the Ecosystem Group	Retention Class (%)
Rare Ecosystems		
2	IDFun-DP	100
5	IDFun2-FH	100
9	IDFun2-SD	100
14	PPdh2 04	100
15	IDF dm^2 07, IDF dm^2 XB	50
16	IDFun-CD	100
19	MSdk 07, IDFdm^{2}A-SB	100
24	ESSFdm^2/FS	100
30	ESSFdm1-FH	100
Uncommon Ecosystems		
8	PPdh2 03	100
10	ICH mk1 06	50
13	ICHdm-XA	50
17	ICH mk1 07, ICH dm-SD	100
18	MSdk 06, IDFdm^{2}a-SH	100
29	ESSFwm 04	50
35	ESSFdku-FH, ESSFdmu1-FH, ESSFwmu-WE, ESSFdmu2-WE	100

<u>TSR4 approach where different</u>

FSC standards for rare and uncommon ecosystems were not applied.

2.1.18 Isolated Stands

Isolated stands are patches of THLB that are too small and too far from other large THLB patches to be operationally viable. In the ISS Base Case Scenario, isolated stands were defined as:

- Any THLB contiguous patch that is <4ha in size and >200m from the closest THLB contiguous patch >4ha. Here, it is assumed that a THLB patch <4ha is not economically viable for harvesting if a road longer than 200m has to be built to access it.
- Any THLB contiguous patch <1ha in size and >50m from the closest THLB patch >4ha in size. Here, a relatively small THLB patch <1ha is not economically viable if it is more than 50m from a larger THLB patch. However, THLB patches <1ha and within 50m are assumed economically viable because they can be separated by existing road right-of-ways or riparian buffers.

<u>TSR4 approach where different</u>

Given the aspatial approach applied for some netdown factors, it is likely that isolated stands were not considered.

2.1.19 Cultural Heritage Resources

Most known archaeological sites and band-specific Traditional Use Studies are located in areas with additional ecological or environmental constraints. DRM staff have indicated that additional areas over those already excluded from the THLB are expected to be minimal. Thus, no additional THLB exclusion were applied in the ISS Base Case Scenario.

TSR4 approach where different

The ISS Base Case Scenario applied the same assumption; cultural heritage resources were not explicitly modelled.

2.1.20 Existing Wildlife Tree Retention Areas

Wildlife tree retention areas (WTRA) are sections of the cutblocks left standing to meet various non-timber objectives (e.g., stand level biodiversity). The WTRAs were identified through a GIS exercise that compiled information from the RESULTS Forest Cover Reserve layer and VRI to consolidate the spatial location and age of these stands. These WTRAs amounted to 2.5% of the associated THLB.

TSR4 approach where different

A 6% aspatial netdown was applied to all THLB area. Thus, reductions for future WTRA were also considered at this stage of the netdown process.

2.1.21 Future Wildlife Tree Retention Areas

To account for future WTRAs, a 6.0% area reduction (from TSR4) was applied, but only to the THLB area of existing natural stands and their corresponding future managed stands. The THLB for existing managed stands and their corresponding future managed stands was reduced by 3.5% to account for future WTRAs. This 3.5% average (ranging between 1.6 to 7.3%) was applied used in the previous TSR3 as a spatially-explicit reduction for existing WTRA. It also reflects the difference in WTRAs for natural stands (6.0%) and the WTRAs identified for existing WTRAs (2.5% - section 2.1.20).

To properly account for in-block retention associated with riparian zones, rare and uncommon ecosystems, and existing WTRAs, an in-block retention field was populated in the resultant file. Since WTRAs can overlap riparian zones and both WTRA and riparian zones can contribute to rare and uncommon ecosystems, the maximum value of the 3 factors was used to populate the in-block retention field. In addition, 10 retention classes were applied in the model - each of 10% in length – and an area-weighted average retention percentage was developed for each of the 10 classes and then used to determine the reserved in-block retention for each block, corresponding to the retention class.

As they are managed through a selection silvicultural system, reductions for future WTRA were not applied to FMER stands.

TSR4 approach where different

While existing WTRAs were not specifically determined, a 6% WTRA reduction was applied to the entire THLB area – existing and future. It was deduced that the 6% WTRA reduction was also applied to FMER OF/OR.

2.1.22 Open Range Conversions

Fire Maintained Ecosystems Restoration (FMER) areas were established for grass-growing areas under the authority of the Kootenay-Boundary Higher Level Plan Order (KBLUPO). The THLB area within Open Forest (OF) ecosystems is managed under an uneven-aged management regime with successive entries (detailed in section 0). The THLB area within Open Range (OR) ecosystems is managed as a single clearcut entry with 10 m³/ha retention. The THLB area is gradually reduced over time as OR ecosystems are treated. Note that UWR habitat type identified as OF/OR was not included under the open range conversions strategy. The OF/OR habitat types identified in the UWR layer were not used in the ISS Base Case Scenario.

TSR4 approach where different

The ISS Base Case Scenario applied the same silvicultural systems.

The ISS team elected to use the FMER layer from TSR4 as it better reflects open forest, open range, and grassland connectivity. The publicly available FMER layer was only used in the TSR Benchmark analysis.

In TSR4, estimates for the area of OR and OF within FMLB were 21,083 ha (4,161 ha in OR (OR, OR/OF) and 16,922 ha in OF (OF, MF/OF) while the ISS Base Case Scenario identified 15,707 ha (1,829 ha in OR (OR, OR/OF) and 13,878 ha in OF (OF, MF/OF)). The differences between the two analyses were likely due to the non-forested land base definition differences discussed in section 2.1.2.

Note that the Open Range Conversion THLB reported in the Public Discussion Paper was 14,810 ha, while the TSR4 resultant indicated only 2,123 ha; it is unclear how this difference occurred. The public discussion paper estimate of the THLB Open Range Conversion was approximately 13,500 ha higher than the current analysis. Compared to the TSR4 resultant, the current analysis identified 818 ha less THLB Open Range Conversion; another factor to contribute to this difference was the converted area to open range between the two analyses.

2.1.23 Future Roads, Trails and Landings

To account for future roads deductions, yield curves for future managed stands (i.e., following stand-replacing harvest disturbance of an existing natural stand) were reduced by 3.8%.

TSR4 approach where different

The 3.8% reduction was applied to all THLB stands older than 70 years (according to the FAIB netdown script but 60 years is documented in the TSR4 data package document). It is possible that the future THLB was reduced for both existing roads (5.3% of the FMLB area) and future roads (3.8% of the yield).

2.2 NON-TIMBER MANAGEMENT ASSUMPTIONS

This section describes the criteria and considerations used to model non-timber resources.

2.2.1 Green-up and adjacency

The KBLUPO specifies block level green-up targets based on Operational Planning Regulation (section 68(4) – green-up height of 2.5 m for areas adequately stocked and 3.0 m for areas not adequately stocked except community watersheds, visually sensitive areas, Enhanced Resource Development Zones (ERDZ) – Timber, and FMER. These green-up constraints were configured in the model according to (Table 22).

Table 22 Green-up Constraints

Management Zone	Green-up Constraint
Enhanced Resource Development Zone = 'Timber'	THLB area restricted to max 33% <2 years within each landscape unit/ERDZ
FMER – Open Forest and Open Range	No green-up requirements were set
Neither ERDZ nor FMER (Integrated Resource Management Zones - IRMZ)	Remaining THLB area restricted to max 33% <12 years within each landscape unit/IRMZ

TSR4 approach where different

The same constraints for green-up and adjacency were applied.

2.2.2 Stand-Level Biodiversity

The stand-level biodiversity is typically addressed by means of WTRAs. Details on how existing and future WTRAs were determined are discussed in sections 2.1.20 and 2.1.21. The ISS Base Case Scenario applied two reductions to the THLB for WTRAs, accordingly:

- 6.0% of the THLB area of existing natural stands (and their corresponding future managed stands), and
- 3.5% of the THLB area of existing managed stands (and their corresponding future managed stands).

TSR4 approach where different

In TSR4, the 6% WTRA was applied to all THLB area, yet the existing WTRA were not specifically identified.

2.2.3 Landscape-Level Biodiversity Objectives

Spatially defined OGMA\MMAs were used to meet the landscape-level biodiversity targets set by the KBHLPO. Four sensitivity analyses were designed to explore the status of mature and old seral requirements relative to the spatial OGMA/MMAs and the targets established in the KBLUPO (section 3.1).

TSR4 approach where different

The TSR4 applied modelling constraints to maintain the KBHLPO targets for mature-plus-old and old forests: (1) within each BEC variant along with assigned natural disturbance type (NDT), and (2) for each landscape unit along with the assigned biodiversity emphasis option (BEO). The TSR4 also used a different (older) version of BEC, thus some variants did not match. Finally, the TSR4 used an aspatial modelling approach which are likely less constraining compared to applying spatially-explicit targets.

2.2.4 Community and Domestic Watersheds

There are 12 community and 149 domestic watersheds within the TSA; all modelled through an indicator of peak flow – Equivalent Clearcut Area (ECA) – with maximum thresholds of 30%. Given the separate accounts for natural non-forest (0% ECA), private (75% ECA), and permanent anthropogenic disturbances (AD) (100% ECA), ECA targets were adjusted relative to the modelled FMLB area (Detailed statistics are provided in Appendix 1):

- Determine the area for private lands, AD, natural non-forest, and FMLB.
- Determine the maximum area allowed to be disturbed.
  - Max Area ECA (ha) = Watershed Gross Area (ha) * ECA target (%).
- Determine the Area ECA generated from AD and private lands.
  - Area ECA AD+Private = Max Area ECA (ha) – (Area AD (ha) x ECA (100%) – Area Private (ha) x ECA (75%)).
- Determine the new max ECA.
  - New Max ECA (%) = (Max Area ECA (ha) – Area ECA AD+Private(ha)) /FMLB area (ha)

ECA recovery curves were developed for each AU following the guidance from (Winkler & Boon, 2015). In addition, these curves were adjusted to address lower productivity sites where the height will never reach 25 m. The percent ECA relative to the stand height is calculated as follows:

$$\text{ECA}[\%] = 100 * \left(1 - e^{-0.24 * (height[m]-2)}\right)^{2.909}$$

Stand heights for each AU were determined during the yield development (section 2.4.3).

Attempts were made to assess the impact of 2017 wildfires on community and domestic watersheds via ECA. However, there were no 2017 wildfires within community watersheds or within domestic watersheds. Thus, no wildfire ECA assumptions were modelled.

TSR4 approach where different

The TSR4 data package mentions only 10 community watersheds. It is possible that the two additional community watersheds in the ISS Base Case (Tatley and Taynton) were not modelled in TSR4 because there was little THLB throughout (Appendix 1). Community watersheds were modelled using a forest cover requirement of max 30% <6m in height.

The TSR4 data package mentions that the domestic watersheds have the same forest cover targets as the community watersheds, yet the FAIB resultant does not spatially identify the domestic watersheds. It is unclear if the forest cover requirements for domestic watersheds were applied in TSR4 analysis.

2.2.5 Ungulate Winter Ranges

As described in section 2.1.12, some UWRs were 100% excluded from the THLB.

UWR U-4-008 was established to protect habitat for white-tailed deer, mule deer, moose, elk, bighorn sheep, and mountain goat and was modelled according to the prescribed forest cover constraints (Table 23). For habitat types that have snow interception cover and mature cover requirements, both constraints were modelled. In addition, a maximum 33% <21 years of the FMLB was maintained for each habitat type and landscape unit combination.

Note that both the GIS layer available via DataBC and the Forsite consolidated data included 2 more habitat types (Open Forest and Open Range) that, for the most part, do not overlap with the FMER OF/OR. No forest requirements were modelled for these 2 habitat types.

Table 23 Forest Cover Constraints for UWR U-4-008

Habitat Type	Cover Requirement	Target	FMLB Area (ha)	NHLB (ha)	THLB (ha)
Managed Forest - Dry	Mature Cover	10% > 100 years	19,186	6,051	13,136
Managed Forest - Transitional	Snow Interception Cover	10% > 60 years	13,687	5,026	8,661
Managed Forest - Transitional	Mature Cover	10% > 100 years, Fd and Sx leading			
Managed Forest - Mesic	Snow Interception Cover	10% > 60 years	15,514	3,197	12,317
Managed Forest - Mesic	Mature Cover	20% > 100 years, Fd and Sx leading			
Managed Forest - Moist	Snow Interception Cover	20% > 60 years	31,035	8,754	22,281
Managed Forest - Wet	Snow Interception Cover	30% > 60 years	5,920	4,660	1,259
Total			**85,342**	**27,687**	**57,655**

The heavily pixilated UWR layer available via DataBC was consolidated into a more appropriate spatial layer for forest-level analysis that was later accepted by the project team for use in the ISS Base Case Scenario. This process made use of the latest datasets available from DataBC for UWR, VRI (January 01, 2016), and BEC v10, and the Forsite consolidated ownership dataset (section 2.1.1). It aimed to maintain similar areas for each UWR habitat class by landscape unit in the consolidated dataset compared to the DataBC dataset. The following procedure, originally developed by Reg Davies, RPF (Forsite), was applied:

1. Develop a resultant GIS file to include VRI, ownership, and BEC (resultant 1).
2. Develop a second resultant GIS file to include VRI, ownership, BEC, and UWR (resultant 2).
3. Determine the area for each UWR habitat class from the DataBC UWR dataset
4. Determine the percentage cover for each polygon in resultant 1 by UWR habitat class using the values from resultant 2. For example, resultant 2 indicates that polygon #1 is covered 80% by habitat class A. The 80% value is then added into a new field in resultant 1 (e.g., PCT_HABITAT_CLASS_A).
5. Assign UWR habitat classes in resultant 1
    a. For each UWR habitat class, starting with the class with the least area determined at step 3
        i. Sort descending resultant 1 by the percentage covered
        ii. Assign UWR habitat class
        iii. Tally the cumulative area
        iv. Stop when the cumulative area reaches the area determined at step 3
6. Select all records from resultant 1 that were assigned to UWR habitat classes and dissolve by UWR habitat classes.

Results from this consolidation procedure showed trivial differences in area between DataBC and consolidated datasets (0.0% to -1.8% or 0 to -29 ha), but significant spatial improvement as the consolidated UWR habitat is more contiguous; aligned with VRI, BEC or ownership linework rather than severely fragmented raster polygons.

TSR4 approach where different

The same forest cover requirements were applied. The TSR4 likely used the DataBC version of the UWR U-4-008.

2.2.6 Grizzly Bear Habitat and Connectivity Corridors

The KBHLPO provides for the maintenance of mature and old forest cover requirements adjacent to important grizzly bear habitat, and within mapped connectivity corridors. Where applicable, these areas must first be used to address 'mature and old' targets. There is no explicit modelling of grizzly bear habitat as it is managed at an operational level.

TSR4 approach where different

The ISS Base Case Scenario applied the same assumption; grizzly bear habitat was not explicitly modelled.

2.2.7 Visual Quality Objectives

Visual quality objectives (VQOs) were addressed in the model for each VLI polygon using Plan-to-Perspective (P2P) ratios, Visually Effective Green-up (VEG) heights determined for 5% slope class increments, and maximum percentage alterations. The P2P ratios and VEG heights by slope class and VQO percentage alterations by visual absorption capacity (VAC) are detailed in Table 24 and Table 25, respectively and the following steps were undertaken:

1) For each VLI polygon, area-weighted averages of the managed site index for the most common species within the VLI polygon, and area-weighted averages of the slope were determined.
2) VEG height values were assigned to each VLI polygon using the calculated area-weighted slope average and relationship shown in Table 24.
3) An age was determined (using Site Tools (v4.1)) for each VLI polygon according to the VEG height and area-weighted average of the managed site index of the most common species. This is the age at which VEG height is reached; the area of stands within each VLI polygon needs to be lower than the maximum percentage alteration.
4) The maximum percentage alteration applied to each VLI polygon was calculated as the P2P ratio by slope class multiplied by the proposed percentage alteration in perspective view by VQO/VAC. For example, the largest max percentage is for slope class 0-5%, VQO class M (modification) and high VAC: 4.68 x 18.0 = 84.2%. The lowest: 1.04*0.1=0.104%.

Table 24 P2P Ratios and VEG Heights by Slope Class

	Modified Visual Unit Slope Classes for P2P Ratios and VEG Heights														
Slope %	0-5	5.1-10	10.1-15	15.1-20	20.1-25	25.1-30	30.1-35	35.1-40	40.1-45	45.1-50	50.1-55	55.1-60	60.1-65	65.1-70	70+
P2P Ratio	4.68	4.23	3.77	3.41	3.04	2.75	2.45	2.22	1.98	1.79	1.6	1.45	1.29	1.17	1.04
VEG Height (m)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	6.5	7.0	7.5	8.0	8.5	8.5	8.5

Table 25 VQO by Percent Alterations

VQO	Max % Alteration in Perspective View		
	Low VAC	Medium VAC	High VAC
Preservation	0	0	0
Retention	0.1	0.7	1.5
Partial Retention	1.6	4.3	7.0
Modification	7.1	12.5	18.0
Maximum Modification	N/A	N/A	N/A

The VLI data accessed from DataBC indicated there are 140 VLI polygons with the TSA. However, VQOs were established for only 128 VLI polygons. The other 12 VLI polygons were either entirely excluded from THLB, or were sliver polygons for which area-weighted average site indices could not be determined. Detailed statistics are provided in Appendix 1.

TSR4 approach where different

The same maximum percentage alteration targets were applied. However, the slope information present in the FAIB resultant was questionable when overlaid with contour lines.

2.3 Harvesting Assumptions

Harvest assumptions describe the criteria and considerations used to model timber harvesting activities.

2.3.1 Utilization Levels

The minimum merchantable timber specifications for all species and analysis units (natural and managed) are presented in Table 26.

Table 26 Utilization Levels

Leading Species	Minimum Diameter at Breast Height (cm)	Maximum Stump Height (cm)	Minimum Top Diameter Inside Bark (cm)
Pine	12.5	30	10
Cedar	17.5	30	15
All other	17.5	30	10

TSR4 approach where different

The same utilization levels were applied.

2.3.2 Minimum Harvest Criteria

The model considered stands to be eligible for a clearcut treatment when they met the minimum harvest age (MHA) associated with one or more minimum harvest criteria; in this case, a pre-assigned minimum harvestable age and a minimum volume per hectare by leading species and slope class (Stands that never met the minimum harvest criteria were reconsidered and made available at the age they reached 95% of CMAI and yield ≥150 m³/ha. While the area of these stands is relatively small, they can help the model achieve a more realistic spatial solution, and therefore remained in the THLB.

Table 27). In addition to these criteria, yields for existing and future managed stands had to reach 95% of the culmination of mean annual increment (CMAI).

Stands that never met the minimum harvest criteria were reconsidered and made available at the age they reached 95% of CMAI and yield ≥150 m³/ha. While the area of these stands is relatively small, they can help the model achieve a more realistic spatial solution, and therefore remained in the THLB.

Table 27 Minimum Harvestable Age Criteria

Leading Species	Slope	Minimum Harvestable Age (years)	Minimum Volume (m³/ha)	Age at Minimum Volume (years)
Pine	<40%	60	150	120
Pine	≥40%	60	200	120
Douglas-fir	<40%	80	100	150
Douglas-fir	≥40%	80	150	150
All Other	any	80	150	120

For stands within FMER areas, the MHA was fixed at 90 years for both the OR that are clearcut once with 10 m³/ha retention and the OF that are managed under an uneven-aged silvicultural system.

TSR4 approach where different

Only the minimum harvest criteria described in Stands that never met the minimum harvest criteria were reconsidered and made available at the age they reached 95% of CMAI and yield ≥150 m³/ha.

While the area of these stands is relatively small, they can help the model achieve a more realistic spatial solution, and therefore remained in the THLB.

Table 27 were applied. The CMAI was not used for stands that never met minimum harvest criteria and the managed stands.

2.3.3 Harvest Priority

Harvest priority refers to a range of factors used to prioritize and, thus, control the harvest flow. For example, certain units or areas must be harvested first for salvage purposes or delayed to achieve one or more non-timber objective.

Specific harvest priorities were not set in the ISS Base Case Scenario. The model explored many options to achieve the most favourable timber harvest solution that meets all non-timber objectives. The model was designed to achieve the highest even flow harvest level (i.e., flat line) to provide a more direct comparison with TSR4. Alternative timber harvest flows were explored for comparison (section 3).

TSR4 approach where different

The first harvest priority was applied on pine-leading stands to reflect the salvage MPB efforts, the second priority was applied to the FMER OF and OR, and third priority was applied on the oldest stands.

2.3.4 Silvicultural Systems

While the predominant silvicultural system used within the TSA is clearcut with reserves (i.e., WTRAs), two additional silvicultural systems were applied:

5) OR stands within FMER areas were configured as a single clearcut entry with 10 m³/ha retention that were then reclassified as NHLB.

6) OF stands within FMER areas were configured as an uneven-aged silvicultural system where the first entry was scheduled at age 90 to remove 49.5% of the full VDYP yield, or approximately 45 m³/ha. The second entry was scheduled after 50 years (i.e., stand age ≥140 years) to remove another 49.5% of the reduced yield (i.e., VDYP yield reduced by 49.5%). After each successive entry, the age was reset to 90 on the same VDYP yield and harvesting was excluded for the next 50 years (Figure 4).

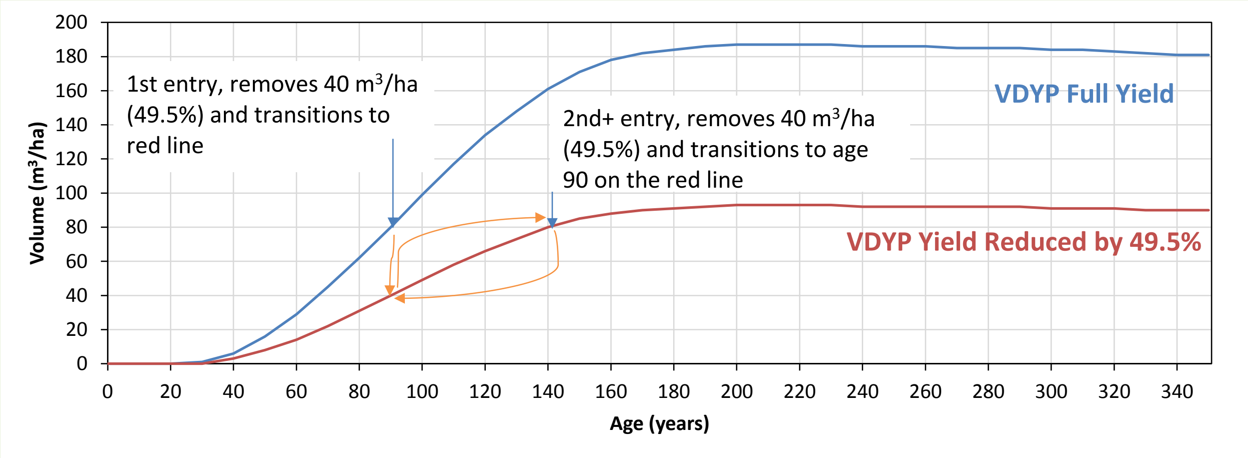


Figure 4 Example of Uneven-aged Silvicultural System

TSR4 approach where different

The residual volume after the first entry in the uneven-aged silvicultural system was 25 m³/ha. This difference could be related to (1) different OR areas used to determine VDYP yield, or (2) how the age was reset and how different models handle uneven-aged silvicultural systems.

2.4 Growth and Yield Assumptions

Growth and yield assumptions describe how net volumes for natural and managed stands were developed and incorporated in the model. They also describe changes in other tree and stand attributes over time (height, tree diameters, presence of dead trees, etc.).

2.4.1 Managed and Natural Stand Definitions

To project stand growth and yield, existing stands were classified according to their 'state'; as either natural or managed stands based on their year of establishment. Natural stands were considered stands with no past logging history, or with logging history prior to 1982. Managed stands were considered to be stands with logging history beginning in 1982.

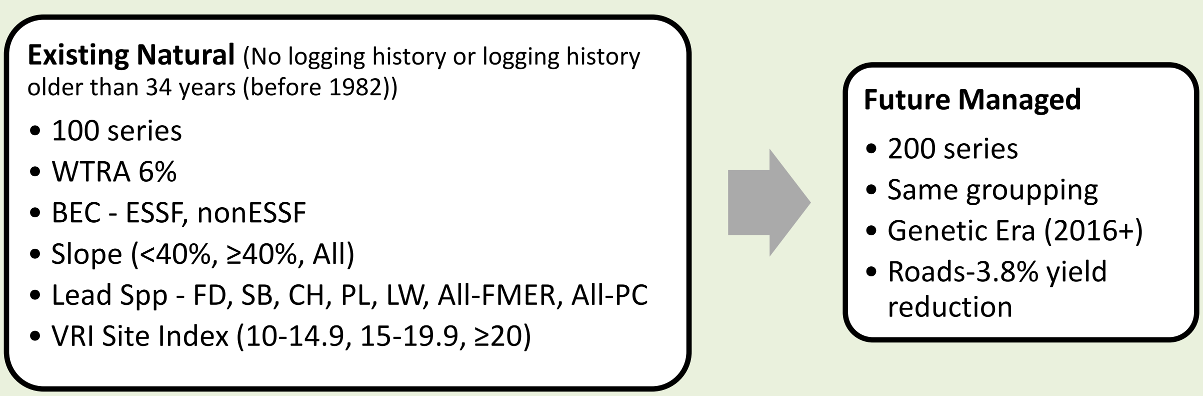
Stands that were disturbed in the model through a harvesting treatment were set to transition to a future managed stand, whereas stands that were disturbed by a natural agent (and not salvaged) were set to return as natural stands.

TSR4 approach where different

The same managed and natural stand definitions were applied.

2.4.2 Analysis Unit Characteristics

Stands were grouped into analysis units (AU) to reduce the complexity and volume of information in the model and for assigning potential treatments and transitions to yield curves following harvest. AUs are based on state (existing natural, existing managed, and future managed), leading species, site index, FMER, BEC zone, genetic gain era, and slope (Figure 5). Two series of AUs were added to accommodate the volume adjustments described in Table 2 for stands impacted by 2017 wildfires with low and moderate burn severities; 1,000 and 2,000, series respectively. Finally, logged AUs with no species information in the VRI were assigned to the dominant AU within each BEC variant. Detailed AU descriptions and statistics are provided in Appendix 2.



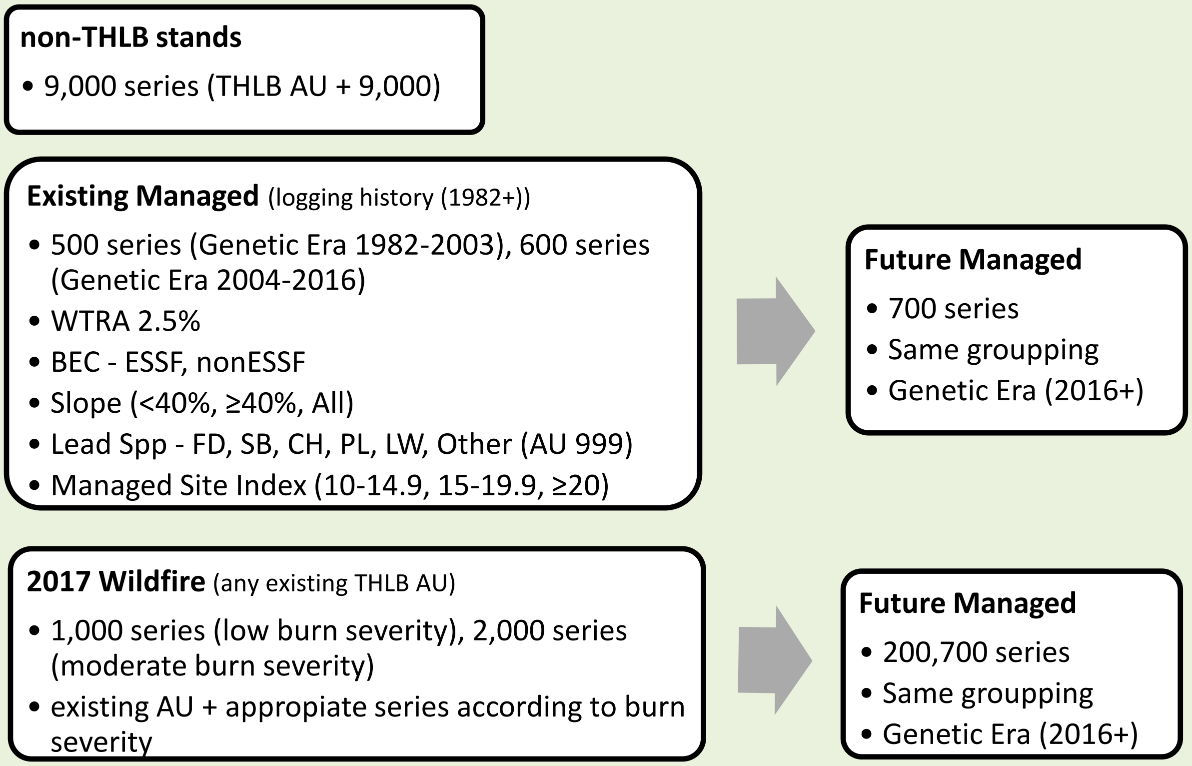


Figure 5 Analysis Units Assignment

<u>TSR4 approach where different</u>

AUs were aggregated based only on state, leading species, site index, and FMER. Area-weighted averages were used to develop assumptions related to BEC zone, genetic gain era, and slopes. There were 45 AUs developed for TSR4 (44 AUs for THLB, 1 AU for NHLB), compared to 293 AUs developed for the ISS Base Case Scenario (292 AUs for THLB, 1 AU for NHLB).

2.4.3 Stand Projection Models

Yield curves developed for the forest estate model were prepared using the following stand projection models:

- Existing natural stands: Variable Density Yield Prediction (VDYP) console (v. 7.30a, Build 299) at a VRI polygon level. The VDYP input polygon and layer datasets current to May 12, 2017 were used as inputs. A VDYP yield curve is generated for each VRI polygon, then area-weighted averages of these curves are calculated according to the assigned AUs. The deciduous component of the AUs covering the THLB is removed. Because the MPB is assumed to have run its course within the TSA, no MPB yield specific modelling is conducted, but the dead volume due to remaining MPB stands was removed from the VDYP yields.
- Existing and future managed stands: Table Interpolation Program for Stand Yields (TIPSY) (v. 4.4, Ministry Standard Database, September 2017). A TIPSY yield is developed for each existing and future managed AU given the regeneration assumptions inputs (Appendix 3).

TSR4 approach where different

An older version of VDYP7 was likely used with a single input dataset; the approach for calculating area-weighted averages was the same. TIPSY v.4.3 was used but which version of the Ministry Standard Database is unclear.

2.4.4 Yield Adjustments

For natural stands, the default provincial stand loss factors were used as reductions to stand volume for decay, waste and breakage factors. These factors were applied in VDYP to develop the yield curves.

For managed (second growth) stands, the operational adjustment factors (OAF) were applied in TIPSY. OAF1 affects the magnitude of the yield curve and is constant across all ages This reflects volume losses due to a range of abiotic and biotic factors, including unmapped non-productive areas (e.g., rock and wetland), weather-related losses (e.g., wind, snow, and ice), and gaps from brush competition, and pests. OAF2 accelerates with age and reflects losses from decay, waste and breakage, as well as, specific forest health losses that increase over time.

An OAF1 of 85% (i.e., 15% reduction) was applied, while OAF2 differed by leading species and BEC zone to reflect losses from root rot disease (Table 28).

Table 28 Operational Adjustment Factor 2

Leading Species	BEC	OAF 1 (%)	OAF2 (%)
FD	Non-ESSF	85	89.2
PL	Non-ESSF	85	91.3
Non-FD, Non-PL	Non-ESSF	85	95
All	ESSF	85	95

Damage to trees from mountain pine beetle (MPB) has more recently been recorded within the TSA since 1978; this peaked in 2008 and has since declined. The DRM staff observed that the current MPB infestation has run its course and that licensees have proactively salvaged damaged stands. Any remaining dead volume attributed to MPB damage was removed from the VDYP yields – for each VRI feature ID, the dead percentage from MPB was multiplied with the pine percentage and the resulting percentage removed from the total VDYP yield. Otherwise, no specific yield adjustments were applied to address MPB.

TSR4 approach where different

The same yield adjustments were applied.

2.4.5 Site Index Assignments

Site index reflects the potential productive capacity of a stand; measured as top height in meters at age 50. The VRI site index (interpreted) was used to develop yield curves for existing natural stands while a managed site index was derived for existing and future managed stands. Managed stand site indices were calculated for each species as area-weighted averages of site index estimates assigned in the provincial site productivity layer (correlated to BEC site series) and applied to VRI polygons. Figure 6 shows the area distribution of both natural and managed stands across the THLB.

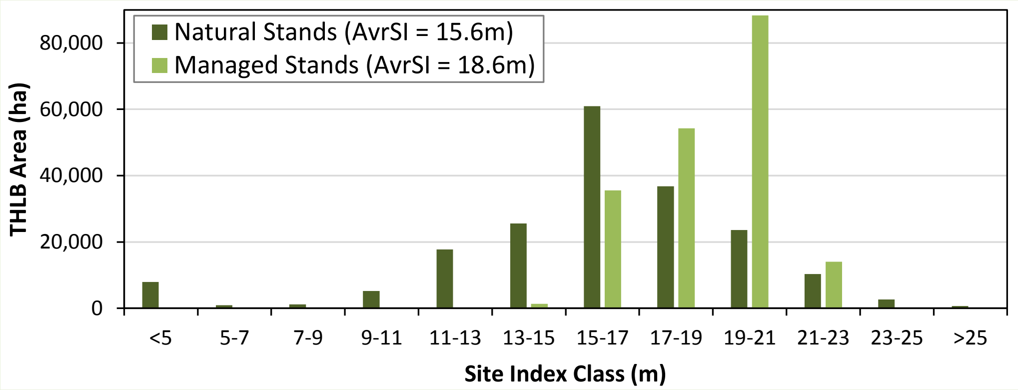


Figure 6 Distribution of Natural and Managed Stand Site Indices over the THLB

<u>TSR4 approach where different</u>

Look-up tables to correlate site indices with BEC site series (SIBEC), developed through predictive ecosystem mapping (site series), were used to assign site index for managed stands.

2.4.6 Not Satisfactorily Restocked

Not satisfactorily restocked (NSR) areas do not have a sufficient number of well-spaced trees of desirable tree species. This definition does specify why the area is NSR (harvesting or natural disturbances) and suggests that NSR areas require some remedy or consideration (i.e., it is not satisfactory). *Current* NSR typically refers to stands recently disturbed (i.e., since 1987) that are regenerating but are not yet declared as being stocked, while *backlog* NSR refers to stands disturbed prior to 1987 that are not declared as satisfactorily restocked.

At present, all previously identified backlog NSR within TSA had been addressed. Thus, VRI records indicating NSR were assumed to have regenerated as existing managed stands, unless other netdown factors (e.g., reserves, riparian, existing WTRA) apply.

<u>TSR4 approach where different</u>

The same NSR assumptions were applied.

2.4.7 Select Seed Use / Genetic Gain

Genetic gain assumptions for existing managed stands were based on past use of select seed with genetic gains. Planting stock from tree nurseries is derived from seed assigned by seed planning unit (acceptable geographic extent) and by seed class (i.e., A – Tree seed orchard, B+ – natural stands identified as superior provenances, and B – natural stands).

Estimated genetic gains (Table 29) from the TSR3 were applied to stands regenerated during the period 1982-2003 (i.e., genetic gain era). The Tree Improvement Branch (FLNRO) provided estimates for the 2004-2016 and 2016+ genetic gain eras. These gains were applied in TIPSY for developing yields for existing and future managed stands associated with each AU – specifically aggregated according to genetic gain era (section 2.4.2).

Table 29 Genetic gain by species for existing and future managed stands to be applied in TIPSY

Era	Fdi	Lw	Pli	Sx
1982-2003	0	2	3	15
2004-2016	0	19	1	13
2016+	3	27	5	27

TSR4 approach where different

TSR4 spread genetic gains across the land base by applying an area-weighted average genetic gain for each species.

2.4.8 Regeneration Delay

Regeneration delay is the average time, in years, needed to establish stands following a stand-replacing disturbance event like logging. Where applicable, the age of seedling stock planted is considered. For the ISS Base Case Scenario, 2- to 3-year regeneration delays were applied to all existing and future managed stands (see Appendix 3).

TSR4 approach where different

The same regeneration delay assumptions were applied.

2.5 Natural Disturbance Assumptions

Natural disturbance assumptions define the extent and frequency of natural disturbances across the land base. Assumptions used to model disturbance within the THLB and NHLB are described below.

2.5.1 Natural Disturbance within the THLB

Natural disturbances within the THLB are addressed as non-recoverable losses (NRL) over the entire planning horizon. These are estimates of annual volume loss resulting from catastrophic events, such as insect epidemics, fires, wind damage, and other agents. NRLs were applied according to updated figures recommended to the provincial Chief Forester for TSR4 (Table 30). This NRL rate was subtracted from the annual harvest flows generated for each scenario analyzed.

Table 30 Non-Recoverable Losses

Agent	Cause of loss	Species	NRL (m^3/yr)
Insects	Douglas-fir beetle	F	1,455
	Douglas-fir engraver beetle	F	43
	Spruce bark beetle	Sx/Se	19,000
	Western pine beetle	Pl	36
	Western balsam bark beetle	All	2,386
	Mountain pine beetle	Pl	(3%)
Fire		All	16,441
Flooding		All	801
Windthrow/snowpress*		All	32
Total			**40,194**

TSR4 approach where different

NRLs were originally applied at 14,811 m^3/year.

2.5.2 Natural Disturbance within NHLB

Most non-timber objectives are related to the maintenance of desired forest conditions such as a specified age structure or proportion of old forest and are applied to the entire FMLB. Accordingly, we must account for the natural disturbance outside of the THLB and the role they have in altering forest conditions over time, rather than allowing this forest to age continually and contribute inappropriately to forest cover requirements.

In the ISS Base Case Scenario, natural disturbances within the NHLB were applied as a constant area disturbed annually within each Landscape Unit (LU) and Natural Disturbance Type (NDT). The disturbed area varies based on the BEC variants present, their associated natural disturbance intervals and old seral definitions, as outlined in the Biodiversity Guidebook (B.C. Ministry of Forests and B.C. Ministry of Environment, Lands and Parks, 1995). The proportion of forest expected as old seral forest was calculated based on the disturbance interval:

$$\%\text{ area in old } = \exp\left(-\frac{\text{old age}}{\text{disturb interval}}\right)$$

The % area in old is then used to calculate the effective rotation age associated with this seral distribution:

$$\text{effective rotation age } = \frac{\text{disturb interval}}{1 - \text{ proportion old}}$$

The effective rotation age can then be used to define an annual area of disturbance. For example, ESSF variants in NDT1 have a disturbance interval of 300 years and an old definition of 250 years. This translates into a typical age class distribution where 43% of the area is “old” (>250 years) and the oldest stands are around 531 years. Thus, 1/531st of the area is disturbed each year to maintain this age class distribution.

Table 31 shows the data used to determine the annual disturbance limits applied to the forested NHLB by LU/NDT. Overall, approximately 0.39% of the NHLB is disturbed annually.

Table 31 Calculation of area to be disturbed annually in NHLB by LU/NDT

BEC	NDT	Disturbance Interval (years)	OLD Def (years)	% Area >OLD*	Effective Rotation Age (years)*	NHLB (ha)	Annual Area Disturbed (ha)**
ESSF	1	300	250	43%	531	7,979	15
ESSF	2	200	250	29%	280	5,406	19
ESSF	3	150	140	39%	247	258,775	1,048
ICH	3	150	140	39%	247	14,505	59
IDF	4	250	250	37%	395	20,932	53
MS	3	150	140	39%	247	85,183	345
Total						**392,781**	**1,539**

** %Area Old = exp[-(Old Def/Disturbance Interval)]. Effective Rotation Age = Disturbance Interval/(1-%Area OLD).*
*** Annual Area Disturbed = NHLB/Effective Rotation Age*

TSR4 approach where different

TSR4 did not model natural disturbances within NHLB as spatial OGMAs were assumed to account for any key forest cover requirements.

2.6 Modeling Assumptions

General assumptions were incorporated into the model to improve its efficiency or to produce results that are more realistic spatially. Table 32 summarizes the modeling assumptions employed in the ISS Base Case Scenario.

Table 32 Modeling assumptions

<table>
<tr><th>Criteria</th><th>Assumption</th></tr>
<tr><td>Minimum Polygon Size</td><td>Minimum size of the polygon size within the resultant was set depending on the data source within the resultant.
10 m² for road/water buffers
100 m² for larger area features (VRI, VLI etc.)
1,000 m² for very large administrative boundaries (e.g. ownership, landscape units etc.)</td></tr>
<tr><td>Maximum Polygon Size</td><td>Polygons larger than 10 ha were split according to a fixed-area grid</td></tr>
<tr><td>Blocking</td><td>To improve modeling performance, resultant polygons within 20m of each other were blocked (or grouped) where possible by maintaining the same AUs and 5-year age classes. The model was configured for a target harvest opening size of 40 ha.</td></tr>
<tr><td>Harvest Profiles</td><td>The model will track and report the following area-based harvest profiles:
Individual species and species groups
<table><tr><th>Species Group</th><th>Major Tree Species</th></tr><tr><td>White Wood - SxPl</td><td>Spruce, Lodgepole Pine</td></tr><tr><td>White Wood - HwBl</td><td>Hemlock, Balsam</td></tr><tr><td>Red Wood - FdLw</td><td>Douglas-fir, Larch</td></tr><tr><td>Red Wood - PyCw</td><td>Yellow Pine, Cedar</td></tr></table>
Haul time (one-way half-hour classes) and woodsheds (section 2.6.1)
Harvest system (≤40%; 40-70% slope class). Recall, slopes >70% are inoperable
Young seral patches on THLB area under 20 years
Old seral patches on FMLB area defined as old in Table 36, section 3.1</td></tr>
<tr><td>Planning Horizon</td><td>A 300 year planning horizon was applied and reported in 10-year increments (i.e., 30 periods).</td></tr>
<tr><td>Harvest Flow Objectives</td><td>Even Flow for the entire planning horizon</td></tr>
</table>

2.6.1 Haul Time Profile

Haul time was assigned using the consolidated road network described in section 2.1.3, and combined for Cranbrook and Invermere TSAs (Figure 7). Each road segment was given a speed based on its classification (Table 33). These roads were then segmented and a time to travel is assigned to each segment.

$$time = \frac{metres \cdot 3.6}{speed}$$

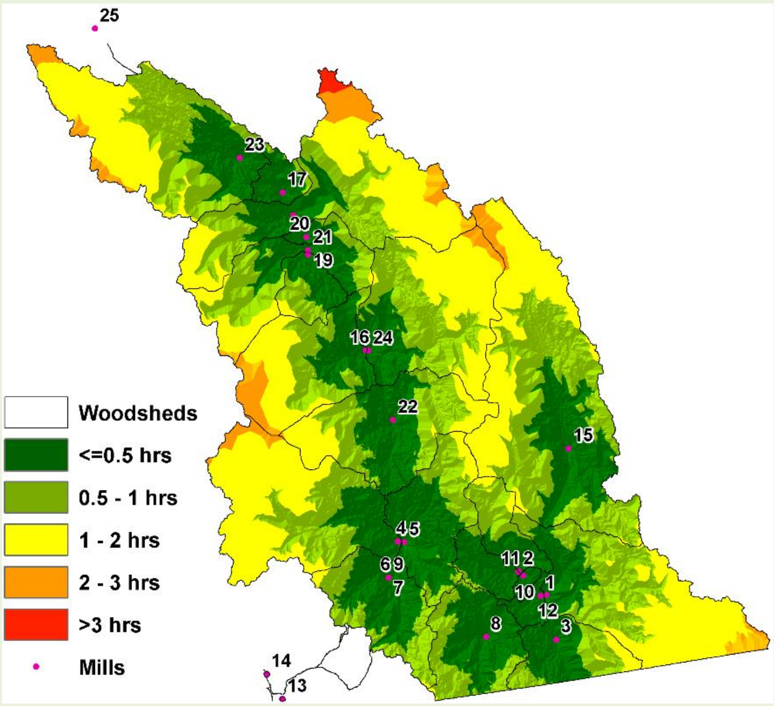
This time-cost was converted to a 20x20m pixel and used as input to the cost distance tool in ArcGIS. This tool calculated the time in seconds to travel to each pixel from the closest (by time) mill location. The cost data was converted to a raster and used as the input surface to the cost distance tool in ArcGIS1 which provided the time in seconds to travel to each pixel from the closest (by time) mill

[1] http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/how-the-cost-distance-tools-work.htm

location by the fastest route. Finally, a cost allocation was applied using the same inputs to identify the woodsheds that supply timber to each mill location.

Table 33 Travel Speed by Road Segments

Road Class	Speed
HIGHWAY	80 km/hr
LOGGING	60 km/hr
SECONDARY	50 km/hr
INBLOCK	30 km/hr
TRAIL	10 km/hr
Non-Roaded	10 km/hr



ID	Company	Location
1	Tembec Industries Ltd.	Elko
2	Galloway Lumber Co. Ltd.	Galloway
3	McDonald Ranch & Lumber Ltd.	Grasmere
4	Bear Lumber Ltd.	Cranbrook
5	Canalog Wood Industries Ltd	Cranbrook
6	Palmer Bar Holdings Inc.	Lumberton
7	Palmer Bar Holdings Inc.	Lumberton
8	Quinton Bros.	Caven
9	Panhandle Forest Products	Lumberton
10	Selkirk Forest Products Ltd.	Galloway
11	Galloway Lumber Co. Ltd.	Galloway
12	Canadian Forest Products Ltd.	Elko
13	J H Huscroft Ltd.	Erickson
14	Wynndel Box & Lumber Co. Ltd.	Wynndel
15	NA	Sparwood
16	Tembec Industries Ltd.	Canal Flats
17	Woodex Industries Ltd.	Edgewater
18	Canadian Forest Products Ltd.	Radium Hot Sprgs
19	Ukass Logging Ltd.	Wilmer Creek
20	North Star Planing Co. Ltd.	Athalmer
21	Enid Lake Logging Ltd.	Invermere
22	Tembec Industries Ltd.	Skookumchuk
23	Brisco Wood Preservers Ltd.	Brisco
24	Canadian Forest Products Ltd.	Canal Flats
25	Louisiana Pacific Canada Ltd.	Golden

Figure 7 Haul Cycle Time Zones

Area-based harvest profile targets were calculated from the merchantable THLB in each haul time class. Two targets were applied in the model over the first 40 years as a minimum 54% of the harvest from the <0.5 hr class and a minimum 38% of the harvest from the 0.5-1.0 hr class.

2.6.2 Harvest System

Slope classes were used to approximate harvest systems (i.e., ground as <40% slope class; cable as 40-70% slope class). Slopes >70% were considered inoperable. An area-based harvest profile target was calculated from the merchantable THLB in each slope class. One harvest system target was applied in the model over the first 40 years as a minimum 78% of the harvest from the ≤40% slope class.

3 Sensitivity Analyses

A range of sensitivity analyses were explored relative to the ISS Base Case scenario. Each sensitivity analysis is described in the following sections and summarized in Table 34.

Table 34 Summary of Model Runs

Scenario Elements	Description	Modelling Run/Approach (including Sensitivity Analyses)	Complexity Index
Harvest Flow	Examine alternative timber harvest flows to better understand potential harvest rates over time for the land base.	Sens [001] – Even flow	1
		Sens [002] – Max non-declining flow	1
		Base [003] – Max initial with max 10% decline	1
Community Watersheds	Examine the impact of increasing disturbance thresholds within community watersheds.	Base [003] – Max 30% <6m heights	2
		Sens [004] – Max 25% <6m heights	1
Harvest Priority	Spatialize harvest and track appropriate harvest profiles and patch sizes.	Base [003] – track and report profiles for species, red/white wood, age, slope class, and haul distance, UWRs	4
		Sens [005] – implement current profile for slope class and haul distance as targets for the first 40 years	2
Mature/Old Seral	Examine the status of mature and old seral requirements relative to spatial OGMAs/MMAs and targets established in the KBHLPO. Detailed in section 3.1.	Base [003] – Only Spatial OGMAs and MMAs	1
		Sens [006] – Spatial OGMA/MMA with full targets (no 1/3rd drawdown in low BEO)	3
		Sens [007] – Only Old Seral	2
		Sens [008] – Only Mat+Old Seral	2
		Sens [009] – Patch size targets (Canfor and BCTS) on Very Early Seral and report on Old Seral	3
FSC Certification	Implement assumptions associated with FSC standards throughout Canfor's operating areas.	Base [003] – FSC On	3
		Sens [010] – FSC Off (i.e., FRPA)	2

*Note: **complexity index** assigned as: **1** = straightforward to **4** = complex; also relates to analysis costs.*

3.1 Landscape-Level Biodiversity Details

3.1.1 Seral Stage Requirements

Four sensitivity analyses were conducted to explore the status of mature and old seral forest requirements relative to spatial OGMA\MMAs and targets established in the KBHLPO (Table 35). This approach provided a thorough comparison of how these landscape-level biodiversity thresholds are maintained utilizing spatial OGMA\MMAs, only old seral, and old/mature seral criteria, as described below.

Table 35 Landscape-Level Biodiversity Sensitivity Analyses Matrix

Scenario	Spatial OGMA/MMAs	Old Seral	Mature + Old Seral	Early Seral Patch
Base [003]	**On**	Off	Off	Off
Sens [006]	**On**	Off	**Full Targets**	Off
Sens [007]	Off	**On***	Off	Off
Sens [008]	Off	Off	**On***	Off
Sens [009]	Off	Off	**On***	**On**

**including 2/3 draw-down for the "Old" seral stage component in low biodiversity emphasis. Includes tracking of old seral patch size for Base Case and Sensitivity 4.*

The KBHLPO specifies that the landscape-level biodiversity is managed via targets for mature-plus-old, and for old forests, that must be maintained: (1) within each BEC variant along with assigned natural disturbance type (NDT) and (2) for each landscape unit along with the assigned biodiversity emphasis option (BEO) (Table 36). The old forest cover requirements for low BEO must be met by the end of the third rotation, while targets can be reduced to one-third of the full target over the first rotation, and to two-thirds over the second rotation.

Table 36 Mature Plus Old, and Old Forest Cover Requirements for Each Landscape Unit

NDT	BEC Zone	Version 11 BEC Variant	Version 6 BEC Variant	Stand Age		% Retention (Mat+Old/Old) by biodiversity emphasis		
				Mature	Old	Low*	Interm	High
1	ESSF	wcw, wm[2]	vc, wm, wc1, wc2, wc4	>120	>250	19/19 (6.3)	36/19	54/28
	ICH		vk1, wk1	>100	>250	17/13 (4.3)	34/13	51/19
2	ESSF	wh2, wm4, wmw, wm1	wm, dm, wmu, wm	>120	>250	14/9 (3)	28/9	42/13
	ICH	mw1, mw2, dm	mw1, mw2, dm	>100	>140	15/9 (3)	31/9	46/13
3	ESSF	dk1, dk2, dw, dkw, dm, dmw	dk, dc1	>120	>140	14/14 (4.7)	23/14	34/21
	ICH	dm, dw1, dmk4, mk4, mk5	dm, dw1, mk1	>100	>140	14/14 (4.7)	23/14	34/21
	MS	dk1, dk2	dk, dku	>100	>140	14/14 (4.7)	26/14	39/21
4	IDF	dk5, dm[2], un, xk,	dm[2], un	>100	>250	17/13 (4.3)	34/13	51/19
	IDF	xx2	PPdh2					
	PP	dh2	dh2					
5	ESSF	dkp, wmp	dkp, wmp	n/a				
	AT	All	All					

** bracketed targets employ a 2/3 draw-down for the "Old" seral stage component in low biodiversity emphasis.*

Note that the landscape units/BEO layer identifies, in some cases, multiple BEOs for the same landscape unit. Each landscape unit that has multiple BEOs is spatially separated by the BEO in the layer accessed from DataBC. Thus, no further GIS processing was implemented.

3.1.2 Patch Size Requirements

Patch size distributions are not legally-established for the project area but they can be examined as another indicator of landscape-level biodiversity. The Base Case Scenario was configured to report patch sizes according to the criteria and thresholds shown in Table 37 and Table 38 for stands classified as very early (0-20 years) and old (as described in Table 36) seral stages. Very early seral patches were modelled in 30 reporting units with THLB area >500ha.

To address gaps in the forest cover or FMLB data and to prevent patches being created due to roads, a 25 metre buffer was used to assign patch sizes to stands; stands could form a patch if they were within 50 metres of one another.

Table 37 Patch Size Criteria and Thresholds – Canfor Operating Areas Only

NDT 2		NDT 3		NDT 4	
Patch (ha)	**Target (%)**	**Patch (ha)**	**Target (%)**	**Patch (ha)**	**Target (%)**
<40 ha	30-40	<40 ha	15-25	<40 ha	30-40
40<80 ha	30-40	40<250 ha	20-40	40<80 ha	30-40
80<250 ha	20-40	250<1000 ha	30-50	80<250 ha	20-30
≥250 ha	0-5	≥1000 ha	10-20	≥250 ha	5-15

Assessed for each Ecosection (Canfor's adjusted version)
Source: "A Brief Rationale for a Different Approach to Patch Size Analysis", K. Stuart-Smith, June 27, 2012

Table 38 Patch Size Criteria and Thresholds – BCTS and Galloway Operating Area

NDT 1		NDT 2		NDT 3a (Fd absent)		NDT 3b (Fd throughout)		NDT 4	
Patch (ha)	**Target (%)**	**Patch (ha)**	**Target (%)**	**Patch (ha)**	**Target (%)**	**Patch (ha)**	**Target (%)**	**Patch (ha)**	**Target (%)**
<40 ha	30-40	<40 ha	30-40	<40 ha	10-20	<40 ha	20-30	<40 ha	30-40
40<80 ha	30-40	40<80 ha	30-40	40<250 ha	10-20	40<80 ha	25-40	40<80 ha	30-40
80<250 ha	20-30	80<250 ha	20-30	250<1000 ha	60-80	80<250 ha	30-50	80<250 ha	20-30
≥250 ha	n/a	≥250 ha	n/a	≥1000 ha	n/a	≥250 ha	n/a	≥250 ha	5-15

Assessed for each Landscape Unit
Source: Biodiversity Guidebook

4 Silviculture Scenario

The Silviculture Scenario explored alternative silviculture tactics that would benefit long-term timber and non-timber objectives. In particular, this scenario was aiming to enhance timber quantity and quality over the mid- and long-term, as well as, improve biodiversity, wildlife habitat, and cultural interests. In addition, the Silviculture Scenario examines incremental silviculture investments that would improve future harvest flows for the TSA, given an expected government funding level of $0.3 million per year over the first 20 years of the planning horizon. In this ISS iteration, the Project Team identified 3 tactics to explore: 1) enhanced basic silviculture, 2) commercial thinning, and 3) fertilization. Each of these tactics are detailed in Table 39.

Criteria for these tactics reflect a broad array of silvicultural activities that may be applied across various conditions for eligible stands. For example, an assortment of alternative activities may be appropriate for the enhanced basic silviculture tactic, including, but not limited to, increase initial planting densities, plant rust-resistant trees, and re-plant rust-impacted stands with alternate species.

Table 39 Silviculture Scenario Tactics

Tactic	Element	Description	Criteria
Enhanced Basic Silviculture	Eligible Stands	Existing natural and managed stands (approx. 73,046 ha THLB – 4,437 ha productive, 56,709 ha health risk, and 11,900 ha productive/health risk).	○ Productive stands: all stands (except CH-, OT-leading) outside FMER and SI managed ≥18 ○ Health risk stands (if not included above) and SI managed ≥15m ○ Root-rot: non-ESSF and Fd- and Pl-leading

Tactic	Element	Description	Criteria
			○ Rust: Pl-leading within spatially identified pine rust risk area (MSdk 01 and 04)
	Timing	As stands that are harvested/regenerated in the model	First 20 years of the planning horizon
	Treatment Response	Transitions	To future enhanced managed stands for the first 20 years. Then, transition back to original un-enhanced yield.
		Regeneration method	No changes from the Base Case (a combination of planted and natural)
		Density	Increase planting to 1,700 stems/ha
		Species Composition	No changes from the Base Case
		Genetic gains	No changes from the Base Case
		Regeneration delay	From 2 yrs to 1 yr
	Costs	Incremental planting of trees sown with select seed	$385/ha
	Anticipated Issues	Currently lacks funding source; possibly operational cost allowance	
Commercial Thinning	Eligible Stands	Existing natural and managed stands (Approx. 2,393 ha THLB).	○ Leading Species: Fd, Lw, Sx ○ Age: 20yrs before and 10 years after age of treatment ○ BEC: all ○ SI (managed or natural): ≥18 m ○ Slope: ≤40% ○ Haul Time: 1.5 hr one-way ○ FMER: outside FMER only
	Timing	Yield/Age criteria	○ Age of treatment: at minimum 100 m^3/ha ○ Intensity: 40% of standing volume ○ Time window: maximum 10 yrs ○ Lock from harvest for 30yrs following thinning
	Treatment Costs	Net cost (cost of treatment less revenue from sales of thinned wood)	○ Total Cost: $1,200/ha ○ Net Cost: 50% of Total Cost = $600/ha
	Treatment Responses	Yield increase following commercial thinning	Treatment response developed for each yield in TASS. The response factor applied then to the corresponding yield developed in VDYP/TIPSY to be aligned with the Base Case.
		Transition of thinned stand	Final harvest MHA: 20 yrs after commercial thinning (or same as un-thinned MHA). If combined with fertilization application, stand is locked from harvest for 10 yrs after each fertilization application.
	Anticipated Issues	Understanding trade-offs between damage to remaining trees and the redistributed volume growth.	
Fertilization	Eligible Stands	Young natural and existing managed stands (approx. 13,151 ha THLB – 1,459 ha for 1 application only, 11,692 ha for 1-2 applications)	○ Fd + Lw + Sx + Pl ≥80%; Sx-leading ≥70% ○ BEC: MS, ICH, and ESSF below 1,650 m ○ FMER: outside FMER only ○ SI managed: >15 ○ Slope ≤ 40%
	Timing	Minimum and maximum age defining opportunity window, for up to 2 applications, every 7 years	7 years before MHA for 1 application, 14 years before MHA for 2 applications

<table>
<tr><th>Tactic</th><th>Element</th><th>Description</th><th>Criteria</th></tr>
<tr><td rowspan="5"></td><td rowspan="3">Treatment Response</td><td>Growth increase 7 years after application (entire stand) – existing natural stands</td><td>10 m^3/ha for each application.</td></tr>
<tr><td>Growth increase after application (entire stand) – existing managed stands</td><td><table><tr><th>Applications (every 7 yrs)</th><th>Fd/Lw (m^3/ha)</th><th>Pl (m^3/ha)</th><th>Sx (m^3/ha</th></tr><tr><td>1</td><td>15</td><td>12</td><td>16</td></tr><tr><td>2</td><td>30</td><td>24</td><td>32</td></tr></table></td></tr>
<tr><td>Transitions to future stands</td><td>Locked from harvesting, 10 years after last application.</td></tr>
<tr><td>Costs</td><td>Fertilization costs for all stands</td><td>$450/ha for each application.</td></tr>
<tr><td>Anticipated Issues</td><td>Fertilize entering water sources, possibly larger buffers around water sources.</td><td></td></tr>
</table>

The opportunity for commercial thinning was explored in two additional sensitivity analyses where the $0.3 million per year funding level was extended from 20 to 60 years and the cost for commercial thinning was kept at $600/ha and then set to $0/ha (Table 40).In addition, each tactic was explored separately in 3 additional runs.

Table 40 Run IDs for the Silviculture Scenario

Run ID	Description
[020]	Replicate the ISS Base Case run [003] with added AUs and Silviculture Scenario features. No Silviculture Scenario targets are applied nor modeled.
[021]	MINDY with **$0.3 million/year** maximum budget for all three silviculture tactics for the first <u>20 years</u> of the planning horizon.
[022]	MINDY with **$1 million/year** maximum budget for all three silviculture tactics for the first <u>20 years</u> of the planning horizon.
[023]	MINDY with **$0.3 million/year** maximum budget for all three silviculture tactics for the first <u>60 years</u> of the planning horizon.
[023a]	MINDY with **$0.3 million/year** maximum budget for all three silviculture tactics for the first <u>60 years</u> of the planning horizon. Here, CT cost was set to $0/ha (i.e., break-even operations).
[024]	MINDY with **$0.3 million/year** maximum budget for **ENH only** for the first <u>20 years</u> of the planning horizon.
[025]	MINDY with **$0.3 million/year** maximum budget for **FERT only** for the first <u>20 years</u> of the planning horizon.
[026]	MINDY with **$0.3 million/year** maximum budget for **CT only** for the first <u>20 years</u> of the planning horizon.

<u>Thinning Maximum Density Stands</u>

Another silviculture tactic was closely examined but abandoned at this time. This would involve a pre-commercial thinning treatment on height-repressed, pine-leading stands to release a sufficient number of potential crop trees to make these stands available for harvest (i.e., meets the minimum harvest criteria) and at least sooner than an untreated stands.

Eligible stands were identified as severely burned areas that were not planted but would likely regenerate naturally to extremely high densities (i.e., >10,000 stems per ha), where stand height growth would eventually stagnate. Since they cannot be identified through existing data sources (i.e., VRI, RESULTS, and fire history), two approaches were used to identify these potentially stagnated stands:

1) VRI plus additional harvest and fire history information (i.e., 2017 high severity fires). This approach identified approximately 3,197 ha of THLB (764 ha with VRI site index <15 m, 2,044 ha 15-19 m, and 590 ha ≥20 m), selected as follows:
    - EARLIEST_NONLOGGING_DIST_TYPE in ['B', 'NB'] or BurnSev 2017 = 'High'.
    - Identified only stands with a fire year more recent than harvest year.
    - Identified stand-replacing wildfires by ensuring that current age to year 2016 was in line with the fire year (i.e., difference between stand age current to 2016 and the difference between year 2016 and fire year was between -5 and 5 years).
    - Age of stands was ≥15 and ≤40 years.
    - Pine leading species.
2) RESULTS forest cover inventory. This area was determined by overlaying the RESULTS forest cover inventory polygons that had total stem/ha ≥10,000 with the THLB area that had the age current to 2016 between 15 and 40 years. This approach identified approximately 529 ha of THLB.

Note that the Base Case Scenario was not originally set-up to identify these stagnated stands. Any gains from this tactic, appropriate yield reductions would first need to be implemented in a separate sensitivity analysis.

Given that there was a relatively small area identified as potentially stagnant stands and the additional effort required to model and appropriately compare harvest flows for this tactic, thinning height-repressed, pine-leading stands was not modelled in this iteration of the ISS.

5 Wildlife Scenario

The Wildlife Scenario was designed to assess habitat quality and quantity for a range of wildlife species while continuing to meet all other timber and non-timber objectives. In this ISS iteration, the Project Team elected to explore three tactics: wildlife habitat, species at risk, and access (Table 41). Due to time and budget constraints, the Project Team decided not to proceed with the access tactic.

Table 41 Wildlife Scenario Tactics

Tactic	Purpose	Method
Wildlife Habitat	Quantify/qualify habitat required to achieve the desired outcome for representative types.	○ Include wildlife habitat ratings for the 7 species identified as indicators of representative habitat types (particularly marten, northern goshawk, and Flammulated owl). ○ Apply Best Management Practices or similar retention levels.
Species at Risk	Clarify how species at risk are considered.	○ Caribou: model federal recovery strategy. ○ Re-evaluate biodiversity criteria and/or matrix habitat.
Access	Manage road density and identify opportunities to rehabilitate key sections (open/closed).	○ Acquire complete existing/planned road network. ○ Link blocks to roads and monitor road density over time. ○ Assess road densities relative to thresholds over key habitat types (e.g., grizzly).

5.1 Wildlife Habitat

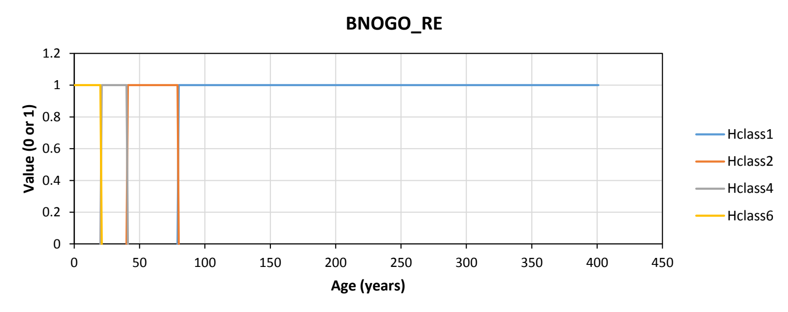
In conjunction with the latest TSR5, an aspatial, post-processing exercise was conducted to examine effects of future forest harvest on wildlife habitat (Muhly, et al., 2016). Habitat models were completed for seven wildlife species: grizzly bear, elk, mule deer, marten, Williamson's sapsucker, flammulated owl, and northern goshawk. These species were selected in discussion with the Ktunaxa Nation and as indicators of representative habitat types in the TSAs, such as old and mature forests.

The wildlife habitat tactic builds upon the (Muhly, et al., 2016) analyses by implementing the habitat models directly into the forest estate model to examine effects on both, harvest flow and wildlife habitat ratings over time, when aspatial and spatial targets for wildlife habitat are implemented. The key products from the (Muhly, et al., 2016) analyses include:

- **RRM WHR models** - Wildlife Habitat Rating models (Madrone Environmental Services Ltd.) that accesses information across multiple tabs and produces results that include Predictive Ecosystem Management (PEM) units, all possible structural stages for each PEM unit, and habitat classes by each of 14 habitat types (i.e., wildlife species and life requisite combination).
- **CSV output file** - consolidated results from all of WHR models into a single spreadsheet. This file joins to PEM spatial datasets by PEM unit and structural stage.
- **CSV lookup table** - consolidated lookup table that links the structural stage to age for each PEM unit.
- **Spatial PEM** - Summarizing these spatial data produced similar results as those presented in the (Muhly, et al., 2016) analyses.

The above key products were used to develop habitat class rating over age curves which were linked spatially to PEM and to the GIS resultant file that was used to develop the forest estate model. The forest estate model was programmed to track the THLB and non-THLB area within each habitat class rating and for each of the 14 habitat types. The habitat class ratings were reported over the planning horizon, aspatially in a similar format to (Muhly, et al., 2016) and spatially-explicit in the form of maps (i.e., one map for each habitat type showing all habitat class ratings by THLB and non-THLB). The methodology and scenarios modelled is detailed in Table 42.

Table 42 Methodology to Include Wildlife Habitat Model into Forest Estate Model

<table>
<tr><th>Phase</th><th>Description</th></tr>
<tr><td>Translate wildlife habitat models outputs into binary curves</td><td>From the CSV output file, extract the wildlife habitat class curves (class ratings from 1 to 6, 1 highest, 6 none) by structural stage and by each unique PEM unit/slope/aspect combination – called here wildlife analysis unit, or W_AU – (14 curves for each W_AU), then translate structural stage to age for each W_AU using the CSV lookup table, and develop a unique set of binary curves (0 or 1 values over age). For example, for one particular W_AU and habitat type, habitat class rating 4 occurs ages 0-60, rating 3 occurs 60-80yrs, rating 2 occurs 80-120, and rating 1 over 120yrs. These binary curves will instruct the forest estate model where a certain habitat rating occurs on the land base.


Spatial PEM is further summarized accordingly:
o PEM units (Ecosection, BEC zone, subzone, variant phase, site series),
o slope class (<35%, 35-100%, >100%),
o aspect class (135-285°, 285-135°), and
o stand class (B-Broadleaf>75%, C – Coniferous >75%, M-Mixed (neither C>75% or B>75%).</td></tr>
<tr><td>Check results against (Muhly, et al., 2016) analyses</td><td>Link the binary habitat curves to the spatial PEM and compare results with the tables summarized in (Muhly, et al., 2016). Results were described in:
o Memo_WHSM_differences_20190123.pdf
o Memo_WHSM_inconsistencies_20190219.pdf</td></tr>
<tr><td>Link habitat model results with forest estate model</td><td>o Add a field called W_AU to the spatial PEM and assign unique IDs based on the unique combinations of the above factors (PEM, slope class etc.).
o For each fragment (spatial resultant dataset for the project area), determine dominant W_AU (i.e., majority by area). The W_AU is now linked spatially to the forest estate and each W_AU has binary curves attached, corresponding to each of the 14 habitat types.</td></tr>
<tr><td>Aspatial Targets</td><td>Track and control area for each of the 14 habitat types by the 6 habitat classes, for the entire TSA and by land base type (THLB and non-THLB): 14 x 6 x 1 x 2 = 168 targets</td></tr>
<tr><td>Spatial Targets</td><td>None developed for this ISS iteration</td></tr>
<tr><td>Runs</td><td>
<table>
<tr><th>Run ID</th><th>Description</th></tr>
<tr><td>[030] No harvest and no habitat targets</td><td>No harvest treatments and no habitat targets. This run simply tracks the status of wildlife habitat classes under a 'no harvest' scenario. Note that fire disturbances on the non-THLB still apply; thus, some foraging habitat (or habitat needing young ages) might be present in the long-term.</td></tr>
<tr><td>[031] Harvest targets only</td><td>Maintain ISS Base Case harvest flow (accept max 1% change in harvest level) and apply lower weights to encourage the model wildlife habitat targets; not necessarily maintain them.</td></tr>
<tr><td>[032] Harvest and habitat targets</td><td>Apply habitat targets (i.e., maintain current distribution of 'at least habitat class 3' (i.e., combine class 1, 2, and 3) and apply a MINDY harvest flow (Maximum Initial Non-Declining Yield).</td></tr>
<tr><td>[033] Habitat targets only</td><td>Apply habitat targets (i.e., maintain current distribution of 'at least habitat class 3' (i.e., combine class 1, 2, and 3) without harvest targets. Model determines the harvest necessary to achieve appropriate foraging habitat (or habitat needing young ages).</td></tr>
</table>
</td></tr>
</table>

Phase	Description
Outputs	o Area distribution for each of the 14 habitat types by the 6 habitat classes, for the entire TSA and by land base type (THLB and non-THLB). Summarize outputs in line graphs – 168 graphs. o Spatial results at pre-determined periods (years 0, 20, 50, 100). The CFLB area by habitat type and class is included into a GIS feature class based on the GIS resultant used to develop the forest estate model in order to include the Crown non-CFLB area in the spatial outputs. The non-CFLB area is not included into the forest estate model in order to improve efficiency.

5.2 SPECIES AT RISK

While this tactic highlights species at risk, only the Southern Mountain Caribou was recommended by the Project Team, given the available time and budget. This tactic examines potential impacts on timber harvest from implementing the federal recovery strategy for the Purcells South herd area and combines the results across both, Cranbrook and Invermere TSAs. The federal recovery strategy aims to reduce the disturbance levels within High/Low Elevation Range and Matrix Range in the context of recovery plan thresholds (65% undisturbed). The disturbances include permanent (e.g., hydro transmission lines, camps, mines, roads etc.) and temporary (i.e., <40yrs old harvests and temporary roads) disturbed areas and their associated 500 m buffer. Wildfire disturbed areas are also considered temporary disturbances for 40yrs following the wildfire event, yet no buffers are associated with wildfires in order to estimate the disturbance levels.

Because the forest estate model cannot track the buffers associated with the temporary disturbed areas and the overlaps between the buffers, the temporary disturbed area < 40yrs old within the Purcells South herd area is tracked and controlled as a surrogate to cap the disturbance level:

- Maximum 35% for the High or Low Elevation range, and
- Maximum 35% for the Matrix Range, as a surrogate for low predation risk (< 3wolves/1000 km²).

In addition, the harvest openings for the entire TSA are also controlled in order reduce the sliver disturbed areas which are associated with relatively large 500 m buffers. Finally, the temporary roads construction and usage are tracked and reported in order to estimate more accurately the buffers associated with the temporary roads. For example, if a temporary road segment was not used for the last 40 yrs, it is assumed to be greened-up and no disturbed area and associated buffers are included to estimate the disturbance levels.

The modeling outputs were used to conduct a post-processing disturbance level assessment at eight periods along the planning horizon: P0 (initial), P0a (5 yrs), P1 (10 yrs), P2 (20 yrs), P5 (50 yrs), P10 (100 yrs), P20 (200 yrs), and P30 (300 yrs). The following methodology was applied:

- Determine the permanent anthropogenic features:
  - Buffer all permanent linear features (roads, seismic, hydro lines, pipelines, etc.) and permanent disturbed polygonal features (e.g., mines, camps, municipalities etc.) by 500m. Consolidate into a “permanent anthropogenic disturbance” layer (PAD).
- Determine the temporary features.
  - In P0, fire history since 1976 if not properly accounted in the inventory and all other forested polygonal features <40yrs old (e.g., cut-blocks) and their associated 500m buffer areas. Include all 500-m buffered temporary roads.
  - In P0a, and P1-P2, the last 40-year of fire history corresponding to each analyzed period, the non-THLB disturbed areas (i.e., random fires), and the THLB blocks harvested by the

model with their associated 500 m buffers. Include all 500-m buffered temporary roads and any future roads built and used by the model.
    - From P5 on, relative to the period in question, the last 40 yrs of the non-THLB disturbed areas and the THLB blocks harvested by the model with their associated 500 m buffers. Include all 500-m buffered temporary used/built roads by the model in the last 40 yrs.
- Determine the NRLs for the Low Elevation range (prorated based on THLB area within the range relative to the total THLB) in order to adjust the maximum disturbance level target (i.e., 35% less percentage of NRLs).
- Report results spatially (i.e., maps) and graphically.

In this ISS iteration, three runs were modeled and their outputs used to conduct the post-processing analysis:

- [040] – No harvest for the entire TSA.
- [041] – ISS Base Case scenario harvest schedule and assessment of the federal recovery strategy disturbance levels for the Purcells South herd area.
- [042] – Attempt to reduce the disturbance levels within the Purcells South herd area by controlling the area under 40yrs (for each range – Low/High Elevation and Matrix) and grouping harvest openings within each range and for the rest of the TSA (i.e., 3 sets of harvest opening control).

6 Reserve Scenario

The reserve scenario aimed to identify where and how we should reserve forested stands to address landscape-level biodiversity and where possible, non-timber values, while minimizing impacts to the working forest. While it considers strategies already in place (e.g., spatial OGMAs and MMAs), this scenario incorporates operational factors to identify alternative areas to maintain for non-timber values.

We did not intend to apply results as reserves in an operational sense. Rather, these candidate reserves provided additional information – as starting point – for revising existing reserves or developing recruitment strategies; involving a collaborative planning team to review each landscape unit – one at a time.

We also recognize that we currently do not have full information regarding First Nations values. While tactics to address specific First Nations values may not be directly modelled in this Reserve Scenario, they are considered within other scenarios where appropriate information is available. We will continue to work with First Nations to understand and incorporate their values into the Reserve and other Scenarios as information becomes available.

6.1 Approach

The Reserve Scenario involved three general steps:

1) First, each stand was assigned a relative score considering the quality/desirability of the candidate reserves (i.e., stand-level scoring relative to the stand features, anchors, and constraints).

3) Then, a model steadily selected candidate reserves that meet landscape-level thresholds. Here, two models were developed in two stages:

    a) determine the most suitable candidate stands that meet old seral landscape-level biodiversity targets, and

   b) assign an additional score to the stands selected from (a), as a start to determine the most suitable candidate reserves that meet both, old seral and mature-plus-old seral landscape-level biodiversity requirements.

4) Finally, results were further analyzed (post-processing) in the combined scenario to indicate the performance of candidate reserves relative to the old interior forest. Since old interior forest requirements were not set in the KBLUP, the spatial grouping of candidate reserves was implemented throughout the entire analysis to mimic the selection of OGMAs.

6.2 STAND-LEVEL SCORING

Relative scores were assigned to each stand with the following objectives (Figure 8):

- Assign scores based on stand features to assess their overall suitability as candidate reserves.
- Assign scores to resource management areas on their overall suitability as candidate reserves. Scoring for resource management areas was applied separately according to two main management tactics:
  - Anchors are areas that exclude timber harvesting altogether, and
  - Constraints are areas that restrict timber harvesting on a portion of stands.

Scores were assigned based on impact to timber availability within each area. A stand's total score was the sum of the applicable scores (both Stand Features and Resource Management Area). Stands were then sorted by their total scores – those with the highest values reflected the most desirable candidate reserves.

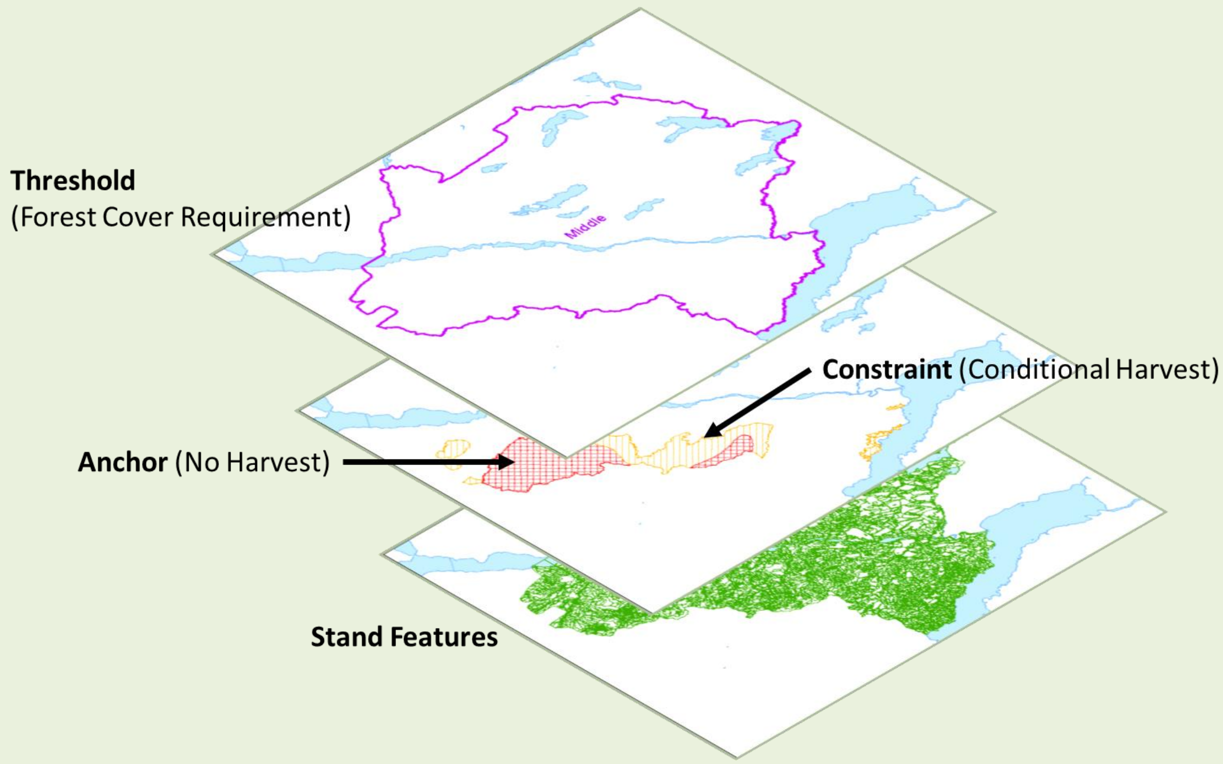


Figure 8 Approach for ranking stands as candidate reserves

6.2.1 Stand Features

Stand features scoring utilized vegetation and other attributes to rank stands based on their overall suitability as candidate reserves. Stands were evaluated using the indicators described in Table 43 and Table 44. In some cases, stand feature scores provided the 'tie-breaking' assessment between two stands identified as candidate reserves. These scores were developed and assessed independently of scores developed for resource management areas. In addition, categories and scoring considered stand resilience, while negative values reflected undesirable stand characteristics.

The total stand feature score was calculated as the sum of the applicable category scores. Stand-level indicators for scoring stand features were detailed for each stage (i.e., stage 1 determines the most suitable candidate reserves to meet old seral requirements in Table 43, and stage 2 determines the most suitable reserves candidates to meet both old and mature-plus-old KBLUP seral requirements in Table 44).

Table 43 Stand Feature Scoring for Old Forest

Indicator	Category	Score
Seral Stage	Old Conifer (as defined by KBLUP)	**8**
	Very Old Conifer (>250 years NDT3; >400 years others)	**10**
	Old Deciduous (>100 years)	**8**
	Very Old Deciduous (Old + 50 years)	**10**
Species Composition	≥ Three Conifer Species (Mixed Stand)	**5**
	Lodgepole Pine Leading (≥50%)	**-10**
	Balsam Leading (≥50%)	**-10**
Tree Height	≥ 30 m	**8**
	≥ 20 and < 30m	**4**
Interior Old Forest	Interior buffer (100 m) on old stands	**5**

Note: Old Interior Forest must include the buffer to be selected as a candidate reserve

Table 44 Stand Feature Scoring for Mature Recruitment

Indicator	Category	Score
Seral Stage	Early & Mid	**-10**
	Older Mid Conifer (40 years prior to Mature Conifer as defined in KBLUP)	**3**
	Mature Conifer (as defined in KBLUP)	**5**
	Older Mature Conifer (>200 years NDT1; mature-old midpoint for others)	**7**
	Mature Deciduous (>40 years)	**3**
	Older Mature Deciduous (>60 years)	**5**
Species Composition	≥ Three Conifer Species (Mixed Stand)	**5**
	Lodgepole Pine Leading (≥70%)	**-10**
	Balsam Leading (≥50%)	**-10**
Tree Height	≥ 20 m	**4**
Interior Old Forest	Mature stands within 200m from old interior forest	**5**

6.2.2 Resource Management Areas

Resource management areas include areas that restrict harvesting completely (i.e., anchors) or partially (i.e., constraints) (Table 45). Anchors were assigned a score of 10 because these areas are already excluded from harvesting because of some established requirement.

Like stand features, constraints were used to influence the selection of candidate reserves when a choice is presented. Constraints were scored (from 1 to 10 - Table 45) based on their perceived impact to timber availability (i.e., the higher the score, the greater the impact to timber supply relative to other constraints). The total score for a stand is the sum of all applicable category scores for that stand including those for multiple overlapping constraints.

Table 45 Resource Management Area Scoring

Category	Constraints	Score
Constraint	Old forest identified from first run*	**20**
Anchor	Parks and Protected Areas	**10**
Anchor	FSC High Conservation Value Forests (Endangered Forests Only)	**10**
Anchor	FSC Rare and Uncommon Ecosystems (100% reduction)	**10**
Anchor	WHA 4-044, 4-045, 4-109, 4-112: Data sensitive	**10**
Anchor	WHA 4-046 through 4-063: Rocky Mountain Tailed Frog	**10**
Anchor	WHA 4-066, 4-069, 4-070, 4-074,4-075: Long-billed Curlew	**10**
Anchor	WHA 4-086: Lewis's Woodpecker	**10**
Anchor	WHA 4-099,4-101: Flammulated Owl	**10**
Anchor	WHA 4-082, 4-083, 4-084, 4-085, 4-108, 4-110, 4-127 through 4-144, 4-181 through 4-202: Williamson's Sapsucker	**10**
Anchor	WHA 4-114, 4-115, 4-178, 4-179, 4-243 through 4-276: Western Screech Owl	**10**
Anchor	WHA 4-116, 4-117, 4-119: Antelope-brush/blue-bunch wheatgrass	**10**
Anchor	WHA 4-118,4-120: Douglas-fir/snowberry/balsamroot	**10**
Anchor	UWR u-4-013, u-4-014: Woodland Caribou Range	**10**
Anchor	Proposed or Draft WHAs (No Harvest GWM)**	**10**
Anchor	Proposed or Draft UWRs (No Harvest GWM)**	**10**
Anchor	Riparian Reserves (FSC or FRPA standards)	**10**
Anchor	Wildlife Tree Retention (≥ 2ha)	**10**
Anchor	Cultural Values**	**10**
Constraint	Current OGMAs and MMAs (update with Canfor July 22 version)	**4**
Constraint	KBLUP connectivity corridors	**10**
Constraint	UWR u-4-006, u-4-008 (white-tailed deer, mule deer, moose, elk, bighorn sheep, and mountain goat)	**6**
Constraint	Community and Domestic Watersheds	**3**
Constraint	VQO: Retention (R)	**7**
Constraint	VQO: Partial Retention (PR)	**3**
Constraint	VQO: Modification (M)	**1**
Constraint	Wildland Urban Interface (WUI)	**-2**
Constraint	Landscape-Level Fuel Breaks	**-2**
Constraint	Physically Inoperable (inoperable, unstable terrain, ESA, steep slopes)	**5**
Constraint	Isolated Stands	**3**
Constraint	Economic Inoperable (Low Productivity Sites, Problem Forest Types)	**1**
Constraint	Non-Merchantable Forest Types (decadent stands >200 yrs with uncertain economic operability)	**1**

** Developed in stage 1 of the analysis*

*** Data not available at this time*

Green highlighted items were also considered in stage 1 to improve recruitment of old seral reserves and alignment to the KBLUP intent.

While connectivity corridors were available under the KBLUP, important habitat for GBEAR had not yet been developed.

6.3 Criteria and Thresholds

Threshold(s) were used to evaluate when the required objective is met with the candidate reserves. Thresholds are the indicators and targets to be maintained or enhanced through this analysis. In modelling terms, these are typically forest cover requirements configured as target levels that the model seeks to achieve as:

- minimum or maximum levels,
- units in percent or area,
- over a given unit (e.g., watershed or landscape unit), or
- across specified periods (not applicable for this reserve scenario).

Stands were ranked and grouped relative to each landscape-level threshold until the appropriate requirements were met. For this analysis, landscape-level thresholds were assessed for the following indicators: old forest retention, mature-plus-old retention, reserves size distribution, and interior old forest (tracked only).

6.3.1 Old Forest Retention

BEC version 11 was used to assess the old forest retention as designated in Table 46. Thresholds were calculated as the percentage of forest area (FMLB) within the BEC unit (zone and variant) for each landscape unit.

Table 46 Old Forest Targets Applied to BEC Variants within Landscape Units

NDT	BEC Zone	Version 11 BEC Variant	Version 6 BEC Variant (Reference Only*)	Stand Age	% Retention by biodiversity emphasis		
					Low**	Interm	High
1	ESSF	wcw, wm2, wmw	wcw, wm, wmw, wmu	≥250	19	19	28
2	ESSF	mm3, mmw, wh2, wm1, wm4		≥250	9	9	13
	ICH	mw1, mw2	mw1	≥250	9	9	13
3	ESSF	dk1, dk2, dkw	dk1, dk2, dku, dkw, dm, dmw	≥140	14	14	21
	ICH	dm, dw1, mk4, mk5	dm, dw1, mk1	≥140	14	14	21
	MS	dk, dw	dk	≥140	14	14	21
4	IDF	dk5, dm2, un, xk, xx2	dm2, un, xk	≥250	13	13	19
	PP		dh2				
5	ESSF	dkp, mmp, wmp, wcp	dkp, dmp, wcp, wmp	n/a			
	IMA	All	All				

** BECv6 was not used for this analysis but shown here as a reference to the targets established in KBLUP.*
*** "Old" seral stage targets in low biodiversity emphasis may be reduced up to 2/3 draw-down over the first rotation.*
Note: ESSFdk1/dk2 and MSdk1/dk2 were mapped in BECv6 but grouped in OGMA calculations. BECv6 to BECv11: MSdk1 = MSdw; MSdk2 = MSdk

For identifying candidate reserves, we applied the full target rather than the 2/3 drawdown for old seral in LUs with low BEO.

6.3.1 Mature-Plus-Old Forest Retention

BEC version 11 was used to assess the mature-plus-old forest retention as designated in Table 47. Thresholds were calculated as the percentage of forest area (FMLB) within the BEC unit (zone and variant) for each landscape unit.

Table 47 Mature-Plus-Old Forest Targets Applied to BEC Variants within Landscape Units

LU #	LU Name	BEO	NDT	BECv6 Variants	Mature Age	Older Mature Age	% Retention (Mat+Old)
I01	Findlay	H	3	ESSF dk1, dku	≥120	≥130	34
I02	Buhl/Bradford	H	3	ESSF dk1, dku	≥120	≥130	34
I02	Buhl/Bradford	H	3	MS dk	≥100	≥120	39
I11	Kootenay	H	3	ESSF dk1, dku	≥120	≥130	34
I11	Kootenay	H	3	MS dk	≥100	≥120	39
I16	Jumbo	H	1	ESSF wm, wmu	≥120	≥200	54
I16	Jumbo	H	3	ESSF dk1, dk2, dku	≥120	≥130	34
I16	Jumbo	H	3	MS dk	≥100	≥120	39
I17	Goldie	H	3	ESSF dk1, dku	≥120	≥130	34
I17	Goldie	H	3	MS dk	≥100	≥120	39
I19	Fenwick	I	3	MS dk	≥100	≥120	26
I20	Pallisar	I	3	MS dk	≥100	≥120	26
I22	Albert	H	3	ESSF dk1, dk2, dku	≥120	≥130	34
I22	Albert	H	3	MS dk	≥100	≥120	39
I24	Pedley	H	3	MS dk	≥100	≥120	39
C04	Hellroaring - Meachen	H	1	ESSF wm, wmw	≥120	≥200	54
C09	Yahk River	L	3	ESSF dk	≥120	≥130	14
C09	Yahk River	L	3	ICH mk1	≥100	≥120	14
C14	Wigwam River	H	3	ESSF dk, dkw	≥120	≥130	34
C14	Wigwam River	H	3	MS dk	≥100	≥120	39
C15	Lodgepole - Bighorn	H	3	ICH mk1	≥100	≥120	34
C15	Lodgepole - Bighorn	H	3	MS dk	≥100	≥120	39
C18	East Flathead	I	3	MS dk	≥100	≥120	26
C22	Upper Elk	I	3	MS dk	≥100	≥130	39
C22	Upper Elk	I	3	ESSF dk, dkw	≥120	≥120	34
C23	West Elk	H	3	ESSF dk, dkw	≥120	≥130	34

Source: KBLUP Variance 08, November 2006 and Table 46

6.3.2 Reserve Size Distribution

Given the complexities involved with assessing reserves relative to multiple thresholds and the desire to group reserves into larger areas where appropriate, this analysis was designed as a spatial model (i.e., Patchworks™). One of the goals of the reserves scenario was to develop relatively large, contiguous areas of mature and old forest to maximize the area of the interior forest habitat. Therefore, reserve size distribution targets were implemented according to Table 48.To avoid splitting reserves that result from narrow road buffers, a distance threshold for combining reserves was applied by cleaning topology (i.e., combine where reserves are under 10m). In addition, narrow riparian buffers were not included in order to avoid narrow and relatively large size areas to be selected as candidate reserves. Finally, individual polygons were aggregated prior to running the model in order to avoid interior gaps within a patch of selected reserves.

Table 48 Reserve Size Distribution Targets

NDT*	Area (ha)	Target	Weight
Each NDT	<2	< 0%	Very High
Each NDT	2-10	< 10%	High
NDT 1	10-50	≥ 5%	
	50-250	≥ 15%	Low
	250-1000	≥ 40%	Medium
	≥1000	≥ 40%	High
NDT 2	10-50	< 100% (no target)	
	50-250	≥ 25%	Low
	250-500	≥ 35%	Medium
	≥500	≥ 35%	High
NDT 3 (MS)	10-50	≥ 30%	Low
	50-250	≥ 30%	Medium
	≥250	≥ 40%	High
NDT 3 (ICH/ESSF) & NDT 4	10-50	< 100% (no target)	
	50-250	≥ 30%	Low
	250-500	≥ 40%	Medium
	≥500	≥ 20%	High

Note that these sizes are for reserves and differ from those for cutblocks in the Biodiversity Guidebook.
Adapted from Habitat Branch document - Guidance for OGMA Implementation (Holt 2000).

6.3.3 Interior Old Forest

Specific criteria for interior old forest were not established for the Invermere TSA. The KBLUP implementation strategy document references Appendix 1 of the Biodiversity Guidebook, which includes a very general description of edge effects and interior old forest. For this analysis, interior old forest was identified as the area of ‘old seral' forest or natural forest area that is uninfluenced by the microclimate of biotic edge effects. For this exercise, we applied a 100m buffer from adjacent stands less than 60 years (age class 1-3) or any permanent anthropogenic disturbance (e.g., primary road right-of-ways, pipeline and railroad corridors, transmission lines, and urban communities). Old forest was defined according to Table 46.

Initially, interior old forest included natural non-forest (e.g., lakes, wetlands, rock) to eliminate 'natural edges'. The natural non-forest features were then erased from the interior layer. The buffered area of old forest stands was maintained as edge areas to identify, where necessary, mature stands with potential recruitment areas.

A post-processing exercise should be considered to assess the final interior old forest selected (see section 6.4.4). If controls are implemented, this analysis is important to verify that interior old forest targets were met.

6.4 Analysis Steps

The subsections below briefly describe the steps required for the Reserve Scenario analysis, including work to prepare the model prior to processing, running the model, and post-processing following each run.

6.4.1 Pre-Analysis Summary

An accompanying Excel file summarizes detailed statistics for the stand-level scoring (section 6.2). Overall, the current landscape-level biodiversity objectives are in deficit for:

- Old Seral (202 reporting units) by 9,211 ha (10%) in 34 reporting units, and
- Mature-Plus-Old Seral (24 reporting units) by 2,259 ha (7%) in 6 reporting units.

Note that: a) we applied the full target rather than the 2/3 drawdown for old seral in LUs with low BEO, and b) mature-plus-old targets only apply to specific LU/BEC Variant combinations; not all of them.

6.4.2 Pre-Processing

A resultant file (overlays of spatial data developed for the ISS Base Case analysis) provided an initial spatial dataset to work with. The following spatial data - not required for the ISS Base Case - were added to the resultant for the Reserve Scenario:

- Interior Old Forest +edges (100m),
- Current FSC high value and endangered forests,
- Current OGMAs and MMAs,
- KBLUP connectivity corridors,
- Landscape-level fuel breaks,
- Riparian reserves (FSC for Canfor Operating areas and FRPA for the rest), and
- Wildlife tree retention areas ≥ 2ha.

Assessment criteria were calculated as separate fields in the spatial database for each of the stand features and resource management area indicators. The cumulative scores for each of the two stages were tracked in two separate fields. This was done using a python script that accessed Excel spreadsheets with scores for each indicator.

6.4.3 Processing

Two separate models were developed and applied:

1. The first run focused on identifying stands that met the old forest requirements (Table 46) and assessing these criteria to calculate the old forest surplus/deficit for each LU/BEC reporting unit. While this includes parameters for interior old forest and reserve size distribution, only the cumulative scores of stand features for old forest (Table 43) were applied in this run.
2. The second run focused on identifying mature stands as recruitment for future OGMAs, which is required: a) where old seral status is in deficit for a LU/BEC unit, b) where mature-plus-old targets were established (section 6.3.1), and c) to address identified connectivity corridors (grizzly bear not available). This process also incorporated, through anchors and constraints, reserves associated with other non-timber values. In this run, cumulative scores were calculated from stand feature scores for mature recruitment (Table 44), and identified anchors and constraint scoring (Table 45).

The primary approach to modelling each process was to maximize the cumulative score while trending towards the landscape-level criteria and thresholds. Once target thresholds were met, selection of candidate reserves within LU/BEC reporting units was halted. A Patchworks™ model was built with the following components:

1. Thresholds defined in section 6.3.1 were used to create ratio accounts for each reporting unit (i.e., area selected divided by total forested area) to meet old and mature-plus-old forest area targets. The model was first run only with these targets. The targets had a minimum value with a relatively high weight (i.e., 1e12) and a maximum value with a slightly lower weight than the minimum value (i.e., 1e10). The goal was to restrict the model of over-selecting candidate stands needed to meet the old and mature-plus-old forest area targets.
2. Maximize the value of each stand measured as the score/ha value (i.e., total area selected as reserves divided by the total score of the area selected). Note that scoring scheme discouraged the selection of early- and mid-seral candidate reserves, unless the reporting unit had a deficiency of mature and old stands needed to meet the old and mature-plus-old forest area targets.
3. Minimize the area selected from the THLB while maintaining similar amount of total area selected and similar value of selected reserves (i.e., score/ha).
4. Maximize the area selected as candidate reserves from the a-priori determined old interior (+associated edge). Continue to achieve similar values for total area selected and its quality.
5. Attempt to meet the reserve size distribution patterns detailed in section 6.3.2.

Within each of the steps 2-5 above, weights were balanced such that the old and mature-plus-old forest area targets were not violated (i.e., first increase the weights until the old and mature-plus-old forest area targets are starting to be violated, then decrease the weights so the old and mature-plus-old forest area targets are met). For example, during step 2, the weight on the quality of the selected reserves (i.e., score/ha) was first increased to a relatively high weight so the model will select only the stands with the highest score/ha values in each reporting unit. Because a relatively high value of the stands was requested by increasing the weight on score/ha account, the model would select only a subset of the stands available and thus, not meeting the minimum old and mature-plus-old forest targets. The weight of score/ha account was then refined to a point that the minimum old and mature-plus-old forest targets were met.

6.4.4 Post-Processing

Patchworks™ does not dynamically track buffer areas like those required to maintain old interior forest over time. A post-processing is required to determine the actual old-interior areas that were maintained over time. Since there are no KBLUP targets for the old interior forest, a post-processing exercise might be conducted for the combined scenario that incorporates the candidate reserves.

6.4.5 Adjustments

The Reserve Scenario modelling process was developed to accommodate adjustments with the stand-level scoring and/or the assigned thresholds. Implementing these adjustments as sensitivities can be easily done but changes to spatial designations (e.g., turning off WHAs) requires more work to rebuild and/or redefine the resultant file.

6.4.6 Implementation

The approach anticipated for implementing candidate reserves in the Combined Scenario is to 'lock' the selected areas from harvesting over the short- to mid-term (e.g., 20 to 40 years). In this case, edge polygons identified to maintain forest interior thresholds will also be included with the candidate reserves.

The candidate reserves also provide additional information – as starting point – for revising existing reserves or developing recruitment strategies; involving a collaborative planning team to review each landscape unit – one at a time.

7 Combined Scenario

The Combined Scenario aimed to guide development, implementation, and monitoring of tactical plans over the first 20 years of the planning horizon. Key elements from the three scenarios (ISS Base Case, Silviculture, and Reserve) were included to provide an integrated strategy to this first iteration of the ISS process. Specific tactics and approaches are briefly summarized in Table 49.

For comparison, two separate runs were completed for the Combined Scenario:

- ***Run 1 (Candidate Reserves)*** utilized the spatially defined candidate reserves developed through the reserve scenario (i.e., full old seral target in LUs with low BEO). These areas were locked from being harvested over the first 20 years and aspatial seral targets were applied afterwards (i.e., included 2/3 drawdown).
- ***Run 2 (Current OGMAs/MMAs)*** utilized the current spatially defined OGMA/MMA areas. These areas were locked from being harvested over the first 20 years and aspatial seral targets were applied afterwards (i.e., included 2/3 drawdown).

Table 49 Tactics Applied in the Combined Scenario

Scenario	Tactic	Approach
ISS Base Case	BEC v11	○ Updated the spatial delineation of BEC draft version 11 with final BEC version 11.
ISS Base Case	OGMA	○ Updated the spatial delineation of OGMA/MMA with Canfor's latest version dated July 22, 2019.
ISS Base Case	FSC HCVF Areas	○ Updated the spatial delineation of FSC HCVF (Endangered Forests and Reserve Areas) with Canfor's latest version dated July 22, 2019.
ISS Base Case	Proposed WHAs	○ Implemented spatial delineation of core habitat areas of proposed WHAs for Lewis Woodpecker, Westslope Cutthroat Trout, and Bull Trout (TAG# 4-278 to 4-283, 4-305).
ISS Base Case	Wildfires	○ Updated forest inventory for 2018 wildfires according to available burn severity mapping.
ISS Base Case	Depletions	○ Updated forest inventory for depletions and established WTR areas to January 2019.
ISS Base Case	Seral Targets	○ Continued to apply old seral targets for each LU/BEO/NDT/BEC zone combination using latest BEC v11. ○ Included 2/3 drawdown on old seral targets for LUs with low BEO. ○ Applied mature-plus-old seral targets only to designated LU/BEO/NDT/BEC zone combinations (26 reporting units for both TSAs).

Scenario	Tactic	Approach
ISS Base Case	Harvest Flow	○ Developed harvest flow at current AAC over the initial period and a non-declining pattern thereafter, while maintaining an even merchantable growing stock over the last 100 years of the 300-year planning horizon.
ISS Base Case	Harvest Profile	○ Maintained current harvest profiles for harvest system (i.e., ground/slope ≤40%) and haul time (i.e., <0.5hrs and 0.5-1hr), over the first 40 years.
ISS Base Case	Harvest Opening Sizes	○ Implemented harvest opening criteria as follows: • 0 to 1 hectare: None allowed, hard constraint • 1 to 5 hectares: Maximum 5% of harvest area, moderately hard weight
ISS Base Case	Visual Quality	○ Applied VEG height to each analysis unit within VLI polygons rather than an average VEG height for the VLI polygon.
Silviculture	Analysis Units	○ Split AUs originally grouped with site index 15-20 m to identify eligible stands for various silviculture tactics. For consistency with TSR, maintained the same yield curves for the split AUs.
Silviculture	Treatments	○ Implemented treatments for enhanced basic and fertilization over the first 20 years but extended the commercial thinning treatments to the first 60 years. ○ Limited the area treated for enhanced basic and commercial thinning to 10% and 5%, respectively, of the eligible area over each period. Also limited the budget for all treatments to $300,000 per year.
Reserve	Landscape-Level Biodiversity	○ Prepared one model that utilized the spatially defined candidate reserves developed through the reserve scenario (i.e., full old seral target in LUs with low BEO). Locked these areas from being harvested over the first 20 years and applied aspatial seral targets afterwards (i.e., include 2/3 drawdown). ○ For comparison, prepared a second model that utilized the current spatially defined OGMA/MMA areas. Locked these areas from being harvested over the first 20 years and applied aspatial seral targets afterwards.

8 References

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Appendix 1 Detailed Statistics of the Non-Timber Objectives

Table 50 Community and Domestic Watersheds

Watersheds	Gross Area (ha)	Non Forest (ha)	Private Lands (PL) (ha)	Anthropogenic Disturbance (AD) (ha)	FMLB (ha)	THLB (ha)	Max ECA 30% (ha)	Max ECA less PL and AD (ha)	Max ECA target on FMLB (%)
Community Watersheds	**38,439**	**13,768**	**3,273**	**13**	**21,209**	**4,448**			
Abel	3,490	485	1,079	5	1,921	331	1,047	234	12%
Cold	975	311	234	2	427	45	293	115	27%
Forster	16,608	8,693	0	2	7,833	1,147	4,982	4,981	64%
Luxor	9,288	2,366	53	4	6,779	2,258	2,786	2,744	40%
Macaulay	1,384	210	197	0	975	51	415	267	27%
Madias	2,436	486	810	0	1,136	273	731	123	11%
Sophy	889	57	200	0	629	336	267	117	19%
Tatley	1,914	518	701	0	696	7	574	49	7%
Taynton	1,456	642	0	1	813	0	437	436	54%
Domestic Watersheds	**107,099**	**33,901**	**16,645**	**422**	**55,837**	**17,022**			
Barbour Face	71	12	26	0	33	8	21	2	5%
Bayview Creek	127	102	5	2	19	13	38	32	100%
Bayview Creek 1	113	90	0	1	23	13	34	34	100%
Bayview Creek 2	133	34	0	0	99	0	40	40	40%
Bayview Creek 3	213	85	100	2	26	24	64	-13	0%
Beard Creek	932	200	4	0	723	160	279	277	38%
Beard Face	941	12	611	1	311	207	282	-177	0%
Billy Goat	686	669	16	11	1	0	206	186	100%
Billy Goat Face	255	80	168	2	8	0	77	-51	0%
Birchlands Creek	37	35	0	1	2	2	11	11	100%
Body Creek	558	3	164	0	386	210	167	45	12%
Brady Creek	1,811	15	959	6	828	335	543	-181	0%
Brady Creek 1	454	48	151	1	245	201	136	22	9%
Brady Creek 2	479	4	32	2	440	135	144	118	27%
Brisco Creek	405	54	117	0	234	21	122	34	14%
Bryanton Creek	471	7	22	0	434	275	141	125	29%
Burnais Creek	1,146	119	30	0	984	276	344	321	33%
Burnais Creek 1	145	5	0	0	136	94	43	43	32%
Burnside-Squaw Point Face	680	1	427	0	251	116	204	-116	0%

Watersheds	Gross Area (ha)	Non Forest (ha)	Private Lands (PL) (ha)	Anthropogenic Disturbance (AD) (ha)	FMLB (ha)	THLB (ha)	Max ECA 30% (ha)	Max ECA less PL and AD (ha)	Max ECA target on FMLB (%)
Cain Brook	282	53	5	0	224	82	85	81	36%
Carbonate Creek	247	13	194	0	38	31	74	-72	0%
Carbonate Creek 1	281	41	0	0	240	6	84	84	35%
Carbonate Creek 2	233	60	0	1	172	7	70	69	40%
Carriage Creek	214	25	3	0	186	0	64	62	33%
Carriage-Shuswap Face	158	28	86	0	44	0	47	-17	0%
Castor Creek	526	81	0	0	439	221	158	158	36%
Cedared Creek	871	255	41	1	572	97	261	230	40%
Cedared Creek 1	480	143	0	0	335	79	144	144	43%
Cedared-Fraling Face	1,274	117	699	0	457	76	382	-142	0%
Cobalt Face	153	78	11	1	63	1	46	37	58%
Copper Creek	654	3	2	0	641	467	196	195	30%
CPR-Hannant Face	163	1	30	1	124	120	49	26	21%
Cronkite Creek	426	218	113	8	94	69	128	38	40%
Cronkite Creek 1	235	91	12	1	131	41	70	60	46%
Cronkite Creek 2	239	132	0	0	107	6	72	72	67%
De Grazie Creek	292	118	78	2	96	45	88	27	29%
De Grazie Creek 1	260	174	0	0	86	9	78	78	91%
DeGrazie-Pratt Face	224	6	131	1	88	61	67	-31	0%
Diorite Creek	6,296	3,045	0	0	3,251	6	1,889	1,889	58%
Dunbar Face	198	0	193	0	5	1	59	-85	0%
Einiger Creek	557	17	32	0	497	307	167	143	29%
Emily Creek	961	6	4	0	931	692	288	285	31%
Eugene Creek	124	70	13	1	41	0	37	27	66%
Fairmont Creek	726	318	28	0	379	16	218	197	52%
Fairmont Creek 1	287	125	0	0	161	2	86	86	54%
Forster Face	80	8	72	0	0	0	24	-30	0%
Foxy Spring	1,081	131	564	0	385	73	324	-99	0%
Fraling Creek	1,233	209	63	0	958	158	370	322	34%
Fraling Creek 1	1,341	740	0	0	601	152	402	402	67%
Fraling Creek 2	287	142	0	0	145	18	86	86	59%
Fraling Creek 3	387	209	0	0	178	3	116	116	65%
Gaddes Brook	1,032	83	558	0	390	76	309	-109	0%

Watersheds	Gross Area (ha)	Non Forest (ha)	Private Lands (PL) (ha)	Anthropogenic Disturbance (AD) (ha)	FMLB (ha)	THLB (ha)	Max ECA 30% (ha)	Max ECA less PL and AD (ha)	Max ECA target on FMLB (%)
Gaddes Brook 1	373	95	81	0	196	23	112	51	26%
Geary Creak	361	34	34	0	293	0	108	83	28%
Goldie Creek	399	0	396	0	2	2	120	-178	0%
Grainger Face	287	3	148	0	136	0	86	-25	0%
Hardie Creek	1,347	93	483	6	765	252	404	38	5%
Hatch Creek	796	523	47	8	226	0	239	198	88%
Hatch Creek 1	265	117	0	0	148	0	80	80	54%
Hogranch Creek	33	1	29	1	3	3	10	-13	0%
Hogranch Creek 1	761	295	32	1	431	124	228	204	47%
Hogranch Creek 2	443	65	87	0	286	162	133	68	24%
Hogranch Creek3	719	85	156	0	470	322	216	98	21%
Home Basin Creek	818	300	0	0	518	64	246	246	47%
Hot Creek	997	487	61	5	449	59	299	250	56%
Hot Creek 1	216	195	0	0	21	0	65	65	100%
Hurst Creek	373	20	29	0	316	217	112	90	28%
Inlet Creek	2,722	651	0	2	2,043	976	817	815	40%
Johnson Draw Creek	407	185	192	3	30	0	122	-24	0%
Johnson Draw Creek 1	243	24	0	1	218	0	73	72	33%
Johnson Draw Creek 2	160	99	0	0	62	0	48	48	78%
Kindersley Creek	3,423	807	84	4	2,495	831	1,027	961	39%
Kindersley Creek 1	2,237	720	0	0	1,502	318	671	671	45%
Kindersley Creek 2	167	81	0	0	85	37	50	50	59%
Kindersley Creek 3	187	127	0	0	60	25	56	56	93%
Lame Joe Face	180	0	0	0	179	99	54	54	30%
Lansdowne Creek	564	59	0	1	504	1	169	169	34%
Little Pool Face	45	44	1	0	0	0	14	13	100%
Luxor Face	3,133	74	2,633	0	426	146	940	-1,035	0%
Marion Creek	975	80	736	4	154	93	292	-263	0%
Marion Creek 1	465	16	228	0	220	12	139	-32	0%
Marion Creek 2	328	5	179	0	144	15	98	-36	0%
Marion Creek 3	740	57	310	1	372	54	222	-11	0%
Marion Creek 4	1,079	246	148	0	685	49	324	212	31%
Mather Creek	42	0	0	0	41	34	13	13	31%

Watersheds	Gross Area (ha)	Non Forest (ha)	Private Lands (PL) (ha)	Anthropogenic Disturbance (AD) (ha)	FMLB (ha)	THLB (ha)	Max ECA 30% (ha)	Max ECA less PL and AD (ha)	Max ECA target on FMLB (%)
Mather Creek 4	1	0	0	0	1	0	0	0	30%
Mather Creek 5	366	13	0	0	353	8	110	110	31%
Mather Creek 6	348	1	0	0	342	279	104	104	30%
McCready Creek	221	0	22	0	198	108	66	49	25%
McKeeman Creek	299	107	93	3	99	28	90	18	18%
McKeeman Creek 1	343	65	0	0	277	15	103	103	37%
McKeeman Creek 2	103	65	0	0	37	0	31	31	82%
McKeeman Creek 3	192	77	0	0	114	3	58	58	50%
McKeeman Face	364	81	284	3	0	0	109	-106	0%
Monteagle Creek	326	107	33	3	183	123	98	70	38%
Montgomery Creek	360	23	224	0	113	15	108	-60	0%
Mossom Spring	318	185	34	3	99	0	95	68	69%
Mud Creek	2,086	118	460	2	1,483	910	626	279	19%
Neave Creek	1,214	207	555	2	449	86	364	-54	0%
Nelson Brook	536	460	14	15	62	8	161	140	100%
Nelson Creek	671	231	363	3	76	12	201	-74	0%
Nelson Creek 1	322	90	27	1	203	52	97	75	37%
Nelson Creek 2	164	27	0	0	137	0	49	49	36%
Nelson Face	128	29	51	2	46	12	39	-1	0%
Newbolt Creek	258	9	0	0	247	51	77	77	31%
Paddy Creek	317	60	74	2	180	80	95	38	21%
Pratt Creek	888	162	54	0	661	385	266	226	34%
Prust Creek	75	2	41	0	32	25	23	-8	0%
Pye Face	392	160	222	10	10	2	118	-57	0%
Ram Creek	1,941	1,269	14	1	650	149	582	572	88%
Ram Creek 1	700	285	0	0	413	68	210	210	51%
Ram Face	155	1	19	0	135	20	47	33	24%
Reed Face	423	32	117	4	250	218	127	36	14%
Rubie Creek	670	282	1	0	384	62	201	200	52%
Rubie Face	194	3	38	2	145	95	58	28	19%
Shuswap Creek	2,696	360	20	1	2,304	232	809	793	34%
Shuswap Creek 1	466	133	0	0	331	32	140	140	42%
Shuswap Creek 2	616	213	0	1	394	152	185	184	47%

Watersheds	Gross Area (ha)	Non Forest (ha)	Private Lands (PL) (ha)	Anthropogenic Disturbance (AD) (ha)	FMLB (ha)	THLB (ha)	Max ECA 30% (ha)	Max ECA less PL and AD (ha)	Max ECA target on FMLB (%)
Shuswap Creek 3	495	90	0	0	404	88	149	149	37%
Sinclair Creek	9,615	9,251	344	44	20	6	2,885	2,594	100%
Soles Creek	698	567	3	10	128	0	209	200	100%
Soles Creek 1	367	163	0	1	204	0	110	109	53%
Spring Brook	1,251	164	48	2	1,018	907	375	337	33%
Spring Face	69	0	28	0	39	39	21	0	0%
Stoddart Creek	1,579	704	73	2	801	92	474	418	52%
Stoddart Creek 1	417	416	0	0	2	0	125	125	100%
Sun Creek	1,616	416	778	8	421	197	485	-104	0%
Ta Ta Creek	102	30	0	0	71	11	30	30	43%
Ta Ta Creek 1	379	51	0	0	324	186	114	114	35%
Ta Ta Creek 2	165	9	69	6	85	80	50	-7	0%
Templeton Face	219	7	98	0	110	91	66	-8	0%
Thorold Creek	938	3	3	0	913	685	281	279	31%
Tower Face	48	3	3	0	41	0	14	12	29%
Twin Face	67	0	57	0	10	0	20	-23	0%
Windermere Creek	4,094	437	339	137	3,144	1,205	1,228	871	28%
Windermere Creek 1	283	29	0	0	254	7	85	85	33%
Windermere Creek 2	289	4	0	60	219	106	87	42	19%
Windermere Creek 3	254	2	0	0	248	99	76	76	31%
Windermere Creek 4	1,473	597	0	0	876	2	442	442	50%
Windermere Creek 5	413	89	0	0	324	8	124	124	38%
Windermere Creek 6	1,468	217	0	0	1,246	90	440	440	35%
Windermere Creek 7	553	119	0	0	430	126	166	166	39%
Witness Creek	675	308	0	0	365	46	203	203	55%
Wolf Creek	1,877	554	141	8	1,175	373	563	451	38%
Wolf Creek 1	692	305	0	0	387	2	208	208	54%
Wolf Creek 2	724	346	2	0	376	6	217	216	57%
Wolf Face	147	39	16	0	91	82	44	32	35%
Yearling Creek	441	79	22	0	338	82	132	116	34%
Yearling Creek 1	421	84	0	1	336	109	126	126	37%
Yearling Creek 2	364	56	0	0	305	138	109	109	36%

Table 51 Visual Quality Objectives

VLI Polygon ID	Established VQO	VAC	Species	Slope (%)	Site Index (m)	Height (m)	Age at Height (years)	THLB (ha)	THLB Younger than Target Age (ha)	NHLB (ha)	NHLB Younger than Target Age (ha)	Current (%)	Max Target (%)
107303	PR	H	B	59.5	15.6	8.0	25	0	0	944	0	0.0	10.2
107304	PR	M	Fd	53.0	18.0	7.5	17	560	107	3,469	218	8.1	6.9
107308	PR	M	Fd	20.8	19.6	5.0	10	338	9	168	0	1.9	13.1
107309	M	M	AT	12.6	20.9	4.0	6	0	0	2	0	0.0	47.1
107320	PR	L	S	25.6	21.7	5.5	13	0	0	4	0	0.0	4.4
107362	PR	H	AT	19.0	20.9	4.5	7	0	0	28	0	0.0	23.9
107423	M	M	Fd	18.2	19.8	4.5	8	0	0	0	0	0.0	42.6
107427	M	H	S	63.7	16.1	8.5	27	0	0	30	0	0.0	23.2
107453	R	L	Fd	52.8	18.6	7.5	16	136	3	437	0	0.5	0.2
107468	M	H	B	60.4	15.0	8.5	28	0	0	79	0	0.0	26.1
107472	PR	M	Fd	15.7	20.2	4.5	8	652	63	288	2	6.9	14.7
107474	PR	H	AT	0.7	20.5	3.0	4	0	0	7	0	0.0	32.8
107478	M	L	Fd	24.1	20.1	5.0	9	46	0	31	0	0.0	21.6
107479	M	M	Fd	50.8	19.1	7.5	16	262	9	1,322	1	0.6	20
107488	PR	M	P	14.8	20.4	4.0	7	1	0	1	0	0.0	16.2
107489	PR	H	AT	1.3	20.2	3.0	4	0	0	5	0	0.0	32.8
107493	PR	M	P	50.9	18.7	7.5	16	79	13	100	1	8.0	6.9
107501	M	H	P	13.6	20.5	4.0	7	71	0	8	0	0.0	67.9
107520	PR	M	P	51.8	16.3	7.5	18	208	33	527	3	4.8	6.9
107525	PR	M	Fd	36.9	19.4	6.5	13	462	0	217	0	0.0	9.5
107526	M	H	P	8.9	18.1	3.5	7	31	0	28	0	0.0	76.1
107527	M	H	AT	5.1	19.2	3.5	6	2	0	63	0	0.0	84.2
107529	PR	M	Fd	22.6	18.9	5.0	10	918	220	775	2	13.1	13.1
107534	PR	L	Fd	33.4	19.7	6.0	12	844	106	534	48	11.2	3.9
107537	PR	M	Fd	30.2	19.8	6.0	11	227	39	154	11	13.4	11.8
107541	PR	L	Fd	55.1	18.0	8.0	18	11	0	202	0	0.2	2.6
107545	PR	M	P	56.8	15.6	8.0	20	1	0	296	0	0.0	6.2
107548	M	H	AT	0.4	19.2	3.0	5	0	0	5	0	0.0	84.2
107553	M	M	Fd	51.3	17.8	7.5	17	224	0	1,576	0	0.0	20
107556	PR	M	P	59.9	16.2	8.0	20	0	0	232	0	0.0	6.2
107564	M	H	Fd	11.9	19.9	4.0	7	0	0	95	0	0.0	67.9
107567	M	M	Fd	55.5	17.5	8.0	18	331	114	1,169	14	8.5	20
107571	M	H	Fd	10.8	15.3	4.0	9	0	0	0	0	0.0	67.9
107576	M	H	Fd	15.3	17.7	4.5	9	155	36	66	0	16.4	67.9
107582	R	L	Fd	35.6	19.8	6.5	13	218	0	223	0	0.0	0.2

VLI Polygon ID	Established VQO	VAC	Species	Slope (%)	Site Index (m)	Height (m)	Age at Height (years)	THLB (ha)	THLB Younger than Target Age (ha)	NHLB (ha)	NHLB Younger than Target Age (ha)	Current (%)	Max Target (%)
107585	M	H	Fd	11.9	19.2	4.0	8	179	0	72	0	0.0	67.9
107590	PR	M	Fd	20.6	19.7	5.0	10	284	14	27	0	4.4	13.1
107599	R	L	Fd	12.8	18.2	4.0	8	410	0	109	0	0.0	0.4
107607	PR	L	Fd	28.1	21.6	5.5	10	334	0	155	0	0.0	4.4
107609	M	H	Fd	9.9	21.0	3.5	5	0	0	3	0	0.0	76.1
107619	PR	L	Fd	44.8	17.3	6.5	15	58	47	145	0	23.3	3.2
107632	R	H	Sx	4.2	17.7	3.0	8	0	0	158	0	0.0	7
107643	M	H	Fd	12.0	18.7	4.0	8	43	0	32	0	0.0	67.9
107649	M	M	S	52.8	16.3	7.5	22	76	0	610	0	0.0	20
107652	M	M	Fd	51.2	18.1	7.5	17	33	0	758	0	0.0	20
107654	PR	L	Fd	20.3	18.7	5.0	10	722	41	1,028	0	2.4	5.5
107656	PR	M	Fd	49.1	18.0	7.0	15	106	0	994	3	0.3	7.7
107658	PR	L	Fd	10.2	17.3	4.0	8	43	4	30	0	5.6	6.8
107677	R	H	AT	6.9	17.1	3.5	6	0	0	55	0	0.0	6.3
107684	PR	M	Fd	56.2	17.2	8.0	19	26	17	287	3	6.5	6.2
107685	M	H	Fd	14.6	19.8	4.0	7	0	0	7	0	0.0	67.9
107697	PR	L	AT	9.8	17.8	3.5	6	147	0	142	0	0.0	6.8
107709	M	H	Fd	8.6	18.7	3.5	7	22	0	141	0	0.0	76.1
107712	M	H	Fd	14.2	19.0	4.0	8	299	0	112	0	0.0	67.9
107717	PR	M	P	43.4	18.3	6.5	14	388	94	787	8	8.7	8.5
107718	PR	M	P	40.0	17.7	6.5	14	590	0	801	0	0.0	9.5
107736	PR	M	S	51.5	15.8	7.5	24	7	0	230	0	0.0	6.9
107748	PR	M	P	45.0	17.6	6.5	14	99	0	564	0	0.0	8.5
107749	PR	M	Fd	43.6	18.8	6.5	14	8	0	182	0	0.0	8.5
107752	M	H	Fd	10.4	19.1	4.0	8	228	19	46	0	7.1	76.1
107755	PR	L	Fd	40.1	18.2	6.5	14	482	0	352	0	0.0	3.6
107757	PR	H	Fd	8.9	17.8	3.5	7	151	0	78	0	0.0	29.6
107761	PR	M	P	45.9	18.2	7.0	15	160	0	1,111	0	0.0	7.7
107772	PR	H	S	53.8	15.5	7.5	24	0	0	0	0	0.0	11.2
107777	PR	L	P	37.1	19.4	6.5	13	1	0	9	0	0.0	3.6
107780	PR	H	Fd	56.8	16.8	8.0	19	41	0	311	0	0.0	10.2
107784	PR	M	S	47.1	16.4	7.0	21	0	0	526	0	0.0	7.7
107787	PR	M	S	48.3	16.9	7.0	20	80	1	936	0	0.1	7.7
107794	PR	L	Fd	38.6	17.4	6.5	14	2	0	74	0	0.0	3.6
107795	R	M	P	33.6	17.5	6.0	13	491	140	513	4	14.3	1.7
107805	R	H	Fd	2.9	17.0	3.0	5	0	0	1	0	0.0	7
107806	PR	M	Fd	5.8	15.2	3.5	8	10	0	0	0	0.0	18.2

VLI Polygon ID	Established VQO	VAC	Species	Slope (%)	Site Index (m)	Height (m)	Age at Height (years)	THLB (ha)	THLB Younger than Target Age (ha)	NHLB (ha)	NHLB Younger than Target Age (ha)	Current (%)	Max Target (%)
107811	PR	M	Sx	23.1	16.4	5.0	15	419	255	57	2	54.0	13.1
107822	PR	L	Fd	43.3	18.2	6.5	14	5	0	4,072	10	0.3	3.2
107825	PR	L	Fd	30.4	16.6	6.0	14	0	0	3	0	0.0	4.4
107827	PR	M	P	22.5	16.5	5.0	11	28	6	1	0	19.5	13.1
107837	M	H	Fd	14.6	18.1	4.0	8	40	0	50	0	0.0	67.9
107840	PR	M	Fd	32.4	15.9	6.0	15	0	0	1	0	0.0	10.5
107849	PR	M	P	31.8	16.6	6.0	14	787	212	508	11	17.3	10.5
107854	M	H	Fd	8.7	17.5	3.5	7	0	0	3	0	0.0	76.1
107858	PR	M	P	39.0	17.4	6.5	15	516	0	2,135	0	0.0	9.5
107860	PR	M	Fd	10.3	16.7	4.0	8	0	0	260	1	0.5	18.2
107863	M	H	Sx	23.7	16.8	5.0	15	31	0	13	0	0.0	54.7
107866	PR	M	L	32.4	16.0	6.0	15	0	0	86	0	0.0	10.5
107874	M	H	Fd	12.1	17.8	4.0	8	56	0	51	0	0.0	67.9
107887	M	H	AT	8.9	19.1	3.5	6	104	0	102	0	0.0	76.1
107893	M	H	Fd	15.3	18.9	4.5	9	0	0	32	0	0.0	67.9
107904	PR	M	Fd	40.7	18.5	6.5	14	158	0	377	0	0.0	8.5
107916	PR	M	Fd	52.4	16.9	7.5	18	0	0	271	0	0.0	6.9
107917	M	H	Fd	23.5	18.1	5.0	10	0	0	274	0	0.0	54.7
107927	M	H	Fd	3.2	16.0	3.0	6	0	0	10	0	0.0	84.2
107928	PR	M	Fd	31.8	17.9	6.0	13	276	111	229	2	22.5	10.5
107945	PR	L	Fd	12.1	17.8	4.0	8	665	66	174	1	8.0	6
107949	PR	H	Fd	12.1	17.9	4.0	8	209	0	74	0	0.0	26.4
107952	M	H	Fd	7.4	17.5	3.5	7	589	1	101	5	0.8	76.1
107958	PR	H	Fd	4.5	18.4	3.0	5	53	0	26	0	0.0	32.8
107961	PR	M	Fd	44.4	18.2	6.5	14	383	173	565	1	18.3	8.5
107967	M	H	Fd	12.2	17.6	4.0	8	360	0	1	0	0.0	67.9
107968	PR	M	P	45.4	17.7	7.0	15	421	0	672	0	0.0	8.5
107972	PR	M	P	55.7	16.5	8.0	19	1	0	263	0	0.0	6.2
107973	M	M	Fd	32.4	17.4	6.0	13	143	0	156	7	2.4	30.6
107977	M	M	P	37.7	19.7	6.5	13	1,594	260	1,800	21	8.3	27.8
107979	PR	L	Fd	37.4	18.0	6.5	14	164	10	111	9	6.9	3.6
107981	PR	L	Fd	26.0	17.4	5.5	12	430	67	230	39	16.0	4.4
107985	PR	M	Fd	57.6	17.8	8.0	18	0	0	848	0	0.0	6.2
107988	M	H	Fd	7.0	17.9	3.5	7	212	0	62	0	0.0	76.1
107992	M	H	Fd	8.0	17.4	3.5	7	703	58	365	36	8.7	76.1
107993	M	H	Fd	2.7	17.1	3.0	5	320	43	51	6	13.3	84.2
107994	PR	M	Fd	57.0	17.6	8.0	18	47	0	1,845	1	0.0	6.2

VLI Polygon ID	Established VQO	VAC	Species	Slope (%)	Site Index (m)	Height (m)	Age at Height (years)	THLB (ha)	THLB Younger than Target Age (ha)	NHLB (ha)	NHLB Younger than Target Age (ha)	Current (%)	Max Target (%)
107995	M	H	Fd	6.8	18.2	3.5	7	20	0	0	0	0.0	76.1
108000	PR	M	P	42.9	18.4	6.5	14	169	44	350	30	14.2	8.5
108004	M	M	Fd	10.3	16.8	4.0	8	64	0	49	0	0.0	52.9
108005	PR	M	L	17.1	23.2	4.5	7	675	135	60	19	21.1	14.7
108006	M	M	AT	3.4	15.7	3.0	5	0	0	3	0	0.0	58.5
108008	PR	L	P	40.8	17.2	6.5	15	50	0	776	0	0.0	3.2
108015	PR	H	P	5.2	13.2	3.5	10	4	0	0	0	0.0	32.8
108017	M	M	P	47.3	19.0	7.0	14	12	0	191	5	2.6	22.4
108018	PR	H	Sx	1.8	15.3	3.0	10	329	306	116	22	73.8	32.8
108020	PR	M	L	28.0	22.6	5.5	9	112	82	46	4	54.7	11.8
108021	M	L	L	13.2	18.9	4.0	7	1,712	157	258	1	8.0	26.8
108022	PR	H	Fd	3.9	17.5	3.0	5	15	0	17	0	0.0	32.8
108023	PR	L	Fd	50.3	17.6	7.5	17	0	0	178	0	0.1	2.9
108024	M	M	Fd	5.1	15.8	3.5	8	263	0	227	3	0.5	58.5
108027	M	M	Fd	19.2	18.7	4.5	9	5	3	1	0	51.2	42.6
108028	PR	L	Fd	61.6	17.5	8.5	20	0	0	7	3	45.3	2.1
108032	PR	L	L	35.3	15.3	6.5	18	0	0	27	0	0.0	3.9
108033	M	L	S	0.1	15.0	3.0	10	0	0	3	0	0.0	33.2
108034	M	L	P	3.9	15.5	3.0	7	55	0	3	0	0.0	33.2
108035	PR	L	Fd	28.0	18.8	5.5	11	83	0	85	0	0.0	4.4
108039	M	L	P	1.0	15.0	3.0	8	6	0	0	0	0.0	33.2
108040	M	M	P	9.9	15.0	3.5	9	0	0	0	0	0.0	52.9
Total								**23,588**	**3,119**	**42,752**	**559**		

Appendix 2 Analysis Units

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
101	EN	FD	nonESSF	N/A	0	10 ≤ SI < 15		CC	112	201	12,040	0	12,040
102	EN	FD	nonESSF	N/A	0	15 ≤ SI < 20		CC	80	202	13,561	0	13,561
103	EN	FD	nonESSF	N/A	0	≥20		CC	80	203	1,844	0	1,844
104	EN	SB	nonESSF	N/A	All	10 ≤ SI < 15		CC	127	204	3,928	0	3,928
105	EN	SB	nonESSF	N/A	All	15 ≤ SI < 20		CC	90	205	5,857	0	5,857
106	EN	SB	nonESSF	N/A	All	≥20		CC	80	206	1,012	0	1,012
107	EN	CH	nonESSF	N/A	All	All		CC	80	207	394	0	394
108	EN	PL	nonESSF	N/A	0	10 ≤ SI < 15		CC	112	208	2,112	0	2,112
109	EN	PL	nonESSF	N/A	0	15 ≤ SI < 20		CC	80	209	13,048	0	13,048
110	EN	PL	nonESSF	N/A	0	≥20		CC	60	210	2,641	0	2,641
111	EN	PL_PFT	nonESSF	N/A	0	All		CC	101	208	2,617	0	2,617
112	EN	LW	nonESSF	N/A	All	10 ≤ SI < 15		CC	130	212	1,645	0	1,645
113	EN	LW	nonESSF	N/A	All	15 ≤ SI < 20		CC	97	213	5,671	0	5,671
114	EN	LW	nonESSF	N/A	All	≥20		CC	80	214	1,568	0	1,568
115	All	ORcc	All	N/A	All	All		CC,once	90	215	1,305	0	1,305
116	All	OFpc, FdPy, Py	All	N/A	All	All		PC	90	216	11,392	0	11,392
121	EN	FD	ESSF	N/A	0	10 ≤ SI < 15		CC	109	221	287	0	287
122	EN	FD	ESSF	N/A	0	15 ≤ SI < 20		CC	80	222	109	0	109
123	EN	FD	ESSF	N/A	0	≥20		CC	80	223	39	0	39
124	EN	SB	ESSF	N/A	All	10 ≤ SI < 15		CC	113	224	7,397	0	7,397
125	EN	SB	ESSF	N/A	All	15 ≤ SI < 20		CC	86	225	5,741	0	5,741
126	EN	SB	ESSF	N/A	All	≥20		CC	80	226	132	0	132
128	EN	PL	ESSF	N/A	0	10 ≤ SI < 15		CC	105	228	1,674	0	1,674
129	EN	PL	ESSF	N/A	0	15 ≤ SI < 20		CC	75	229	3,248	0	3,248
130	EN	PL	ESSF	N/A	0	≥20		CC	60	230	162	0	162
131	EN	PL_PFT	ESSF	N/A	All	All		CC	104	228	1,315	0	1,315
132	EN	LW	ESSF	N/A	All	10 ≤ SI < 15		CC	126	232	118	0	118
133	EN	LW	ESSF	N/A	All	15 ≤ SI < 20		CC	96	233	323	0	323
134	EN	LW	ESSF	N/A	All	≥20		CC	80	234	35	0	35
151	EN	FD	nonESSF	N/A	40	10 ≤ SI < 15		CC	137	251	2,546	0	2,546
152	EN	FD	nonESSF	N/A	40	15 ≤ SI < 20		CC	88	252	2,862	0	2,862
153	EN	FD	nonESSF	N/A	40	≥20		CC	80	253	256	0	256
158	EN	PL	nonESSF	N/A	40	10 ≤ SI < 15		CC	149	258	752	0	752
159	EN	PL	nonESSF	N/A	40	15 ≤ SI < 20		CC	96	259	3,481	0	3,481
160	EN	PL	nonESSF	N/A	40	≥20		CC	66	260	388	0	388
171	EN	FD	ESSF	N/A	40	10 ≤ SI < 15		CC	132	271	342	0	342
172	EN	FD	ESSF	N/A	40	15 ≤ SI < 20		CC	89	272	287	0	287

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
173	EN	FD	ESSF	N/A	40	≥20		CC	80	273	15	0	15
178	EN	PL	ESSF	N/A	40	10 ≤ SI < 15		CC	126	278	1,140	0	1,140
179	EN	PL	ESSF	N/A	40	15 ≤ SI < 20		CC	86	279	2,133	0	2,133
180	EN	PL	ESSF	N/A	40	≥20		CC	63	280	191	0	191
216	FM	OFpc, FdPy, Py	All	N/A	All	All		PC	90	216	803	0	803
501	EM	FD	nonESSF	GE1	0	10 ≤ SI < 15		CC	94	701	59	0	59
502	EM	FD	nonESSF	GE1	0	15 ≤ SI < 20		CC	86	702	5,331	0	5,331
503	EM	FD	nonESSF	GE1	0	≥20		CC	80	703	1,663	0	1,663
504	EM	SB	nonESSF	GE1	All	10 ≤ SI < 15		CC	90	704	14	0	14
505	EM	SB	nonESSF	GE1	All	15 ≤ SI < 20		CC	83	705	1,684	0	1,684
506	EM	SB	nonESSF	GE1	All	≥20		CC	80	706	1,403	0	1,403
507	EM	CH	nonESSF	GE1	All	All		CC	80	707	76	0	76
508	EM	PL	nonESSF	GE1	0	10 ≤ SI < 15		CC	74	708	12	0	12
509	EM	PL	nonESSF	GE1	0	15 ≤ SI < 20		CC	74	709	10,734	0	10,734
510	EM	PL	nonESSF	GE1	0	≥20		CC	60	710	6,062	0	6,062
512	EM	LW	nonESSF	GE1	All	10 ≤ SI < 15		CC	80	712	2	0	2
513	EM	LW	nonESSF	GE1	All	15 ≤ SI < 20		CC	80	713	1,122	0	1,122
514	EM	LW	nonESSF	GE1	All	≥20		CC	80	714	382	0	382
521	EM	FD	ESSF	GE1	0	10 ≤ SI < 15		CC	97	721	4	0	4
522	EM	FD	ESSF	GE1	0	15 ≤ SI < 20		CC	96	722	292	0	292
523	EM	FD	ESSF	GE1	0	≥20		CC	92	723	31	0	31
524	EM	SB	ESSF	GE1	All	10 ≤ SI < 15		CC	102	724	727	0	727
525	EM	SB	ESSF	GE1	All	15 ≤ SI < 20		CC	98	725	7,223	0	7,223
527	EM	CH	ESSF	GE1	All	All		CC	109	727	22	0	22
528	EM	PL	ESSF	GE1	0	10 ≤ SI < 15		CC	84	728	3	0	3
529	EM	PL	ESSF	GE1	0	15 ≤ SI < 20		CC	85	729	5,618	0	5,618
530	EM	PL	ESSF	GE1	0	≥20		CC	66	730	12	0	12
532	EM	LW	ESSF	GE1	All	10 ≤ SI < 15		CC	88	732	0	0	0
533	EM	LW	ESSF	GE1	All	15 ≤ SI < 20		CC	85	733	36	0	36
534	EM	LW	ESSF	GE1	All	≥20		CC	80	734	4	0	4
551	EM	FD	nonESSF	GE1	40	10 ≤ SI < 15		CC	94	751	7	0	7
552	EM	FD	nonESSF	GE1	40	15 ≤ SI < 20		CC	84	752	478	0	478
553	EM	FD	nonESSF	GE1	40	≥20		CC	80	753	307	0	307
558	EM	PL	nonESSF	GE1	40	10 ≤ SI < 15		CC	75	758	3	0	3
559	EM	PL	nonESSF	GE1	40	15 ≤ SI < 20		CC	74	759	831	0	831
560	EM	PL	nonESSF	GE1	40	≥20		CC	61	760	603	0	603
571	EM	FD	ESSF	GE1	40	10 ≤ SI < 15		CC	97	771	2	0	2
572	EM	FD	ESSF	GE1	40	15 ≤ SI < 20		CC	94	772	107	0	107
573	EM	FD	ESSF	GE1	40	≥20		CC	90	773	46	0	46

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
578	EM	PL	ESSF	GE1	40	10 ≤ SI < 15		CC	97	778	1	0	1
579	EM	PL	ESSF	GE1	40	15 ≤ SI < 20		CC	85	779	2,155	0	2,155
580	EM	PL	ESSF	GE1	40	≥20		CC	67	780	43	0	43
601	EM	FD	nonESSF	GE2	0	10 ≤ SI < 15		CC	94	701	11	0	11
602	EM	FD	nonESSF	GE2	0	15 ≤ SI < 20		CC	86	702	1,331	0	1,331
603	EM	FD	nonESSF	GE2	0	≥20		CC	80	703	1,160	0	1,160
604	EM	SB	nonESSF	GE2	All	10 ≤ SI < 15		CC	89	704	1	0	1
605	EM	SB	nonESSF	GE2	All	15 ≤ SI < 20		CC	84	705	755	0	755
606	EM	SB	nonESSF	GE2	All	≥20		CC	80	706	890	0	890
607	EM	CH	nonESSF	GE2	All	All		CC	80	707	17	0	17
608	EM	PL	nonESSF	GE2	0	10 ≤ SI < 15		CC	75	708	8	0	8
609	EM	PL	nonESSF	GE2	0	15 ≤ SI < 20		CC	74	709	4,404	0	4,404
610	EM	PL	nonESSF	GE2	0	≥20		CC	61	710	3,582	0	3,582
612	EM	LW	nonESSF	GE2	All	10 ≤ SI < 15		CC	81	712	5	0	5
613	EM	LW	nonESSF	GE2	All	15 ≤ SI < 20		CC	80	713	1,974	0	1,974
614	EM	LW	nonESSF	GE2	All	≥20		CC	80	714	2,772	0	2,772
621	EM	FD	ESSF	GE2	0	10 ≤ SI < 15		CC	97	721	8	0	8
622	EM	FD	ESSF	GE2	0	15 ≤ SI < 20		CC	95	722	86	0	86
623	EM	FD	ESSF	GE2	0	≥20		CC	91	723	0	0	0
624	EM	SB	ESSF	GE2	All	10 ≤ SI < 15		CC	104	724	551	0	551
625	EM	SB	ESSF	GE2	All	15 ≤ SI < 20		CC	98	725	2,249	0	2,249
629	EM	PL	ESSF	GE2	0	15 ≤ SI < 20		CC	85	729	2,852	0	2,852
630	EM	PL	ESSF	GE2	0	≥20		CC	67	730	24	0	24
632	EM	LW	ESSF	GE2	All	10 ≤ SI < 15		CC	90	732	11	0	11
633	EM	LW	ESSF	GE2	All	15 ≤ SI < 20		CC	85	733	51	0	51
634	EM	LW	ESSF	GE2	All	≥20		CC	80	734	44	0	44
652	EM	FD	nonESSF	GE2	40	15 ≤ SI < 20		CC	84	752	331	0	331
653	EM	FD	nonESSF	GE2	40	≥20		CC	80	753	136	0	136
658	EM	PL	nonESSF	GE2	40	10 ≤ SI < 15		CC	76	758	0	0	0
659	EM	PL	nonESSF	GE2	40	15 ≤ SI < 20		CC	75	759	825	0	825
660	EM	PL	nonESSF	GE2	40	≥20		CC	63	760	584	0	584
671	EM	FD	ESSF	GE2	40	10 ≤ SI < 15		CC	97	771	5	0	5
672	EM	FD	ESSF	GE2	40	15 ≤ SI < 20		CC	93	772	81	0	81
673	EM	FD	ESSF	GE2	40	≥20		CC	90	773	14	0	14
679	EM	PL	ESSF	GE2	40	15 ≤ SI < 20		CC	85	779	1,232	0	1,232
680	EM	PL	ESSF	GE2	40	≥20		CC	68	780	23	0	23
1101	EN_Fire	FD	nonESSF	N/A	0	10 ≤ SI < 15	Low	CC	*	201	28	0	28
1102	EN_Fire	FD	nonESSF	N/A	0	15 ≤ SI < 20	Low	CC	*	202	18	0	18
1103	EN_Fire	FD	nonESSF	N/A	0	≥20	Low	CC	*	203	1	0	1

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
1104	EN_Fire	SB	nonESSF	N/A	All	10 ≤ SI < 15	Low	CC	*	204	16	0	16
1105	EN_Fire	SB	nonESSF	N/A	All	15 ≤ SI < 20	Low	CC	*	205	62	0	62
1106	EN_Fire	SB	nonESSF	N/A	All	≥20	Low	CC	*	206	3	0	3
1108	EN_Fire	PL	nonESSF	N/A	0	10 ≤ SI < 15	Low	CC	*	208	4	0	4
1109	EN_Fire	PL	nonESSF	N/A	0	15 ≤ SI < 20	Low	CC	*	209	136	0	136
1110	EN_Fire	PL	nonESSF	N/A	0	≥20	Low	CC	*	210	15	0	15
1111	EN_Fire	PL_PFT	nonESSF	N/A	0	All	Low	CC	*	208	4	0	4
1113	EN_Fire	LW	nonESSF	N/A	All	15 ≤ SI < 20	Low	CC	*	213	36	0	36
1116	All_Fire	OFpc, FdPy, Py	All	N/A	All	All	Low	PC	*	216	5	0	5
1124	EN_Fire	SB	ESSF	N/A	All	10 ≤ SI < 15	Low	CC	*	224	46	0	46
1125	EN_Fire	SB	ESSF	N/A	All	15 ≤ SI < 20	Low	CC	*	225	47	0	47
1126	EN_Fire	SB	ESSF	N/A	All	≥20	Low	CC	*	226	1	0	1
1128	EN_Fire	PL	ESSF	N/A	0	10 ≤ SI < 15	Low	CC	*	228	6	0	6
1129	EN_Fire	PL	ESSF	N/A	0	15 ≤ SI < 20	Low	CC	*	229	19	0	19
1130	EN_Fire	PL	ESSF	N/A	0	≥20	Low	CC	*	230	3	0	3
1131	EN_Fire	PL_PFT	ESSF	N/A	All	All	Low	CC	*	228	2	0	2
1133	EN_Fire	LW	ESSF	N/A	All	15 ≤ SI < 20	Low	CC	*	233	1	0	1
1151	EN_Fire	FD	nonESSF	N/A	40	10 ≤ SI < 15	Low	CC	*	251	2	0	2
1152	EN_Fire	FD	nonESSF	N/A	40	15 ≤ SI < 20	Low	CC	*	252	3	0	3
1153	EN_Fire	FD	nonESSF	N/A	40	≥20	Low	CC	*	253	4	0	4
1158	EN_Fire	PL	nonESSF	N/A	40	10 ≤ SI < 15	Low	CC	*	258	6	0	6
1159	EN_Fire	PL	nonESSF	N/A	40	15 ≤ SI < 20	Low	CC	*	259	13	0	13
1160	EN_Fire	PL	nonESSF	N/A	40	≥20	Low	CC	*	260	3	0	3
1178	EN_Fire	PL	ESSF	N/A	40	10 ≤ SI < 15	Low	CC	*	278	5	0	5
1179	EN_Fire	PL	ESSF	N/A	40	15 ≤ SI < 20	Low	CC	*	279	12	0	12
1180	EN_Fire	PL	ESSF	N/A	40	≥20	Low	CC	*	280	1	0	1
1216	FM_Fire	OFpc, FdPy, Py	All	N/A	All	All	Low	CC	*	216	1	0	1
1502	EM_Fire	FD	nonESSF	GE1	0	15 ≤ SI < 20	Low	CC	*	702	3	0	3
1503	EM_Fire	FD	nonESSF	GE1	0	≥20	Low	CC	*	703	0	0	0
1505	EM_Fire	SB	nonESSF	GE1	All	15 ≤ SI < 20	Low	CC	*	705	47	0	47
1506	EM_Fire	SB	nonESSF	GE1	All	≥20	Low	CC	*	706	2	0	2
1509	EM_Fire	PL	nonESSF	GE1	0	15 ≤ SI < 20	Low	CC	*	709	147	0	147
1510	EM_Fire	PL	nonESSF	GE1	0	≥20	Low	CC	*	710	13	0	13
1513	EM_Fire	LW	nonESSF	GE1	All	15 ≤ SI < 20	Low	CC	*	713	0	0	0
1524	EM_Fire	SB	ESSF	GE1	All	10 ≤ SI < 15	Low	CC	*	724	53	0	53
1525	EM_Fire	SB	ESSF	GE1	All	15 ≤ SI < 20	Low	CC	*	725	60	0	60
1529	EM_Fire	PL	ESSF	GE1	0	15 ≤ SI < 20	Low	CC	*	729	82	0	82
1552	EM_Fire	FD	nonESSF	GE1	40	15 ≤ SI < 20	Low	CC	*	752	4	0	4
1553	EM_Fire	FD	nonESSF	GE1	40	≥20	Low	CC	*	753	0	0	0

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
1559	EM_Fire	PL	nonESSF	GE1	40	15 ≤ SI < 20	Low	CC	*	759	2	0	2
1579	EM_Fire	PL	ESSF	GE1	40	15 ≤ SI < 20	Low	CC	*	779	13	0	13
1605	EM_Fire	SB	nonESSF	GE2	All	15 ≤ SI < 20	Low	CC	*	705	0	0	0
1609	EM_Fire	PL	nonESSF	GE2	0	15 ≤ SI < 20	Low	CC	*	709	7	0	7
1613	EM_Fire	LW	nonESSF	GE2	All	15 ≤ SI < 20	Low	CC	*	713	4	0	4
1614	EM_Fire	LW	nonESSF	GE2	All	≥20	Low	CC	*	714	0	0	0
1624	EM_Fire	SB	ESSF	GE2	All	10 ≤ SI < 15	Low	CC	*	724	1	0	1
1625	EM_Fire	SB	ESSF	GE2	All	15 ≤ SI < 20	Low	CC	*	725	7	0	7
1629	EM_Fire	PL	ESSF	GE2	0	15 ≤ SI < 20	Low	CC	*	729	26	0	26
1652	EM_Fire	FD	nonESSF	GE2	40	15 ≤ SI < 20	Low	CC	*	752	1	0	1
1659	EM_Fire	PL	nonESSF	GE2	40	15 ≤ SI < 20	Low	CC	*	759	6	0	6
1679	EM_Fire	PL	ESSF	GE2	40	15 ≤ SI < 20	Low	CC	*	779	56	0	56
2101	EN_Fire	FD	nonESSF	N/A	0	10 ≤ SI < 15	Moderate	CC	*	201	44	0	44
2102	EN_Fire	FD	nonESSF	N/A	0	15 ≤ SI < 20	Moderate	CC	*	202	13	0	13
2103	EN_Fire	FD	nonESSF	N/A	0	≥20	Moderate	CC	*	203	1	0	1
2104	EN_Fire	SB	nonESSF	N/A	All	10 ≤ SI < 15	Moderate	CC	*	204	54	0	54
2105	EN_Fire	SB	nonESSF	N/A	All	15 ≤ SI < 20	Moderate	CC	*	205	73	0	73
2106	EN_Fire	SB	nonESSF	N/A	All	≥20	Moderate	CC	*	206	17	0	17
2108	EN_Fire	PL	nonESSF	N/A	0	10 ≤ SI < 15	Moderate	CC	*	208	20	0	20
2109	EN_Fire	PL	nonESSF	N/A	0	15 ≤ SI < 20	Moderate	CC	*	209	269	0	269
2110	EN_Fire	PL	nonESSF	N/A	0	≥20	Moderate	CC	*	210	17	0	17
2111	EN_Fire	PL_PFT	nonESSF	N/A	0	All	Moderate	CC	*	208	2	0	2
2112	EN_Fire	LW	nonESSF	N/A	All	10 ≤ SI < 15	Moderate	CC	*	212	0	0	0
2113	EN_Fire	LW	nonESSF	N/A	All	15 ≤ SI < 20	Moderate	CC	*	213	41	0	41
2116	All_Fire	OFpc, FdPy, Py	All	N/A	All	All	Moderate	PC	*	216	26	0	26
2124	EN_Fire	SB	ESSF	N/A	All	10 ≤ SI < 15	Moderate	CC	*	224	105	0	105
2125	EN_Fire	SB	ESSF	N/A	All	15 ≤ SI < 20	Moderate	CC	*	225	144	0	144
2126	EN_Fire	SB	ESSF	N/A	All	≥20	Moderate	CC	*	226	4	0	4
2128	EN_Fire	PL	ESSF	N/A	0	10 ≤ SI < 15	Moderate	CC	*	228	29	0	29
2129	EN_Fire	PL	ESSF	N/A	0	15 ≤ SI < 20	Moderate	CC	*	229	77	0	77
2130	EN_Fire	PL	ESSF	N/A	0	≥20	Moderate	CC	*	230	9	0	9
2133	EN_Fire	LW	ESSF	N/A	All	15 ≤ SI < 20	Moderate	CC	*	233	0	0	0
2151	EN_Fire	FD	nonESSF	N/A	40	10 ≤ SI < 15	Moderate	CC	*	251	12	0	12
2152	EN_Fire	FD	nonESSF	N/A	40	15 ≤ SI < 20	Moderate	CC	*	252	3	0	3
2153	EN_Fire	FD	nonESSF	N/A	40	≥20	Moderate	CC	*	253	2	0	2
2158	EN_Fire	PL	nonESSF	N/A	40	10 ≤ SI < 15	Moderate	CC	*	258	7	0	7
2159	EN_Fire	PL	nonESSF	N/A	40	15 ≤ SI < 20	Moderate	CC	*	259	33	0	33
2160	EN_Fire	PL	nonESSF	N/A	40	≥20	Moderate	CC	*	260	2	0	2
2172	EN_Fire	FD	ESSF	N/A	40	15 ≤ SI < 20	Moderate	CC	*	272	0	0	0

AU	State	Lead Species	BEC	Genetic Era	Slope	SI	2017 Fire	Treatment	MHA	Regen AU	THLB (ha)	NHLB (ha)	Total (ha)
2178	EN_Fire	PL	ESSF	N/A	40	10 ≤ SI < 15	Moderate	CC	*	278	20	0	20
2179	EN_Fire	PL	ESSF	N/A	40	15 ≤ SI < 20	Moderate	CC	*	279	82	0	82
2180	EN_Fire	PL	ESSF	N/A	40	≥20	Moderate	CC	*	280	2	0	2
2216	FM_Fire	OFpc, FdPy, Py	All	N/A	All	All	Moderate	CC	*	216	21	0	21
2502	EM_Fire	FD	nonESSF	GE1	0	15 ≤ SI < 20	Moderate	CC	*	702	5	0	5
2505	EM_Fire	SB	nonESSF	GE1	All	15 ≤ SI < 20	Moderate	CC	*	705	79	0	79
2506	EM_Fire	SB	nonESSF	GE1	All	≥20	Moderate	CC	*	706	7	0	7
2509	EM_Fire	PL	nonESSF	GE1	0	15 ≤ SI < 20	Moderate	CC	*	709	348	0	348
2510	EM_Fire	PL	nonESSF	GE1	0	≥20	Moderate	CC	*	710	3	0	3
2513	EM_Fire	LW	nonESSF	GE1	All	15 ≤ SI < 20	Moderate	CC	*	713	1	0	1
2524	EM_Fire	SB	ESSF	GE1	All	10 ≤ SI < 15	Moderate	CC	*	724	20	0	20
2525	EM_Fire	SB	ESSF	GE1	All	15 ≤ SI < 20	Moderate	CC	*	725	292	0	292
2529	EM_Fire	PL	ESSF	GE1	0	15 ≤ SI < 20	Moderate	CC	*	729	99	0	99
2552	EM_Fire	FD	nonESSF	GE1	40	15 ≤ SI < 20	Moderate	CC	*	752	20	0	20
2553	EM_Fire	FD	nonESSF	GE1	40	≥20	Moderate	CC	*	753	1	0	1
2559	EM_Fire	PL	nonESSF	GE1	40	15 ≤ SI < 20	Moderate	CC	*	759	19	0	19
2572	EM_Fire	FD	ESSF	GE1	40	15 ≤ SI < 20	Moderate	CC	*	772	7	0	7
2573	EM_Fire	FD	ESSF	GE1	40	≥20	Moderate	CC	*	773	0	0	0
2579	EM_Fire	PL	ESSF	GE1	40	15 ≤ SI < 20	Moderate	CC	*	779	82	0	82
2602	EM_Fire	FD	nonESSF	GE2	0	15 ≤ SI < 20	Moderate	CC	*	702	2	0	2
2605	EM_Fire	SB	nonESSF	GE2	All	15 ≤ SI < 20	Moderate	CC	*	705	86	0	86
2606	EM_Fire	SB	nonESSF	GE2	All	≥20	Moderate	CC	*	706	3	0	3
2609	EM_Fire	PL	nonESSF	GE2	0	15 ≤ SI < 20	Moderate	CC	*	709	348	0	348
2610	EM_Fire	PL	nonESSF	GE2	0	≥20	Moderate	CC	*	710	5	0	5
2613	EM_Fire	LW	nonESSF	GE2	All	15 ≤ SI < 20	Moderate	CC	*	713	44	0	44
2614	EM_Fire	LW	nonESSF	GE2	All	≥20	Moderate	CC	*	714	38	0	38
2624	EM_Fire	SB	ESSF	GE2	All	10 ≤ SI < 15	Moderate	CC	*	724	2	0	2
2625	EM_Fire	SB	ESSF	GE2	All	15 ≤ SI < 20	Moderate	CC	*	725	179	0	179
2629	EM_Fire	PL	ESSF	GE2	0	15 ≤ SI < 20	Moderate	CC	*	729	93	0	93
2633	EM_Fire	LW	ESSF	GE2	All	15 ≤ SI < 20	Moderate	CC	*	733	7	0	7
2652	EM_Fire	FD	nonESSF	GE2	40	15 ≤ SI < 20	Moderate	CC	*	752	14	0	14
2659	EM_Fire	PL	nonESSF	GE2	40	15 ≤ SI < 20	Moderate	CC	*	759	26	0	26
2660	EM_Fire	PL	nonESSF	GE2	40	≥20	Moderate	CC	*	760	4	0	4
2672	EM_Fire	FD	ESSF	GE2	40	15 ≤ SI < 20	Moderate	CC	*	772	3	0	3
2679	EM_Fire	PL	ESSF	GE2	40	15 ≤ SI < 20	Moderate	CC	*	779	88	0	88
9000	NHLB	All	All	All	All	All	All	FIRE	0	9000	0	411,388	411,388
Total											**193,618**	**411,388**	**605,006**

**Operability window becomes active when the total volume (standing after fire + emerging after fire) reaches the same volume as the volume at MHA of the corresponding original AU. For example, AU 1101 corresponding original AU is 101 (1101-1000). The THLB area includes the in-block retention.*

Appendix 3 TIPSY Regeneration Assumptions

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
201	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	19.07	3	19.44	5	18.36	27	18.62	27		
201	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	19.07		19.44		18.36					
202	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	19.55	3	19.93	5	18.9	27	19.23	27		
202	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	19.55		19.93		18.9					
203	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	19.49	3	19.82	5	18.99	27	19.58	27		
203	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	19.49		18.99		19.82		19.58			
204	MS	P	1	1300	2	0.95	Sw40 Bl35 Pl25	19.13	27	16.23		19.39	5				
205	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	19.63	27	19.49	5	16.55					
206	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	19.72	27	19.21	5	16.53					
207	ICH	P	1	1300	2	0.95	Sw50 Fd30 Cw10 Bl10	20.23	27	20.32	3	14.93		17.1			
208	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	19.42	5	18.99	27	16.58					
209	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	19.61	5	16.63		19.17	27	18.67	27	19.45	3
209	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	19.61		19.17		19.45		18.67			
210	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	19.67	5	19.32	27	18.86	27	19.49	3	16.7	
210	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	19.67		18.86		19.49		19.32			
212	MS	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Sw15	19.89	5	18.75	27	19.64	3	19.01	27		
213	MS	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Sw15	19.92	5	19.61	27	19.6	3	19.4	27		
214	MS	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Sw5	20.73	5	20.94	27	20.49	3	19.97	27		
221	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.55	3	17.18	5	18.08	27	15.2	27		
221	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.55		17.18		18.08					
222	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	19.02	3	17.67	5	18.79	27	15.24	27		
222	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	19.02		17.67		18.79					
223	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	18.93	3	17.23	5	17.36	27	15.28	27		
223	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	18.93		17.36		17.23		15.28			
224	ESSF	P	1	1300	2	0.95	Se40 Bl35 Pl25	15.15	27	14.48		17.06	5				
225	ESSF	P	1	1300	2	0.95	Se35 Pl35 Bl30	15.2	27	17.13	5	14.54					
226	ESSF	P	1	1300	2	0.95	Se35 Pl35 Bl30	15.26	27	17.26	5	14.35					
228	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	16.99	5	15.17	27	15.03					
229	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	17	5	14.97		15.18	27	18.14	27	18.36	3
229	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	17		15.18		18.36		18.14			
230	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	17.08	5	15.19	27	18.25	27	18.02	3	14.8	
230	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	17.08		18.25		18.02		15.19			
232	ESSF	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Se15	17.22	5	18.92	27	18.43	3	15.26	27		
233	ESSF	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Se15	17.61	5	19.55	27	18.41	3	14.9	27		
234	ESSF	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Se5	19.51	5	21.34	27	19.81	3	15.1	27		
251	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	19.25	3	19.35	5	18.54	27	19.05	27		
251	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	19.25		19.35		18.54					

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
252	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	19.71	3	19.96	5	19.67	27	19.64	27		
252	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	19.71		19.96		19.67					
253	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	19.36	3	20.16	5	20.02	27	19.75	27		
253	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	19.36		20.02		20.16		19.75			
258	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	19.05	5	19.26	27	16.08					
259	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	19.49	5	16.39		19.52	27	19.23	27	19.6	3
259	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	19.49		19.52		19.6		19.23			
260	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	19.73	5	19.85	27	19.55	27	19.37	3	16.65	
260	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	19.73		19.55		19.37		19.85			
271	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.54	3	17.39	5	18.24	27	15.23	27		
271	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.54		17.39		18.24					
272	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.62	3	17.97	5	19.25	27	15.19	27		
272	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.62		17.97		19.25					
273	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	19.26	3	17.87	5	18.83	27	15.25	27		
273	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	19.26		18.83		17.87		15.25			
278	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	17.12	5	15.16	27	14.99					
279	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	17.22	5	15.1		15.21	27	18.58	27	18.59	3
279	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	17.22		15.21		18.59		18.58			
280	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	17.5	5	15.25	27	18.92	27	18.2	3	15.15	
280	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	17.5		18.92		18.2		15.25			
501	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	0	16.7	3		2		15		
501	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
502	IDF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.48	0	18.63	3	17.77	2	17.99	15		
502	IDF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.48		18.63		17.77					
503	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.76	0	21.41	3	19.62	2	20.27	15		
503	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.76		19.62		21.41		20.27			
504	MS	P	1	1300	2	0.95	Sw40 Lw35 Pl25	15.2	15		2	17.97	3				
505	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	17.8	15	18.43	3	14.94					
506	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	20.9	15	20.1	3	17.51					
507	ICH	P	1	1300	2	0.95	Sw50 Fd30 Cw10 Bl10	20.67	15	21.02	0	16.05		17.84			
508	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.59	3		15						
509	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.59	3	15.55		18.74	15	18.23	2	18.85	0
509	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.59		18.74		18.85		18.23			
510	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.37	3	20.22	15	20.02	2	20.57	0	17.96	
510	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.37		20.02		20.57		20.22			
512	ICH	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Sw15	18	3	17.93	0	17.93	0	15.31	15		
513	MS	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Sw15	19.33	3	18.14	2	19.35	0	18.62	15		
514	MS	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Sw5	21.25	3	21.91	2	20.87	0	20.07	15		

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
521	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.67	0	16.67	3		2	15.29	15		
521	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.67		16.67							
522	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.1	0	16.98	3	17.94	2	15.23	15		
522	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.1		16.98		17.94					
523	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.46	0	17.38	3	18.88	2	15.3	15		
523	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.46		18.88		17.38		15.3			
524	ESSF	P	1	1300	2	0.95	Se40 Bl35 Pl25	14.68	15	14.35		17.13	3				
525	ESSF	P	1	1300	2	0.95	Se35 Pl35 Bl30	15.23	15	16.97	3	14.91					
527	ESSF	P	1	1300	2	0.95	Se50 Fd30 Cw10 Bl10	15.64	15	19.58	0	15.14		14.45			
528	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	16.91	3		15						
529	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	16.91	3	14.83		15.14	15	18.23	2	18.29	0
529	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	16.91		15.14		18.29		18.23			
530	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.68	3	15.18	15	18.96	2	20.24	0	17.63	
530	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.68		18.96		20.24		15.18			
532	ESSF	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Se15	16.72	3		0		0	15.3	15		
533	ESSF	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Se15	17.25	3	17.71	2	18.57	0	15.23	15		
534	ESSF	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Se5	17.84	3	22.49	2	20.48	0	15.3	15		
551	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	0	16.7	3		2		15		
551	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
552	IDF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.77	0	18.93	3	18.61	2	18.84	15		
552	IDF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.77		18.93		18.61					
553	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.82	0	21.02	3	20.21	2	20.48	15		
553	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.82		20.21		21.02		20.48			
558	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.3	3		15						
559	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.3	3	15.64		18.96	15	18.61	2	18.99	0
559	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.3		18.96		18.99		18.61			
560	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.07	3	20.01	15	20.24	2	20.27	0	17.32	
560	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.07		20.24		20.27		20.01			
571	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.7	0	16.7	3		2	15.3	15		
571	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
572	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.19	0	17.54	3	18.42	2	15.19	15		
572	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.19		17.54		18.42					
573	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.81	0	17.73	3	19.45	2	15.29	15		
573	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.81		19.45		17.73		15.29			
578	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	14.9	3		15						
579	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	17	3	15.02		15.19	15	18.26	2	18.32	0
579	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	17		15.19		18.32		18.26			
580	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.58	3	15.19	15	19.95	2	20.16	0	16.96	

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
580	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.58		19.95		20.16		15.19			
601	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	0	16.7	1		19		13		
601	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
602	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.48	0	18.63	1	17.77	19	17.99	13		
602	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.48		18.63		17.77					
603	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.76	0	21.41	1	19.62	19	20.27	13		
603	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.76		19.62		21.41		20.27			
604	MS	P	1	1300	2	0.95	Sw40 Lw35 Pl25	15.2	13		19	17.97	1				
605	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	17.8	13	18.43	1	14.94					
606	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	20.9	13	20.1	1	17.51					
607	ICH	P	1	1300	2	0.95	Sw50 Fd30 Cw10 Bl10	20.67	13	21.02	0	16.05		17.84			
608	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.59	1		13						
609	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.59	1	15.55		18.74	13	18.23	19	18.85	0
609	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.59		18.74		18.85		18.23			
610	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.37	1	20.22	13	20.02	19	20.57	0	17.96	
610	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.37		20.02		20.57		20.22			
612	IDF	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Sw15	18	1	17.93	0	17.93	0	15.31	13		
613	MS	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Sw15	19.33	1	18.14	19	19.35	0	18.62	13		
614	ICH	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Sw5	21.25	1	21.91	19	20.87	0	20.07	13		
621	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.67	0	16.67	1		19	15.29	13		
621	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.67		16.67							
622	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.1	0	16.98	1	17.94	19	15.23	13		
622	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.1		16.98		17.94					
623	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.46	0	17.38	1	18.88	19	15.3	13		
623	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.46		18.88		17.38		15.3			
624	ESSF	P	1	1300	2	0.95	Se40 Bl35 Pl25	14.68	13	14.35		17.13	1				
625	ESSF	P	1	1300	2	0.95	Se35 Pl35 Bl30	15.23	13	16.97	1	14.91					
627	ESSF	P	1	1300	2	0.95	Se50 Fd30 Cw10 Bl10	15.64	13	19.58	0	15.14		14.45			
628	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	16.91	1		13						
629	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	16.91	1	14.83		15.14	13	18.23	19	18.29	0
629	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	16.91		15.14		18.29		18.23			
630	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.68	1	15.18	13	18.96	19	20.24	0	17.63	
630	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.68		18.96		20.24		15.18			
632	ESSF	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Se15	16.72	1		0		0	15.3	13		
633	ESSF	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Se15	17.25	1	17.71	19	18.57	0	15.23	13		
634	ESSF	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Se5	17.84	1	22.49	19	20.48	0	15.3	13		
651	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	0	16.7	1		19		13		
651	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
652	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.77	0	18.93	1	18.61	19	18.84	13		
652	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.77		18.93		18.61					
653	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.82	0	21.02	1	20.21	19	20.48	13		
653	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.82		20.21		21.02		20.48			
658	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.3	1		13						
659	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.3	1	15.64		18.96	13	18.61	19	18.99	0
659	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.3		18.96		18.99		18.61			
660	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.07	1	20.01	13	20.24	19	20.27	0	17.32	
660	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.07		20.24		20.27		20.01			
671	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.7	0	16.7	1		19	15.3	13		
671	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
672	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.19	0	17.54	1	18.42	19	15.19	13		
672	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.19		17.54		18.42					
673	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.81	0	17.73	1	19.45	19	15.29	13		
673	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.81		19.45		17.73		15.29			
678	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	14.9	1		13						
679	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	17	1	15.02		15.19	13	18.26	19	18.32	0
679	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	17		15.19		18.32		18.26			
680	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.58	1	15.19	13	19.95	19	20.16	0	16.96	
680	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.58		19.95		20.16		15.19			
701	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	3	16.7	5		27		27		
701	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
702	IDF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.48	3	18.63	5	17.77	27	17.99	27		
702	IDF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.48		18.63		17.77					
703	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.76	3	21.41	5	19.62	27	20.27	27		
703	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.76		19.62		21.41		20.27			
704	MS	P	1	1300	2	0.95	Sw40 Lw35 Pl25	15.2	27		27	17.97	5				
705	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	17.8	27	18.43	5	14.94					
706	MS	P	1	1300	2	0.95	Sw35 Pl35 Bl30	20.9	27	20.1	5	17.51					
707	ICH	P	1	1300	2	0.95	Sw50 Fd30 Cw10 Bl10	20.67	27	21.02	3	16.05		17.84			
708	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.59	5		27						
709	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.59	5	15.55		18.74	27	18.23	27	18.85	3
709	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.59		18.74		18.85		18.23			
710	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.37	5	20.22	27	20.02	27	20.57	3	17.96	
710	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.37		20.02		20.57		20.22			
712	IDF	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Sw15	18	5	17.93	3	17.93	3	15.31	27		
713	MS	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Sw15	19.33	5	18.14	27	19.35	3	18.62	27		
714	ICH	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Sw5	21.25	5	21.91	27	20.87	3	20.07	27		

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
721	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.67	3	16.67	5		27	15.29	27		
721	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.67		16.67							
722	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.1	3	16.98	5	17.94	27	15.23	27		
722	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.1		16.98		17.94					
723	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.46	3	17.38	5	18.88	27	15.3	27		
723	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.46		18.88		17.38		15.3			
724	ESSF	P	1	1300	2	0.95	Se40 Bl35 Pl25	14.68	27	14.35		17.13	5				
725	ESSF	P	1	1300	2	0.95	Se35 Pl35 Bl30	15.23	27	16.97	5	14.91					
727	ESSF	P	1	1300	2	0.95	Se50 Fd30 Cw10 Bl10	15.64	27	19.58	3	15.14		14.45			
728	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	16.91	5		27						
729	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	16.91	5	14.83		15.14	27	18.23	27	18.29	3
729	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	16.91		15.14		18.29		18.23			
730	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.68	5	15.18	27	18.96	27	20.24	3	17.63	
730	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.68		18.96		20.24		15.18			
732	ESSF	P	1	1300	2	0.95	Pl40 Fd30 Fd15 Se15	16.72	5		3		3	15.3	27		
733	ESSF	P	1	1300	2	0.95	Pl40 Lw30 Fd15 Se15	17.25	5	17.71	27	18.57	3	15.23	27		
734	ESSF	P	1	1300	2	0.95	Pl45 Lw35 Fd15 Se5	17.84	5	22.49	27	20.48	3	15.3	27		
751	MS	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	16.7	3	16.7	5		27		27		
751	MS	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
752	IDF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Sw10	18.77	3	18.93	5	18.61	27	18.84	27		
752	IDF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.77		18.93		18.61					
753	MS	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Sw15	20.82	3	21.02	5	20.21	27	20.48	27		
753	MS	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Sw15	20.82		20.21		21.02		20.48			
758	MS	P	1	1300	3	0.913	Pl50 Sw35 Bl15	18.3	5		27						
759	MS	P	0.8	1300	2	0.913	Pl50 Bl15 Sw15 Lw10 Fd10	18.3	5	15.64		18.96	27	18.61	27	18.99	3
759	MS	N	0.2	3000	2	0.913	Pl60 Sw20 Fd10 Lw10	18.3		18.96		18.99		18.61			
760	MS	P	0.9	1300	2	0.913	Pl55 Sw20 Lw10 Fd10 Bl5	21.07	5	20.01	27	20.24	27	20.27	3	17.32	
760	MS	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Sw5	21.07		20.24		20.27		20.01			
771	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	16.7	3	16.7	5		27	15.3	27		
771	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	16.7		16.7							
772	ESSF	P	0.75	1300	2	0.892	Fd45 Pl30 Lw15 Se10	18.19	3	17.54	5	18.42	27	15.19	27		
772	ESSF	N	0.25	2500	2	0.892	Fd60 Pl20 Lw20	18.19		17.54		18.42					
773	ESSF	P	0.85	1300	2	0.892	Fd35 Pl35 Lw15 Se15	20.81	3	17.73	5	19.45	27	15.29	27		
773	ESSF	N	0.15	2500	2	0.892	Fd45 Lw20 Pl20 Se15	20.81		19.45		17.73		15.29			
778	ESSF	P	1	1300	2	0.913	Pl50 Se35 Bl15	14.9	5		27						
779	ESSF	P	0.8	1300	2	0.913	Pl50 Bl15 Se15 Lw10 Fd10	17	5	15.02		15.19	27	18.26	27	18.32	3
779	ESSF	N	0.2	3000	2	0.913	Pl60 Se20 Fd10 Lw10	17		15.19		18.32		18.26			
780	ESSF	P	0.9	1300	2	0.913	Pl55 Se20 Lw10 Fd10 Bl5	20.58	5	15.19	27	19.95	27	20.16	3	16.96	

AU	BEC	Regen	Proportion	Density	Delay	OAF2	Species Comp	SI Spp1	GW Spp1	SI Spp2	GW Spp2	SI Spp3	GW Spp3	SI Spp4	GW Spp4	SI Spp5	GW Spp5
780	ESSF	N	0.1	3000	2	0.913	Pl70 Lw15 Fd10 Se5	20.58		19.95		20.16		15.19			