

Invermere Timber Supply Area Vegetation Resources Inventory

Statistical Adjustment

Version 2.0

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EXECUTIVE SUMMARY

The Invermere Timber Supply Area (TSA) stakeholders initiated a Vegetation Resources Inventory (VRI) program in 2007 to upgrade and adjust their existing inventory. The stakeholders determined that the existing photo interpreted Forest Inventory Planning (FIP) inventory (1995 photos) was acceptable. The FIP data was rolled over to VRI format in 2000 and this dataset was used for the VRI Phase II design and statistical adjustment.

The target population was Crown land in the Invermere TSA, outside parks, vegetated treed (VT) and at least 30 years in 2007 (457,587 ha). The primary objectives of this program were to:

1. Develop statistically unbiased volume estimates for stands > 30 years in the VT landbase;
2. Achieve an overall $\pm 10\%$ sampling error (95% probability) for live volume;
3. Collect coarse woody debris estimates at all Phase II plots; and,
4. Complete additional destructive sampling of lodgepole pine (Pl) to test (as part of a separate project) the ability of the Provincial Pl taper equations to predict the taper of smallwood Pl in the Invermere TSA.

McColl Forestry (McColl) established 119 Phase II plots (2007 and 2008 field seasons) and destructively sampled 120 trees (2008 field season) as part of the Net Volume Adjustment Factor program. Height, age, basal area, stems per hectare, and live net merchantable volume were adjusted following Ministry of Forests and Range (MFR) VRI statistical adjustment methods. All projections and volumes were generated using VDYP7. Following adjustment, the results are:

- The average live net merchantable volume (12.5cm +) is 185m³/ha, a 12% increase over the original inventory estimates.
- The average polygon height is 19.7m, a 5% decrease versus the original inventory estimates.
- The average polygon age is 137 years, a 6% decrease versus the original inventory estimates.
- The average site index is 12m, a 3% decrease versus the original inventory estimates.
- The average basal area is 28m²/ha, an 8% increase versus the original inventory estimates.
- The average density is 939 stems per hectare, a 12% increase versus the original inventory estimates.

The overall volume statistics were $\pm 13\%$ (95% probability) which did not achieve the target of $\pm 10\%$ (95% probability). This is likely due to the use of basal area and stems per hectare in the yield model as these attributes exhibited relatively large variability in the TSA.

The key recommendations from this project are that:

1. The adjusted height, age, basal area, stems per hectare and volume be used in the timber supply analysis base case in Timber Supply Review;
2. The stakeholders use the Pl NVAF data together with other destructively sampled Pl tree data to assess possible taper issues in the small Pl population of interest.
3. The stakeholders consider the CWD and forest health data provided in this report as a starting point for investigating specific CWD and forest health issues.

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1.0 INTRODUCTION

1.1 Vegetation Resources Inventory Overview

The Vegetation Resources Inventory (VRI) is the Ministry of Forests and Range's (MFR) forest inventory standard on public lands in BC. Where possible, forest licensees must use the VRI standard in their Data Package submission for Timber Supply Review (TSR).

The VRI is a four-step process (Figure 1):

1. Phase I (unadjusted inventory data) – Estimates of polygon attributes are derived for the target population, usually from photo-interpretation.
2. Phase II (ground sample data) – Measurements are taken from randomly located ground samples in the target population.
3. Net Volume Adjustment Factor (NVAF) sampling – Random trees are selected for stem-analysis from the Phase II samples to develop adjustment ratios that correct taper and decay estimation bias.
4. Statistical Adjustment Phase – The Phase I estimates are adjusted using the NVAF-corrected Phase II ground samples to provide an adjusted unbiased estimate of forest inventory attributes. The final product is an adjusted VRI database.

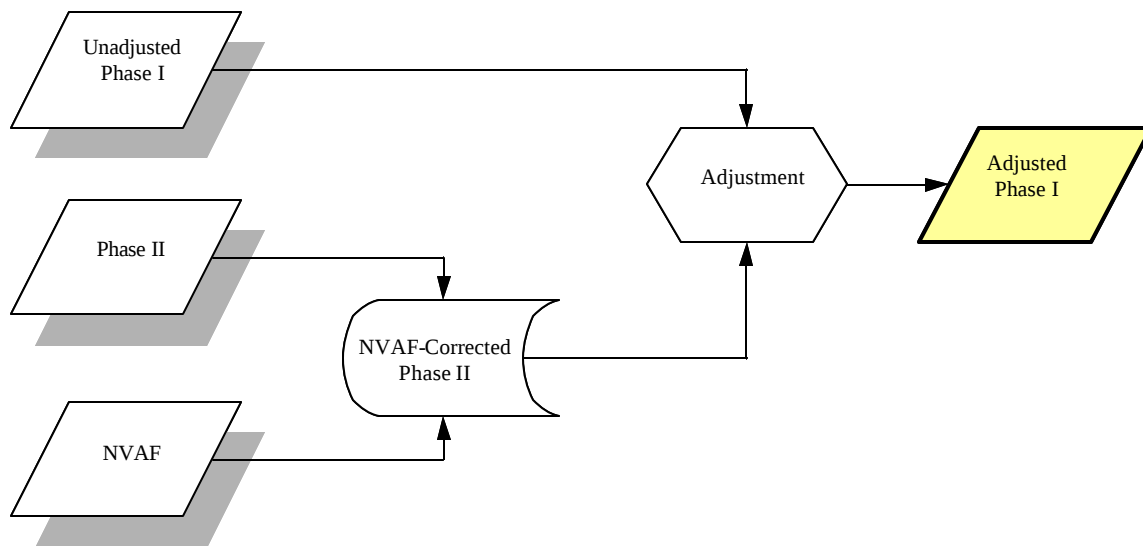


Figure 1. VRI Flow-chart.

1.2 Invermere TSA VRI Program

The Invermere Timber Supply Area (TSA) stakeholders initiated a VRI program in 2007. The first step was to develop the VRI strategic implementation plan (VSIP)¹ which recognized that the existing photo interpreted inventory suitably addressed the stakeholder's information needs but that a Phase II program was required to adjust and correct for bias in height, age, and volume. There was also a need to quantify (at a broad level) the amount of coarse woody debris in the TSA, identify forest health issues, and report on dead wood volumes in the TSA.

The inventory used in this project was developed in 1995 using the standards at the time. This Forest Inventory Planning (FIP) data was rolled over to the VRI format in 2000. Depletion updates were provided by Tembec in September 2007 which included Tembec's harvested updates to September 2007.

Timberline Natural Resource Group Ltd. (Timberline) completed the Phase II VRI project implementation plan (VPIP)² in 2007 using the most current data at the time. McColl Forestry Ltd. completed the Phase II ground sampling during the 2007 and 2008 field seasons and the NVAF program during the 2008 field season. Timberline completed the NVAF analysis and statistical adjustment of the Phase I.

1.3 Problem Statement

The Invermere TSA inventory is based on photo-interpreted inventory attribute estimates using the FIP procedures which were rolled over to VRI. The Provincial Chief Forester requires that the bias implicit in photo-interpretation be removed and the statistical precision of the inventory be known before the Annual Allowable Cut (AAC) is determined. The VRI is designed to provide the Chief Forester with a level of comfort in the inventory for TSR. The Chief Forester requested information quantifying dead wood and forest health agents in the TSA.

The objectives of the Phase II program (from the VPIP) were to:

1. *Develop statistically unbiased volume estimates for stands at least 30 years old in the Invermere TSA vegetated treed (VT) land base;*
2. *Achieve an overall $\pm 10\%$ sampling error (95% probability) for live volume in the Invermere TSA;*
3. *Collect coarse woody debris information in all Phase II plots to support landscape level biodiversity objectives; and*
4. *Collect site series information to get improved information on landscape level biodiversity.³*

¹ Tembec Enterprises Ltd., November 2006. *Invermere Timber Supply Area Vegetation Resources Inventory Strategic Implementation Plan*. Unpublished. Pp. 25.

² Timberline Natural Resource Group Ltd., July 2008. *Invermere Timber Supply Area Vegetation Resources Inventory Resources Phase II Project Implementation Plan Version 3.2*. Unpublished. Pp. 32.

³ This data was collected for use by the Invermere stakeholders.

1.4 Analysis and Reporting Objectives

The analysis objectives were to:

1. *Compile the 2007/2008 VRI Phase II (ground data) to MFR standards;*
2. *Adjust the VRI Phase II net merchantable volume using NVAF data;*
3. *Complete the statistical adjustment of the inventory; and*
4. *Summarize the plot data to report on dead down wood and forest health issues from the ground sampling program.*

The report objective is to:

1. *Document the statistical adjustment procedures used in this analysis;*
2. *Report on the results;*
3. *Identify areas of uncertainty in the data ; and*
4. *Summarize the dead wood and forest health results, and provide recommendations for its use in TSR*

1.5 Terms of Reference

Timberline prepared this report for Marcie Belcher, *RFT* (Tembec) and the Inventory TSA stakeholders. Hamish Robertson, *RPF* (Timberline) was the project manager and Hugh Carter, *MSc, RFT* (Timberline) completed the analysis and prepared the report. Chris Mulvihill, *RPF* (MFR) provided technical support during the design, implementation, and analysis phases of the projects. The results from this report will be reviewed and approved by the MFR Forest Analysis and Inventory Branch (FAIB) prior to use in TSR.

2.0 DATA

2.1 Land Base

The Invermere TSA is located within the Southern Interior Forest Region – Rocky Mountain District (Appendix I). The Rocky Mountain Forest District is situated in the southeast corner of BC and was created in 2003 by amalgamating the former Invermere and Cranbrook Forest Districts. The Invermere TSA covers approximately 1.12 million hectares of which approximately 458,000 ha (41%) are VT and > 30 years in 2007.

The Invermere TSA is located in the interior dry-belt of BC and contains six biogeoclimatic (BGC) zones. The BGC zones, in order of relative proportion are: Montane Spruce (MS), Englemann Spruce-Subalpine Fir (ESSF), Interior Douglas-fir (IDF), Interior Cedar-Hemlock (ICH), Ponderosa Pine (PP), and Alpine Tundra (AT). Lodgepole pine (Pl) and Douglas-fir (Fd) are the main species on the TSA, while interior spruce (Sx), western larch (Lw), and subalpine fir (Bl) are also important species. Minor species include ponderosa pine, western hemlock, western redcedar, whitebark pine, cottonwood, aspen, and birch. The age distribution is relatively uniform across all age classes.

2.2 Target Population

The target population was defined in 2007 using the TSA data obtained from the LRDW. The target population was identified as VT areas greater than or equal to 30 years in 2007. A depletion update was provided by Tembec that excluded all of Tembec's harvested areas up to September 2007.

The target population is 457,587 ha and represents approximately 41% of the total TSA area (Table 1).

Table 1. Invermere TSA net down.

Land Class	Area (ha)	% TSA
Total TSA	1,119,460	
Non-contributing	95,477	8.5%
Park	196,350	17.5%
Stands < 30 years	19,672	1.8%
Non Vegetated	254,282	22.7%
Non Treed	90,163	8.1%
Harvested	5,929	0.5%
Target Population	457,587	40.9%

2.3 Post-Stratification

The 2007 target population was stratified by pine, spruce, and Douglas-fir leading polygons in the operable area, and other areas in the target population not in the first three strata (including inoperable areas). The strata were then sub-stratified by age. Samples were selected and distributed using this stratification scenario.⁴

Approximately half of the population (54% or 247,595 ha) was located in stands within the Pine - Operable, Spruce - Operable, or Douglas-fir - Operable leading strata. Approximately 42% of the population (192,791 ha) in the first three strata was greater than 80 years. The Other stratum represents approximately 46% of the population with a majority greater than 140 years. Adjustment statistics were computed at the stratum level only; sub-strata were only used for sample selection.

Table 2. 2007 stratification scenario.

Stratum	Sub-Stratum	Area (ha)	% Pop.	% Stratum
Pine – Operable	30-80 yrs	33,562	7.3	31.6
	81-140 yrs	51,044	11.2	48.0
	141+ yrs	21,708	4.7	20.4
	<i>Sub-Total</i>	<i>106,313</i>	<i>23.2</i>	<i>100.0</i>
Douglas-fir – Operable	30-80 yrs	15,116	3.3	16.5
	81-140 yrs	42,283	9.2	46.1
	141+ yrs	34,420	7.5	37.5
	<i>Sub-Total</i>	<i>91,818</i>	<i>20.1</i>	<i>100.0</i>
Spruce – Operable	30-80 yrs	6,128	1.3	12.4
	81-140 yrs	7,497	1.6	15.2
	141+ yrs	35,839	7.8	72.5
	<i>Sub-Total</i>	<i>49,464</i>	<i>10.8</i>	<i>100.0</i>
Other – any areas not in strata 1-3	30-80 yrs	37,876	8.3	18.0
	81-140 yrs	55,603	12.2	26.5
	141+ yrs	116,513	25.5	55.5
	<i>Sub-Total</i>	<i>209,992</i>	<i>45.9</i>	<i>100.0</i>
<i>Total</i>		<i>457,587</i>	<i>100.0</i>	

Table 3. Invermere TSA photo-interpreted inventory statistics.

Stratum	Area (ha)	Height (m)	Age (yrs)	BA 7.5cm+ (m ² /ha)	SPH 7.5cm+ (trees/ha)	SI (m)	Vol. 12.5cm+ (m ³ /ha)
Pine – Operable	106,313	20.3	109	30.5	1,189	15.2	202.0
Douglas-fir – Operable	91,818	22.2	131	25.8	718	14.2	160.3
Spruce – Operable	49,464	25.6	191	34.0	753	11.6	265.0
Other	209,992	19.2	161	21.7	728	10.6	124.4
<i>Total</i>	<i>457,587</i>	<i>20.7</i>	<i>146</i>	<i>25.9</i>	<i>836</i>	<i>12.5</i>	<i>164.9</i>

⁴ Any polygon that was split by the operability line was deemed to be operable. This reassignment resulted in a shift in area from the Other strata into the other three strata and altered the area represented by each stratum and the selection weights used in this analysis.

2.4 Phase II (Ground Sampling)

2.4.1 Actual Sample Size

One hundred twenty (120) plots were selected for establishment. Samples located in harvested areas were replaced because a harvest depletion update was provided in September 2007.

Two samples were visited that had recently been harvested and these were replaced. Three samples were visited and considered unsafe, but were relocated using the MFR procedure for relocating unsafe samples. An additional sample was considered unsafe and not relocated as it posed minimal impact to the overall outcome (Table 4).⁵ Overall 119 samples were considered valid and used for this analysis (Appendix I, Figure 10).

Table 4. Plot distribution.

Land Class	No. Plots	(%)
Sampled Plots	120	100%
Harvested – not replaced	0	0%
Unsafe – not relocated	1	1%
Valid Plots	119	99%
Harvested – replaced	2	2%
Unsafe – relocated	3	3%
Total	119	100%

2.4.2 Sampling Weights

The plots were initially selected in 2007. The Other stratum was intentionally under-sampled because it was of low interest in timber supply analysis. The weights were computed based on the distribution of the sample size, using 119 plots (Table 5). Sampling weights ranged from 2,043 ha to 12,625 ha or in relative terms from 1 to 6.2.⁶ The average weight was 3,845 ha/plot or 1.9 in relative terms. The sampling weight for each individual ground sample is provided in Appendix III.

Table 5. Phase II Sampling weights.

Stratum	Sub-Stratum	Area (ha)	No. Plots	Area/Plot
Pine – Operable	30-80 yrs	33,562	15	2,237
	81-140 yrs	51,044	23	2,219
	141+ yrs	21,708	8	2,713
	Sub-Total	106,313	46	2,311
Douglas-fir – Operable	30-80 yrs	15,116	6	2,519
	81-140 yrs	42,283	19	2,225
	141+ yrs	34,420	12	2,868
	Sub-Total	91,818	37	2,482
Spruce – Operable	30-80 yrs	6,128	3	2,043
	81-140 yrs	7,497	3	2,499
	141+ yrs	35,839	12	2,987
	Sub-Total	49,464	18	2,748
Other	30-80 yrs	37,876	3	12,625
	81-140 yrs	55,603	5	11,120
	141+ yrs	116,513	10	11,651
	Sub-Total	209,992	18	11,666

2.4.3 Phase II Plot Statistics

The Phase II plot volumes were fairly consistent amongst all strata. Spruce volume contained the largest proportion of dead volume. The Pine - Operable and Douglas-fir - Operable strata had similar live and dead volumes. Site index was consistent over all strata with an overall average of 13.3m. (Table 6). The Pine - Operable stratum had the highest density and site index (15.3m). The Other stratum had the lowest average age, height, site index, and volume. Phase I and Phase II data is provided in Appendix IV.

⁵ Confirmed in discussions with Chris Mulvihill, RPF on July 2, 2008.

⁶ Relative weights are an expression of each weight compared to the minimum weight. Relative weights provide simple comparisons between substrata.

Table 6. Phase II plot statistics.

Stratum	n	Height (m)	Age (yrs)	BA (m ² /ha)	SPH (trees/ha)	SI (m)	Volume 12.5+ cm (m ³ /ha)		
							Live	Dead	Total
Pine – Operable	46	20.8	116	32.6	1,313	15.3	212.6	26.2	238.8
Douglas-fir– Operable	37	22.4	132	27.6	645	15.0	197.9	25.8	223.7
Spruce – Operable	18	23.7	155	31.1	846	13.6	230.0	37.7	267.7
Other	18	18.8	131	30.1	1,159	11.2	189.1	20.6	209.7
Total	119	20.6	130.3	30.3	1,058	13.3	200.7	24.8	225.5

Note: Phase II (ground sampling) volume was whole-stem volume less tops, stumps, NVAf-corrected cruiser-called decay, waste, and breakage.

2.5 NVAf

One hundred twenty (120) trees (110 live and 10 dead) were destructively sampled and used for the analysis (Table 7). Trees were selected by live / dead, maturity (Immature = 120 years, Mature > 120 years), and leading species. The “design-based” method was used for determining the ratios to account for the unequal distribution of plots within the TSA. The compiled NVAf tree data was provided by the MFR Volume and Decay Sampling Officer. Twenty (20) extra Pl trees were destructively sampled to obtain data to complete

Table 7. NVAf tree summary statistics.

Live/ Dead	Maturity Class ⁷	Spp	No. Trees	Avg. Volume (m ³)		
				Phase II	NVAF	% Diff.
Dead	All	All	10	0.4863	0.4598	-5.4%
Live	Immature	All	43	0.2482	0.2532	2.0%
	Mature	Pl	16	0.3292	0.3328	1.1%
		Fd	22	0.4732	0.486	2.7%
		Sx	14	0.4401	0.4396	-0.1%
		Others	15	0.3205	0.3155	-1.6%
	All	All	120	0.6403	0.6428	+0.3

further analysis on small Pl taper. On average the NVAf volume was higher than the Phase II volume, meaning that the field samplers typically overstated the net factor. Overall the field samplers were reasonably accurate when net-factoring the trees (+0.3%), with the exception of the dead trees (-5.4%). The complete NVAf sample tree list is provided in Appendix II.

2.5.1 Small Pl Taper

As part of the NVAf program, the Invermere stakeholders sought data to support analysis of smallwood Pl taper against Provincial Pl taper equations. Forty-six (46) Pl trees (5 Dead, 25 Immature, and 16 Mature - Dead) were destructively sampled as part of the NVAf program and can be used for future analyses. If this issue is to be assessed further, the next step is to define the smallwood Pl population, determine the number of trees required for analysis, implement the program, and complete the analysis.

⁷ Immature trees were all trees in polygons that had a stand age less than 121 years. All other trees were Mature.

3.0 METHODS

3.1 Phase I Projection

Photo-interpretation was done using photos taken in 1995. For this analysis the photo-interpreted age was projected to 2007 by adding the required number of years.⁸ The photo-interpreted height, basal area (BA), stems per hectare (SPH), and corresponding net merchantable volume were also projected to 2007 using VDYP7 (version 7.5c.27). VDYP7 does not project BA, SPH, or volume in cases where tree heights are less than 7.6 m. In these cases, polygons were assumed to have no volume, basal area and density. All other critical VDYP7 input (species composition, crown closure, forest inventory zone, inventory standard, and BEC) were not modified.

The data received from the LRDW included multiple records with the same feature_ID. The feature_ID is supposed to be a unique identifier for all VRI polygons in BC. To rectify this and to ensure proper areas were used, Timberline generated a unique ID for all polygons received from the LRDW that were used to define the target population.⁹

3.2 NVAF

The NVAF ratios were computed using the data received from the MFR. Ratios were computed using the design-based method (as per MFR request) and applied to the Phase II net merchantable volume computed from the raw data.

3.3 Phase II Compilation

The Phase II (ground sampling) data was compiled using the MFR SAS VRI Phase II compiler.¹⁰ The new compiler accounts for the inclusion of dead standing and fallen at the auxiliary plots. The plot data came in a raw form from the MFR as the cleaning routine is not functioning properly.¹¹ The data was checked using the VRI compiler error checking routines and other logic error checks throughout the analysis, however, only minor data entry errors were identified and fixed.

The GPS points were viewed in GIS to confirm that plots landed at the intended points. Three samples (samples 63, 94, and 97) were located in adjacent polygons, but in each case the differences between the intended and actual locations were so minor that they could be attributed to error in the GPS. The maximum difference between the intended coordinate and actual corrected coordinate was 6m. In all cases the intended polygon was used for analysis. The rationale for this is that the sample point location in the polygon is the audited step and not the GPS recording.

⁸ The majority of the Phase II plots (97 of 119 plots) were sampled in 2007 and the remainder sampled in 2008. As per MFR standards the data is projected to the year that the majority of sampling was completed.

⁹ The common records were combined to represent the total area of the polygon.

¹⁰ The compiler was received from the MFR on February 4, 2009.

¹¹ While we completed logical data checks Timberline assumes no responsibility for errors that would have been identified through the MFR data cleaning process.

3.4 Statistical Adjustment

The most recent MFR VRI statistical adjustment standards were used to adjust height, age, basal area (7.5+ cm), stems per hectare (7.5+ cm), and live net merchantable volume (12.5+ cm).¹² The MFR adjustment procedures assume that the unadjusted (Phase I) inventory volume is biased due to two sources of error:

1. An attribute bias associated with the photo-interpreted height, age, basal area, and stems per hectare; and
2. A model bias inherent to the growth and yield model used to estimate volume (VDYP7)¹³.

Three critical attributes needed for volume prediction are not adjusted in the process but are important for determination of other critical attributes. Inventory standard determines how basal area and stems per hectare are either used or generated, BEC zones are important for loss and are needed for every polygon, and species composition is used to distribute the volume.

The interim attribute adjustment procedure is a two-step process (Figure 2) described as follows:

- Step 1: Phase I height, age, basal area (7.5+ cm), and stems per hectare (7.5+ cm) bias are corrected using an adjustment ratio of means (ROM) calculated from the Phase I and Phase II plots. An attribute-adjusted volume is then estimated using VDYP7 with the adjusted height and age.
- Step 2: An adjustment ratio estimated from the attribute-adjusted volume (12.5+ cm) and the Phase II volume is calculated and this ratio is used to correct the model bias in the attribute-adjusted volume.

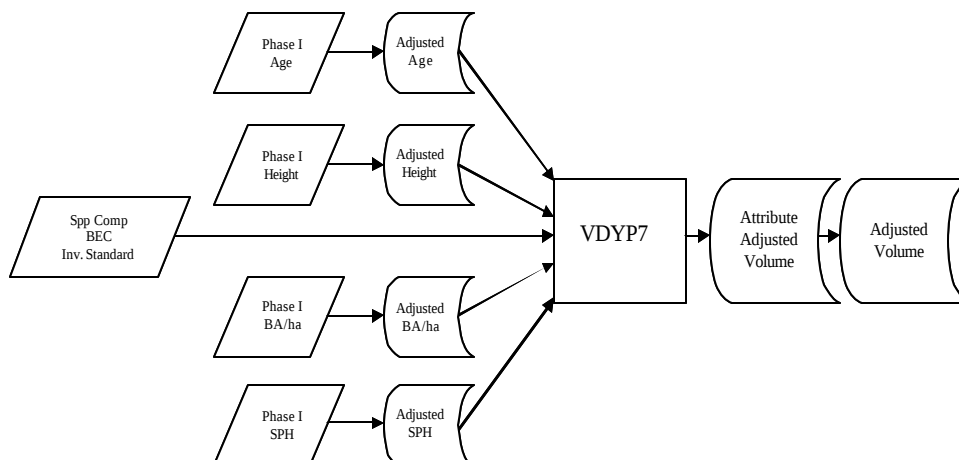


Figure 2. Interim procedures for adjustment of baseline VRI timber attributes.

¹² Ministry of Forests and Range. 2008. *Vegetation Resources Inventory Interim Procedures and Standards for Statistical Adjustment of Baseline VRI Timber Attributes*. Unpublished Report, January 2008. 36 pp.

¹³ VDYP7 is the new standard for growth and yield modeling in BC for unmanaged stands. All work prior to this adjustment was completed using VDYP6.

4.0 RESULTS

4.1 NVAF

The average NVAF ratio for live trees varied between 0.945 and 1.027 with an overall average of 1.005 (Table 8). The overall 95% sampling error (E%) for live trees was 3.0%. The remaining species groups were consistent and the sampling errors were relatively low with the Dead and Pl species group having higher sampling errors. The Fd – Operable stratum had the largest ratio (1.027), suggesting that the field samplers thought there was more decay in Fd than there actually was. Figure 3 illustrates the relationships between the cruiser called net factor and the destructively sampled trees for each species group.

Table 8. NVAF ratios.

Live/ Dead	Maturity	Spp	No. Trees	Ratio	95% E%
Dead	All	All	10	0.945	14.1%
Live	Immature	All	43	1.020	4.9%
		Pl	16	1.011	11.4%
	Mature	Fd	22	1.027	6.3%
		Sx	14	0.999	7.8%
		Others	15	0.984	8.6%
	All	All	120	1.005	3.0%

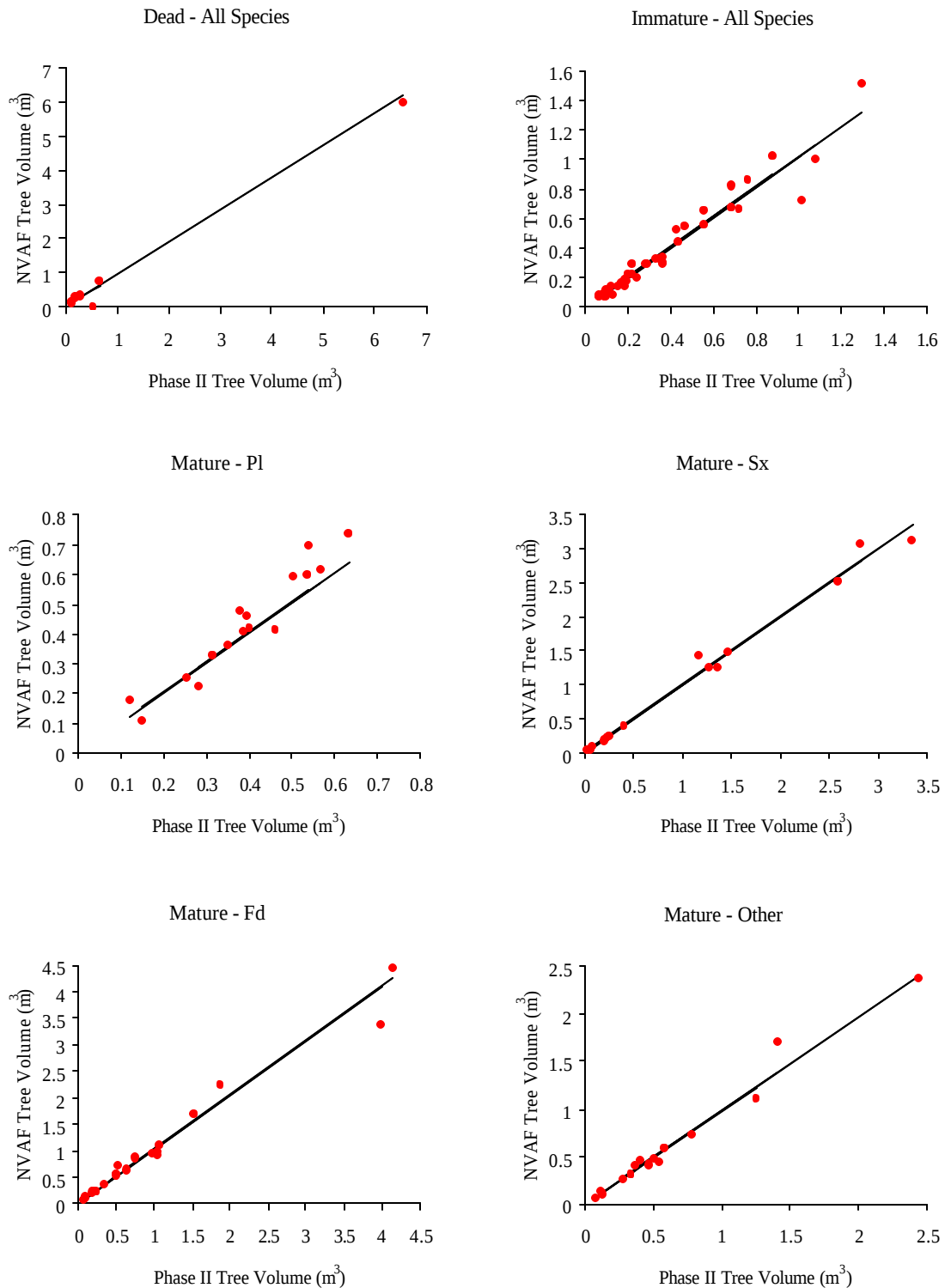


Figure 3. NVAF scatterplots.

4.2 Height

Six plots had no suitable height observation, leaving 113 plots for analysis. On average, height was over-estimated by approximately 5% with a sampling error of $\pm 6\%$ (95% probability) (Table 9, Figure 4). The sampling error of the adjustment ratio was particularly high in the Other stratum, which has a low number of observations.

Table 9. Height adjustment statistics for the target population.

Stratum	Unadjusted Pop.		n	Sample		ROM	Adjusted. Population		
	Area (ha)	Avg. (m)		Phase I (m)	Phase II (m)		Adj. Avg. (m)	95% E	
Pine – Operable	106,313	20.3	45	21.3	20.8	0.977	19.8	1.2	6.1
Douglas-fir– Operable	91,818	22.2	35	23.1	22.4	0.970	21.6	1.8	8.5
Spruce – Operable	49,464	25.6	17	26.0	23.7	0.912	23.3	2.9	12.6
Other	209,992	19.2	16	20.1	18.8	0.935	17.9	2.5	14.0
Total	457,587	20.7	113	21.6	20.5	0.949	19.7	1.2	6.2

4.3 Age

Four (4) plots had no suitable age observation, leaving 115 plots for analysis. Phase I age was over-estimated on average by approximately 6% with a sampling error of $\pm 9.5\%$ (95% probability) (Table 10, Figure 5). Age in the Spruce - Operable stratum was over-estimated by almost 14% with a $\pm 20\%$ sampling error (95% probability). The overall sampling error was relatively low at approximately 10%.

Table 10. Age adjustment statistics for the target population.

Stratum	Unadjusted Pop.		n	Sample		ROM	Adjusted Pop.		
	Area (ha)	Avg. (yrs)		Phase I (yrs)	Phase II (yrs)		Adj. Avg. (yrs)	95% E	
Pine – Operable	106,313	109	45	110	116	1.056	115	13	11.6
Douglas-fir– Operable	91,818	131	35	135	132	0.975	128	17	13.0
Spruce – Operable	49,464	191	18	181	155	0.860	164	33	19.9
Other	209,992	161	17	144	131	0.912	147	27	18.7
Total	457,587	146	115	138	130	0.941	137	13	9.5

4.4 Basal Area

All 119 plots were used for the basal area analysis. Phase I basal area was underestimated on average by approximately 8% (Table 11, Figure 6) with a 10.9% (95% probability) sampling error. Basal area was underestimated in the Other stratum by approximately 24%. The Spruce – Operable stratum Phase I basal area was over-estimated on-average by approximately 8% with a sampling error of approximately $\pm 29\%$. The results suggest that basal area generated by VDYP7 in the Spruce – Operable stratum has relatively low precision, which could be due to poor inventory values used for generating basal area estimates.

Table 11. Basal area adjustment statistics for the target population.

Stratum	Unadjusted Pop.		n	Sample			Adjusted Pop.		
	Area (ha)	Avg. (m ² /ha)		Phase I (m ² /ha)	Phase II (m ² /ha)	ROM	Adj. Avg. (m ² /ha)	95% E (m ² /ha)	(%)
Pine – Operable	106,313	30.5	46	31.9	32.6	1.022	31.2	3.9	12.4
Douglas-fir– Operable	91,818	25.8	37	27.7	27.6	0.995	25.6	4.8	18.9
Spruce – Operable	49,464	34.0	18	34.0	31.1	0.915	31.1	8.9	28.5
Other	209,992	21.7	18	24.3	30.1	1.236	26.9	6.1	22.7
<i>Total</i>	<i>457,587</i>	<i>25.9</i>	<i>119</i>	<i>27.8</i>	<i>30.3</i>	<i>1.084</i>	<i>28.1</i>	<i>3.1</i>	<i>10.9</i>

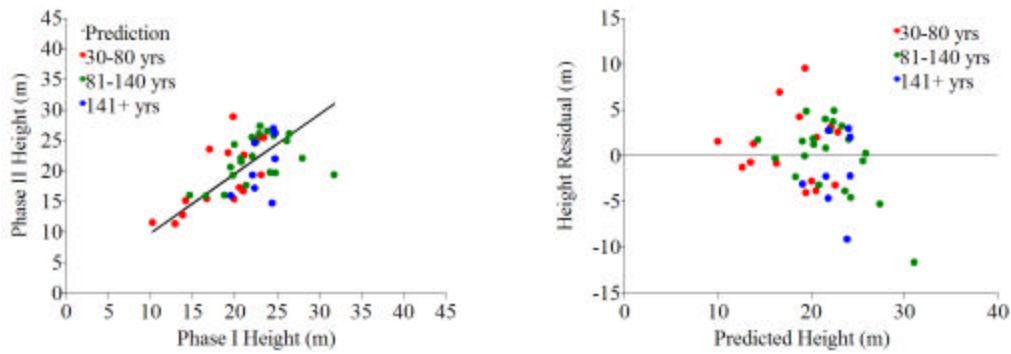
4.5 Stem Per Hectare

All one-hundred nineteen (119) plots were used for the SPH analysis. Phase I SPH was under-estimated on average by approximately 12% with a sampling error $\pm 18.5\%$ (95% probability) (Table 12, Figure 7). SPH was over-estimated in the Douglas-fir – Operable stratum by approximately 15%. All other strata were under-estimated for stems per hectare in the Phase I. The most variable stratum was the Other stratum with a sampling error of approximately $\pm 41\%$ (95% probability).

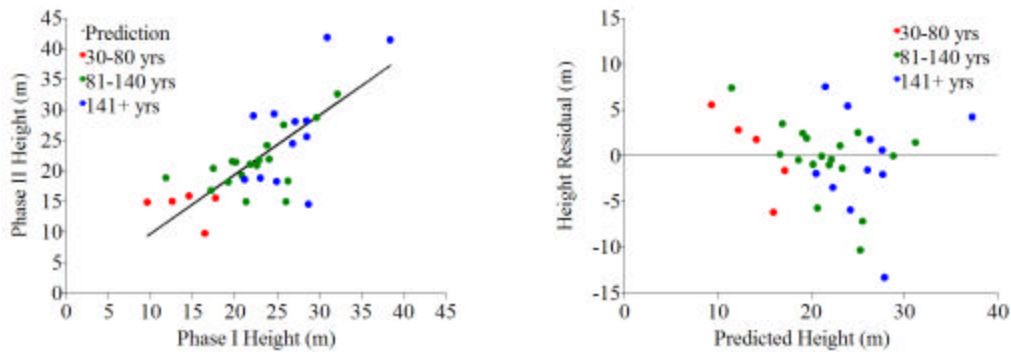
Table 12. Stems per hectare adjustment statistics for the target population.

Stratum	Unadjusted Pop.		n	Sample			Adjusted Pop.		
	Area (ha)	Avg. (SPH)		Phase I (SPH)	Phase II (SPH)	ROM	Adj. Avg. (SPH)	95% E (SPH)	(%)
Pine – Operable	106,313	1,189	46	1,202	1,313	1.092	1,299	195	15.0
Douglas-fir– Operable	91,818	718	37	755	645	0.854	614	142	23.1
Spruce – Operable	49,464	753	18	758	846	1.116	840	227	27.0
Other	209,992	728	18	915	1,159	1.267	922	381	41.3
<i>Total</i>	<i>457,587</i>	<i>836</i>	<i>119</i>	<i>933</i>	<i>1,058</i>	<i>1.123</i>	<i>939</i>	<i>174</i>	<i>18.5</i>

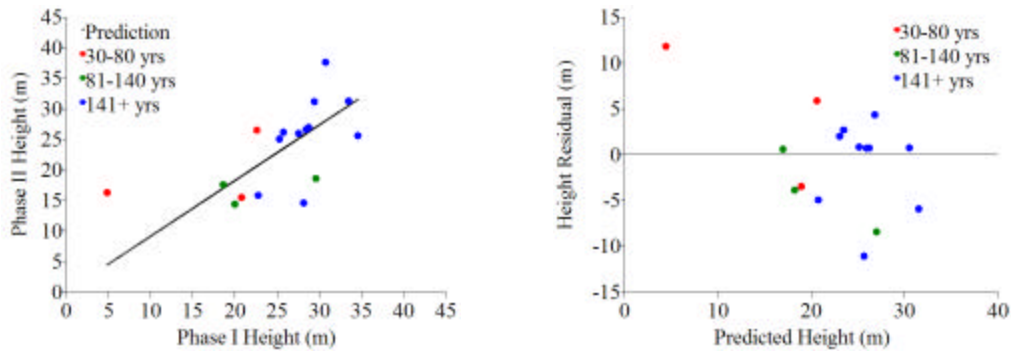
Pine - Operable



Douglas-fir - Operable



Spruce - Operable



Other

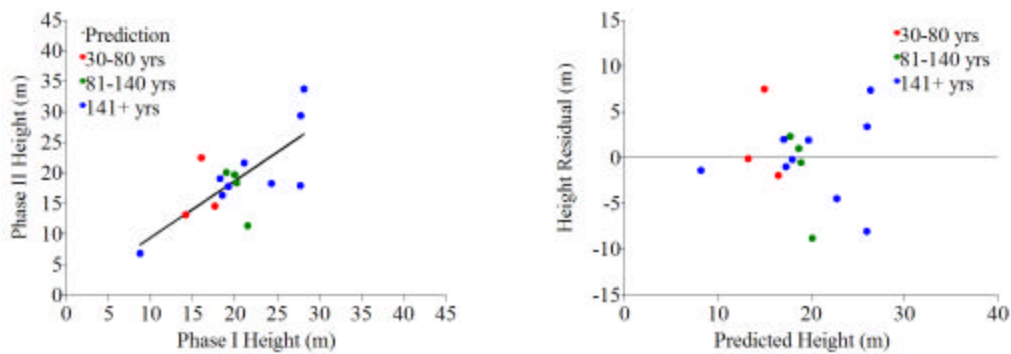
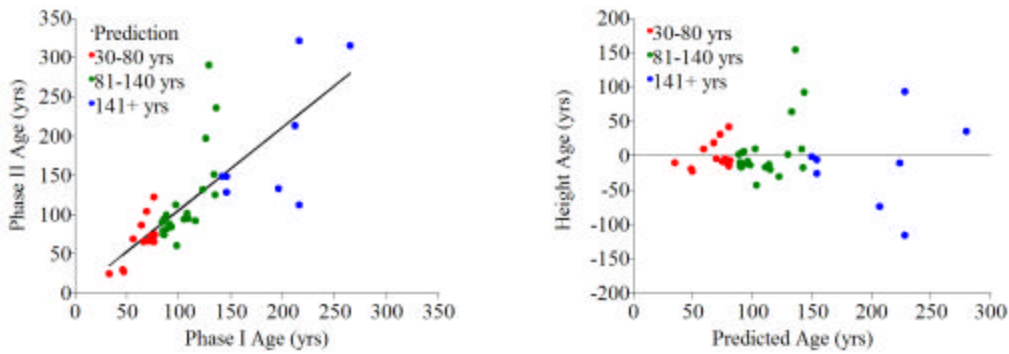
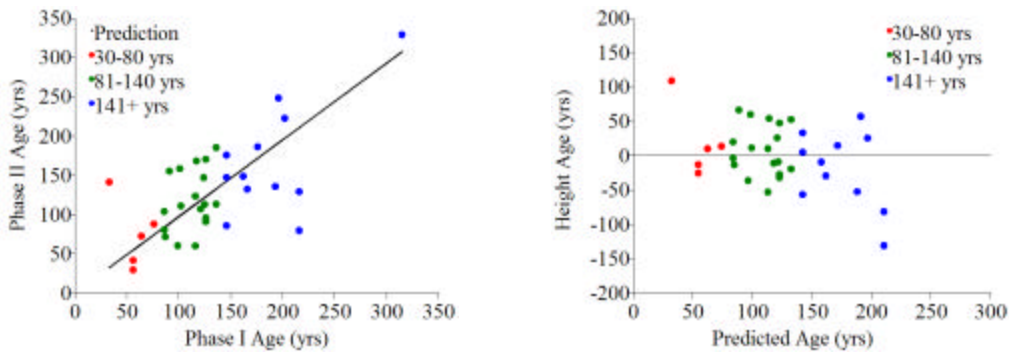


Figure 4. Height scatterplots by stratum.

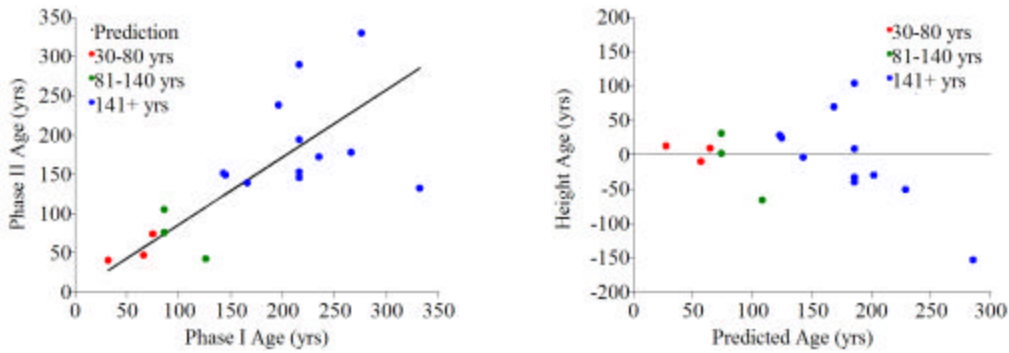
Pine - Operable



Douglas-fir - Operable



Spruce - Operable



Other

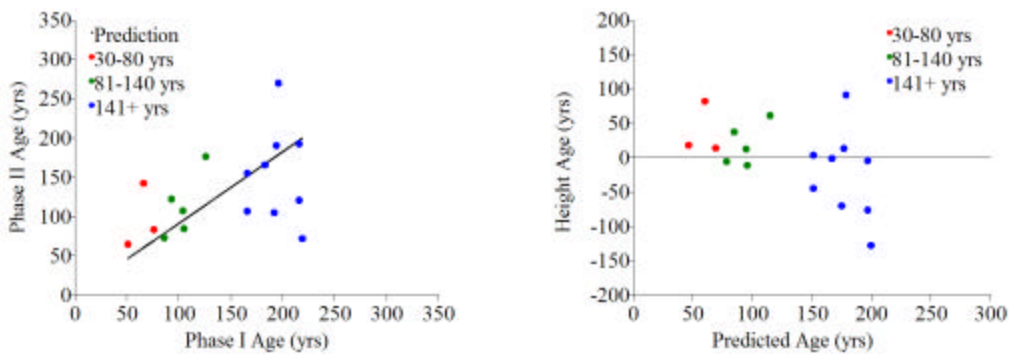
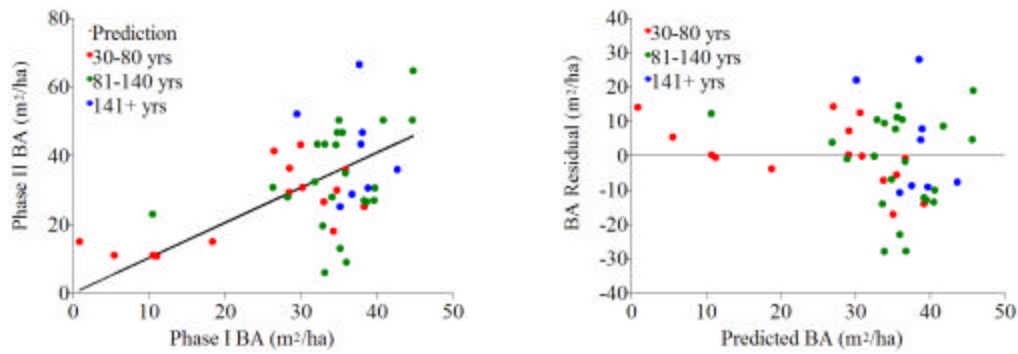
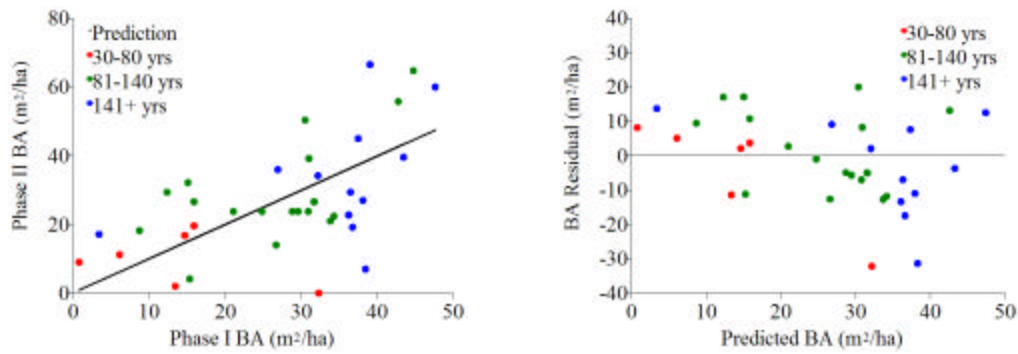


Figure 5. Age scatterplots by stratum.

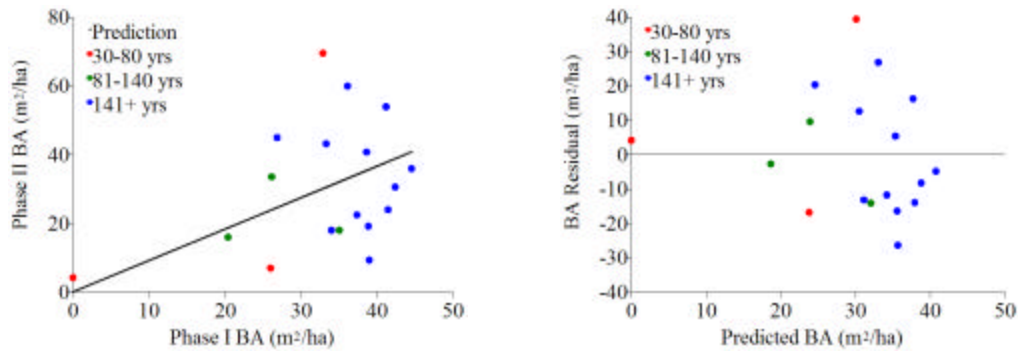
Pine - Operable



Douglas-fir - Operable



Spruce - Operable



Other

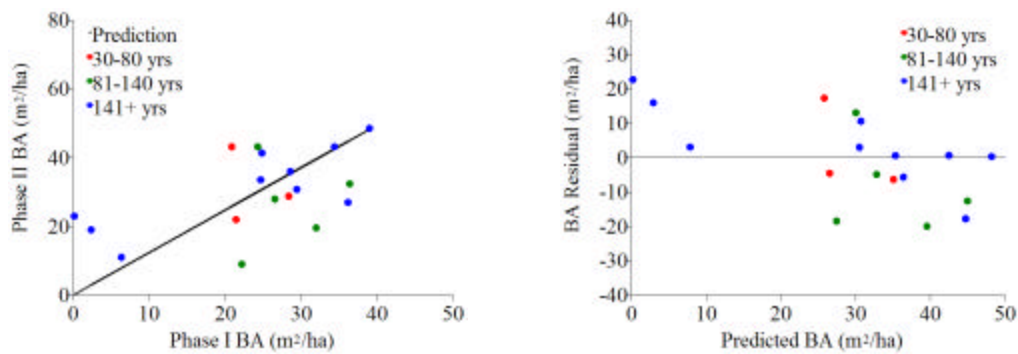
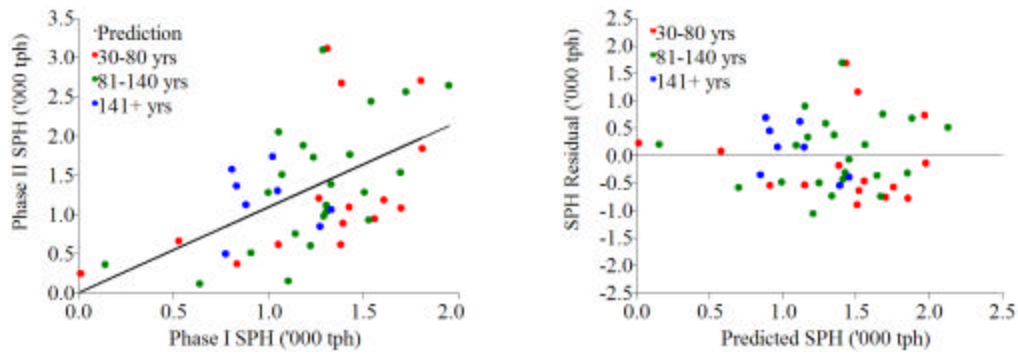
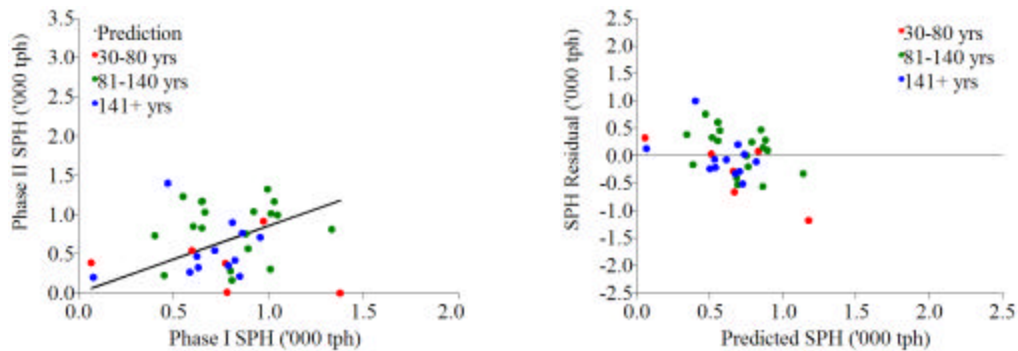


Figure 6. Basal area (7.5+ cm) scatterplots by stratum.

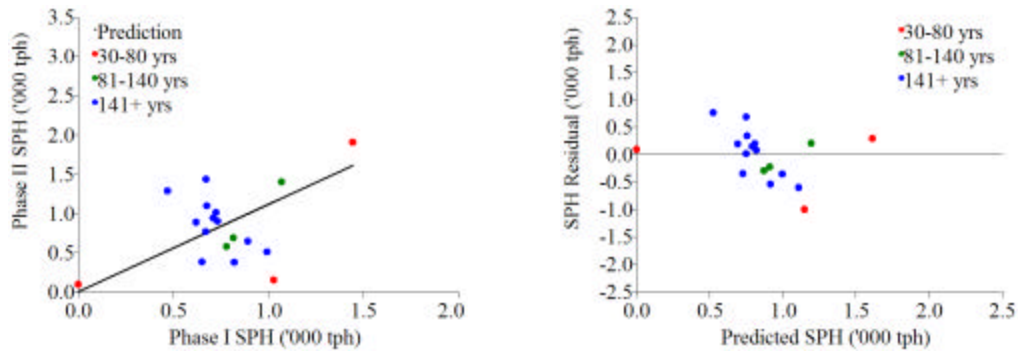
Pine - Operable



Douglas-fir - Operable



Spruce - Operable



Other

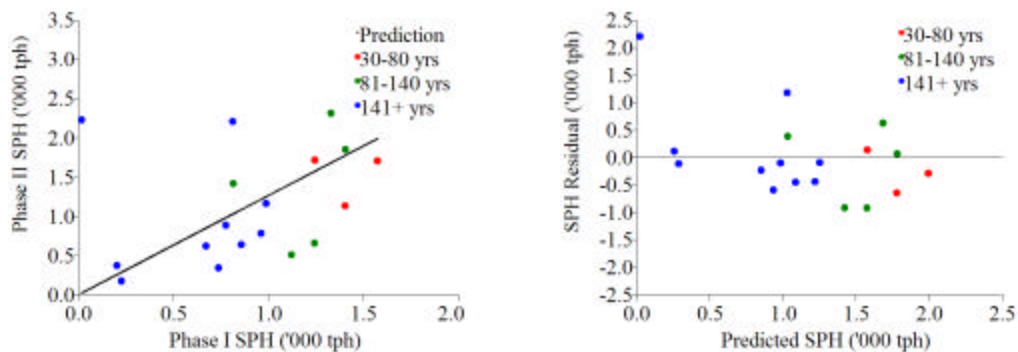


Figure 7. Stems per hectare (7.5+ cm) scatterplots by stratum.

4.6 Input-adjusted VDYP7 Volume

After adjusting the bias in height, age, basal area, and SPH, VDYP7 volumes were re-estimated using the adjusted input. Attribute-adjusted volumes showed no appreciable change at the 12.5cm+ levels when compared to the Phase I volumes (Table 13). These metrics are for comparison purposes only and do not have any impact on the outcome of the analysis.

Table 13. Volume change due to input attribute adjustment.

Stratum	Area (ha)	Volume (m ³ /ha) 12.5cm+			
		Phase I	Attribute-Adjusted	Diff. (m ³ /ha)	(%)
Pine – Operable	106,313	202.0	196.6	-5.4	-2.7%
Douglas-fir– Operable	91,818	160.3	155.0	-5.3	-3.3%
Spruce – Operable	49,646	265.0	221.1	-43.9	-16.6%
Other	209,992	124.4	139.7	15.3	12.3%
Total	457,587	164.8	164.8	0.0	0.0%

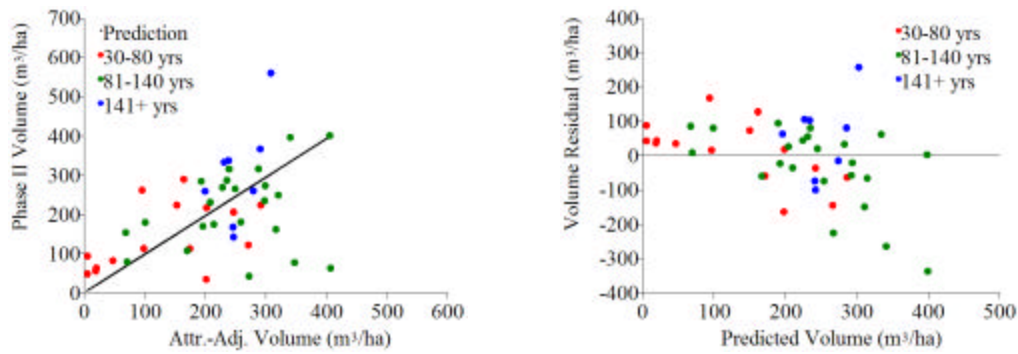
4.7 Live Net Merchantable Volume

The overall live net merchantable volume increased by 12% following adjustment (Table 14, Figure 8) with a $\pm 13\%$ overall sampling error (95% probability). The average adjusted live volume/ha was approximately 185 m³/ha. The sampling error for the Spruce – Operable stratum was approximately 36% and could reflect the variable basal area predictions generated from VDYP.

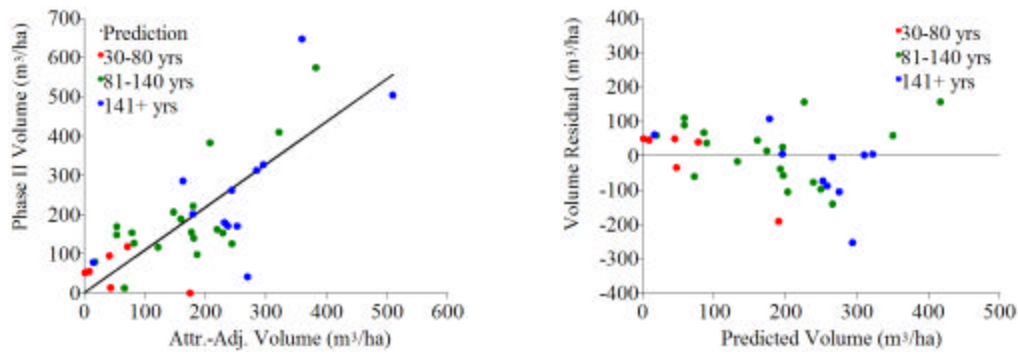
Table 14. Live net merchantable volume (12.5cm+) adjustment statistics.

Stratum	Attr. Adj. Vol.		n	Sample			Adjusted Population		
	Area (ha)	Avg. (m ³ /ha)		Phase I (m ³ /ha)	Phase II (m ³ /ha)	ROM	Adj. Avg. (m ³ /ha)	95% E (m ³ /ha)	(%)
Pine – Operable	106,313	196.6	46	214.0	210.2	0.982	193.1	32.4	16.8
Douglas-fir– Operable	91,818	155.0	37	180.2	196.5	1.090	169.0	35.6	21.0
Spruce – Operable	49,464	221.1	18	229.9	230.7	1.003	221.9	80.7	36.4
Other	209,992	139.7	18	149.2	190.6	1.278	178.6	47.9	26.8
Total	457,587	164.8	119	179.2	200.7	1.121	184.7	24.4	13.2

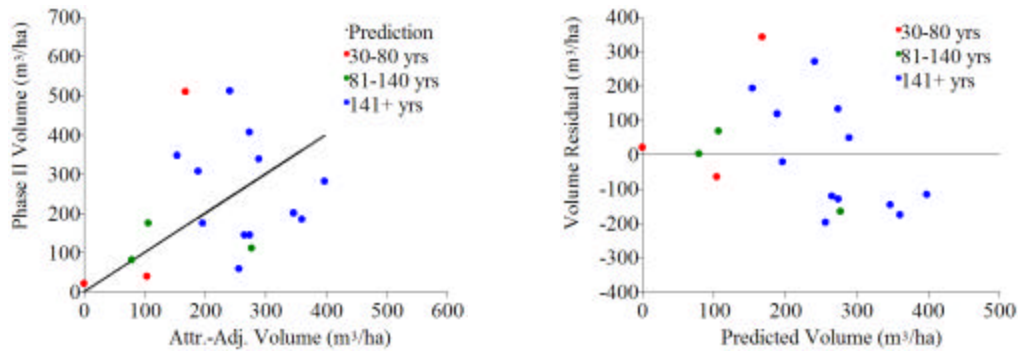
Pine - Operable



Douglas-fir - Operable



Spruce - Operable



Other

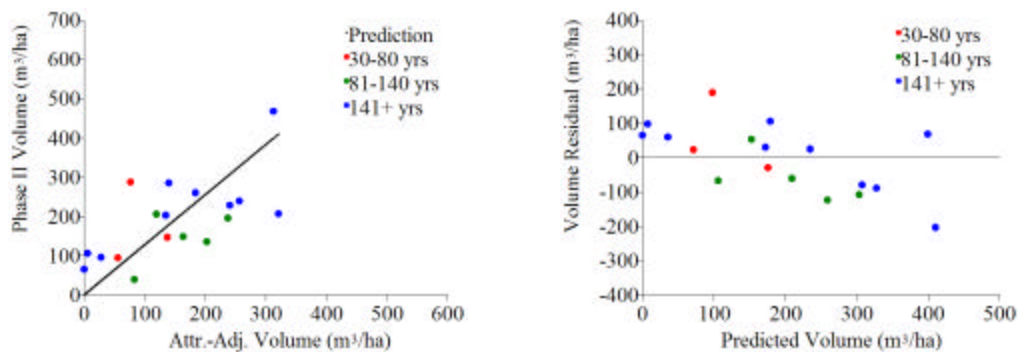


Figure 8. Live volume (12.5+ cm) scatterplots.

4.8 Site Index

Site index is not directly adjusted in the VRI standard statistical adjustment. Instead, an adjusted site index is derived from adjusted height and age. The inventory site index decreased by approximately 2.5% after adjustment (Table 15). The decrease was largest in the Pine – Operable stratum at -5.1%. This is consistent with the height in this strata decreasing and the age increasing in this stratum.

Table 15. Site index change after adjustment.

Stratum	Area (ha)	Phase I SI (m)	Adj. SI (m)	Difference (%)
Pine – Operable	106,313	15.2	14.5	-5.1%
Douglas-fir – Operable	91,818	14.2	14.0	-1.6%
Spruce – Operable	49,464	11.6	11.4	-1.6%
Other	209,992	10.6	10.4	-1.7%
Total	457,587	12.5	12.2	-2.6%

4.9 Coarse Woody Debris

Coarse woody debris (CWD) was collected at each sample to derive a broad indication of the volume of down dead wood (by species) currently in the Invermere TSA. All 119 samples were used for the summary excluding any accumulations encountered in the field sampling (Table 16). Overall the Spruce - Operable stratum had the largest amounts of CWD (117.4 m³/ha). Overall, Xc (unknown conifer) pieces made up the majority of volume followed by Pl. As expected, the variability around the volumes was quite high which suggests that these estimates should only be used as broad indications of down dead wood. If management decisions related to CWD were required, more samples or different procedures are required to achieve a level of comfort for each stratum.

Table 16. Summary of CWD volume.

Stratum	Area (ha)	Plots	Volume (m ³ /ha)							
			B	Fd	Pl	Sx	Xc	Decid	Other	Total
Pine – Operable	106,313	46	2.4	3.8	26.7	3.0	67.5	0.6	8.3	112.2
Douglas-fir– Operable	91,818	37	1.7	14.8	9.1	2.5	21.4	1.3	3.3	54.1
Spruce – Operable	49,464	18	17.3	0.8	14.2	18.6	62.0	0.3	4.3	117.4
Other	209,992	37	6.0	5.2	25.9	7.8	53.2	0.3	2.8	101.2
Total	457,587	119	5.8	6.5	21.6	7.2	52.9	0.6	4.5	99.0

4.10 Forest Health

Forest health is a significant management consideration for the Invermere TSA stakeholders. Forest health data is collected in Phase II sampling and provides a broad indication of the occurrence of forest health indicators on the landbase. Each sample is a random point (representing approximately 3,845 ha not weighted by strata areas) within the target population and together the samples cover a range of variability in the TSA. Table 17 shows the presence of forest health indicators within Invermere TSA. Each occurrence is the equivalent to the presence

of at least one tree within a plot being affected by one of the damage agents.¹⁴ This table represents only a summary of forest health indicators (with no precision) within the TSA and should not be used for management decisions; however this information can be used as a guide for further work to obtain more detailed information.

Insects had the highest incidence of any important damage agent. Thirty-eight (38) of the 119 samples had at least one tree with an insect identified by the field samplers (approximately 32%). Twelve (12) samples had MPB identified and of these twelve, five samples were in the Pine – Operable stratum, meaning that approximately 11% of samples in this stratum were affected by MPB. Windthrow¹⁵ also had considerable occurrence within the TSA where 23 of the 119 samples (approximately 19% of the samples) had windthrow identified by the field samplers.

Table 17. Presence of damage agents.

Damage Agent	Occurrences in Samples (n)	% of Samples with Occurrence
Scarring	44	37
Insects	38	32
Aphids	17	14
Bark beetles	19	16
Windthrow	23	19
Fire Damage	18	15
Animal	16	13
Stem Disease	16	13
Dwarf Mistletoe	11	9
Stem Rot	8	7
Frost Damage	8	7
Mechanical	5	4
Root Disease	3	3
Snow or Ice	2	2
Broom Rust	1	1
Slide Damage	1	1

¹⁴ It is possible that one tree could be exhibiting all the occurrences of damage agents within that plot. This is only a summary and further work could be completed if more detailed information is required.

¹⁵ It is possible that one forest health indicator is the result of another. For example windthrow could be a result of trees being infected by diseases or insects.

5.0 DISCUSSION

5.1 Sample vs. Population

A sample must adequately cover the range of Phase I values in the population to avoid extrapolating information to areas that were not sampled (given that all polygons had a chance of being sampled). We expect that a minimal amount of extrapolation will be required with a random sample since the minimum and maximum values observed in the population will not always be included in the sample. With a random sample of size n , one would expect on average that $100\%/2n$ of the population is below or above the minimum or maximum observed in the sample.

Table 18. Population outside of the sampled range.

Stratum	Expected Proportion	Age		Height		Volume	
		Below	Above	Below	Above	Below	Above
Pine – Operable	1.1	1.2	0.0	0.2	0.0	0.0	0.1
Douglas-fir– Operable	1.4	0.5	0.1	0.1	0.0	0.0	0.2
Spruce – Operable	2.8	1.7	1.7	2.3	1.1	0.0	0.4
Other	2.8	0.3	0.8	1.4	0.1	0.0	0.0

Overall only small portions of area were outside of the expected proportion for all attributes for all variables (Table 18). The largest amount of area not covered in the range of sampling was the below height category for the Spruce – Operable stratum (2.3%). For all areas that are outside of the sampled area there is the potential for biased estimates of those attributes as they were extrapolated. The risk is low in the Invermere TSA as the amount of area above or below the range of attributes are all within the expected proportions.

5.2 Accuracy and Precision

The statistical adjustment provides unbiased estimates at the scale in which the ratios were computed. In the case of the Invermere TSA, unbiased estimates will be at the stratum level. There is always a possibility that local bias exists within a stratum. It would be inappropriate to estimate sub-stratum bias given the small sample size provided at a smaller scale.

The MFR-recommended precision for adjusted average volume at the management unit level is a sampling error of $\pm 10\%$ (95% probability). The overall sampling error achieved in this project was $\pm 13\%$ (95% probability).

5.3 Impact of Change

5.3.1 Live Volume

The overall live volume increased by about 12% following adjustment (Table 19). The increase in live volume is most prevalent in the Other stratum which increased by approximately 54 m³/ha. This stratum is of little interest in timber supply and carried significant weight in the overall average due to the area occupied. There was a relatively large decrease in basal area for the Spruce – Operable stratum which likely

Table 19. Volume change after adjustment.

Stratum	Area (ha)	Volume 12.5cm + (m ³ /ha)		Difference (m ³ /ha) (%)	
		Phase I	Adjusted		
Pine – Operable	106,313	202.0	193.1	-8.9	-4.4%
Douglas-fir – Operable	91,818	160.3	169.0	8.7	5.4%
Spruce – Operable	49,464	265.0	221.8	-43.2	-16.3%
Other	209,992	124.4	178.6	54.2	43.6%
Other - Operable	39,855	121.1	173.2	52.1	43.0%
Other - Inoperable	170,137	138.6	201.6	63.0	45.5%
Total	457,587	164.9	184.7	19.8	12.0%

strongly impacted the volume estimates derived from VDYP7. The impact of change between the Phase II ground volumes and the attribute adjusted volume is negligible with a decrease in attribute adjusted volume of approximately 4%, indicating that in general, VDYP7 adequately predicted volume in the target population with the adjusted input attributes.

5.3.2 Age

The age adjustment had little impact on the age class distribution (Figure 9). The result was more slightly area in age classes 2, 3 and 5 and less area in age classes 4 and 9. This is confirmed by the relatively small adjustment made overall. Age class 2 covers the range of 21-50 and this figure only includes area for ages 30 and above as defined in the target population.

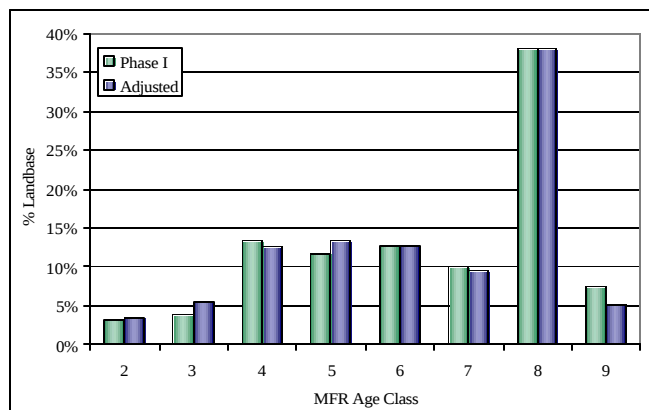


Figure 9. Change in MFR age class.

5.4 Risks and Uncertainties

5.4.1 Spruce – Operable Stratum

The Spruce - Operable stratum (11% of the target population) volume sampling error was $\pm 36\%$ (95% probability). This high variability is likely due to the low number of observations (18) and VDYP7's ability to generate reliable basal area estimates, which is significant for volume estimation.

5.4.2 Age Trend

The statistical adjustment removes the bias in each stratum. It is possible that an age-related trend exists within each stratum. All residuals were plotted against stand age to detect any age-related trend. Age in the Other stratum and stems per hectare in the Spruce – Operable stratum showed

slight age related trends, but are of minor concern. Volume is the most important attribute and there were no age correlations in any stratum.

6.0 CONCLUSIONS

After adjustment, live net merchantable volume increased by 24m³/ha (or 12%). Height and age decreased by 5% and 6%, respectively, and basal area and stems per hectare increased by 8% and 12%, respectively. Site index decreased by 3%.

As discussed, the main source of uncertainty in the inventory is the Spruce – Operable stratum; however it is expected that this is of marginal importance in timber supply analysis. The overall volume statistics were $\pm 13\%$ (95% probability) which is greater than the anticipated target sampling error of $\pm 10\%$ (95% probability).¹⁶ This is likely due to the use of basal area and stems per hectare in VDYP as these attributes exhibited relatively large variability in the TSA. If the TSA stakeholders are concerned about the relatively high sampling errors in the Spruce – Operable and Other strata they should consider installing more samples in an attempt to bring the sampling error to an acceptable level.

6.1 Recommendations

Unbiased estimates of height, age, basal area, stems per hectare, and volume were obtained using the MFR's VRI statistical adjustment standard methods. These estimates represent the best available inventory estimates. Therefore, we recommend that:

MFR use the adjusted estimates of height, age, basal area, stems per hectare, and volume in the timber supply analysis base case.

The NVAF destructive sample was intended to obtain some of the data required to properly investigate how well the Provincial Pl taper equations fit small Pl. Therefore, we recommend that:

The stakeholders use the Pl NVAF data together with other destructively sampled Pl tree data to assess possible taper issues in the small Pl population of interest.

The data collected for CWD and forest health information could provide insight to particular forest health issues with a presence within the TSA. Therefore, we recommend that:

The stakeholders consider the CWD and forest health statistics provided in this report as a starting point for investigating specific CWD and forest health issues.

The new inventory data provides a rich set of information that can be used for a variety of broad scale strategic planning. Therefore, we recommend that:

The stakeholders use the adjusted inventory for forest management planning.

¹⁶ The sample design was completed using VDYP6 and the adjustment was completed using VDYP7. One of the key differences between the two models is that basal area is a key factor in deriving volume estimates in VDYP7, whereas it is not used in VDYP6. The differences between models may partly explain why this project did not achieve the target sampling error.

APPENDIX I – PHASE II PLOT DISTRIBUTION

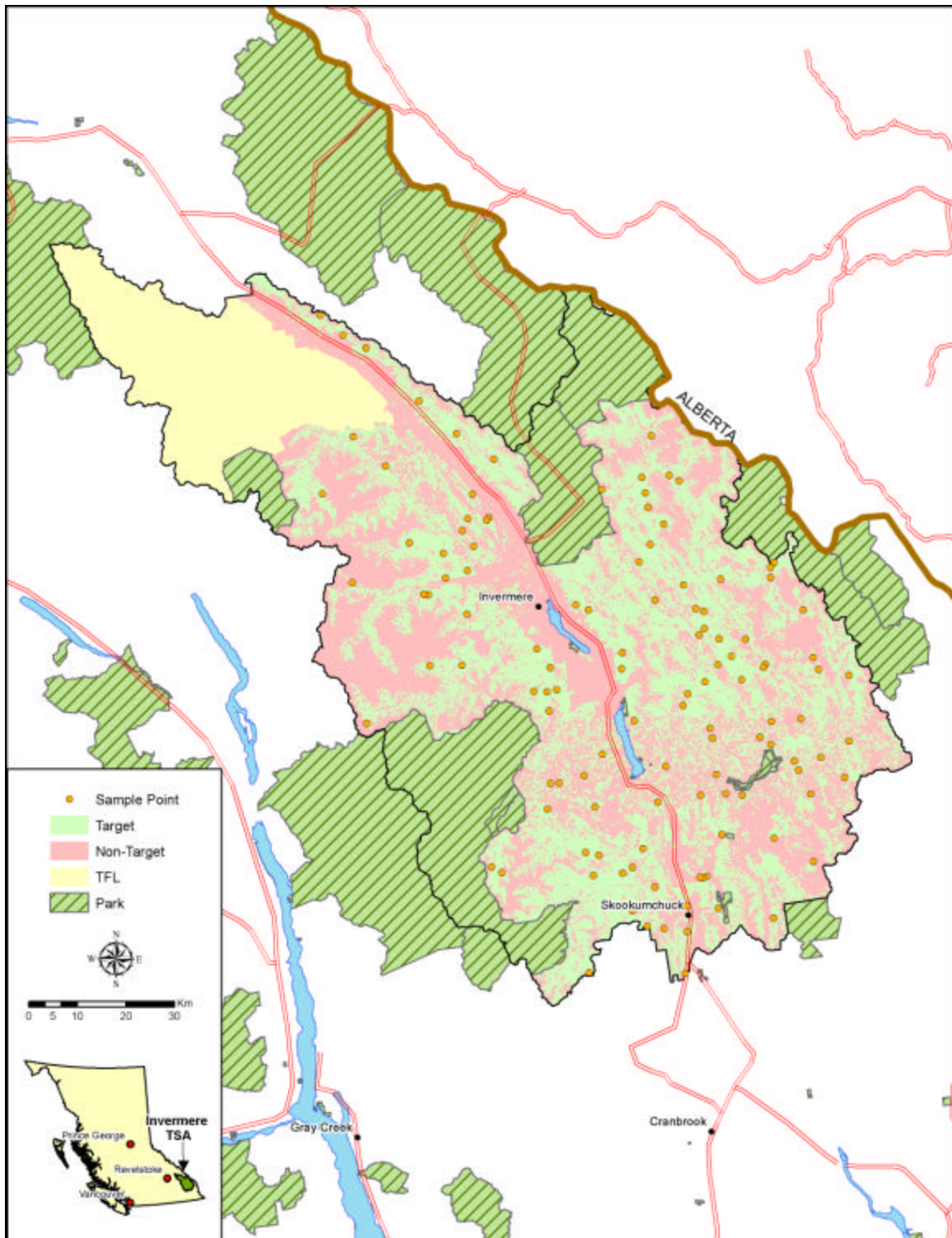


Figure 10. Plot locations in the target population for the Invermere TSA.

APPENDIX II – NVAF SAMPLE LIST

Table 20. NVAF tree list.

Live/ Dead	Maturity	Species Group	Sample	Plot	Tree No.	Species	DBH (cm)	Age (years)	Volume (m ³)		Total Weight
									NVAF	Phase II	
Dead	Immature	Dead	17	W	6	Pl	13.4	77	0.086	0.133	5292801
Dead	Immature	Dead	35	E	3	Pl	23.3	113	0.320	0.305	1644722
Dead	Immature	Dead	35	E	6	Pl	20.7	105	0.299	0.271	2079388
Dead	Immature	Dead	36	W	10	Fd	25.9	101	0.152	0.124	2600975
Dead	Mature	Dead	41	E	1	Bl	20.4	213	0.130	0.133	4891276
Dead	Mature	Dead	53	N	5	Se	77.7	391	5.977	6.558	1105156
Dead	Mature	Dead	53	W	2	Bl	36.8	128	0.292	0.197	2121297
Dead	Mature	Dead	95	S	2	Fd	40.5	152	0.000	0.544	1024607
Dead	Mature	Dead	104	W	1	Pl	35.5	164	0.740	0.672	2659361
Dead	Mature	Dead	104	W	4	Pl	26.8	170	0.232	0.194	4665516
Live	Immature	Immature	2	N	1	Pl	13.8	82	0.079	0.062	3612930
Live	Immature	Immature	10	E	3	Pl	13.4	87	0.091	0.091	5369298
Live	Immature	Immature	10	N	2	Pl	16.6	76	0.087	0.099	3436351
Live	Immature	Immature	10	S	8	Pl	17.4	89	0.139	0.121	3125886
Live	Immature	Immature	10	W	5	Pl	14.2	90	0.083	0.082	4639687
Live	Immature	Immature	14	N	8	Pl	16.2	61	0.079	0.132	2546287
Live	Immature	Immature	14	S	3	Pl	16.8	71	0.182	0.185	2339720
Live	Immature	Immature	14	S	4	Pl	12.7	68	0.071	0.087	4209168
Live	Immature	Immature	14	S	6	Pl	16.1	71	0.165	0.165	2610342
Live	Immature	Immature	14	W	7	Pl	19.3	63	0.197	0.241	1794001
Live	Immature	Immature	17	E	10	Pl	20.8	83	0.332	0.366	2226166
Live	Immature	Immature	17	S	4	Se	15.8	92	0.100	0.114	2332700
Live	Immature	Immature	17	W	3	Pl	14.5	77	0.138	0.183	4511702
Live	Immature	Immature	17	W	7	Pl	19.7	82	0.295	0.294	2435304
Live	Immature	Immature	21	E	1	Pl	21.6	60	0.302	0.358	2602153
Live	Immature	Immature	21	E	2	Pl	31.9	87	1.001	1.078	1145829
Live	Immature	Immature	21	W	2	Pl	24.6	76	0.522	0.429	1909248
Live	Immature	Immature	29	N	5	Fd	32	73	0.673	0.685	2647070
Live	Immature	Immature	35	E	4	Pl	14.7	92	0.071	0.098	4329430
Live	Immature	Immature	35	N	1	Pl	15.3	65	0.117	0.098	4049283
Live	Immature	Immature	37	E	4	Py	24.4	83	0.285	0.363	3351099

Live/ Dead	Maturity	Species Group	Sample	Plot	Tree No.	Species	DBH (cm)	Age (years)	Volume (m ³)		Total Weight
									NVAF	Phase II	
Live	Immature	Immature	37	S	6	Py	38.4	90	0.726	1.012	1333812
Live	Immature	Immature	46	E	3	Sx	20	74	0.329	0.328	3470994
Live	Immature	Immature	46	E	4	Sx	23.5	75	0.438	0.438	2535608
Live	Immature	Immature	46	E	7	Sx	26.4	76	0.657	0.561	1992077
Live	Immature	Immature	46	N	5	Sx	17.1	77	0.175	0.192	4804144
Live	Immature	Immature	46	W	2	Fd	31.9	77	0.858	0.762	4972375
Live	Immature	Immature	46	W	6	Sx	29.7	75	0.819	0.684	1573986
Live	Immature	Immature	64	S	3	Pl	22.8	91	0.326	0.346	2199112
Live	Immature	Immature	64	S	4	Pl	18.7	93	0.135	0.153	3252886
Live	Immature	Immature	64	S	9	Fd	21.5	76	0.167	0.170	5477908
Live	Immature	Immature	76	E	5	Fd	45	145	1.511	1.297	1226678
Live	Immature	Immature	76	N	6	Fd	28.8	142	0.549	0.463	3009916
Live	Immature	Immature	76	W	4	Fd	23	62	0.296	0.277	4654047
Live	Immature	Immature	76	W	6	Fd	14.7	59	0.072	0.066	11239915
Live	Immature	Immature	85	N	6	Fd	20.6	104	0.220	0.219	5974401
Live	Immature	Immature	85	S	9	Lw	18.5	139	0.217	0.198	9474426
Live	Immature	Immature	86	N	5	Fd	36.7	164	1.016	0.881	1858162
Live	Immature	Immature	104	E	1	Pl	28.6	149	0.291	0.220	4096990
Live	Immature	Immature	104	N	6	Pl	14.2	65	0.068	0.062	17466227
Live	Immature	Immature	121	E	1	Pl	15.7	75	0.186	0.189	3844290
Live	Immature	Immature	121	N	1	Pl	24.4	74	0.552	0.556	1610762
Live	Immature	Immature	121	S	1	Pl	26.7	72	0.666	0.721	1332213
Live	Mature	Mature-F	36	S	1	Fd	30.3	122	0.574	0.597	1944141
Live	Mature	Mature-F	40	N	5	Fd	37.5	162	0.989	0.888	1229204
Live	Mature	Mature-F	40	W	2	Fd	52.7	128	2.244	1.877	595549
Live	Mature	Mature-F	40	W	4	Fd	45.2	137	1.691	1.527	846753
Live	Mature	Mature-F	40	W	6	Fd	35.5	105	0.870	0.763	1373275
Live	Mature	Mature-F	50	N	4	Fd	40.6	111	0.984	1.046	866964
Live	Mature	Mature-F	50	W	1	Fd	47.6	149	0.936	0.979	621437
Live	Mature	Mature-F	75	N	2	Fd	59.1	256	3.379	4.000	779079
Live	Mature	Mature-F	80	N	2	Fd	32.1	100	0.623	0.646	2705430
Live	Mature	Mature-F	83	E	6	Fd	39	205	0.716	0.515	1056459
Live	Mature	Mature-F	83	N	2	Fd	15.3	118	0.074	0.075	6867842
Live	Mature	Mature-F	83	N	5	Fd	20	121	0.220	0.175	4034984
Live	Mature	Mature-F	83	S	2	Fd	17.3	196	0.090	0.096	5355278

Live/ Dead	Maturity	Species Group	Sample	Plot	Tree No.	Species	DBH (cm)	Age (years)	Volume (m ³)		Total Weight
									NVAF	Phase II	
Live	Mature	Mature-F	83	S	5	Fd	22.2	233	0.234	0.206	3,206,193
Live	Mature	Mature-F	89	E	1	Fd	24.3	97	0.365	0.344	2,662,501
Live	Mature	Mature-F	89	E	2	Fd	27.6	101	0.530	0.503	2,172,690
Live	Mature	Mature-F	89	E	4	Fd	20.5	97	0.235	0.245	3,565,035
Live	Mature	Mature-F	90	N	4	Fd	42.2	279	0.907	1.042	1,486,208
Live	Mature	Mature-F	92	W	2	Fd	71.4	138	4.439	4.145	540,106
Live	Mature	Mature-F	97	W	4	Fd	42.3	202	1.096	1.073	1,507,414
Live	Mature	Mature-F	99	S	5	Fd	32.7	194	0.546	0.494	1,473,462
Live	Mature	Mature-F	108	N	1	Fd	28.8	126	0.122	0.106	7,630,348
Live	Mature	Mature-O	40	N	1	Lw	30.4	162	0.475	0.503	1,447,422
Live	Mature	Mature-O	41	S	1	Pa	54.9	405	1.707	1.406	447,062
Live	Mature	Mature-O	50	S	3	Bl	28	61	0.416	0.470	1,461,381
Live	Mature	Mature-O	50	W	4	Bl	24.4	87	0.304	0.336	1,900,863
Live	Mature	Mature-O	53	S	10	Bl	21.8	102	0.264	0.280	4,015,612
Live	Mature	Mature-O	59	N	2	Bl	30.6	213	0.439	0.536	2,409,153
Live	Mature	Mature-O	59	N	3	Bl	16.2	113	0.067	0.080	8,697,043
Live	Mature	Mature-O	75	S	9	Cw	49.8	216	2.371	2.442	862,710
Live	Mature	Mature-O	75	W	3	Cw	31	82	0.590	0.583	2,281,541
Live	Mature	Mature-O	108	W	4	Pa	19.3	144	0.130	0.111	13,159,235
Live	Mature	Mature-O	111	W	3	Bl	33.7	122	0.731	0.785	6,091,794
Live	Mature	Mature-O	112	N	2	Bl	19.3	158	0.105	0.126	24,689,122
Live	Mature	Mature-O	115	E	3	Bl	32.8	147	0.399	0.363	21,538,392
Live	Mature	Mature-O	119	E	1	Bl	44.2	280	1.115	1.253	1,920,952
Live	Mature	Mature-O	119	S	4	La	33.1	238	0.452	0.408	3,467,124
Live	Mature	Mature-PL	18	N	1	Pl	14.9	282	0.108	0.150	4,366,069
Live	Mature	Mature-PL	18	N	4	Pl	21.8	308	0.330	0.317	2,021,040
Live	Mature	Mature-PL	18	S	3	Pl	23.5	296	0.408	0.388	1,770,237
Live	Mature	Mature-PL	18	S	4	Pl	19.3	281	0.249	0.254	2,575,489
Live	Mature	Mature-PL	18	W	1	Pl	23.2	301	0.358	0.349	1,816,516
Live	Mature	Mature-PL	18	W	4	Pl	25.5	297	0.418	0.401	1,490,674
Live	Mature	Mature-PL	26	N	9	Pl	19.9	112	0.224	0.282	7,269,833
Live	Mature	Mature-PL	43	N	1	Pl	34.9	398	0.694	0.541	600,297
Live	Mature	Mature-PL	43	N	3	Pl	26.1	291	0.462	0.395	1,067,194
Live	Mature	Mature-PL	43	N	6	Pl	30.7	334	0.618	0.566	771,343
Live	Mature	Mature-PL	43	S	4	Pl	17.1	303	0.176	0.122	2,515,513

Live/ Dead	Maturity	Species Group	Sample	Plot	Tree No.	Species	DBH (cm)	Age (years)	Volume (m ³)		Total Weight
									NVAF	Phase II	
Live	Mature	Mature-PL	43	W	1	Pl	28	284	0.476	0.379	927,275
Live	Mature	Mature-PL	90	E	2	Pl	34	221	0.597	0.538	1,003,716
Live	Mature	Mature-PL	90	W	6	Pl	25.7	196	0.737	0.634	1,732,889
Live	Mature	Mature-PL	92	E	2	Pl	22.6	134	0.414	0.461	2,298,868
Live	Mature	Mature-PL	99	E	3	Pl	28.4	186	0.593	0.504	840,145
Live	Mature	Mature-S	41	E	3	Se	23.4	270	0.221	0.222	1,934,616
Live	Mature	Mature-S	50	E	1	Sx	16.6	49	0.087	0.080	3,487,158
Live	Mature	Mature-S	50	N	1	Sx	40.2	109	1.260	1.274	559,352
Live	Mature	Mature-S	57	S	2	Se	13.8	54	0.048	0.057	8,416,654
Live	Mature	Mature-S	62	W	5	Se	50.5	329	2.527	2.595	594,960
Live	Mature	Mature-S	80	S	2	Sx	51.4	184	3.124	3.349	628,827
Live	Mature	Mature-S	90	W	4	Sx	23.9	103	0.397	0.400	3,017,785
Live	Mature	Mature-S	92	N	7	Se	57.7	139	3.075	2.824	508,366
Live	Mature	Mature-S	111	S	1	Se	25.4	65	0.233	0.242	8,559,294
Live	Mature	Mature-S	111	W	2	Se	44.6	141	1.426	1.176	2,763,202
Live	Mature	Mature-S	111	W	4	Se	46.3	162	1.249	1.356	2,550,275
Live	Mature	Mature-S	111	W	5	Se	48.4	169	1.470	1.469	2,264,881
Live	Mature	Mature-S	112	N	6	Se	22	146	0.184	0.201	15,147,370
Live	Mature	Mature-S	115	E	4	Se	13.3	106	0.029	0.029	2,762,471

Note: Volume is whole-stem volume less top, stump, decay, and waste.

APPENDIX III – PHASE II SAMPLING WEIGHTS & PLOT LOCATIONS

Table 21. Phase II sampling weights and actual plot locations.

Project	Plot	Stratum	Substratum	Zone	Easting	Northing	Weight
0091	0001	Pine - Operable	30-80 yrs	11	588971	5524928	2,237
0091	0002	Pine - Operable	30-80 yrs	11	564015	5577907	2,237
0091	0003	Pine - Operable	30-80 yrs	11	594496	5535689	2,237
0091	0004	Pine - Operable	30-80 yrs	11	602280	5578589	2,237
0091	0005	Pine - Operable	30-80 yrs	11	566689	5577561	2,237
0091	0007	Pine - Operable	30-80 yrs	11	609177	5541737	2,237
0091	0008	Pine - Operable	30-80 yrs	11	611672	5565584	2,237
0091	0009	Pine - Operable	30-80 yrs	11	597272	5618433	2,237
0091	0010	Pine - Operable	30-80 yrs	11	567912	5582338	2,237
0091	0011	Pine - Operable	30-80 yrs	11	588841	5601590	2,237
0091	0012	Pine - Operable	30-80 yrs	11	548188	5640204	2,237
0091	0013	Pine - Operable	30-80 yrs	11	583618	5534885	2,237
0091	0014	Pine - Operable	30-80 yrs	11	591671	5618756	2,237
0091	0015	Pine - Operable	30-80 yrs	11	599155	5575469	2,237
0091	0016	Pine - Operable	81-141 yrs	11	627005	5559561	2,219
0091	0017	Pine - Operable	81-141 yrs	11	622658	5574934	2,219
0091	0018	Pine - Operable	81-141 yrs	11	577343	5538518	2,219
0091	0019	Pine - Operable	81-141 yrs	11	617776	5549783	2,219
0091	0020	Pine - Operable	81-141 yrs	11	582157	5543029	2,219
0091	0021	Pine - Operable	81-141 yrs	11	600457	5586281	2,219
0091	0022	Pine - Operable	81-141 yrs	11	583124	5617345	2,219
0091	0023	Pine - Operable	81-141 yrs	11	580994	5527071	2,219
0091	0024	Pine - Operable	81-141 yrs	11	625147	5552248	2,219
0091	0025	Pine - Operable	81-141 yrs	11	545063	5600403	2,219
0091	0026	Pine - Operable	81-141 yrs	11	542468	5611518	2,219
0091	0027	Pine - Operable	81-141 yrs	11	533760	5634608	2,219
0091	0028	Pine - Operable	81-141 yrs	11	578335	5530637	2,219
0091	0029	Pine - Operable	81-141 yrs	11	553631	5604333	2,219
0091	0030	Pine - Operable	81-141 yrs	11	628745	5572934	2,219
0091	0031	Pine - Operable	81-141 yrs	11	599201	5590574	2,219
0091	0032	Pine - Operable	81-141 yrs	11	616376	5597916	2,219
0091	0033	Pine - Operable	81-141 yrs	11	570369	5543751	2,219

Project	Plot	Stratum	Substratum	Zone	Easting	Northing	Weight
0091	0035	Pine - Operable	81-141 yrs	11	600808	5589761	2,219
0091	0036	Pine - Operable	81-141 yrs	11	539633	5627804	2,219
0091	0037	Pine - Operable	81-141 yrs	11	587470	5516466	2,713
0091	0038	Pine - Operable	141+ yrs	11	605273	5579913	2,713
0091	0039	Pine - Operable	141+ yrs	11	599236	5563673	2,713
0091	0040	Pine - Operable	141+ yrs	11	610968	5560941	2,713
0091	0041	Pine - Operable	141+ yrs	11	572966	5542810	2,713
0091	0042	Pine - Operable	141+ yrs	11	620822	5556941	2,713
0091	0043	Pine - Operable	141+ yrs	11	566573	5573547	2,713
0091	0044	Pine - Operable	141+ yrs	11	599212	5617073	2,713
0091	0045	Pine - Operable	141+ yrs	11	564960	5558750	2,713
0091	0046	Spruce - Operable	30-80 yrs	11	591954	5615495	2,043
0091	0047	Spruce - Operable	30-80 yrs	11	608981	5562710	2,043
0091	0048	Spruce - Operable	30-80 yrs	11	589652	5530176	2,043
0091	0049	Spruce - Operable	81-141 yrs	11	568722	5577701	2,499
0091	0050	Spruce - Operable	81-141 yrs	11	565737	5586548	2,499
0091	0051	Spruce - Operable	81-141 yrs	11	526019	5623817	2,499
0091	0052	Spruce - Operable	141+ yrs	11	615554	5597016	2,987
0091	0053	Spruce - Operable	141+ yrs	11	608596	5583008	2,987
0091	0054	Spruce - Operable	141+ yrs	11	615283	5594935	2,987
0091	0055	Spruce - Operable	141+ yrs	11	586360	5552151	2,987
0091	0056	Spruce - Operable	141+ yrs	11	553591	5612600	2,987
0091	0057	Spruce - Operable	141+ yrs	11	612002	5577427	2,987
0091	0058	Spruce - Operable	141+ yrs	11	621171	5587520	2,987
0091	0059	Spruce - Operable	141+ yrs	11	529091	5575771	2,987
0091	0060	Spruce - Operable	141+ yrs	11	594897	5608664	2,987
0091	0061	Spruce - Operable	141+ yrs	11	617692	5565406	2,987
0091	0062	Spruce - Operable	141+ yrs	11	563686	5553577	2,987
0091	0063	Spruce - Operable	141+ yrs	11	591558	5604865	2,987
0091	0064	Douglas-fir - Operable	30-80 yrs	11	593665	5535495	2,519
0091	0065	Douglas-fir - Operable	30-80 yrs	11	576328	5563320	2,519
0091	0066	Douglas-fir - Operable	30-80 yrs	11	599200	5585134	2,519
0091	0067	Douglas-fir - Operable	30-80 yrs	11	592985	5535684	2,519
0091	0068	Douglas-fir - Operable	30-80 yrs	11	603872	5551288	2,519
0091	0069	Douglas-fir - Operable	30-80 yrs	11	538764	5652305	2,519
0091	0070	Douglas-fir - Operable	30-80 yrs	11	595924	5528858	2,519
0091	0071	Douglas-fir - Operable	81-141 yrs	11	595367	5573442	2,225
0091	0072	Douglas-fir - Operable	81-141 yrs	11	584296	5526139	2,225

Project	Plot	Stratum	Substratum	Zone	Easting	Northing	Weight
0091	0073	Douglas-fir - Operable	81-141 yrs	11	615284	5556956	2,225
0091	0074	Douglas-fir - Operable	81-141 yrs	11	544085	5600630	2,225
0091	0075	Douglas-fir - Operable	81-141 yrs	11	534338	5655497	2,225
0091	0076	Douglas-fir - Operable	81-141 yrs	11	555559	5609122	2,225
0091	0077	Douglas-fir - Operable	81-141 yrs	11	566756	5558618	2,225
0091	0078	Douglas-fir - Operable	81-141 yrs	11	574830	5594539	2,225
0091	0079	Douglas-fir - Operable	81-141 yrs	11	573456	5552816	2,225
0091	0080	Douglas-fir - Operable	81-141 yrs	11	555100	5614924	2,225
0091	0081	Douglas-fir - Operable	81-141 yrs	11	548979	5603423	2,225
0091	0082	Douglas-fir - Operable	81-141 yrs	11	598572	5543819	2,225
0091	0083	Douglas-fir - Operable	81-141 yrs	11	583751	5569308	2,225
0091	0084	Douglas-fir - Operable	81-141 yrs	11	556632	5619764	2,225
0091	0085	Douglas-fir - Operable	81-141 yrs	11	595355	5552394	2,225
0091	0086	Douglas-fir - Operable	81-141 yrs	11	594068	5571193	2,225
0091	0087	Douglas-fir - Operable	81-141 yrs	11	561916	5626337	2,225
0091	0088	Douglas-fir - Operable	81-141 yrs	11	582450	5580254	2,225
0091	0089	Douglas-fir - Operable	81-141 yrs	11	588896	5559274	2,225
0091	0090	Douglas-fir - Operable	141+ yrs	11	583071	5583498	2,868
0091	0091	Douglas-fir - Operable	141+ yrs	11	603160	5583814	2,868
0091	0092	Douglas-fir - Operable	141+ yrs	11	611528	5576885	2,868
0091	0093	Douglas-fir - Operable	141+ yrs	11	559387	5614571	2,868
0091	0094	Douglas-fir - Operable	141+ yrs	11	554989	5632489	2,868
0091	0095	Douglas-fir - Operable	141+ yrs	11	550044	5585153	2,868
0091	0096	Douglas-fir - Operable	141+ yrs	11	558871	5614084	2,868
0091	0097	Douglas-fir - Operable	141+ yrs	11	599034	5565859	2,868
0091	0098	Douglas-fir - Operable	141+ yrs	11	606735	5574888	2,868
0091	0099	Douglas-fir - Operable	141+ yrs	11	577265	5593115	2,868
0091	0101	Douglas-fir - Operable	141+ yrs	11	591097	5593338	2,868
0091	0102	Douglas-fir - Operable	141+ yrs	11	615931	5554958	2,868
0091	0103	Other	30-80 yrs	11	549124	5608442	12,625
0091	0104	Other	30-80 yrs	11	571351	5538891	12,625
0091	0105	Other	30-80 yrs	11	529825	5604888	12,625
0091	0106	Other	81-141 yrs	11	621891	5577553	11,121
0091	0107	Other	81-141 yrs	11	543492	5585898	11,121
0091	0108	Other	81-141 yrs	11	599077	5556241	11,121
0091	0109	Other	81-141 yrs	11	550773	5543266	11,121
0091	0110	Other	81-141 yrs	11	594659	5627036	11,121
0091	0111	Other	141+ yrs	11	592163	5612445	11,651

Project	Plot	Stratum	Substratum	Zone	Easting	Northing	Weight
0091	0112	Other	141+ yrs	11	567882	5519106	11,651
0091	0113	Other	141+ yrs	11	552379	5595428	11,651
0091	0114	Other	141+ yrs	11	552699	5541808	11,651
0091	0115	Other	141+ yrs	11	616580	5535941	11,651
0091	0116	Other	141+ yrs	11	597354	5595751	11,651
0091	0117	Other	141+ yrs	11	530215	5660262	11,651
0091	0118	Other	141+ yrs	11	600444	5552035	11,651
0091	0119	Other	141+ yrs	11	605039	5595963	11,651
0091	0120	Other	141+ yrs	11	606954	5525412	11,651
0091	0121	Pine - Operable	30-80 yrs	11	579484	5539498	2,237
0091	0122	Pine - Operable	81-141 yrs	11	572048	5559443	2,219

APPENDIX IV – PHASE I & II DATA

Table 22. Phase I data from sampled polygons.

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0001	42.8	Py	70	21.0	69	18.3	0.9	13	Se	20	30	1	ESSF dk 1	6.4	5.8
0091	0002	28.4	Pl	50	19.9	64	18.4	34.3	1,810	Bl	20	60	3	ESSF dk 1	211.5	202
0091	0003	13.6	Pl	50	14.2	76	11.7	18.4	1,381	La	40	30	3	ESSF dku	53.2	47.8
0091	0004	19.2	Pl	80	10.2	33	16.0	5.4	529	Se	20	30	3	ESSF dku	6.7	5.8
0091	0005	55.4	Pl	60	20.5	76	17.2	28.5	1,311	Pl	30	40	3	ESSF dk 1	181.2	175
0091	0007	34.7	Pl	50	17.0	66	15.4	26.5	1,609	Se	30	30	3	ESSF dku	102.8	96
0091	0008	26.4	Pl	60	12.9	47	15.0	10.5	835	Pl	20	10	3	ESSF dku	22.4	19.5
0091	0009	8.5	Pl	70	19.2	56	19.2	30.2	1,699	Pl	30	60	3	MS dk	159.6	153.3
0091	0010	435.2	Pl	85	16.7	64	15.4	28.5	1,803	Bl	15	20	3	ESSF dku	107.5	98.8
0091	0011	15.1	Pl	60	13.8	46	16.0	11.0	1,053	Fd	20	50	3	ESSF dk 1	24.3	20.5
0091	0012	9.4	Pl	100	22.7	76	19.2	35.9	1,267			50	3	IDF dm 2	248.9	247.1
0091	0013	46.7	Pl	50	21.1	73	18.1	33.0	1,559	Pl	30	40	3	ESSF dk 1	210.1	202.6
0091	0014	203.1	Pl	70	23.1	74	19.9	34.7	1,385	At	10	30	3	ESSF dk 1	279.1	271.5
0091	0015	52.1	Pl	80	19.8	71	17.2	30.0	1,426	Se	10	60	3	ICH mk 1	171.4	164.9
0091	0016	16.0	Pl	80	20.0	135	12.7	34.6	1,430	Se	20	70	3	MS dk	213.7	208.4
0091	0017	145.8	Pl	60	20.8	89	16.0	32.2	1,541	Pl	40	70	3	MS dk	203	193.7
0091	0018	24.3	Pl	40	24.2	129	16.5	44.7	1,238	Se	30	50	3	ICH mk 1	352.8	340.7
0091	0019	16.7	Pl	90	22.5	134	14.8	39.7	1,306	Se	10	50	3	ESSF dku	306.5	299.4
0091	0020	8.6	Pl	80	26.2	86	21.1	35.5	1,055	Bl	20	50	3	ESSF dk 1	328.1	320.9

Invermere TSA VRI Statistical Adjustment

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0021	108.4	Pl	60	23.0	85	18.5	31.8	1,143	Bl	40	60	3	ESSF dku	237.3	228.8
0091	0022	20.3	Pl	100	24.8	108	18.2	38.6	999			40	1	MS dk	327.5	317
0091	0023	29.1	Pl	70	24.6	85	19.9	33.1	1,105	Pl	30	40	3	ESSF dk 1	279.2	272.6
0091	0024	11.1	Pl	100	22.9	136	15.1	40.9	1,184			50	3	IDF dm 2	294.7	288.3
0091	0025	30.4	Pl	50	26.5	97	20.4	44.8	1,288	Fd	30	60	3	ICH mk 1	410.1	406
0091	0026	10.8	Pl	40	23.8	123	16.5	39.6	1,222	Se	40	30	3	ESSF dk 2	300.5	298.2
0091	0027	38.0	Pl	40	31.8	116	23.9	36.0	639	Pl	30	30	3	IDF dm 2n	405.3	407.2
0091	0028	186.3	Pl	70	28.0	98	21.7	35.2	908	Bl	25	40	3	ESSF dku	352.5	347.8
0091	0029	21.6	Pl	70	22.1	86	17.5	34.8	1,330	Se	20	50	3	ICH mk 1	255.2	249.7
0091	0030	6.3	Pl	70	16.5	109	11.2	26.3	1,292	Bl	30	50	3	ESSF wm	106.5	101.2
0091	0031	30.2	Pl	80	19.5	85	15.4	34.1	1,696	Bl	20	50	3	ESSF dk 2	204.5	196.5
0091	0032	45.5	Pl	60	21.3	105	15.4	38.3	1,506	Lw	30	50	3	ESSF dk 1	264.9	259.2
0091	0033	92.5	Pl	90	19.8	84	15.7	35.9	1,724	Se	10	30	3	ESSF dk 1	222.8	214.4
0091	0035	47.9	Pl	90	18.8	93	14.1	32.9	1,529	Fd	10	60	3	ESSF dk 1	178.7	170.5
0091	0036	2.3	Pl	80	22.0	126	14.8	35.0	1,072	Fd	10	60	3	PP dh 2	238.4	236.1
0091	0037	48.5	Py	100	20.7	88	14.6	10.5	142			20	1	ESSF dk 1	73.1	69.1
0091	0038	23.7	Pl	70	24.6	142	16.3	37.7	1,023	Fd	30	50	1	IDF dm 2n	312.4	308.8
0091	0039	21.3	Pl	60	24.4	196	14.6	35.2	833	Fd	30	60	3	IDF dm 2	245.9	246.9
0091	0040	24.0	Pl	40	24.8	146	16.3	29.5	808	Lw	30	50	3	ESSF dk 1	242.2	238.9
0091	0041	60.9	Pa	80	22.4	216	12.6	36.7	776	Bl	20	30	1	ESSF dku	253.4	246.1
0091	0042	12.6	Pl	60	24.8	146	16.3	38.1	883	Fd	30	60	3	ICH mk 1	296.1	291.2
0091	0043	11.5	Pl	80	19.5	265	9.6	38.8	1,272	Se	10	70	3	ICH mk 1	203	200
0091	0044	19.6	Pl	40	22.1	212	12.4	42.7	1,331	Lw	25	70	1	MS dk	265.9	279.6
0091	0045	9.9	Pl	60	22.4	216	12.6	37.9	1,049	Pl	30	50	3	ESSF dk 1	237	231.5

Invermere TSA VRI Statistical Adjustment

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0046	21.3	Se	50	22.6	75	19.2	32.9	1,445	Fd	30	30	3	MS dk	212.5	167.2
0091	0047	23.0	Se	100	4.9	32	14.6	0.0	0			10	3	ESSF dk 1	0	0
0091	0048	31.0	Se	100	20.8	66	19.9	26.0	1,028			70	3	ESSF dk 1	135.9	103.8
0091	0049	24.5	Se	70	29.6	86	23.1	35.1	780	Fd	20	60	3	ESSF dk 1	335.6	276.5
0091	0050	10.0	Se	70	20.0	126	10.2	26.1	1,070	Bl	20	50	3	ESSF dku	136.9	106.1
0091	0051	54.1	Se	50	18.6	86	13.9	20.4	816	Pa	30	30	1	ESSF wmu	104.2	78.8
0091	0052	18.3	Se	60	34.6	235	14.5	44.6	725	Se	40	70	3	ESSF dk 1	464.5	397
0091	0053	130.1	Se	70	35.5	332	12.1	42.4	470	Se	20	60	3	ICH mk 1	410.8	346
0091	0054	16.4	Se	92	28.5	276	7.5	41.2	672	Fd	8	60	1	MS dk	330.8	273
0091	0055	1.4	Se	50	25.3	166	10.5	26.9	620	Bl	30	30	1	ESSF dku	189.9	153.6
0091	0056	35.7	Se	60	29.4	143	15.5	34.0	651	Se	30	40	3	ESSF dku	317.8	264.7
0091	0057	33.4	Se	70	27.6	145	13.8	38.9	893	Fd	20	60	1	ESSF dk 1	329	273.5
0091	0058	10.1	Se	100	22.8	216	6.6	37.4	993		0	10	3	IDF dm 2	233	195.7
0091	0059	18.1	Se	50	28.2	196	10.8	39.0	821	Pl	30	70	3	IDF dm 2	294.8	255.6
0091	0060	33.5	Se	80	30.8	216	11.8	38.7	671	Bl	20	50	1	ESSF wm	342.2	288.6
0091	0061	23.9	Se	60	25.8	216	8.2	33.3	677	Bl	20	50	3	ESSF dk 1	233.5	188.2
0091	0062	14.6	Se	70	33.5	266	12.1	41.5	733	Se	20	40	1	PP dh 2	430.6	359.6
0091	0063	27.2	Se	70	28.8	216	10.2	36.1	710	Fd	30	40	1	MS dk	286.7	240.6
0091	0064	16.3	Fd	40	14.6	76	12.4	14.7	975	Pa	40	20	3	ESSF dku	39.5	41.9
0091	0065	11.2	Fd	60	12.6	56	13.6	0.8	68	Lw	30	60	3	ICH mk 1	1.5	1.7
0091	0066	28.4	Pl	50	22.3	81	18.3	33.1	1,305	Se	30	50	3	MS dk	244	239.7
0091	0067	49.3	Fd	60	17.7	64	16.6	15.9	775	Bl	20	50	3	ESSF dk 1	69.5	71.9
0091	0068	18.2	Fd	50	9.6	33	17.0	6.1	599	Bl	30	40	3	ESSF dk 1	7.9	8.8
0091	0069	13.8	Fd	100	20.4	76	16.8	32.3	1,378			20	3	ICH mk 1	168.9	175.3

Invermere TSA VRI Statistical Adjustment

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0070	59.0	Fd	90	16.5	56	17.2	13.5	784	Bl	10	50	3	ESSF dk 1	43.9	44.1
0091	0071	48.6	Fd	70	22.6	126	13.8	28.9	894	Pl	20	50	3	ESSF dk 2	183.9	181.2
0091	0072	8.8	Fd	60	24.1	99	16.7	26.7	809	Bl	20	10	3	ESSF dku	187.9	186.9
0091	0073	12.9	Fd	50	20.8	125	12.8	29.6	1,032	Pl	20	40	3	ESSF dku	176.4	177.5
0091	0074	46.7	Fd	100	29.7	102	20.2	42.8	1,014			10	3	MS dk	342.1	322.1
0091	0075	12.8	Fd	50	32.2	126	19.7	44.8	667	Bl	30	50	3	ESSF dk 1	416	383
0091	0076	18.3	Fd	80	21.8	116	13.9	15.9	404	Fd	10	50	3	MS dk	89.3	79.3
0091	0077	16.5	Fd	80	19.7	86	15.0	31.7	1,335	Bl	20	40	3	ESSF dk 1	141.3	148
0091	0078	21.6	Fd	40	22.9	124	14.1	31.8	801	Fd	40	60	3	MS dk	170.8	160
0091	0079	21.4	Fd	100	19.6	116	12.5	15.4	453			60	3	IDF xk	74	66.9
0091	0080	9.9	Fd	80	25.8	126	15.7	30.6	654	Se	20	20	3	ESSF dku	214	208.1
0091	0081	17.0	Fd	70	19.2	136	11.3	21.1	651	Pl	20	50	3	MS dk	91.7	82.7
0091	0082	40.6	Fd	80	26.3	87	19.8	31.0	1,050	Fd	10	60	3	ESSF dk 1	228.9	229.5
0091	0083	37.5	Fd	70	21.3	136	12.5	31.1	997	Se	20	70	3	ESSF dk 1	181.2	180.3
0091	0084	4.9	Fd	50	17.2	91	12.7	15.1	649	Se	40	50	3	MS dk	57.1	54.2
0091	0085	1.5	Fd	100	17.5	86	13.4	12.4	552			60	3	ESSF dk 1	54.8	54.1
0091	0086	5.8	Fd	90	23.8	117	15.1	34.4	1,012	Fd	10	70	3	MS dk	218.8	219.8
0091	0087	22.4	Fd	60	26.1	116	16.6	33.9	882	Se	20	70	3	ESSF dk 1	250.6	244.4
0091	0088	13.8	Fd	50	20.1	101	13.9	24.9	923	La	40	20	3	ESSF dku	121.3	122.4
0091	0089	28.2	Fd	50	11.8	121	7.6	8.8	606	Bl	45	60	3	ESSF dk 2	17.4	18.1
0091	0090	17.3	Fd	80	26.9	196	13.5	43.5	825	Fd	20	60	1	ESSF dk 1	285	285.2
0091	0091	22.9	Fd	60	30.9	162	16.9	39.1	719	Pl	30	30	1	IDF dm 2	373.5	360
0091	0092	14.9	Fd	100	27.1	166	14.6	38.2	632			30	3	ESSF dk 1	256.8	244.1
0091	0093	37.3	Fd	90	21.2	146	12.1	3.4	80	Se	10	30	3	ESSF dk 1	19.7	15.6

Invermere TSA VRI Statistical Adjustment

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0094	14.1	Fd	100	24.7	216	12.0	36.8	850			50	3	MS dk	239.8	232.1
0091	0095	5.6	Fd	40	28.7	216	14.0	38.5	588	Bl	30	20	3	ESSF dk 1	284.3	270.1
0091	0096	1.5	Fd	50	28.5	146	16.2	36.3	625	Bl	30	30	3	ESSF dk 1	272.4	253
0091	0097	11.4	Fd	100	22.2	146	12.6	27.0	791			30	3	ESSF dk 1	170.1	163.5
0091	0098	27.4	Fd	60	38.4	315	17.1	47.7	472	Pl	20	30	3	MS dk	537.7	509.9
0091	0099	24.9	Fd	80	25.0	176	13.1	36.5	958	At	20	30	3	MS dk	238.3	237.6
0091	0101	41.0	Fd	70	28.5	193	14.5	37.5	812	Pl	20	10	3	ESSF dku	297.9	296.1
0091	0102	39.6	Fd	50	23.0	202	11.5	32.2	864	Pl	50	40	3	ESSF dk 1	168.1	179.9
0091	0103	8.5	Bl	85	17.6	66	16.6	28.4	1,245	Lw	10	60	1	MS dk	123.1	137.7
0091	0104	34.7	Pl	95	14.2	76	11.7	21.5	1,574	Lw	5	70	3	ESSF dk 1	54.2	56
0091	0105	8.3	Se	50	16.0	51	20.3	20.9	1,404	B	40	30	1	ESSF dk 1	70.6	76.9
0091	0106	4.5	Pl	60	20.0	86	15.7	32.0	1,243	Se	40	20	3	ICH mk 1	190.8	202.9
0091	0107	10.9	Pl	80	20.2	104	14.5	36.4	1,406	Pl	20	30	1	ESSF dk 1	220.8	237.6
0091	0108	11.2	Pl	50	15.0	126	9.2	22.2	1,123	Lw	30	60	1	MS dk	79.8	83.1
0091	0109	8.7	Se	60	19.0	93	13.1	24.3	1,330	Bl	40	50	3	ESSF dk 2	109.6	119.6
0091	0110	25.4	At	40	21.5	105	14.6	26.6	816	Se	30	50	3	MS dk	143.5	163.9
0091	0111	6.4	Bl	70	27.8	216	11.4	36.2	738	Pa	30	30	3	ESSF dku	280.1	321.2
0091	0112	32.6	Se	50	24.3	183	8.9	34.4	813	Se	30	60	1	ESSF dk 1	220.6	256.6
0091	0113	17.1	Se	86	21.1	196	6.6	28.6	962	Se	9	50	1	MS dk	151.1	184
0091	0114	55.8	Bl	60	18.5	192	6.1	24.7	989	Se	40	50	3	ESSF dk 1	102.6	135
0091	0115	26.4	Se	58	8.8	219	2.7	0.2	18	Se	29	60	3	ICH mk 1	0.2	0.2
0091	0116	15.1	Lw	80	27.8	166	15.5	29.5	672	Bl	20	40	3	ESSF dk 2	212.4	240.9
0091	0117	3.3	Se	60	19.2	166	7.1	24.9	858	Se	20	60	3	ESSF dk 1	126.4	140.2
0091	0118	8.1	Fd	90	28.2	194	14.3	39.0	777	Bl	10	30	3	ESSF dku	266.2	312.8

Invermere TSA VRI Statistical Adjustment

Phase I																
Project	Sample	Area (ha)	Spp1	Spp1 Pct	Ht1 (m)	Age1 (yrs)	SI1 (m)	BA 7.5 (m ² /ha)	SPH 7.5 (SPH)	Spp2	Spp2 Pct	Crown Closure	Case	BEC Label	Vol. 12.5 (m ³ /ha)	A.A. Vol. 12.5 (m ³ /ha)
0091	0119	2.6	La	90	18.3	216	9.3	6.4	227	Pl	10	50	3	IDF dm 2	26.6	28
0091	0120	7.4	Pa	60	9.5	219	3.8	2.4	204	Fd	20	20	3	ESSF dk 1	4.7	5.9
0091	0121	57.4	Pl	50	23.4	77	19.8	38.3	1,393	B	20	40	3	ESSF dku	299.4	292.1
0091	0122	24.3	Pl	50	14.6	91	10.8	28.3	1,950	Se	40	20	3	ESSF dk 1	78.1	71.3

Note: A.A. is the VDYP 7 attribute-adjusted volume.

Table 23. Phase II data from sampled polygons.

Project	Sample	Feature_ID	Map ID	Poly ID	Phase II						
					Spp	Height (m)	Age (years)	SI (m)	BA m ² /ha	SPH trees/ha	Vol 12.5 m ³ /ha
0091	0001	18523C1D488ED7B24DE091B76445DC4A	082G082	690	Py	16.7	104	11.0	15.0	248	91.9
0091	0002	2877E4C646474CF0C58C6F989D304648	082K040	568	Pl	15.4	87	11.3	18.0	1,843	34.4
0091	0003	30653CB641A5F6B6C86BC48CB42EB2D4	082G092	213	Fd	15.2	67	14.5	15.0	618	80.7
0091	0004	43E4C2D840B228E11CD9C9A8BB5C3B1A	082J033	292	Pl	11.6	25	22.3	11.0	664	47.8
0091	0005	488BB043499552284A3090A756573CE9	082K040	619	Pl	17.3	65	16.2	36.4	3,119	110.7
0091	0007	5333EFA843AB30C91831F8A09D798F72	082J003	703	Fd	23.6	66	21.7	41.4	1,188	256.3
0091	0008	6E2E64CC41F91040B34962B88FEF92DD	082J023	1204	Fd	11.4	27	24.5	11.0	373	54.7
0091	0009	6FC1B69A4AEF3B1F6879E1898BD6B8FC	082J072	819	Pl	23.0	69	20.4	30.8	1,084	219.0
0091	0010	72449B29450ABA0E4AC7BBBA79BD1213	082K040	248	Pl	15.5	87	11.5	29.4	2,710	110.9
0091	0011	AE2E715A412DE70D0CCB199625FB5DC2	082J052	390	Pl	12.8	30	21.3	10.8	620	62.6
0091	0012	E4D5E11945C5842EF7D79EA0DCBA7A55	082K099	436	Fd	25.3	123	15.7	36.0	1,210	201.5
0091	0013	E85111964365048F5E95BA8D53791C6F	082G091	459	Pl	22.6	73	19.3	26.6	947	212.4
0091	0014	F1DD64634DE26149A03B5B91955A6B15	082J072	723	Pl	19.4	69	17.0	30.0	2,677	119.2
0091	0015	F27D1A2A4D8063D893A7D580F9D4680F	082J032	926	Lw	28.9	66	25.8	43.2	1,096	283.3
0091	0016	0123EA044E8A33AF327FC6AEC9F41E9C	082J014	173	Fd	24.4	125	15.0	43.2	1,767	234.7
0091	0017	02BFB4EE495C288CF97E73AE4960E10C	082J034	668	Pl	21.5	82	16.9	43.4	2,444	278.3
0091	0018	02D0DE1F409DA312247E15B2B15B557C	082G091	90	Pl	19.8	291	6.3	50.4	1,733	428.3
0091	0019	18AF763642F2F51824EC1E9ECC391E93	082J004	48	Pl	24.8	151	13.2	30.6	1,036	291.0
0091	0020	2C01B10F457DA922FB4A8BBFAEECD5B3	082J001	1048	Lw	25.0	95	17.8	46.8	2,055	243.8
0091	0021	38DD00154219B24C2595F887ADDEB799	082J043	603	Pl	27.4	78	23.1	32.4	758	263.1
0091	0022	3B5C7F0049AF25BE5C85F9AF8E072AC2	082J071	128	Pl	19.7	102	13.0	26.6	1,283	158.8
0091	0023	44697A8446DB914FC3B9108FFA9912D1	082G081	64	Lw	25.8	75	21.3	6.0	155	41.8

Invermere TSA VRI Statistical Adjustment

Project	Sample	Feature_ID	Map ID	Poly ID	Phase II						
					Spp	Height (m)	Age (years)	SI (m)	BA m ² /ha	SPH trees/ha	Vol 12.5 m ³ /ha
0091	0024	45AD1A494E6369FF705712A68C295BBE	082J014	1010	Fd	26.1	236	12.2	50.4	1,883	326.8
0091	0025	45DCB4DA43B1951DFCDE51A4A9E0642E	082K059	393	Pl	26.1	113	17.8	64.8	3,101	392.2
0091	0026	490A60DB4597AE01C1ED05BBBB2DFC01	082K069	428	Se	26.6	132	14.0	27.0	604	237.5
0091	0027	562EBABF4B670B531DCAF89370177CFE	082K088	171	Fd	19.4	92	14.7	9.0	120	61.8
0091	0028	A4F6FDD44A1CCA6E5C8914844CF661B3	082G091	535	Cw	22.1	61	20.7	13.0	513	75.9
0091	0029	B1BAFD834B2868892A5907A045011387	082K059	124	Fd	22.4	74	18.8	46.8	1,388	259.6
0091	0030	B73ED0344279D4EA328581A9886AD96A	082J025	450	Fd	15.9	95	11.6	30.8	981	175.8
0091	0031	C20318BE45C975D1822DE2981E665ACA	082J042	726	Pl	20.7	80	16.5	28.0	1,539	166.2
0091	0032	C3E5E51D42AEDFA968F07792FA1BC05F	082J054	451	Se	17.7	94	12.5	27.0	1,286	176.7
0091	0033	C98DEECA42FC71608C57B196FC187A32	082K010	481	Pl	19.3	91	14.1	35.0	2,566	171.2
0091	0035	D4EDCED245EAA01687FD64BC49F8A64B	082J043	562	Pl	16.1	85	12.5	19.6	933	105.6
0091	0036	E216D0C8437972429AD7C2BE5D16C347	082K088	615	Fd	25.5	197	15.5	50.4	1,512	295.6
0091	0037	E8AF782C4978CF7A2BF5A189EAF15090	082G072	5	Py	22.1	100	15.2	23.0	364	150.4
0091	0038	4FCFDD2E498A4ABC4F77E6B22E8DEFE1	082J033	327	Pl	27.0	149	15.8	66.6	1,741	591.2
0091	0039	709181F64A981793F8AD64807C2E5F59	082J022	1023	Fd	14.8	133	9.7	25.2	1,366	148.6
0091	0040	711AD0E8488DE3F188009685C79616E3	082J013	160	Fd	26.2	149	14.9	52.2	1,579	344.8
0091	0041	BCBE10D6464DF8D3DD46FC8CDFE62EFA	082J001	600	Pa	17.2	322	4.8	28.8	500	166.7
0091	0042	BDFC63B94B5A3EB7043DEAA59AE63749	082J014	549	Bl	22.0	129	11.8	46.8	1,126	378.8
0091	0043	D1E621914E5F62C9BEE42CBE8589B568	082K040	903	Pl	16.0	315	7.2	30.6	850	280.3
0091	0044	DDA18FFE4BFAEFB11651879F0CBDCE74	082J063	149	Pl	19.4	213	7.5	36.0	1,065	277.0
0091	0045	E278EE1E4E19998571612AB74EF19236	082K020	784	Pl	24.6	112	16.5	43.4	1,305	353.6
0091	0046	797AA64347B351DC48564E8D9AB7D6A5	082J062	112	Fd	26.5	74	22.2	69.6	1,911	499.4
0091	0047	D9D2A7254E76D8ADFF239E8B642183E1	082J023	864	Fd	16.3	41	23.0	4.2	100	21.6
0091	0048	F1DFABF14C98C30836686D888CA01B62	082G092	617	Fd	15.5	47	19.0	7.0	155	39.6
0091	0049	6CAEF2984601AF3FECB27C8237474F7E	082K040	633	Sx	18.6	76	14.0	18.0	581	110.1

Invermere TSA VRI Statistical Adjustment

Project	Sample	Feature_ID	Map ID	Poly ID	Phase II						
					Spp	Height (m)	Age (years)	SI (m)	BA m ² /ha	SPH trees/ha	Vol 12.5 m ³ /ha
0091	0050	9AE717E84413345AF669FA882130ED0D	082K050	598	Bl	14.4	43	20.4	33.6	1,405	177.0
0091	0051	D1581A84483D81DBC8F16DB11FC0891F	082K077	112	Se	17.6	105	10.3	16.0	692	80.8
0091	0052	1C7228B74F55787208CF8A84009DAE1C	082J054	448	Fd	25.6	173	15.2	36.0	1,015	290.3
0091	0053	4F114D2245E1F692FFFAE18856AA935D	082J033	86	Bl	-	133	-	30.6	1,291	200.1
0091	0054	544688AC49298E48824F3D9ED2537D68	082J044	31	Se	26.7	330	5.5	54.0	1,440	406.7
0091	0055	7705A2DE4FBB986858509A861474E738	082J012	977	Se	25.1	139	12.3	45.0	890	346.4
0091	0056	7DECBB3D41EF5CD85FD93D925D542A0F	082K069	251	Sx	31.2	152	16.1	18.0	386	146.7
0091	0057	A70A8635483843F8DC948D97E0A1FE4B	082J033	499	Se	26.0	149	14.3	19.2	647	149.4
0091	0058	AF52C7E04A54973E8FF3078191FF77C4	082J044	463	Bl	15.9	153	6.6	22.5	513	175.2
0091	0059	B8B8D24E40096CFE28033F9CE7B649A0	082K038	590	Bl	14.6	239	4.1	9.3	381	59.2
0091	0060	C68F637A485CC4001D094190AD2C3F2E	082J062	851	Se	37.7	194	20.6	40.8	772	338.7
0091	0061	D89ED22548A06DBC3F4F1AA1C262EB68	082J024	732	Bl	26.2	146	12.8	43.2	1,101	305.9
0091	0062	F1D5EC2D488A7D63441FA6B2D9EC4D56	082K020	197	Se	31.3	178	16.8	24.0	905	184.9
0091	0063	F49C27164DB93122594F67896DB9B2B4	082J052	204	Se	27.0	290	6.3	60.0	946	512.5
0091	0064	6EA66FC94657264449977D97E43F0BED	082G092	349	Pl	15.9	88	11.6	16.8	915	92.8
0091	0065	A14DC34B45489CBD7DD2FE932CA907D6	082J021	775	Fd	15.0	42	20.4	9.0	386	50.5
0091	0066	B205088C4C06814160FC2D8B3BA06824	082J042	1150	Fd	-	-	-	43.4	1,122	308.7
0091	0067	CC70CC8845E0806B43623B9BD679E4C3	082G092	235	Fd	15.6	73	13.7	19.6	380	115.6
0091	0068	D5E999384161887EBDE7CF888A126026	082J013	1047	Fd	14.9	142	8.7	11.2	543	53.7
0091	0069	D87B4C084D9DFDEF8406489776886FDB	082N008	515	Bl	-	-	-	0.0	0	0.0
0091	0070	FD45DD4E4D65FF0C931786847D0F6695	082G092	654	Fd	9.8	30	19.9	2.0	9	13.3
0091	0071	04DEBCFC4ADF41F6C081D8A2E5FF4F32	082J032	985	Fd	20.9	91	15.8	23.8	564	144.6
0091	0072	1E616FB24B229DA48CC68F9210CF77FA	082G081	808	Fd	22.0	61	21.4	14.0	163	96.1
0091	0073	2856C363469F4022FD2674906B86DBDB	082J014	437	Pl	19.3	113	12.9	23.8	1,167	163.7
0091	0074	3690CD144D253FD3304C568E8283AFB0	082K059	385	Fd	28.8	111	18.8	55.8	1,013	400.3

Invermere TSA VRI Statistical Adjustment

Project	Sample	Feature_ID	Map ID	Poly ID	Phase II						
					Spp	Height (m)	Age (years)	SI (m)	BA m ² /ha	SPH trees/ha	Vol 12.5 m ³ /ha
0091	0075	3827DED84F21EDBDE102C99FC6D83136	082N008	232	Cw	32.6	96	23.0	64.8	1,029	573.6
0091	0076	41359A37480900B6E074EAB630D62DEC	082K069	675	Fd	21.1	124	13.1	26.6	731	150.3
0091	0077	45DA420641883DD37031D3AD7770E6A8	082K020	531	Pl	21.6	81	17.3	26.6	813	201.6
0091	0078	57A8C63249C97537C328D6A14C1D2AD4	082J041	29	Fd	21.8	147	12.4	26.6	279	194.2
0091	0079	606D7ADD455A6CF2C6384F9CEEBCF407	082J011	553	Fd	-	-	-	4.1	225	12.5
0091	0080	6D61ADFE4BC65338DE0C3491957202B3	082K069	1140	Fd	27.6	171	15.3	50.4	1,169	388.3
0091	0081	6EA234DE420157D1D2D391A89EFB469F	082K059	218	Fd	18.2	113	12.2	23.8	829	130.6
0091	0082	70382D41464078F622EEB6A1C490366F	082J002	525	Fd	18.4	72	16.0	23.8	994	149.4
0091	0083	749CFEBE4D084160B1770395F21E41D8	082J021	284	Fd	15.0	186	8.0	39.2	1,323	227.5
0091	0084	818FD98949F2F715C64085B4A6298039	082K080	631	Fd	16.8	156	10.0	32.2	1,165	165.4
0091	0085	90645ED141F6E7761DD7B4A272BD176B	082J012	893	Fd	20.4	104	13.9	29.4	1,231	144.8
0091	0086	BB0944C9468D79A9F2E84AA6242FF193	082J022	1261	Fd	24.2	169	13.0	22.4	304	158.4
0091	0087	BC8ADB8844A9A804544E8F9FE7C2D7DE	082K080	49	Fd	15.0	60	13.4	21.0	754	122.9
0091	0088	DA97CB304B7CCEA6A5AE588FD5F0767D	082J031	398	Fd	21.5	159	13.4	23.8	1,037	114.0
0091	0089	DC48270044EF8FCCD23A099A3B858270	082J012	329	Fd	18.9	107	12.7	18.2	849	81.6
0091	0090	08FF915148C1068F450E31B400B0D4B3	082J031	38	Fd	24.5	249	11.3	39.6	418	321.8
0091	0091	3E3758DF4F7FB001F359419EDBA43C9C	082J033	191	Fd	41.9	149	24.0	66.6	543	656.6
0091	0092	54E8E029425FB7226C85D3BFCBBF80E5	082J033	503	Fd	28.1	132	16.5	27.0	326	270.2
0091	0093	6B4C285041AD9BAD67423799DDE66471	082K070	39	Fd	18.6	148	10.6	17.1	200	80.2
0091	0094	7FCD40564F4DA1B2C30449A2F2EF7EFD	082K089	675	Se	29.4	129	17.0	19.2	212	178.9
0091	0095	88FD0AD643AD1502A7D12DB456EBB316	082K049	816	Fd	14.6	80	12.5	7.0	266	42.4
0091	0096	91DA6ED74107241EBA0D04A4A502D3BE	082K070	42	Sx	28.3	86	21.8	22.8	468	172.3
0091	0097	AB11A444475EF3016D5A5FBD09E466A3	082J022	826	Fd	29.1	176	15.7	36.0	349	293.8
0091	0098	B4A31C584EEA5423B5DC0DAB3826A99F	082J033	823	Lw	41.5	329	22.1	60.0	1,400	502.2
0091	0099	C61B2FC347FAC30AABF3E4BBABBF59C	082J041	83	Fd	18.3	187	9.3	29.4	709	176.4

Invermere TSA VRI Statistical Adjustment

Project	Sample	Feature_ID	Map ID	Poly ID	Phase II						
					Spp	Height (m)	Age (years)	SI (m)	BA m ² /ha	SPH trees/ha	Vol 12.5 m ³ /ha
0091	0101	E09D914F471D671FD26BACA3C43805C6	082J042	87	Fd	25.6	136	15.7	45.0	898	335.6
0091	0102	F6F6614C43FFC5E722C48581B751F849	082J014	470	Fd	18.9	223	10.7	34.2	764	206.8
0091	0103	612374EF4FD65340F27CD4B1FEFA50FD	082K069	826	Bl	14.6	143	6.6	28.8	1,722	144.0
0091	0104	67C03B644159B3081E1EFBBB861742C7	082F100	83	Pl	13.2	84	10.9	22.0	1,711	93.0
0091	0105	A0219F224FF3A916B1D01B98155FB5FF	082K058	10	Se	22.5	65	20.9	43.2	1,139	281.4
0091	0106	06BF4DF34C990947B4C06D94A5D4DBA7	082J034	255	Se	19.7	73	16.5	19.6	662	133.1
0091	0107	188FD6D642B2A702D95B028203537AC4	082K049	682	Pl	18.4	108	11.8	32.4	1,856	191.5
0091	0108	1B522AA744136925A7BF51A4294F961B	082J012	738	Pl	-	177	-	9.0	514	42.3
0091	0109	22F343B24EA982C42B087583763F46DC	082K009	196	Bl	20.1	123	11.0	43.2	2,318	201.8
0091	0110	7E6DC52B4B83934C687DD08F96DD1B0F	082J072	197	Ep	11.4	85	8.9	28.0	1,422	145.9
0091	0111	1CB2086D468318B6478CD0A7037257E1	082J062	361	Se	17.9	121	10.3	27.0	348	205.8
0091	0112	5E9529F349B9730220A26DA20F1A78ED	082F090	467	Se	18.3	166	6.8	43.2	2,214	238.0
0091	0113	6570CCE144EA23A2DD7B4BB886E4BE87	082K059	954	Se	21.7	270	5.0	36.0	787	258.9
0091	0114	6687F84947F249F266BCDDA617D853C6	082K009	182	Se	16.4	105	9.5	33.6	1,167	204.6
0091	0115	7009B2FF421C5D20C876A98EF2FE6F2D	082G094	224	Bl	6.8	72	7.3	23.0	2,234	65.4
0091	0116	717CC4A6470E4BE23FECD284CDCC08A6	082J052	933	Fd	29.4	155	16.3	30.8	627	233.3
0091	0117	A06A6A964DA264A48489CE8EC70704CB	082N008	14	Fd	17.8	107	14.5	41.4	645	288.6
0091	0118	A871F1B145F5F947F0C9DA88EAE61B7D	082J013	1004	Se	33.8	191	16.1	48.6	890	467.2
0091	0119	BA16425E4D4582EDC11D0BA47572FE29	082J053	845	Bl	19.1	193	6.9	11.0	180	95.2
0091	0120	D60DEC0C46C798292905879BCE0646DB	082G083	113	Se	-	-	-	19.0	378	105.5
0091	0121	C13748A74440494935F008A4849F3469	082J001	713	Pl	25.5	75	21.8	25.2	890	218.9
0091	0122	033EC3A846E597307ACA62BBA9DAFB8BB	082J011	12	Pl	16.1	88	11.7	28.0	2,647	77.7