Williams Lake TSA

Documentation of

Vegetation Resources Inventory Analysis

Prepared For:
Forest Analysis and Inventory Branch
Ministry of Forests, Lands and Natural Resource Operations

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Executive Summary

The objective of this project was to assess the accuracy of the Phase I inventory of the Williams Lake TSA by completing a VRI statistical analysis of selected Phase I inventory attributes in the target population of interest. The analysis was based on current standards.

The results for the Volume Audit (mature) portion of the inventory are good, particularly for age, height, basal area and volume. This may be due in part to the relatively recent aerial photography and ground sampling. The results for the Douglas-fir substrata (the largest substrata with 40 samples) are also good. The results for the remaining substrata (Balsam, Other, Pine and Spruce) are more variable and should be used with caution. The model- and attribute-related volume bias generally compensate somewhat for one another, resulting in an overall low total volume bias.

Stand and stock tables are provided in appendix I of this report and provide a more detailed description of the inventory based on the sample data available.

The agreement between the Phase I and Phase II leading species is 64% for the YSM (immature) stratum and 79% for the Volume Audit (mature) stratum. This is quite good.

The results for the YSM portion of the TSA generally show Phase I underestimation of basal area, height and volume. The 12.5cm utilization level for volume results in very low volumes for the YSM samples. A separate YSM analysis has been conducted (available from FAIB) and includes a more detailed volume analysis including comparisons to TIPSY and Timber Supply Review yield curves.

The Phase II (ground) estimates of SI are consistently lower than those in the provincial site productivity layer (PSPL). Some of the trees assessed for SI sampling are quite old. It is recommended that FAIB revisit the SI tree selection criteria used by the ground sampling crews.

The Phase I primary layer was compared to layers 1 and 2 combined. In this TSA, the differences between the primary and combined layers were small and of little practical importance for basal area and volume. However, multi-layer polygons are expected to be more variable. Identifying multi-layer polygons in the VRI analysis may help explain some of the differences between the ground and inventory, particularly for age and height.

Table 1. The sample size (N), mean, ratio of means (Phase II Ground/Phase I Inventory) and standard error of the ratio expressed as a percent of the ratio (SE of ratio (%)) are given by strata and attribute for the Williams Lake TSA. None of the ratios are statistically different from 1.0 ($\alpha \leq 0.05$) but the ratios that differ from 1.0 by more than 10% are shaded.

		Stratum	
Attribute	Statistic	YSM (Immature)	Volume Audit (mature)
Leading species age (years)	N	77	92
	Mean Phase II Ground	35	140
	Mean Phase I inventory	31	139
	Ratio (Phase II/Phase I)	1.146	1.006
	SE of Ratio (%)	(10%)	(8.1%)
Leading species height (m)	N	75	92
	Mean Phase II Ground	8.7	22.6
	Mean Phase I inventory	8.0	22.8
	Ratio (Phase II/Phase I)	1.088	0.990
	SE of Ratio (%)	(9.6%)	(4.5%)
Basal area (m^2/ha) 7.5 cm+	N	78	92
	Mean Phase II Ground	10.3	27.5
	Mean Phase I inventory	8.0	28.4
	Ratio (Phase II/Phase I)	1.285	0.970
	SE of Ratio (%)	(21.8%)	(11.5%)

		Stratum	
Attribute	Statistic	YSM (Immature)	Volume Audit (mature)
Trees/ha	N	78	92
7.5 cm+	Mean Phase II Ground	796	713
	Mean Phase I inventory	2875	537
	Ratio (Phase II/Phase I)	0.277	1.328
	SE of Ratio (%)	(41.6%)	(13.1%)
Lorey	N	31	90
height	Mean Phase II Ground	10.2	18.6
(m)	Mean Phase I inventory	11.3	20.8
	Ratio (Phase II/Phase I)	0.900	0.894
	SE of Ratio (%)	(11.6%)	(5.9%)
Volume	N	78	92
Net dwb	Mean Phase II Ground	29	187
(m^3/ha)	Mean Phase I inventory	18	176
12.5 cm+	Ratio (Phase II/Phase I)	1.577	1.063
	SE of Ratio (%)	(35.5%)	(14.9%)
Leading	N	72	92
species	Mean Phase II Ground	14.6	13.7
Site index	Mean Phase I inventory	14.7	13.4
(m)	Ratio (Phase II/Phase I)	0.992	1.019
	SE of Ratio (%)	(8.9%)	(5.1%)
Site index	N	69	87
(m)	Mean Phase II Ground	14.9	13.7
	Mean Site prod layer	16.9	17.5
	Ratio (Phase II/site)	0.881	0.78
	SE of Ratio (%)	(6.6%)	(6.6%)

Acknowledgements

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1. Introduction

This report documents the statistical analysis of the Vegetation Resources Inventory (VRI) for the Williams Lake Timber Supply Area (TSA).

1.1Scope and Objectives

This project has two main objectives:

- Perform a VDYP7-based VRI analysis for the Williams Lake TSA, based on current standards (FAIB 2011) for the Volume Audit (mature) population using 92 ground samples (a mix of VRI Phase 2, CMI and NFI), and
- Perform a Young Stand Monitoring (YSM) analysis using the 78 Young Stand Monitoring (Immature) ground samples established in the 2012 field season.

This report addresses the first objective. The second objective is addressed in a separate report. Both reports are available from FAIB at: http://www.for.gov.bc.ca/hts/vri/planning_reports/tsa_analysis.html

2. Background

The ground sampling plan for the Williams Lake TSA is documented in "Williams Lake Timber Supply Area TSA 29 – Vegetation resources inventory project implementation plan: Williams Lake TSA – Young Stand Monitoring, Williams Lake TSA East – Volume Audit Sampling, Net Volume Adjustment Factor Sampling and Air Calls" (Nona Phillips Forestry Consulting 2013) available from the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO).

2.1 Description of the Target Population Area

The description of the target population is taken from Nona Phillips Forestry Consulting (2013). The Williams Lake TSA covers almost 5 million ha (Table 2) and is located in the central interior of British Columbia (Figure 1). It is in the Fraser Basin and Interior Plateau, between the Coast Mountains to the west and the Cariboo Mountains in the east. It is bounded by the Quesnel TSA to the north, Wells Gray and Mitchell-Niagara Parks to the east, the 100 Mile House and Lillooet TSAs to the south and Tweedsmuir Provincial Park, Kingcome and Sunshine Coast TSAs to the west.

Williams Lake TSA – East is located within the overall TSA, east of Alexis Creek and north of the Big Creek ecological reserve. It includes most of the old Williams Lake District and all of the former Horsefly District.

Table 2. A summary of the land base (taken from Nona Phillips Forestry Consulting 2013).

Land Classification	Area (ha)	% of TSA
Total TSA Area	**4,933,664**	**100.0%**
Net-downs	**844,545**	**17.1%**
Military Reserve	6	0.0%
Parks	588,926	11.9%
Private	231,605	4.7%
Indian Reserve	24,008	0.5%
Net Area	**4,089,119**	**82.9%**
Non-Vegetated	582,017	11.8%
Vegetated	3,507,102	71.1%
Non-Treed	682,644	13.8%
Treed	2,824,458	57.3%

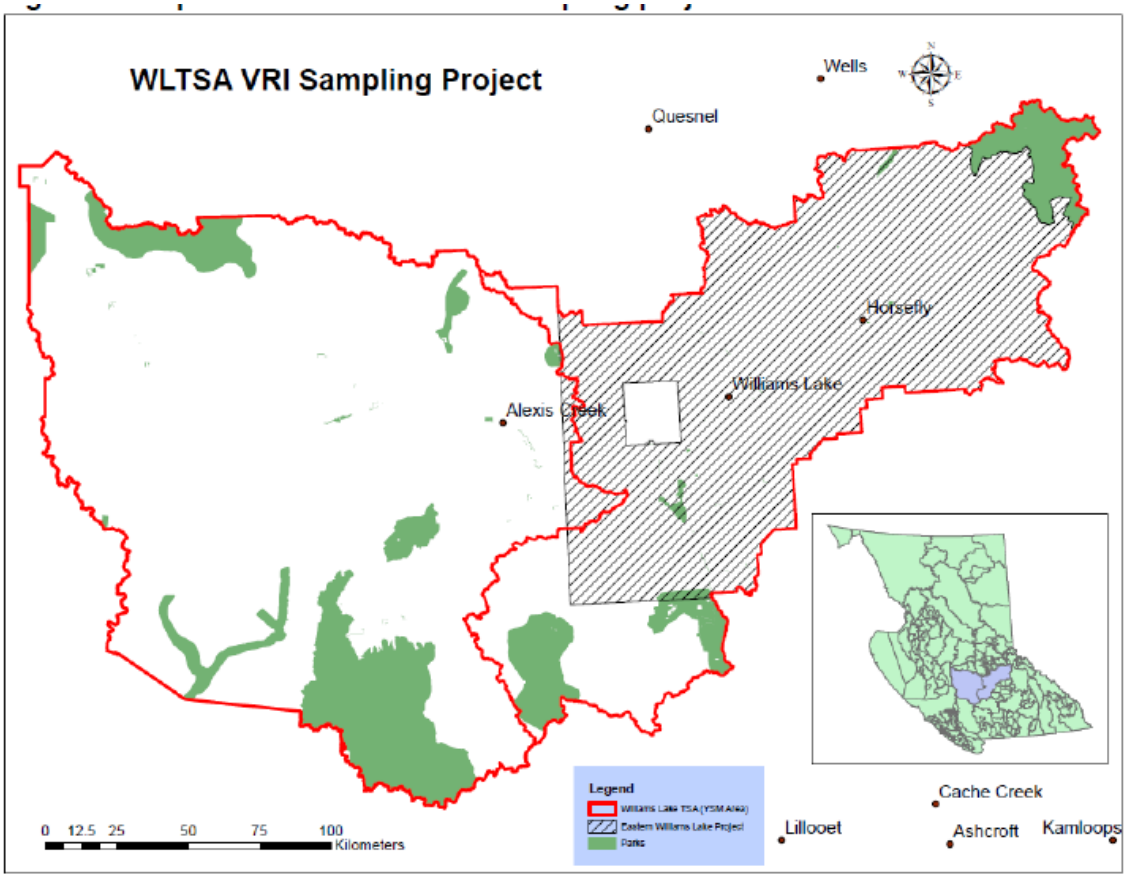

Figure 1. The location of the Williams Lake TSA Nona Philips Forestry Consulting (2013). The two sampling populations are indicated – the Williams Lake TSA (outlined in red) and the Williams Lake TSA East (cross hatched).

The ground sample locations are given in Figure 2 and Figure 3.

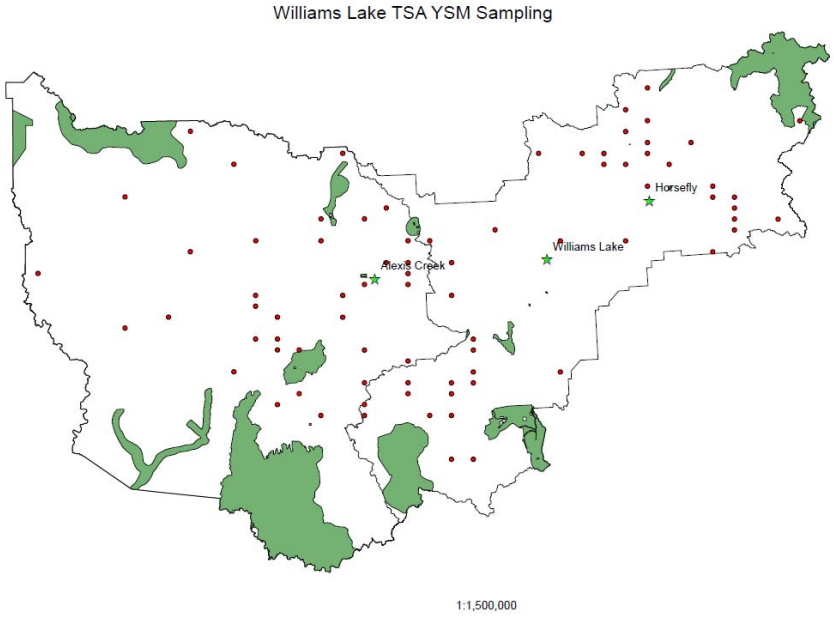

Figure 2. The locations of the YSM ground samples within the Williams Lake TSA are given.

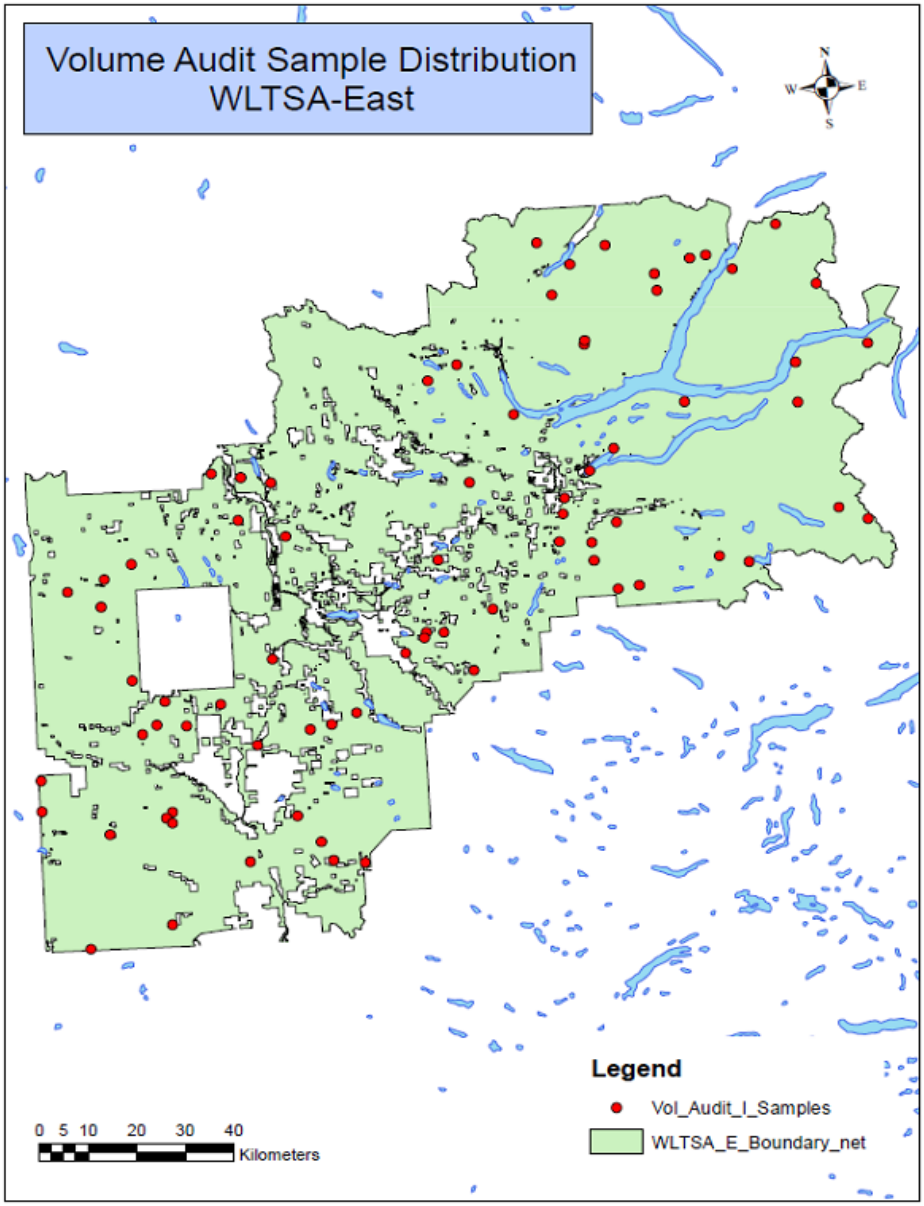

Figure 3. The locations of the Volume audit ground samples within the Williams Lake East TSA are given.

The Williams Lake TSA includes three general landscape types. The Chilcotin Plateau, west of the Fraser River, is characterized by a drier climate with extensive lodgepole pine forests and some Douglas-fir, and is bounded on the west by the Coast Mountains. The central portion of the TSA, both east and west of the Fraser River, has mixed species forests, primarily leading in Douglas-fir and lodgepole pine, interspersed with open range. To the east of the Fraser River, the rolling plateau gently increases in elevation to meet the Cariboo Mountains and Quesnel Highlands where forests of spruce, pine, western red cedar, western hemlock and sub-alpine fir predominate.

There are forty-three biogeoclimatic subzones/variants in the TSA. The dominant tree species in the TSA are lodgepole pine (about 63% of the volume in the THLB) and Douglas-fir (15%). Other tree species include spruce, subalpine fir (balsam), western red cedar and western hemlock, especially in the Williams Lake TSA - East. The Williams Lake TSA experienced a high level of Mountain Pine Beetle infestation in the last decade.

The Williams Lake TSA – East inventory is a VRI standard inventory with photography flown in the 2009 to 2011 field seasons.

The remaining Williams TSA inventory to the west and south of the East 'block' is based on older inventories rolled-over from the previous Forest Inventory Planning (FIP/FC1) standard. The one exception is a large area near Alexis Creek, which was part of the Lignum VRI project. This part of the inventory was last updated in 2012 The complex history of the inventory for Williams Lake TSA over the past 45 years including a discussion of previous inventory projects can be found in the 2008 Strategic Inventory Plan (VSIP).

The Vegetation Resources Inventory (VRI) project implementation plan (VPIP) for the Williams Lake TSA identified two separate populations of interest for Phase II ground sampling:

1 Williams Lake TSA – The Young Stand Monitoring (YSM) project population is not restricted to the Vegetated Treed (VT) component of the land base. This allows for the inclusion of silviculture openings where the crown closure in the database is less than 10%. These openings are an important portion of the YSM population. The age of the stands is 15 to 50 years.

2 Williams Lake TSA East – The Volume audit population is restricted to the eastern portion of the TSA (Figure 1) and includes only the VT component of the land base. The Volume Audit population includes stands ages 51 years and older.

Private land, parks and federal Lands (military reserves and Indian reserves) are excluded from both the Volume Audit and YSM population. Community Forests and Woodlots have been retained.

The areas by inventory leading species for the two populations are given in Table 3 and Table 4.

Table 3. Williams Lake TSA Young Stand Monitoring (YSM – immature) population is summarized by leading species. From Nona Phillips Forestry Consulting 2013.

Inventory Leading Species	Area (ha)	% of YSM population
Pine (Pl)	242,218	66%
Douglas-fir (Fd)	47,500	13%
Spruce (Sx)	43,063	12%
Aspen (At)	19,009	5%
Balsam (Bl)	8,696	2%
Cedar (Cw)	5,396	1%
Birch (Ep)	2,260	1%
Hemlock (Hw)	1,238	0%
Larch (Lw)	2	0%
Total	369,382	100%

Table 4. Williams Lake TSA Volume Audit (mature) population is summarized by leading species. From Nona Phillips Forestry Consulting 2013.

Inventory Leading Species	Area (ha)	% of Volume Audit population
Douglas-fir (Fd, Fdi)	379,126	46%
Spruce (S,Sx,Se,Sb,Sw)	183,519	22%
Balsam (B,Bl)	92,631	11%
Pine (Pl, Pli, Py)	86,067	10%
Aspen (At, Act, Ac)	36,805	4%
Cedar (Cw)	31,991	4%
Hemlock (Hw)	18,842	2%
Birch (Ep)	6,135	1%
Total	835,116	100%

3. Data Sources

3.1 Phase I photo-interpreted inventory data

The VRI Management System (VRIMS) inventory data from the Land and Resource Data Warehouse projected to January 1, 2013, were provided. Ground sampling was also completed in 2013, so VRIMS data for age, height and volume were used directly in the analysis. Lorey height (LH) at the 7.5cm+ DBH utilization was not provided in the VRIMS file and was generated using VDYP7 Console version 7.7a.33. The Phase I data for the ground sampled polygons are given in Appendix A.

The Volume audit population is Williams Lake East which has a VRI standard inventory based on photography flown from 2009-2011 (Nona Phillips Forestry Consulting 2013). The VRI corresponding to Williams Lake East was extracted from the entire Williams Lake TSA VRI by selecting polygons with a projected age > 50 and a year of photography ≥ 2009.

Table 5. Williams Lake TSA East area distribution by inventory reference year. It includes vegetated treed polygons with a projected age > 50. Polygons with a year of photography ≥ 2009 were selected to exclude the western portion of the TSA.

Reference (photo) year	% of Area	Average polygon size (ha)
2009	55%	14.8
2010	37%	17.3
2011	8%	16.7
2012	1%	20.2
2013	0%	4.8
Total	100%	15.8

Generally, the Phase I inventory tree data come originally from photo interpretation, updated to the year of ground sampling. Volumes are estimated using VDYP7. Outputs from VDYP7 have a utilization level specified by the user – usually 7.5 cm for most attributes and 12.5 cm for volume.

Inventory information for recently disturbed polygons generally comes from the RESULTS (Reporting Silviculture Updates and Land status Tracking System) layer. These are also processed by VDYP7 to project them to the year of ground sampling. For stands less than 7m tall, VDYP will project the age and height until the height is 7m and then generate the remaining attributes. Until the projected height is 7m, the other attributes are not altered and the utilization limit is unchanged from the original data collection. This is illustrated by sample 211 in Table 16 which has a PROJ_HEIGHT_1 = 0.1m and 7,439 trees/ha. The utilization limit is based on Dbh, implying that trees must be at least 1.3m tall so the height for sample 211 does not have a utilization limit.

The analysis here uses the VDYP7 projected inventory which may not be appropriate for stands less than 7m in height. A separate YSM analysis which uses TIPSY to compare yields may be a more appropriate assessment of the YSM portion of the population, especially in shorter stands.

3.2 Ground sample data

The ground sample data come from three sources - VRI ground samples, CMI samples and NFI ground plots. The compiled ground sample attributes are given in Appendix B. There were no substitutions or movements of plots. Sample 227 appears to be borderline plot. Based on the ground GPS coordinates, it appears to be in the adjacent mature polygon but the ground data indicate a young stand. It was retained and paired with the inventory data from the intended sample plan polygon

Samples 202, 228, 236, 250 and 258 were boundary plots and sampled using the walkthrough method (Ducey et al. 2004) and compiled accordingly.

3.2.1 VRI ground samples

Nona Phillips Forestry Consulting Ltd. (2012a) documented the selection of the ground samples for the Williams Lake TSA. The Phase II data were compiled by MFLNRO July 4, 2013 using the most recent regional NVAF values.

The Phase II site index (SI) value for each sample was computed as the average site index (SI) of the T, L, X and O trees on the "trees_h" file.

In general, the YSM ground plots are fixed area, 0.04ha plots while the volume audit plots are a cluster of five variable radius plots.

3.2.2 CMI samples

Of the original 25 CMI samples, eight were rejected as not being in the population, either because of very low crown closure, straddling polygon boundaries or falling on a road. A further two were removed (section 4.3). The remaining 15 plots were all within the volume audit population. These are 0.04 ha fixed area plots.

3.2.3 NFI samples

There were two NFI plots, both within the volume audit population. These are 0.04 ha fixed area plots.

3.3 Phase II Sample Selection Pre-Stratification and Weights

The Volume Audit population was pre-stratified by leading species and further stratified by volume classes to ensure adequate representation of the samples across the target population. Polygons were selected with Probability Proportional to Size (polygon area) With Replacement (PPSWR).

The original Sample weights (Table 6) were taken from *"Williams Lake TSA Sample Selection Report"* (Nona Phillips Forestry Consulting 2013) and used in the analysis the combined sample weights calculated as described in section 4.2..

Table 6. The sample weights for the Williams Lake TSA are given. The combined sample weights are discussed in section 4.2.

Strata	Substrata	Basal area strata	Basal area Criteria (m^2/ha)	Area (A) (ha)	Area %	n	Weight (number of hectares represented by each sample) = A/n	Combined sample weights
Volume audit (mature)	Douglas-fir (Fd)	1	0-19	113,006	30%	10	11,301	9,212
		2	20-34	134,127	35%	12	11,177	9,112
		3	35+	131,993	35%	12	10,999	8,967
		Total		379,126	100%	34		
	Spruce (S)	1	0-24	46,515	25%	4	11,629	9,480
		2	25-35	63,281	34%	6	10,547	8,598
		3	36+	73,723	40%	7	10,532	8,586
		Total		183,519	100%	17		
	Pine-Balsam (P/B)	1	0-10	59,269	33%	5	11,854	9,663
		2	11-20	56,059	31%	5	11,212	9,140
		3	21+	63,370	35%	6	10,562	8,610
		Total		178,698	100%	16		
	Other (O)	1	0-29	17,037	18%	2	8,519	6,944
		2	30-44	29,109	31%	2	14,555	11,865
		3	45+	47,627	51%	4	11,907	9,707
		Total		93,773	100%	8		
	Total			835,116		75		
YSM (Immature)	All			369,382	100%	78	4,736	

Strata	Substrata	Basal area strata	Basal area Criteria (m^2/ha)	Area (A) (ha)	Area %	n	Weight (number of hectares represented by each sample) = A/n	Combined sample weights
CMI	Fd			379,126		6	55,674	9,077
	S			183,519		1	55,674	9,077
	P/B			178,698		4	55,674	9,077
	O			93,773		4	55,674	9,077
		Total		835,116		15		
NFI		Total		835,116		2	417,558	9,077

4. METHODS

4.1 Overview of VRI Sample Data Analysis

The purpose of the VRI sample data analysis is to evaluate the accuracy of the Phase I photo-interpreted inventory data, using the Phase II ground sample data as the basis for the comparison. The analysis includes the following steps.

1 Project the inventory attributes using VDYP7 in accordance with the most recent Ministry standards and procedures.
2 Identify any outliers and data issues with the Phase I and Phase II data files supplied by the Ministry.
3 Identify analysis strata in consultation with Ministry staff.
4 Calculate sample selection probability weights.
5 Compute ratio of means and related statistics for each stratum for both the mature and immature population and the overall unit for the attributes of interest. These ratios of means form the basis of the inventory assessment. The sampling errors for these ratios can be used to assess the risk and uncertainty associated with the sampling process.
6 Produce an analysis of the comparison of leading species.
7 Provide separate tables, graphs and ratios for all key attributes for the immature and the mature components.

There are seven timber attributes that are considered in the current VRI ground sample data analysis:

- Age of the leading species (AGE_PROJ_1),
- Height of the leading species (HEIGHT_PROJ_1),
- Basal area at 7.5cm+ DBH utilization (BASAL_AREA),
- Trees per hectare at 7.5cm+ DBH utilization (VRI_LIVE_STEMS_PER_HA),
- Lorey height[1] (LH) at 7.5cm+ DBH utilization (LH7.5, generated by VDYP7),
- Volume net top, stump (CU), decay, waste and breakage at 12.5cm+ DBH utilization (LIVE_STAND_VOLUME_125), and
- Site index (SITE_INDEX).

For the Williams Lake East TSA, three data sources are available – the 75 VRI Phase II samples, 15 CMI samples and 2 NFI samples. These were combined as described in section 4.2.

4.2 Combining data

Ott (2013) described combining data from different sources, using an example very similar to the current situation. In this case, the data sources to be combined are the volume audit, CMI and NFI plots. These all sample the same population (vegetated-treed polygons with age > 50). The volume audit sample was selected with probability proportional to polygon size resulting in the weights given in Table 6. The CMI and NFI samples are grid-based so the weight for each sample is the population area divided by the sample size. Ott's procedure was used to calculate new weights (Table 6). Essentially, each weight was scaled by the data source sample size divided by the total sample size. For the NFI plots, the original weight, 417,558, was multiplied by 2/92 = 9,077. The resulting weights are relatively constant across

strata and data sources. This is reassuring since all sampling designs were based on the premise that each hectare in the population had an equal probability of being sampled.

4.3 Data issues related to the statistical adjustment

Scatterplots comparing the Phase I and Phase II attributes were examined for potential outliers (Figure 6). Large differences between the ground sample and photo-based estimates, particularly for basal area, tree/ha and volume, were noted for a number of samples

Two CMI plots were removed from the analysis. Sample 3801 was in a right of way and was not considered part of the population. Sample 7556 is in a recent burn and not part of the volume audit population.

Sample 273 was part of the YSM population at the time of the sample plan (with a projected age of 33 in 2011. A more recent update with RESULTS places the sample in a polygon with an age of 7. The corresponding ground data (4 pine trees with Dbh < 4cm and one deciduous tree with Dbh = 20 cm) are consistent with a very young plot. The RESULTS-revised Phase label for the sample does not meet the YSM population definition and sample 273 was dropped from further analysis.

Some plots have no trees with Dbh ≥ 7.5 cm. Within the YSM population, samples 211, 213, 214, 224, 241, 244, 259 and 269 had live trees but none with Dbh ≥ 7.5cm. Sample 258 had only dead trees. Samples 212 and 270 had no trees.

The YSM population was further examined for evidence of veteran or residual trees and plots that appear to be outside the YSM population. There was evidence of two veteran trees in plot 226. These were retained in all calculations. Some of the trees plots located in the YSM population are older than the YSM population but there do not appear to be any data or plot location errors. All were retained in the analyses.

4.4 Phase I Inventory – primary and combined L1 and L2 layers

Polygons in the Phase I Inventory can have one or two layers (L1 and L2). One of these is designated the primary, or R1, layer. Typically in VRI analysis, the ground plot summaries are compared to the Phase I Inventory summary for the primary layer. However, the ground plot data are not separated into layers. The analysis here includes the comparison of ground to Phase I inventory primary layer (the usual analysis) but the scope was expanded to include a comparison of ground to Phase I inventory combined L1 & L2 layers.

Seven of the 170 ground samples had two layers identified. All had an overstorey dominated by Douglas-fir and all but one had an understorey dominated by Douglas-fir. The exception had an understorey dominated by aspen.

The Phase I inventory layers were combined using the protocol in section 12.7 of the photo interpretation procedures (FAIB 2014).

- Volume – the L1 and L2 volumes were summed.
- Trees/ha – the L1 and L2 Trees/ha were summed.
- Basal area – the L1 and L2 basal areas were summed.
- Species composition – pro-rated using layer basal area.
- Age and Height– the leading species age and height were pro-rated using layer basal area.

Two subsets of the inventory were used - ground sample and population. For both subsets, the primary layer was summarized as well as the sum of the L1 and L2 layers. The subsets are described in Table 7. Note the strata for the combined layers were based on the primary layer. In some cases, the combined age or species composition would have led to assignment to a different stratum.

Table 7. The data subsets are described.

Label	Maturity	Sample	Layer
YSM – sample Primary	YSM (Immature)	Ground sampled polygons	Primary
YSM – sample Combined	YSM (Immature)	Ground sampled polygons	Combined
YSM – Pop Primary	YSM (Immature)	Inventory where 15 ≤ age ≤ 50	Primary
YSM – Pop Combined	YSM (Immature)	Inventory where 15 ≤ age ≤ 50	Combined
Volume Audit – sample Primary	Volume Audit (mature)	Ground sampled polygons	Primary
Volume Audit – sample Combined	Volume Audit (mature)	Ground sampled polygons	Combined
Volume Audit – Pop Primary	Volume Audit (mature)	Inventory where age > 50 and year ≥ 2009	Primary
Volume Audit – Pop Combined	Volume Audit (mature)	Inventory where age > 50 and year ≥ 2009	Combined

4.5 Height and Age data matching

Two height and age comparisons were undertaken – leading species and species matched. For the leading species comparison, the ground leading species age and height were compared to the Inventory leading species and height, regardless of whether the species were the same. For the species matched comparison, the MFLRNO data matching procedures (FAIB 2011) were followed to determine the appropriate Phase I and II heights and ages for the comparison ratios.

The ground heights and ages used in the analysis were based on the average values for the T, L, X & O[1] trees for the ground leading species (by basal area at 4cm + DBH utilization) on the ground. Some of the trees sampled for age and height had a breast height age < 5. These were not considered suitable and were not used in calculating site index.

The objective of the species matching was to choose an inventory height and age (i.e. for either the leading or second species) so that the ground and inventory species "matched".

If a leading species match could not be made at the sp0 (Table 19) level, conifer-to-conifer (or deciduous-to-deciduous) matches were allowed. However, conifer-deciduous matches were not considered acceptable. Appendix E provides the details for the height and age data matching.

4.6 Site Index from the VRI Phase I polygons

As with age and height, site index (SI) was compared at the leading species level and species matched. The only difference is that for the species matched site index comparison, only Case 1 samples where the Phase II and Phase I leading species were the same) and case 2 (Phase II leading species and Phase I secondary species were the same and there was a height and age available for the Phase I secondary species) were included. No other cases were considered acceptable matches for the ground plots. SI is the average SI of the SI of the leading species.

4.7 Site index from Provincial Site productivity layer

The provincial site productivity layer (PSPL[2]) provides an alternative source of site index estimates, particularly for the YSM population. This layer provides site index estimates for up to 22 species. The intersection of the provincial site productivity layer and the ground plots was provided by the FAIB. Of

[1]The T or "top height" tree is the tree of largest DBH in the central plot of the cluster, regardless of species. The L or "leading species" tree is the tree of largest DBH on any plot in the plot cluster. If a suitable (age or height) leading species sample tree is not found in any plot in the cluster, a "replacement" tree is selected. An "O" tree is the closest suitable (for height and age) tree of the leading species within 5.64m of the plot center. An "X" tree is the closest suitable tree of the leading species further than 5.64m but closer than 25m to plot centre. For further details, refer to the MFLNRO document "VRI Ground Sampling Procedures Version 4.8, May 2008, Amendment # 1: Modifications to the Leading Species Site Tree Selection Procedures", April, 2009.

[2] http://www.for.gov.bc.ca/hts/siteprod/download/FLNR_Provincial_Site_Productivity_Layer.pdf

the 78 YSM ground plots, three did not have any trees to determine leading species and two were AT leading and there was not an associated AT site index estimate in the site productivity layer. An additional four plots did not have acceptable SI trees. In the volume audit population, two had no trees and three did not have a spruce site index estimate in the site productivity layer. Therefore, 87 of the 92 volume audit plots had PSPL estimates.

The PSPL SI values are taken from the PSPL tile with the largest overlap with the ground plot. The sample size for the PSPL SI is greater than the VRI inventory SI because of the species matching – the PSPL has more species and more matches. As noted in the PSPL documentation[3], the PSPL site indexes are more appropriately used for strategic, as opposed to operational, purposes. If used for site-specific applications, as is the case here, the site index estimates should be verified through a ground-based survey. The PSPL estimates in the Williams Lake TSA are approved, indicating they passed a third party accuracy assessment based on published standards and procedures.

Site index field data are collected by site series within the Biogeoclimatic Ecosystem Classification system (SIBEC). The SIBEC SI estimates are then averaged by species for each site series with sufficient field data and applied spatially through the Predictive Ecosystem Mapping (PEM) or Terrestrial Ecosystem Mapping (TEM) processes. The data are collected from a large number of sample points across the province using standard, documented methods.

The SI's in the PSPL are all estimates from models, either from PEM/TEM/SIBEC or a biophysical model when a PEM/TEM derived SI is not yet available. In the case of PEM/TEM/SIBEC estimates applied to the Williams Lake TSA, two models are used to estimate SI: a PEM/TEM is used to estimate site series and the SIBEC model is used to estimate site index from the PEM/TEM site series estimate. As a consequence, users of the site index layer must be aware of the accuracies in these models, particularly if the SI estimates are used on a site specific basis as is the case here.

The site index layer was designed to assist with strategic-level decision-making where the effects of the any errors in the site index estimate are reduced from the grouping and averaging of individual site index values for points across a broader area such as an analysis unit. The site index estimates are provided on a 1 ha grid, giving the user a lot of flexibility in grouping points for weighting and averaging.

5. RESULTS AND DISCUSSION

5.1 Attribute bias

The ratios of the weighted mean Phase II ground sample attribute to the corresponding weighted mean Phase I inventory attribute were computed for each of the seven key attributes identified in Section 4.1. The analysis stratification for the Volume Audit population was based on Phase I inventory leading species groups from the primary layer. The samples from the YSM population were not post-stratified. The means are given in Table 8 and the ratios in Table 9.

[3] http://www.for.gov.bc.ca/hts/siteprod/provlayer.html

Table 8. Sample-estimated weighted means for the Phase I inventory and Phase II ground sample for seven key inventory attributes, for the target population in the Williams Lake TSA. The Phase I attributes are from the primary layer only.

Attribute		Weighted means						
		YSM	Volume Audit (mature)					
		(Immature)	Balsam	Fir	Other	Pine	Spruce	Mature
Leading	N	77	15	40	12	7	18	92
Species	Phase II Ground	35	180	127	179	95	125	140
Age	Phase I Sample	31	167	126	175	84	141	139
(years)	Phase I Population	32	163	125	162	89	159	136
Species	N	70	15	38	12	7	18	90
Matched	Phase II Ground	36	180	129	179	95	125	141
Age(years)	Phase I Sample	32	174	124	178	84	135	139
Leading	N	75	15	40	12	7	18	92
Species	Phase II Ground	8.7	20.8	22.0	28.6	15.2	24.1	22.6
Height	Phase I Sample	8.0	19.4	22.6	29.8	15.7	24.1	22.8
(m)	Phase I Population	8.5	8.5	19.2	22.4	27.2	15.9	26.8
Species	N	68	15	38	12	7	18	90
Matched	Phase II Ground	9.0	20.8	22.4	28.6	15.2	24.1	22.7
Height (m)	Phase I Sample	8.2	20.2	22.6	29.9	15.7	24.2	23.0
Basal area	N	78	15	40	12	7	18	92
(m^2/ha)	Phase II Ground	10.3	24.0	24.7	53.2	9.6	25.9	27.5
7.5 cm+	Phase I Sample	8.0	20.6	27.6	43.9	15.6	31.0	28.4
	Phase I Population	9.0	22.1	26.5	44.3	15.5	32.9	28.2
Trees/ha	N	78	15	40	12	7	18	92
7.5 cm+	Phase II Ground	796	562	775	786	956	548	713
	Phase I Sample	2875	419	588	437	674	537	537
	Phase I Population	2149	469	552	563	677	491	546
Lorey	N	31	15	38	12	7	18	90
Height	Phase II Ground	10.2	16.9	18.5	22.6	13.4	19.4	18.6
(m)	Phase I Sample	11.3	18.6	20.0	28.1	14.6	21.7	20.8
Volume net	N	78	15	40	12	7	18	92
Dwb (m^3/ha)	Phase II Ground	29	169	163	361	22	201	187
12.5 cm+	Phase I Sample	18	120	169	262	88	215	176
	Phase I Population	18	131	161	261	76	251	178
Leading	N	72	15	40	12	7	18	92
Species	Phase II Ground	14.6	8.7	14.2	16.5	10.9	16.0	13.7
Site index	Phase I Sample	14.7	8.3	14.6	16.3	12.5	13.6	13.4
(m)	Phase I Population	15.5	8.6	14.5	14.8	12.4	14.5	13.7
Species	N	60	15	36	12	7	16	86
Matched	Phase II Ground	14.7	8.7	14.0	16.5	10.9	15.3	13.4
Site index (m)	Phase I Sample	14.7	8.7	14.4	15.5	12.5	13.6	13.3
Site index	N	69	13	38	12	7	17	87
(m)	Phase II Ground	14.9	8.6	14.3	16.5	10.9	15.4	13.7
Site prod	Phase I Sample	16.9	15.7	17.3	19.0	15.5	19.4	17.5

In general, the attribute means from the Phase I sample and the Phase I population are very close for the volume audit population. The Volume Audit (mature) ratios for age, height, basal area and volume are close to 1.0 (Table 9). These are important inventory attributes and the results are very good. Trees per hectare has the poorest estimates.

The results for the leading species substrata within the Volume audit stratum show more variability. The heights are still very good. Basal area and volume show similar trends by species group. The Phase I inventory overestimates Fir, pine and spruce volumes while balsam and *Other* are underestimated.

For the YSM (immature) stratum, the Phase I inventory ages and heights are lower than the ground measurements while the site index estimates are good. The site productivity layer site index estimate appears to consistently overestimate the ground site index. Volume, basal area and trees/ha for the YSM (immature) stratum are very sensitive to the utilization level. The Williams Lake Young Stand Monitoring report, available from the FAIB), gives a more detailed examination of the YSM (immature) stratum.

In general, the PSPL estimates of site index were higher than those observed on the ground plots and the ratio is statistically smaller than 1.0 for the volume audit population. This is a concern since it may indicate errors in the PSPL or errors in the ground SI assessment. Some of the trees samples for SI are quite old and there appears to be a trend of increasing bias with age (Figure 4).

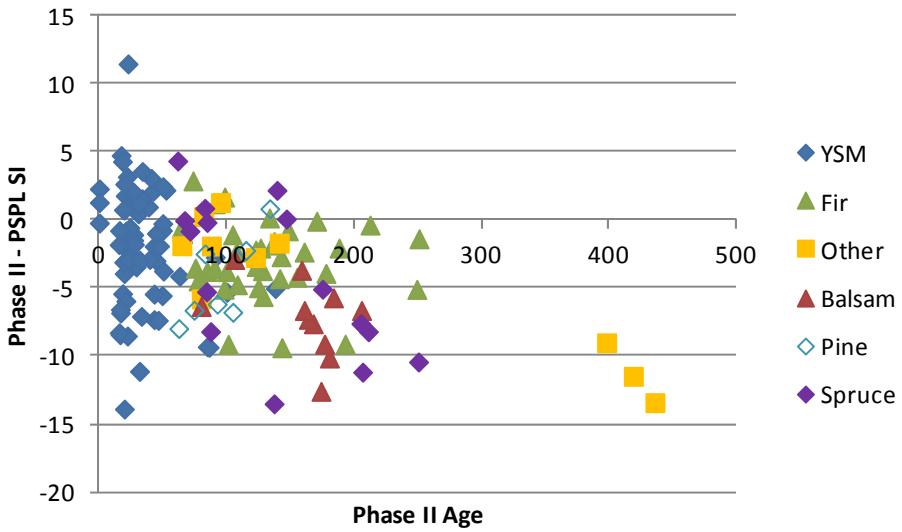

Figure 4. The site index bias (Phase II SI – PSPL SI) is plotted against Phase II age. There is a trend of increasing bias with age.

In terms of the mature population, some of the trees in the Phase II sample are very old and may not be representative SI trees since site index data is less reliable from trees older than age 150. Older trees frequently have hidden pathology or other damage as well as an earlier history of suppression, etc. This situation is likely a significant contributing factor in PSPL site indices being higher than the ground-based site indices. The Williams Lake has significant pine mortality from mountain pine beetle. Some of the polygons are likely residual stands and the current overstorey may have originally been an understorey under a pine overstorey. If this was the case, the SI trees may have had slow initial height growth, reducing the SI estimate. In terms of the immature population, it is reasonable to expect the site indices from the young trees (in the YSM plots) to be more variable than older trees as minor differences in age or height can have a large effect on SI. Some of the site trees had a breast height of less than 5 years (not used here) and some had a significant number of years to breast height (breast height age = 9.5 versus a toil age of 19). It is recommended that FAIB revisit the SI tree selection criteria used by the ground sampling crews.

In general, the Phase I Inventory sample mean was close to the Phase I population mean for the Volume audit (mature) strata but were more variable for the species strata, particularly the spruce strata.

Table 9. Ratio of means comparisons (and sampling error % at a 95% confidence level) for seven attributes, for the target populations in the Williams Lake TSA. The ratios are based on the Phase I primary layer.

Attribute	Ratio of weighted means (with 95% sampling error shown as % of ratio)						
	YSM	Volume			Audit	(mature)	
	(Immature)	Balsam	Fir	Other	Pine	Spruce	Mature
Leading Species	1.146	1.077	1.01	1.02	1.128	0.887	1.006
Age (years)	(10.0%)	(11.6%)	(16.3%)	(17.8%)	(16.6%)	(13.9%)	(8.1%)
Species matched	1.135	1.034	1.044	1.003	1.128	0.928	1.017
Age (years)	(11.1%)	(9.1%)	(16.1%)	(18.4%)	(16.6%)	(13.4%)	(7.6%)
Leading Species	1.088	1.074	0.973	0.959	0.97	1.001	0.99
Height (m)	(9.6%)	(12.9%)	(7.3%)	(9.7%)	(7.6%)	(8.9%)	(4.5%)
Species matched	1.094	1.028	0.99	0.955	0.97	0.996	0.989
Height (m)	(11.2%)	(10.8%)	(7.1%)	(10.4%)	(7.6%)	(8.1%)	(4.2%)
Basal area	1.285	1.168	0.895	1.214	0.619	0.837	0.97
(m^2/ha) 7.5 cm+	(21.8%)	(21%)	(16.8%)	(24.1%)	(83.2%)	(14%)	(11.5%)
Trees/ha	0.277	1.341	1.319	1.799	1.418	1.021	1.328
7.5 cm+	(41.6%)	(35.6%)	(16.9%)	(27%)	(66.7%)	(20.6%)	(13.1%)
Lorey Height	0.900	0.909	0.928	0.803	0.914	0.893	0.894
(m)	(11.6%)	(20.9%)	(8.1%)	(14.2%)	(19.6%)	(11.3%)	(5.9%)
Volume net Dwb	1.577	1.412	0.965	1.376	0.254	0.938	1.063
(m^3/ha) 12.5 cm+	(35.5%)	(26.4%)	(25.8%)	(26%)	(63.7%)	(19.1%)	(14.9%)
Leading Species	0.992	1.047	0.973	1.015	0.875	1.176	1.019
Site index (m)	(8.9%)	(18.4%)	(5.2%)	(14.1%)	(10.9%)	(13.1%)	(5.1%)
Species matched	1.003	0.998	0.968	1.068	0.875	1.124	1.01
Site index (m)	(9.4%)	(18.1%)	(5.3%)	(13.5%)	(10.9%)	(10.5%)	(4.9%)
Site index (m)	0.881	0.549	0.827	0.868	0.706	0.791	0.78
Site prod	(6.6%)	(13%)	(5.7%)	(22.6%)	(17.5%)	(16.5%)	(6.6%)

5.2 Primary versus combined layers

The ground plots do not distinguish layers (other than the potential identification of veteran or residual trees). The expectation was that rather than comparing the ground summaries to the Phase I primary layer, the ground summaries should be compared to the Phase I combined layers. In practice, this introduced a number of complications. Based on the combined layers, 5 of the 78 YSM samples are older than the stratum age range of 15-50 years. Two samples from the YSM population with two Phase I layers are given in Table 10 for illustration. For sample 220, the ground data match the primary layer (layer 2), except for trees/ha. For sample 245, the combined layers match the ground sample better, except for the species composition.

Table 10. The effect of combining layers is illustrated with two samples from the YSM population. In both cases, layer 2 is the primary layer.

Layer	Sample	CC (%)	Spp1	Spp2	Spp3	Pct1	Pct2	Pct3	Age	Height (m)	Basal area (m^2/ha)	Trees/ha	Vol_nwb @ 12.5 cm (m^3/ha)
1	220	3	SX	AT	PL	80	15	5	113	26.5	3.0	50	25
2	220	25	PL	AT	SX	80	10	10	24	4.7	3.0	1800	
Comb	220	28	SX	PL	AT	45	42.5	12.5	69	15.6	6.0	1850	25
Ground	200		PL			100			17	6.1	2.2	250	1
1	245	5	AT	PL		80	20		116	18.3	2.5	34	11
2	245	10	PL	AT		90	10		41	8.0	3.8	463	3
Comb	245	15	PL	AT		62.2	37.8		71	12.1	6.3	497	14
Ground	245		AT	SX		92	8		78	14.5	20.3	1576	50

For young stands, the basal area in each layer is generally small and weighting by crown closure may be preferable to weighting by basal area.

The combined layers had slightly more basal area and volume than the primary layer but the increase was minor (< 5%). For stems/ha, for the sampled polygons, the combined layers had 625 stems/ha vs. 537 stems/ha for the primary layer. The difference at population level was lower (599 vs. 546 stems/ha).

Table 11. Sample-estimated weighted means for the Phase I inventory and Phase II ground sample for seven key inventory attributes, for the target population in the Williams Lake TSA.

Attribute		Weighted means						
		YSM	Volume		Audit	(mature)		
		(Immature)	Balsam	Fir	Other	Pine	Spruce	Mature
Leading	N	77	15	40	12	7	18	92
Species	Phase II Ground	35	180	127	179	95	125	140
Age	Phase I Sample – Primary	31	167	126	175	84	141	139
(years)	Phase I Sample – Combined	35	167	129	175	84	141	140
	Phase I Population – Primary	32	163	125	162	89	159	136
	Phase I Population - Combined	37	163	123	162	93	159	136
Leading	N	75	15	40	12	7	18	92
Species	Phase II Ground	8.7	20.8	22.0	28.6	15.2	24.1	22.6
Height	Phase I Sample – Primary	8.0	19.4	22.6	29.8	15.7	24.1	22.8
(m)	Phase I Sample – Combined	8.5	19.4	22.7	29.8	15.7	24.1	22.9
	Phase I Population – Primary	8.5	8.5	19.2	22.4	27.2	15.9	26.8
	Phase I Population - Combined	9.2	19.2	22.2	27.1	16.1	26.8	22.7
Basal area	N	78	15	40	12	7	18	92
(m^2/ha)	Phase II Ground	10.3	24.0	24.7	53.2	9.6	25.9	27.5
7.5 cm+	Phase I Sample – Primary	8.0	20.6	27.6	43.9	15.6	31.0	28.4
	Phase I Sample – Combined	8.3	20.6	29.3	43.9	15.5	31.0	29.1
	Phase I Population – Primary	9.0	22.1	26.5	44.3	15.5	32.9	28.2
	Phase I Population - Combined	9.3	22.2	27.8	44.5	15.8	33.0	28.9
Trees/ha	N	78	15	40	12	7	18	92
7.5 cm+	Phase II Ground	796	562	775	786	956	548	713
	Phase I Sample - Primary	2875	419	588	437	674	537	537
	Phase I Sample – Combined	2878	419	791	437	674	537	625
	Phase I Population - Primary	2149	469	552	563	677	491	546
	Phase I Population - Combined	2158	473	642	601	690	510	599
Volume net	N	78	15	40	12	7	18	92
Dwb (m^3/ha)	Phase II Ground	29	169	163	361	22	201	187
12.5 cm+	Phase I Sample - Primary	18	120	169	262	88	215	176
	Phase I Sample – Combined	21	120	173	262	88	215	178
	Phase I Population - Primary	18	131	161	261	76	251	178
	Phase I Population - Combined	18	131	165	261	76	251	180

For the samples in Table 10, both layers have relatively low crown closure. Polygons with two layers may be more heterogeneous, in general, than single layer polygons. This may exacerbate the issues that arise when comparing a ground sample, which covers a limited area, to photo estimates that cover the entire polygon. Multi-layer stands are a challenge for ground sampling, particularly for selecting height, age and site trees. The ideal solution is to identify layers in the ground sample and compare layers. This may not be feasible. However, if field crews are told which samples were identified as multi-layer, the ground crews could assign the sampled trees to layer 1 or layer 2.

Identifying multi-layer polygons in the inventory analysis should be investigated, particularly in the data screening and for the height - age matching. If the Phase I layers are combined, decisions should be made whether to base the sampling stratification on the Phase I primary of combined layers. If the primary

layer is used for sample selection, a decision should be made whether to analyze the data using the stratification based on the combined layers.

In this TSA, the differences between the primary layer and the combined layers are minimal. This may not be the case in other TSAs so the recommendations here should be viewed with caution.

5.3 Model-Related and Attribute-Related Components of Volume Bias

The difference between the mean Phase I inventory volume and the mean Phase II ground sample volume is an estimate of the total volume bias. In the YSM stratum, 31 out of 78 samples were tall enough for VDYP7 to estimate volumes or Lorey height. For the rest of the samples, the VDYP7 Lorey height was set to missing and the volume set to zero.

The model and attribute-related volume bias analysis focuses on the Volume Audit (mature) population, where VDYP7 produced volumes for all samples.

The Phase I inventory estimates of volume for a polygon are generated by VDYP7. Generally, photo interpreted estimates of species composition, age, height, basal area and trees/ha are input into VDYP7. These are projected to the year of ground sampling and various volumes estimated. There are two potential sources of bias that contribute to the volume bias.

1 Attribute-related volume bias: This is the bias associated with providing VDYP7 with incorrect input attributes i.e. species composition, height, age, basal area, trees/ha) as well as errors associated with projecting these attributes to the year of ground sampling. In addition, the bias includes sampling error – comparing the Phase I polygon to the Phase II sample plot.

2 Model-related volume bias: This is bias associated with predicting volume from projected species composition, height, age, basal area, trees/ha using the VDYP7 yield model. Depending on the volume, it can include errors in estimation of decay, waste and breakage.

Estimates of the relative contribution of each of these bias components to the total inventory volume bias can be obtained by estimating a new volume using the attributes from the ground sample as inputs to the VDYP7 yield model. The model-related bias is evaluated by comparing this third volume to the ground volume. The total bias minus model bias is considered attribute bias.

VOL A – Phase II ground volume – assumed to be correct.

VOL B – Phase I inventory – uses the photo interpreted attributes, projected to the year of ground sampling, using VDYP7. It includes errors in original attributes, projection errors, and volume estimation errors.

VOL C– VDYP7 volume using the ground attributes. It includes only VDYP7 volume estimation errors.

Total bias = VOL A – VOL B

Model bias = VOL A – VOL C. Includes VDYP7 volume estimation errors but not errors in input attributes.

Attribute bias = VOL C - VOL B. Does not include VDYP7 volume estimation errors but includes errors in original attributes, errors in attribute projection and sampling errors.

The YSM volume results (Table 12) will not be discussed other than to note the stands are young, with little net volume and the total volume is dominated by model bias. A separate report investigates the YSM sample in more detail including a comparison to TIPSY yields.

For the Volume audit, overall the results are good. Overall, and for the stratum with larger sample size (Douglas-fir), all the biases were less than 15%. (Figure 5, Table 12 and Table 13). Generally the model bias is positive and the attribute bias is negative. The exceptions are the Balsam and Other strata which have the largest overall bias. These had the lowest Phase I volume. The "Other" volume bias is dominated by two cedar leading samples. Sample 73 had a ground volume of 729 m^3/ha compared to a

Phase I Inventory volume of 315 m^3/ha. Sample 75 had a ground volume of 885 m^3/ha compared to a Phase I inventory volume of 405 m^3/ha.

Table 12. Volumes for model-related and attribute-related bias comparison.

Stratum		N	Weighted mean Live Volume (m^3/ha) net Dwb at 12.5cm DBH						Dead Volume	
			Phase II Ground	VDYP7 Phase I Inventory	VDYP7 volume with Phase II attributes as input	Model-related volume bias	Attribute-related volume bias	Total volume bias	Phase II Ground	Phase I Inventory
			A	B	C	A-C	C-B	A-B		
YSM (immature)		78	28.8	18.3	20.2	8.7	1.9	10.6	8.7	0.5
Volume Audit (mature)	Balsam	15	169.0	119.7	143.8	25.2	24.1	49.3	106.8	11.5
	Fir	40	163.1	169.1	145.1	18.1	-24.1	-6.0	34.1	5.6
	Other	12	360.6	262.1	298.7	61.9	36.5	98.5	62.8	13.6
	Pine	7	22.3	88.1	15.9	6.4	-72.1	-65.7	88.1	39.0
	Spruce	18	201.3	214.6	183.4	17.9	-31.2	-13.3	104.7	47.4
	Total	92	187.1	176.0	162.9	24.2	-13.1	11.1	67.3	18.2

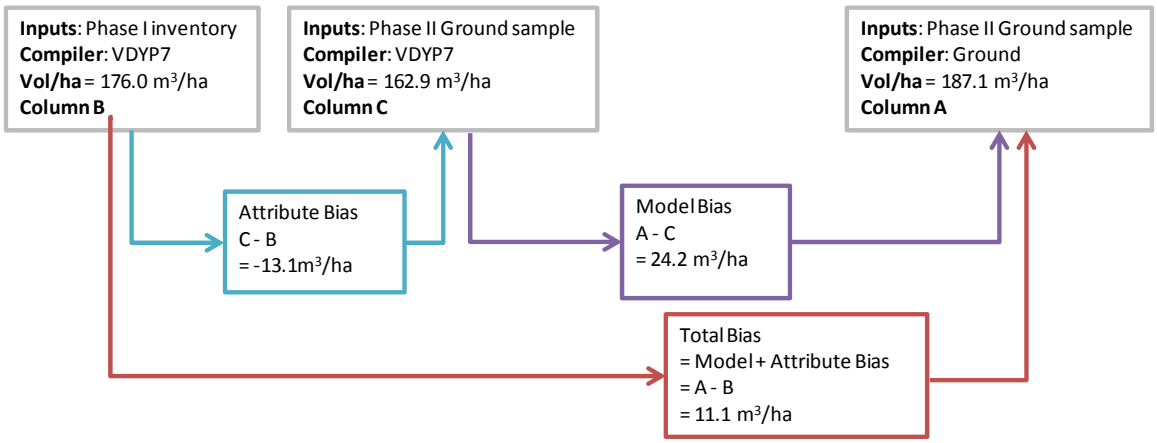

Figure 5. The relationship between the model and attribute components of total volume bias for the mature target population in the Williams Lake TSA (from Table 12). A negative bias indicates Phase I overestimation whereas a positive bias indicates underestimation.

Table 13. Ratios of mean volumes (12.5cm+ DBH net Dwb) representing total, model and attribute bias, with associated sampling error (expressed as a % of the mean bias) at a 95% confidence level.

			Ratio of Weighted Mean Volume/ha net dwb at 12.5cm+ DBH (and sampling error at a 95% confidence level)		
			Total bias: Ground/Inventory	Model bias: Ground/VDYP7 (ground attributes)	Attribute bias: VDYP7 (Ground attributes)/Inventory
Stratum		N	(Table 12 A/B)	(Table 12 A/C)	(Table 12 C/B)
YSM (immature)		78	1.577 (±28.6%)	1.43 (±14.6%)	1.103 (±22.7%)
Volume Audit (mature)	Balsam	15	1.412 (±19%)	1.175 (±4.7%)	1.201 (±12.9%)
	Fir	40	0.965 (±12.7%)	1.124 (±3.8%)	0.858 (±10.7%)
	Other	12	1.376 (±18.3%)	1.207 (±5.6%)	1.139 (±12.9%)
	Pine	7	0.254 (±8.2%)	1.402 (±61.1%)	0.181 (±5%)
	Spruce	18	0.938 (±9.1%)	1.097 (±3%)	0.855 (±8.3%)
	Total	92	1.063 (±8.1%)	1.149 (±2.4%)	0.925 (±6.3%)

5.4 Leading species comparison

Table 14 and Table 15 summarize the agreement between the leading species in the Phase I inventory and the leading species from the Phase II ground sample compilation for the sampled polygons. For the YSM population, 50 out of 78 (64%) of the samples were correctly classified and for the Volume audit, 73 out of 92 (79%) were correctly classified. This agreement is quite high.

Table 14. The Phase II ground vs. Phase I inventory leading species cross-tabulation for the YSM (Immature) target population in the Williams Lake TSA. The shaded cells are correct classifications. The overall correct classification rate is 64%.

Phase I Inventory leading spp	YSM (Immature) Phase II Ground Leading Species @ 4cm DBH utilization									Total	% agreement
	None	A	B	C	E	F	H	P	S		
A								6	1	7	0%
B			1	1						2	50%
C				2					1	3	67%
E										0	0%
F					1	4		1		6	67%
H										0	0%
P	3	2				3		42	3	53	79%
S			4					2	1	7	14%
Total	3	2	5	3	1	7	0	51	6	78	
% agreement	0%	0%	20%	67%	0%	57%	0%	82%	17%	100%	64%

Table 15. The Phase II ground vs. Phase I inventory leading species cross-tabulation for the Volume Audit (mature) target population in the Williams Lake TSA. The shaded cells are correct classifications. The overall correct classification rate is 79%.

Phase I Inventory leading spp	Volume Audit (mature) Phase II Ground Leading Species @ 4cm DBH utilization									Total	% Agreement
	None	A	B	C	E	F	H	P	S		
A		4				1			3	8	50%
B			13						2	15	87%
C				3						3	100%
E										0	0%
F	2			2		35			1	40	88%
H							1			1	100%
P								7		7	100%
S			3	1		4			10	18	56%
Total	2	4	16	6	0	40	1	7	16	92	
% agreement	0%	100%	81%	50%	0%	88%	100%	100%	63%	100%	79%

5.5 Limitations of the approach

Attribute definitions in young stands – Some of the Phase I attributes for young stands are obtained from silvicultural records and may have different definition and standards of data collection. In particular, although height and age may have been measured in the field, site index for young stands is usually estimated from SIBEC or from the previous stand.

Utilization limit in young stands – The Phase I attributes do not have utilization limit. This can lead to the counterintuitive result where samples 211 - 214 all have a Phase I stems/ha of more than 3,000 yet the Phase I basal area is 0 m^2/ha. It is possible the trees are all shorter than 1.3m (an thus have no BA) but the Phase I height for samples 212-214 is ≥ 2.0m.

Sample unit – The Phase I sample unit is the polygon while the Phase II sample unit is a fixed area plot (YSM) or a cluster of 5-variable radius plots (Volume audit). In highly variable polygons (polygons with small openings, rock, multi-layered stands, mixes of immature and mature, etc.), a photo-interpreter may reflect this within-polygon variability in the Phase I attribute values that are assigned. However, the Phase II plot may not be as effective in capturing such variability.

VDYP7 – VDYP7 is used to project the Phase I attributes to the year of ground sampling. For very young stands, VDYP7 uses a module called VRIYoung which does not estimate the full suite of inventory attributes until the polygon meets the minimum criteria of breast height age ≥ 6 years, dominant height ≥ 6 m and basal area (7.5cm+ DBH) ≥2 m^2/ha. Hence VDYP7 may not be the most appropriate model for projecting young managed stands. In the timber supply analysis process, the table interpolation program for stand yields (TIPSY) is generally used instead of VDYP7 for estimating yields of young managed stands.

Net volume – VDYP7 and the Phase II ground compiler use different methods to reduce whole stem merchantable volume to volume net of decay, waste and breakage (DWB). Net factoring, in combination with the net volume adjustment factor (NVAF), is used in the ground compiler and is generally considered more accurate and precise. VDYP7 was developed from TSP and PSP data and net volumes were estimated using BEC-based loss factors. Any net volume estimation bias associated with the BEC-based loss factors is built into the VDYP7 model.

Sample sizes – The sample sizes for the leading species substrata within the volume audit (mature) population are small, resulting in estimates with high standard errors.

Target population - THLB – The target population for the volume audit (mature) stratum was the vegetated trees portion of the land base. The Timber Harvesting Land Base (THLB) is a subset of this area. If the THLB differs substantially from the larger population (e.g., more productive, less pine), the results may not be appropriate for the THLB.

6. Conclusions and recommendations

The results for the Volume Audit (mature) portion of the inventory are good, particularly for age, height, basal area and volume. This may be due in part to the relatively recent aerial photography and ground sampling. The results for the pine substrata (the largest substrata with 40 samples) are also good. The results for the remaining substrata (Balsam, Other, Pine and Spruce) are more variable and should be used with caution. The model- and attribute-related volume bias generally compensate somewhat for one another, resulting in an overall low total volume bias.

The agreement between the Phase I and Phase II leading species is 64% for the YSM (immature) stratum and 79% for the Volume Audit (mature) stratum. This is also good.

The results for the YSM portion of the TSA generally show Phase I underestimation of basal area, height and volume. The 12.5cm utilization level for volume results in very low volumes for the YSM samples. A separate YSM analysis was conducted (available from FAIB at: http://www.for.gov.bc.ca/hts/vri/monitoring/monitoring.html) and includes a more detailed volume analysis including comparisons to TIPSY and Timber Supply Review yield curves.

The Phase I primary layer was compared to layers 1 and 2 combined. In this TSA, the differences between the primary and combined layers were small and of little practical importance for basal area and volume. However, multi-layer polygons are expected to be more variable. Identifying multi-layer polygons in the VRI analysis may help explain some of the differences between the ground and inventory, particularly for age and height.

The Phase II (ground) estimates of SI are lower higher than those in the PSPL. Some of the trees assessed for SI sampling are quite old. It is recommended that FAIB revisit the SI tree selection criteria used by the ground sampling crews.

7. Literature cited

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8. Appendix A: Phase I inventory attributes

Table 16. The Phase I inventory projected attributes are given.

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
YSM	4676	200	8569284	ESSF	V	40	2009	36	6.9	27	6	60	1.0	1928		0	PL	80	SE	20									
YSM	4676	201	8563473	ICH	V	38	2009	40	14.3	40	14.5	55	18.5	1110	12.7	61	PL	50	FD	20	SX	20	CW	10					1
YSM	4676	202	6604708	SBPS	F	10.1	1996	20	3.4			4	0.0	3456		0	PL	60	AT	40									
YSM	4676	203	8315929	ICH	V	35.4	2009	37	13.6	37	14.3	55	31.7	2448	11.3	64	FD	68	SX	19	AC	9	PL	2	AT	2			0
YSM	4676	204	5910058	SBPS	F	169.7	1999	22	3.9			5	0.0	25851		0	PL	100											
YSM	4676	205	6180112	IDF	F	515	1995	22	3.9			2	0.0	6623		0	PL	70	AT	30									
YSM	4676	206	6265093	SBPS	F	35.2	1995	46	9			3	6.1	631	8.3	6	PL	80	FD	20									0
YSM	4676	207	8655824	IDF	V	49.1	2010	23	6	23	6	20	5.0	500		0	AT	40	PL	40	FD	20							
YSM	4676	208	8730953	IDF	V	51	1996	40	16.9	40	14.5	40	20.1	1419	14.5	58	PLI	95	FD	5									9
YSM	4676	209	4336921	ESSF	F	314.2	1981	49	9.5			10	4.9	516	8.8	4	PL	100											
YSM	4676	210	4356026	MS	F	103.5	1990	33	1.9			30	0.0	0		0	PL	100											
YSM	4676	211	2073662	MS	F	36.8	1995	20	0.1			11	0.0	7439		0	PL	100											
YSM	4676	212	6358629	SBPS	I	117.8	1995	21	1.3			10	0.0	3208		0	PLI	100											
YSM	4676	213	8671995	SBPS	I	104.6	2010	16	2.7			16	0.0	8817		0	PLI	100											
YSM	4676	214	6350686	SBPS	F	147.6	1997	19	3.2			6	0.0	7745		0	PL	100											
YSM	4676	215	2123593	SBPS	F	658.2	1981	47	2.7			70	0.0	0		0	PL	100											
YSM	4676	216	2116625	SBPS	F	22.4	1999	44	13.7			27	14.1	1270	11.9	36	PL	90	S	10									
YSM	4676	217	6645226	SBPS	F	15.8	1994	25	5.7			20	0.0	2944		0	AT	60	PL	40									
YSM	4676	218	7626898	SBPS	F	200.8	1994	23	5.3			5	0.0	6305		0	AT	55	PL	45									
YSM	4676	219	9260579	IDF	V	40.4	1999	24	6.6	24	5.4	10	5.0	2364		0	AT	60	PL	30	FD	5	S	5					
YSM	4676	220	8774620	SBPS	V	63.3	2010	24	4.7	24	10	25	3.0	1800		0	PL	80	AT	10	SX	10							
YSM	4676	221	9254761	SBPS	V	90.7	2005	28	4.5			60	5.0	8676		0	PLI	100											
YSM	4676	222	8653234	IDF	I	16.4	2010	33	10.8	33	11.2	45	13.8	1876	9.9	8	AT	55	FD	35	PL	10							0
YSM	4676	223	8731496	IDF	I	148.7	1998	25	4.6			45	3.0	5492		0	PLI	100											
YSM	4676	224	8987857	SBPS	F	84.1	1996	19	5.3			10	0.0	4806		0	PL	100											
YSM	4676	225	8755376	IDF	V	67.9	2010	43	11.9	68	17.9	50	20.6	954	11.2	56	FD	75	SX	15	AT	10							
YSM	4676	226	8869325	IDF	I	59.9	2011	42	12.6			4	14.0	1152	10.2	25	FDI	100											

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
YSM	4676	227	8563612	ICH	V	3.6	2009	39	14.1	39	14.6	50	15.9	1940	11.9	21	SX	50	FD	40	BL	10							
YSM	4676	228	8572874	ESSF	V	24	2009	34	4.9	34	4.7	20	1.0	800		0	SE	60	PL	30	BL	10							
YSM	4676	229	8561890	ICH	V	13.8	2009	19	12	19	11	35	10.0	800		0	SX	80	CW	10	AC	10							
YSM	4676	230	8562034	ICH	V	24.6	2009	49	20.7	49	22	55	34.8	1255	18.1	192	BL	60	SX	30	CW	5	AC	5					
YSM	4676	231	8843040	SBS	V	2.8	2009	44	22.3	34	10	50	14.4	560	18.3	61	AC	70	SX	20	AT	10							0
YSM	4676	232	8324324	ICH	V	15.1	2009	27	6	27	12	40	5.0	2300		0	SX	60	PL	30	CW	10							
YSM	4676	233	8320870	ESSF	V	147.7	2009	24	8.2	24	3.5	15	3.3	419	6.0	1	PL	60	SX	40									0
YSM	4676	234	8316509	ICH	V	3.8	2009	36	12.3	36	13.3	60	13.5	477	11.8	13	PL	70	SX	20	FD	10							17
YSM	4676	235	9256459	ICH	V	14.7	2009	34	13.6	34	14.9	60	18.9	1348	12.2	42	PL	70	SE	10	AC	10	CW	10					5
YSM	4676	236	8289717	ICH	V	65.6	2009	49	12.2	49	12.2	75	19.7	1456	13.3	65	CW	40	HW	30	SX	20	FD	5	BL	5			
YSM	4676	237	8315707	ICH	V	49.7	2009	39	12.5	39	13.6	70	46.8	1896	11.0	138	CW	70	HW	20	SX	10							
YSM	4676	238	6570484	SBPS	F	5.8	1998	26	9			40	5.4	347	8.5	2	PL	100											2
YSM	4676	239	8557342	ICH	V	74.3	2009	34	15.2	34	16.6	60	39.1	2879	12.4	104	SX	70	AC	30									
YSM	4676	240	8692744	ICH	V	7.4	2009	49	18.4	49	16.9	75	33.8	1535	15.2	137	FD	50	EP	30	SX	15	CW	5					
YSM	4676	241	4344755	SBPS	I	14.7	1998	22	5.7			10	0.0	8040		0	PLI	100											
YSM	4676	242	9430245	ESSF	V	138.2	2009	29	7	29	9	55	5.0	850		0	BL	80	SE	20									
YSM	4676	243	9251708	IDF	V	59	2010	43	7.5			45	2.9	378	7.1	2	PL	100											0
YSM	4676	244	2130382	SBPS	F	307.6	1989	44	2.5			50	0.0	0		0	PL	100											
YSM	4676	245	6332546	SBPS	F	4.5	1987	41	8			10	3.8	463	7.5	3	PL	90	AT	10									
YSM	4676	246	9056454	SBPS	I	283.7	1993	26	5.2			15	0.0	2157		0	PLI	90	AT	10									
YSM	4676	247	8716312	SBPS	I	74.6	2010	28	4	28	5.7	35	3.0	1900		0	SW	70	PL	30									
YSM	4676	248	7622211	MS	I	70.8	2004	20	6.5			8	0.0	5954		0	PLI	100											
YSM	4676	249	2065067	IDF	F	174.5	1989	34	10.5			20	8.4	849	9.4	11	PL	90	AT	10									
YSM	4676	250	8680189	SBPS	F	114.6	1999	18	5			1	0.0	5231		0	PL	100											
YSM	4676	251	2123655	SBPS	F	18.4	1989	44	3			40	0.0	0		0	PL	100											
YSM	4676	252	2109136	MS	F	441.5	1981	47	9.2			50	5.1	550	8.5	5	PL	100											0
YSM	4676	253	7618273	SBPS	V	50.7	1999	21	3.1	19	3.8	30	1.0	1198		0	PL	90	AT	10									
YSM	4676	254	5920992	IDF	I	52.5	2006	24	3.2			14	0.0	784		0	PLI	100											
YSM	4676	255	2110015	SBPS	F	24.5	1989	49	4			20	0.0	0		0	PL	100											
YSM	4676	256	2332547	SBPS	F	75.7	1994	25	4.6			20	0.0	6153		0	PL	100											

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
YSM	4676	257	6389898	IDF	F	52.9	1988	46	13.8			1	13.2	961	12.3	36	PL	80	AT	20									1
YSM	4676	258	7620531	SBPS	I	30.2	2009	17	3.4			7	0.0	4037		0	PLI	100											
YSM	4676	259	8988017	MS	I	46.8	2003	17	2.4			5	0.0	2243		0	PL	50	SX	30	BL	20							
YSM	4676	260	2111409	ESSF	F	28.4	1994	21	3.6			10	0.0	1127		0	PL	90	S	10									
YSM	4676	261	9261641	SBPS	I	79.1	2008	22	4.9	22	6	27	0.0	6224		0	PLI	90	AT	10									
YSM	4676	262	6252046	SBPS	F	117.5	1993	26	4.8			5	0.0	2222		0	PL	90	AT	10									
YSM	4676	263	9250360	IDF	V	58.6	1999	27	5.7	27	6.9	10	0.0	477		0	FD	50	PL	50									
YSM	4676	264	6279599	IDF	F	5.6	1988	40	7.8			40	3.9	89	7.6	0	PL	100											2
YSM	4676	265	7623628	IDF	F	61.2	1994	26	4.8			14	0.0	10475		0	PL	100											
YSM	4676	266	8658138	SBPS	I	40	2008	24	5.4			26	0.0	7520		0	PLI	100											
YSM	4676	267	8991998	SBPS	V	76.4	2010	23	6			30	4.0	1915		0	PL	100											
YSM	4676	268	8728301	MS	I	105.8	2010	23	6	23	4	50	7.0	2881		0	PLI	80	SX	20									
YSM	4676	269	8728140	MS	V	21	2004	27	7.3			60	4.0	4433		0	PLI	100											
YSM	4676	270	6365382	MS	F	8.8	1997	18	3			1	0.0	4067		0	PL	100											
YSM	4676	271	8773555	IDF	V	38.9	2010	33	7.8	43	14	30	3.6	439	8.6	2	PL	70	FD	20	SX	10							0
YSM	4676	272	8866092	SBS	V	3.2	2009	39	17.3	32	14.9	60	29.1	1494	15.6	106	AT	45	EP	25	FDI	15	SX	10	BL	5			
YSM	4676	274	8571261	ESSF	V	31.7	2009	35	14.1	74	13.8	55	25.4	2013	11.3	63	SX	76	BL	20	AC	4							
YSM	4676	275	8568868	ICH	V	88.1	2009	22	15	22	16	35	20.0	800		0	CW	50	FD	20	SX	10	EP	10	BL	10			
YSM	4676	276	8975507	SBPS	V	54.5	2009	17	5.2	17	7	30	0.0	1200		0	PLI	90	AT	10									
YSM	4676	277	8321485	ICH	V	41	2010	47	19	49	14.8	40	25.2	1787	15.7	105	PL	83	FD	17									
YSM	4676	278	8321162	ESSF	V	8.7	2009	34	10.4	34	11.1	85	34.7	5967	9.0	0	FDI	40	SX	30	BL	20	EP	10					
Balsam	9663	52	8317922	ESSF	V	133.2	2009	64	9.8	64	15.2	20	5.1	302	9.6	12	BL	90	SE	10									
Balsam	9663	53	8319734	ESSF	V	66.8	2009	134	21.5			15	5.4	203	20.0	30	BL	100											
Balsam	9140	57	8325450	ESSF	V	26.1	2009	184	22.3	234	25.1	35	18.1	402	21.5	116	BL	70	SE	30									17
Balsam	9140	58	8338130	ESSF	V	33.5	2009	194	18.3	234	23.1	25	11.1	302	18.6	57	BL	60	FD	20	SE	20							56
Balsam	8610	63	8338045	ESSF	V	30	2009	214	29.2	274	33.1	30	26.0	349	29.1	229	BL	60	SE	40									66
Balsam	8610	64	8572206	ESSF	V	5.8	2009	194	22.3	264	26.1	40	23.0	402	21.8	149	BL	70	SE	30									19
Balsam	8610	65	8317006	ESSF	V	78.2	2009	214	23.2	264	29.1	50	40.0	600	23.5	283	BL	60	SE	40									
Balsam	8610	66	8325774	ESSF	V	37.1	2009	234	21.2	194	18.2	40	25.0	499	18.2	132	BL	60	SE	40									
Balsam	8610	67	8338142	ESSF	V	14.4	2009	164	19.3	224	27.2	65	45.1	802	18.7	251	BL	75	SE	25									6

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
Balsam	9663	97	8338654	ESSF	V	34.7	2009	94	10.6	114	13.5	15	2.7	182	10.8	7	BL	60	SE	20	FD	15	HW	5					7
Balsam	9077	3181	8341907	ESSF	V	8.2	2009	114	18.5	134	21.4	50	26.1	399	16.9	129	BL	90	SE	10									
Balsam	9077	6296	8303907	ESSF	V	36.5	2009	164	17.3			60	30.4	706	14.1	122	BL	100											
Balsam	9077	6301	8315457	ESSF	V	66	2009	184	23.3	204	26.2	35	14.1	303	22.9	99	BL	70	SE	30									
Balsam	9077	6936	8313252	ESSF	V	212.7	2009	229	21.2	304	25.1	40	30.0	350	20.7	174	BL	75	SE	25									0
Balsam	9077	9406	8338887	ESSF	V	15.3	2009	154	14.4	184	18.2	45	12.5	553	14.2	49	BL	70	SE	30									4
Fir	9212	1	8709887	IDF	I	41	2010	83	18.5	63	15.5	50	17.8	603	16.0	81	FD	85	PL	15									4
Fir	9212	2	8732721	BG	V	8.2	2010	133	15.2			25	10.2	250	14.2	31	FD	100											
Fir	9212	3	8655006	IDF	V	28.6	2010	58	10.5	58	10.5	35	6.1	517	9.9	11	FD	55	PL	45									0
Fir	9212	4	8717971	IDF	I	57.1	2010	118	17.3	118	17.2	45	15.5	426	15.7	61	FD	90	PL	10									5
Fir	9212	5	8653572	IDF	V	4	2010	78	15.5	78	15.4	35	5.9	338	14.5	19	FD	75	AT	15	SX	10							1
Fir	9212	6	8652758	IDF	V	23.7	2010	303	32.1			15	16.0	174	30.7	118	FD	100											14
Fir	9212	7	8743425	BG	V	15.5	2010	153	16.2			55	19.1	548	14.1	62	FD	100											6
Fir	9212	8	9055446	IDF	V	22.1	2010	113	16.3			20	7.3	202	15.5	28	FD	100											49
Fir	9212	9	8740691	IDF	V	27.8	2010	93	16.3			35	18.6	597	14.0	66	FD	100											
Fir	9212	10	8757940	IDF	V	73.1	2010	58	16.7	58	17.6	45	19.3	557	15.3	81	FD	80	AT	15	PL	5							1
Fir	9112	11	8808405	IDF	V	167.2	2011	117	25.2			55	32.4	743	21.0	197	FDI	100											4
Fir	9112	12	8991726	IDF	V	645.8	2009	84	18.6			50	31.1	983	15.1	126	FDI	100											1
Fir	9112	13	8653000	IDF	V	17.1	2010	93	15.3	93	15.3	55	20.7	849	13.6	80	FD	65	PL	30	AT	5							0
Fir	9112	14	8733700	IDF	I	38	2010	65	18.7	53	15.6	45	26.2	396	16.8	117	FD	90	AT	10									
Fir	9112	15	8710088	IDF	V	3.3	2010	63	15.6			50	31.3	792	13.0	106	FD	100											
Fir	9112	16	8733271	IDF	I	76.6	2010	103	18.3			50	25.6	693	15.4	106	FD	100											
Fir	9112	17	8750749	IDF	V	37	2010	153	27.2	133	23.4	60	28.2	397	24.3	200	FD	98	SX	2									5
Fir	9112	18	8750909	IDF	V	157.9	2010	133	20.2			50	21.4	595	17.3	101	FD	100											8
Fir	9112	19	8787267	IDF	V	46.1	2010	113	21.3			55	29.6	493	18.6	153	FD	100											
Fir	9112	20	9288358	IDF	V	13.1	2010	183	32.2	163	29.3	50	25.1	308	29.6	223	FDI	80	SX	15	AT	5							
Fir	9112	21	9482716	IDF	V	8.9	2011	142	30.2	102	22.2	40	25.2	273	27.9	198	FDI	98	AT	2									
Fir	9112	22	8787875	IDF	V	99.7	2010	133	23.3			55	33.3	592	20.0	186	FD	100											
Fir	8967	23	8841806	SBS	V	18.7	2009	164	26.3	144	25.5	50	35.1	695	22.6	228	FDI	90	SX	10									3
Fir	8967	24	8809257	IDF	V	41.5	2009	154	28.3	124	24.6	55	40.1	730	24.4	318	FDI	60	SX	20	PLI	20							43

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
Fir	8967	25	8313324	ICH	V	52.8	2009	249	35.2	229	32.2	55	65.0	450	31.2	573	FD	70	SE	20	CW	5	PL	5					13
Fir	8967	26	8693060	ICH	V	15.5	2009	114	33.6	114	31.6	70	60.7	772	28.2	533	FD	50	SX	20	EP	20	AT	10					
Fir	8967	27	8563873	ICH	V	20.8	2009	184	38.3	184	35.2	50	40.0	397	34.1	411	FD	60	SX	20	BL	10	AC	5	AT	5			
Fir	8967	28	8333756	ICH	V	14.2	2009	124	29.5	124	28.5	55	50.8	537	25.9	364	FD	40	HW	30	SX	20	CW	10					7
Fir	8967	29	8709647	IDF	V	24.4	2010	153	25.2	153	27.3	50	44.8	494	24.1	310	FD	60	SX	35	AT	5							6
Fir	8967	30	8651747	IDF	V	18.2	2010	248	25.1	148	22.1	50	35.0	547		228	FD	75	PL	25									42
Fir	8967	31	8740655	IDF	V	24.2	2010	183	28.2			55	36.0	788	23.3	239	FD	100											
Fir	9077	31	9288919	IDF	V	53.7	2010	73	21.6	73	19.4	55	26.1	794	18.4	148	FDI	80	PLI	20									
Fir	8967	32	8740933	IDF	V	49.3	2011	140	28			65	40.2	960	22.6	270	FD	100											3
Fir	8967	33	9291607	IDF	V	8.5	2012	70	16.7			55	45.4	1884	12.9	149	FDI	100											2
Fir	8967	34	9288616	IDF	V	29.2	2010	183	32.2	143	28.3	50	35.0	430	28.8	293	FDI	90	SX	10									
Fir	9077	676	5763119	IDF	V	48.9	2005	58	11.5			35	12.1	890	9.5	21	FD	100											4
Fir	9077	3156	8864984	SBS	V	38.9	2009	74	16.5	64	15.7	45	26.5	597	14.3	101	FDI	95	AT	5									
Fir	9077	3791	8787004	IDF	V	44.8	2010	83	17.4	38	12.8	20	12.6	302		48	FD	80	AT	20									
Fir	9077	3796	8740657	IDF	V	70.8	2010	83	16.4			45	24.8	794	13.7	88	FD	100											
Fir	9077	6281	8567196	SBS	V	21.7	2009	134	34.5	134	32.3	15	13.1	158	33.2	130	FD	80	AT	20									4
Other	9077	41	8883861	SBS	V	32	2009	114	31.5	124	28.5	40	31.2	484	28.6	229	ACT	55	SX	20	AT	10	FDI	10	BL	5			1
Other	6944	69	8983045	SBS	V	12.8	2009	94	23.5	114	24.6	30	22.6	334	22.8	144	AT	50	SX	30	BL	10	PLI	10					129
Other	11865	70	8895839	IDF	V	15.9	2010	83	23.4	78	21.8	60	38.2	778	21.4	211	AT	80	SX	20									
Other	11865	71	8992550	IDF	V	36.8	2010	83	23.4	103	24.5	40	30.8	435	23.0	208	AT	50	SX	40	PL	10							24
Other	9707	72	8557977	ICH	V	42.4	2009	204	37.1	204	36.2	45	45.0	446	33.6	383	AC	50	SX	30	BL	20							
Other	9707	73	8317626	ICH	V	54.9	2009	404	34.2	244	24.2	70	70.0	400	31.1	315	CW	80	HW	15	SX	5							
Other	9707	74	8336257	ICH	V	6.3	2009	184	27.3	234	30.3	55	50.2	397	27.7	245	HW	50	CW	50									
Other	9707	75	8337289	ICH	V	43.8	2009	304	38.2	304	36.1	60	75.4	399	35.2	404	CW	95	HW	5									
Other	6944	103	8655252	BG	V	10.4	2010	63	16.5	93	18.4	35	15.9	297	16.9	72	AT	60	FD	40									2
Other	9077	3171	8326828	ICH	V	11.6	2009	134	36.3	114	32.3	40	40.3	332	34.0	297	ACT	85	AT	15									
Other	9077	3176	8333600	ICH	V	23.1	2009	304	35.2	204	32.2	50	60.3	349	33.5	324	CW	85	HW	10	FD	5							19
Other	9077	9411	8339230	ICH	V	13.1	2009	114	29.4	134	32.4	55	36.0	439	28.3	252	AT	70	SX	10	FD	10	AC	10					17
Pine	9663	55	8729568	IDF	V	221.9	2010	73	13.4	193	21.1	10	3.5	283	13.6	10	PL	85	FD	10	AT	5							13
Pine	9663	56	8991983	SBPS	V	487.4	2010	73	16.4			35	8.7	316	15.5	53	PL	100											75

Strata	Sample weight	SAMPLE	FEATURE_ID	BEC	inventory standard	Polygon area (ha)	Reference year	Projected Age sp1	Projected Height sp1	Projected Age sp2	Projected Height sp2	Input CC%	Projected BA7.5	Projected TPH7.5	Lorey height (m)	Volume NWB 12.5 (m^3/ha)	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Dead Volume (m^3/ha)
Pine	9140	59	9259793	SBPS	V	28	2010	83	14.3	73	15.5	35	12.6	459	13.6	61	PL	90	FD	10									53
Pine	9140	60	8728376	SBPS	V	15.5	2010	73	11.3			65	15.1	1347	9.8	31	PL	100											1
Pine	9140	61	8981965	SBPS	V	608.4	2010	83	14.6			45	20.7	1398	12.5	78	PL	100											17
Pine	8610	62	8308863	SBS	V	4.2	2009	62	134	25.2	124	27.5	45.2	741	22.9	379	PL	95	SX	5									26
Pine	9077	661	8655171	IDF	V	153.8	2010	661	73	15.4	73	15.5	5.7	220	15.1	28	PL	60	FD	40									88
Spruce	9480	35	8975544	SBPS	V	20.6	2009	35	84	18.9	84	19.5	9.0	172	18.6	56	SX	60	PLI	30	AT	10							113
Spruce	9480	36	8289865	ESSF	V	36.9	2009	36	224	18.2	184	17.3	15.0	400	16.8	78	SE	55	BL	40	PL	5							
Spruce	9480	37	8871455	SBS	V	4.1	2009	37	129	20.6			15.2	248	19.2	86	SX	100											
Spruce	9480	38	8679390	ICH	V	9.1	2009	38	104	8.3	104	12.5	1.9	257	8.3	1	SB	90	BL	10									
Spruce	8598	39	8872046	SBPS	V	16	2009	39	129	26.5	94	23.4	30.4	293	24.4	225	SX	70	PLI	20	AT	10							269
Spruce	8598	40	8847268	SBS	V	8.9	2009	40	129	27.5	104	25.4	35.4	489	25.0	271	SX	70	AT	20	PLI	10							111
Spruce	8598	41	8937129	SBS	V	64.3	2011	41	152	33.2	62	20.4	33.9	395	27.2	260	SX	60	EP	30	AT	10							164
Spruce	8598	42	8850257	SBS	V	12.4	2009	42	64	17.2	64	15.7	27.2	909	15.3	121	SX	60	AT	20	ACT	10	PLI	10					13
Spruce	8598	43	5761387	IDF	V	11.5	2005	43	64	20.6	71	17.5	29.8	1017	16.7	157	SW	67	FD	33									108
Spruce	8598	44	8776335	SBPS	V	30.2	2010	44	103	23.5	83	16.3	30.7	643	19.7	190	SX	70	PL	20	AT	10							15
Spruce	8586	45	8808272	IDF	V	6.1	2009	45	144	24.5	184	30.2	45.3	1020	23.0	313	SX	60	FDI	25	AT	15							3
Spruce	8586	46	8986898	SBS	V	30.6	2009	46	124	26.5	84	24.6	50.5	1167	23.1	350	SX	50	AT	25	FDI	15	EP	10					1
Spruce	9077	46	8843250	SBS	V	19.6	2009	46	124	25.6	119	28.5	35.3	632	23.5	254	SX	70	FDI	20	AT	5	BL	5					2
Spruce	8586	47	9256796	SBS	V	56.5	2011	47	82	23.5	92	25.2	38.6	591	21.9	259	SX	70	AT	20	ACT	10							2
Spruce	8586	48	9473996	ICH	V	58.7	2009	48	229	29.2	229	30.3	44.9	448	27.1	331	SE	65	CW	20	BL	10	FD	5					11
Spruce	8586	49	8289716	ESSF	V	22.7	2009	49	304	27.1	229	23.2	45.0	499	23.2	317	SE	55	BL	45									
Spruce	8586	50	8317574	ESSF	V	70.7	2009	50	124	34.4	124	30.6	40.0	191	30.7	317	SX	52	CW	24	BL	24							
Spruce	8586	51	8325482	ESSF	V	19.1	2009	51	234	32.1	204	29.2	38.0	399	29.0	342	SE	70	BL	30									51

9. Appendix B: Phase II compiled ground attributes

Table 17. The Phase II compiled ground attributes are given.

Strata1	Strata2	Sample	Species composition At DBH ≥ 4.0 cm	Basal area (m^2/ha) DBH ≥ 7.5 cm	Trees/ha DBH ≥ 7.5 cm	Lorey height (m) DBH ≥ 7.5 cm	Live volume net DWB (m^3/ha) DBH ≥ 12.5 cm
YSM	YSM	200	Se 98 Pl 02	14.9	1651	7.6	8
YSM	YSM	201	Pl 94 Cw 06	7.3	575	11.2	21
YSM	YSM	202	Pl 63 At 31 Sx 06	6.5	751	5.5	13
YSM	YSM	203	Fd 49 Sx 42 Pl 07 Bl 02	23.0	1351	9.9	72
YSM	YSM	204	Pl 100	1.6	325	4.0	0
YSM	YSM	205	Pl 100	0.4	50	3.5	0
YSM	YSM	206	Pl 100	10.6	776	7.5	23
YSM	YSM	207	Pl 100	0.4	25	4.7	1
YSM	YSM	208	Fd 86 Pl 14	6.7	425	6.9	15
YSM	YSM	209	Pl 100	25.6	1376	11.5	91
YSM	YSM	210	Pl 100	10.4	1176	7.9	8
YSM	YSM	211		0.0	0	3.7	0
YSM	YSM	212		0.0	0		0
YSM	YSM	213		0.0	0	3.2	0
YSM	YSM	214		0.0	0	3.3	0
YSM	YSM	215	Pl 100	1.1	150	10.0	0
YSM	YSM	216	Pl 97 Fd 03	17.8	1626	9.2	27
YSM	YSM	217	Pl 86 At 14	1.3	175	5.4	0
YSM	YSM	218	Pl 100	0.2	25	3.4	0
YSM	YSM	219	Pl 100	1.5	175	4.3	0
YSM	YSM	220	Pl 100	2.2	250	4.7	1
YSM	YSM	221	Pl 100	0.6	125	4.3	0
YSM	YSM	222	Pl 100	0.2	25	4.5	0
YSM	YSM	223	Pl 100	4.6	600	4.9	1
YSM	YSM	224		0.0	0	3.3	0
YSM	YSM	225	Fd 77 Sx 15 Pl 08	27.8	1276	10.5	122
YSM	YSM	226	Fd 100	3.2	50	19.7	21
YSM	YSM	227	Bl 59 Fd 22 Sx 17 Ac 01 Pl 01	27.6	1976	6.9	73
YSM	YSM	228	Bl 93 Se 07	2.4	275	6.5	4
YSM	YSM	229	Sx 49 Cw 37 Bl 14	6.9	275	9.9	25
YSM	YSM	230	Bl 38 Cw 37 Pl 11 Sx 07 Ac 07	37.7	1451	11.7	186
YSM	YSM	231	Sx 96 Ep 03 Bl 01	14.1	325	14.5	102
YSM	YSM	232	Pl 51 Sx 39 Ac 08 Cw 02	24.6	1501	9.9	80
YSM	YSM	233	Pl 89 Sx 11	7.9	776	6.6	6
YSM	YSM	234	Pl 52 Sx 48	18.9	1551	10.1	59
YSM	YSM	235	Sx 42 Cw 20 Pl 19 Fd 09 Bl 08 At 01	17.8	1151	10.8	54
YSM	YSM	236	Cw 57 Sx 18 Hw 17 Fd 04 Bl 04	34.1	2327	9.4	111
YSM	YSM	237	Cw 34 Hw 32 Ep 15 Sx 14 Ac 05	26.6	1576	10.6	87
YSM	YSM	238	Pl 100	6.0	700	6.5	3
YSM	YSM	239	Bl 60 Sx 26 Cw 14	32.7	1876	11.7	127
YSM	YSM	240	Fd 46 Ep 43 Sx 08 Bl 01 Hw 02	23.5	1326	10.3	98
YSM	YSM	241		0.0	0	2.7	0
YSM	YSM	242	Bl 79 Se 21	26.5	1976	9.1	61
YSM	YSM	243	Pl 100	19.3	2477	12.2	16
YSM	YSM	244		0.0	0	4.9	0

Strata1	Strata2	Sample	Species composition At DBH ≥ 4.0 cm	Basal area (m^2/ha) DBH ≥ 7.5 cm	Trees/ha DBH ≥ 7.5 cm	Lorey height (m) DBH ≥ 7.5 cm	Live volume net DWB (m^3/ha) DBH ≥ 12.5 cm
YSM	YSM	245	At 92 Sx 08	20.3	1576	12.1	50
YSM	YSM	246	Pl 100	2.2	300	4.7	0
YSM	YSM	247	Pl 100	4.9	525	5.4	3
YSM	YSM	248	Pl 100	0.9	150	3.3	0
YSM	YSM	249	Pl 92 At 08	10.7	1001	7.7	17
YSM	YSM	250	Pl 100	0.2	25	4.7	0
YSM	YSM	251	Pl 100	4.4	600	5.7	5
YSM	YSM	252	Pl 100	38.5	4703	9.6	28
YSM	YSM	253	Pl 42 At 42 Sx 16	6.7	675	8.0	9
YSM	YSM	254	Pl 56 Sx 44	1.4	150	7.0	3
YSM	YSM	255	Pl 84 At 16	18.3	1101	11.2	70
YSM	YSM	256	Pl 100	1.7	325	3.4	0
YSM	YSM	257	Fd 100	15.2	625	12.0	64
YSM	YSM	258		0.0	0		0
YSM	YSM	259		0.0	0	2.6	0
YSM	YSM	260	Pl 100	2.3	325	5.0	0
YSM	YSM	261	Pl 100	1.0	100	5.0	0
YSM	YSM	262	Pl 100	5.0	776	4.3	0
YSM	YSM	263	Pl 100	2.2	325	4.2	0
YSM	YSM	264	Pl 93 Sx 07	8.4	1251	6.8	4
YSM	YSM	265	At 61 Pl 39	5.6	350	6.2	13
YSM	YSM	266	Pl 100	1.9	325	4.2	0
YSM	YSM	267	Pl 78 Sx 22	1.1	175	4.6	0
YSM	YSM	268	Pl 79 Sx 18 Bl 03	7.5	951	6.1	4
YSM	YSM	269		0.0	0	3.1	0
YSM	YSM	270		0.0	0		0
YSM	YSM	271	Fd 67 Pl 26 At 07	3.3	525	6.2	1
YSM	YSM	272	Pl 36 Ac 28 At 24 Bl 11 Fd 01	26.4	1676	13.4	104
YSM	YSM	274	Bl 47 Pl 22 Sx 17 Ep 13 Ac 01	29.2	1801	11.1	95
YSM	YSM	275	Sx 25 Ep 21 Fd 19 Ac 16 Bl 12 Pl 06	15.0	1451	8.9	27
YSM	YSM	276	Pl 90 Sx 10	1.9	375	4.3	0
YSM	YSM	277	Pl 89 Fd 10 Cw 01	14.3	1651	11.2	15
YSM	YSM	278	Fd 55 Bl 34 Sx 07 Cw 04	60.5	3753	12.6	221
Audit	Balsam	52	Bl 100	2.1	200	3.0	5
Audit	Balsam	53	Bl 93 Se 07	28.0	564	24.2	201
Audit	Balsam	57	Bl 100	18.2	254	17.0	137
Audit	Balsam	58	Bl 45 Se 27 Hw 18 Pl 10	11.0	540	15.6	57
Audit	Balsam	63	Bl 79 Se 21	25.2	1263	15.4	146
Audit	Balsam	64	Bl 60 Se 40	27.0	932	21.7	184
Audit	Balsam	65	Se 82 Bl 18	39.6	269	29.1	459
Audit	Balsam	66	Bl 57 Se 43	25.2	362	22.8	246
Audit	Balsam	67	Se 53 Bl 47	34.2	527	26.8	285
Audit	Balsam	97	Bl 71 Hw 29	9.8	198	17.3	71
Audit	Balsam	3181	Bl 53 Se 47	36.1	225	21.7	294
Audit	Balsam	6296	Bl 100	38.3	525	11.7	184
Audit	Balsam	6301	Bl 100	26.1	976	8.5	95
Audit	Balsam	6936	Bl 88 Se 12	18.6	725	9.7	88
Audit	Balsam	9406	Bl 92 Se 08	24.9	951	10.7	124
Audit	Fir	1	Fd 100	19.8	538	22.3	135

Strata1	Strata2	Sample	Species composition At DBH ≥ 4.0 cm	Basal area (m^2/ha) DBH ≥ 7.5 cm	Trees/ha DBH ≥ 7.5 cm	Lorey height (m) DBH ≥ 7.5 cm	Live volume net DWB (m^3/ha) DBH ≥ 12.5 cm
Audit	Fir	2	Fd 100	22.4	288	19.4	152
Audit	Fir	3	Fd 100	12.0	502	8.6	58
Audit	Fir	4	Fd 89 Pl 11	18.0	1323	5.8	66
Audit	Fir	5	Fd 93 Sx 07	15.0	795	11.4	86
Audit	Fir	6	Fd 100	21.6	257	23.2	193
Audit	Fir	7	Fd 100	14.0	538	19.1	67
Audit	Fir	8	Fd 100	4.2	99	15.3	22
Audit	Fir	9	Fd 70 Pl 30	10.0	446	13.1	44
Audit	Fir	10	Fd 100	12.6	665	19.5	53
Audit	Fir	11	Fd 100	45.0	1337	20.7	270
Audit	Fir	12	Fd 92 At 08	36.4	2096	13.3	146
Audit	Fir	13	Fd 52 Sx 29 At 19	21.0	1129	13.6	82
Audit	Fir	14	Fd 100	23.8	885	17.1	171
Audit	Fir	15	Fd 100	33.6	1813	10.5	165
Audit	Fir	16	Fd 100	22.4	737	14.6	118
Audit	Fir	17	Fd 71 Sw 29	50.4	1578	26.6	366
Audit	Fir	18	Fd 100	7.2	184	14.1	41
Audit	Fir	19	Fd 100	20.0	331	19.8	139
Audit	Fir	20	At 38 Fd 38 Sx 24	29.4	572	24.9	223
Audit	Fir	21	Fd 100	16.8	274	28.5	141
Audit	Fir	22	Fd 93 Jr 07	19.6	1199	14.5	89
Audit	Fir	23	Fd 90 Pl 10	14.0	672	14.9	76
Audit	Fir	24	Fd 84 Sx 16	34.2	894	23.8	279
Audit	Fir	25	Cw 43 Fd 29 Sx 28	33.6	354	27.1	279
Audit	Fir	26	Fd 82 Bl 12 Ep 06	40.8	949	23.4	278
Audit	Fir	27	Sx 46 Bl 31 Ac 15 At 08	18.2	240	27.9	165
Audit	Fir	28	Cw 33 Hw 33 Fd 20 Sx 14	36.0	1085	23.5	211
Audit	Fir	29	Fd 73 Sx 23 At 04	30.8	1038	20.1	191
Audit	Fir	30		0.0	0		0
Audit	Fir	31	Fd 92 S 08	57.6	991	24.8	437
Audit	Fir	31	Fd 100	24.0	275	22.1	193
Audit	Fir	32	Fd 100	46.2	1388	25.1	308
Audit	Fir	33	Fd 86 At 10 Sx 04	29.4	1538	15.4	128
Audit	Fir	34	Fd 100	32.2	519	20.8	237
Audit	Fir	676	Fd 97 Pl 03	17.0	1051	10.8	52
Audit	Fir	3156	Fd 60 Sx 39 Bl 01	64.9	1151	23.7	654
Audit	Fir	3791		0.0	0		0
Audit	Fir	3796	Fd 98 Pl 02	18.6	1226	10.0	57
Audit	Fir	6281	Fd 74 Ac 23 Bl 03	18.4	75	15.8	173
Audit	Other	41	Ac 83 Sx 17	34.7	275	17.8	280
Audit	Other	69	At 67 Bl 33	4.2	93	15.9	30
Audit	Other	70	Sx 43 At 43 Fd 10 Pl 04	29.4	1140	22.2	214
Audit	Other	71	At 75 Sx 25	14.0	644	20.6	69
Audit	Other	72	Sx 44 Bl 26 Cw 19 Ac 07 Fd 04	48.6	1326	29.0	391
Audit	Other	73	Cw 67 Hw 33	96.0	1071	32.4	663
Audit	Other	74	Hw 68 Bl 11 Cw 11 Sx 05 Fd 05	57.0	968	29.5	478
Audit	Other	75	Cw 78 Hw 22	144.0	1025	29.5	832
Audit	Other	103	Fd 75 At 25	16.0	318	15.7	105
Audit	Other	3171	Ac 48 Cw 42 Sx 10	59.6	675	23.4	588

Strata1	Strata2	Sample	Species composition At DBH ≥ 4.0 cm	Basal area (m^2/ha) DBH ≥ 7.5 cm	Trees/ha DBH ≥ 7.5 cm	Lorey height (m) DBH ≥ 7.5 cm	Live volume net DWB (m^3/ha) DBH ≥ 12.5 cm
Audit	Other	3176	Cw 68 Hw 32	105.7	1126	16.1	462
Audit	Other	9411	Sx 48 At 20 Bl 16 Ac 15 Cw 01	19.5	350	14.4	149
Audit	Pine	55	Fd 50 Pl 50	2.0	61	15.5	12
Audit	Pine	56	Pl 100	5.0	236	18.5	27
Audit	Pine	59	Pl 71 Fd 29	7.0	729	12.5	17
Audit	Pine	60	Pl 100	30.8	3892	8.2	26
Audit	Pine	61	Pl 92 At 08	12.0	1145	13.9	21
Audit	Pine	62	Pl 83 Sx 17	8.4	387	17.0	51
Audit	Pine	661	Pl 83 Fd 17	2.8	300	7.7	4
Audit	Spruce	35	Sx 75 Pl 25	7.2	462	12.2	32
Audit	Spruce	36	Bl 100	19.6	313	10.1	165
Audit	Spruce	37	Sx 100	6.0	170	13.1	40
Audit	Spruce	38	Sx 73 Pl 27	5.7	380	6.0	19
Audit	Spruce	39	Sx 100	10.8	130	18.9	91
Audit	Spruce	40	Fd 84 Sx 16	45.6	431	35.5	473
Audit	Spruce	41	Sx 71 At 21 Ac 08	25.2	624	23.3	203
Audit	Spruce	42	Sx 62 At 24 Fd 14	29.4	625	22.5	205
Audit	Spruce	43	Sw 75 Fd 25	28.8	1020	18.4	181
Audit	Spruce	44	Sx 89 Pl 11	25.2	919	20.7	175
Audit	Spruce	45	Fd 65 Sx 24 At 11	30.6	814	21.4	211
Audit	Spruce	46	Fd 36 At 32 Sx 32	39.6	802	22.9	292
Audit	Spruce	46	Fd 50 Sx 34 At 09 Pl 07	21.5	375	16.7	160
Audit	Spruce	47	Sx 79 Fd 16 Pl 05	34.2	406	20.3	307
Audit	Spruce	48	Cw 68 Bl 14 Fd 09 Se 09	52.8	1063	26.3	315
Audit	Spruce	49	Bl 100	28.8	619	17.3	203
Audit	Spruce	50	Sx 60 Bl 40	36.0	392	25.1	377
Audit	Spruce	51	Bl 73 Se 27	27.0	424	21.7	232

10. Appendix C: Site index

Table 18. Site index (SI) estimates are given by species and source. The ground SI potentially includes old (> 120 years) trees.

		Ground		Phase I				PSPL							
	sample	Spp1	SI1	Spp1	Spp2	SI1	SI2	SX	HW	BL	CW	PL	FD	AT	EP
YSM	200	SE	22.4	PL	SE	10.9	22.7	26.4	18.3	19.4	18.4	24.6	24	17.9	
YSM	201	PL	16.4	PL	FD	18.4	20.3	20.8		20	16.4	23.7	22.9	19.1	18.6
YSM	202	PL	16.2	PL	AT	10.9		18.4				20.1			
YSM	203	FD	26.4	FD	SX	20.6	22.9	24.1	19.2	20.7	18	21	25.9	21.1	18.8
YSM	204	PL	14.6	PL		11.1		17.9				13.7			
YSM	205	PL	14.5	PL	AT	11.1		17.3				16.4	15.3		
YSM	206	PL	11.8	PL	FD	11.0		17.9				13.7			
YSM	207	PL	5.5	AT	PL	12.4	15.0					19.4	16.4		
YSM	208	FD	12.3	PLI	FD	21.0	20.3	16.9				16.4	15.3	14.1	
YSM	209	PL	14.3	PL		11.0		.		10		12.1			
YSM	210	PL	13.3	PL		4.2		16.9				16.2			
YSM	211	PL	14.5	PL				18.4		17.5		17.6			
YSM	212			PLI				17.9		.		13.7			
YSM	213	PL	8.3	PLI		12.0		17.9				13.7			
YSM	214	PL	9.0	PL		11.1		16.7				15			
YSM	215	PL	11.8	PL		4.1		17.9				13.7			
YSM	216	PL	12.8	PL	S	16.4		17.9				13.7			
YSM	217	PL	17.3	AT	PL	11.0		17.3				15			
YSM	218	PL	14.5	AT	PL	11.0		16.7				14.7			
YSM	219	PL	13.9	AT	PL	13.1	13.0	17.4				16.4	15.3	14.7	
YSM	220	PL	18.4	PL	AT	11.9	18.4	17.9				13.7			
YSM	221	PL	15.5	PLI		9.9	.	17.9				13.7			
YSM	222	PL	8.9	AT	FD	15.4	19.8	18.6				19.3	16.4	17.1	
YSM	223	PL	13.0	PLI		11.1		17.2				16.4	15.3	13.7	
YSM	224	PL	9.2	PL		15.9		18.4				17.6			
YSM	225	FD	14.4	FD	SX	16.2	16.0	19.1				19.6	17.1	16.9	19.5
YSM	226	FD	12.1	FDI		17.2		19.1				19.6	17.1	18.2	
YSM	227	BL		SX	FD	22.0	21.0	20.8		20	16.4	23.7	22.9	18.8	18.3
YSM	228	BL	20.5	SE	PL	14.1	8.5			9		17.3			
YSM	229	SX	24.5	SX	CW	39.0	28.4	22.7	19.9	21.3	17.6	22.5	24.3	20.5	17.8
YSM	230	CW	12.1	BL	SX	23.9	25.5	22.9	18.6	20.9	17.4	21	24	20.8	18.9
YSM	231	SX		AC	SX	25.0	19.2	20.5		21.1		21.1	21	20.7	19.2
YSM	232	PL	22.1	SX	PL	17.6	21.3	24.1	18	19.7	18	21	25.9	19.7	18.4
YSM	233	PL	18.7	PL	SX	17.9	14.1			12		19.5	19.6		
YSM	234	SX	21.7	PL	SX	17.5	22.9	20.8	.	20	16.4	23.7	22.9	19.2	18.8
YSM	235	SX	22.4	PL	SE	20.1	30.8	20.8	.	20	16.4	23.7	22.9	20.5	18.3
YSM	236	CW	8.7	CW	HW	15.0	14.9	24	19.9	21.3	18	21.1	25.7		18.4
YSM	237	CW	19.7	CW	HW	18.7	19.6	22.7	19.9	21.3	17.6	22.5	24.3	18.2	18.3
YSM	238	PL	15.7	PL		17.9		17.9				13.7			
YSM	239	BL	16.4	SX	AC	26.2	23.0	20.1		20.5	16.7	24	23.8	20.9	19.2
YSM	240	EP	18.7	FD	EP	21.2	17.7	22.7	19.9	21.3	17.6	22.5	24.3	20.8	19.5
YSM	241	PL	5.0	PLI		15.1		17.9				13.7			
YSM	242	BL	16.6	BL	SE	18.7	26.8			17.6		17.1			
YSM	243	PL	10.3	PL		10.1		19.1				19.6	17.1	14.1	
YSM	244	PL	8.1	PL		4.1		17.9				13.7			
YSM	245	AT	11.5	PL	AT	11.0		17.9				13.7			
YSM	246	PL	12.6	PLI	AT	11.9		17.9				13.7			

		Ground		Phase	I			PSPL							
	sample	Spp1	SI1	Spp1	Spp2	SI1	SI2	SX	HW	BL	CW	PL	FD	AT	EP
YSM	247	PL	16.9	SW	PL	12.7	11.9	17.9				13.7			
YSM	248	PL	7.9	PLI		17.9		9.8				15			
YSM	249	PL	12.1	PL	AT	15.9						9	16.7		
YSM	250	PL	12.9	PL		16.1		17.9				13.7			
YSM	251	PL		PL		4.8		17.9				13.7			
YSM	252	PL	12.4	PL		11.1		16.9		15.8		16.2			
YSM	253	AT	16.2	PL	AT	9.9	9.9	17.9				13.7			
YSM	254	PL	17.1	PLI		9.0		17.1				16.4	15.3	13.4	
YSM	255	PL	16.1	PL		5.4		17.9				13.7			
YSM	256	PL		PL		11.1		15.1				15			
YSM	257	FD	13.7	PL	AT	16.0		17.9				16.4	15.3		
YSM	258			PLI		12.9		15.5				14.7			
YSM	259	PL	9.7	PL	SX	10.2		16.9		15.8		16.2			
YSM	260	PL	15.7	PL	S	10.9		12		12		15			
YSM	261	PL	19.2	PLI	AT	13.1	12.9	18.1				21			
YSM	262	PL	16.3	PL	AT	11.0		17.9				13.7			
YSM	263	PL	13.4	FD	PL	13.9	14.2	16.8				16.4	15.3	13.4	
YSM	264	PL	11.0	PL		11.0		17.3				16.4	15.3	15	
YSM	265	PL	12.0	PL		11.0		16.9				15	15	14.2	
YSM	266	PL	13.1	PLI		13.0		17.9				13.7			
YSM	267	PL	18.0	PL		15.0		17.9				13.7			
YSM	268	PL	14.7	PLI	SX	15.0	16.2	16.9		17.3		16.2			
YSM	269	PL	9.6	PLI		14.9		16.9		17.8		16.2			
YSM	270			PL		11.2		18.4		16		17.6			
YSM	271	FD	15.3	PL	FD	12.9	18.7	19.1				19.6	17.1	17.8	
YSM	272	PL	23.1	AT	EP	21.2	20.2	21		18.4		21.8	21		19.7
YSM	274	BL	23.1	SX	BL	24.0	11.9	.		19.5		19.8	19.5		
YSM	275	SX	21.9	CW	FD	30.8	40.8	20.8		20	16.4	23.7	22.9	18.4	18.7
YSM	276	PL	19.5	PLI	AT	18.0	18.0	21.6				20.3			
YSM	277	PL	15.8	PL	FD	21.0	17.4	19.5	18.2	20.3	15.9	23.2	21.6	20.3	17.9
YSM	278	FD	21.3	FDI	SX	17.8	21.0	19.5	16.7	20.3	15.9	23.2	21.6		
Balsam	52	BL	7.3	BL	SE	10.4	15.5			13.7					
Balsam	53	BL	6.3	BL		11.0				14.3					
Balsam	57	BL	7.3	BL	SE	8.6	9.5			14					
Balsam	58	BL	6.9	BL	FD	6.0	10.9			19.5		19.8	18.6		
Balsam	63	BL	10.0	BL	SE	12.7	13.6			20.1		18	18.8		
Balsam	64	BL	8.5	BL	SE	8.2	9.5			17.6		17.1			
Balsam	65	SE	11.4	BL	SE	8.0	11.3			17.6		17.1			
Balsam	66	BL	14.4	BL	SE	6.1	6.9			20.1		18	20		
Balsam	67	SE	7.7	BL	SE	7.7	11.0			15					
Balsam	97	BL	8.3	BL	SE	7.3	7.8			12		19.5	19.3		
Balsam	3181	BL	13.7	BL	SE	10.6	11.1			16.6		17.1			
Balsam	6296	BL	6.3	BL		6.7				12.3					
Balsam	6301	BL	6.5	BL	SE	9.3	10.9			13.8					
Balsam	6936	BL	7.5	BL	SE	6.3	8.4			15					
Balsam	9406	BL	8.9	BL	SE	5.7	7.2			15.5		17.1			
Fir	1	FD	11.8	FD	PL	14.4	14.5	19.1				19.6	17.1	14.6	
Fir	2	FD	10.2	FD		9.1							12.3		
Fir	3	FD	11.5	FD	PL	11.1	10.6	16.9				15.1	15	15.3	
Fir	4	FD	10.2	FD	PL	11.0	11.2	17.6				16.4	15.3	15	

		Ground		Phase	I			PSPL							
	sample	Spp1	SI1	Spp1	Spp2	SI1	SI2	SX	HW	BL	CW	PL	FD	AT	EP
Fir	5	FD	11.5	FD	AT	12.8	12.0	17.8				16.4	15.3	16.5	
Fir	6	FD	11.6	FD		14.3		17.8				16.4	15.3	16	
Fir	7	FD	11.6	FD		9.1							15		
Fir	8	FD	11.9	FD		10.7		18.6				18	16.9	17.5	
Fir	9	FD	13.3	FD		12.0		19.1				19.6	17.1	18.8	
Fir	10	FD	14.7	FD	AT	16.9	16.6	19.1				18.2	16.9	16.5	19.4
Fir	11	FD	13.6	FDI		16.0						21.1	16.4		20.1
Fir	12	FD	12.3	FDI		14.4		21.1				18	21.9	17.2	
Fir	13	FD	14.4	FD	PL	11.2	11.2	16.9				15	15	16.3	
Fir	14	FD	13.7	FD	AT	17.3	15.6					18.5	16.1	14.7	
Fir	15	FD	7.8	FD		15.0		16.8				18	16.9	14.9	
Fir	16	FD	12.8	FD		12.5						19.2	16.4	15.1	
Fir	17	FD	15.3	FD	SX	15.2	11.4	19.1				19.6	17.1	16.1	
Fir	18	FD	11.5	FD		12.0		19.1				19.6	17.1	15.6	
Fir	19	FD	13.1	FD		13.8						20.8	16.4		19
Fir	20	FD	12.3	FDI	SX	16.7	13.5	19.1				19.6	17.1	18.4	
Fir	21	FD	17.0	FDI	AT	17.4	15.4	19.1				19.6	17.1	18	19.5
Fir	22	FD	11.1	FD		13.9						21.2	15.3		19.6
Fir	23	FD	15.2	FDI	SX	14.2	12.0	19.9		18.6		19.9	19.1	19.3	18.9
Fir	24	FD	16.7	FDI	SX	15.7	13.1	19.1				19.6	17.1	17.5	
Fir	25	CW	19.2	FD	SE	16.6	13.9	25		23.2	17.5	21	21	21.5	18.6
Fir	26	FD	18.1	FD	SX	21.6	20.0	20.1		20.5	16.4	24	23.8	18.8	18.8
Fir	27	SX	15.6	FD	SX	20.0	17.5	25		23.2	17.2	21	21	18.9	18.9
Fir	28	CW	20.5	FD	HW	18.1	16.4	22.7	19.9	21.3	17.6	22.5	24.3	20.2	18.8
Fir	29	FD	16.2	FD	SX	14.1	12.6					18.3	15	15.7	
Fir	30			FD	PL	11.7	14.0	17				16.4	15.3	14.6	
Fir	31	FD	14.9	FD		14.6		17.8				18	16.9	16.4	
Fir	31	FD	14.5	FDI	PLI	18.3	16.6					21.2	15.3		19.3
Fir	32	FD	15.8	FD		16.3		20				20.6	20.1	19.4	
Fir	33	FD	15.8	FDI		14.8		19.1				19.6	17.1	16.5	
Fir	34	FD	14.2	FDI	SX	16.7	14.2	19.7				18	16.9	18	19.6
Fir	676	FD	12.6	FD		12.2		19.1				19.6	17.1	18.6	
Fir	3156	FD	19.4	FDI	AT	14.1	14.0	21		19.8		21	19.3	17.5	19
Fir	3791			FD	AT	13.7	16.3					20.3	15.1	18.1	
Fir	3796	FD	12.2	FD		12.9		19.1				19.6	17.1	18.9	
Fir	6281	FD	21.5	FD	AT	20.5	21.7	20		15		22.4	22.6	18.4	18.7
Other	41	AC	27.1	ACT	SX	20.1	16.2	21		20.8		21.8	21	20.5	19.2
Other	69	AT	15.9	AT	SX	17.2	14.1	18		15		18	18	17.8	
Other	70	SX	20.4	AT	SX	18.3	17.1	19.1				19.6	17.1	17.7	
Other	71	AT	15.1	AT	SX	18.3	15.4	19.1				19.6	17.1	17	
Other	72	SX	19.9	AC	SX	22.9	17.5	22.7	19.9	21.3	17.6	22.5	24.3	20.2	19.5
Other	73	CW	6.5	CW	HW	6.4	7.9	24.1	18.7	19.6	18	21	25.9	20.5	17.8
Other	74	HW	18.2	HW	CW	11.8	9.2	22.7	19.9	21.3	17.6	22.5	24.3	19	17.5
Other	75	CW	6.9	CW	HW	11.7	15.0	19.5	17.2	20.3	15.9	23.2	21.6	18.5	
Other	103	FD	15.7	AT	FD	14.7	13.4						15		
Other	3171	AC	29.6	ACT	AT	23.6	23.1	24.1		20.4	18	21	25.9	20.9	19.3
Other	3176	CW	4.2	CW	HW	9.5	14.5	22.7	19.9	21.3	17.6	22.5	24.3	18.7	18.4
Other	9411	SX	19.1	AT	SX	20.5	18.6	24.9	19.2	20	18.2	23.1	25.8	19.3	18.3
Pine	55	PL	9.8	PL	FD	11.3	10.7	16.8				16.4	15.3	15.7	
Pine	56	PL	10.5	PL		13.9		16.5				12.7	12		

		Ground		Phase	I			PSPL							
	sample	Spp1	SI1	Spp1	Spp2	SI1	SI2	SX	HW	BL	CW	PL	FD	AT	EP
Pine	59	PL	12.3	PL	FD	11.1	13.4	21.6				20.3			
Pine	60	PL	7.8	PL		9.6		15.1				15			
Pine	61	PL	11.1	PL		11.4		17.9				13.7			
Pine	62	PL	15.8	PL	SX	17.1	15.4	15		15.3		15	20.5		
Pine	661	PL	8.9	PL	FD	13.0	13.4	16.9				15.1	15	16.3	
Spruce	35	SX	11.8	SX	PLI	13.8	15.5	21				18			
Spruce	36	BL	10.0	SE	BL	6.3	5.9			17.6		17.1			
Spruce	37	SX	11.6	SX		9.9		17.7		18		17.7	19.35	19.45	
Spruce	38	SX	7.3	SB	BL	5.6	7.6	20.8		20	16.4	23.7	22.9	20.13	18.58
Spruce	39	SX	20.8	SX	PLI	14.1	18.0	21.6				20.3			
Spruce	40	FD	21.1	SX	AT	14.8	17.9	21		20.3		21.8	21	19.8	18.8
Spruce	41	SX	20.8	SX	EP	17.8	18.8	21		18.3		21.8	21	18.9	18.5
Spruce	42	SX	15.7	SX	AT	16.2	14.0	21		20		21.8	21	19.6	19.1
Spruce	43	SW	20.7	SW	FD	19.1	15.3	19.1				19.6	17.1	16.5	
Spruce	44	SX	10.9	SX	PL	14.5	12.8	15.4				15.4	12		
Spruce	45	FD	19.5	SX	FDI	11.3	15.7	19.1				19.6	17.1	18	19.5
Spruce	46	FD	21.9	SX	AT	14.5	19.2	21		20		21.8	21	19.9	18.9
Spruce	46	FD	25.3	SX	FDI	13.9	17.9	21		20.7		21.8	21	18.6	19
Spruce	47	SX	20.9	SX	AT	17.8	18.9	21		19.6		21.8	21	20.6	18.7
Spruce	48	CW	6.0	SE	CW	12.0	9.4	20.8		20	16.4	23.7	22.9	18.9	18.5
Spruce	49	BL	9.8	SE	BL	9.5	7.4			20		18.2			
Spruce	50	SX	26.5	SX	CW	21.5	16.7			19.5		19.8	19.6		
Spruce	51	BL	9.4	SE	BL	13.7	13.1			17.6		17.1			

11. Appendix D: Scatterplots to find potential outliers

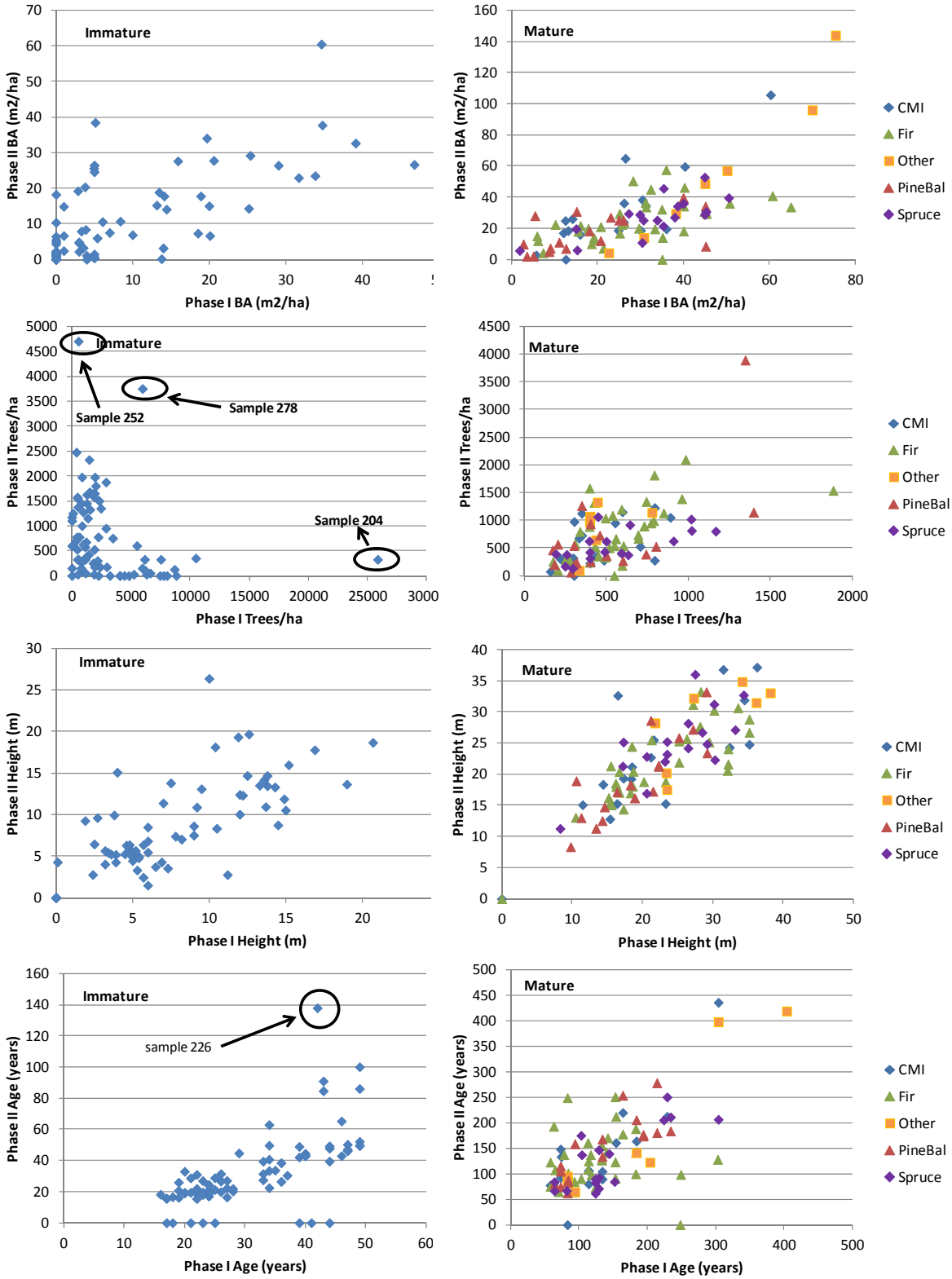

Figure 6. The Phase I inventory and Phase II Ground data are plotted for the seven attributes of interest. Potential outliers are identified. For sample 252, in Phase II there are 140 live trees on the plot with Dbh ≥

7.5, 24 of which had Dbh ≥ 12.5. Sample 226 has two live trees on the ground plot and these are potentially veteran trees (see section 4.3).

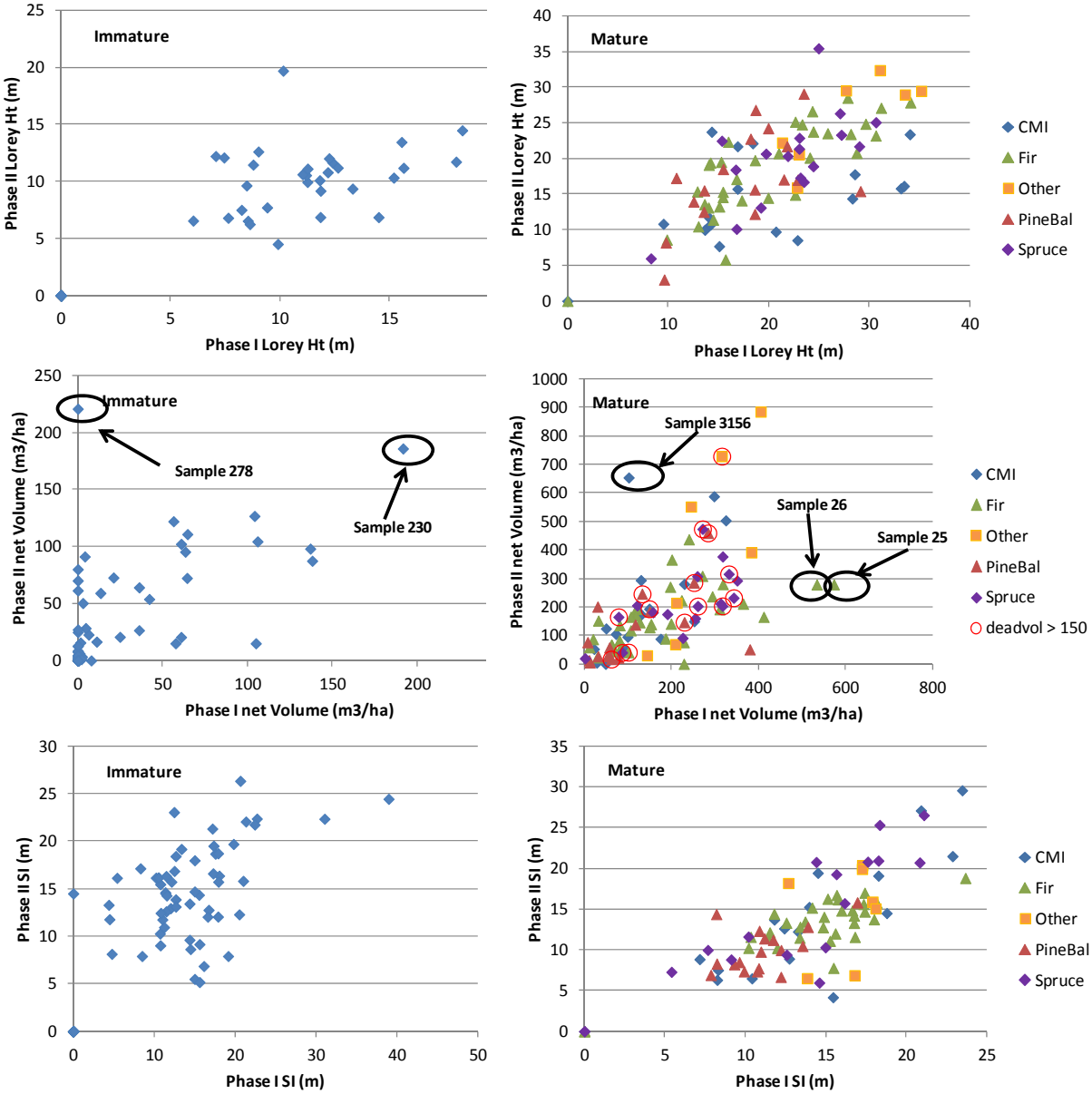

Figure 6 (cont.). In the mature volume graph, samples with more than 150 m^3/ha of dead gross volume are circled. Sample 278 has a Phase I photo BA of 34.7 m^2/ha but the trees are small with no net volume.

12. APPENDIX E: HEIGHT AND AGE MATCHING

The current standard for Phase II ground age and height is based on the average of the T, L, X and O trees. The five possible matching cases are as follows:

Case 1: Phase I leading species matches the Phase II leading species at the Sp0 level
Case 2: Phase I second species matches the Phase II leading species at the Sp0 level
Case 3: Phase I leading species matches the Phase II leading species on a conifer-to-conifer (or deciduous-to deciduous) basis
Case 4: Phase I second species matches the Phase II leading species on a conifer-to-conifer (or deciduous-to deciduous) basis
Case 5: No match

Table 19. The Sp0 groupings are given.

Sp0 Code	Species	Description
AC	AC	Poplar
AT	AT	Trembling Aspen
B	B, BA, BG, BL	Fir
C	CW	Western Red Cedar
D	DR	Alder
E	E, EA, EP	Birch
F	FD	Douglas Fir
H	H, HM, HW	Hemlock
L	L, LA, LT, LW	Larch
MB	MB	Broadleaf Maple
PA	PA, PF	Whitebark & Limber Pine
PL	PJ, PL	Lodgepole & Jack Pine
PW	PW	Western White Pine
PY	PY	Yellow Pine
S	S, SB, SE, SS, SW, SX	Spruce
Y	Y	Yellow Cedar

Table 20. The results of matching the Phase I inventory and Phase II ground heights and ages.

Mature	Strata	sample	Phase II (ground) leading species attributes					Phase I (Inventory)				
			Species @ 4cm DBH	Mean		Sample size		Leading species	Secondary species	Case of match	Age for match	Height for match
				Age[4]	Height[5]	Age[6]	Height[7]					
YSM	YSM	200	SE	27	8.5	4	3	PL	SE	2	27	6
YSM	YSM	201	PL	43	13.3	4	3	PL	FD	1	40	14.3
YSM	YSM	202	PL	20	5.5	4	2	PL	AT	1	20	3.4
YSM	YSM	203	FD	31	14.2	4	4	FD	SX	1	37	13.6
YSM	YSM	204	PL	22	5.2	4	3	PL		1	22	3.9
YSM	YSM	205	PL	19	4.3	5	5	PL	AT	1	22	3.9
YSM	YSM	206	PL	43	8.6	4	3	PL	FD	1	46	9
YSM	YSM	207	PL	20	1.5	3	2	AT	PL	2	23	6
YSM	YSM	208	FD	45	8.8	4	4	PLI	FD	2	40	14.5
YSM	YSM	209	PL	52	13.1	4	3	PL		1	49	9.5
YSM	YSM	210	PL	40	9.3	4	4	PL		1	33	1.9
YSM	YSM	211	PL	19	4.3	5	5	PL		1	20	0.1

[4] Age = age_tlxo
[5] Height = ht_tlxo
[6] Sample size for age = n_age_tlxo
[7] Sample size for height = n_ht_tlxo

Mature	Strata	sample	Phase II (ground) leading species attributes					Phase I (Inventory)				
			Species @ 4cm DBH	Mean Age[4]	Mean Height[5]	Sample size Age[6]	Sample size Height[7]	Leading species	Secondary species	Case of match	Age for match	Height for match
YSM	YSM	212				5	5	PLI		2		
YSM	YSM	213	PL	18	3.3	4	3	PLI		1	16	2.7
YSM	YSM	214	PL	21	4.0	5	5	PL		1	19	3.2
YSM	YSM	215	PL	47	9.6	3	3	PL		1	47	2.7
YSM	YSM	216	PL	48	11.0	3	4	PL	S	1	44	13.7
YSM	YSM	217	PL			4	3	AT	PL	2		
YSM	YSM	218	PL			4	2	AT	PL	2		
YSM	YSM	219	PL	25	5.0	4	2	AT	PL	2	24	5.4
YSM	YSM	220	PL	17	6.1	5	1	PL	AT	1	24	4.7
YSM	YSM	221	PL	20	5.3	5	3	PLI		1	28	4.5
YSM	YSM	222	PL	32	2.8	4	3	AT	FD	4	33	11.2
YSM	YSM	223	PL	29	6.3	5	4	PLI		1	25	4.6
YSM	YSM	224	PL	16	3.3	4	4	PL		1	19	5.3
YSM	YSM	225	FD	91	19.4	4	4	FD	SX	1	43	11.9
YSM	YSM	226	FD	138	19.7	2	2	FDI		1	42	12.6
YSM	YSM	227	BL	49		4	0	SX	FD	3	39	
YSM	YSM	228	BL	23	5.7	1	1	SE	PL	3	34	4.9
YSM	YSM	229	SX	26	10.1	2	2	SX	CW	1	19	12
YSM	YSM	230	CW	100	18.7	2	2	BL	SX	3	49	20.7
YSM	YSM	231	SX		26.4	0	1	AC	SX	2		10
YSM	YSM	232	PL	27	12.4	5	5	SX	PL	2	27	12
YSM	YSM	233	PL	21	7.1	4	2	PL	SX	1	24	8.2
YSM	YSM	234	SX	39	13.5	4	3	PL	SX	2	36	13.3
YSM	YSM	235	SX	34	11.9	4	4	PL	SE	2	34	14.9
YSM	YSM	236	CW	86	12.3	3	3	CW	HW	1	49	12.2
YSM	YSM	237	CW	42	14.7	3	3	CW	HW	1	39	12.5
YSM	YSM	238	PL	27	7.5	4	4	PL		1	26	9
YSM	YSM	239	BL	63	16.0	4	4	SX	AC	3	34	15.2
YSM	YSM	240	EP	50	17.8	4	4	FD	EP	2	49	16.9
YSM	YSM	241	PL	22	2.5	4	4	PLI		1	22	5.7
YSM	YSM	242	BL	45	11.4	4	3	BL	SE	1	29	7
YSM	YSM	243	PL	85	13.8	5	5	PL		1	43	7.5
YSM	YSM	244	PL	49	6.5	5	5	PL		1	44	2.5
YSM	YSM	245	AT			5	4	PL	AT	2		
YSM	YSM	246	PL	27	5.7	4	3	PLI	AT	1	26	5.2
YSM	YSM	247	PL	22	6.4	5	3	SW	PL	2	28	5.7
YSM	YSM	248	PL	33	3.7	4	3	PLI		1	20	6.5
YSM	YSM	249	PL	41	8.4	4	2	PL	AT	1	34	10.5
YSM	YSM	250	PL	17	4.5	4	5	PL		1	18	5
YSM	YSM	251	PL	40		4	0	PL		1	44	
YSM	YSM	252	PL	50	10.9	5	4	PL		1	47	9.2
YSM	YSM	253	AT	29	10.0	4	4	PL	AT	2	19	3.8
YSM	YSM	254	PL	19	5.7	3	3	PLI		1	24	3.2
YSM	YSM	255	PL	50	15.1	3	2	PL		1	49	4
YSM	YSM	256	PL	21		4	0	PL		1	25	
YSM	YSM	257	FD	65	14.7	5	4	PL	AT	3	46	13.8
YSM	YSM	258				1	1	PLI		2		
YSM	YSM	259	PL	16	2.8	5	5	PL	SX	1	17	2.4
YSM	YSM	260	PL	20	5.2	5	5	PL	S	1	21	3.6

Mature	Strata	sample	Phase II (ground) leading species attributes					Phase I (Inventory)				
			Species @ 4cm DBH	Mean Age[4]	Mean Height[5]	Sample size Age[6]	Sample size Height[7]	Leading species	Secondary species	Case of match	Age for match	Height for match
YSM	YSM	261	PL	16	5.1	4	2	PLI	AT	1	22	4.9
YSM	YSM	262	PL	20	5.4	5	2	PL	AT	1	26	4.8
YSM	YSM	263	PL	22	4.3	4	1	FD	PL	2	27	6.9
YSM	YSM	264	PL	43	7.4	4	3	PL		1	40	7.8
YSM	YSM	265	PL	32	6.4	5	4	PL		1	26	4.8
YSM	YSM	266	PL	24	4.8	4	3	PLI		1	24	5.4
YSM	YSM	267	PL	18	5.5	5	4	PL		1	23	6
YSM	YSM	268	PL	27	6.8	4	4	PLI	SX	1	23	6
YSM	YSM	269	PL	17	3.6	4	4	PLI		1	27	7.3
YSM	YSM	270				5	4	PL		2		
YSM	YSM	271	FD	28	6.1	4	4	PL	FD	2	43	14
YSM	YSM	272	PL			3	3	AT	EP	5		
YSM	YSM	274	BL	34	13.5	4	4	SX	BL	2	74	13.8
YSM	YSM	275	SX	31	10.6	2	2	CW	FD	3	22	15
YSM	YSM	276	PL	16	5.4	4	4	PLI	AT	1	17	5.2
YSM	YSM	277	PL	46	13.7	4	3	PL	FD	1	47	19
YSM	YSM	278	FD	50	18.2	4	2	FDI	SX	1	34	10.4
Audit	Balsam	52	BL	80	8.3	5	5	BL	SE	1	64	9.8
Audit	Balsam	53	BL	168	17.2	5	5	BL		1	134	21.5
Audit	Balsam	57	BL	206	21.4	5	5	BL	SE	1	184	22.3
Audit	Balsam	58	BL	174	18.3	5	5	BL	FD	1	194	18.3
Audit	Balsam	63	BL	181	23.4	5	5	BL	SE	1	214	29.2
Audit	Balsam	64	BL	177	21.2	5	5	BL	SE	1	194	22.3
Audit	Balsam	65	SE	278	33.2	5	5	BL	SE	2	264	29.1
Audit	Balsam	66	BL	184	28.6	5	5	BL	SE	1	234	21.2
Audit	Balsam	67	SE	254	27.2	5	5	BL	SE	2	224	27.2
Audit	Balsam	97	BL	159	18.9	5	5	BL	SE	1	94	10.6
Audit	Balsam	3181	BL	106	21.2	3	3	BL	SE	1	114	18.5
Audit	Balsam	6296	BL	220	19.3	5	5	BL		1	164	17.3
Audit	Balsam	6301	BL	164	15.3	4	3	BL	SE	1	184	23.3
Audit	Balsam	6936	BL	213	22.7	3	1	BL	SE	1	229	21.2
Audit	Balsam	9406	BL	161	18.4	3	2	BL	SE	1	154	14.4
Audit	Fir	1	FD	249	24.5	5	4	FD	PL	1	83	18.5
Audit	Fir	2	FD	127	16.2	5	5	FD		1	133	15.2
Audit	Fir	3	FD	75	13.0	5	5	FD	PL	1	58	10.5
Audit	Fir	4	FD	98	14.4	5	3	FD	PL	1	118	17.3
Audit	Fir	5	FD	137	21.3	4	4	FD	AT	1	78	15.5
Audit	Fir	6	FD	128	20.6	4	5	FD		1	303	32.1
Audit	Fir	7	FD	123	18.5	5	5	FD		1	153	16.2
Audit	Fir	8	FD	108	18.2	5	5	FD		1	113	16.3
Audit	Fir	9	FD	85	18.0	4	5	FD		1	93	16.3
Audit	Fir	10	FD	123	20.4	5	5	FD	AT	1	58	16.7
Audit	Fir	11	FD	137	25.3	3	3	FDI		1	117	25.2
Audit	Fir	12	FD	101	18.1	5	5	FDI		1	84	18.6
Audit	Fir	13	FD	64	15.1	5	5	FD	PL	1	93	15.3
Audit	Fir	14	FD	108	20.4	5	5	FD	AT	1	65	18.7
Audit	Fir	15	FD	193	15.1	5	5	FD		1	63	15.6
Audit	Fir	16	FD	90	17.0	5	5	FD		1	103	18.3
Audit	Fir	17	FD	251	31.2	5	5	FD	SX	1	153	27.2

Mature	Strata	sample	Phase II (ground) leading species attributes					Phase I (Inventory)				
			Species @ 4cm DBH	Mean Age[4]	Mean Height[5]	Sample size Age[6]	Sample size Height[7]	Leading species	Secondary species	Case of match	Age for match	Height for match
Audit	Fir	18	FD	129	18.8	5	5	FD		1	133	20.2
Audit	Fir	19	FD	161	25.5	5	5	FD		1	113	21.3
Audit	Fir	20	FD	100	21.6	4	5	FDI	SX	1	183	32.2
Audit	Fir	21	FD	171	30.2	5	5	FDI	AT	1	142	30.2
Audit	Fir	22	FD	155	18.8	5	4	FD		1	133	23.3
Audit	Fir	23	FD	178	25.7	4	4	FDI	SX	1	164	26.3
Audit	Fir	24	FD	212	33.2	4	5	FDI	SX	1	154	28.3
Audit	Fir	25	CW	98	26.7	2	2	FD	SE	3	249	35.2
Audit	Fir	26	FD	125	30.6	5	5	FD	SX	1	114	33.6
Audit	Fir	27	SX	143	28.8	5	5	FD	SX	2	184	35.2
Audit	Fir	28	CW	73	25.2	5	5	FD	HW	3	124	29.5
Audit	Fir	29	FD	91	21.9	3	3	FD	SX	1	153	25.2
Audit	Fir	30				4	4	FD	PL	5		
Audit	Fir	31	FD	188	27.7	5	5	FD		1	183	28.2
Audit	Fir	31	FD	148	25.5	4	4	FDI	PLI	1	73	21.6
Audit	Fir	32	FD	142	27.2	5	5	FD		1	140	28
Audit	Fir	33	FD	65	17.1	5	5	FDI		1	70	16.7
Audit	Fir	34	FD	143	24.1	5	4	FDI	SX	1	183	32.2
Audit	Fir	676	FD	78	15.1	4	4	FD		1	58	11.5
Audit	Fir	3156	FD	134	32.6	4	4	FDI	AT	1	74	16.5
Audit	Fir	3791				1	1	FD	AT	5		
Audit	Fir	3796	FD	82	15.3	4	4	FD		1	83	16.4
Audit	Fir	6281	FD	105	31.9	1	1	FD	AT	1	134	34.5
Audit	Other	41	AC	106	36.8	1	1	ACT	SX	1	114	31.5
Audit	Other	69	AT	65	17.5	5	5	AT	SX	1	94	23.5
Audit	Other	70	SX	95	28.2	5	5	AT	SX	2	78	21.8
Audit	Other	71	AT	88	20.2	4	4	AT	SX	1	83	23.4
Audit	Other	72	SX	123	31.5	5	5	AC	SX	2	204	36.2
Audit	Other	73	CW	419	34.8	5	5	CW	HW	1	404	34.2
Audit	Other	74	HW	141	32.2	4	4	HW	CW	1	184	27.3
Audit	Other	75	CW	398	33.0	6	5	CW	HW	1	304	38.2
Audit	Other	103	FD	82	19.2	5	5	AT	FD	2	93	18.4
Audit	Other	3171	AC	90	37.2	3	3	ACT	AT	1	134	36.3
Audit	Other	3176	CW	436	24.8	5	3	CW	HW	1	304	35.2
Audit	Other	9411	SX	80	24.3	2	2	AT	SX	2	134	32.4
Audit	Pine	55	PL	74	11.3	5	5	PL	FD	1	73	13.4
Audit	Pine	56	PL	115	17.2	5	5	PL		1	73	16.4
Audit	Pine	59	PL	62	12.5	5	5	PL	FD	1	83	14.3
Audit	Pine	60	PL	105	13.0	5	5	PL		1	73	11.3
Audit	Pine	61	PL	83	14.7	5	5	PL		1	83	14.6
Audit	Pine	62	PL	134	25.8	5	5	PL	SX	1	134	25.2
Audit	Pine	661	PL	93	12.8	3	3	PL	FD	1	73	15.4
Audit	Spruce	35	SX	87	16.2	5	5	SX	PLI	1	84	18.9
Audit	Spruce	36	BL	205	25.1	5	5	SE	BL	2	184	17.3
Audit	Spruce	37	SX	92	16.9	5	5	SX		1	129	20.6
Audit	Spruce	38	SX	137	11.3	5	5	SB	BL	1	104	8.3
Audit	Spruce	39	SX	71	24.2	5	5	SX	PLI	1	129	26.5
Audit	Spruce	40	FD	147	36.0	4	4	SX	AT	3	129	27.5
Audit	Spruce	41	SX	85	27.1	5	5	SX	EP	1	152	33.2

Mature	Strata	sample	Phase II (ground) leading species attributes					Phase I (Inventory)				
			Species @ 4cm DBH	Mean		Sample size		Leading species	Secondary species	Case of match	Age for match	Height for match
				Age[4]	Height[5]	Age[6]	Height[7]					
Audit	Spruce	42	SX	84	21.3	5	5	SX	AT	1	64	17.2
Audit	Spruce	43	SW	67	22.8	5	5	SW	FD	1	64	20.6
Audit	Spruce	44	SX	175	25.2	5	5	SX	PL	1	103	23.5
Audit	Spruce	45	FD	139	31.2	3	3	SX	FDI	2	184	30.2
Audit	Spruce	46	FD	83	28.2	5	5	SX	AT	3	124	26.5
Audit	Spruce	46	FD	62	26.7	1	1	SX	FDI	2	119	28.5
Audit	Spruce	47	SX	67	23.2	5	5	SX	AT	1	82	23.5
Audit	Spruce	48	CW	250	22.3	2	2	SE	CW	2	229	30.3
Audit	Spruce	49	BL	207	22.0	5	5	SE	BL	2	229	23.2
Audit	Spruce	50	SX	90	32.7	5	5	SX	CW	1	124	34.4
Audit	Spruce	51	BL	211	24.8	5	5	SE	BL	2	204	29.2

13. Appendix F: Scatterplots and residuals

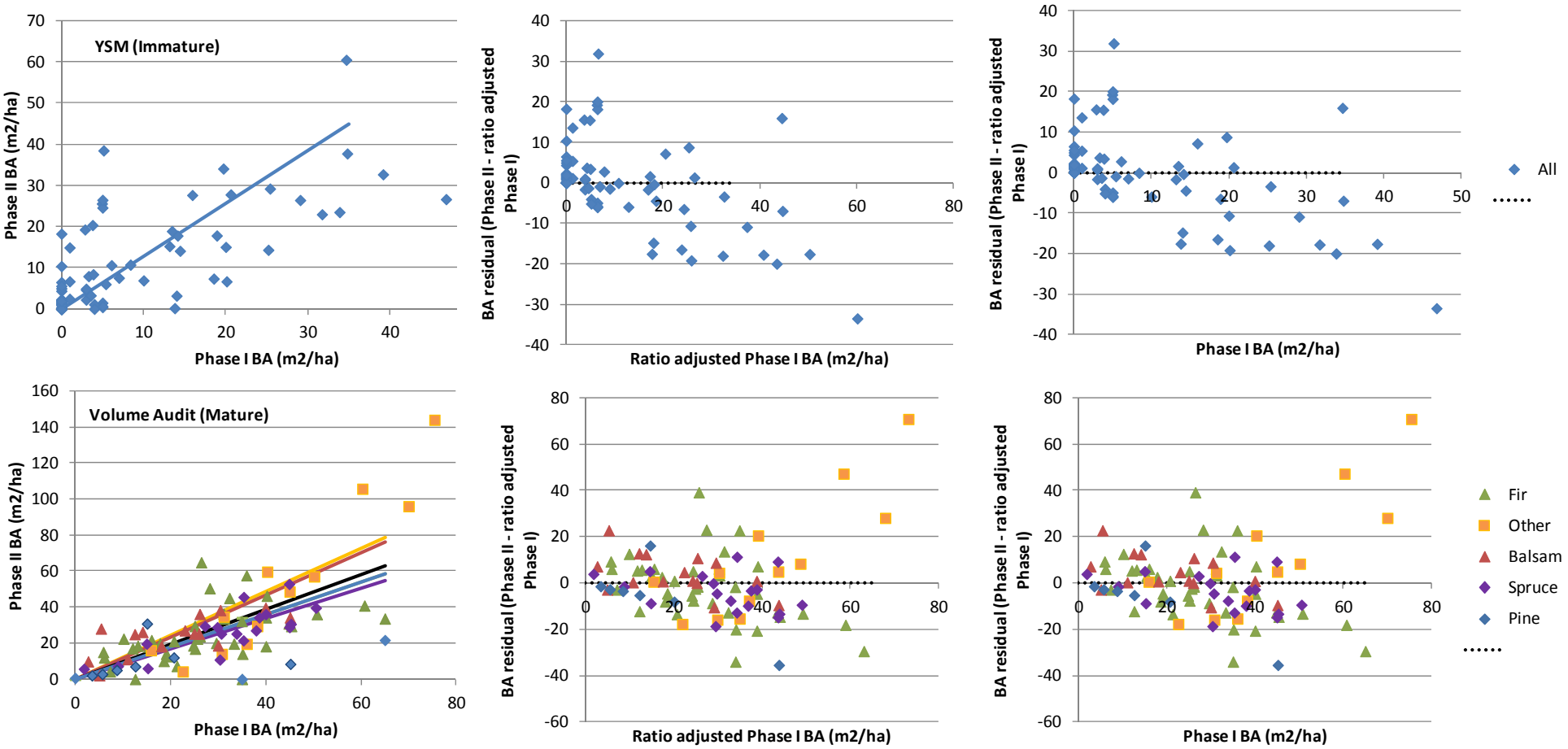

Figure 7. The scatterplots for BA are given. The top left graph gives the Phase I photo and Phase II ground estimates of basal area for the YSM (Immature) stratum with a line representing the ratio. The top middle graph plots the residuals against the adjusted Phase I BA. The top right graph plots the residuals against the Phase I BA. Ideally the residuals would be scattered uniformly around the x-axis. The slight downward trend is not uncommon and may indicate the need for a regression estimator rather than a ratio (i.e., the need for an intercept). The bottom graphs are similar except in the bottom left, the ratios are given by leading species. The black line is the ratio for all Volume Audit (mature) samples.

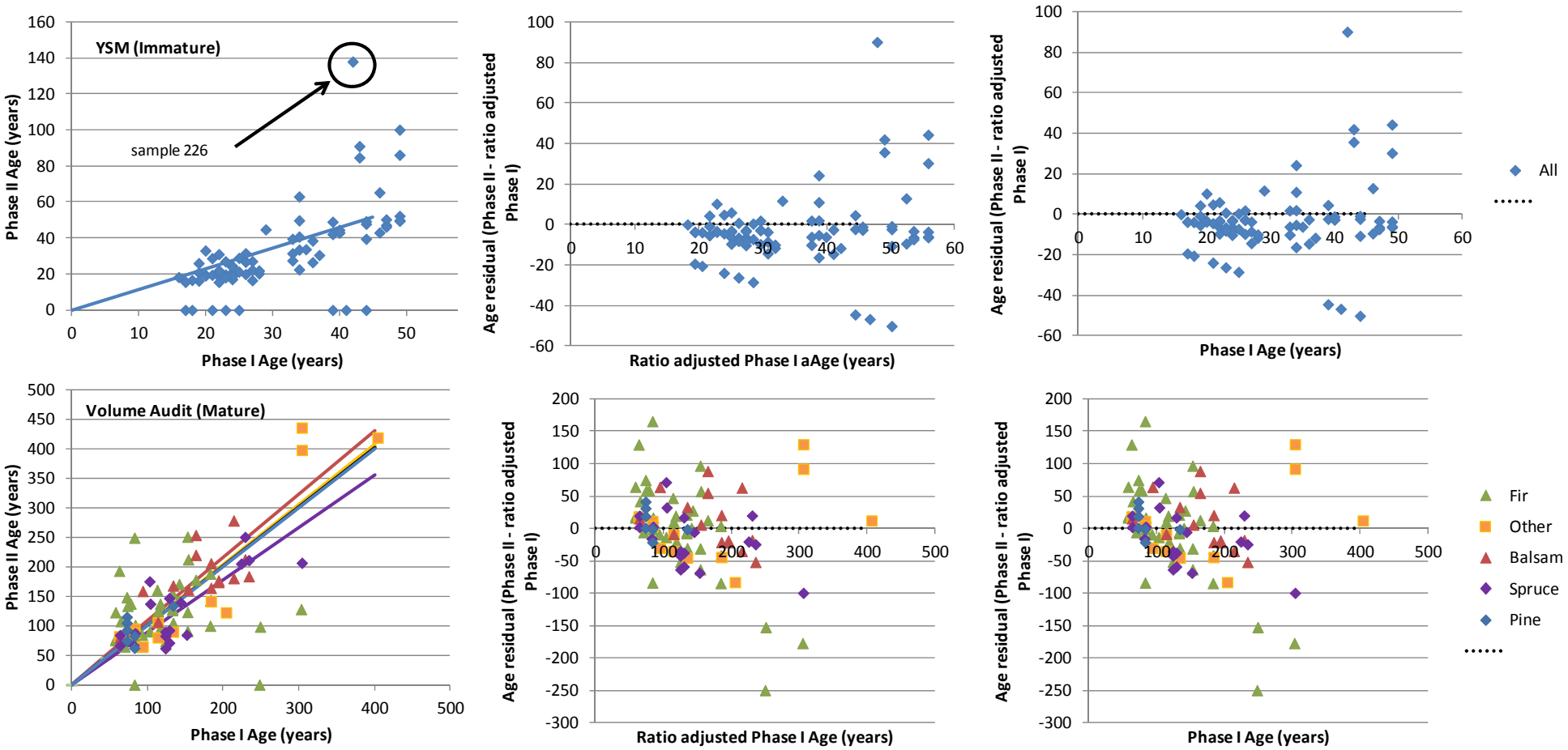

Figure 8. The scatterplots for Age are given.

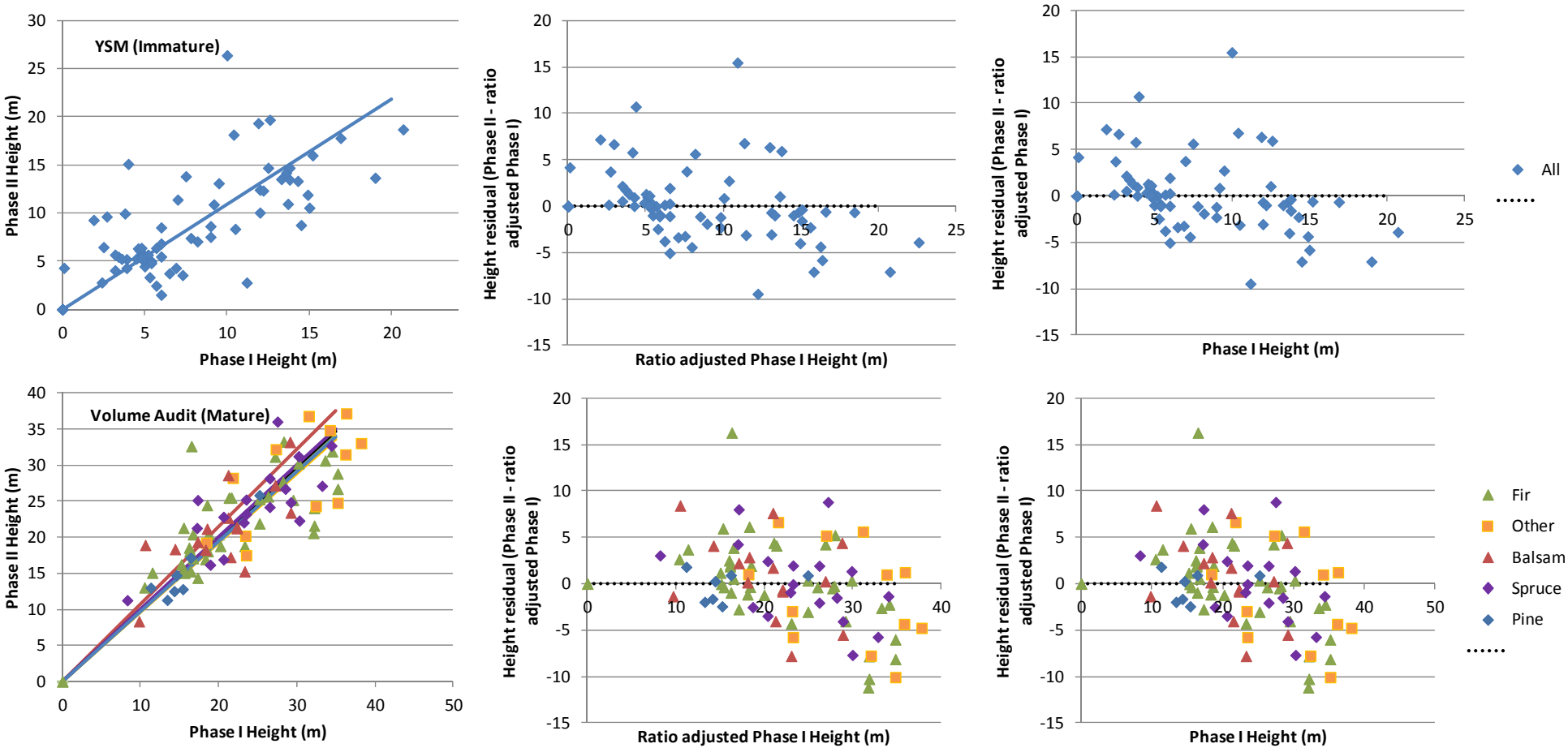

Figure 9. The scatterplots for Height are given.

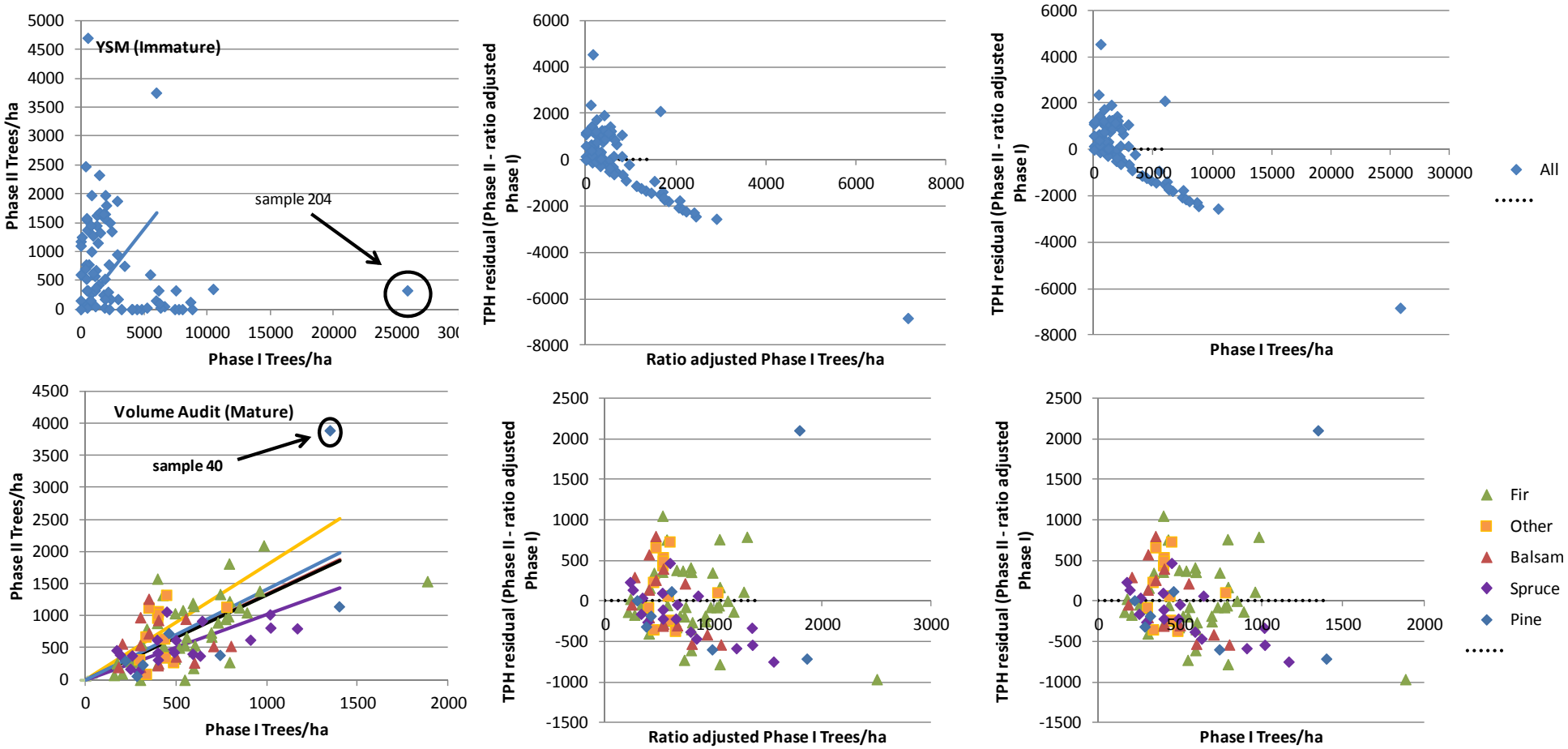

Figure 10. The scatterplots for Trees/ha are given.

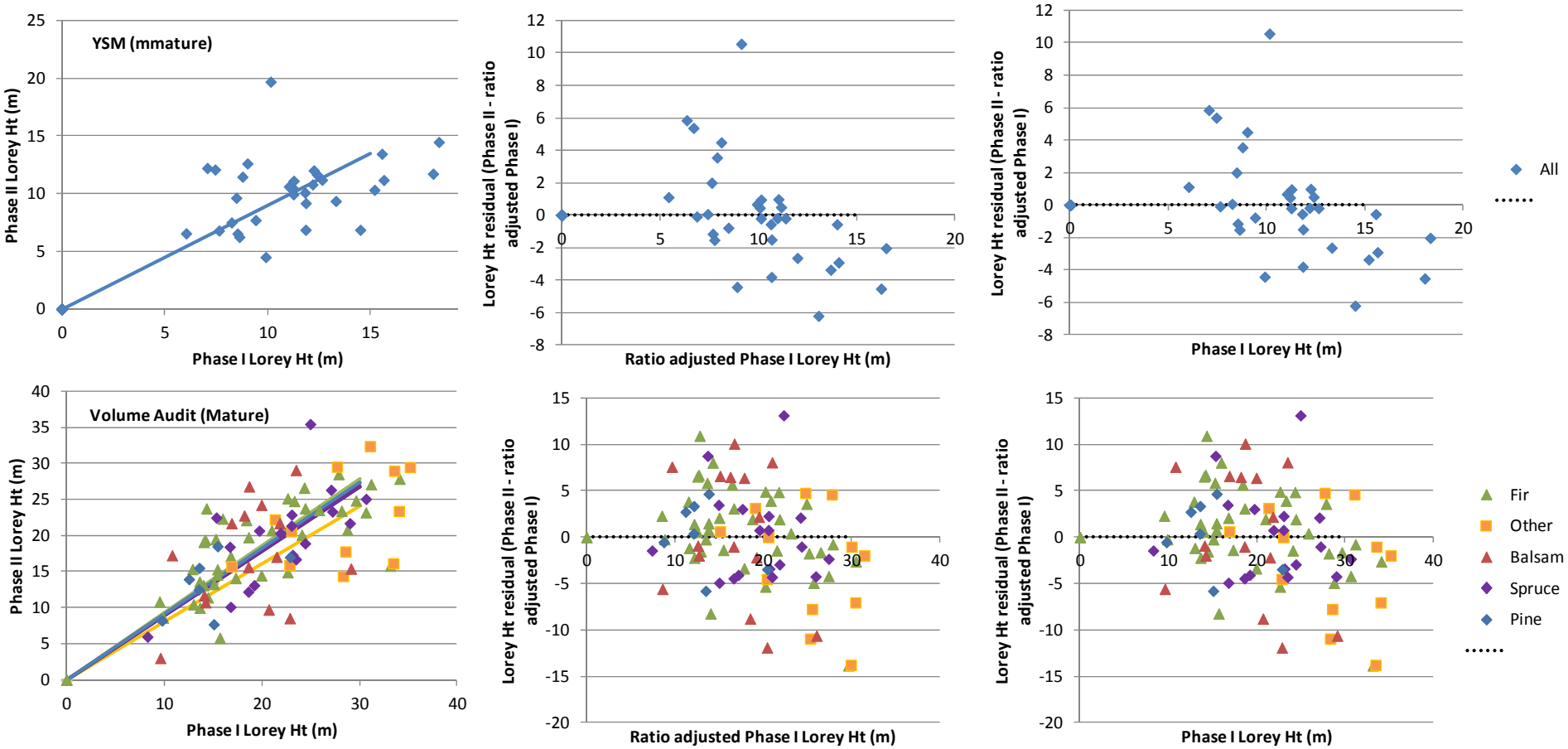

Figure 11. The scatterplots for Lorey height are given. In the YSM (Immature) stratum, 31 of 79 plots had Phase I estimates of Lorey height.

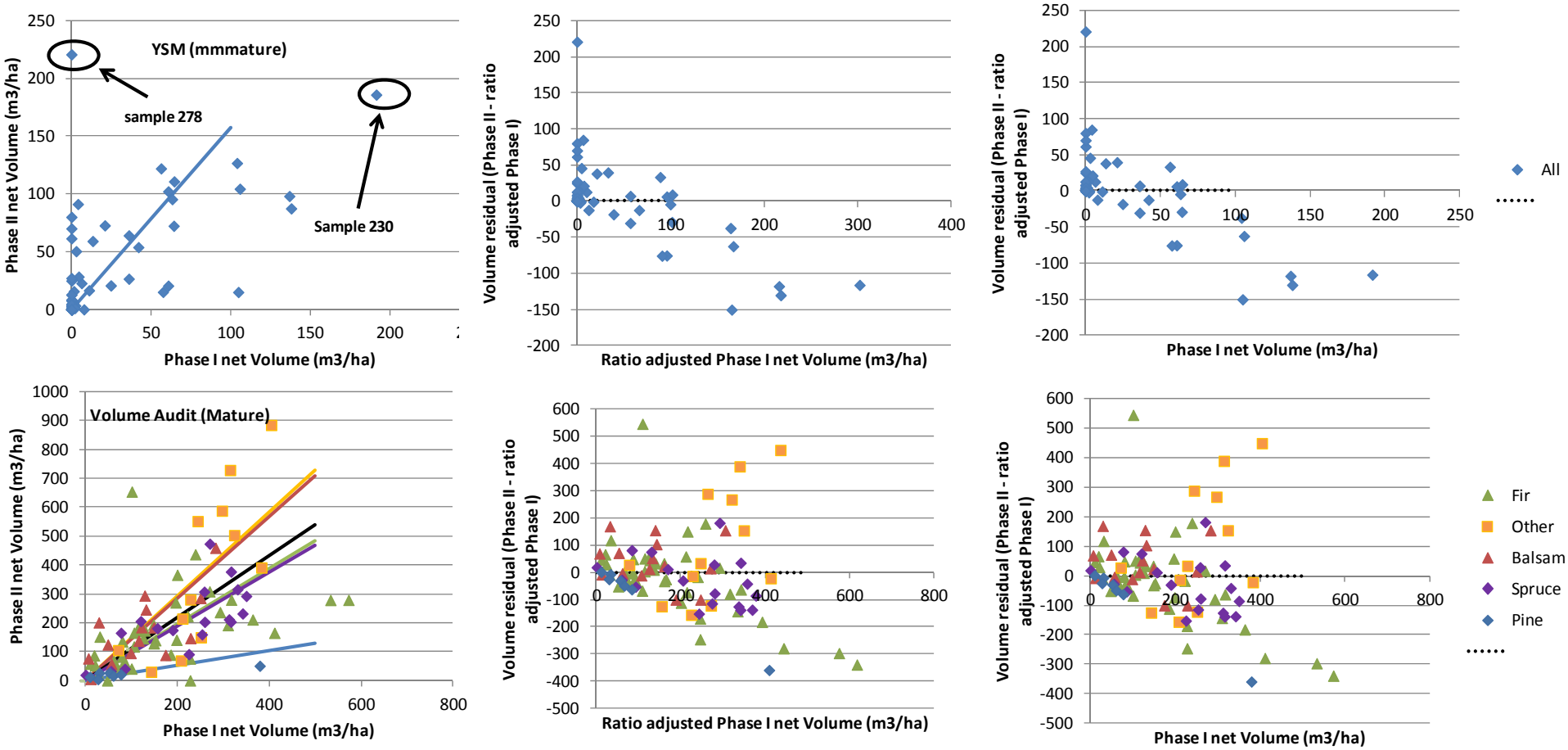

Figure 12. The scatterplots for Volume net of decay, waste and breakage are given.

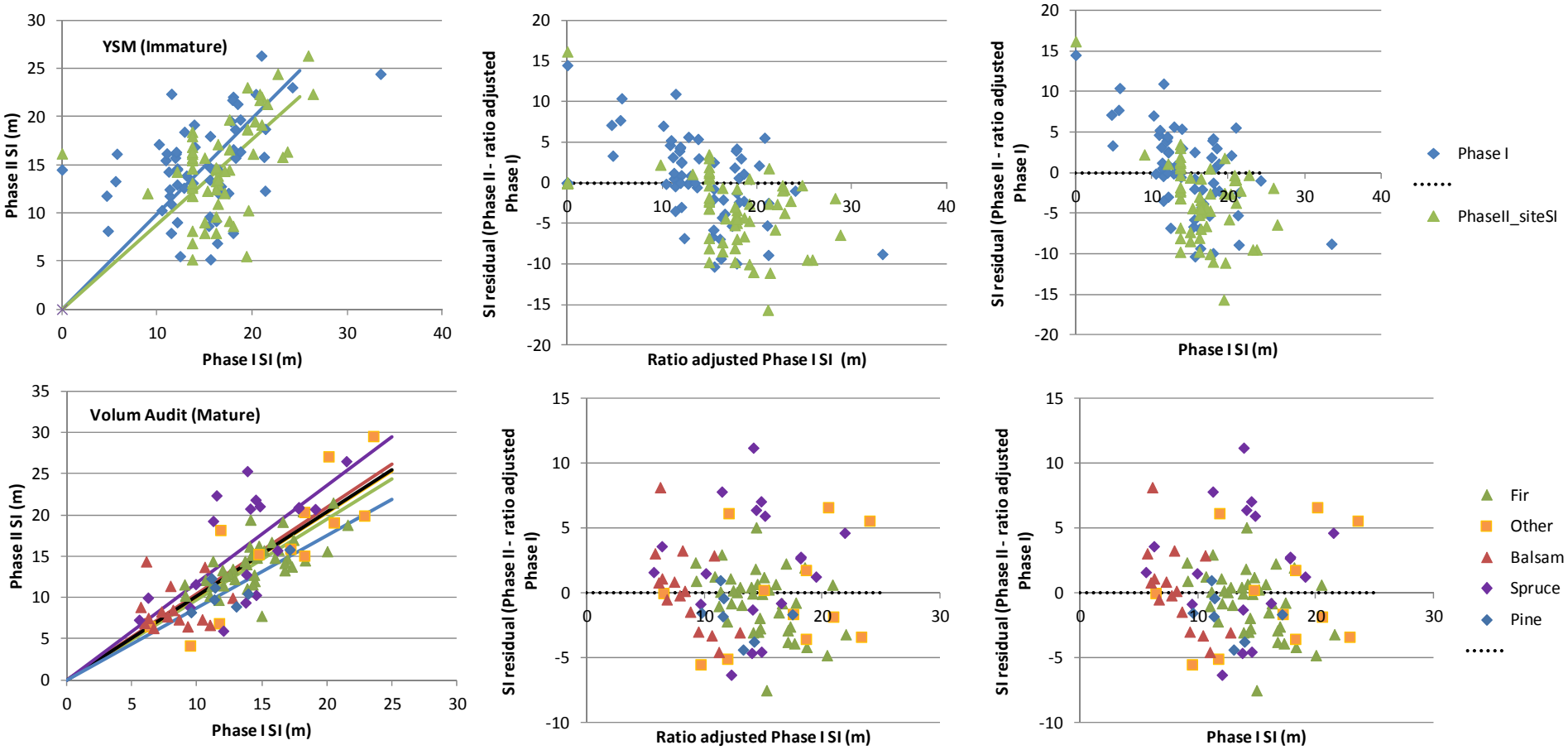

Figure 13. The scatterplots for Site index are given. For the YSM (immature) population, the Phase I VRI site index estimates are given as well as the estimates from the site productivity layer.

14. Appendix G: Graphs of total volume bias, model bias and attribute bias.

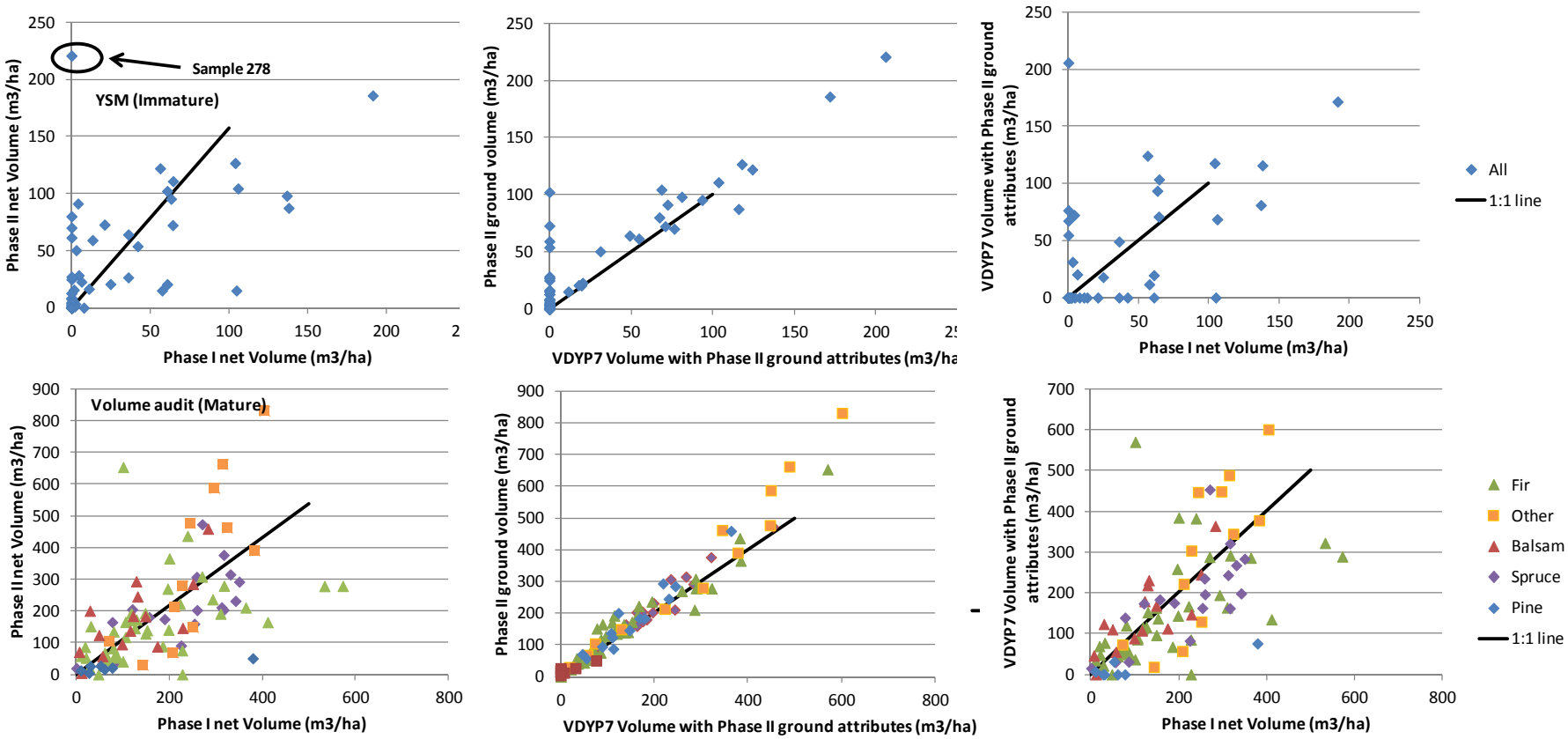

Figure 14. The left column of graphs illustrates the total volume error (Phase I vs. Phase II volume). There are two potential sources of volume error in Phase I. First, the attributes fed into VDYP7 could be incorrect (attributed-related volume error). Second, the volume estimation routines in VDYP7 could be biased (model-related volume error). Total volume error = attribute-related volume error + model-related volume error. The centre column of graphs illustrates model-related volume error (VDYP7 volume using Phase II inputs vs. Phase II volume). The model-related volume error is small indicating the VDYP7 volume estimates are similar to those from the ground compiler. The right column of graphs illustrates the attribute-related volume error (Phase I volume vs. VDYP7 volume using Phase II inputs). The attribute-related volume error dominates the total volume error indicating that most of the differences in volume between Phase I and Phase II are due to differences in the input values to VDYP7. In the YSM (immature) stratum, 49 of 99 plots had missing VDYP7 volumes.

15. Appendix I – Stand and Stock tables

Williams Lake TSA

ADDENDUM: Stand and Stock Tables from VRI Phase II Ground Samples

Prepared for:

Ministry of Forests, Lands and Natural Resource Operations
Forest Analysis and Inventory Branch
Victoria, BC

Prepared by:

Forest Analysis Ltd.

JUNE 3, 2014

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1 Introduction and Notes to Tables

This set of stand and stock tables and accompanying graphs was produced as an addendum to the report "Williams Lake TSA: Documentation of Vegetation Resources Inventory Analysis"[1]. That report includes information on the definition of the population of interest, the ground sampling and weights. In addition, that report also compares the VRI Phase I inventory to the Phase II ground sampling in terms of the ratio of means and associated standard errors.

The stand and stock tables give here are based on the Phase II ground sampling although the stratification into mature and immature is based on the Phase I inventory.

1. Immature or Young Stand Monitoring (YSM): stands between 15 and 50 years of age, *not* restricted to Vegetated Treed (VT) polygons. The population includes the entire TSA.
2. Mature or Volume Audit: stands 51 years and older in the Vegetated Treed portion of the landbase. The population includes only the eastern portion of the TSA.

Seventy-eight samples are located in the immature or YSM population and 92 samples are located in the mature (volume audit) population.

The samples were further stratified by BEC and the YSM, by Phase I leading species age. The BEC stratification is based on the Phase I (Inventory) BEC.

Table 1. The strata used to summarize the results are defined.

Stratification	Strata	Definition	YSM	Volume Audit
BEC	ICH	ICH	14	13
	IDF	IDF	16	37
	Other	ESSF, MS, SBS	18	35
	SBPS	SBPS	30	7
YSM Age (Phase I Inventory)	Young	ages 15-30	42	
	Older	ages 31-50	36	
Total			78	92

The Phase II ground samples trees with DBH ≥ 4cm. Hence the lower bound of the 4 cm DBH class is 4 cm rather than 2.5 cm.

All volumes/ha reported in the stock tables are merchantable volume (10cm minimum top diameter and 30cm high stump) net of decay, waste and breakage. Volumes have been net factored and have had net volume adjustment factors (NVAF) applied. As a result of the merchantability limits, there is no volume reported in the lowest DBH class.

In the tables, a "." In a cell indicates there were not trees with that combination of species, Dbh class and live/dead status. A zero indicates trees were present but represented fewer than 0.5 trees/ha for the stand tables and less than 0.05 m^3/ha for the stock table.

[1] *"Williams Lake TSA: Documentation of Vegetation Resources Inventory Analysis",* prepared by Forest Analysis Ltd.

2 Live Mature

Most of the live, mature trees are Douglas-fir and most are in the smallest Dbh class.

Table 1. *Stand Table: Distribution of Mean Trees/ha by DBH class Mature samples (51+ years of age), LIVE trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	.	0	.	0	0	0	1	1	0	0	.	1	4
AT	4	14	5	6	2	3	1	1	1	.	.	.	.	.	37
B	53	31	25	22	11	10	4	2	2	1	1	0	0	0	164
C	21	9	1	3	3	4	1	2	2	2	1	1	1	2	55
E	6	.	.	1	.	.	.	.	.	.	.	.	.	.	7
F	230	108	71	38	26	14	9	6	4	3	2	1	1	2	514
H	25	18	7	6	3	2	0	1	1	1	1	0	0	0	66
PL	47	67	16	4	0	0	.	.	.	.	.	.	.	.	135
S	53	50	16	13	14	10	4	5	3	2	2	1	0	0	172
Subtotal	440	297	141	93	60	44	20	17	13	9	6	4	3	5	1153

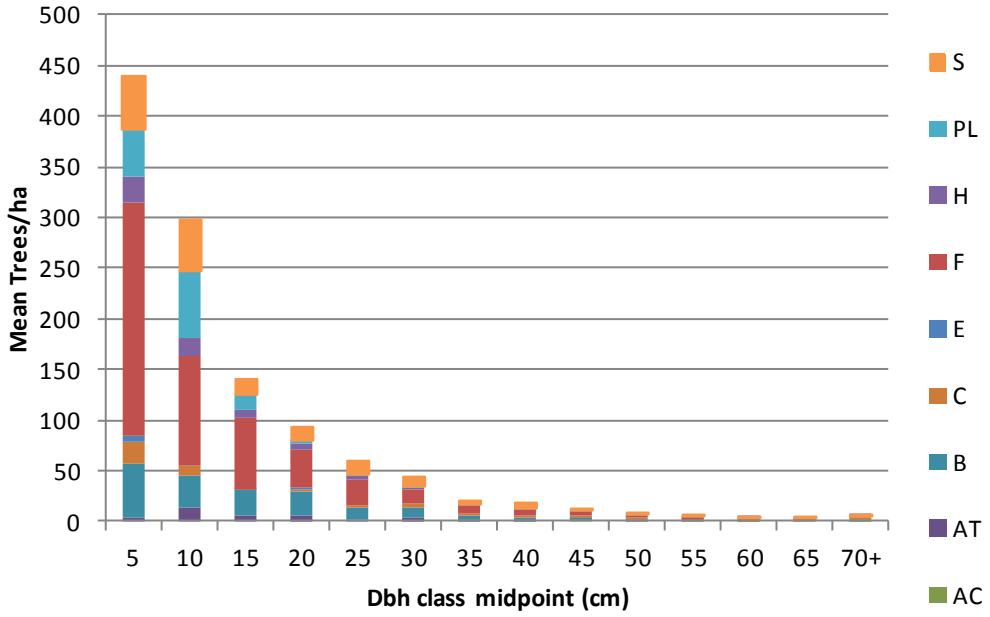

Figure 1. *Mean trees/ha by DBH class and species for mature samples (51+ years of age), LIVE trees.*

Most of the live, mature volume is Douglas-fir with approximately 25% of the volume in trees with Dbh > 52.2 cm.

Table 2. *Stock Table: Distribution of Mean Volume m^3/ha) by DBH class Mature samples (51+ years of age), LIVE trees*

Volume (m^3/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	.	0.1	.	0.2	0.1	0.4	1.4	1.3	0.5	1.0	.	2.9	7.9
AT	0.0	0.0	0.4	1.0	0.6	1.1	1.0	1.0	0.9	.	.	.	.	.	6.0
B	0.0	0.2	1.6	3.6	3.3	5.2	2.9	2.1	2.7	2.1	1.4	0.2	0.3	1.0	26.6
C	0.0	0.1	0.0	0.4	0.7	2.0	0.7	1.0	1.8	1.9	1.3	1.6	1.8	7.6	21.1
E	0.0	.	.	0.1	.	.	.	.	.	.	.	.	.	.	0.1
F	0.0	1.1	5.1	6.1	7.8	7.0	6.8	6.4	5.5	4.9	4.2	3.0	2.2	10.1	70.2
H	0.0	0.1	0.3	1.0	1.0	0.9	0.2	0.7	1.1	1.8	1.3	0.9	1.7	1.5	12.4
PL	0.0	0.6	1.2	0.7	0.2	0.1	.	.	.	.	.	.	.	.	2.8
S	0.0	0.3	1.2	2.4	5.0	6.2	3.4	5.8	4.6	3.8	4.3	2.5	1.8	1.2	42.5
Subtotal	0.0	2.6	9.7	15.3	18.8	22.6	15.1	17.4	17.9	15.9	13.0	9.2	7.9	24.2	189.7

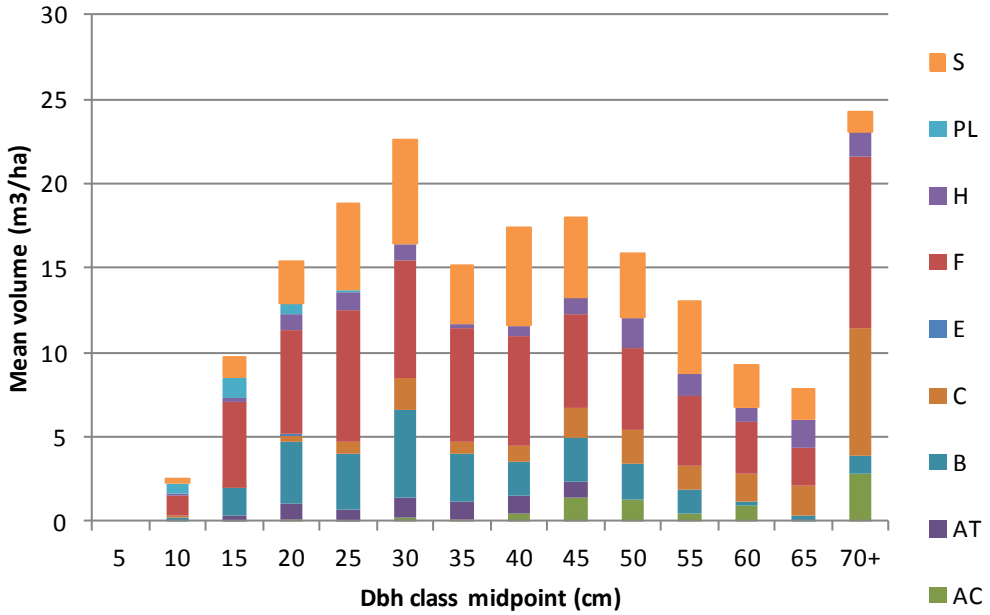

Figure 2. *Mean volume (m^3/ha) by DBH class and species for mature samples (51+ years of age), LIVE trees.*

3 Dead Mature

Most of the dead, mature trees are lodgepole pine in the 10-20 cm Dbh classes.

Table 3. *Stand Table: Distribution of Mean Trees/ha by DBH class Mature samples (51+ years of age), DEAD trees*

	Trees /ha														
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0
AT	12	.	0	.	1	0	0	.	.	.	.	.	.	.	14
B	0	15	7	8	6	6	4	2	2	1	0	0	.	.	52
C	2	.	.	.	1	.	0	.	.	0	0	0	1	1	6
E	.	.	2	.	.	.	.	.	.	.	.	.	.	.	2
F	15	26	9	11	3	2	1	1	0	0	0	0	0	1	71
H	3	1	.	1	.	.	0	.	.	.	.	.	.	0	5
PL	1	28	35	22	10	8	3	1	0	0	0	.	.	.	108
S	12	2	4	5	1	2	1	1	1	0	0	0	0	0	30
Subtotal	45	72	56	46	23	17	10	6	3	2	1	1	1	2	287

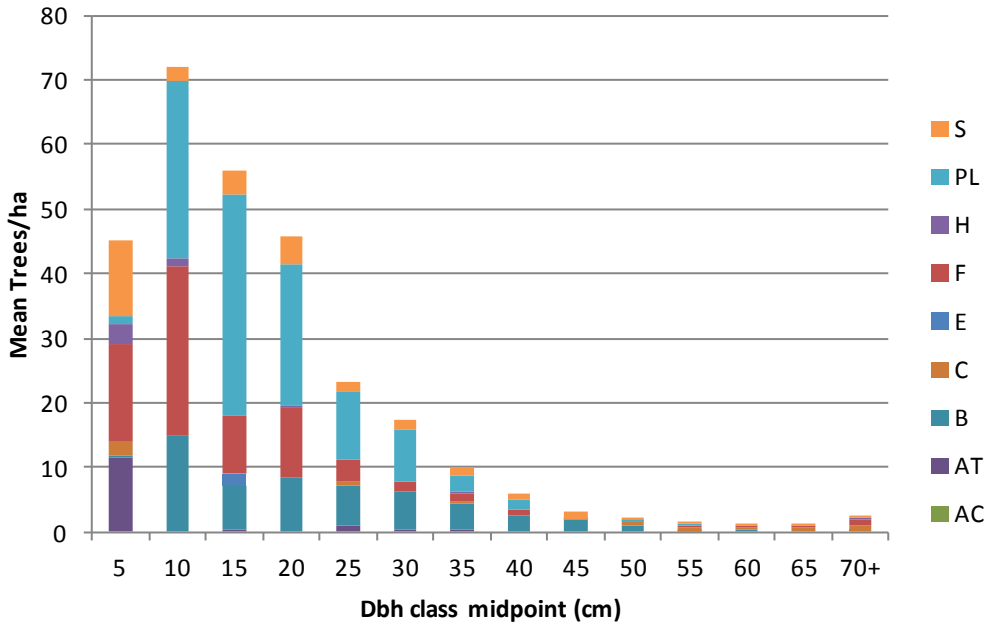

Figure 3. *Mean trees/ha by DBH class and species for mature samples (51+ years of age), DEAD trees.*

Most of the dead, mature volume is lodgepole pine, followed by balsam. The majority of the large, dead trees are cedar and Douglas-fir.

Table 4. *Stock Table: Distribution of Mean Volume m³/ha) by DBH class Mature samples (51+ years of age), DEAD trees*

Volume (m³/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	.	.	.	.	.	.	.	.	.	.	.	0.0	0.0
AT	0.0	.	0.0	.	0.1	0.0	0.0	.	.	.	.	.	.	.	0.1
B	0.0	0.2	0.4	1.2	1.3	2.3	2.1	1.7	1.7	1.3	0.2	0.4	.	.	12.9
C	0.0	.	.	.	0.1	.	0.1	.	.	0.4	0.1	0.0	0.7	0.5	1.8
E	.	.	0.0	.	.	.	.	.	.	.	.	.	.	.	0.0
F	0.0	0.1	0.4	0.7	0.2	0.2	0.2	0.0	0.0	0.0	0.2	0.1	0.1	0.8	3.0
H	0.0	0.0	.	0.0	.	.	0.0	.	.	.	.	.	.	0.1	0.1
PL	0.0	0.4	2.9	4.2	3.5	4.3	2.1	1.5	0.1	0.4	0.1	.	.	.	19.4
S	0.0	0.1	0.2	0.9	0.3	0.8	0.8	0.9	1.0	0.3	0.2	0.4	1.4	1.3	8.7
Subtotal	0.0	0.7	3.9	7.1	5.5	7.6	5.3	4.2	2.9	2.4	0.8	0.9	2.2	2.7	46.1

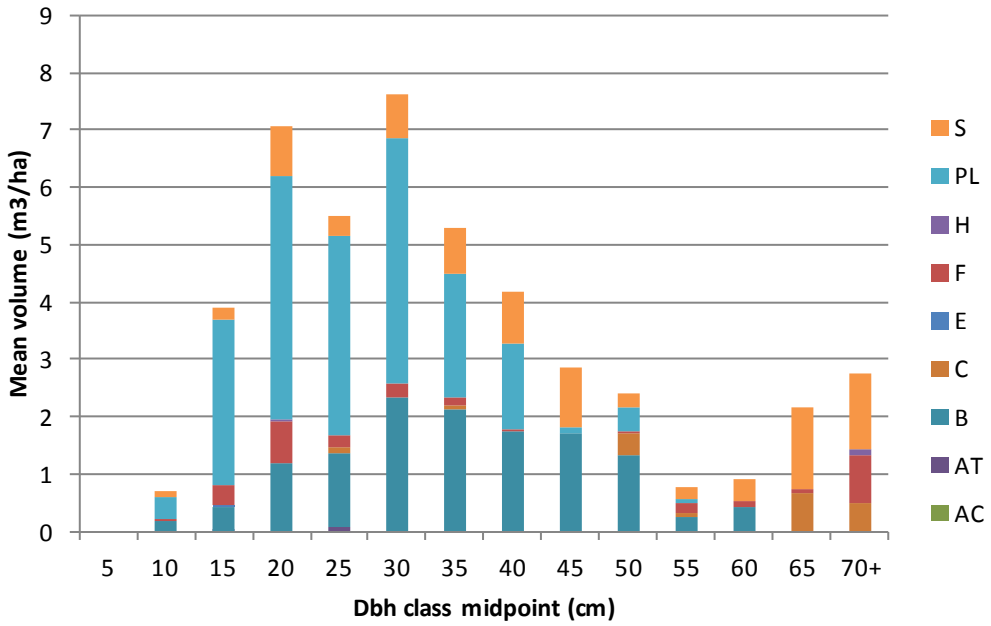

Figure 4. *Mean volume (m³/ha) by DBH class and species for mature samples (51+ years of age), DEAD trees.*

4 Live Immature

Most of the live, immature trees are lodgepole pine.

Table 5. *Stand Table: Distribution of Mean Trees/ha by DBH class immature samples (15 – 50 years of age), LIVE trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	13	6	5	2	.	0	.	.	.	.	.	.	.	.	26
AT	45	26	8	4	1	0	.	.	.	.	.	.	.	.	84
B	65	66	38	10	2	0	.	.	.	.	.	.	.	.	180
C	47	21	12	4	.	0	0	0	1	.	.	.	.	.	87
E	8	7	3	3	1	.	.	.	.	.	.	.	.	.	23
F	32	29	18	11	5	4	2	.	.	.	.	.	.	.	100
H	54	7	2	1	0	0	0	.	.	.	.	.	.	.	65
PL	490	286	66	18	2	1	0	.	.	.	.	.	.	.	864
S	119	79	29	9	3	.	0	1	.	.	.	.	.	.	240
Subtotal	874	528	181	62	15	6	3	1	1	0	0	0	0	0	1669

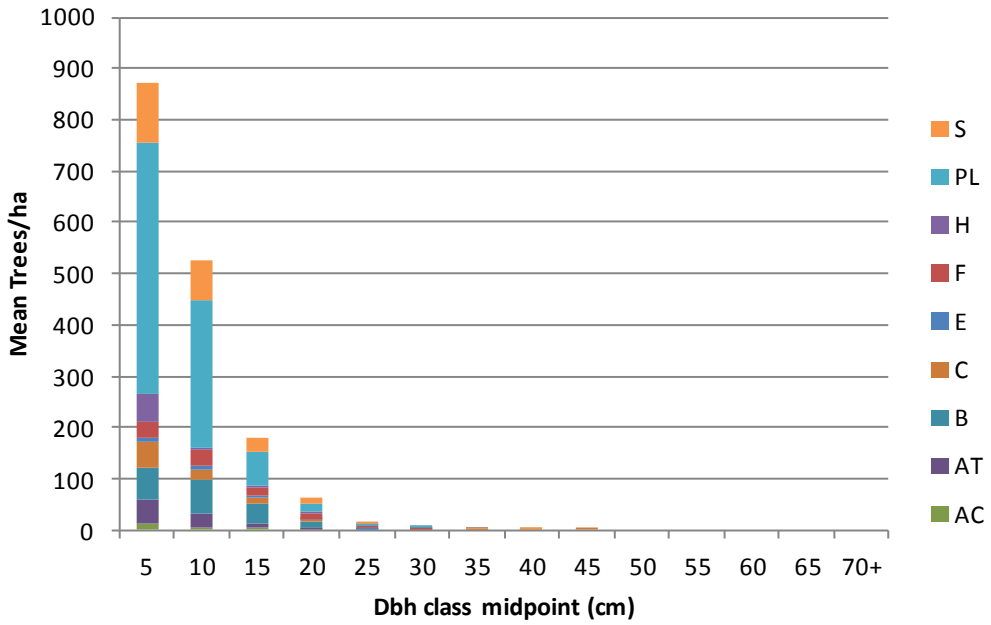

Figure 5. *Mean trees/ha by DBH class and species for immature samples (15 – 50 years of age), LIVE trees.*

Lodgepole pine is the species with the most live, immature volume. Most of the volume in larger trees is cedar, spruce of hemlock.

Table 6. *Stock Table: Distribution of Mean Volume m^3/ha) by DBH class immature samples (15 – 50 years of age), LIVE trees*

Volume (m^3/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	0.0	0.0	0.4	0.3	.	0.1	.	.	.	.	.	.	.	.	0.7
AT	0.0	0.0	0.5	0.5	0.2	0.1	.	.	.	.	.	.	.	.	1.3
B	0.0	0.4	2.5	1.5	0.4	0.2	.	.	.	.	.	.	.	.	5.0
C	0.0	0.2	0.7	0.5	.	0.1	0.2	0.2	0.8	.	.	.	.	.	2.7
E	0.0	0.1	0.2	0.5	0.3	.	.	.	.	.	.	.	.	.	1.0
F	0.0	0.1	0.9	1.6	1.4	1.4	0.9	.	.	.	.	.	.	.	6.3
H	0.0	0.0	0.1	0.2	0.1	0.1	0.2	.	.	.	.	.	.	.	0.6
PL	0.0	1.2	3.7	2.5	0.5	0.3	0.2	.	.	.	.	.	.	.	8.5
S	0.0	0.4	1.6	1.3	0.8	.	0.2	0.8	.	.	.	.	.	.	5.1
Subtotal	0.0	2.5	10.6	8.7	3.7	2.4	1.7	1.0	0.8	0.0	0.0	0.0	0.0	0.0	31.3

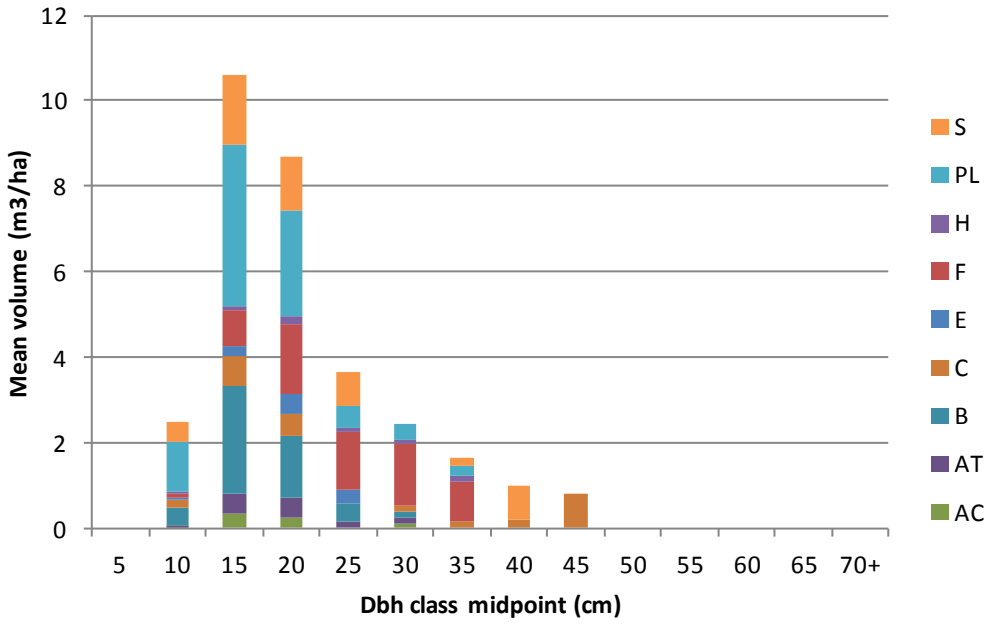

Figure 6. *Mean volume (m^3/ha) by DBH class and species for immature samples (15 – 50 years of age), LIVE trees.*

5 Dead Immature

Most of the dead, immature trees are lodgepole pine.

Table 7. *Stand Table: Distribution of Mean Trees/ha by DBH class immature samples (15 – 50 years of age), DEAD trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1
AT	3	2	0	1	.	.	.	.	.	.	.	.	.	.	5
B	15	5	1	.	.	.	.	.	.	.	.	.	.	.	22
C	3	.	0	.	.	.	.	0	1	1	.	.	.	0	5
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	4	6	3	2	3	1	.	.	.	.	.	.	.	.	19
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PL	55	48	24	6	2	.	0	.	.	.	.	.	.	.	135
S	1	2	1	.	1	.	0	.	.	.	.	.	.	.	5
Subtotal	81	63	30	9	5	1	1	0	1	1	0	0	0	0	192

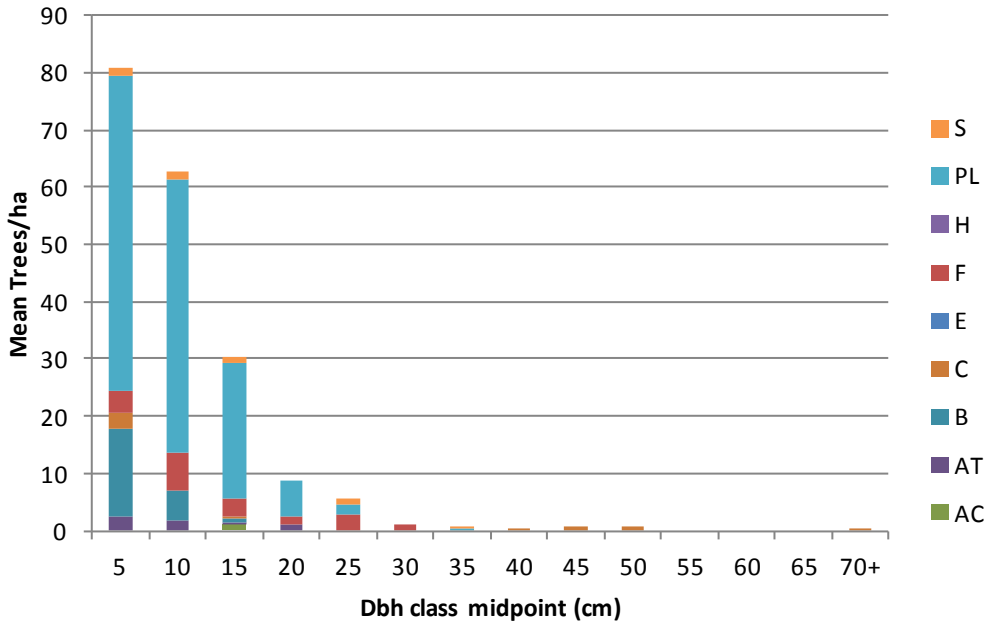

Figure 7. *Mean trees/ha by DBH class and species for immature samples (15 – 50 years of age), DEAD trees.*

Most of the dead, immature volume is lodgepole pine.

Table 8. *Stock Table: Distribution of Mean Volume m³/ha) by DBH class immature samples (15 – 50 years of age), DEAD trees*

Volume (m³/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	0.0	.	.	.	.	.	.	.	.	.	.	.	0.0
AT	0.0	0.0	0.0	0.0	.	.	.	.	.	.	.	.	.	.	0.0
B	0.0	0.0	0.0	.	.	.	.	.	.	.	.	.	.	.	0.1
C	0.0	.	0.0	.	.	.	.	0.0	0.0	0.0	.	.	.	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.1	0.2	0.5	0.1	.	.	.	.	.	.	.	.	1.0
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PL	0.0	0.3	1.6	0.8	0.4	.	0.2	.	.	.	.	.	.	.	3.3
S	0.0	0.0	0.1	.	0.3	.	0.2	.	.	.	.	.	.	.	0.5
Subtotal	0.0	0.3	1.8	1.1	1.2	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9

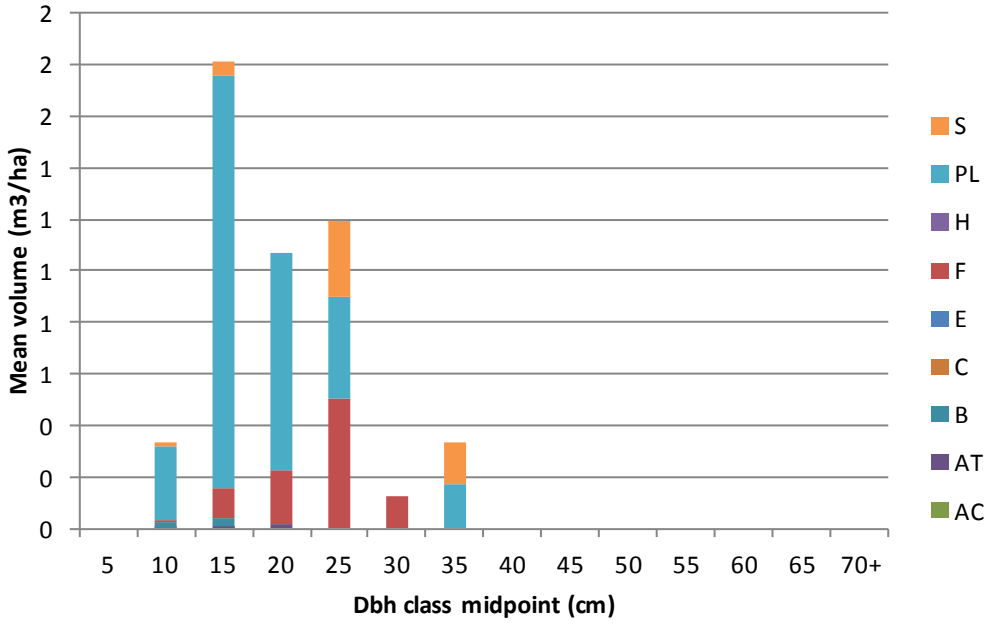

Figure 8. *Mean volume (m³/ha) by DBH class and species for immature samples (15 – 50 years of age), DEAD trees.*

6 Live Immature, ages 15 - 30

Table 9. *Stand Table: Distribution of Mean Trees/ha by DBH class for young, immature samples (15 – 30 years of age), LIVE trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	2	.	.	.	.	.	.	.	.	.	.	.	2
AT	6	3	1	1	.	.	.	.	.	.	.	.	.	.	11
B	33	12	2	.	.	.	.	.	.	.	.	.	.	.	47
C	6	.	1	.	.	.	.	1	1	1	.	.	.	.	8
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	8	14	6	3	6	2	.	.	.	.	.	.	.	.	40
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PL	114	104	51	13	3	.	1	.	.	.	.	.	.	.	285
S	3	3	2	.	2	.	1	.	.	.	.	.	.	.	11
Subtotal	170	136	65	18	11	2	1	1	1	1	0	0	0	0	405

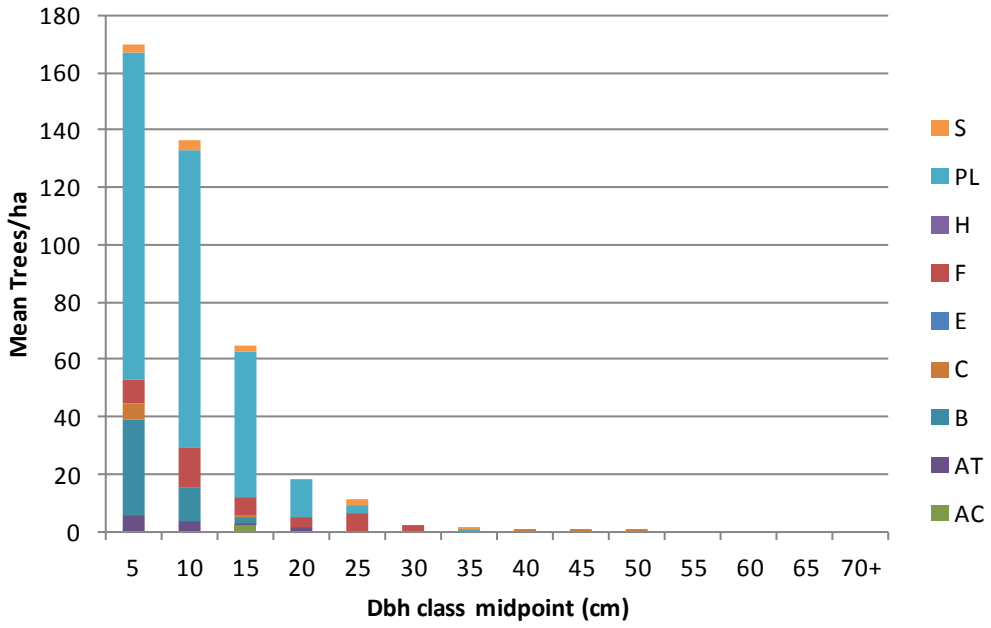

Figure 9. *Mean trees/ha by DBH class and species for young, immature samples (15 - 30 years of age), LIVE trees.*

Table 10. *Stock Table: Distribution of Mean Volume m^3/ha) by DBH class young, immature samples (15-30 years of age), LIVE trees*

Volume (m^3/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	0.0	0.0	0.1	0.1	.	0.2	.	.	.	.	.	.	.	.	0.3
AT	0.0	0.0	0.0	0.1	0.1	0.3	.	.	.	.	.	.	.	.	0.6
B	0.0	0.2	0.8	0.5	.	.	.	.	.	.	.	.	.	.	1.4
C	0.0	0.0	.	0.2	.	.	.	.	.	.	.	.	.	.	0.2
E	0.0	0.0	0.1	0.1	0.1	.	.	.	.	.	.	.	.	.	0.3
F	0.0	0.0	0.1	.	.	.	.	.	.	.	.	.	.	.	0.1
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PL	0.0	0.4	1.1	0.6	0.2	.	.	.	.	.	.	.	.	.	2.3
S	0.0	0.1	0.6	0.5	0.2	.	.	.	.	.	.	.	.	.	1.5
Subtotal	0.0	0.7	2.7	2.1	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7

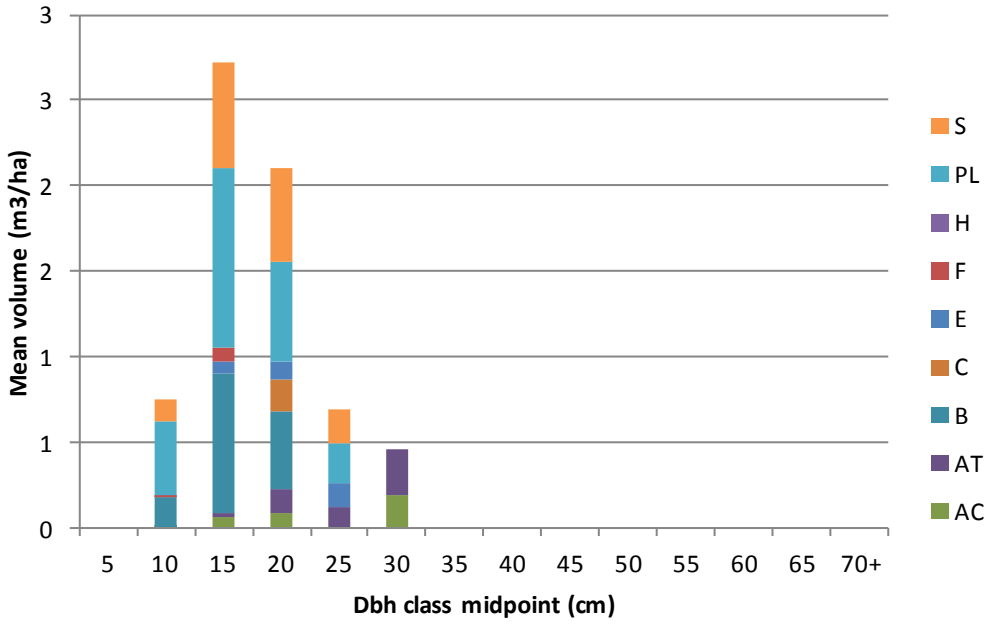

Figure 10. *Mean volume (m^3/ha) by DBH class and species for young, immature samples (15 - 30 years of age), LIVE trees.*

7 Dead Immature, ages 15 - 30

Table 11. *Stand Table: Distribution of Mean Trees/ha by DBH class for young, immature samples (15 – 30 years of age), Dead trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1
AT	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	.	.	.	.	.	.	.	.	1	1	.	.	.	1	2
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PL	5	.	1	.	1	.	.	.	.	.	.	.	.	.	6
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	5	0	2	1	1	0	0	0	1	1	0	0	0	1	9

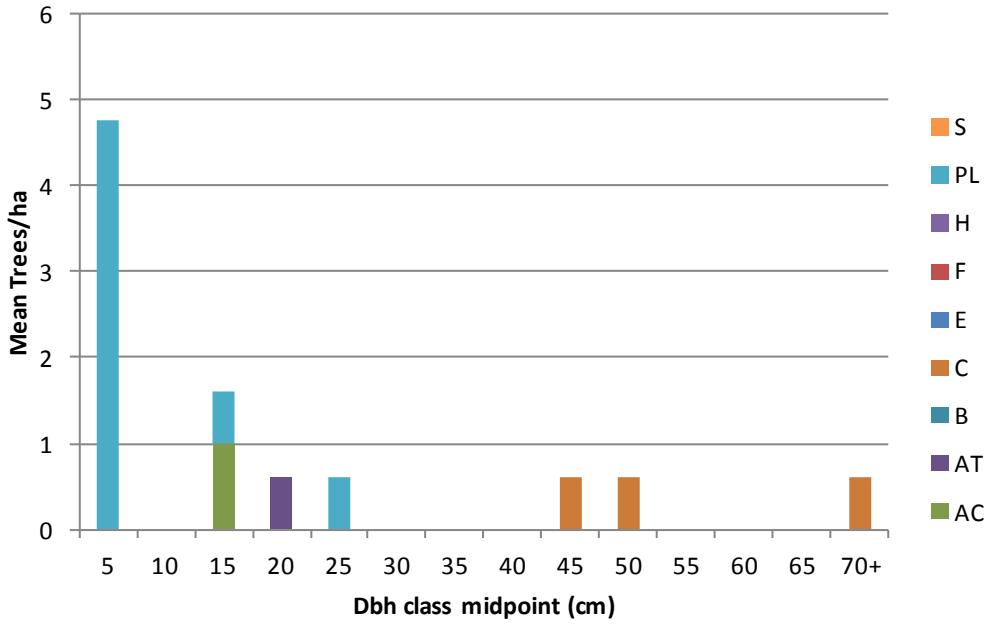

Figure 11. *Mean trees/ha by DBH class and species for young, immature samples (15 - 30 years of age), Dead trees.*

Table 12. *Stock Table: Distribution of Mean Volume m^3/ha) by DBH class young, immature samples (15-30 years of age), Dead trees*

Volume (m^3/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	.	.	.	0.0	.	.	.	.	.	.	.	.	.	.	0.0
B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	.	.	.	.	.	.	.	.	0.0	0.0	.	.	.	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PL	0.0	.	0.0	.	0.2	.	.	.	.	.	.	.	.	.	0.2
S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

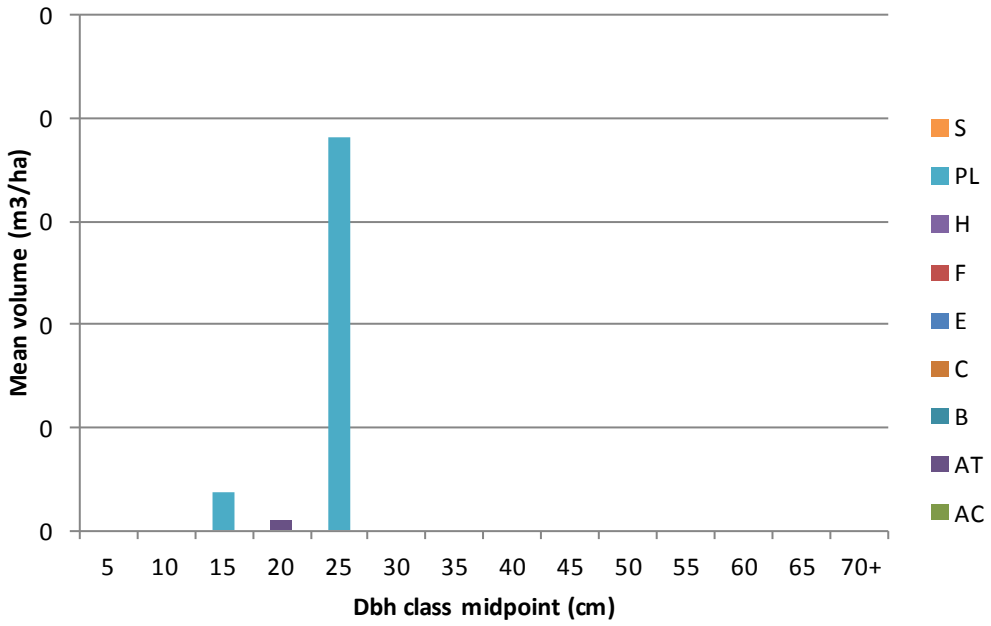

Figure 12. *Mean volume (m^3/ha) by DBH class and species for young, immature samples (15 - 30 years of age), Dead trees.*

8 Live Immature, ages 31 - 50

Table 13. *Stand Table: Distribution of Mean Trees/ha by DBH class for older, immature samples (31-50 years of age), LIVE trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	25	8	10	3	.	.	.	.	.	.	.	.	.	.	47
AT	39	46	17	6	1	.	.	.	.	.	.	.	.	.	108
B	108	112	64	17	3	1	.	.	.	.	.	.	.	.	305
C	95	43	26	7	.	1	1	1	2	.	.	.	.	.	174
E	14	15	6	6	2	.	.	.	.	.	.	.	.	.	43
F	64	56	36	24	11	8	3	.	.	.	.	.	.	.	202
H	117	16	4	3	1	1	1	.	.	.	.	.	.	.	142
PL	461	393	114	33	3	2	1	.	.	.	.	.	.	.	1008
S	189	130	48	14	6	.	1	1	.	.	.	.	.	.	388
Subtotal	1112	820	324	113	28	12	6	2	2	0	0	0	0	0	2418

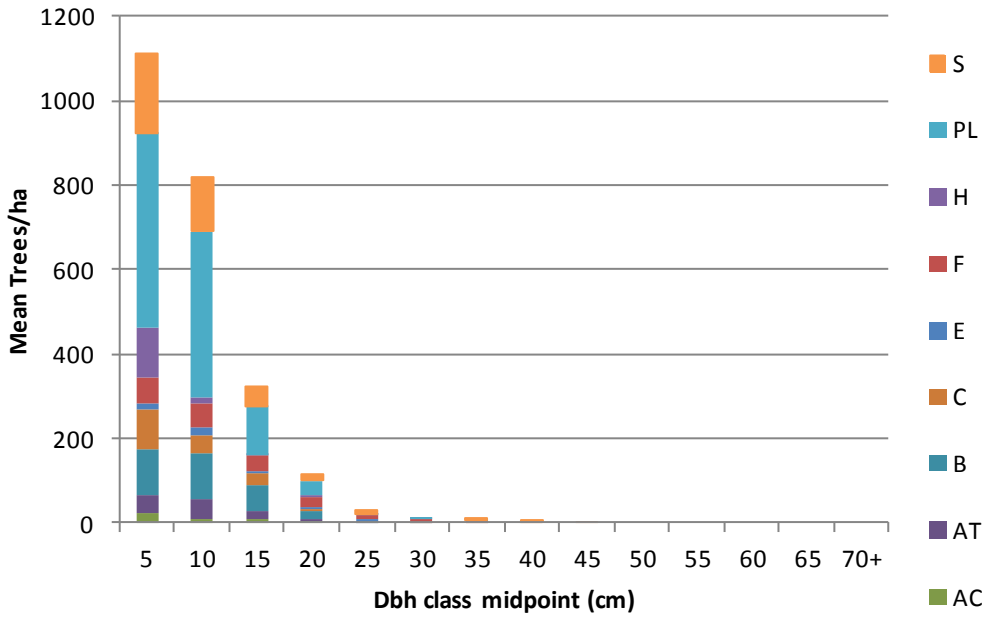

Figure 13. *Mean trees/ha by DBH class and species for older, immature samples (31-50 years of age), LIVE trees.*

Table 14. *Stock Table: Distribution of Mean Volume m^3/ha) by DBH class older, immature samples (31-50 years of age), LIVE trees*

Volume (m^3/ha)															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	0.0	0.0	0.7	0.5	.	.	.	.	.	.	.	.	.	.	1.2
AT	0.0	0.1	1.0	0.8	0.2	.	.	.	.	.	.	.	.	.	2.1
B	0.0	0.8	4.5	2.6	0.9	0.4	.	.	.	.	.	.	.	.	9.2
C	0.0	0.4	1.5	0.9	.	0.2	0.3	0.5	1.8	.	.	.	.	.	5.6
E	0.0	0.1	0.4	0.9	0.5	.	.	.	.	.	.	.	.	.	1.9
F	0.0	0.2	1.8	3.5	3.0	3.1	2.0	.	.	.	.	.	.	.	13.6
H	0.0	0.1	0.2	0.4	0.1	0.2	0.4	.	.	.	.	.	.	.	1.4
PL	0.0	2.1	6.9	4.7	0.9	0.7	0.4	.	.	.	.	.	.	.	15.7
S	0.0	0.8	2.8	2.1	1.5	.	0.5	1.7	.	.	.	.	.	.	9.3
Subtotal	0.0	4.5	19.8	16.4	7.1	4.7	3.6	2.1	1.8	0.0	0.0	0.0	0.0	0.0	60.0

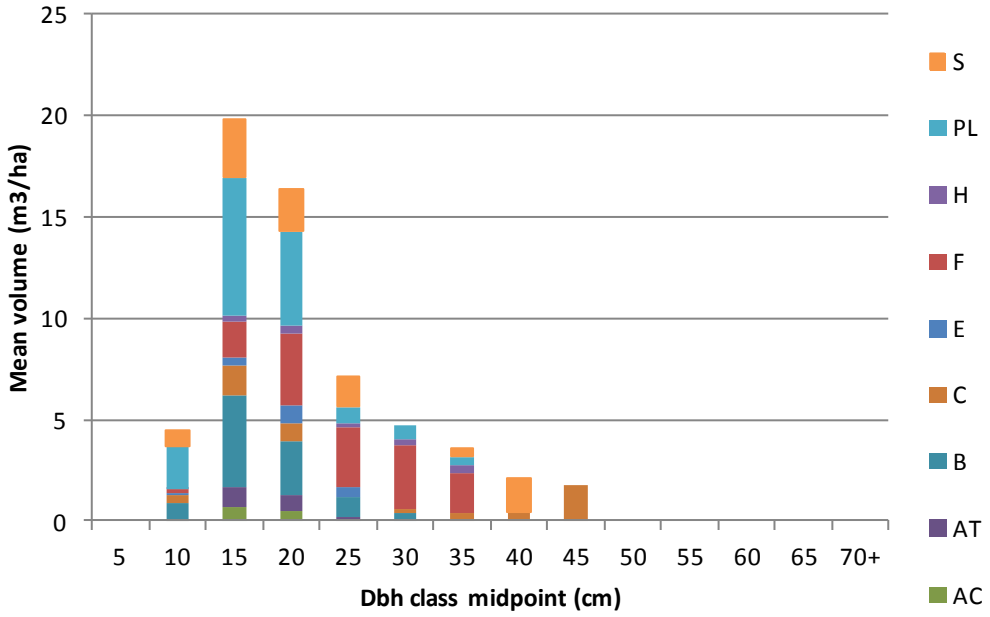

Figure 14. *Mean volume (m^3/ha) by DBH class and species for older, immature samples (31-50 years of age), LIVE trees.*

9 Dead Immature, ages 15 - 30

Table 15. *Stand Table: Distribution of Mean Trees/ha by DBH class for older, immature samples (31-50 years of age), Dead trees*

Trees /ha															
	DBH Class (cm)														
Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
AC	.	.	2	.	.	.	.	.	.	.	.	.	.	.	2
AT	6	3	1	1	.	.	.	.	.	.	.	.	.	.	11
B	33	12	2	.	.	.	.	.	.	.	.	.	.	.	47
C	6	.	1	.	.	.	.	1	1	1	.	.	.	.	8
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	8	14	6	3	6	2	.	.	.	.	.	.	.	.	40
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PL	114	104	51	13	3	.	1	.	.	.	.	.	.	.	285
S	3	3	2	.	2	.	1	.	.	.	.	.	.	.	11
Subtotal	170	136	65	18	11	2	1	1	1	1	0	0	0	0	405

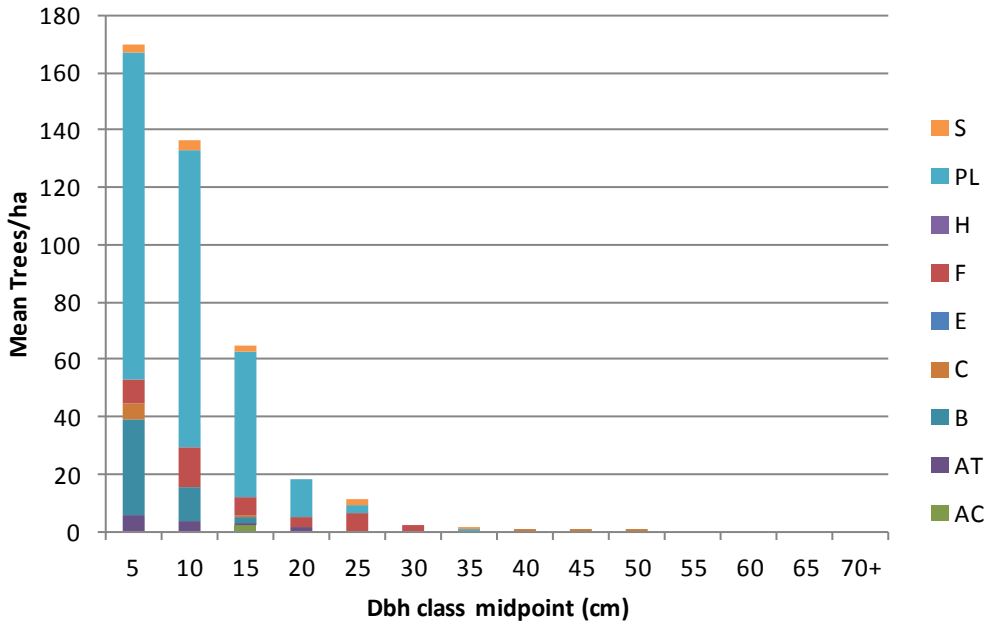

Figure 15. *Mean trees/ha by DBH class and species for older, immature samples (31-50 years of age), Dead trees.*

10 Live, mature, by BEC

The IDF is dominated by Douglas-fir while the remaining BEC zones are dominated by pine and spruce.

Table 16. *Stand Table: Distribution of Mean Trees/ha by DBH class for live, mature samples by BEC zone.*

		Trees /ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	.	2	.	3	2	2	4	4	.	2	.	0	18
	AT	.	.	.	.	.	.	1	.	2	.	.	.	.	.	3
	B	18	49	2	26	5	11	3	3	.	2	.	.	.	.	119
	C	8	56	8	22	19	30	10	12	14	13	8	8	8	17	231
	E	44	.	.	5	.	.	.	.	.	.	.	.	.	.	49
	F	.	.	21	.	15	5	9	6	3	1	.	1	1	1	61
	H	174	127	49	40	23	14	2	6	5	7	5	2	3	2	457
	PL	2	6	2	2	.	.	.	.	.	.	.	.	.	.	11
	S	50	37	24	5	16	8	8	11	6	1	1	.	0	.	166
	Subtotal	295	275	104	101	78	71	34	39	33	26	13	13	12	19	1115
IDF	AC															0
	AT	.	34	12	10	1	3	2	3	0	.	.	.	.	.	65
	B															0
	C	49	3	.	.	.	.	.	.	.	.	.	.	.	.	52
	E															0
	F	549	241	148	82	47	24	12	8	6	4	3	3	1	3	1131
	H															0
	PL	24	24	5	2	.	.	.	.	.	.	.	.	.	.	54
	S	69	76	15	9	10	4	2	2	1	1	.	.	0	.	189
	Subtotal	690	379	180	102	58	31	16	12	7	5	3	3	2	3	1491
Other	AC	.	.	.	.	.	.	.	.	1	.	1	.	.	1	3
	AT	10	.	.	5	4	4	1	1	1	.	.	.	.	.	25
	B	137	64	67	50	29	23	9	4	5	2	2	0	0	1	396
	C															0
	E															0
	F	15	20	20	11	12	9	8	5	2	2	2	.	.	1	108
	H	.	.	.	.	.	.	0	1	.	.	.	.	.	.	1
	PL	8	1	12	3	1	1	.	.	.	.	.	.	.	.	26
	S	29	19	14	21	15	15	4	5	5	4	4	2	1	0	140
	Subtotal	199	105	113	91	62	53	23	17	14	8	9	2	1	4	699
SBPS	AC															0
	AT	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2
	B															0
	C															0
	E															0
	F	.	24	.	5	.	.	.	.	.	.	.	.	.	.	29
	H															0
	PL	454	730	120	30	.	.	.	.	.	.	.	.	.	.	1334
	S	86	78	15	12	26	19	5	6	1	.	1	.	.	.	248
	Subtotal	540	832	134	46	26	21	5	6	1	0	1	0	0	0	1613

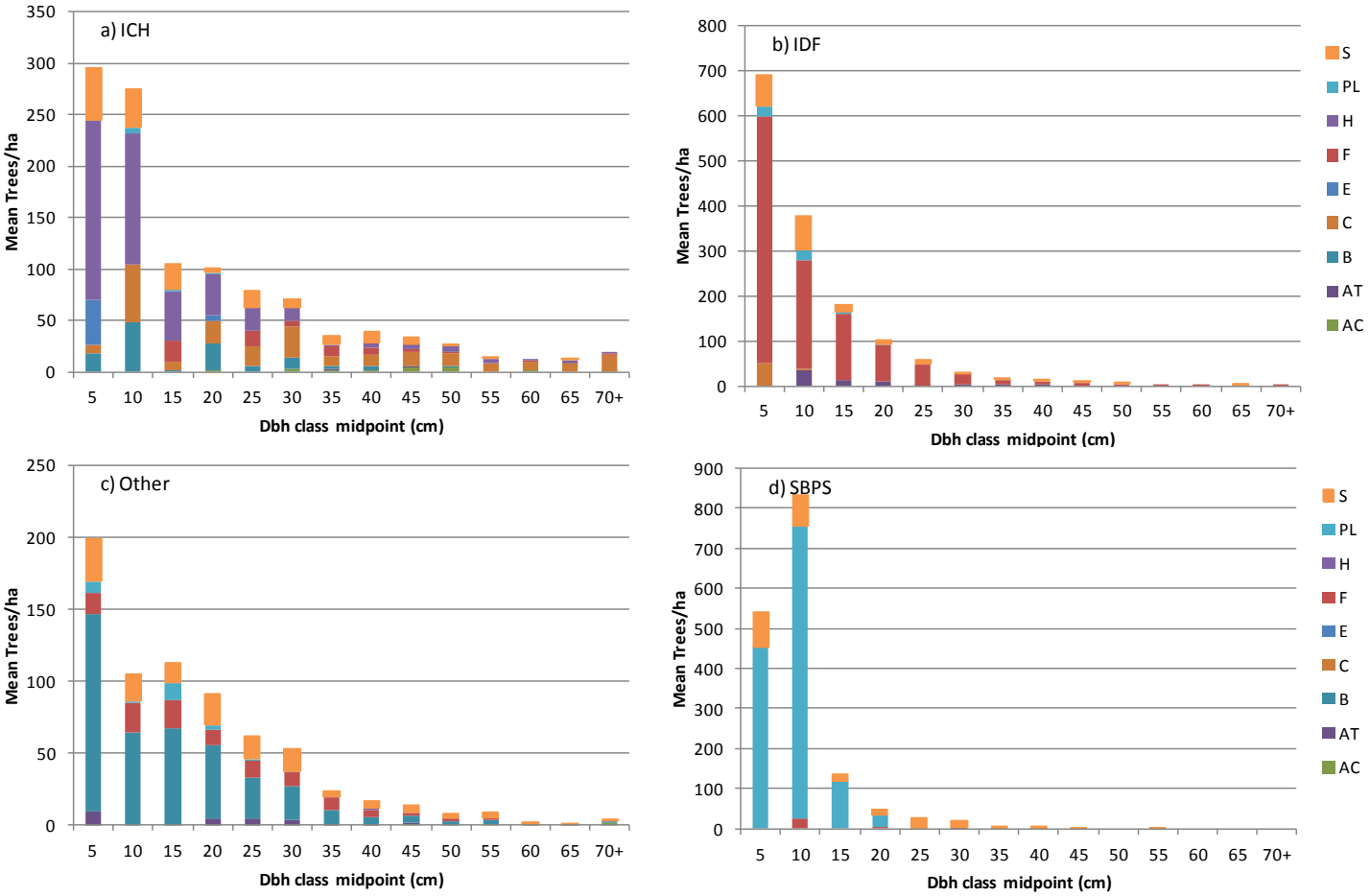

Figure 16. *Mean trees/ha by DBH class and species for live, mature samples by BEC zone.*

The SBPS has the lowest volumes.

Table 17. *Stock Table: Distribution of Mean volume/ha by DBH class for live, mature samples by BEC zone.*

		Volume m^3/ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	0.4	.	1.7	0.9	3.0	6.6	9.2	.	6.6	.	3.1	0	31.6
	AT	.	.	.	.	.	1.0	.	3.0	.	.	.	.	.	0	4.0
	B	0.7	0.2	4.3	1.6	6.7	2.7	3.5	.	2.8	.	.	.	.	0	22.6
	C	0.7	0.3	2.9	5.1	13.8	5.1	6.8	12.4	13.3	9.3	11.5	12.7	52.9	0	146.9
	E	.	.	1.0	.	.	.	.	.	.	.	.	.	.	0	1.0
	F	.	1.4	.	5.9	2.3	6.3	6.3	4.1	1.5	.	2.2	1.8	5.8	0	37.6
	H	0.8	1.9	6.7	7.3	6.0	0.8	2.8	7.4	12.4	9.3	6.0	12.1	10.5	0	83.9
	PL	0.1	0.1	0.2	.	.	.	.	.	.	.	.	.	.	0	0.4
	S	0.3	2.2	0.7	5.3	4.9	7.6	13.2	10.3	2.1	1.8	.	2.0	.	0	50.4
	Subtotal	2.7	6.1	16.2	25.3	35.4	24.3	35.6	43.9	41.4	20.4	26.2	28.7	72.3	0.0	378.4
IDF	AC															0.0
	AT	.	0.0	0.9	1.6	0.4	1.2	1.5	2.0	0.4	.	.	.	.	.	7.8
	B															0.0
	C	0.0	0.0	.	.	.	.	.	.	.	.	.	.	.	.	0.0
	E															0.0
	F	0.0	2.4	10.1	12.7	13.4	11.5	8.5	7.6	8.7	7.4	6.0	6.7	4.8	18.0	117.9
	H															0.0
	PL	0.0	0.2	0.3	0.2	.	.	.	.	.	.	.	.	.	.	0.7
	S	0.0	0.5	0.8	1.7	3.5	2.2	1.5	2.2	0.9	1.6	.	.	1.3	.	16.0
	Subtotal	0.0	3.2	12.1	16.2	17.3	14.8	11.5	11.8	9.9	9.0	6.0	6.7	6.0	18.0	142.5
Other	AC	.	.	.	.	.	.	.	.	1.3	.	1.3	.	.	6.5	9.0
	AT	0.0	.	.	0.9	1.3	1.5	0.6	0.7	0.8	.	.	.	.	.	5.8
	B	0.0	0.4	4.3	8.0	8.3	11.4	6.7	4.2	7.2	4.6	3.9	0.7	0.7	2.7	63.0
	C															0.0
	E															0.0
	F	0.0	0.3	1.9	2.3	3.9	5.2	6.5	6.4	3.6	4.6	4.6	.	.	5.1	44.4
	H	.	.	.	.	.	.	0.3	0.7	.	.	.	.	.	.	1.1
	PL	0.0	0.0	0.8	0.6	0.5	0.3	.	.	.	.	.	.	.	.	2.1
	S	0.0	0.2	1.1	3.9	6.0	10.3	3.9	6.6	7.2	7.8	10.4	6.6	2.7	3.1	69.7
	Subtotal	0.0	0.9	8.0	15.7	20.0	28.7	17.9	18.6	20.1	16.9	20.2	7.3	3.5	17.4	195.2
SBPS	AC															0.0
	AT	.	.	.	.	.	0.9	.	.	.	.	.	.	.	.	0.9
	B															0.0
	C															0.0
	E															0.0
	F	.	0.0	.	0.5	.	.	.	.	.	.	.	.	.	.	0.5
	H															0.0
	PL	0.0	7.0	9.8	4.9	.	.	.	.	.	.	.	.	.	.	21.7
	S	0.0	0.0	1.3	2.2	8.1	10.2	3.9	7.9	1.9	.	2.2	.	.	.	37.8
	Subtotal	0.0	7.0	11.1	7.5	8.1	11.1	3.9	7.9	1.9	0.0	2.2	0.0	0.0	0.0	60.8

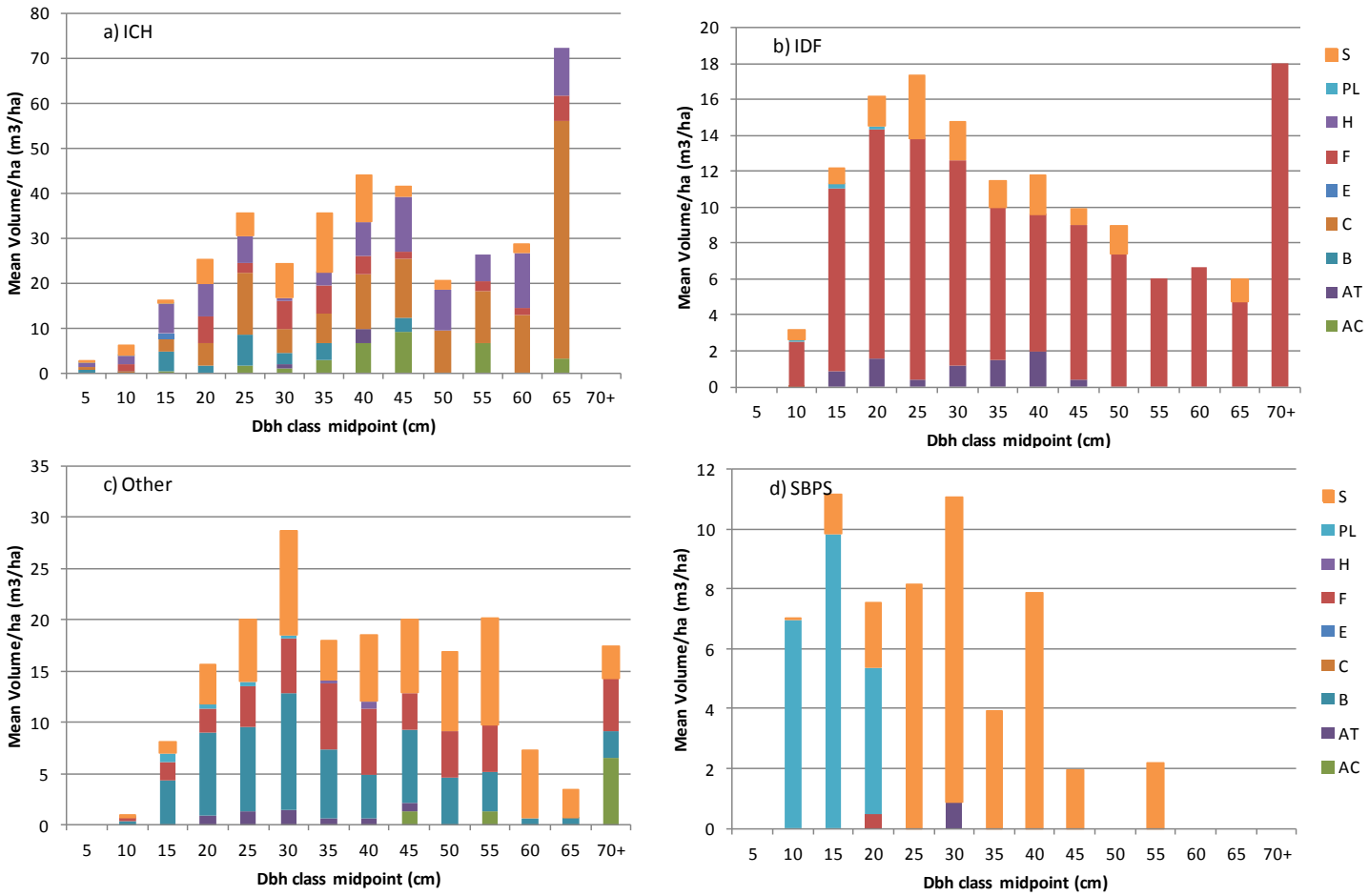

Figure 17. *Mean volume/ha by DBH class and species for live, mature samples by BEC zone.*

11 Dead, mature, by BEC

Table 18. *Stand Table: Distribution of Mean Trees/ha by DBH class for dead, mature samples by BEC zone.*

		Trees /ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0
	AT															0
	B	.	29	18	5	5	2	1	.	1	.	.	.	.	.	61
	C	15	.	.	.	6	.	2	.	.	3	3	2	4	5	40
	E	.	.	11	.	.	.	.	.	.	.	.	.	.	.	11
	F	.	.	.	.	4	.	.	3	.	.	.	.	.	0	7
	H	23	8	.	4	.	.	2	.	.	.	.	.	.	2	38
	PL	.	.	4	3	.	11	.	4	.	.	.	.	.	.	22
	S	2	.	18	8	.	2	1	1	2	.	.	1	1	0	35
	Subtotal	39	37	51	20	14	14	6	8	3	3	3	2	4	8	215
IDF	AC															0
	AT	28	.	.	.	2	.	0	.	.	.	.	.	.	.	30
	B															0
	C															0
	E															0
	F	20	60	21	25	6	2	2	1	0	.	0	1	1	2	140
	H															0
	PL	3	16	23	16	3	1	1	0	.	.	.	.	.	.	62
	S	26	.	1	1	1	1	.	1	0	.	0	.	.	.	32
	Subtotal	77	76	45	42	11	4	3	2	0	0	1	1	1	2	265
Other	AC															0
	AT	.	.	1	.	1	1	.	.	.	.	.	.	.	.	3
	B	1	29	12	21	14	15	11	7	5	3	0	1	.	.	117
	C															0
	E															0
	F	18	4	1	1	2	2	1	1	.	0	1	0	0	0	33
	H															0
	PL	.	11	9	18	13	13	5	2	0	1	0	.	.	.	71
	S	3	6	1	8	3	2	3	1	2	0	0	0	1	1	32
	Subtotal	22	50	24	48	33	33	20	11	6	4	2	1	1	1	256
SBPS	AC															0
	AT															0
	B															0
	C															0
	E															0
	F															0
	H															0
	PL	.	226	279	105	57	17	7	.	.	.	.	.	.	.	691
	S															0
	Subtotal	0	226	279	105	57	17	7	0	0	0	0	0	0	0	691

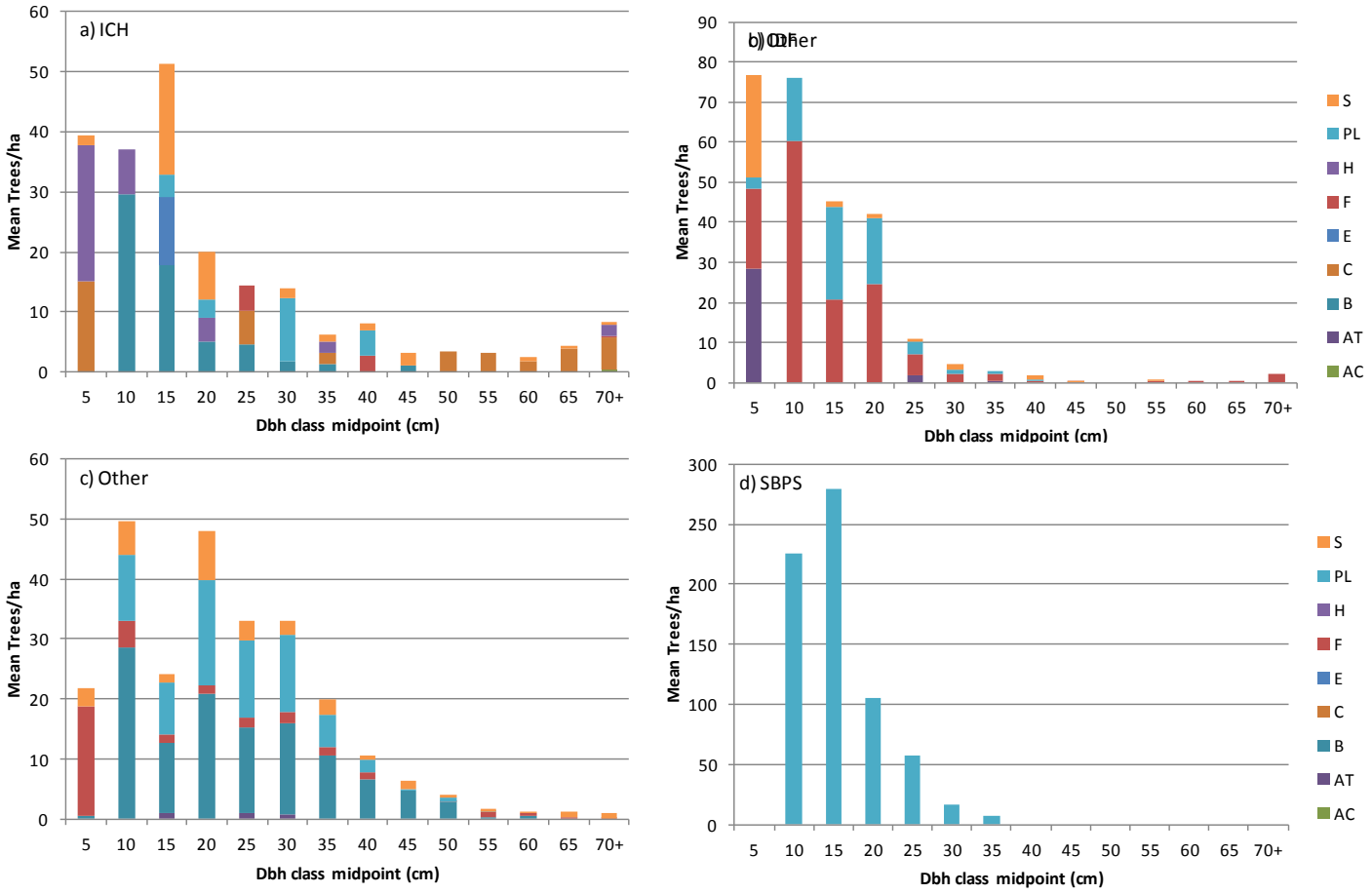

Figure 18. *Mean trees/ha by DBH class and species for dead, mature samples by BEC zone.*

Table 19. *Stock Table: Distribution of Mean Volume/ha by DBH class for dead, mature samples by BEC zone.*

	Volume m^3/ha															
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	.	.	.	.	.	.	.	.	.	.	.	0.0	0.0
	AT															0.0
	B	.	0.0	1.3	0.8	1.1	0.7	0.7	.	0.0	.	.	.	.	.	4.6
	C	0.0	.	.	.	0.7	.	0.4	.	.	2.7	0.5	0.0	4.6	3.4	12.3
	E	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	0.2
	F	.	.	.	.	0.0	.	.	0.0	.	.	.	.	.	0.3	0.3
	H	0.0	0.0	.	0.2	.	.	0.0	.	.	.	.	.	.	0.8	1.0
	PL	.	.	0.4	0.6	.	6.1	.	4.5	.	.	.	.	.	.	11.7
	S	0.0	.	0.8	1.7	.	1.0	0.9	1.9	2.1	.	.	1.0	1.5	1.6	12.6
	Subtotal	0.0	0.0	2.7	3.4	1.8	7.8	2.0	6.4	2.1	2.7	0.5	1.0	6.1	6.1	42.7
IDF	AC															0.0
	AT	0.0	.	.	.	0.1	.	0.0	.	.	.	.	.	.	.	0.1
	B															0.0
	C															0.0
	E															0.0
	F	0.0	0.1	0.8	1.6	0.4	0.2	0.3	0.1	0.0	.	0.2	0.2	0.1	1.9	5.8
	H															0.0
	PL	0.0	0.2	2.0	2.8	0.9	0.4	0.4	0.0	.	.	.	.	.	.	6.8
	S	0.0	.	0.1	0.1	0.1	0.6	.	1.0	0.3	.	0.0	.	.	.	2.2
	Subtotal	0.0	0.3	2.9	4.5	1.6	1.2	0.7	1.0	0.3	0.0	0.2	0.2	0.1	1.9	14.8
Other	AC															0.0
	AT	.	.	0.0	.	0.0	0.0	.	.	.	.	.	.	.	.	0.0
	B	0.0	0.4	0.6	2.9	3.1	6.0	5.5	4.7	4.6	3.6	0.7	1.1	.	.	33.1
	C															0.0
	E															0.0
	F	0.0	0.0	0.1	0.2	0.1	0.4	0.1	0.1	.	0.1	0.3	0.1	0.1	0.1	1.6
	H															0.0
	PL	.	0.2	0.8	3.7	4.6	6.9	4.4	2.3	0.3	1.1	0.2	.	.	.	24.4
	S	0.0	0.2	0.2	1.6	0.8	1.1	1.8	0.6	1.6	0.7	0.6	0.6	3.3	2.9	16.1
	Subtotal	0.0	0.9	1.6	8.5	8.6	14.4	11.8	7.6	6.5	5.4	1.7	1.8	3.4	3.0	75.3
SBPS	AC															0.0
	AT															0.0
	B															0.0
	C															0.0
	E															0.0
	F															0.0
	H															0.0
	PL	.	3.2	22.3	20.9	17.9	8.6	4.7	.	.	.	.	.	.	.	77.7
	S															0.0
	Subtotal	0.0	3.2	22.3	20.9	17.9	8.6	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.7

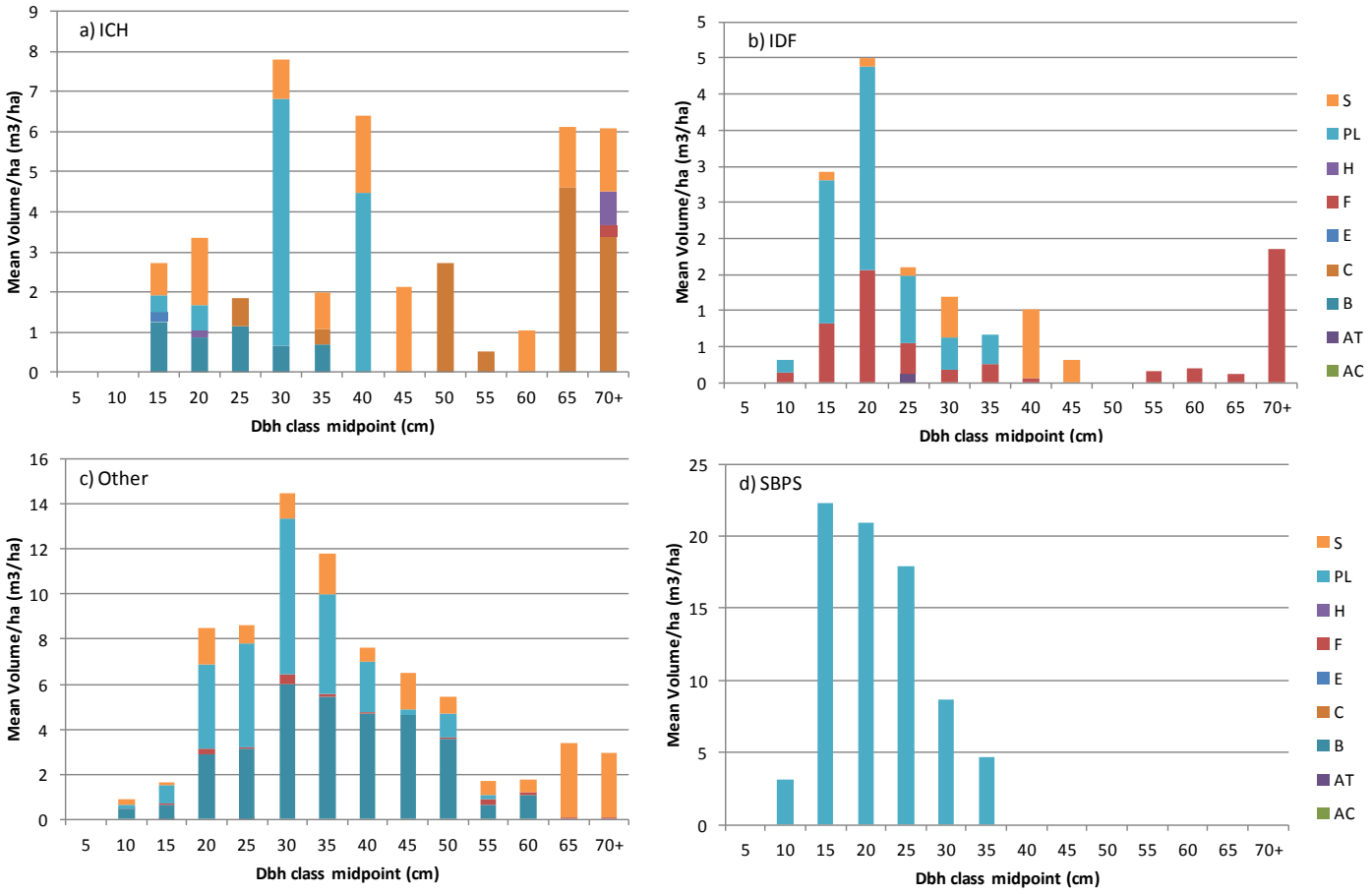

Figure 19. *Mean volume/ha by DBH class and species for dead, mature samples by BEC zone.*

12 Live, Immature, by BEC

Table 20. *Stand Table: Distribution of Mean Trees/ha by DBH class for live, immature samples by BEC zone.*

		Trees /ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	43	14	16	5	.	2	.	.	.	.	.	.	.	.	80
	AT	.	4	.	.	.	.	.	.	.	.	.	.	.	.	4
	B	222	132	89	32	9	2	.	.	.	.	.	.	.	.	486
	C	229	104	64	23	.	2	2	2	5	.	.	.	.	.	431
	E	43	38	14	11	7	.	.	.	.	.	.	.	.	.	113
	F	79	64	55	13	5	7	.	.	.	.	.	.	.	.	223
	H	300	41	11	7	2	2	2	.	.	.	.	.	.	.	365
	PL	71	122	80	32	7	.	2	.	.	.	.	.	.	.	314
	S	457	254	105	34	9	.	.	.	.	.	.	.	.	.	860
	Subtotal	1444	772	436	157	39	14	5	2	5	0	0	0	0	0	2875
IDF	AC															0
	AT	38	11	.	5	2	.	.	.	.	.	.	.	.	.	55
	B															0
	C															0
	E															0
	F	69	66	23	20	8	5	8	.	.	.	.	.	.	.	199
	H															0
	PL	382	363	44	6	.	.	.	.	.	.	.	.	.	.	794
	S	25	14	5	5	.	.	.	.	.	.	.	.	.	.	48
	Subtotal	513	453	72	36	9	5	8	0	0	0	0	0	0	0	1096
Other	AC	22	14	11	4	.	.	.	.	.	.	.	.	.	.	51
	AT	6	21	4	4	.	.	.	.	.	.	.	.	.	.	35
	B	111	182	93	17	.	.	.	.	.	.	.	.	.	.	403
	C	28	13	1	.	.	.	.	.	.	.	.	.	.	.	42
	E	.	3	3	6	.	.	.	.	.	.	.	.	.	.	11
	F	6	13	14	19	11	6	.	.	.	.	.	.	.	.	68
	H															0
	PL	534	402	103	33	3	3	.	.	.	.	.	.	.	.	1077
	S	122	129	35	7	6	.	1	3	.	.	.	.	.	.	303
	Subtotal	828	776	264	90	19	8	1	3	0	0	0	0	0	0	1990
SBPS	AC															0
	AT	93	48	18	4	2	1	.	.	.	.	.	.	.	.	166
	B															0
	C															0
	E															0
	F	7	2	.	.	.	.	.	.	.	.	.	.	.	.	8
	H															0
	PL	717	254	49	8	1	1	.	.	.	.	.	.	.	.	1030
	S	10	3	2	1	1	.	.	.	.	.	.	.	.	.	16
	Subtotal	827	305	69	13	3	2	0	0	0	0	0	0	0	0	1220

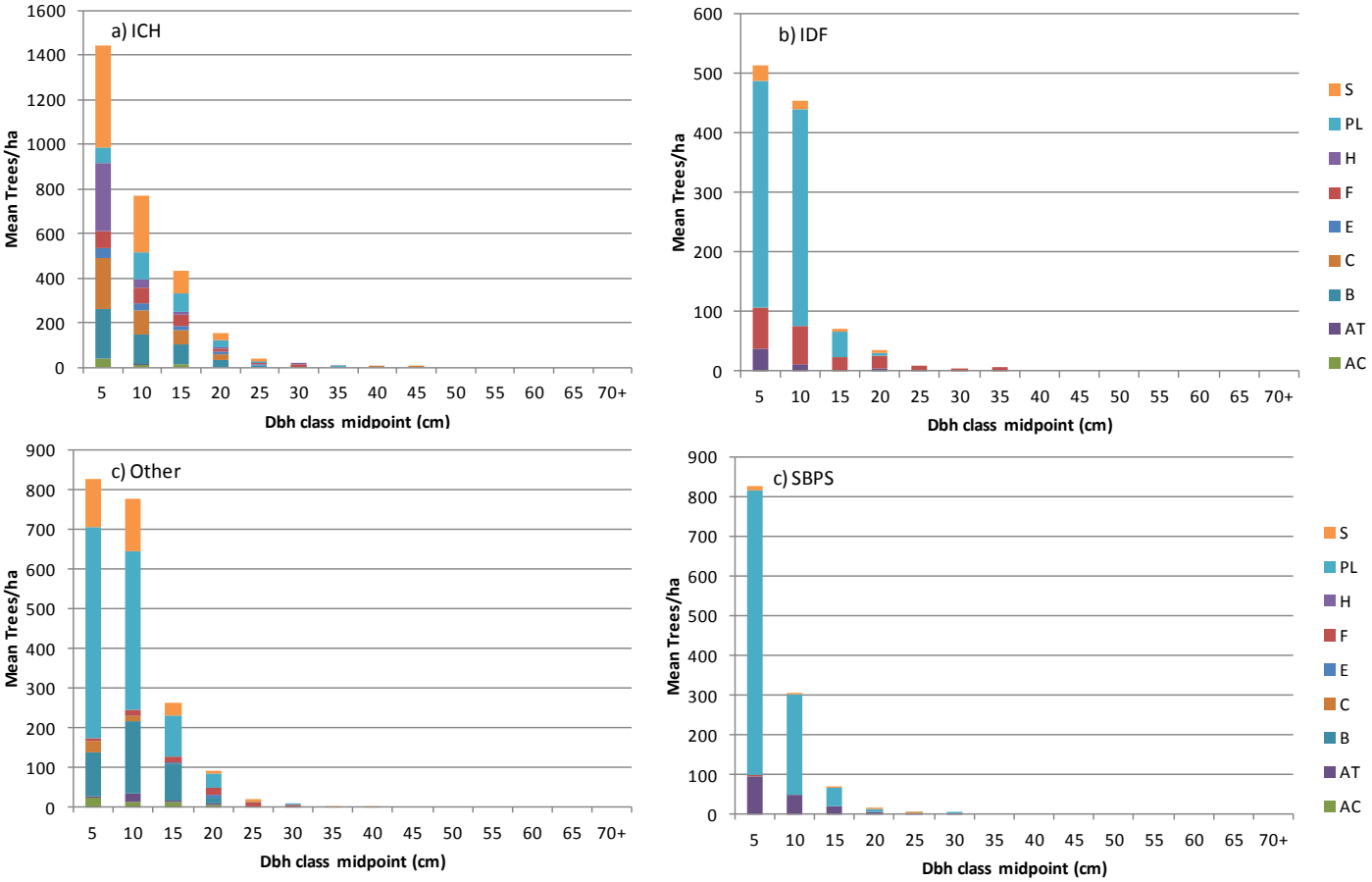

Figure 20. *Mean trees/ha by DBH class and species for live, immature samples by BEC zone.*

Table 21. *Stock Table: Distribution of Mean Volume/ha by DBH class for live, immature samples by BEC zone.*

		Volume m^3/ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC															
	AT															
	B															
	C															
	E															
	F															
	H															
	PL															
	S															
	Subtotal															
IDF	AC															0.0
	AT	0.0	0.0	.	0.4	0.3	.	.	.	.	.	.	.	.	.	0.7
	B															0.0
	C															0.0
	E															0.0
	F	0.0	0.1	1.0	3.2	2.2	2.0	4.5	.	.	.	.	.	.	.	13.1
	H															0.0
	PL	0.0	1.1	2.0	0.6	.	.	.	.	.	.	.	.	.	.	3.7
	S	0.0	0.1	0.3	0.7	.	.	.	.	.	.	.	.	.	.	1.1
	Subtotal	0.0	1.3	3.3	4.9	2.6	2.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6
Other	AC	0.0	0.0	1.1	0.7	.	.	.	.	.	.	.	.	.	.	1.8
	AT	0.0	0.0	0.4	0.8	.	.	.	.	.	.	.	.	.	.	1.2
	B	0.0	1.3	6.4	2.4	.	.	.	.	.	.	.	.	.	.	10.2
	C	0.0	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	0.2
	E	.	0.0	0.1	0.5	.	.	.	.	.	.	.	.	.	.	0.7
	F	0.0	0.1	0.7	2.9	2.8	2.1	.	.	.	.	.	.	.	.	8.6
	H															0.0
	PL	0.0	2.0	5.5	4.6	0.6	0.9	.	.	.	.	.	.	.	.	13.5
	S	0.0	0.8	1.7	0.8	1.4	.	0.9	3.3	.	.	.	.	.	.	8.9
	Subtotal	0.0	4.3	16.1	12.7	4.8	3.0	0.9	3.3	0.0	0.0	0.0	0.0	0.0	0.0	45.0
SBPS	AC															0.0
	AT	0.0	0.1	1.0	0.5	0.3	0.4	.	.	.	.	.	.	.	.	2.2
	B															0.0
	C															0.0
	E															0.0
	F	0.0	0.0	.	.	.	.	.	.	.	.	.	.	.	.	0.0
	H															0.0
	PL	0.0	0.9	2.6	1.1	0.2	0.3	.	.	.	.	.	.	.	.	5.2
	S	0.0	0.0	0.1	0.1	0.2	.	.	.	.	.	.	.	.	.	0.4
	Subtotal	0.0	1.0	3.7	1.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8

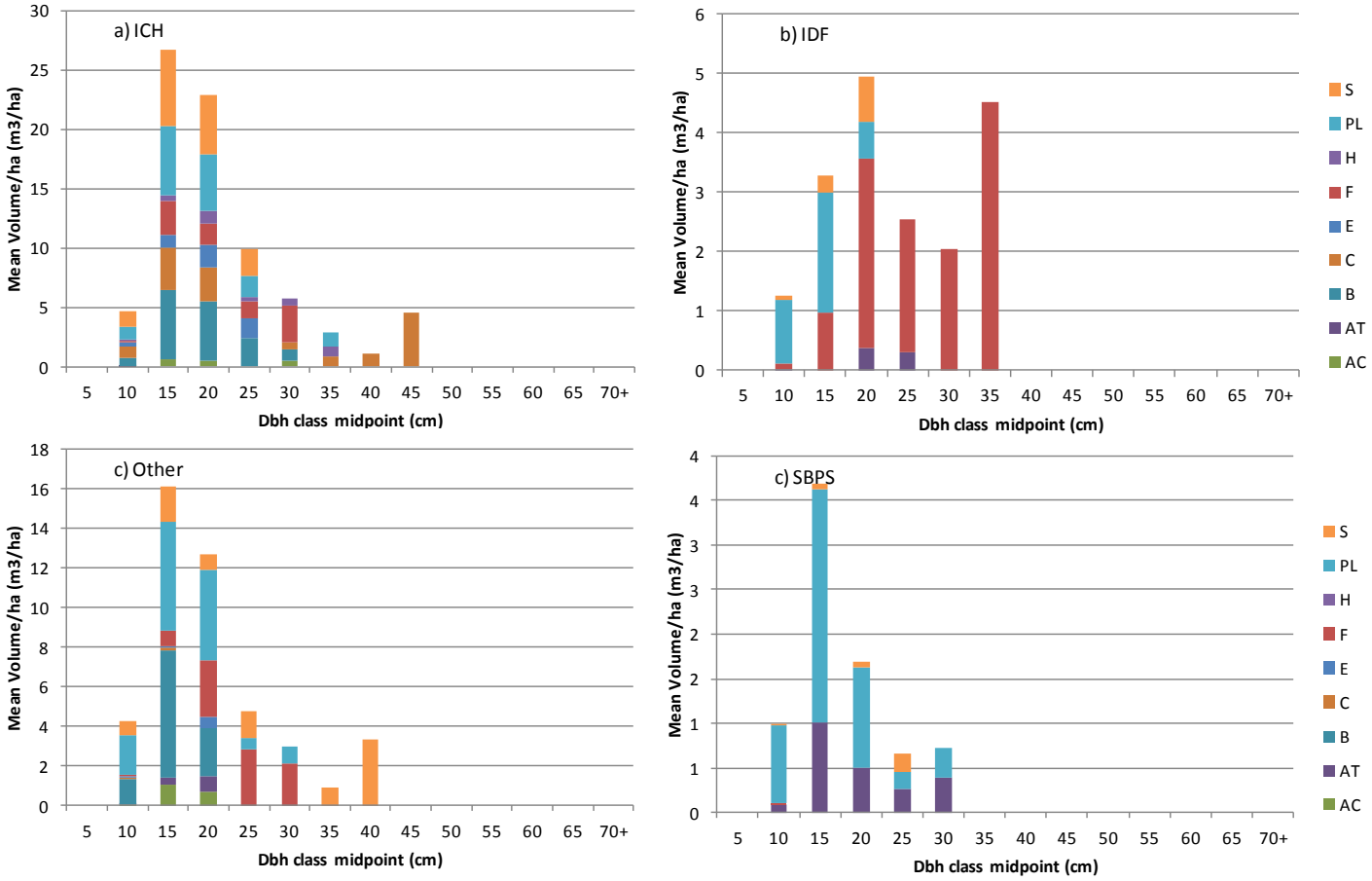

Figure 21. *Mean volume/ha by DBH class and species for live, immature samples by BEC zone.*

13 Dead, Immature, by BEC

Table 22. *Stand Table: Distribution of Mean Trees/ha by DBH class for dead, immature samples by BEC zone.*

		Trees /ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	5	.	.	.	.	.	.	.	.	.	.	.	5
	AT															0
	B	36	21	5	.	.	.	.	.	.	.	.	.	.	.	63
	C	14	.	2	.	.	.	.	.	2	2	.	.	.	2	21
	E															0
	F	.	11	.	.	2	4	.	.	.	.	.	.	.	.	16
	H															0
	PL	57	59	102	32	4	.	.	.	.	.	.	.	.	.	254
	S	.	7	5	.	5	.	.	.	.	.	.	.	.	.	18
	Subtotal	107	98	120	32	11	4	0	0	2	2	0	0	0	2	377
IDF	AC															0
	AT	.	.	.	2	.	.	.	.	.	.	.	.	.	.	2
	B															0
	C															0
	E															0
	F	13	19	13	6	11	2	.	.	.	.	.	.	.	.	63
	H															0
	PL	19	50	20	.	3	.	.	.	.	.	.	.	.	.	92
	S															0
	Subtotal	31	69	33	8	14	2	0	0	0	0	0	0	0	0	156
Other	AC															0
	AT															0
	B	39	7	.	.	.	.	.	.	.	.	.	.	.	.	46
	C	.	.	.	.	.	.	.	1	1	1	.	.	.	.	4
	E															0
	F	6	3	1	1	1	.	.	.	.	.	.	.	.	.	13
	H															0
	PL	6	7	.	.	1	.	.	.	.	.	.	.	.	.	14
	S	6	1	.	.	.	.	1	.	.	.	.	.	.	.	8
	Subtotal	56	18	1	1	3	0	1	1	1	1	0	0	0	0	85
SBPS	AC															0
	AT	7	4	1	2	.	.	.	.	.	.	.	.	.	.	13
	B															0
	C															0
	E															0
	F															0
	H															0
	PL	103	66	3	1	.	.	1	.	.	.	.	.	.	.	174
	S															0
	Subtotal	110	70	4	3	0	0	1	0	0	0	0	0	0	0	188

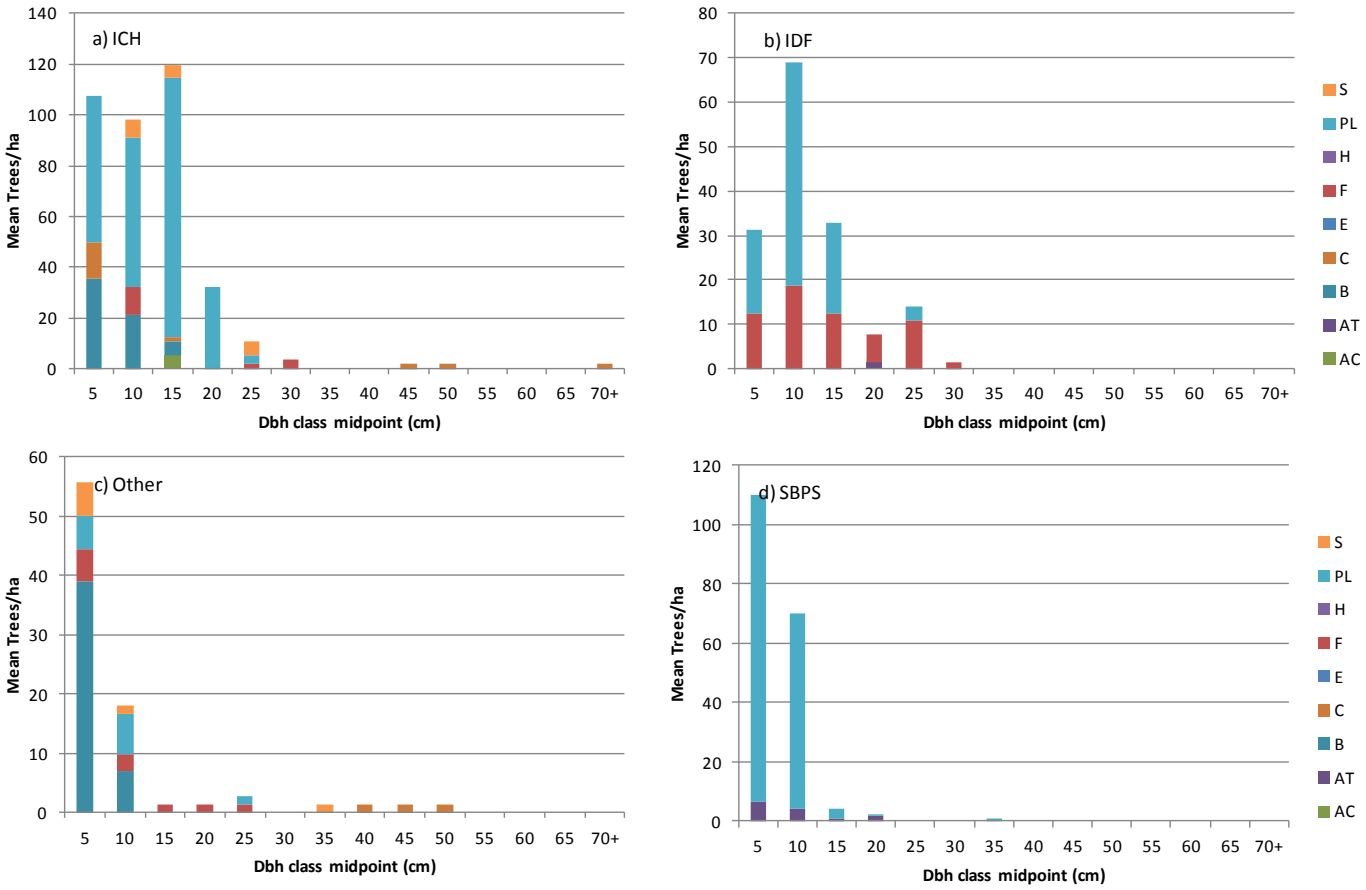

Figure 22. *Mean trees/ha by DBH class and species for dead, immature samples by BEC zone.*

Table 23. *Stock Table: Distribution of Mean Volume/ha by DBH class for dead, immature samples by BEC zone.*

		Volume m^3/ha														
		DBH Class (cm)														
	Sp0	5	10	15	20	25	30	35	40	45	50	55	60	65	70+	*Subtotal*
ICH	AC	.	.	0.0	.	.	.	.	.	.	.	.	.	.	.	0.0
	AT															0.0
	B	0.0	0.1	0.2	.	.	.	.	.	.	.	.	.	.	.	0.3
	C	0.0	.	0.0	.	.	.	.	.	0.0	0.0	.	.	.	0.0	0.0
	E															0.0
	F	.	0.0	.	.	0.3	0.0	.	.	.	.	.	.	.	.	0.3
	H															0.0
	PL	0.0	0.7	7.5	4.5	0.9	.	.	.	.	.	.	.	.	.	13.5
	S	.	0.1	0.3	.	1.6	.	.	.	.	.	.	.	.	.	2.0
	Subtotal	0.0	0.9	8.0	4.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1
IDF	AC															0.0
	AT	.	.	.	0.0	.	.	.	.	.	.	.	.	.	.	0.0
	B															0.0
	C															0.0
	E															0.0
	F	0.0	0.0	0.5	0.8	2.2	0.6	.	.	.	.	.	.	.	.	4.1
	H															0.0
	PL	0.0	0.3	1.0	.	0.7	.	.	.	.	.	.	.	.	.	2.0
	S															0.0
	Subtotal	0.0	0.4	1.4	0.8	2.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1
Other	AC															0.0
	AT															0.0
	B	0.0	0.0	.	.	.	.	.	.	.	.	.	.	.	.	0.0
	C	.	.	.	.	.	.	.	0.0	0.0	0.0	.	.	.	.	0.0
	E															0.0
	F	0.0	0.0	0.1	0.2	0.0	.	.	.	.	.	.	.	.	.	0.2
	H															0.0
	PL	0.0	0.1	.	.	0.4	.	.	.	.	.	.	.	.	.	0.5
	S	0.0	0.0	.	.	.	.	0.7	.	.	.	.	.	.	.	0.7
	Subtotal	0.0	0.1	0.1	0.2	0.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
SBPS	AC															0.0
	AT	0.0	0.0	0.0	0.0	.	.	.	.	.	.	.	.	.	.	0.0
	B															0.0
	C															0.0
	E															0.0
	F															0.0
	H															0.0
	PL	0.0	0.2	0.2	0.1	.	.	0.4	.	.	.	.	.	.	.	0.9
	S															0.0
	Subtotal	0.0	0.2	0.2	0.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

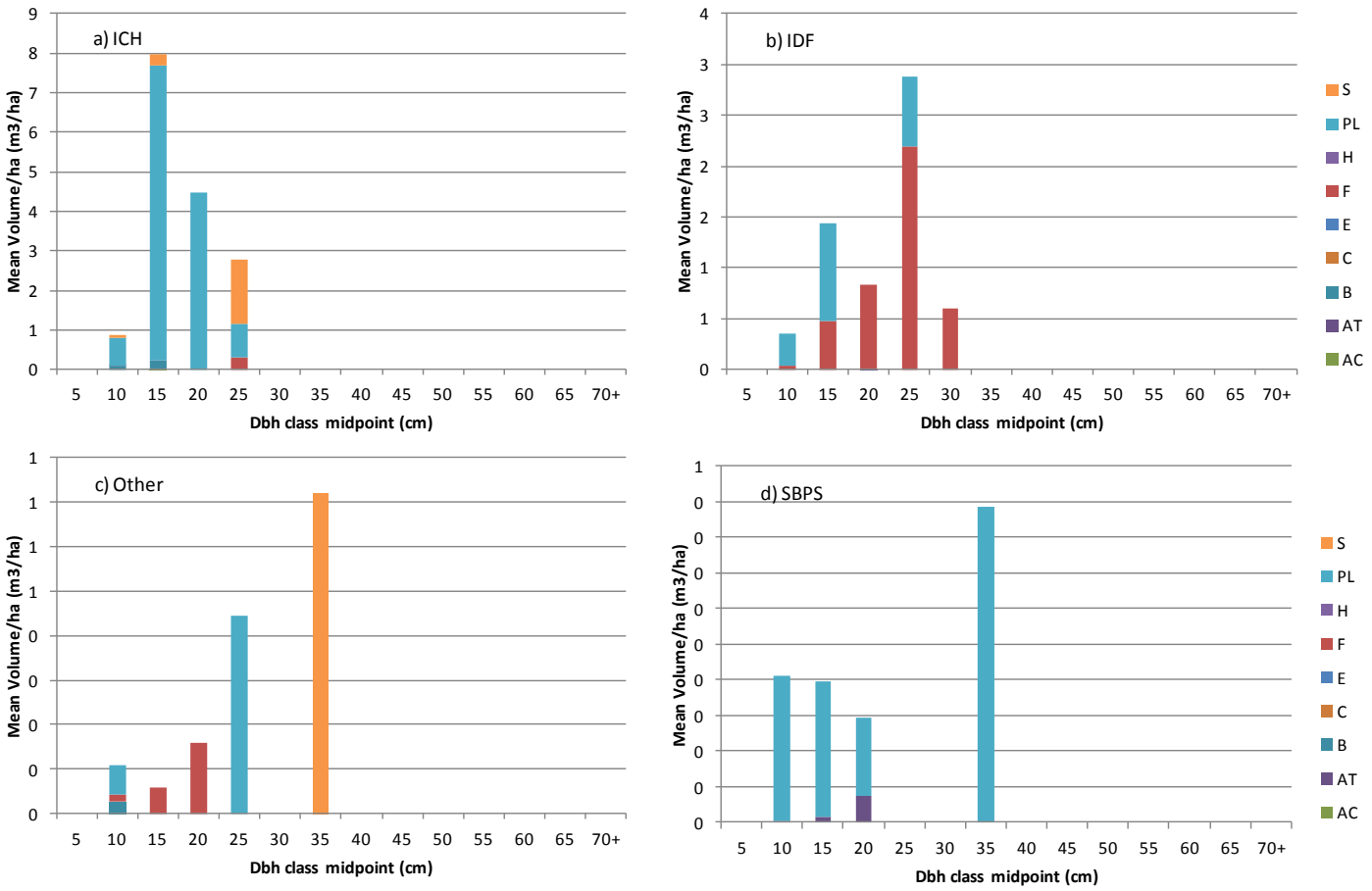

Figure 23. *Mean Volume/ha by DBH class and species for dead, immature samples by BEC zone.*