Prince George TSA

Documentation of

Vegetation Resources Inventory Analysis – Volume Audit (Mature)

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 Prince George 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.

In general, the Volume Audit (mature) Phase I (inventory) ages are older and the Phase I heights taller than the Phase II (ground) means (Table 1). The Volume Audit (mature) Phase I basal area is 25% larger than the Phase II basal area, due largely to overestimation in the pine stratum. The volumes are much closer. The Phase I volumes have been adjusted for MPB mortality but the basal area estimates have not. Trees per hectare has the poorest agreement between Phase I and Phase II.

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 attribute for the volume audit (mature) portion of the Prince George TSA. The ratios that differ from 1.0 by more than 10% are shaded.

Attribute	Statistic	Volume Audit (Current)	Volume Audit (2015)
Leading species age (years)	N	174	174
	Mean Phase II Ground	126	126
	Mean Phase I inventory	149	149
	Ratio (Phase II/Phase I)	0.845	0.845
	SE of Ratio (%)	(5.5%)	(5.5%)
Leading species height (m)	N	174	174
	Mean Phase II Ground	22.2	22.2
	Mean Phase I inventory	24.0	24.0
	Ratio (Phase II/Phase I)	0.927	0.928
	SE of Ratio (%)	(3.8%)	(3.7%)
Basal area (m^2/ha) 7.5 cm+	N	180	181
	Mean Phase II Ground	28.6	28.6
	Mean Phase I inventory	35.5	35.5
	Ratio (Phase II/Phase I)	0.807	0.804
	SE of Ratio (%)	(9.1%)	(9.2%)
Trees/ha 7.5 cm+	N	179	180
	Mean Phase II Ground	866	868
	Mean Phase I inventory	597	596
	Ratio (Phase II/Phase I)	1.451	1.456
	SE of Ratio (%)	(11.1%)	(11%)
Lorey height (m)	N	178	179
	Mean Phase II Ground	16.7	16.7
	Mean Phase I inventory	21.6	21.6
	Ratio (Phase II/Phase I)	0.776	0.773
	SE of Ratio (%)	(4.7%)	(4.7%)
Volume Net dwb (m^3/ha) 12.5 cm+	N	180	181
	Mean Phase II Ground	189.5	189
	Mean Phase I inventory	189.1	189
	Ratio (Phase II/Phase I)	1.002	0.998
	SE of Ratio (%)	(10.8%)	(10.8%)
Leading species Site index (m)	N	173	173
	Mean Phase II Ground	13.8	13.8
	Mean Phase I inventory	13.8	13.8
	Ratio (Phase II/Phase I)	0.997	0.998

Attribute	Statistic	Volume Audit (Current)	Volume Audit (2015)
	SE of Ratio (%)	(5.5%)	(5.5%)
Site index	N	137	174
(m)	Mean Phase II Ground	15.4	13.8
Bh_age	Mean Site prod layer	18.6	18.3
10-120	Ratio (Phase II/site)	0.825	0.756
	SE of Ratio (%)	(5.2%)	(5.3%)

In general, the Provincial Site Productivity Layer (PSPL) estimates of site index (SI) were higher than those observed on the ground plots for the volume audit population. The PSPL indicates potential productivity. For the volume audit strata in a region heavily impacted by mountain pine beetle, it is not surprising the actual SI is lower than the PSPL estimates.

A previous inventory audit found mature volumes were overestimated and spruce heights were overestimated. The results here confirm height overestimation for the spruce (and pine) strata. Overall, the volume audit volumes are close (1% bias) with more variation at the species strata.

For the Volume audit, 79 of 180 (44%) sample had the same leading species in Phase I and Phase II. This agreement is quite low, primarily for the pine-leading stratum, but should be expected given the level of MPB attack in this unit. The Phase I leading species composition includes all live trees + dead pine while the Phase II leading species composition includes only live trees. For comparison, the Phase II leading species based on live trees + dead standing pine was compared to the Phase I leading species. When the Phase II dead standing pine is included, the agreement goes from 44% to 61% (109 of 180 samples). If the samples with Phase I leading species = P are removed, the agreement is 60% (70 out of 116) which is more typical.

The new MPB adjustment algorithm was compared to the current MPB adjustment algorithm. Age, height and SI did not change substantially while volumes and TPH changed slightly and basal area estimation was improved considerably (relative to the Phase II ground samples) for the pine stratum. With the new MPB adjustment algorithm, post-MPB stands are projected to grow at a slightly accelerated rate due to increased growing space.

The results are very similar to those reported in 2015. The main differences are in the comparison of ground to PSPL SI. When the ground sample SI trees are restricted to those with a breast height age from 10 – 120, the sample size decreases and the overall ratio improves from 0.76 to 0.82. The largest differences are for the Balsam and Pine strata.

Acknowledgements

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1. Scope and Objectives

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

This project has two main objectives:

- Perform a VDYP7-based VRI analysis for the Prince George TSA, based on current standards (FAIB 2011) for the Volume Audit (mature) population using 181 ground samples (a mix of VRI Phase 2, CMI and NFI), and
- Perform a Young Stand Monitoring (YSM) analysis using the 52 Young Stand Monitoring (Immature) ground samples established in the 2014 field season.

This report addresses the first objective. The second objective is addressed in a separate report. Both reports are available from FAIB.

2. Changes from 2015

A VRI analysis was undertaken in 2015 with the same raw data files used here. Minor changes to the ground compiler and to the analysis procedures prompted the re-analysis of the data presented here. The main changes are listed.

- The VRI ground sample compiler has been revised to deal with boundary plots.
- The ground sample trees used for estimation of site index were restricted to those with a breast height age from 10 – 120 years.
- The species matching for spruce was revised so that SB, SE and SS are matched at the species level and all other spruces are matched at the genus level (SW, SX, SXW).
- Fallen live trees and fallen dead trees are no longer included in the ground plot summaries.
- The site index for the VRI (Phase I) second species was estimated using VDYP7.

3. Background

The ground sampling plan for the Prince George TSA is documented in "Prince George Timber Supply Area TSA 24 – Vegetation resources inventory project implementation plan including volume audit sampling and young stand monitoring" (Nona Phillips Forestry Consulting 2014a) available from the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO).

3.1 Description of the Target Population Area

The description of the target population is taken from Nona Phillips Forestry Consulting (2014b). The Prince George TSA covers about 6.5 million ha (Table 2) and is located in the north-central interior of British Columbia (Figure 1). It extends from near the Alberta border in the southeast to Tweedsmuir Provincial Park in the southwest and the Spatsizi Plateau Wilderness Park in the northwest. The TSA includes the City of Prince George, the larger communities of Vanderhoof and Fort St. James and several smaller communities including Fraser Lake.

The original project area did not cover the entire TSA landbase. The northern portion of the Fort St James Natural Resource District was excluded. The area is not currently being used for forest operations and there is not a strong business case to sample it for Timber Supply Review (TSR) purposes.

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

1 Volume Audit sampling occurred on the Vegetated Treed component of the land base. The Volume Audit population includes stands ages 51 years and older.
2 The Young Stand Monitoring project population was not restricted to the Vegetated Treed 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.

The exclusions from both the Volume Audit and the YSM land base include area in the TSA north of NTS Letter Block 093M, private land, parks and federal lands including military reserves and Indian reserves. Community Forests and Woodlots have been retained.

An additional exclusion to the Volume Audit population land base is BEC based and is related to operability. This exclusion includes BEC zone BAFA and all BEC zone ESSF except subzones mm1, mv1, wk1 and xv1.

The ground sample locations are given in Figure 2.

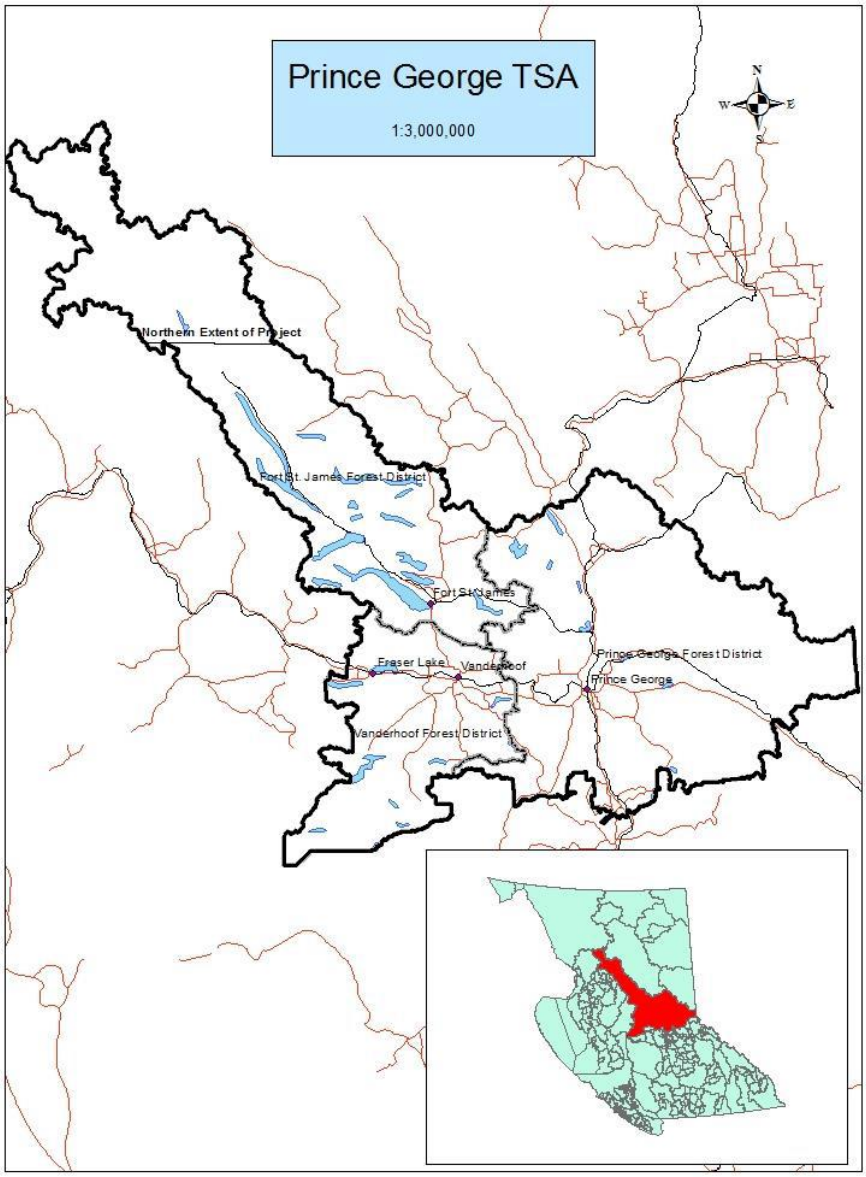

Figure 1. The location of the Prince George TSA (from Nona Phillips Forestry Consulting 2014a).

The Prince George TSA is part of the Ministry of Forests, Lands and Natural Resource Operations' Omineca Region. There are three Natural Resource Districts within the TSA: Prince George, Vanderhoof and Fort St. James. Each district is responsible for the administration of the forest management activities within its borders.

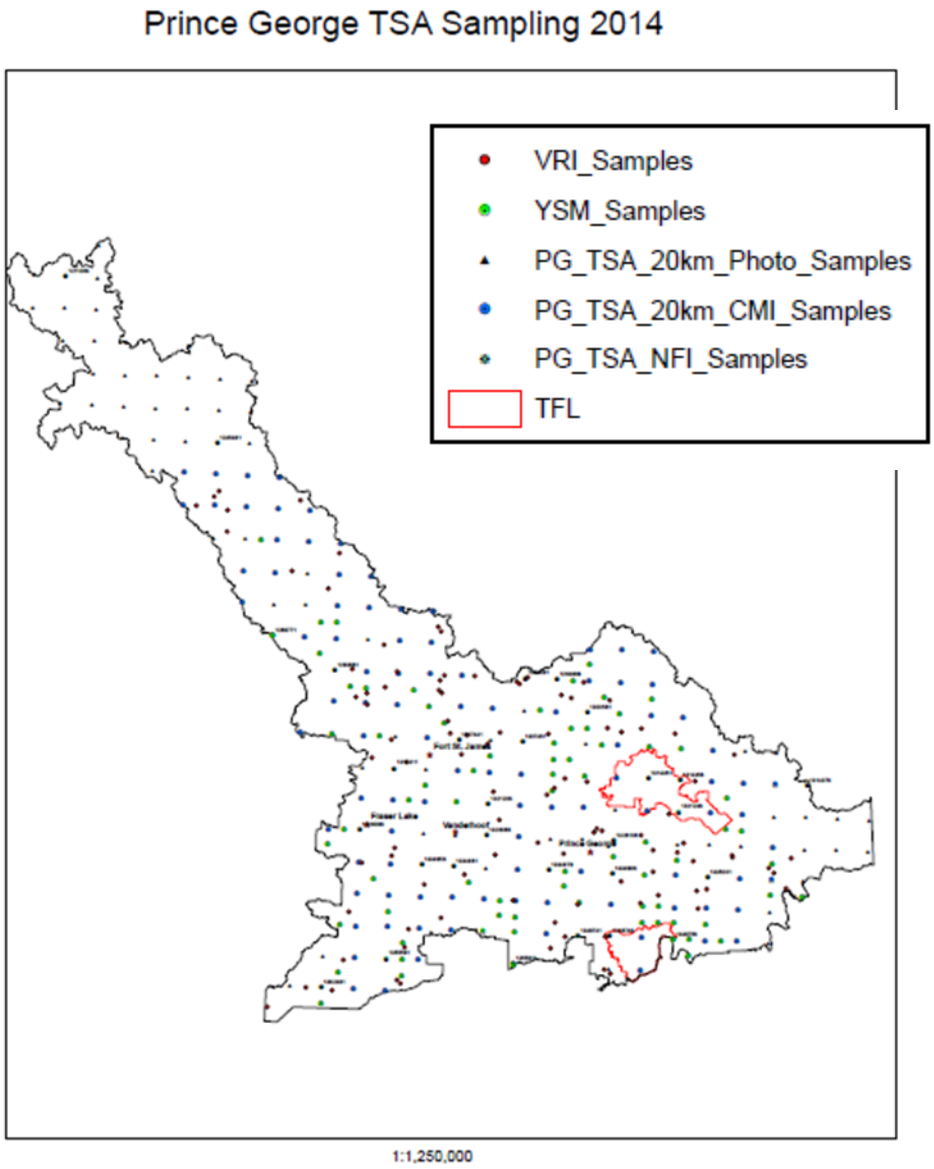

Figure 2. The locations of the ground samples within the Prince George TSA are given (from FAIB).

Table 2. A summary of the land base (taken from Nona Phillips Forestry Consulting 2014b).

Land Classification	Area (ha)	% of TSA
Total TSA Area	**6,509,204**	**100.0%**
Net-downs	**857,924**	**13.2%**
Parks	448,951	6.9%
Private	381,171	5.9%
Federal	9,093	0.1%
Indian Reserve	18,709	0.3%
Net Area	**5,651,280**	**86.8%**
Non-Vegetated	378,632	5.8%
Vegetated	5,272,648	81.0%
Non-Treed	989,921	15.2%
Treed	4,282,727	65.8%

Three strata were defined (Table 3). The YSM and VA strata constitute the original target population covered by the VPIP. The portion of the TSA not covered by the YSM and VA strata is referred to as the *complement* and comprises additional sampling completed in this unit that is not included in this VA analysis or the YSM analysis.

Table 3. The strata are defined.

Abbreviation	Strata	Description
VA	Volume Audit	Vegetated treed, age 51+. Excludes the northern portion of Fort St. James, private and federal land as well as BEC zone BAFA and portions of the ESSF.
YSM	Young Stand Monitoring	Ages 15-50 (includes non-vegetated and non-treed). Excludes the northern portion of Fort St. James, private and federal land as well as BEC zone BAFA and portions of the ESSF.
Complement	Complement	Everything else, including the northern portion of Fort St. James, federal land, ages < 15. Additional sampling completed in this unit is relevant to the overall state-of-the-forest analysis.

3.2 State of the Inventory

Several VRI projects have been planned and undertaken by district, starting in 2000. The initial objective was to upgrade the District inventories to Provincial standards. The first phase was to provide a VRI standard inventory in each of the three Districts administered in the Prince George TSA by 2005. This was completed.

Vanderhoof was a VRI retrofit project, which involved estimating new VRI attributes on the existing polygon delineation. The other two Districts were standard VRI Phase I projects. Phase II projects acquired statistical analysis by District have also been completed. Most recently, new aerial photos were flown in 2012 for a VRI Phase I Photo Interpretation project in the Vanderhoof District.

Mountain pine beetle (MPB) has been active in the TSA. The pine stands have been impacted by an unprecedented high level of infestation that occurred in British Columbia since 2000. MPB peaked in the Prince George and Vanderhoof Districts in 2004 and in the Fort St. James District in 2006. Photo acquisition for the Prince George TSA was undertaken in the 2015/2016 fiscal year.

The inventory files used for this project's sample selection reflect the following updates:

- Vanderhoof District - harvest and reforestation updates current to 2011
- Vanderhoof District – polygon volumes adjusted to reflect MPB mortality
- Fort St. James District – depletion updates completed to November 2013
- Prince George TSA (all Districts) - ages projected to 2014

The areas by inventory leading species for the YSM and VA populations are given in Table 4 and Table 5.

Table 4. Prince George TSA Young Stand Monitoring (YSM – immature) population is summarized by leading species. From Nona Phillips Forestry Consulting 2014b.

Inventory Leading Species	Area (ha)	% of YSM population
Spruce (S)	302,510	43.3%
Pine (P)	291,118	41.7%
Aspen (AT, ACT)	44,957	6.4%
Balsam (B)	36,210	5.2%
Birch (EP)	13,078	1.9%
Douglas-fir (FD)	8,878	1.3%
Cedar (CW)	653	0.1%
Hemlock (HW)	610	0.1%
Alder (DR)	33	0.0%
Tamarack (LT)	15	0.0%
Oak (QG)	9	0.0%
Total	698,071	100.0%

Table 5. Prince George TSA Volume Audit (mature) population is summarized by leading species. From Nona Phillips Forestry Consulting 2014b.

Inventory Leading Species	Area (ha)	% of Volume Audit population
Pine (P)	1,220,401	41.6%
Spruce (S)	1,034,965	35.3%
Balsam (B)	336,194	11.5%
Aspen (AC)	192,863	6.6%
Douglas-fir (FD)	56,336	1.9%
Cedar (CW)	38,147	1.3%
Hemlock (H)	25,394	0.9%
Birch (EP)	25,370	0.9%
Tamarack (LT)	1,376	0.0%
Salix (WS)	73	0.0%
Oak (QG)	11	0.0%
Larch (L)	8	0.0%
Willow (W)	7	0.0%
Total	2,931,144	100.0%

4. Data Sources

4.1 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 (assumed to correspond to a 2012 sampling year), were provided. The inventory corresponds to the 2014 projection and the year 12 BC Mountain Pine Beetle projection[1].

Ground sampling was completed in 2014. Ground samples with a measurement date prior to July 1, 2014 were considered to have a measurement year of 2013. Those measured on or after July 1, 2014 were considered to have a measurement year of 2014. For those samples with a measurement year of 2014, the Phase I inventory information was projected to 2014. 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 Phase I inventory has been adjusted for MPB by reducing the trees/ha (TPH) and volume but not basal area (BA). This was not projected as the BA and TPH are not compatible with one another. Rather, the MPB adjustment was removed by adding the dead TPH to the live TPH. These unadjusted values were then projected and the MPB percent dead applied at the end of the projection.

Prince George has a VRI standard inventory based on photography flown primarily from 1991-2010 (Table 6).

Table 6. Prince George TSA area distribution by inventory reference year for the volume audit population.

Reference (photo) year	% of Area	Average polygon size (ha)
1951-1960	0%	17.9
1961-1970	0%	15.1
1971-1980	0%	18.6
1981-1990	0%	9.6
1991-2000	34%	12.4
2001-2010	65%	10.8
2011+	0%	7.4
All	100%	11.3

[1] https://www.for.gov.bc.ca/hre/bcmpb/year12.htm

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 polygons are processed by VDYP7 to project them to the year of ground sampling. For stands less than 7m tall, VDYP7 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 024C sample 5631 (old sample 0910) which, in 2012, had a PROJ_HEIGHT_1 = 0.3 m and 1,943 trees/ha (and a projected age of 6). The utilization limit is based on Dbh, implying that trees must be at least 1.3m tall so the height for sample 5631 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.

4.2 Phase II Ground sample data

The ground sample data come from four data sources – YSM, VA ground samples, CMI samples and NFI ground plots. Each data source sampled a specific portion of the Prince George TSA (Table 7). The VA samples were selected with probability proportional to polygon size. The YSM, NFI and CMI samples were selected from various intensities of a grid. As a result, the sampling weights (the area represented by each sample) vary with data source (section 4.3).

Table 7. The data sources and strata are given. Shading indicates which data sources have samples in which strata. For example, the YSM data source only sampled the YSM strata while the NFI data source sampled all three strata.

		Strata		
Data Source	Proj_id	YSM	VA	Complement
YSM	024Y			
VA	0242			
NFI	CMI4			
CMI	024C			

Samples within the VA strata are the basis for this analysis and report while samples within the YSM strata provide data for the separate YSM analysis and report. The compiled ground sample attributes are given in Appendix B. There were no substitutions or movements of plots.

4.2.1 VA samples

Nona Phillips Forestry Consulting Ltd. (2014a) documented the selection of the ground samples for the Prince George TSA. The Phase II data were compiled by MFLNRO in 2015 using the most recent regional NVAF values. The VA samples are selected with probability proportional to polygon area (with replacement). The plots generally consist of a five plot cluster of variable radius plots.

4.2.2 NFI samples

The NFI samples are 0.04 ha fixed area plots located on a 20 x 20 km grid which covers the entire TSA. Not all of the samples on the 20 x 20 km grid were completed as part of the NFI. Of the original 26 NFI samples, two were removed from this analysis (section 5.3).

4.2.3 YSM samples

The YSM samples are established on an intensified 5 km by 10 km grid from the original NFI 20 x 20 km grid. The YSM ground plots are fixed area, 0.04 ha plots. Only plots that met the YSM strata definition (Table 3) were included.

4.2.4 CMI samples

The original NFI sampling was completed across the 20 x 20 km grid by adding CMI plots so that all points on the grid were sampled. These are 0.04 ha fixed area plots, also covering the entire TSA. Of the original 98 024C samples, two were removed from this analysis (section 5.3).

4.3 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 8) were taken from *"Prince George TSA Sample Selection Report"* (Nona Phillips Forestry Consulting 2014a). The combined sample weights were calculated as described in section 5.2 and used in the analysis.

Table 8. The sample weights for the Prince George TSA are given. The combined sample weights are discussed in section 5.2.

Source	Strata	Sub strata	Volume Criteria (m^3/ha)	Area (A) (ha)	Area %	n	Weight (number of hectares represented by each sample) = A/n	Combined sample weights
Volume audit (mature)	Pine (P)	1	0-68.8	450,860	37%	15	30,057	16606
		2	68.8-154.2	422,263	35%	15	28,151	15553
		3	>154.2	347,277	28%	12	28,940	15989
		Total		1,220,400	100%	42		
	Spruce (S)	1	0-157.1	286,037	28%	10	28,604	15803
		2	157.1-275.5	362,888	35%	12	30,241	16708
		3	>275.5	386,040	37%	13	29,695	16406
		Total		1,034,965	100%	35		
	Balsam (B)	1	0-119.5	104,335	31%	3	34,778	19215
		2	119.5-206.1	109,912	33%	4	27,478	15181
		3	>206.1	121,947	36%	4	30,487	16844
		Total		336,194	100%	11		
	Other (Oth)	1	0-154.5	103,207	30%	4	25,802	14255
		2	154.5-251.9	110,404	33%	4	27,601	15249
		3	>251.9	125,973	37%	4	31,493	17400
		Total		339,584	100%	12		
	Total			2,931,143		100		
YSM	(Immature)			698,071		50	13,688	13424
NFI	Volume Audit			2,931,143		9	325683	16194
	YSM			698,071		2	349036	13424
	Complement			2,879,990		13	221538	75789
	Total					24		
CMI	Volume Audit			2,931,143		71	41284	16194
	YSM			698,071		0		
	Complement			2,879,990		25	115200	75789
	Total					96		

5. METHODS

5.1 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 and overall 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.

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 (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).

The ground data (Table 7) were combined as described in section 5.2.

5.2 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 in the volume audit strata. The volume audit sample was selected with probability proportional to polygon size resulting in the weights given in Table 8. The remaining 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 8). Essentially, each weight was scaled by the data source sample size divided by the total sample size. 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.

5.3 Data issues related to the statistical adjustment

Scatterplots comparing the Phase I and Phase II attributes were examined for potential outliers (Figure 7). Large differences between the ground sample and photo-based estimates were noted for a number of samples.

Sample 024C-1191-MO1 and 024C-1841-MO1 were in cutblocks and were dropped. Sample CMI1-0276-FRI was in a 2011 wildfire and dropped. Sample CMI4-0064-FRI had no ground data collected and was dropped.

VRI audit samples 47 and 49 have no volumes in the original sample design and were both assigned to the Spruce strata and substrata 1 (i.e., volume<157.1 m^3/ha). After checking the original data and projection

using VDYP7, sample 47 should be in substrata 3 (i.e., the volume > 276 m^3/ha) and sample 49 should remain in substrata 1, but its volume is greater than zero.

The YSM sample population definition is 15-50 years. YSM sample 271 has a projected age of 146 years and its volume is about 227 m^3/ha. It was dropped from the YSM population but should continue to be measured.

Table 9. The following samples were dropped.

proj_id	Samp_no	Phase I Age	Comment	Action
024C	1191	143	In large cutblock	Dropped
024C	1841	178	In large cutblock	Dropped
024Y	271	146	Too old for YSM	Dropped
CMI4	276	71	In a 2011 wildfire	Dropped
CMI4	64	17	No Data - DROP	Dropped

The Phase I inventory came from three files corresponding to Fort St. James, Prince George and Vanderhoof. Some feature_ids occurred in two files. Duplicate feature_ids were removed.

The YSM population was examined for evidence of veteran or residual trees and plots that appear to be outside the YSM population. The samples that have trees with age_tot > 50, suit_tr = "Y" and suit_ht = "Y" are given in Table 10. Some trees were identified as residual. All sample trees were retained.

Table 10. The age sample trees from YSM plots that have any trees with age_tot > 50, suit_tr = "Y" and suit_ht = "Y" are given. These are potential veteran trees.

clstr_id	Species	TH_tree	SI	Age_bh	Age_tot	Height	BNG_DIAM	Residual	Comment
024Y-0220-YO1	SW	T	7.7	89.5	108.2	13.7	22.4		All the trees are
024Y-0220-YO1	BL	S	18.8	42	53.0	16.4	15.3		older
024Y-0220-YO1	SW	L	5.0	172	198.4	17.2	21.6		No issues.
024Y-0220-YO1	BL	S	9.9	76	93.8	14.5	15.4		
024Y-0220-YO1	SW	L	15.2	51	62.4	15.5	23.6		
024Y-0220-YO1	BL	S	6.7	134	155.9	16.7	22.7		
024Y-0220-YO1	BL	S	11.4	79	95.3	16.9	25.6		
024Y-0222-YO1	BL	T	22.4	46	55.1	21.1	28.7		One old tree.
024Y-0222-YO1	SXW	O	20.5	42	51.6	17.6	25.2		It has a larger Dbh
024Y-0222-YO1	FDI	S	24.6	43	51.0	22.1	25.6		But is shorter.
024Y-0222-YO1	BL	L	8.6	123	142.3	18.7	30.8		Low SI
024Y-0222-YO1	FDI	S	24.3	35	43.1	18.7	17.4		No issues.
024Y-0222-YO1	BL	L	21.9	46	55.4	20.6	28		
024Y-0222-YO1	FDI	S	22.7	44	52.4	20.7	26.2		
024Y-0228-YO1	SX	S	15.1	47	58.5	14.3	28.7		One slightly older
024Y-0228-YO1	PLI	L	20.9	17	22.9	9.6	13.3		tree
024Y-0228-YO1	PLI	L	20.7	15	20.9	8.6	12.5		
024Y-0228-YO1	SX	S	24.4	18	26.7	10.2	17.6		
024Y-0228-YO1	SX	S	19.1	23	32.9	9.1	13.4		
024Y-0228-YO1	PLI	L	19.0	14	20.2	7.2	11.9		
024Y-0228-YO1	PLI	T	21.2	17	22.8	9.8	14.6		
024Y-0237-YO1	SX	S	9.5	75	90.8	14.1	31.5		All the trees are
024Y-0237-YO1	BL	T		60.4	74.9	15.9	33.3	R	older
024Y-0237-YO1	BL	L	9.2	55	73.6	10.1	18.7		No issues.
024Y-0237-YO1	BL	L	10.6	60	77.1	12.6	18.4		
024Y-0238-YO1	BL	L	16.0	122	134.7	27.9	60		All the trees are
024Y-0238-YO1	SXW	T	14.9	120	131.6	27.8	53.7		older
024Y-0238-YO1	SXW	S	9.2	162	178.2	24.7	47.5		No issues.
024Y-0238-YO1	BL	L	16.6	104.6	116.9	26.7	49		
024Y-0239-YO1	BL	T	19.3	41	51.7	16.5	29		One slightly older

clstr_id	Species	TH_tree	SI	Age_bh	Age_tot	Height	BNG_DIAM	Residual	Comment
024Y-0239-YO1	BL	L	20.3	30	40.2	13.5	14.5		tree
024Y-0239-YO1	BL	L	20.6	32	42.0	14.6	24.4		
024Y-0239-YO1	BL	L	20.6	34	44.0	15.3	27.7		
024Y-0252-YO1	BL	L	19.0	48	58.9	18.4	22.7		All the trees are
024Y-0252-YO1	BL	L	19.9	49	59.4	19.6	29.6		older
024Y-0252-YO1	BL	T	18.0	59	70.4	20.4	25.7		No issues.
024Y-0252-YO1	BL	L	19.4	55	65.7	20.8	30.4		
024Y-0252-YO1	BL	L	18.5	49	60.1	18.2	28		

The samples in Table 11 do not have Phase II heights or ages for the leadings species.

Table 11. The samples without Phase II heights or ages for the leadings species are summarized.

Clstr_id	Ground Spp comp 4.0 cm	Comment
0242-0004-QO1	Sx 100	one pine sampled
0242-0021-QO1	Ep 43 At 43 Sx 14	only AT sampled for age & height
0242-0039-QO1	Bl 33 Pl 33 Sw 34	one pine sampled
0242-0086-QO1	Ep 43 Sx 30 X 23 Bl 04	only spruce sampled for age & ht
024Y-0200-YO1	Pl 65 Sx 35	
024Y-0217-YO1	Fd 99 At 01	
024Y-0231-YO1	Sx 44 Ac 39 Ep 14 Bl 02 At 01	only AC sampled for age & height
024Y-0236-YO1	Sx 44 Bl 43 Pl 13	
024Y-0238-YO1	Ac 100	

Trees with a breast height age_bh < 10 years or age_bh > 120 are not considered suitable SI trees and were removed from the calculation of site index (Figure 3).

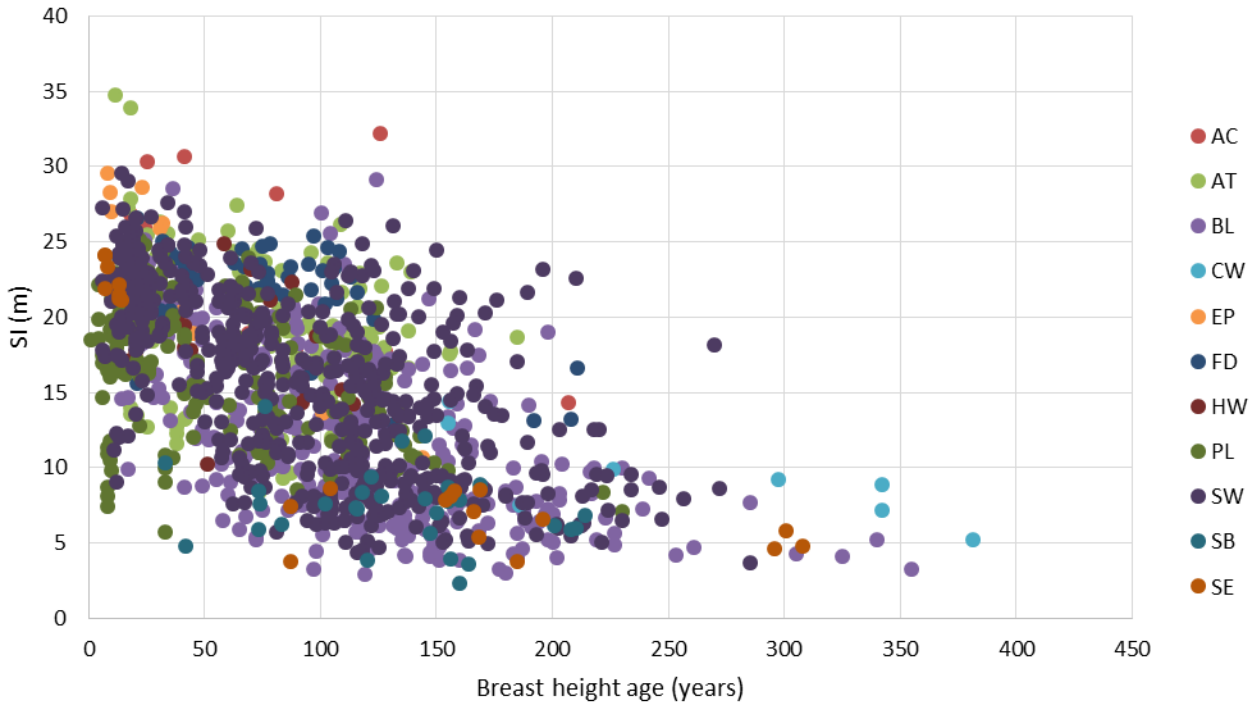

Figure 3. SI is plotted against breast height age.

5.4 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 leading species were the same. For the species matched comparison, the MFLRNO data matching procedures (FAIB 2011), with some modification for spruce, 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[2] trees for the ground leading species (by basal area at 4cm + DBH utilization) on the ground.

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 27) 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.

5.5 Site Index from the Phase II Samples

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 that were suitable height and age trees and of the leading species. Trees with a breast height < 10 years or > 120 years were not used for estimating site index (Figure 3).

5.6 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 SI of the leading species, generally calculated from the leading species height and age.

5.7 Site index from Provincial Site productivity layer

The provincial site productivity layer (PSPL[3]) 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. The October 2014 PSPL (version 3.2) was used.

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 thus more matches. As noted in the PSPL documentation[4], the PSPL site indexes are more appropriately used for strategic rather than operational, purposes. If used for site-specific applications, as is the case here, the site index estimates should be verified through a ground-

[2]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.

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

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

based survey. The PEM/TEM data for the site productivity layer are approved for most of the Prince George and Fort St. James portions of the TSA, indicating they passed a third party accuracy assessment based on published standards and procedures. The original Vanderhoof PEM did not pass accuracy assessment in some areas. For these areas, the SI values in the PSPL are populated from the bio-physical model.

The ground samples were intersected with the current site productivity tile by an aspatial match of X and Y coordinates between ground samples and each 1ha grid point in the site productivity tile. For those few records without a model source (PEM/BIO), there was no ground sample match found with a 1ha grid point, so the grid was coarsened to a 2ha × 2ha grid. If the PSPL did not include a SI for the Phase I leading species, the SI for the next closest species was used. Forty-two samples had a Phase I leading species of SW but no SW SI in the PSPL. The SX SI from the PSPL was used. One sample had a Phase I leading species of SW but no SW or SX SI in the PSPL. The SB SI was used. One sample had a Phase I leading species of SB but no SB in the PSPL. The SX SI was used. Sample 0242-0093-QO1 had a leading species of HW but no HW SI. The FD SI =25.3 was converted to an HW SI = 23.4 using SiteTools.

5.8 Analysis of Dead Pine

The BC Mountain Pine Beetle (BCMPB) model has been developed to estimate the volume of mature pine mortality associated with the mountain pine beetle (MPB) infestation. The Phase I inventory typically reports live volume only. However, in areas where the BCMPB model is applied, live volume (and trees/ha) by species for all species as well as dead volume (and trees/ha) for lodgepole pine only are reported.

The Phase II ground sample provides live and dead volumes, basal area and trees/ha area by species for all species.

To provide an assessment of the dead pine estimates in the Phase I inventory, the following fractions were computed:

- Dead pine volume as a fraction of the live pine volume + dead pine volume;
- Dead pine volume as a fraction of live all species volume + dead pine volume.

A new MPB adjustment algorithm has been developed. The current MPB algorithm adjusts trees per hectare (TPH) and volume. The new algorithm, in addition to adjusting TPH and volume, adjusts basal area, species composition, age and height. It also adjusts the reference year and some of the disturbance fields. FAIB provided the results of the new adjustment algorithm for the ground sampled polygons. The target population for adjustment is any forest polygon with a component of pine with a projected age ≥ 30 and a pine component ≥ 10%. The results of the new MPB adjustment algorithm are given in section 6.5. Appendix H (section 16) illustrates the new algorithm with two scenarios.

6. RESULTS AND DISCUSSION

6.1 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 5.1. The analysis stratification for the Volume Audit population was based on Phase I inventory leading species groups from the primary layer. The means are given in Table 12 and the ratios in Table 13. The population summaries were taken from the file PG_TSA_netdown_VDYP_2015June17.csv provided by FAIB. The population was projected to January 1, 2015.

Table 12. Sample-estimated weighted means for the Phase I inventory and Phase II ground sample for seven key inventory attributes, for the volume audit strata of the Prince George TSA. The Phase I attributes are from the primary layer only.

Attribute		Volume Audit (mature)					2015
		Balsam	Other	Pine	Spruce	All	All
Leading	N	32	23	62	57	174	174
Species	Phase II Ground	152	115	116	126	126	126
Age	Phase I Sample	185	129	128	158	149	149
(years)	Phase I Population	162	139	125	172	147	147
Species	N	32	22	60	55	169	169
Matched	Phase II Ground	152	116	116	127	127	126
Age(years)	Phase I Sample	187	127	125	155	147	147
Leading	N	32	23	62	57	174	174
Species	Phase II Ground	21.1	25.5	20.5	23.4	22.2	22.2
Height	Phase I Sample	20.2	25.1	23.2	26.5	24.0	24.0
(m)	Phase I Population	21.1	26.1	22.6	27.2	24.5	24.5
Species	N	32	22	60	55	169	169
Matched	Phase II Ground	21.2	25.4	20.3	23.4	22.1	22.2
Height (m)	Phase I Sample	20.6	24.7	23.6	24.9	23.6	23.6
Basal area	N	34	24	65	57	180	180
(m^2/ha)	Phase II Ground	31.1	38.5	19.1	33.9	28.6	28.7
7.5 cm+	Phase I Sample	28.1	42.1	37.3	35.2	35.5	35.5
	Phase I Population	32.8	40.6	37.7	34.6	36.5	36.5
Trees/ha	N	34	24	65	56	179	179
7.5 cm+	Phase II Ground	795	819	841	958	866	871
	Phase I Sample	745	696	460	621	597	597
	Phase I Population	876	745	1134	621	880	880
Lorey	N	34	23	65	56	178	178
Height	Phase II Ground	14.4	18.2	17.2	17.0	16.7	16.7
(m)	Phase I Sample	18.2	23.4	21.2	23.3	21.6	21.6
Volume net	N	34	24	65	57	180	180
Dwb (m^3/ha)	Phase II Ground	203	269	110	238	189	190
12.5 cm+	Phase I Sample	163	232	132	252	189	189
	Phase I Population	188	231	124	248	187	187
Leading	N	32	23	62	56	173	173
Species	Phase II Ground	10.7	18.0	13.1	14.7	13.8	13.8
Site index	Phase I Sample	8.1	15.9	16.3	13.6	13.8	13.8
(m)	Phase I Population	14.2	17.4	15.6	14.9	15.0	14.3
Leading Spp	N	21	18	51	49	139	
Site index (m)	Phase II Ground	12.7	19.6	14.3	16.0	15.4	
Bh_age 10-120	Phase I Sample	8.7	16.0	16.5	14.0	14.3	
Spp matched	N	15	9	10	27	61	79
Site index (m)	Phase II Ground	11.7	19.5	14.8	15.7	15.1	13.5
Bh_age 10-120	Phase I Sample	8.0	16.2	15.1	12.9	12.5	11.6
Site index	N	21	17	51	48	137	174
(m)	Phase II Ground	12.7	19.6	14.3	16.1	15.4	13.8
Site prod	PSPL	16.2	19.0	19.8	18.3	18.6	15.0

In general, the Volume Audit (mature) Phase I ages are older and the Phase I heights taller than the Phase II means. The Volume Audit (mature) Phase I basal area is 25% larger than the Phase II basal area, due largely to overestimation in the pine stratum. The volumes are much closer. The Phase I volumes have

been adjusted for MPB mortality but the Phase I BA estimates have not. Trees per hectare has the poorest agreement between Phase I and II.

The Phase I and Phase II average volumes for the volume audit population were very close. In section 3.2, it was noted that a previous inventory audit found mature volumes were overestimated and spruce heights were overestimated. The results here confirm height overestimation for the spruce (and pine) strata. Overall, the volume audit volumes are close (1% bias).

Table 13. Ratio of means comparisons (and sampling error % at a 95% confidence level) for seven attributes, for the target populations in the Prince George TSA. The ratios are based on the Phase I primary layer.

		Volume Audit	(mature)		All	2015
Attribute	Balsam	Other	Pine	Spruce	Mature	All
Leading Species	0.821	0.888	0.903	0.797	0.845	0.845
Age (years)	(8.6%)	(19.5%)	(9.3%)	(10.1%)	(5.5%)	(5.5%)
Species matched	0.814	0.911	0.928	0.82	0.861	0.861
Age (years)	(8.4%)	(20.2%)	(9%)	(10.2%)	(5.4%)	(5.4%)
Leading Species	1.048	1.016	0.882	0.885	0.927	0.928
Height (m)	(7.7%)	(10.4%)	(6.9%)	(5.7%)	(3.8%)	(3.7%)
Species matched	1.027	1.027	0.861	0.939	0.938	0.937
Height (m)	(7.2%)	(10.9%)	(7.4%)	(5.2%)	(3.8%)	(3.7%)
Basal area	1.107	0.915	0.51	0.963	0.807	0.808
(m^2/ha) 7.5 cm+	(17.6%)	(24.8%)	(17%)	(11.9%)	(9.2%)	(9.1%)
Trees/ha	1.067	1.176	1.827	1.541	1.451	1.459
7.5 cm+	(17.2%)	(24.9%)	(21.1%)	(19.9%)	(11.1%)	(11.1%)
Lorey Height	0.791	0.778	0.811	0.73	0.776	0.776
(m)	(9.9%)	(13.8%)	(7.8%)	(8.1%)	(4.7%)	(4.7%)
Volume net Dwb	1.246	1.159	0.836	0.946	1.002	1.005
(m^3/ha) 12.5 cm+	(23.9%)	(29.9%)	(25.6%)	(13.7%)	(10.8%)	(10.7%)
Leading Species	1.316	1.135	0.803	1.078	0.997	0.998
Site index (m)	(11.8%)	(13%)	(8.6%)	(8.8%)	(5.5%)	(5.5%)
Leading Spp SI (m)	1.468	1.227	0.87	1.149	1.073	
Bh_age 10-120	(15.7%)	(8.5%)	(8.1%)	(10%)	(5.8%)	
Spp matched SI (m)	1.462	1.201	0.975	1.223	1.209	1.159
Bh_age 10-120	(16.7%)	(15.5%)	(11.9%)	(14.6%)	(8.5%)	(6.8%)
Site index (m)	0.784	1.033	0.724	0.88	0.825	0.756
PSPL	(17.8%)	(9.5%)	(7.5%)	(8%)	(5.2%)	(5.3%)

The PSPL estimates of site index were generally higher than those observed on the ground plots for the volume audit population. Prior to screening the sample trees for SI by age there was a trend of increasingly negative bias with age (Figure 4) particularly for the pine leading stratum.

As a result of screening SI by age, the sample sizes have decreased and the ratios are closer to 1.0 than in the 2015 analysis. For other attributes, the current results are very close to those in 2015.

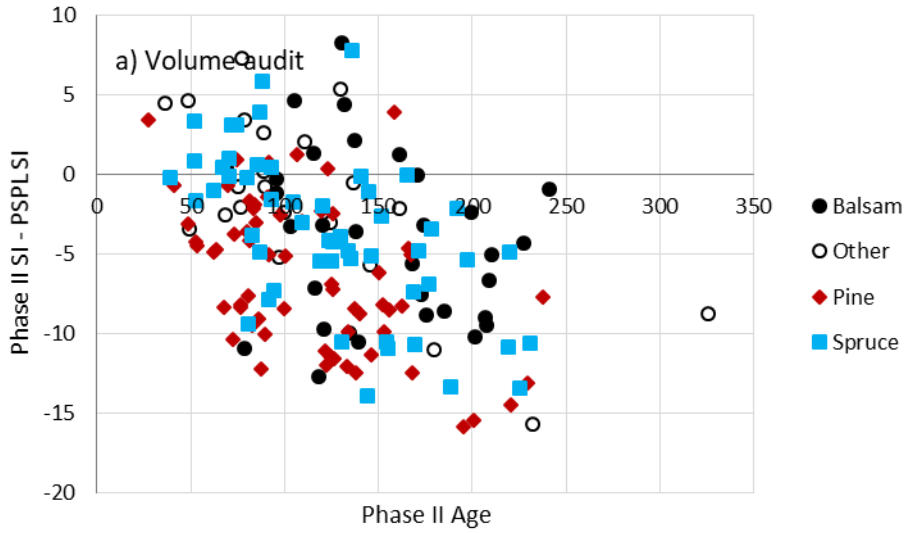

Figure 4. The site index bias (Phase II SI – PSPL SI) is plotted against Phase II age for the volume audit population. There is a trend of increasingly negative bias with age. Taken from the 2015 analysis so there is no screening of SI trees by age.

When the SI trees are screened to remove trees with a breast height age < 10 or > 120 years, the overestimation of SI decreases and the trend with age is much less evident.

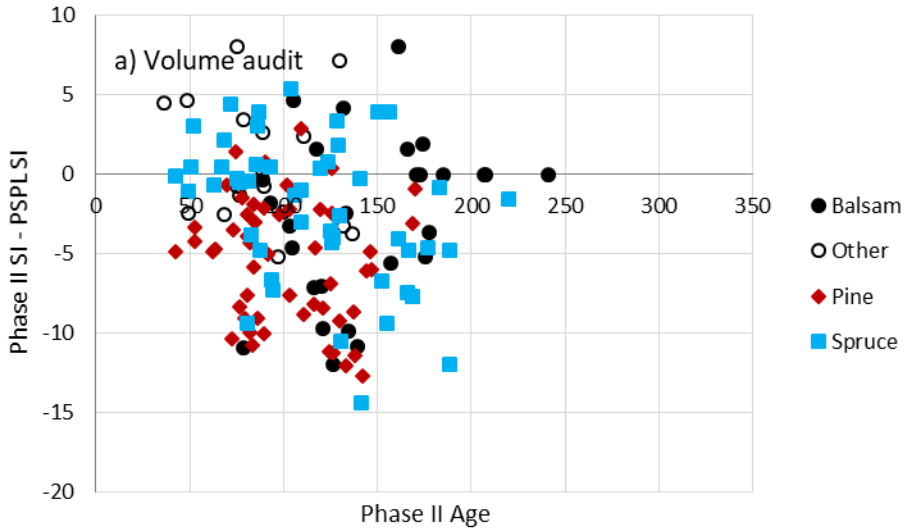

Figure 5. The same as Figure 4 but SI trees with breast height < 10 or > 120 are removed.

The Prince George TSA has had 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 beneath a pine overstorey. If this was the case, the SI trees may have had slow initial height growth, lowering the SI estimate.

6.2 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. 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. The remaining attributes required for VDYP7 (e.g., BEC zone) are taken from provincial map layers. 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 the bias associated with predicting volume from projected species composition, height, age, basal area, trees/ha using the VDYP7 yield model versus the ground compiler. 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.

For the Volume audit, overall the results are good. Overall, and for spruce, the biases were less than 10%. (Figure 6, Table 14 and Table 15). Generally the model bias is positive and the attribute bias is negative, except Balsam. The overall bias for the Balsam strata is large and duemainly to model-related bias. The Phase I underestimates the Balsam BA but the larger issue appears to be the underestimation of SI.

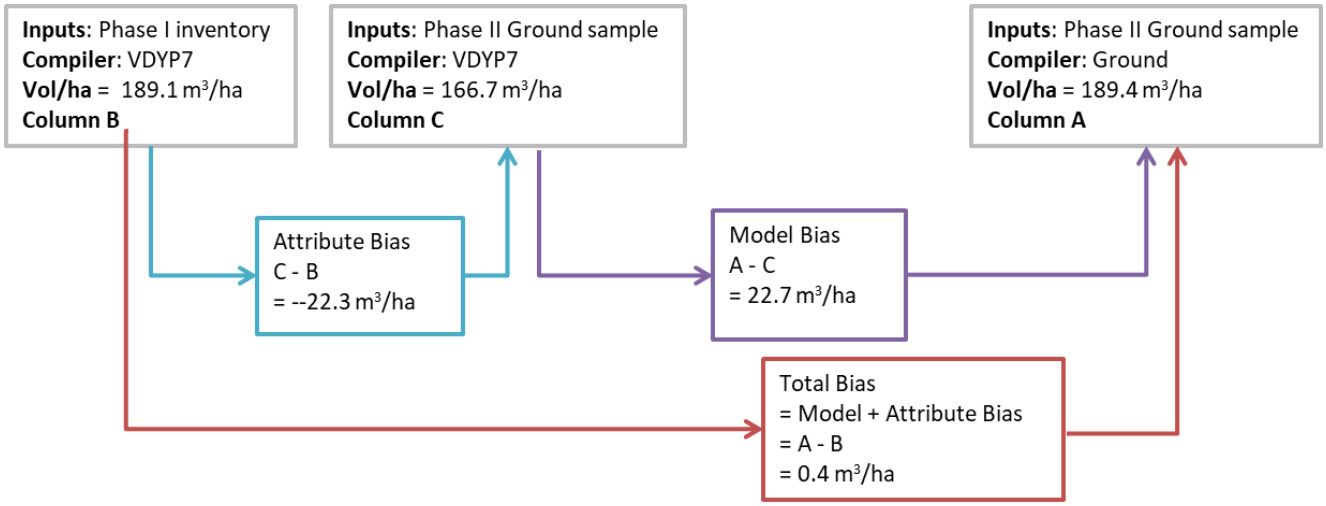

Figure 6. The relationship between the model and attribute components of total volume bias for the mature target population in the Prince George TSA (from Table 14). A negative bias indicates Phase I overestimation whereas a positive bias indicates underestimation.

Table 14. 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		
Volume Audit (mature)	Balsam	34	203.1	163.0	171.5	31.5	8.5	34	45.0	4.4
	Other	24	269.1	232.3	207.1	62.0	-25.2	24	31.9	16.8
	Pine	65	110.1	131.8	101.9	8.2	-29.9	65	126.8	148.7
	Spruce	57	237.9	251.6	220.4	17.6	-31.2	57	49.1	20.3
	Total	180	189.4	189.1	166.7	22.7	-22.3	180	74.0	62.9
2015	Total	34	203.1	163.0	171.5	31.5	8.5	34	74.1	65.2

Table 15. 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 14 A/B)	(Table 14 A/C)	(Table 14 C/B)
Volume Audit (mature)	Balsam	34	1.246 (±23.9%)	1.184 (±10.7%)	1.052 (±27.5%)
	Other	24	1.159 (±29.9%)	1.3 (±13.1%)	0.891 (±28.6%)
	Pine	65	0.836 (±25.6%)	1.081 (±6.2%)	0.773 (±27.4%)
	Spruce	57	0.946 (±13.7%)	1.08 (±4.7%)	0.876 (±14.3%)
	Total	180	1.002 (±10.8%)	1.136 (±4.2%)	0.882 (±11.1%)
2015	Total	180	1.004 (±5.5%)	1.17 (±3%)	0.858 (±5.1%)

6.3 Leading species comparison

Table 16 summarizes 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 Volume audit, 79 out of 180 (44%) were correctly classified. This agreement is quite low, primarily for the pine-leading stratum. The Phase I leading species composition includes all live trees + dead pine while the Phase II leading species composition only includes live trees. For comparison, the Phase II live trees + dead standing pine were compared ("PL + Dead" in Table 16). When the Phase II dead standing pine is included, the agreement goes from 44% to 61% (109 of 180 samples). If the polygons with Phase I leading species = P are removed, the correct classification rate rises to 60% (69 out of 115) which is more typical.

Table 16. The Phase II ground vs. Phase I inventory leading species cross-tabulation for the Volume Audit (mature) target population in the Prince George TSA. The shaded cells are correct classifications. The overall correct classification rate is 44%. If the Phase II leading species is based on live trees + dead pine ("PL + dead"), the correct classification rate is 61%.

Phase I Inventory	Volume Audit (mature) Phase II Ground Leading Species @ 4cm DBH utilization													%
leading spp	None	AC	AT	B	C	E	F	H	P	S	SB	SE	Total	Agreement
None	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
AT	1	1	8	1	0	0	0	0	2	3	0	0	16	50%
B	1	0	0	26	0	1	0	1	1	4	0	0	34	76%
C	0	0	0	0	2	0	0	0	0	0	0	0	2	100%
E	0	0	1	0	0	0	0	0	0	0	0	0	1	0%
F	0	0	0	1	0	0	0	0	0	1	0	0	2	0%
H	0	0	0	1	0	0	1	1	0	0	0	0	3	33%
PL	0	0	5	13	0	1	3	0	10	29	3	1	65	15%
PL + dead	0	0	4	7	0	0	2	0	40	11	0	1	65	62%
S	0	0	3	15	0	0	3	1	0	29	0	0	51	57%
SB	0	0	1	1	0	0	0	0	1	0	3	0	6	50%
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	2	1	17	57	2	2	7	3	13	66	3	1	180	
Agreement	50%	0%	47%	46%	100%	0%	0%	33%	77%	44%	100%	0%		44%

The previous comparison is important. However, for some polygons the choice of leading species is somewhat arbitrary and varies with utilization level (see Table 11). Two additional comparisons were undertaken to evaluate the reasonableness of the species estimates. The first comparison used the rule that if the leading and secondary species differ by 10% or less, either can be considered the leading species; this is a standard that is used in the photo interpretation process. The second comparison used a 20% threshold. For sample 0242-0072-QO1, the ground species composition is At 39 Sw 32 BL 21 Ac 08 while the Phase I species composition is Sw 40 At 40 Pli 10 AC 10. This sample would not be considered a leading species match. Using the first reasonableness criteria (10%), the Phase I leading species could be either Sw or At (their species percentages are ≤ 10% of each other).

Using 10% reasonable criteria, 55% of the volume audit samples are close in terms of leading species (Table 17). This rises to 65% when the criteria is reasonableness criteria is raised to 20%.

Table 17. A comparison of leading species using two reasonableness criteria. The 10% rule is that if the leading and second species are within 10% of each other, either can be considered the leading species. The 20% rule is similar but uses a 20% threshold.

	N			%	
Strata	All	10% rule	20% rule	10% rule	20% rule

Strata		N			%	
		All	10% rule	20% rule	10% rule	20% rule
Volume Audit	Balsam	34	28	29	82%	85%
	Fir	24	16	16	67%	67%
	Other	65	15	24	23%	37%
	Spruce	57	40	48	70%	84%
	Total	180	99	117	55%	65%

6.4 Analysis of Dead Pine

Mountain Pine Beetle has killed most of the lodgepole pine in B.C. In the Prince George district, the main years of attack were 2004-2006[5], after most of the Phase I aerial photography was acquired. The MFLNRO has developed a methodology to update the Phase I inventory to account for this pine mortality. This procedure applies a kill rate to pine leading polygons and converts some of the live volume and trees/ha to dead volume and trees/ha. All other attributes, including species composition and basal area, are unchanged.

The Phase I inventory estimate of live volume is very close to the ground sample volume. The Phase I estimate of the live pine volume much larger than the ground measurement. This is likely a result of not adjusting the species composition to reflect the dead pine. The Phase I estimate of dead pine volume is also larger than the ground estimate.

The dead (and live) pine volume is relatively minor except in the Pine substrata and the rest of the discussion focuses on the Pine substratum (n = 65). For the Pine substratum, the Phase I inventory overestimates the live + dead pine volume. The ground sampling occurred in 2014, about 9 years after the peak of the MPB outbreak. The ground plots only tally standing trees. Some of the pine may now be on the ground and not included in the estimate of dead volume.

Table 18. Weighted average volumes/ha (net dwb at 12.5cm+ DBH), by stratum, as well as dead pine volume expressed as a percent of total pine volume as well as total live + dead pine volume.

Stratum		n	Weighted mean volume net of decay, waste & breakage @ 12.5 cm									
			Live all species A		Live - pine only B		Dead - pine only C		Pine mortality as % of pine C/(B+C)		Pine mortality as % of live all + dead Pl C/(A+C)	
			Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
Volume Audit (mature)	Balsam	34	163.0	203.1	0.8	5.9	4.7	8.1	85%	58%	3%	4%
	Other	24	232.3	269.1	3.8	4.2	17.4	16.7	82%	80%	7%	6%
	Pine	65	131.8	110.1	64.4	14.3	154.2	116.1	71%	89%	54%	51%
	Spruce	57	251.6	238.0	6.3	3.5	21.1	22.9	77%	87%	8%	9%
	Total	180	189.1	189.5	25.8	8.0	65.2	52.7	72%	87%	26%	22%

6.5 New MPB adjustment algorithm results

The new MPB algorithm was applied to the sampled polygons and provided by FAIB. None of the ground-sampled polygons in the Young Stands Monitoring (YSM) portion of the population met the MPB-adjustment target population definition and none were adjusted. Three MPB-adjusted polygons were in the Complement (non-volume audit, non-YSM) portion of the TSA. Most of the adjusted polygons were pine-leading (Table 19).

[5] Walton, A. 2013. Provincial-level projection of the current mountain pine beetle outbreak: Update of the infestation projection based on the provincial aerial overview surveys of forest health conducted from 1999 through 2012 and the BCMPB Model (year10). 13p.

Table 19. The number of ground samples polygons in the volume audit population that were adjusted using the new MPB adjustment algorithm are given.

substrata	Non MPB-adjusted	MPB adjusted	Total	Fraction
Balsam	32	2	34	6%
Other	17	7	24	29%
Pine	6	59	65	91%
Spruce	44	13	57	23%
All	99	81	180	45%

Ages and heights for the adjusted leading species were provided but not for the secondary species. For the case-matched height and age comparisons, this meant only case 1 and case 3 matches were available.

The MPB adjusted values were assumed to correspond to the new reference year which was then projected, using VDYP7 Console, to the year of ground sampling. The new age and height were then run through SiteTools to estimate the site index.

The leading species agreement rose from 44% (Table 16) to 52% (Table 20).

Table 20. The same as Table 16 except the Phase I leading species is based on the new MPB adjustment algorithm. The overall correct classification rate is 52%

Phase I Inventory leading spp	Volume Audit (mature) Phase II Ground Leading Species @ 4cm DBH utilization												Total	% Agreement
	None	AC	AY	B	C	E	F	H	P	S	SB	SE		
None													0	
AC														
AT	1	1	10	1			1		2	4			20	50%
B	1			29		1		1	1	4			37	78%
C					2								2	100%
E			1										1	0%
F				1						1			2	0%
H				1			1	1					3	33%
P			1	8		1	1		10	18	2		41	24%
S			5	17			4	1		39	1	1	68	57%
SB			1	1					1		3		6	50%
SE														
Total	2	1	18	58	2	2	7	3	14	66	6	1	180	
% agreement	0%	0%	56%	50%	100%	0%	0%	33%	71%	59%	50%	0%		52%

MPB impacted polygons tend to have more mixed species composition and the leading species does not necessarily dominate the species composition. The Phase II ground leading species matched the Phase I second species for approximately 25% of the ground sampled polygons in the VA population (Table 21). If Case 1 and Case 2 are considered matches, the correct species classification rises from 52% (for case 1 only) to 83% (cases 1 and 2).

Table 21. The Phase II ground and Phase I MPB-adjusted leading and second species are compared for the ground-sampled polygons in the VA population. The cases are described in section 13

Phase II ground		N			Match with Phase II leading species and Phase I leading or second species
leading species	leading spp %	Total	Match with Phase I leading species (Case 1)	Match with Phase I second species (Case 2)	
AC	71%	1			0%
AT	59%	18	10	7	94%
B	70%	58	29	17	79%

Phase II ground			N		Match with Phase II leading species and Phase I leading or second species
leading species	leading spp %	Total	Match with Phase I leading species (Case 1)	Match with Phase I second species (Case 2)	
C	93%	2	2		100%
E	43%	2			0%
F	61%	7		2	29%
H	53%	3	1	1	67%
P	81%	14	10	2	86%
S	70%	66	39	27	100%
SB	82%	6	3		50%
SE	100%	1			0%
UN	0%	2			0%
Total	69%	180	94	56	83%

The species strata is based on the Phase I leading species which may change as a result of the new MPB adjustment. The original strata, based on the unadjusted Phase I composition is used for comparison.

The leading speciesage, height and SI did not change substantially (Table 22 and Table 23). The species matched age, height and SI differences increased slightly. The volumes and TPH changed slightly. Both the original and the new MPB algorithm adjust the Phase I volume and TPH for MPB. In the original MPB algorithm, the Phase I is projected to the update year and then mortality applied. In the new algorithm, the mortality is applied at the MPB year. With the new algorithm, the post-MPB stand is projected and likely grows at a slightly accelerated rate due to increased growing space. The biggest effect of the new algorithm is on basal area which went from an overall ratio of 0.808 (approximately 20% overestimation of BA in Phase I) to a ratio of 0.986, a considerable improvement, particularly for the pine stratum.

Table 22. The inventory attribute means from Table 12 are compared to those obtained from the new MPB adjustment algorithm.

Attribute			Volume	Audit	(mature)			2015
			Balsam	Other	Pine	Spruce	All	All
Leading	Original	N	32	23	62	57	174	174
Species		Phase II Ground	152	115	116	126	126	126
Age		Phase I Sample	185	129	128	158	149	149
(years)	New MPB	Phase I Sample	185	129	127	158	148	148
Species	Original	N	32	22	60	55	169	169
Matched		Phase II Ground	152	116	116	127	127	126
Age(years)		Phase I Sample	187	127	125	155	147	147
	New MPB	N	32	16	49	52	149	112
		Phase II Ground	152	126	119	127	130	129
		Phase I Sample	185	140	128	159	153	155
Leading	Original	N	32	23	62	57	174	174
Species		Phase II Ground	21.1	25.5	20.5	23.4	22.2	22.2
Height		Phase I Sample	20.2	25.1	23.2	26.5	24.0	24.0
(m)	New MPB	Phase I Sample	20.2	25.1	23.2	26.5	24.0	24.3
Species	Original	N	32	22	60	55	169	169
Matched		Phase II Ground	21.2	25.4	20.3	23.4	22.1	22.2
Height (m)		Phase I Sample	20.6	24.7	23.6	24.9	23.6	23.6
	New MPB	N	32	16	49	52	149	174
		Phase II Ground	21.2	25.6	19.8	23.4	22.0	21.9
		Phase I Sample	20.2	25.8	24.1	26.5	24.3	23.4
Basal area	Original	N	34	24	65	57	180	180
(m^2/ha)		Phase II Ground	31.1	38.5	19.1	33.9	28.6	28.7
7.5 cm+		Phase I Sample	28.1	42.1	37.3	35.2	35.5	35.5
	New MPB	Phase I Sample	27.8	40.9	21.4	33.7	29.1	29.1

Attribute			Volume Balsam	Audit Other	(mature) Pine	Spruce	All	2015 All
Trees/ha	Original	N	34	24	65	56	179	179
7.5 cm+		Phase II Ground	795	819	841	958	866	871
		Phase I Sample	745	696	460	621	597	597
	New MPB	Phase I Sample	751	725	543	632	635	635
Lorey	Original	N	34	23	65	56	178	178
Height		Phase II Ground	14.4	18.2	17.2	17.0	16.7	16.7
(m)		Phase I Sample	18.2	23.4	21.2	23.3	21.6	21.6
	New MPB	Phase I Sample	18.1	23.2	21.9	23.2	21.8	21.8
Volume net	Original	N	34	24	65	57	180	180
Dwb (m^3/ha)		Phase II Ground	203	269	110	238	189	190
12.5 cm+		Phase I Sample	163	232	132	252	189	189
	New MPB	Phase I Sample	163	234	154	256	199	199
Leading	Original	N	32	23	62	56	173	173
Species		Phase II Ground	10.7	18.0	13.1	14.7	13.8	13.8
Site index		Phase I Sample	8.1	15.9	16.3	13.6	13.8	13.8
(m)	New MPB	Phase I Sample	8.3	16.0	15.7	13.6	13.7	13.7
Leading	Original	N	21	18	51	49	139	
Species		Phase II Ground	12.7	19.6	14.3	16.0	15.4	
Site index (m)		Phase I Sample	8.7	16.0	16.5	14.0	14.3	
Bh_age 10-120	New MPB	Phase I Sample	8.7	16.1	16.1	13.9	14.2	
Species	Original	N	19	13	23	42	97	79
Matched SI (m)		Phase II Ground	12.8	19.4	14.6	15.9	15.4	13.5
Bh_age 10-120		Phase I Sample	8.9	16.0	15.0	12.8	13.0	11.6
Species	New MPB	N	15	9	21	27	72	79
Matched SI (m)		Phase II Ground	11.7	19.5	14.4	15.7	15.0	13.5
Bh_age 10-120		Phase I Sample	8.0	16.5	15.3	12.9	13.0	11.7

Table 23. The ratios from Table 13 are contrasted to the ratios obtained using the new MPB adjustment algorithm.

Attribute		Volume Balsam	Other	Audit Pine	(mature) Spruce	All Mature	All Mature
Leading Species	Original	0.821	0.888	0.903	0.797	0.845	0.845
Age (years)		(8.6%)	(19.5%)	(9.3%)	(10.1%)	(5.5%)	(5.5%)
	New MPB	0.822	0.891	0.914	0.799	0.849	0.849
		(8.7%)	(19.5%)	(9.3%)	(10.2%)	(5.5%)	(5.5%)
Species matched	Original	0.814	0.911	0.928	0.82	0.861	0.861
Age (years)		(8.4%)	(20.2%)	(9%)	(10.2%)	(5.4%)	(5.4%)
	New MPB	0.822	0.9	0.924	0.799	0.849	0.833
		(8.7%)	(24.3%)	(10.5%)	(10.7%)	(5.9%)	(6.5%)
Leading Species	Original	1.048	1.016	0.882	0.885	0.927	0.928
Height (m)		(7.7%)	(10.4%)	(6.9%)	(5.7%)	(3.8%)	(3.7%)
	New MPB	1.049	1.018	0.848	0.886	0.916	0.917
		(7.7%)	(10.4%)	(7.4%)	(5.7%)	(3.9%)	(3.9%)
Species matched	Original	1.027	1.027	0.861	0.939	0.938	0.937
Height (m)		(7.2%)	(10.9%)	(7.4%)	(5.2%)	(3.8%)	(3.7%)
	New MPB	1.049	0.991	0.822	0.883	0.905	0.940
		(7.7%)	(12.4%)	(8.7%)	(5.9%)	(4.3%)	(4.7%)
Basal area	Original	1.107	0.915	0.51	0.963	0.807	0.808
(m^2/ha) 7.5 cm+		(17.6%)	(24.8%)	(17%)	(11.9%)	(9.2%)	(9.1%)
	New MPB	1.118	0.94	0.891	1.007	0.984	0.986

Attribute		Balsam	Volume Other	Audit Pine	(mature) Spruce	All Mature	All Mature
		(17.6%)	(24.9%)	(18.9%)	(12%)	(8.5%)	(8.5%)
Trees/ha 7.5 cm+	Original	1.067 (17.2%)	1.176 (24.9%)	1.827 (21.1%)	1.541 (19.9%)	1.451 (11.1%)	1.459 (11.1%)
	New MPB	1.059 (17.1%)	1.13 (25.3%)	1.549 (19.4%)	1.513 (20.3%)	1.364 (10.8%)	1.371 (10.8%)
Lorey Height (m)	Original	0.791 (9.9%)	0.778 (13.8%)	0.811 (7.8%)	0.73 (8.1%)	0.776 (4.7%)	0.776 (4.7%)
	New MPB	0.794 (9.9%)	0.787 (13.8%)	0.784 (7.7%)	0.732 (8.1%)	0.768 (4.6%)	0.768 (4.6%)
Volume net Dwb (m^3/ha) 12.5 cm+	Original	1.246 (23.9%)	1.159 (29.9%)	0.836 (25.6%)	0.946 (13.7%)	1.002 (10.8%)	1.005 (10.7%)
	New MPB	1.242 (23.9%)	1.148 (29.9%)	0.713 (23%)	0.93 (13.6%)	0.952 (10.6%)	0.955 (10.5%)
Leading Species Site index (m)	Original	1.316 (11.8%)	1.135 (13%)	0.803 (8.6%)	1.078 (8.8%)	0.997 (5.5%)	0.998 (5.5%)
	New MPB	1.297 (12.1%)	1.126 (13%)	0.831 (9%)	1.08 (8.6%)	1.01 (5.5%)	1.010 (5.5%)
Leading Species Site index (m) Bh_age 10-120	Original	1.468 (15.7%)	1.227 (8.5%)	0.87 (8.1%)	1.149 (10%)	1.073 (5.8%)	
	New MPB	1.468 (15.7%)	1.215 (8.6%)	0.892 (8.4%)	1.152 (9.8%)	1.084 (5.7%)	
Species Matched Site index (m) Bh_age 10-120	Original	1.438 (15.3%)	1.21 (11%)	0.971 (12%)	1.238 (10.6%)	1.189 (6.7%)	1.159 (6.8%)
	New MPB	1.462 (16.7%)	1.183 (15.7%)	0.944 (10.7%)	1.223 (14.6%)	1.154 (8%)	1.152 (6.8%)

There are many factors contributing to differences between the Phase I adjusted estimates and Phase II ground measurements. There are estimation errors associated with the original Phase I photo interpretation including errors in species composition and basal area. The Phase I inventory is then projected to the year of MPB attack, introducing additional error. There are errors associated with the estimates of location and degree of MPB impact. The MPB adjustment algorithm introduces additional errors. Finally, the Phase I estimates are for a polygon while the Phase II estimates are a small area sample within the polygon.

6.6 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 024Y sample 212 which has a Phase I stems/ha of 1,445 yet the Phase I basal area is 0 m^2/ha. It is possible the trees are all shorter than 1.3m (and thus have no BA) but the Phase I height is 3.8 m.

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 treed 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.

7. Conclusions and recommendations

The results for the Volume Audit (mature) portion of the inventory are good for height and volume, key inventory attributes. This includes the Pine stratum which has been heavily impacted by MPB. This indicates that the MPB adjustment for volume appears, on average, to be working well. The Phase I inventory overestimates BA, particularly for the pine stratum. BA, unlike volume, is not adjusted for MPB.

The leading species agreement for the Volume Audit population is poor (44% or 79 out of 180). Much of this appears to be due to MPB. Of the 65 samples with a Phase I leading species of pine, only 10 had a Phase II leading species of pine. The Phase I species composition includes dead pine. When the Phase II species composition is modified to include dead pine, the leading species agreement rises to 60%.

The TSA has had significant depletions due to MPB. The volume and trees/ha have been adjusted to account for this but the species composition, age and height have not been altered. A complete re-inventory of the Prince George TSA should be undertaken and the VRI analysis re-run for comparison. The aerial photo acquisition is occurring in the 2015/2016 fiscal year.

The new MPB adjustment algorithm was compared to the current MPB adjustment algorithm. Age, height and SI did not change substantially while volumes and TPH changed slightly and basal area estimation was improved considerably (relative to the Phase II ground samples) for the pine stratum. With the new MPB adjustment algorithm, post-MPB stands are projected to grow at a slightly accelerated rate due to increased growing space.

8. Literature cited

FAIB. 2014. Vegetation Resources Inventory – Photo Interpretation Procedures. Version 3.0. Ministry of Forests, Lands and Natural Resource Operations. 21p + app.

FAIB 2011. Vegetation Resources Inventory – VRI sample data analysis procedures and standards. Version 1, June 2011. Ministry of Forests and Range, Forest Analysis and Inventory Branch. 23p. + app.

Jahraus Consulting Inc. 2013. Morice TSA – Documentation of Vegetation Resources Inventory Analysis. 20p + app,

Nona Phillips Forestry Consulting. 2014a. Prince George TSA VRI Sample Selection Report. March 2014. 14p. + app.

Nona Phillips Forestry Consulting. 2014b. Prince George Timber Supply Area – TSA 24: Vegetation resources inventory project implementation plan including volume audit sampling and young stand monitoring. March 24, 2014. 14p. + app.

9. Appendix A: Phase I inventory attributes

Table 24. The Phase I inventory projected attributes are given.

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024Y	2014	200	13424	YSM	Other	V	83.4	V	N	2000	SBS																						
024Y	2014	201	13424	YSM	Other	V	22.6	V	N	2000	SBS																						
024Y	2014	204	13424	YSM	Other	V	159.4	V	N	2000	ESSF																						
024Y	2014	205	13424	YSM	Other	I	100.7	V	N	2004	ESSF	7.0	18	6.4	764	SX	40	PLI	40	BL	20							22	22	4.0	11.2	8	0
024Y	2014	210	13424	YSM	Other	I	92.9	V	N	2008	SBS																						
024Y	2014	212	13424	YSM	Other	V	11.4	V	N	2000	SBS		1			PL	98	AT	2									17	17	4.6	6.5		
024Y	2014	225	13424	YSM	Other	F	11.4	V	N	1990	ICH		6			SW	100											35		5.9			
024Y	2014	232	13424	YSM	Other	V	2.9	V	N	1997	ICH		5			PL	100											48		5.1			
024Y	2014	234	13424	YSM	Other	V	40.7	V	N	2000	SBS																						
024Y	2014	236	13424	YSM	Other	V	1.9	V	N	2000	SBS																						
024Y	2014	238	13424	YSM	Other	F	7.9	V	N	1996	SBS		9			BL	63	SW	37									31		5.4			
024Y	2014	239	13424	YSM	Other	V	39.5	V	N	2000	SBS																						
024Y	2014	240	13424	YSM	Other	V	74.4	V	N	2000	SBS																						
024Y	2014	244	13424	YSM	Other	V	6.9	V	N	2002	SBS		5			SXW	36	FDI	30	PLI	26	AT	8					22	22	2.3	3.8		
024Y	2014	255	13424	YSM	Other	V	21.3	V	N	2002	SBS		6			S	90	BL	10									25	25	3.0	3.6		
024Y	2014	256	13424	YSM	Other	V	10.6	V	N	2002	SBS		5			SXW	100											19		2.6			
024Y	2014	262	13424	YSM	Other	V	10.7	V	N	2002	SBS		5			SXW	90	BL	10									42	42	1.8	2.4		
024Y	2014	273	13424	YSM	Other	F	7.3	V	N	1995	SBS																						
024Y	2014	202	13424	YSM	VT	V	101.7	V	T	2000	ESSF																						
024Y	2014	206	13424	YSM	VT	V	94.5	V	T	1990	SBS																						
024Y	2014	207	13424	YSM	VT	I	403.6	V	T	2006	ESSF																						
024Y	2014	208	13424	YSM	VT	F	52.8	V	T	1993	ESSF		10			S	82	BL	9	AT	4	AC	3	PL	2			24		4.2			
024Y	2014	211	13424	YSM	VT	I	11.9	V	T	2003	SBPS																						
024Y	2014	213	13424	YSM	VT	V	224.6	V	T	1990	ESSF	12.1	10	13.1	1073	PL	81	SX	9	BL	8	AT	2					38	38	14.2	8.7	33	0
024Y	2014	214	13424	YSM	VT	F	1.7	V	T	1990	SBS		10			S	50	PL	50									27		3.6			
024Y	2014	215	13424	YSM	VT	V	20.5	V	T	2002	SBS		20			SW	90	FDI	10									35	35	6.8	9.9		
024Y	2014	216	13424	YSM	VT	V	23.2	V	T	2002	SBS		10			SW	93	AT	4	PLI	2	BL	1					25	25	4.6	12.0		
024Y	2014	217	13424	YSM	VT	V	12.2	V	T	2000	SBS																						

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024Y	2014	218	13424	YSM	VT	V	77.1	V	T	2000	SBS																						
024Y	2014	219	13424	YSM	VT	V	33.7	V	T	2000	SBS																						
024Y	2014	220	13424	YSM	VT	V	4.5	V	T	2002	SBS	19.6	50	40.0	784	SW	60	BL	20	PLI	20							45	58	21.9	21.1	269	0
024Y	2014	221	13424	YSM	VT	V	4.2	V	T	2002	ESSF		10			SW	100											22		3.0			
024Y	2014	222	13424	YSM	VT	V	27.3	V	T	1996	SBS	16.2	32	34.1	1945	BL	47	S	23	PL	18	FD	6	AT	6			50	50	18.4	19.9	155	6
024Y	2014	223	13424	YSM	VT	V	27.8	V	T	2000	SBS																						
024Y	2014	224	13424	YSM	VT	F	14.2	V	T	1997	ICH	8.9	10	9.1	819	EP	50	SX	40	AT	10							25	25	12.5	4.5	14	0
024Y	2014	226	13424	YSM	VT	I	28	V	T	2008	SBS	8.3	30	3.7	477	SX	50	PLI	30	AC	20							36	34	8.3	11.1	2	0
024Y	2014	227	13424	YSM	VT	I	61.1	V	T	2004	ESSF																						
024Y	2014	228	13424	YSM	VT	V	71.8	V	T	2000	SBS																						
024Y	2014	229	13424	YSM	VT	I	235.1	V	T	2008	SBS	8.8	15	7.8	800	PLI	70	SX	20	AT	10							25	25	10.9	5.5	11	1
024Y	2014	230	13424	YSM	VT	V	29.3	V	T	2003	SBS	14.1	15	23.9	1854	SW	40	SB	30	AT	20	PLI	10					42	72	16.8	11.3	71	0
024Y	2014	231	13424	YSM	VT	I	133.6	V	T	2006	SBS	7.4	90	3.3	475	SX	80	BL	10	EP	10							33		7.8		1	0
024Y	2014	233	13424	YSM	VT	V	16.2	V	T	2002	SBS	14.4	25	30.4	1777	SW	30	BL	20	AT	20	EP	15	FDI	10	AC	5	48	48	15.9	15.1	105	0
024Y	2014	235	13424	YSM	VT	V	49.2	V	T	2002	SBS		25			PL	40	AT	30	EP	20	BL	10					24	24	7.2	8.7		
024Y	2014	237	13424	YSM	VT	F	39.9	V	T	1997	SBS		10			SX	70	BL	30									25	25	3.0	3.6		
024Y	2014	241	13424	YSM	VT	V	55.8	V	T	1996	SBS	8.2	20	5.6	731	S	81	BL	15	EP	2	AT	2					45	45	9.1	9.6	4	0
024Y	2014	242	13424	YSM	VT	I	29.3	V	T	2007	SBS	11.1	70	18.6	1549	PLI	80	BL	10	SX	10							31		13.5	7.5	30	5
024Y	2014	243	13424	YSM	VT	V	15.6	V	T	2000	SBS																						
024Y	2014	245	13424	YSM	VT	V	48.1	V	T	2002	SBS	10.8	30	8.1	769	PL	68	AT	24	SXW	6	SB	1	ACT	1			26	26	11.3	12.6	11	0
024Y	2014	246	13424	YSM	VT	V	11.8	V	T	2002	SBS	10.3	35	8.4	885	PL	80	AT	10	SX	10							26	26	11.3	12.6	10	0
024Y	2014	247	13424	YSM	VT	I	97.8	V	T	2007	SBS		25			SX	100											22		3.0			
024Y	2014	248	13424	YSM	VT	V	48.8	V	T	2002	SBS	14.8	30	24.3	1876	AT	50	PL	25	SXW	25							26	26	17.2	15.0	69	1
024Y	2014	249	13424	YSM	VT	V	24.4	V	T	2002	SBS		30			S	45	AC	18	EP	14	PL	12	AT	11			27	27	3.6	7.9		
024Y	2014	250	13424	YSM	VT	V	9.1	V	T	1996	SBS		10			S	70	EP	30									28	24	4.1	8.8		
024Y	2014	251	13424	YSM	VT	V	71.9	V	T	2002	SBS		30			SXW	80	AT	20									34	34	5.6	10.4		
024Y	2014	252	13424	YSM	VT	V	16	V	T	2002	SBS	8.6	55	15.1	1541	SXW	40	PL	40	BL	20							43	43	7.6	11.9	24	0
024Y	2014	253	13424	YSM	VT	V	72.2	V	T	2002	SBS	9.2	50	8.6	876	PL	70	SXW	10	BL	10	AT	10					27	27	10.7	5.1	11	0
024Y	2014	254	13424	YSM	VT	V	26	V	T	2002	SBS	8.8	55	10.7	1137	PL	64	S	25	AT	6	BL	4	AC	1			28	28	11.1	5.6	17	0
024Y	2014	257	13424	YSM	VT	V	18.1	V	T	2002	SBS		35			SXW	70	FD	10	BL	10	AT	10					33	33	5.3	9.0		
024Y	2014	258	13424	YSM	VT	V	48.5	V	T	2002	SBS	10.5	35	8.8	708	PL	67	AT	24	S	9							36	36	11.1	12.2	12	2

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024Y	2014	259	13424	YSM	VT	V	38.7	V	T	2002	SBS		40			SXW	54	EP	31	ACT	7	BL	6	AT	2			38	38	6.8	11.3		
024Y	2014	260	13424	YSM	VT	V	15.8	V	T	2002	SBS		20			SXW	97	PLI	2	BL	1							24	24	2.8	6.3		
024Y	2014	261	13424	YSM	VT	V	6.4	V	T	2002	SBS	9.7	60	17.0	1725	SW	50	BL	30	FD	20							39	43	10.9	19.2	25	0
024Y	2014	263	13424	YSM	VT	V	58.6	V	T	2002	SBS		35			SXW	70	EP	20	BL	10							28	23	3.9	6.0		
024Y	2014	264	13424	YSM	VT	V	10.7	V	T	2002	SBS		60			SW	90	PL	10									28	28	3.9	9.1		
024Y	2014	265	13424	YSM	VT	V	15.9	V	T	2003	SBS		50			SW	50	PLI	20	AT	10	BL	10	EP	10			35	35	6.1	11.3		
024Y	2014	266	13424	YSM	VT	V	4.7	V	T	2003	SBS	7.2	30	4.5	593	PLI	30	SW	30	AT	30	BL	5	FDI	5			27	27	8.8	3.9	3	0
024Y	2014	267	13424	YSM	VT	I	238	V	T	2011	SBS		11			SX	90	PLI	10									31	31	7.0	12.8		
024Y	2014	268	13424	YSM	VT	V	8.5	V	T	2002	SBS	9.5	40	13.0	1338	AT	80	SXW	20									28	28	11.9	5.2	16	0
024Y	2014	269	13424	YSM	VT	I	39.2	V	T	2003	SBS	8.6	20	4.5	445	PLI	70	AT	20	BL	10							22	16	9.4	7.7	4	1
024Y	2014	272	13424	YSM	VT	V	17.6	V	T	1997	SBS		30			BL	60	PL	30	SW	10							36	36	7.1	11.5		
CMI4	2014	81	13424	YSM	VT	V	41.2	V	T	1997	SBS		10			S	33	AT	25	PL	24	AC	13	BL	5			27	26	5.7	13.7		
CMI4	2014	111	13424	YSM	VT	F	82.9	V	T	1996	ESSF		10			S	100											23		2.2			
242	2013	78	19321	VA	Balsam	V	5.3	V	T	1996	ESSF	20.8	40	20.2	553	BL	80	SX	20									218	238	23.1	25.3	136	0
242	2013	79	19321	VA	Balsam	V	40.6	V	T	2002	SBS	8.6	40	21.9	2191	BL	70	EP	20	SXW	10							87	87	10.8	10.1	29	0
242	2013	80	19321	VA	Balsam	V	13.3	V	T	1996	SBS	13.8	10	3.2	132	BL	80	SX	20									158	158	13.6	17.0	13	0
242	2014	81	15266	VA	Balsam	V	9.8	V	T	1996	SBS	27.5	18	23.0	214	BL	45	SX	35	FDI	10	AT	5	EP	5			159	169	26.6	31.7	189	0
242	2013	82	15266	VA	Balsam	V	2.9	V	T	1997	ESSF	23.9	40	30.1	314	BL	60	SW	30	HW	10							187	217	24.2	29.2	218	0
242	2014	83	15266	VA	Balsam	V	7.7	V	T	1997	SBS	24.0	25	26.3	388	BL	65	SW	30	PL	5							133	133	26.0	25.4	193	12
242	2014	84	15266	VA	Balsam	V	113	V	T	1990	ESSF	19.6	50	31.1	1147	BL	70	SX	30									205	205	23.6	24.1	197	0
242	2014	85	16937	VA	Balsam	V	3.6	V	T	1996	SBS	21.8	50	36.7	564	BL	50	SX	30	EP	15	AT	5					139	149	23.1	25.2	243	0
242	2014	86	16937	VA	Balsam	V	25.6	V	T	1996	SBS	27.9	65	50.7	743	BL	50	SX	35	AC	10	EP	5					149	149	29.7	32.0	446	0
242	2014	87	16937	VA	Balsam	V	12.6	V	T	1998	SBS	25.7	50	54.3	731	BL	60	SX	30	AT	10							157	157	28.4	29.7	429	0
242	2014	88	16937	VA	Balsam	V	10.5	V	T	1998	SBS	19.5	60	44.2	1143	BL	60	SX	30	PLI	10							197	217	22.2	24.4	267	11
024C	2014	591	16284	VA	Balsam	V	17.5	V	T	2002	ESSF	9.5	40	17.0	1400	BL	100											183		12.9		32	0
024C	2014	596	16284	VA	Balsam	V	40.7	V	T	1996	ESSF	16.9	60	26.1	948	BL	80	SX	20									249	319	19.1	24.1	134	0
024C	2014	1246	16284	VA	Balsam	V	79.8	V	T	1996	ICH	20.2	15	7.1	220	BL	85	SX	15									144	169	20.0	28.9	45	0
024C	2013	1386	16284	VA	Balsam	V	29.5	V	T	2002	ESSF	16.2	50	35.1	639	BL	90	SE	10									232	252	18.8	21.5	169	0
024C	2014	1876	16284	VA	Balsam	V	20.9	V	T	1996	ESSF	27.7	45	34.7	454	BL	50	SW	50									199	219	28.1	31.2	318	0
024C	2014	1886	16284	VA	Balsam	V	23.3	V	T	1997	ESSF	24.0	35	15.9	214	BL	100											198		26.1		120	0
024C	2014	2361	16284	VA	Balsam	V	64.3	V	T	1998	ESSF	19.5	50	33.5	980	BL	65	SX	30	AT	5							137	137	21.9	24.2	208	0

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024C	2013	2366	16284	VA	Balsam	V	28.3	V	T	1998	ESSF	19.4	50	44.8	878	BL	70	SX	20	PLI	10							176	186	22.3	23.5	260	17
024C	2014	3011	16284	VA	Balsam	V	77.1	V	T	1997	ESSF	19.5	60	40.2	775	BL	70	SE	15	PL	15							268	278	21.9	25.6	209	37
024C	2013	3021	16284	VA	Balsam	V	16.3	V	T	1997	ESSF	14.0	45	35.1	1318	BL	100											262		18.9		143	0
024C	2013	3026	16284	VA	Balsam	V	45.6	V	T	1997	ESSF	14.7	40	12.6	569	BL	100											167		17.6		54	0
024C	2014	3711	16284	VA	Balsam	V	8.5	V	T	1996	ESSF	12.9	10	6.2	317	BL	100											124		14.3		22	0
024C	2013	4346	16284	VA	Balsam	V	48.7	V	T	1995	SBS	15.0	30	33.5	1710	BL	60	SXW	30	EP	10							87	92	17.9	19.1	146	0
024C	2014	4366	16284	VA	Balsam	V	6.3	V	T	1996	ESSF	17.3	30	15.0	302	BL	80	SX	20									239	319	18.2	20.1	79	0
024C	2014	6131	16284	VA	Balsam	F	24	V	T	1998	ESSF	12.9	50	41.3	1214	BL	100											127		17.1		157	0
024C	2013	6136	16284	VA	Balsam	V	7.4	V	T	1998	ESSF	18.6	65	42.4	1046	BL	70	SX	25	PLI	5							136	156	21.8	22.8	238	15
024C	2014	6826	16284	VA	Balsam	V	8.6	V	T	1996	ESSF	13.8	30	24.9	504	BL	100											229		16.2		99	0
024C	2014	6831	16284	VA	Balsam	V	3.9	V	T	1996	ESSF	7.6	10	1.5	144	BL	100											99		8.0		2	0
024C	2014	8131	16284	VA	Balsam	V	41.8	V	T	1998	ESSF	16.5	30	25.1	563	BL	90	SX	10									277	277	18.9	21.1	125	0
024C	2014	8766	16284	VA	Balsam	V	8.5	V	T	1997	ESSF	21.8	45	30.0	315	BL	70	SW	30									198	218	22.2	25.5	198	0
024C	2014	9236	16284	VA	Balsam	V	13.9	V	T	1998	ESSF	16.0	50	40.2	1001	BL	100											257		20.9		194	0
024C	2014	9246	16284	VA	Balsam	V	27.5	V	T	1998	ESSF	20.0	60	45.0	918	BL	50	SX	30	PLI	20							217	237	22.1	24.2	230	69
CMI4	2014	177	16284	VA	Balsam	V	8.4	V	T	1996	ESSF	14.1	45	10.2	604	BL	90	SX	10									229	243	16.2	18.4	38	0
242	2013	89	14334	VA	Other	V	10.8	V	T	2002	SBS	13.7	65	35.5	1825	AT	90	S	10									97	92	15.2	18.4	80	0
242	2014	90	14334	VA	Other	V	4	V	T	2003	SBS	25.9	25	16.1	196	AT	60	AC	20	SW	20							122	92	28.1	22.7	100	0
242	2013	91	14334	VA	Other	V	3.3	V	T	1998	BWBS	16.5	50	31.1	635	AT	40	PLI	30	SX	20	BL	10					86	86	18.1	17.9	96	64
242	2014	92	14334	VA	Other	V	2.2	V	T	2002	SBS	17.9	25	24.6	522	AT	80	SXW	20									53	53	19.4	17.1	121	0
242	2013	93	15334	VA	Other	V	8.8	V	T	1996	ICH	21.5	50	44.6	726	HW	65	CW	25	SX	5	BL	5					108	178	20.8	29.0	223	0
242	2014	94	15334	VA	Other	F	12	V	T	1990	ICH	21.8	40	42.8	696	HW	60	CW	30	FD	10							215		24.5		217	0
242	2014	95	15334	VA	Other	V	1	V	T	2002	SBS	22.6	50	40.9	755	AT	60	SXW	20	PL	20							83	73	24.0	23.7	268	3
242	2014	96	15334	VA	Other	V	18.7	V	T	1998	SBS	25.0	55	44.1	532	AT	80	PLI	15	SX	5							107	117	26.8	27.4	223	59
242	2014	97	17496	VA	Other	V	8.6	V	T	2002	SBS	26.3	40	47.3	321	FDI	50	SW	35	BL	15							193	163	28.7	28.2	350	0
242	2014	98	17496	VA	Other	V	17.1	V	T	2002	SBS	23.6	68	44.9	666	AT	45	EP	35	SW	10	FDI	5	PLI	5			103	103	25.4	24.4	279	12
242	2014	99	17496	VA	Other	V	12.5	V	T	1997	ICH	30.1	65	80.6	395	CW	60	HW	30	SW	10							318	268	31.0	29.7	407	0
242	2014	100	17496	VA	Other	V	8.1	V	T	2002	SBS	22.8	68	41.2	649	EP	60	AT	25	SW	10	FDI	5					93	93	23.6	23.6	269	0
024C	2013	551	16284	VA	Other	V	22.8	V	T	2002	SBS	25.8	60	36.4	480	AT	40	SW	35	PL	25							147	177	27.3	27.1	197	76
024C	2013	1211	16284	VA	Other	V	47.5	V	T	2002	SBS	23.1	65	40.6	471	AT	50	EP	30	SW	15	PLI	5					102	102	25.3	22.3	235	12
024C	2013	1221	16284	VA	Other	V	9.2	V	T	2002	SBS	25.1	55	38.5	432	AT	70	SW	10	PLI	10	AC	10					102	102	26.3	28.2	213	35

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024C	2014	3671	16284	VA	Other	V	5.2	V	T	2003	SBS	22.0	60	36.2	511	AT	60	SW	25	PLI	15							112	112	22.1	25.9	167	44
024C	2013	4951	16284	VA	Other	V	14.1	V	T	2000	SBS	23.8	50	37.2	699	AT	65	SX	20	PL	10	ACT	5					104	104	24.5	28.5	218	16
024C	2014	4996	16284	VA	Other	V	6.5	V	T	1997	ICH	15.4	80	35.4	2804	HW	40	BL	20	PL	20	SW	10	FD	10			53	53	16.0	16.7	138	0
024C	2013	5006	16284	VA	Other	V	33.4	V	T	1997	ICH	33.0	65	96.6	360	CW	84	HW	16									284	267	35.1	32.5	455	0
024C	2014	5011	16284	VA	Other	V	14	V	T	1997	SBS	26.8	45	26.2	348	AT	60	EP	25	SW	10	SB	5					138	128	29.3	24.4	173	0
024C	2013	7436	16284	VA	Other	V	13.7	V	T	2002	SBS	14.5	70	19.0	1117	AT	65	SW	30	PL	5							72	69	15.4	16.3	57	0
024C	2014	8706	16284	VA	Other	V	17.3	V	T	2000	SBS	20.6	40	29.8	567	AT	70	PL	20	SW	10							105	105	22.6	21.4	107	48
CMI4	2014	40	16284	VA	Other	V	10.1	V	T	2002	SBS	27.1	45	35.3	355	AT	55	EP	15	SW	15	PLI	15					113	103	29.3	25.4	215	50
CMI4	2014	449	16284	VA	Other	V	48.7	V	T	2002	SBS	29.2	65	74.1	748	FDI	85	SW	10	BL	5							87	92	34.5	33.0	677	0
242	2014	1	16699	VA	Pine	V	14.7	V	T	2000	SBS	21.9	40	29.9	86	PL	90	SW	10									195	195	24.3	24.2	24	217
242	2014	2	16699	VA	Pine	V	3.4	V	T	2000	SBS	21.6	40	30.3	240	PL	90	SW	10									155	165	23.7	26.4	69	176
242	2014	3	16699	VA	Pine	V	4	V	T	2003	SBS	25.6	60	37.9	77	PL	90	SW	10									232	232	28.2	27.7	36	321
242	2013	4	16699	VA	Pine	V	10.5	V	T	2002	SBS	19.7	70	45.6	116	PL	95	SXW	5									77	72	22.8	23.5	27	315
242	2013	6	16699	VA	Pine	V	22.9	V	T	2002	SBS	21.3	70	47.0	277	PL	85	SW	8	AT	7							92	112	24.5	26.9	63	309
242	2014	7	16699	VA	Pine	V	17.2	V	T	2000	SBPS	15.3	55	33.6	570	PL	100											115		18.1		65	126
242	2014	8	16699	VA	Pine	V	8.8	V	T	2000	SBS	16.7	50	29.6	404	PL	80	S	20									155	155	18.7	20.6	43	115
242	2013	9	16699	VA	Pine	V	7.2	V	T	2000	ESSF	15.6	35	23.5	93	PL	90	SX	5	BL	5							94	89	17.4	20.0	12	109
242	2014	11	16699	VA	Pine	V	3.3	V	T	2002	SBS	17.6	35	25.4	260	PL	50	SXW	30	AT	20							83	73	19.6	18.3	57	90
242	2013	12	16699	VA	Pine	V	6.3	V	T	2002	SBS	18.2	70	27.0	152	PL	75	AT	25									97	92	19.8	20.0	25	133
242	2014	13	16699	VA	Pine	V	2.7	V	T	2002	SBS	21.0	75	37.0	54	PL	100											93		24.5		12	288
242	2014	14	16699	VA	Pine	V	22.4	V	T	2000	ESSF	21.3	45	32.6	239	PL	70	S	20	BL	10							175	165	23.5	24.5	69	187
242	2014	15	16699	VA	Pine	V	10.8	V	T	2000	SBS	10.1	60	23.8	1908	PL	100											55		12.1		38	4
242	2013	16	15639	VA	Pine	V	28.6	V	T	2000	SBS	24.6	55	41.0	314	PL	65	SX	27	AT	6	ACT	2					129	124	25.9	28.9	146	218
242	2013	17	15639	VA	Pine	V	12	V	T	2002	SBS	21.2	65	46.4	344	PL	60	AT	25	SW	15							117	97	23.9	22.4	100	223
242	2013	18	15639	VA	Pine	V	14.2	V	T	1997	SBS	21.3	45	31.5	300	PL	80	SX	20									117	107	23.3	23.0	95	155
242	2014	19	15639	VA	Pine	V	21.6	V	T	2002	SBS	15.5	80	31.7	700	PL	90	SB	10									83	99	18.9	10.5	72	92
242	2014	20	15639	VA	Pine	V	11.1	V	T	2000	SBS	18.9	50	30.0	1297	PL	60	S	40									145	135	19.7	23.9	163	22
242	2013	21	15639	VA	Pine	F	14.6	V	T	1990	SBS	22.3	50	31.2	470	PL	70	AT	30									154		25.1	0.0	144	74
242	2013	23	15639	VA	Pine	V	3.8	V	T	2003	SBS	18.7	55	27.3	357	PL	50	BL	35	SW	10	FDI	5					131	121	18.7	23.4	85	88
242	2014	24	15639	VA	Pine	V	3.8	V	T	2003	SBS	25.8	70	41.2	190	PL	75	SW	20	AT	5							132	132	27.7	30.3	92	307
242	2013	25	15639	VA	Pine	V	11.7	V	T	2000	SBS	18.4	60	37.0	631	PL	60	AT	35	SX	5							74	74	20.2	21.3	76	129

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
242	2014	26	15639	VA	Pine	V	15	V	T	2003	SBS	12.8	65	34.3	1431	PLI	90	SB	10									87	87	15.3	11.5	105	28
242	2014	27	15639	VA	Pine	V	13.4	V	T	2003	SBS	18.6	60	29.4	553	PLI	60	AT	40									87	87	22.4	16.4	128	43
242	2013	28	15639	VA	Pine	V	5.9	V	T	2002	SBS	20.9	60	33.2	350	PL	58	SW	42									137	142	26.6	18.4	112	131
242	2013	29	15639	VA	Pine	V	1.6	V	T	2000	ESSF	17.3	70	37.6	606	PL	90	SX	10									124	119	19.9	19.1	103	126
242	2013	30	15639	VA	Pine	V	4.9	V	T	2002	SBS	22.3	50	40.9	377	PLI	70	AT	20	SW	10							122	102	24.8	23.3	140	171
242	2013	31	16078	VA	Pine	V	0.8	V	T	1996	SBS	26.3	40	26.5	470	PL	70	AT	30									178	178	27.5	27.8	218	0
242	2014	32	16078	VA	Pine	V	4.3	V	T	2002	ESSF	24.9	55	42.7	365	PL	60	SW	40									153	153	25.6	29.2	182	222
242	2014	33	16078	VA	Pine	V	7.7	V	T	2002	SBS	28.4	45	42.6	394	PL	70	SXW	20	SB	10							183	163	28.3	32.9	389	25
242	2013	34	16078	VA	Pine	V	1.5	V	T	2002	SBS	23.6	65	35.6	716	PL	80	SW	15	AT	5							167	167	25.4	28.1	285	18
242	2013	35	16078	VA	Pine	V	8.9	V	T	2002	SBS	25.5	70	56.0	322	PLI	80	SW	15	FDI	5							122	132	27.8	30.5	183	354
242	2013	36	16078	VA	Pine	V	14.8	V	T	2002	SBS	26.3	65	45.7	625	PL	50	SW	40	SB	10							142	162	24.3	32.5	296	146
242	2014	37	16078	VA	Pine	V	2.7	V	T	2002	SBS	21.9	60	46.0	299	PLI	40	SW	20	FDI	15	AT	15	EP	10			93	93	23.4	26.6	164	151
242	2014	38	16078	VA	Pine	V	1.2	V	T	2002	SBS	27.3	65	51.7	337	PLI	85	FDI	10	SW	5							103	103	29.3	36.5	230	305
242	2014	39	16078	VA	Pine	V	10.6	V	T	2002	SBS	26.0	50	42.0	232	PL	90	SXW	10									143	123	27.7	29.7	189	204
242	2013	40	16078	VA	Pine	V	4	V	T	2003	SBS	22.2	70	43.1	466	PLI	100											114		25.4		174	196
242	2013	41	16078	VA	Pine	V	9.7	V	T	1998	SBS	18.8	60	38.0	1066	PLI	85	SX	10	AT	5							86	96	21.0	23.3	239	21
242	2014	42	16078	VA	Pine	V	29.2	V	T	1998	SBS	26.2	55	44.9	498	PLI	50	SX	40	AT	10							297	177	27.2	30.3	243	131
242	2014	101	16699	VA	Pine	V	1	V	T	2002	SBS	23.1	55	26.8	76	PL	95	SW	5									93	93	25.5	24.6	27	218
242	2014	102	16699	VA	Pine	V	3.2	V	T	2003	SBS	22.8	65	37.9	16	PL	100											132		25.7		7	326
242	2014	106	15639	VA	Pine	V	6.1	V	T	2003	SBS	16.2	55	30.9	669	PLI	100											87		18.4		127	54
024C	2014	1186	16284	VA	Pine	V	17	V	T	1991	SBS	15.2	50	30.4	443	PL	60	SX	40									84	84	17.2	17.6	42	102
024C	2013	1196	16284	VA	Pine	V	3.2	V	T	2000	SBS	25.7	50	37.6	160	PL	80	SX	20									144	144	27.7	29.5	71	302
024C	2013	1216	16284	VA	Pine	V	12.7	V	T	2002	SBS	22.2	60	41.4	466	PLI	50	SW	35	AT	15							112	112	22.9	25.9	226	79
024C	2014	1831	16284	VA	Pine	V	77	V	T	2000	SBS	18.0	70	37.7	771	PL	90	SX	10									90	90	20.7	24.2	91	137
024C	2014	1836	16284	VA	Pine	V	51.8	V	T	2000	ESSF	19.3	65	39.5	230	PL	90	SX	10									155	145	21.7	21.7	61	215
024C	2014	3666	16284	VA	Pine	V	32.2	V	T	2003	SBS	15.5	65	22.2	446	PL	55	BL	25	FD	15	SW	5					102	97	18.1	15.8	36	67
024C	2014	3681	16284	VA	Pine	V	23.1	V	T	2003	ESSF	20.5	60	37.4	443	PL	60	BL	30	SW	10							132	132	23.7	22.2	106	174
024C	2013	4321	16284	VA	Pine	V	19.5	V	T	2002	SBS	18.0	60	36.8	308	PL	95	SW	5									92	92	20.3	22.5	71	173
024C	2013	4326	16284	VA	Pine	V	31.3	V	T	2002	SBS	18.8	65	36.5	371	PL	85	SW	10	BL	5							112	112	20.9	23.0	90	159
024C	2013	4331	16284	VA	Pine	V	67.3	V	T	2002	SBS	17.2	60	37.6	551	PL	100											97		20.2		89	145
024C	2014	6796	16284	VA	Pine	V	8.7	V	T	2003	SBS	26.2	50	34.0	446	PLI	70	SW	20	AT	10							152	152	27.5	30.1	295	12

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024C	2013	8071	16284	VA	Pine	V	14.8	V	T	2000	SBS	23.8	50	34.8	455	PL	75	SX	20	AT	5							144	139	25.6	27.6	174	131
024C	2013	8091	16284	VA	Pine	V	3	V	T	2002	SBS	17.1	60	35.9	1677	PL	50	AT	30	SW	20							72	72	18.9	20.0	181	0
024C	2014	9241	16284	VA	Pine	V	319.9	V	T	1998	SBS	26.6	55	45.7	489	PLI	50	SX	40	AT	10							147	147	27.8	30.7	284	140
024C	2013	9906	16284	VA	Pine	V	55.4	V	T	1997	SBS	19.1	50	34.4	632	PL	70	SX	20	BL	10							167	157	21.6	20.9	133	97
024C	2013	9911	16284	VA	Pine	V	26.5	V	T	1997	ESSF	22.8	60	39.1	420	PL	70	SE	30									167	157	23.6	27.5	163	170
024C	2014	9916	16284	VA	Pine	V	51.3	V	T	1997	SBS	23.6	35	34.8	631	PL	60	BL	30	SB	10							188	148	26.6	24.6	234	55
CMI4	2014	75	16284	VA	Pine	V	8.6	V	T	2002	SBS	28.2	55	52.5	446	PL	80	AT	10	SXW	10							163	163	30.5	30.7	422	75
CMI4	2014	172	16284	VA	Pine	V	10.1	V	T	2000	SBPS	22.6	50	34.0	236	PL	70	S	30									175	175	24.6	25.4	77	220
CMI4	2014	278	16284	VA	Pine	V	81.7	V	T	2000	SBS	23.3	50	36.7	273	PL	65	SX	30	AT	5							85	80	25.0	25.9	114	203
CMI4	2014	322	16284	VA	Pine	V	2.7	V	T	2002	SBS	20.5	70	47.0	20	PLI	100											93		23.4		7	358
CMI4	2014	520	16284	VA	Pine	V	55.4	V	T	2002	SBS	23.7	70	68.8	609	PL	90	SW	9	AT	1							163	133	27.5	24.6	289	313
CMI4	2014	548	16284	VA	Pine	V	12	V	T	1991	SBS	25.3	65	46.9	591	PL	50	AT	30	SX	20							124	124	26.7	29.1	294	88
242	2014	43	15891	VA	Spruce	V	4.9	V	T	2002	SBS	18.8	40	27.7	556	SW	60	EP	15	BL	10	AT	10	SB	5			93	93	20.7	20.7	161	0
242	2013	44	15891	VA	Spruce	V	9.3	V	T	2002	SBS	9.7	50	16.7	1662	SW	60	BL	40									58	58	12.0	11.8	27	0
242	2014	45	15891	VA	Spruce	V	15.6	V	T	2000	SBPS	21.7	50	33.6	483	S	60	PL	40									185	185	25.4	23.6	139	123
242	2013	46	15891	VA	Spruce	V	4.8	V	T	2002	SBS	16.2	25	14.7	394	SB	80	SXW	10	PL	10							177	177	18.0	22.1	65	10
242	2014	47	15891	VA	Spruce	V	4.7	V	T	2002	SBS	26.0	40	40.3	365	SXW	60	AT	30	BL	10							122	122	28.3	27.3	306	0
242	2014	48	15891	VA	Spruce	V	1.3	V	T	1996	ESSF	13.6	20	8.3	180	SX	60	BL	20	HW	10	CW	10					94	94	15.7	11.8	34	0
242	2014	49	15891	VA	Spruce	V	2.9	V	T	2003	SBS		15			SB	100											72		7.3			
242	2014	50	15891	VA	Spruce	V	25.8	V	T	2000	ESSF	13.5	35	25.7	857	S	40	BL	30	PL	30							205	205	16.3	13.0	54	43
242	2014	51	15891	VA	Spruce	V	12.3	V	T	2002	SBS	13.2	70	26.1	1514	SB	90	SW	10									153	163	17.2	19.4	89	0
242	2013	52	15891	VA	Spruce	V	3.1	V	T	2003	SBS	20.6	15	8.3	85	SW	65	PL	20	AT	15							71	71	21.3	20.0	43	12
242	2014	53	16800	VA	Spruce	V	5.4	V	T	1997	ICH	25.6	40	34.2	336	SW	40	EP	30	CW	20	AT	10					218	138	29.2	29.3	223	0
242	2014	54	16800	VA	Spruce	V	2	V	T	1996	ICH	21.2	55	42.1	556	SX	60	BL	30	HW	10							139	119	25.4	20.6	270	0
242	2014	55	16800	VA	Spruce	V	14.5	V	T	2000	SBS	22.4	45	35.1	795	SW	95	PL	5									175	175	27.4	22.5	259	11
242	2013	56	16800	VA	Spruce	V	10.1	V	T	2002	SBS	24.1	60	36.0	466	SW	50	BL	40	AC	5	PLI	5					112	112	27.0	24.7	264	17
242	2013	57	16800	VA	Spruce	V	12.7	V	T	2002	SBS	17.9	55	46.3	1190	SW	60	BL	20	PLI	15	AT	5					52	62	20.6	19.9	278	0
242	2014	58	16800	VA	Spruce	V	2.5	V	T	1997	SBS	30.4	20	24.7	251	SW	100											268		32.8		247	0
242	2014	59	16800	VA	Spruce	V	121.3	V	T	1996	ESSF	29.4	55	25.0	355	SX	90	BL	10									349	199	32.7	27.1	255	0
242	2014	60	16800	VA	Spruce	V	14.4	V	T	2003	SBS	21.3	55	41.8	585	SW	50	BL	25	PLI	20	AT	5					122	122	24.8	19.5	236	55
242	2014	61	16800	VA	Spruce	V	5.2	V	T	2002	ESSF	24.3	30	28.5	313	SXW	80	BL	20									188	183	27.2	22.0	225	0

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
242	2014	62	16800	VA	Spruce	V	2.6	V	T	2001	SBS	21.9	40	33.2	513	SXW	60	BL	20	PL	20							144	124	24.7	21.7	190	57
242	2014	63	16800	VA	Spruce	V	23.8	V	T	2002	SBS	21.1	35	30.0	489	SB	70	PL	20	SXW	10							163	173	24.2	21.6	177	36
242	2014	64	16800	VA	Spruce	V	2.2	V	T	2002	SBS	25.6	40	35.6	393	SXW	70	BL	30									163	143	28.3	26.3	292	0
242	2014	65	16497	VA	Spruce	V	11.6	V	T	1997	ICH	23.1	65	44.0	480	SW	60	BL	30	CW	10							108	108	27.3	22.8	308	0
242	2013	66	16497	VA	Spruce	V	5.3	V	T	2002	SBS	32.5	45	52.9	361	SXW	70	PL	20	SB	10							167	172	35.9	31.4	563	0
242	2014	67	16497	VA	Spruce	V	6.8	V	T	2002	SBS	28.3	55	52.6	425	SW	45	PLI	30	FDI	15	AT	10					103	103	31.4	28.3	346	163
242	2013	68	16497	VA	Spruce	V	5.8	V	T	1997	ICH	36.1	50	63.2	482	SW	69	HW	25	CW	6							217	197	45.4	26.0	650	0
242	2013	69	16497	VA	Spruce	V	4.5	V	T	2002	SBS	29.4	45	34.6	448	SW	65	FD	20	BL	10	AT	5					187	177	33.8	28.8	330	0
242	2013	70	16497	VA	Spruce	F	5.3	V	T	1991	SBS	24.7	40	35.2	776	SX	50	PL	30	AT	20							103		27.7	0.0	300	0
242	2013	71	16497	VA	Spruce	V	26.2	V	T	2003	SBS	29.5	50	36.1	398	SW	60	BL	15	PL	10	AT	10	FDI	5			171	131	32.9	28.2	313	31
242	2014	72	16497	VA	Spruce	F	5.3	V	T	1996	SBS	32.5	40	42.0	435	SW	40	AT	40	PLI	10	AC	10					129		34.4		389	16
242	2014	73	16497	VA	Spruce	V	4.2	V	T	2002	SBS	27.9	40	35.7	470	SW	80	PLI	10	AT	10							143	143	31.4	28.7	321	13
242	2013	74	16497	VA	Spruce	V	23.4	V	T	2002	SBS	26.1	50	41.4	643	SW	70	PL	20	BL	10							192	162	30.9	26.5	347	26
242	2014	75	16497	VA	Spruce	V	19.6	V	T	2002	SBS	22.4	60	50.2	783	SXW	60	AT	20	PL	20							83	93	25.4	24.9	291	87
242	2014	76	16497	VA	Spruce	V	7.4	V	T	2002	SBS	26.4	40	40.3	363	SXW	70	AT	20	BL	10							143	148	29.5	25.9	316	0
242	2014	77	16497	VA	Spruce	V	1.8	V	T	1997	SBS	31.3	40	34.0	246	SW	90	BL	10									208	178	34.0	27.2	337	0
024C	2014	1826	16284	VA	Spruce	V	2.8	V	T	2000	SBS	11.1	15	7.8	769	SB	100											145		13.3		13	0
024C	2013	1856	16284	VA	Spruce	V	29.1	V	T	2002	SBS	13.7	60	32.3	1427	SW	60	SB	30	EP	10							102	102	17.2	13.4	125	0
024C	2013	1866	16284	VA	Spruce	V	18.9	V	T	2002	SBS	26.4	65	50.7	549	SW	60	BL	15	FDI	10	AT	10	EP	5			142	132	29.4	27.3	413	0
024C	2013	1881	16284	VA	Spruce	V	19.8	V	T	1997	SBS	22.3	50	30.7	390	SW	60	BL	40									157	137	27.8	18.9	209	0
024C	2014	2356	16284	VA	Spruce	V	13.5	V	T	1998	ESSF	22.7	55	40.8	767	SX	60	BL	40									157	157	26.8	24.6	312	0
024C	2014	2466	16284	VA	Spruce	V	41.8	V	T	2000	ESSF	19.9	55	33.4	758	SX	40	PL	40	BL	20							185	185	23.4	23.6	119	114
024C	2013	3006	16284	VA	Spruce	V	87.5	V	T	1997	SBS	20.7	70	53.2	929	SW	80	PL	20									107	107	25.2	23.5	293	88
024C	2014	3701	16284	VA	Spruce	V	27.3	V	T	2002	SBS	27.6	40	39.8	361	SXW	60	BL	40									153	143	30.3	28.2	345	0
024C	2014	3706	16284	VA	Spruce	V	49.4	V	T	1996	SBS	18.6	60	31.9	1342	SX	85	BL	15									144	144	23.5	21.0	188	0
024C	2013	4361	16284	VA	Spruce	V	24.4	V	T	1996	SBS	22.5	40	43.8	871	SX	50	BL	30	HW	15	EP	5					198	178	28.4	23.4	306	0
024C	2014	4371	16284	VA	Spruce	V	38.4	V	T	1996	SBS	21.2	50	39.7	795	SX	75	BL	20	AC	5							294	204	25.1	21.3	261	0
024C	2014	6141	16284	VA	Spruce	V	32.5	V	T	1998	ESSF	22.7	40	35.0	450	SX	65	PLI	30	BL	5							177	177	25.7	24.7	191	90
024C	2014	6791	16284	VA	Spruce	V	32.4	V	T	2003	SBS	27.7	50	43.4	360	SW	85	BL	10	AT	5							132	122	30.4	27.4	380	0
024C	2014	7416	16284	VA	Spruce	V	10.7	V	T	2003	SBS	29.9	50	33.4	371	SW	90	BL	10									192	182	33.7	24.8	332	0
024C	2014	7466	16284	VA	Spruce	V	23.1	V	T	2002	SBS	26.3	50	47.1	465	SXW	80	BL	20									208	203	29.9	25.7	392	0

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024C	2013	7481	16284	VA	Spruce	V	7.3	V	T	1996	SBS	24.9	45	39.6	692	SX	80	BL	15	EP	5							258	238	29.6	24.9	324	0
024C	2013	8061	16284	VA	Spruce	V	14.3	V	T	2000	SBS	22.5	60	40.7	786	SX	50	PL	40	AT	10							74	74	28.5	22.4	195	130
024C	2014	8711	16284	VA	Spruce	V	3.3	V	T	2000	SBS	14.7	60	35.0	1660	SB	85	SW	10	PL	5							115	115	18.9	22.5	136	10
024C	2014	8761	16284	VA	Spruce	V	33.4	V	T	1996	ESSF	26.6	30	29.7	506	SW	60	BL	40									219	199	32.1	25.2	266	0
024C	2014	9251	16284	VA	Spruce	V	12.9	V	T	1998	ESSF	22.2	55	40.3	741	SX	50	BL	40	PLI	10							177	177	25.7	24.4	270	33
024C	2014	9256	16284	VA	Spruce	V	5.1	V	T	1998	BWBS	20.7	50	36.2	759	SX	50	AT	20	BL	20	PLI	10					157	147	24.0	22.2	220	19
024C	2013	9886	16284	VA	Spruce	V	9.7	V	T	1997	SBS	27.3	45	41.4	475	SW	65	BL	30	PL	5							217	167	31.1	27.2	347	18
024C	2013	241	75789	Non		V	6576.8	U		2005	SBS																						
024C	2013	541	75789	Non		V	4.9	V	T	2003	SBS	26.8	60	46.1	371	SW	75	BL	20	PLI	5							141	141	30.2	24.1	382	8
024C	2013	546	75789	Non		V	7.1	V	T	2003	SBS	28.5	55	42.9	411	SW	70	PLI	20	BL	5	AT	5					171	131	32.9	26.7	356	49
024C	2014	561	75789	Non		V	103.9	V	N	2002	SBS																						
024C	2014	566	75789	Non		I	107.9	V	N	2012	SBS																						
024C	2014	576	75789	Non		V	8	V	N	2002	SBS																						
024C	2014	1231	75789	Non		V	6958.2	U		2004	SBS																						
024C	2014	1851	75789	Non		I	86.5	V	T	2011	ESSF		11			PLI	100											6		0.8			
024C	2014	2471	75789	Non		I	11.6	V	N	2008	SBPS		5			PLI	59	SX	27	AT	14							10	10	1.8	0.4		
024C	2014	3676	75789	Non		I	21.4	N	L	2011	SBS																						
024C	2013	4946	75789	Non		I	298.4	V	N	2011	SBS																						
024C	2014	4971	75789	Non		I	130	V	T	2012	SBS		11			PLI	90	SX	10									7	6	1.4	0.7		
024C	2013	4981	75789	Non		V	22.1	V	N	2003	SBS	29.1	4	4.9	75	AT	90	PLI	10									101	101	29.3	28.1	37	1
024C	2014	5586	75789	Non		I	45.1	N	L	2011	ESSF																						
024C	2014	5596	75789	Non		V	8.4	V	N	2000	SBS	10.6	8	5.1	408	SW	60	SB	20	PL	20							145	145	11.5	9.0	5	2
024C	2014	5631	75789	Non		I	136.8	V	T	2009	SBS		11			SX	70	PLI	30									8	8	0.4	1.4		
024C	2013	6776	75789	Non		V	5.1	V	N	1997	SBS	33.1	5	2.1	55	SW	80	AC	15	PL	5							147	147	32.8	35.1	24	0
024C	2013	6781	75789	Non		I	73.2	V	N	2003	SBS		1			PLI	60	SX	40									12	12	3.1	0.8		
024C	2014	6821	75789	Non		I	15.6	N	L	2004	SBS																						
024C	2013	7426	75789	Non		I	10	V	N	2007	SBS		1			SX	66	PLI	34									8	8	0.4	2.1		
024C	2014	8716	75789	Non		I	58.5	V	N	2007	SBS		13			PLI	90	AT	10									11	13	2.0	5.0		
024C	2013	8721	75789	Non		V	3	V	N	2002	SBS	17.5	4	3.9	79	SB	100											222		17.8		22	0
024C	2014	8736	75789	Non		I	69.7	V	N	2006	SBS																						
024C	2014	8751	75789	Non		V	13.4	V	T	2009	SBS	29.9	35	49.8	497	SX	75	BL	25									216	166	34.3	29.4	479	0

Project	sample year	new_samp	Sample weight	Strata	substrata	inventory standard	Polygon area (ha)	BCLCS_LEVEL_1	BCLCS_LEVEL_2	Reference year	BEC	Lorey height (m)	Input CC%	Projected BA7.5	Projected TPH7.5	sp01	pct1	sp02	pct2	sp03	pct3	sp04	pct4	sp05	pct5	sp06	pct6	Projected Age sp1	Projected Age sp2	Projected Height sp1	Projected Height sp2	Volume NWB 12.5 (m3/ha)	Dead Volume (m^3/ha)
024C	2014	9901	75789	Non		V	19.3	V	T	1997	SBS	25.7	45	31.5	491	SW	80	BL	15	AT	5							178	148	29.6	23.7	265	0
CMI4	2014	42	75789	Non		V	53.1	V	N	2000	SBS	28.1	7	11.0	146	AT	60	SX	30	PL	10							145	144	28.0	29.6	79	2
CMI4	2014	83	75789	Non		V	26.6	V	N	2002	SBS																						
CMI4	2014	86	75789	Non		V	24.7	V	T	2002	SBS	26.6	50	47.7	443	SXW	70	AT	20	EP	10							153	162	30.3	25.8	372	0
CMI4	2014	131	75789	Non		I	143.6	V	N	2005	SBS		1			PLI	80	SX	20									11	10	2.0	0.5		
CMI4	2014	156	75789	Non		F	14344.7	U		1992	SBS																						
CMI4	2014	203	75789	Non		V	7.7	V	N	2002	SBS	23.3	7	7.0	42	PL	50	SXW	50									123	103	23.8	23.2	37	16
CMI4	2014	251	75789	Non		V	8230	U		2005	SBS																						
CMI4	2014	264	75789	Non		V	27.8	V	T	2009	SBS	29.4	35	40.7	821	SX	55	FD	35	EP	5	PL	5					111	111	29.9	38.1	391	21
CMI4	2014	298	75789	Non		V	30.4	V	N	2000	SBS		5			PL	100											16		4.2			
CMI4	2014	301	75789	Non		I	19.3	V	T	2011	SBS		11			PLI	100											8		2.1			
CMI4	2014	365	75789	Non		V	24.4	V	T	1997	ESSF	20.8	50	27.0	298	BL	90	SW	10									168	197	22.6	24.6	169	0
CMI4	2014	381	75789	Non		F	103.4	V	N	1981	SBS																						
CMI4	2014	436	75789	Non		V	11287.5	U		2003	SBS																						

10. Appendix B: Phase II compiled ground attributes

Table 25. The Phase II compiled ground attributes are given.

Strata	Sub strata	Proj_id	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	Other	024Y	200	Pl 65 Sx 35	18.3	625	15.7	124
YSM	Other	024Y	201	Pl 78 Sx 19 Bl 03	16.6	1601	7.9	27
YSM	Other	024Y	204	Sx 91 Pl 09	1.4	200	5.7	0
YSM	Other	024Y	205	Pl 79 Bl 12 Sx 09	15.3	951	7.8	33
YSM	Other	024Y	210	Pl 90 Sx 10	14.8	851	11.7	60
YSM	Other	024Y	212	Pl 100	16.8	1776	8.8	14
YSM	Other	024Y	225	Sw 100	8.2	976	6.2	6
YSM	Other	024Y	232	At 49 Fd 44 Pl 07	19.8	2076	10.1	28
YSM	Other	024Y	234	Pl 100	4.6	801	5.4	0
YSM	Other	024Y	236	Sx 44 Bl 43 Pl 13	13.1	826	8.1	44
YSM	Other	024Y	238	Ac 100	4.6	25	18.7	34
YSM	Other	024Y	239	Bl 74 Pl 19 Sx 03 Fd 02 Ac 01	24.1	951	13.0	112
YSM	Other	024Y	240	Pl 90 Sb 10	6.8	700	7.4	11
YSM	Other	024Y	244	Pl 86 At 12 Fd 02	24.5	1476	11.0	91
YSM	Other	024Y	255	S 95 Ep 05	20.4	1426	9.5	47
YSM	Other	024Y	256	At 53 Sx 45 Pl 02	22.7	2201	10.0	35
YSM	Other	024Y	262	Sx 95 Ac 03 Ep 02	22.2	976	9.2	75
YSM	Other	024Y	273	Bl 71 Sx 29	6.1	150	13.3	32
YSM	VT	024Y	202	Pl 100	16.6	1126	8.4	38
YSM	VT	024Y	206	Pl 62 Sx 37 At 01	18.0	1151	10.0	57
YSM	VT	024Y	207	Sx 64 At 36	0.9	150	6.2	0
YSM	VT	024Y	208	S 80 Bl 16 Fd 04	9.7	675	8.6	21
YSM	VT	024Y	211					0
YSM	VT	024Y	213	Sx 92 Bl 08	24.8	450	14.4	147
YSM	VT	024Y	214	Pl 78 Sw 22	14.9	1201	6.7	28
YSM	VT	024Y	215	Sw 100	21.1	851	10.3	74
YSM	VT	024Y	216	Sw 93 Ac 07	16.0	926	7.7	40
YSM	VT	024Y	217	Fd 99 At 01	35.2	525	22.9	329
YSM	VT	024Y	218	Pl 100	13.5	1926	8.4	4
YSM	VT	024Y	219	Pl 96 Sb 04	12.9	650	11.5	53
YSM	VT	024Y	220	Sw 42 Bl 37 Pl 20 At 01	20.2	1076	12.6	90
YSM	VT	024Y	221	Pl 50 Sw 41 At 09	26.9	1326	10.0	75
YSM	VT	024Y	222	Bl 54 Fd 27 Sx 09 Pl 06 Ep 04	39.5	1426	14.8	239
YSM	VT	024Y	223	Sx 42 Pl 30 Bl 26 Fd 02	22.4	1576	9.7	59
YSM	VT	024Y	224	Sx 90 Ep 10	21.6	1251	8.1	52
YSM	VT	024Y	226	At 67 Pl 18 Sx 15	9.9	550	13.4	44
YSM	VT	024Y	227	Pl 59 Sx 41	0.6	125	3.8	0
YSM	VT	024Y	228	Pl 62 Sx 36 At 02	8.4	700	7.8	14
YSM	VT	024Y	229	Pl 93 Sx 07	33.5	2577	11.3	109
YSM	VT	024Y	230	Pl 40 At 35 Ac 14 Sb 11	1.3	50	8.4	5
YSM	VT	024Y	231	Sx 44 Ac 39 Ep 14 Bl 02 At 01	21.1	1176	9.8	76
YSM	VT	024Y	233	Sx 58 Ep 21 Ac 11 Bl 10	21.5	625	15.2	117

Strata	Sub strata	Proj_id	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	VT	024Y	235	Pl 57 Sx 17 Bl 09 At 09 Ep 03	21.3	1551	10.4	60
YSM	VT	024Y	237	Bl 63 Sx 33 Ac 04	9.1	425	8.6	34
YSM	VT	024Y	241	S 65 Bl 35	13.9	225	12.3	70
YSM	VT	024Y	242	Pl 95 Sx 05	21.4	1401	11.9	85
YSM	VT	024Y	243	Pl 74 Sx 18 At 04 Bl 04	14.9	1276	9.8	34
YSM	VT	024Y	245	At 54 Pl 21 Bl 20 Sx 05	26.8	1701	12.3	90
YSM	VT	024Y	246	Pl 100	21.9	1651	12.3	67
YSM	VT	024Y	247	Sx 100	2.2	275	5.8	0
YSM	VT	024Y	248	Pl 73 Sx 27	20.4	1376	10.3	66
YSM	VT	024Y	249	S 50 Pl 48 Ep 02	25.2	1426	10.5	85
YSM	VT	024Y	250	S 82 Pl 12 Ep 06	18.2	1526	8.0	23
YSM	VT	024Y	251	Sx 92 Bl 08	13.0	450	9.3	43
YSM	VT	024Y	252	Bl 95 Pl 04 Sx 01	40.0	1776	12.7	229
YSM	VT	024Y	253	Pl 100	26.1	1401	12.0	118
YSM	VT	024Y	254	Pl 93 At 06 Sx 01	19.5	1201	12.0	69
YSM	VT	024Y	257	Fd 87 Sx 09 Ep 02 At 02 Pl tr	33.8	876	13.1	160
YSM	VT	024Y	258	Pl 88 S 12	8.2	550	14.2	42
YSM	VT	024Y	259	Sx 69 At 19 Bl 10 Pl 01 Ac 01	25.7	1851	8.8	73
YSM	VT	024Y	260	Sx 100	18.7	1001	9.4	52
YSM	VT	024Y	261	Sw 64 Pl 32 Bl 02 Ac 01 Ep 01	30.8	1676	13.1	140
YSM	VT	024Y	263	Sx 95 Ep 05	13.1	1126	7.9	23
YSM	VT	024Y	264	Pl 43 Sw 42 Bl 15	24.9	1876	9.3	64
YSM	VT	024Y	265	Ep 88 Sw 10 Ac 02	18.0	851	15.6	88
YSM	VT	024Y	266	At 53 Ep 35 Ac 08 Bl 04	4.2	600	9.6	2
YSM	VT	024Y	267	Pl 63 Sx 29 Ac 05 At 03	5.8	650	9.7	6
YSM	VT	024Y	268	Sx 100	1.0	75	6.1	2
YSM	VT	024Y	269	Pl 58 Ac 28 Bl 14	10.7	851	9.8	20
YSM	VT	024Y	272	Pl 53 Bl 40 Sw 07	16.0	1501	8.4	31
YSM	VT	CMI4	81	Sx 97 Pl 03	5.2	475	6.7	7
YSM	VT	CMI4	111	Se 83 Bl 17	5.9	826	6.1	1
VA	Balsam	242	78	Bl 100	19.8	177	25.0	181
VA	Balsam	242	79	Bl 45 Sx 33 Ep 13 Pl 05 At 04	46.2	2738	11.9	197
VA	Balsam	242	80	Bl 82 Se 18	16.2	447	12.9	76
VA	Balsam	242	81	Bl 47 Ep 40 Sx 13	14.0	423	16.8	94
VA	Balsam	242	82	Hw 67 Bl 24 Sx 09	50.4	752	17.9	294
VA	Balsam	242	83	Bl 54 S 46	36.4	811	26.7	271
VA	Balsam	242	84	Bl 100	23.4	1317	13.0	105
VA	Balsa	242	85	Sx 57 Bl 25 Ep 11 Ac 04 Cw 03	39.2	570	22.0	311

Strata	Sub strata	Proj_id	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
	m							
VA	Balsam	242	86	Ep 43 Sx 30 Ac 23 Bl 04	42.0	321	24.0	316
VA	Balsam	242	87	S 67 Bl 23 Pl 07 At 03	54.0	1335	18.4	364
VA	Balsam	242	88	Bl 78 S 22	32.4	632	20.3	237
VA	Balsam	024C	591	Bl 100	24.3	1126	8.6	84
VA	Balsam	024C	596	Bl 99 Sx 01	25.8	400	11.9	168
VA	Balsam	024C	1246	Sx 61 Bl 39	63.2	425	20.1	556
VA	Balsam	024C	1386	Pl 55 Sx 45	16.3	1326	13.6	66
VA	Balsam	024C	1876	Bl 89 Se 11	39.4	650	11.5	295
VA	Balsam	024C	1886	Bl 83 Se 17	18.0	350	16.3	129
VA	Balsam	024C	2361	Bl 49 S 30 Pl 19 At 02	24.8	350	19.0	213
VA	Balsam	024C	2366	Bl 89 S 11	65.9	1176	18.5	609
VA	Balsam	024C	3011	Bl 82 S 18	26.3	1251	8.6	112
VA	Balsam	024C	3021	Bl 87 S 13	30.8	1026	13.7	218
VA	Balsam	024C	3026	Bl 63 Pl 31 S 06	21.0	776	8.0	86
VA	Balsam	024C	3711		0.0	0	6.1	0
VA	Balsam	024C	4346	Bl 96 Sx 04	41.5	1701	12.3	214
VA	Balsam	024C	4366	Bl 100	38.3	275	15.9	303
VA	Balsam	024C	6131	Bl 100	50.5	2026	11.8	245
VA	Balsam	024C	6136	S 51 Bl 49	25.9	350	15.7	199
VA	Balsam	024C	6826	Bl 100	35.4	675	9.5	177
VA	Balsam	024C	6831	Bl 50 Se 50	13.0	475	6.0	43
VA	Balsam	024C	8131	Bl 97 Se 03	15.9	325	10.9	108

Strata	Sub strata	Proj_id	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
VA	Balsam	024C	8766	Bl 88 Se 12	15.4	575	11.0	71
VA	Balsam	024C	9236	Bl 100	20.8	475	6.6	90
VA	Balsam	024C	9246	Bl 80 S 20	42.8	1001	14.1	320
VA	Balsam	CMI4	177	Bl 75 Se 25	28.4	625	9.1	164
VA	Other	242	89	At 67 Sx 33	37.8	1005	23.8	285
VA	Other	242	90	Ac 71 Ep 29	7.0	20	27.7	60
VA	Other	242	91	Pl 67 At 22 Bl 11	12.6	449	20.7	88
VA	Other	242	92					
VA	Other	242	93	Bl 35 Hw 29 Cw 13 Ac 13 Sx 06	43.4	421	23.2	321
VA	Other	242	94	Hw 38 Fd 38 Cw 24	12.8	344	10.0	57
VA	Other	242	95	Sx 69 Bl 19 At 12	50.4	1505	17.0	343
VA	Other	242	96	At 80 S 20	18.0	400	16.3	126
VA	Other	242	97	Bl 39 Sx 35 Fd 22 Ep 04	41.4	1206	15.7	347
VA	Other	242	98	At 79 Sx 18 Ep 03	39.2	618	21.2	313
VA	Other	242	99	Cw 100	140.0	454	29.3	854
VA	Other	242	100	At 64 Ep 33 Sx 03	70.2	1186	21.6	508
VA	Other	024C	551	At 79 S 14 Bl 07	53.9	1176	20.6	488
VA	Other	024C	1211	At 49 Ep 29 Sw 22	19.7	250	20.0	135
VA	Other	024C	1221	At 43 Sx 39 Sb 17 Bl 01	15.2	801	12.6	76
VA	Other	024C	3671	At 34 Bl 30 S 26 Fd 07 Pl 03	47.0	1701	12.7	274
VA	Other	024C	4951	Sx 54 At 45 Ep 01	26.5	375	24.7	272
VA	Other	024C	4996	Fd 42 Hw 41 Sx 14 Pl 03	56.1	3677	11.2	222
VA	Other	024C	5006	Cw 85 Hw 14 Bl 01	77.8	826	16.5	467
VA	Other	024C	5011	Bl 57 Sx 18 Ep 18 At 04 Ac 03	17.9	325	16.0	135
VA	Other	024C	7436	Sw 73 At 17 Ep 05 Bl 03 Fd 02	25.4	1101	15.8	143
VA	Other	024C	8706	Pl 89 At 11	4.9	350	10.4	17
VA	Other	CMI4	40	At 63 Sx 21 Bl 16	56.7	575	20.3	573
VA	Other	CMI4	449	Sx 55 Bl 45	26.5	625	12.1	196
VA	Pine	242	1	Sw 53 At 35 Pl 12	23.8	868	18.2	163
VA	Pine	242	2	Pl 60 At 20 Sw 20	4.0	241	15.0	13
VA	Pine	242	3	Bl 56 S 38 At 06	28.8	1025	22.1	162
VA	Pine	242	4	Sx 100	1.4	109	19.3	3
VA	Pine	242	6	Pl 100	19.2	976	28.5	105
VA	Pine	242	7	Pl 100	9.8	613	15.6	48
VA	Pine	242	8	S 79 Pl 21	25.2	558	18.6	176
VA	Pine	242	9	Bl 62 Sx 25 Pl 13	8.0	593	12.8	24
VA	Pine	242	11	S 95 At 05	36.0	1209	20.8	237
VA	Pine	242	12	Sx 83 At 17	16.8	480	21.8	115
VA	Pine	242	13	Sx 100	5.6	382	15.0	20
VA	Pine	242	14	S 78 Bl 17 Pl 05	41.4	1271	20.4	221
VA	Pine	242	15	Pl 96 Sx 04	23.0	2415	10.1	45

Strata	Sub strata	Proj_id	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
VA	Pine	242	16	At 48 Sx 48 Fd 04	32.2	780	24.3	243
VA	Pine	242	17	Fd 40 At 27 Sw 17 Ep 10 Pl 06	72.0	2554	20.0	517
VA	Pine	242	18	S 67 Pl 33	25.2	495	23.4	186
VA	Pine	242	19	Pl 50 S 50	2.8	209	17.9	10
VA	Pine	242	20	S 80 Ac 20	7.0	295	11.1	33
VA	Pine	242	21	Ep 43 At 43 Sx 14	8.8	244	15.8	48
VA	Pine	242	23	Bl 50 S 31 Fd 12 Pl 07	28.8	1282	23.0	177
VA	Pine	242	24	S 70 Bl 20 Ac 10	16.2	328	21.2	117
VA	Pine	242	25	At 68 Sx 18 Pl 14	30.8	1471	20.7	192
VA	Pine	242	26	Pl 100	19.0	2393	9.4	15
VA	Pine	242	27	At 91 S 09	11.0	802	16.2	39
VA	Pine	242	28	S 82 At 18	19.8	377	28.4	159
VA	Pine	242	29	Bl 71 Sx 29	34.0	2493	10.7	103
VA	Pine	242	30	Sx 50 At 50	19.6	158	19.3	188
VA	Pine	242	31	Sx 50 Fd 19 Pl 13 Bl 06 Ac 06	24.5	2126	13.4	68
VA	Pine	242	32	Se 100	54.6	1564	20.3	308
VA	Pine	242	33	Bl 81 Sx 10 Pl 09	26.6	1993	9.0	90
VA	Pine	242	34	Sw 100	15.4	793	9.8	68
VA	Pine	242	35	S 67 Ac 17 Bl 16	5.6	380	19.4	27
VA	Pine	242	36	Sw 89 Pl 11	8.0	284	16.7	42
VA	Pine	242	37	Fd 56 Sx 22 Ac 22	12.6	209	26.0	96
VA	Pine	242	38	Fd 91 Sx 09	25.7	248	21.3	247
VA	Pine	242	39	Bl 33 Pl 33 Sw 34	3.0	144	18.7	13
VA	Pine	242	40	S 57 Pl 21 Bl 22	18.2	1427	16.6	52
VA	Pine	242	41	Pl 92 S 08	36.4	1433	17.6	248
VA	Pine	242	42	S 71 At 29	37.8	467	31.6	318
VA	Pine	242	101	Pl 60 S 40	9.3	926	14.4	20
VA	Pine	242	102	Sx 90 Ac 10	14.0	291	28.1	104
VA	Pine	242	106	Pl 100	3.0	226	15.7	9
VA	Pine	024C	1186	Bl 70 Sx 30	11.2	976	11.2	28
VA	Pine	024C	1196	Sx 50 Pl 50	3.9	250	13.4	16
VA	Pine	024C	1216	Sb 60 Sw 27 At 09 Pl 04	14.2	625	13.8	75
VA	Pine	024C	1831	Sx 58 Pl 42	13.5	1101	15.5	44
VA	Pine	024C	1836	Sx 36 Pl 33 Bl 31	11.0	500	16.1	61
VA	Pine	024C	3666	Bl 54 S 23 Pl 18 Fd 05	16.8	1226	8.5	56
VA	Pine	024C	3681	Bl 86 S 14	20.6	1476	8.9	83
VA	Pine	024C	4321	Sw 94 Bl 06	3.7	225	17.5	17
VA	Pine	024C	4326	Pl 71 Sx 29	7.7	375	19.4	55
VA	Pine	024C	4331	Sx 71 Bl 16 Pl 13	7.6	475	19.9	38
VA	Pine	024C	6796	Bl 48 Sb 29 Pl 12 S 11	6.6	450	12.3	16
VA	Pine	024C	8071	Bl 61 Ep 39	17.1	400	11.6	99
VA	Pine	024C	8091	Sw 81 Fd 13 At 06	20.0	976	14.2	101
VA	Pine	024C	9241	At 47 S 31 Bl 22	21.2	450	15.9	173
VA	Pine	024C	9906	Bl 77 S 23	25.2	1651	8.0	88
VA	Pine	024C	9911	Bl 82 S 18	38.4	1001	11.8	265

Strata	Sub strata	Proj_id	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
VA	Pine	024C	9916	Sb 76 Pl 15 Bl 09	28.8	1226	15.7	164
VA	Pine	CMI4	75	Sx 48 Bl 37 At 15	28.0	1401	12.9	146
VA	Pine	CMI4	172	Sx 86 Pl 14	9.2	325	16.6	53
VA	Pine	CMI4	278	Sx 66 Bl 34	12.9	425	14.7	84
VA	Pine	CMI4	322	Sx 76 Ep 11 Fd 10 Pl 02 Bl 01	25.3	1326	18.5	168
VA	Pine	CMI4	520	Sb 60 At 36 Pl 04	11.0	425	17.9	63
VA	Pine	CMI4	548	At 75 Sx 25	22.5	350	24.5	215
VA	Spruce	242	43	Sx 58 Ep 29 Bl 13	33.6	742	15.8	207
VA	Spruce	242	44	Bl 69 Sx 25 Ac 06	46.2	3373	14.2	177
VA	Spruce	242	45	Sx 100	16.8	866	20.9	83
VA	Spruce	242	46	Sb 95 Sw 03 Pl 02	47.6	2375	17.2	216
VA	Spruce	242	47	Sx 32 At 32 Ep 28 Ac 08	45.0	1304	16.5	280
VA	Spruce	242	48	Bl 43 Sx 29 Hw 28	27.0	1373	11.0	102
VA	Spruce	242	49	Pl 96 S 04	9.8	861	6.0	29
VA	Spruce	242	50	S 55 Bl 45	24.0	446	8.0	158
VA	Spruce	242	51	Sb 100	43.4	3711	9.6	120
VA	Spruce	242	52	S 100	2.0	37	14.7	11
VA	Spruce	242	53	Sx 36 Fd 21 Bl 18 Cw 14 Ep 11	50.4	498	27.9	440
VA	Spruce	242	54	Bl 59 Sx 35 Hw 06	28.8	239	24.5	275
VA	Spruce	242	55	Sw 100	31.2	667	25.1	232
VA	Spruce	242	56	Bl 54 Cw 15 Sx 15 Ac 12 Ep 04	46.8	1185	24.6	343
VA	Spruce	242	57	Bl 49 Sw 29 Ep 22	49.0	2637	16.8	211
VA	Spruce	242	58	S 95 Bl 05	48.0	405	28.7	438
VA	Spruce	242	59	Sx 56 Bl 44	48.6	693	23.2	433
VA	Spruce	242	60	S 64 Bl 36	36.0	2060	13.5	170
VA	Spruce	242	61	Bl 76 Sx 24	55.2	1808	10.1	309

Strata	Sub strata	Proj_id	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
VA	Spruce	242	62	Sx 54 Bl 46	15.4	676	14.8	74
VA	Spruce	242	63	At 38 Sb 38 Sw 24	11.2	267	20.4	79
VA	Spruce	242	64	Sx 83 Bl 17	43.2	910	22.8	328
VA	Spruce	242	65	Fd 52 Sx 35 Hw 13	41.4	439	23.1	351
VA	Spruce	242	66	Sx 56 Ac 44	40.5	824	29.0	363
VA	Spruce	242	67	Sx 53 Ac 32 Ep 09 Fd 03 Bl 03	47.6	1103	20.1	321
VA	Spruce	242	68	Hw 54 Sx 46	83.2	1269	23.5	701
VA	Spruce	242	69	Fd 50 Bl 25 Sw 19 Ep 06	28.8	895	15.1	203
VA	Spruce	242	70	Sx 69 Ep 19 At 12	16.8	1166	12.6	60
VA	Spruce	242	71	Bl 48 S 23 Ep 19 At 06 Fd 04	31.0	504	23.1	256
VA	Spruce	242	72	At 39 Sw 32 Bl 21 Ac 08	25.0	1386	14.4	144
VA	Spruce	242	73	Sx 44 Sb 33 Pl 11 Bl 12	25.2	899	21.6	166
VA	Spruce	242	74	Sx 76 Bl 24	50.4	796	18.1	411
VA	Spruce	242	75	At 50 Sx 44 Fd 06	23.8	605	20.6	166
VA	Spruce	242	76	Sx 77 Bl 23	18.2	283	22.0	150
VA	Spruce	242	77	Sx 55 Bl 45	39.2	665	25.0	316
VA	Spruce	024C	1826	Sb 100	0.8	75	5.8	1
VA	Spruce	024C	1856	Sx 79 Ep 11 Bl 10	34.0	600	16.6	241
VA	Spruce	024C	1866	Bl 53 Sx 47	24.6	1026	10.4	163
VA	Spruce	024C	1881	Bl 52 Sx 37 Ep 11	34.1	1101	12.6	218
VA	Spruce	024C	2356	Bl 100	46.5	625	12.9	330
VA	Spruce	024C	2466	Bl 67 Sx 22 Pl 11	24.5	575	19.4	189
VA	Spruc	024C	3006	S 66 Bl 23 Pl 11	52.3	1451	15.0	414

Strata	Sub strata	Proj_id	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
	e							
VA	Spruce	024C	3701	Sx 100	6.7	75	15.2	53
VA	Spruce	024C	3706	Sx 90 Ep 10	18.7	425	15.8	124
VA	Spruce	024C	4361	Bl 51 Sx 36 Hw 13	44.7	575	15.8	420
VA	Spruce	024C	4371	Sx 75 Bl 22 Ep 03	50.4	1451	14.9	368
VA	Spruce	024C	6141	S 72 Bl 28	42.4	826	12.7	267
VA	Spruce	024C	6791	S 56 Bl 40 At 04	26.9	675	10.4	229
VA	Spruce	024C	7416	Ba 59 Sx 41	42.4	1401	11.6	287
VA	Spruce	024C	7466	Sw 82 Sb 12 Bl 06	19.3	675	11.7	111
VA	Spruce	024C	7481	Sx 86 Bl 12 Ep 02	18.3	475	10.0	124
VA	Spruce	024C	8061	Fd 98 Sx 02	51.6	776	18.4	362
VA	Spruce	024C	8711	Bl 72 Sw 28	13.1	951	9.6	51
VA	Spruce	024C	8761	Sx 61 Bl 39	33.6	275	18.9	362
VA	Spruce	024C	9251	Bl 74 S 26	52.2	425	18.3	455
VA	Spruce	024C	9256	At 53 Bl 47	20.4	500	14.8	129
VA	Spruce	024C	9886	Bl 45 S 43 Pl 12	41.7	1701	9.4	296
Non		024C	241	Sx 92 Ep 08	16.6	1801	6.4	9
Non		024C	541	Bl 53 S 47	24.8	1301	12.1	117
Non		024C	546	Ac 66 Bl 24 S 10	70.9	350	22.8	563
Non		024C	561	Pl 81 At 19	1.0	200	5.1	0
Non		024C	566	S 79 Bl 21	3.5	200	10.6	14
Non		024C	576	Bl 74 Pl 17 Sx 09	6.0	475	5.8	11
Non		024C	1231	Bl 51 Sx 46 Ep 03	44.0	751	17.9	399
Non		024C	1851	Sb 89 Pl 11	1.8	150	6.6	2
Non		024C	2471					0
Non		024C	3676	S 100	0.4	25	6.4	1
Non		024C	4946					
Non		024C	4971	Sb 73 Pl 22 Sw 05	5.2	450	12.6	10
Non		024C	4981	Bl 70 Sx 09 Pl 09 Fd 08 At 02	6.5	675	7.0	7
Non		024C	5586					

Strata	Sub strata	Proj_id	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
Non		024C	5596	Sb 100	0.8	100	5.2	0
Non		024C	5631					0
Non		024C	6776					0
Non		024C	6781	Pl 100	0.0	0	3.2	0
Non		024C	6821	Sx 67 Bl 33	3.1	550	5.2	0
Non		024C	7426	Bl 100	0.0	0	3.3	0
Non		024C	8716					0
Non		024C	8721	Sx 100	9.7	75	12.6	70
Non		024C	8736					0
Non		024C	8751	Sx 84 Bl 16	42.2	400	14.9	411
Non		024C	9901	S 100	41.1	525	22.3	372
Non		CMI4	42	Bl 56 At 38 Sx 06	15.8	2101	8.8	13
Non		CMI4	83	Bl 62 Sx 24 Ac 10 At 03 Pl 01	13.1	751	10.7	53
Non		CMI4	86	Sx 51 Bl 49	29.8	475	14.0	310
Non		CMI4	131	Pl 100	0.0	0	3.0	0
Non		CMI4	156	Sx 100	7.5	951	5.1	2
Non		CMI4	203	Bl 100	14.5	50	16.1	115
Non		CMI4	251	Sx 100	18.4	1026	7.0	45
Non		CMI4	264	Fd 64 At 15 Se 11 Ep 05 Pl 02	53.8	876	20.5	598
Non		CMI4	298	At 39 Pl 27 Sx 24 Sb 10	3.7	525	6.1	1
Non		CMI4	301					
Non		CMI4	365	Se 63 Bl 37	20.1	300	12.5	142
Non		CMI4	381	Sx 96 Bl 04	6.1	350	10.2	18
Non		CMI4	436	Sx 90 Ac 06 Bl 04	29.9	976	13.7	159

11. Appendix C: Site index

Table 26. Site index (SI) estimates are given by species and source. The ground SI potentially includes old (> 120 years) trees.

			Sub	Phase	II	Phase	I			PSPL							
proj_id	Samp	Strata	Strata	Spp1	SI1	Spp1	Spp2	SI1	SI2	SX	HW	BL	CW	PL	FD	AT	EP
024Y	200	YSM	Other	PL		PLI	SX	16.0	14.1	16.1		17.1		16.7		13.4	
024Y	201	YSM	Other	PL	19.3	PLI	BL	16.0	15.6	16.9		17.2		17.5		15.4	
024Y	204	YSM	Other	S	17.7	SX	BL	15.0	14.6	18.9		16.4		16.4			
024Y	205	YSM	Other	PL	20.3	SX	PLI	22.0	22.2	18.3		19.5		19.3	20.4		
024Y	210	YSM	Other	PL	21.6	PLI	SX	21.0	26.7	19.2		18.8		19.6	20.8	17.0	18.5
024Y	212	YSM	Other	PL	20.0	PL	AT	16.0	15.9	18.8		18.0		19.7	20.3	18.3	18.9
024Y	225	YSM	Other	S	23.0	SW		15.0		21.6	19.4	15.6	18.0	21.6	23.0	23.0	19.7
024Y	232	YSM	Other	AT	14.2	PL		6.7		24.3	19.2	20.1	16.9	23.7	25.8		18.2
024Y	234	YSM	Other	PL	19.1	PLI		9.0		18.2		15.7		18.6		16.8	19.2
024Y	236	YSM	Other	S		FDI	PLI	19.0	19.6	18.8		16.4		19.2	19.5	16.2	18.7
024Y	238	YSM	Other	AC		BL	SW	15.0		18.2		21.0		19.2	18.0	23.9	19.7
024Y	239	YSM	Other	B	20.2	AT	PL	20.0	20.1	18.8		17.6		19.8	20.1	17.9	18.7
024Y	240	YSM	Other	PL	19.8	PLI		12.0		18.6		17.1		19.5		18.1	19.1
024Y	244	YSM	Other	PL	22.9	SXW	FDI	15.0	16.0	20.6		17.2		20.5	20.2	22.3	17.7
024Y	255	YSM	Other	S	23.7	S	BL	15.0	14.6	18.0		16.5		19.4	20.1	16.6	18.9
024Y	256	YSM	Other	AT	31.0	SXW		20.0		19.7		16.3		20.5	21.9	19.1	19.3
024Y	262	YSM	Other	S	22.7	SXW	BL	5.0	5.9	19.7		21.0		21.0	18.0		19.1
024Y	273	YSM	Other	B	19.0	SW	AT	15.0		18.4		16.9		20.2		17.7	18.3
024Y	202	YSM	VT	PL	19.7	PL		16.0		16.3		16.5		17.1		15.5	
024Y	206	YSM	VT	PL	19.1	PL	S	16.0	15.2	17.1		17.8		18.0		16.0	
024Y	207	YSM	VT	S	20.0	SX	BL	15.0		15.0		19.5		19.8	19.0		
024Y	208	YSM	VT	S	24.5	S	BL	19.0		16.0		19.8		19.7	20.9		
024Y	211	YSM	VT			PL		21.0		21.6				20.3			
024Y	213	YSM	VT	S	25.6	PL	SX	19.0	18.4	19.8		20.3		21.0	18.0	18.8	
024Y	214	YSM	VT	PL	19.1	S	PL	15.0		12.0		19.2		12.0	21.4	19.3	18.6
024Y	215	YSM	VT	S	21.8	SW	FDI	15.0	15.9	20.1		18.2		20.7	21.5	22.3	18.8
024Y	216	YSM	VT	S	23.7	SW	AT	19.0	19.1	20.0		21.4		22.0	25.3	21.8	20.7
024Y	217	YSM	VT	F		EP	FD	20.0	20.3	19.5		19.1		20.1	19.8	16.9	18.1
024Y	218	YSM	VT	PL	20.8	PL		16.0		19.2		18.9		20.4	20.8	19.2	18.4
024Y	219	YSM	VT	PL	20.4	PL		16.0		18.4		18.1		18.9	19.6	15.8	18.3
024Y	220	YSM	VT	S	11.4	SW	BL	29.1	21.0	20.4		19.8		21.3	21.6	20.1	19.1
024Y	221	YSM	VT	PL	19.7	SW		18.0		15.3		18.8		19.8	20.4		
024Y	222	YSM	VT	B	22.1	BL	S	21.4	24.7	20.3		18.8		21.4	20.3	20.9	18.3
024Y	223	YSM	VT	S	21.4	PL	SX	16.0	19.0	18.8		18.6		19.8	20.5	18.2	
024Y	224	YSM	VT	S	26.0	EP	SX	21.6	20.9	19.8	18.0	18.0	18.0	24.0	21.0	22.3	19.6
024Y	226	YSM	VT	AT	22.8	SX	PLI	15.0	16.1	19.5		19.2		21.1	20.1	20.5	18.3
024Y	227	YSM	VT	PL		SX	BL	15.0	15.0	16.1		15.5		16.6			
024Y	228	YSM	VT	PL	20.4	PLI	AT	16.0	15.9	18.8		18.0		19.6	20.5	17.5	18.2
024Y	229	YSM	VT	PL	22.8	PLI	SX	21.0	22.9	20.3		17.8		21.1	20.4	22.0	17.2
024Y	230	YSM	VT	PL	17.1	SW	SB	25.4	10.1	12.0		19.6		19.2	21.8	20.5	19.9
024Y	231	YSM	VT	S		SX	BL	17.0		19.5		20.8		21.0	18.0	23.2	19.9
024Y	233	YSM	VT	S	22.7	SW	BL	21.5	18.9	21.6		21.5		21.6	24.2	22.0	17.2
024Y	235	YSM	VT	PL	23.5	PL	AT	16.0	16.1	20.8		22.4		22.4	24.3	21.8	19.6
024Y	237	YSM	VT	B	9.9	SX	BL	15.0		19.1		20.3		20.7	18.0		
024Y	241	YSM	VT	S	23.1	S	BL	15.0	14.5	19.8		20.3		21.0	18.0	23.0	19.7
024Y	242	YSM	VT	PL	20.9	PLI	BL	21.0		17.3		16.9		20.9	21.3	16.5	19.5
024Y	243	YSM	VT	PL	19.8	PL	SX	16.0	15.0	18.8		17.3		19.7	20.3	18.0	19.0

			Sub	Phase	II	Phase	I			PSPL							
proj_id	**Samp**	**Strata**	**Strata**	**Spp1**	**SI1**	**Spp1**	**Spp2**	**SI1**	**SI2**	**SX**	**HW**	**BL**	**CW**	**PL**	**FD**	**AT**	**EP**
024Y	245	YSM	VT	AT	24.7	PL	AT	21.0	21.0	15.5		18.7		17.6	22.0	19.9	19.6
024Y	246	YSM	VT	PL	19.8	PL	AT	21.0	21.0	18.5		16.2		20.3	21.7	18.5	19.0
024Y	247	YSM	VT	S	21.4	SX		18.0		21.2		20.9		21.6	23.3	22.0	17.2
024Y	248	YSM	VT	PL	23.2	AT	PL	27.0	27.1	19.9		16.6		21.1	21.5	19.6	18.8
024Y	249	YSM	VT	S	25.2	S	AC	15.0	15.1	19.5		16.1		20.6	21.7	19.4	19.1
024Y	250	YSM	VT	S	24.3	S	EP	16.0	15.0	20.0		19.8		21.0	18.0	22.8	19.6
024Y	251	YSM	VT	S	20.3	SXW	AT	15.0	14.1	19.6		20.9		21.0	18.0	19.5	19.0
024Y	252	YSM	VT	B	19.0	SXW	PL	14.1	14.4	21.0		19.7		21.3	22.3	22.0	17.2
024Y	253	YSM	VT	PL	23.4	PL	SXW	20.0	19.5	18.7		16.4		20.5	21.6	18.6	18.9
024Y	254	YSM	VT	PL	20.8	PL	S	20.0	19.5	18.8		20.4		21.5	20.0	19.5	18.3
024Y	257	YSM	VT	F	21.7	SXW	FD	15.0	15.8	21.8		18.9		20.5	22.0	22.3	17.2
024Y	258	YSM	VT	PL	23.5	PL	AT	16.0	16.0	18.1		20.4		21.3	20.0	19.5	18.3
024Y	259	YSM	VT	S	21.8	SXW	EP	15.0	14.0	18.5		13.2		20.5	15.0	21.4	20.7
024Y	260	YSM	VT	S	23.6	SXW	PLI	15.0	15.7	21.1		23.0		22.5	25.3	21.8	18.9
024Y	261	YSM	VT	S	24.2	SW	BL	15.0	24.4	19.2		19.9		21.4	20.0	19.8	18.3
024Y	263	YSM	VT	S	21.4	SXW	EP	15.0	13.8	21.3		19.7		21.5	25.3	21.8	19.1
024Y	264	YSM	VT	PL	21.1	SW	PL	15.0	15.8	20.9		17.7		21.2	21.9	19.1	
024Y	265	YSM	VT	E	26.0	SW	PLI	15.0	15.8	13.2		17.3		15.6	21.2	18.9	19.3
024Y	266	YSM	VT	AT	21.7	PLI	SW	17.0	16.4	16.8		15.7		20.6	21.4	18.7	19.0
024Y	267	YSM	VT	PL	19.6	SX	PLI	19.0	19.5	20.2		20.7		22.0	23.0	21.8	20.7
024Y	268	YSM	VT	S	19.6	AT	SXW	19.0	19.0	21.7		20.2		21.3	24.1	22.0	17.2
024Y	269	YSM	VT	PL	23.0	PLI	AT	21.0	20.9	18.4		16.4		20.7	20.7	16.5	19.0
024Y	272	YSM	VT	PL	17.1	BL	PL	15.0	15.8	18.3		18.3		19.5	20.5	16.9	
CMI4	81	YSM	VT	S	19.8	S	AT	20.0	20.3	17.9		16.4		20.4	21.1	17.3	18.9
CMI4	111	YSM	VT	SE	21.5	S		14.0		19.5		18.3		18.9	20.1		
242	78	VA	Balsam	B	16.8	BL	SX	7.8	7.0	15.0		19.2		20.4	21.6		
242	79	VA	Balsam	B	14.6	BL	EP	8.1	6.8	19.7		16.4		20.8	21.6	19.5	19.5
242	80	VA	Balsam	B	7.9	BL	SX	5.2	6.5	22.1		19.8		22.4	22.3	21.0	19.0
242	81	VA	Balsam	B	16.3	BL	SX	13.2	15.4	22.1		20.9		23.4	23.6	22.9	19.1
242	82	VA	Balsam	H	13.5	BL	SW	9.8	10.4	18.3		12.0		19.5	20.4		
242	83	VA	Balsam	B	17.6	BL	SW	14.5	13.2	21.1		18.0		21.7	21.3	20.0	17.9
242	84	VA	Balsam	B		BL	SX	8.6	7.8	13.7		14.3		15.8			
242	85	VA	Balsam	S	17.2	BL	SX	11.8	11.7	21.8	19.4	15.6	16.9	22.8	24.1	20.8	19.6
242	86	VA	Balsam	E		BL	SX	16.5	17.2	19.5		20.8		21.0	18.0	20.4	19.5
242	87	VA	Balsam	S	10.6	BL	SX	14.8	14.6	17.9		16.2		20.7		19.0	18.4
242	88	VA	Balsam	B	12.8	BL	SX	8.0	7.4	17.3		16.4		20.1		17.8	18.5
024C	591	VA	Balsam	B		BL		4.2		9.0		9.0		18.0			
024C	596	VA	Balsam	B		BL	SX	4.8	4.6	15.0		18.9		20.0			
024C	1246	VA	Balsam	S	23.1	BL	SX	9.3	12.9	22.8	20.5	15.0	16.6	24.0	24.1		17.6
024C	1386	VA	Balsam	PL	11.1	BL	SE	5.1	7.3	18.3		18.2		19.3	20.0	17.5	
024C	1876	VA	Balsam	B		BL	SW	12.4	12.0	10.2		10.7		16.7	17.8		
024C	1886	VA	Balsam	B		BL		10.7		15.0		17.6		17.9	19.7		
024C	2361	VA	Balsam	B		BL	SX	11.1	12.0	12.6		12.0		16.8			
024C	2366	VA	Balsam	B	16.2	BL	SX	9.0	8.3	12.9		12.0		16.6			
024C	3011	VA	Balsam	B		BL	SE	5.6	9.0	12.6		11.7		15.8			
024C	3021	VA	Balsam	B		BL		4.5		12.6		12.0		16.8			
024C	3026	VA	Balsam	B	8.5	BL		6.7		11.7		11.7		16.5			
024C	3711	VA	Balsam			BL		7.2		15.0		18.9		19.7			
024C	4346	VA	Balsam	B	10.3	BL	SXW	13.1	13.3	19.0		17.4		19.5	21.2	18.2	18.6
024C	4366	VA	Balsam	B		BL	SX	4.7	3.6	15.0		19.1		18.9			

			Sub	Phase II		Phase I				PSPL							
proj_id	**Samp**	**Strata**	**Strata**	**Spp1**	**SI1**	**Spp1**	**Spp2**	**SI1**	**SI2**	**SX**	**HW**	**BL**	**CW**	**PL**	**FD**	**AT**	**EP**
024C	6131	VA	Balsam	B	13.3	BL		8.7		11.4		11.4		15.6			
024C	6136	VA	Balsam	S	16.6	BL	SX	11.1	9.6	12.6		12.0		16.8			
024C	6826	VA	Balsam	B	8.1	BL		4.2		15.0		18.9		18.5			
024C	6831	VA	Balsam	B	7.0	BL		5.3		14.4		17.9		19.9			
024C	8131	VA	Balsam	B	12.4	BL	SX	4.2	4.5	15.0		17.6		18.0			
024C	8766	VA	Balsam	B	8.8	BL	SW	8.0	7.9	14.4		18.5		19.1	18.8		
024C	9236	VA	Balsam	B	5.1	BL		5.4		14.2		14.9		16.2			
024C	9246	VA	Balsam	B		BL	SX	7.2	6.6	12.6		12.0		16.8			
CMI4	177	VA	Balsam	B		BL	SX	4.2	4.4	15.0		16.8		17.5			
242	89	VA	Other	AT	17.6	AT	S	10.3	12.8	20.2		18.3		21.3	20.0	20.9	18.3
242	90	VA	Other	AC		AT	AC	18.8	16.2	18.0				18.0		19.9	20.0
242	91	VA	Other	PL	20.0	AT	PLI	13.5	13.9	12.6		12.0		13.8		12.0	
242	92	VA	Other			AT	SXW	19.3	21.0	21.0		21.4		22.0	25.3	21.8	19.4
242	93	VA	Other	B	18.3	HW	CW	12.4	11.2	21.0		22.5		22.3	25.3	21.8	19.5
242	94	VA	Other	H	18.0	HW	CW	9.0		22.8	20.5	15.0	16.6	24.0	24.1	18.2	
242	95	VA	Other	S	20.5	AT	SXW	18.7	21.0	20.8		23.0		22.5	25.3	21.8	20.7
242	96	VA	Other	AT	14.1	AT	PLI	18.9	19.9	19.0		18.3		20.0		19.3	18.9
242	97	VA	Other	B	18.4	FDI	SW	14.6	13.0	20.9		17.8		19.5	22.1	22.3	17.2
242	98	VA	Other	AT	21.7	AT	EP	18.0	18.0	19.2		16.4		20.7	21.6	19.1	20.1
242	99	VA	Other	C		CW	HW	6.8	10.7	22.8	20.5	15.0	16.6	24.0	24.1		18.0
242	100	VA	Other	AT	20.3	EP	AT	17.4	17.4	19.6		16.0		21.3	21.3	19.9	20.1
024C	551	VA	Other	AT	21.2	AT	SW	16.7	11.1	19.1		15.0		18.3	18.8	18.8	19.5
024C	1211	VA	Other	AT	22.1	AT	EP	18.0	15.8	18.7		16.4		20.5	21.6	18.6	19.5
024C	1221	VA	Other	AT	19.7	AT	SW	18.9	19.1	21.6		18.6		22.1	21.0	20.4	19.7
024C	3671	VA	Other	AT	14.0	AT	SW	14.6	16.0	16.6		18.1		21.1	21.2	16.4	17.4
024C	4951	VA	Other	S		AT	SX	17.2	19.1	19.7		19.1		20.6	21.0	18.4	18.4
024C	4996	VA	Other	F	22.9	HW	BL	17.2	19.0	25.6	18.3	19.1	17.3	24.0	25.6	19.4	18.0
024C	5006	VA	Other	C		CW	HW	10.2	12.8	22.8	20.5	15.0	16.6	24.0	24.1		18.8
024C	5011	VA	Other	B	20.0	AT	EP	18.9	15.9	19.7		21.0		21.0	18.0	20.8	19.3
024C	7436	VA	Other	S	17.3	AT	SW	12.7	15.4	19.2		19.9		21.4	20.0	19.8	18.3
024C	8706	VA	Other	PL	19.3	AT	PL	15.4	15.4	17.8		18.0		18.4	18.7	14.8	
CMI4	40	VA	Other	AT	26.1	AT	EP	20.5	19.1	19.0		16.1		20.4	21.7	19.0	19.2
CMI4	449	VA	Other	S		FDI	SW	25.7	24.8	20.0		15.0		22.0	22.6	20.4	19.7
242	1	VA	Pine	S	16.9	PL	SW	14.6	8.3	17.4		18.1		18.4		16.4	
242	2	VA	Pine	PL	15.6	PL	SW	15.0	11.4	18.2		18.0		18.9	19.5	16.2	
242	3	VA	Pine	B	9.5	PL	SW	17.3	8.8	18.1		16.9		20.7	21.5	18.0	
242	4	VA	Pine	S		PL	SXW	19.2	21.0	20.1		16.8		21.3	21.4	19.8	19.1
242	6	VA	Pine	PL	19.3	PL	SW	19.1	16.7	19.5		19.3		21.4	20.0	20.2	18.3
242	7	VA	Pine	PL	12.6	PL		12.1		15.7				16.5			
242	8	VA	Pine	S		PL	S	10.9	8.5	16.9		17.7		18.0		16.3	
242	9	VA	Pine	B	6.6	PL	SX	12.8	14.5	15.4		14.8		15.8			
242	11	VA	Pine	S	18.2	PL	SXW	15.7	16.2	18.1		16.9		20.7	21.5	18.0	18.9
242	12	VA	Pine	S		PL	AT	14.6	14.5	17.5		20.4		21.0	20.0	19.5	18.3
242	13	VA	Pine	S	10.1	PL		19.0		19.7		16.3		20.9	21.6	19.6	19.0
242	14	VA	Pine	S	13.8	PL	S	14.3	10.2	15.3		14.2		14.7			
242	15	VA	Pine	PL	15.1	PL		12.6		18.2		18.4		19.3		17.7	
242	16	VA	Pine	AT	18.5	PL	SX	17.9	17.0	20.0		17.6		20.7	23.1	21.3	20.4
242	17	VA	Pine	F	22.7	PL	AT	16.8	16.0	20.0		18.8		21.3	20.1	20.6	18.3
242	18	VA	Pine	S	13.6	PL	SX	16.3	14.2	19.8		16.5		21.2	21.5	19.7	17.6
242	19	VA	Pine	PL	14.9	PL	SB	15.1	7.3	12.0		17.8		19.2	21.6	19.3	18.8

			Sub	Phase II		Phase I				PSPL							
proj_id	**Samp**	**Strata**	**Strata**	**Spp1**	**SI1**	**Spp1**	**Spp2**	**SI1**	**SI2**	**SX**	**HW**	**BL**	**CW**	**PL**	**FD**	**AT**	**EP**
242	20	VA	Pine	S	17.1	PL	S	12.1	12.0	17.3		17.8		17.8		15.1	
242	21	VA	Pine	E		PL	AT	16.3		19.8		17.7		20.6	22.8	20.8	20.2
242	23	VA	Pine	B	14.6	PL	BL	11.8	13.5	18.4		16.6		20.6	21.6	18.3	17.7
242	24	VA	Pine	S	16.5	PL	SW	19.4	17.4	19.9		16.6		21.1	21.5	19.6	18.2
242	25	VA	Pine	AT	16.8	PL	AT	17.2	17.6	19.3		19.0		20.3	20.7	18.1	18.4
242	26	VA	Pine	PL	10.7	PLI	SB	11.7	8.9	16.2		15.0		18.3	21.3	19.9	18.3
242	27	VA	Pine	AT	10.5	PLI	AT	17.8	12.0	15.9		18.1		19.6	21.2	17.6	18.3
242	28	VA	Pine	S	19.0	PL	SW	18.3	8.1	19.2		19.9		21.4	20.0	19.8	18.3
242	29	VA	Pine	B	10.7	PL	SX	13.1	10.2	16.9		15.8		16.7			
242	30	VA	Pine	S	22.7	PLI	AT	17.4	16.3	19.1		19.6		19.9	20.3	17.0	19.7
242	31	VA	Pine	S	13.7	PL	AT	17.8	15.9	20.8		15.0		19.5	21.1	24.2	19.4
242	32	VA	Pine	SE		PL	SW	16.7	14.5	14.7		11.7		14.7			
242	33	VA	Pine	B	7.6	PL	SXW	18.4	17.1	17.0		16.2		19.0	21.7	19.2	19.0
242	34	VA	Pine	S	13.1	PL	SW	16.2	12.6	20.1		16.8		21.3	21.4	19.8	18.8
242	35	VA	Pine	S	16.5	PLI	SW	20.0	17.5	19.2		20.1		19.6	20.8	17.0	19.4
242	36	VA	Pine	S	7.7	PL	SW	16.0	16.6	19.3		17.7		20.4	21.3	19.1	19.3
242	37	VA	Pine	F	22.3	PLI	SW	18.1	19.3	20.3		15.0		21.5	22.4	20.0	19.4
242	38	VA	Pine	F	22.2	PLI	FDI	22.5	24.8	21.0		20.3		21.8	21.0	19.0	19.5
242	39	VA	Pine	B		PL	SXW	18.9	17.9	12.0		17.1		15.0	21.5	19.2	18.8
242	40	VA	Pine	S	10.7	PLI		18.3		18.0				19.5	20.1	16.5	19.5
242	41	VA	Pine	PL	12.3	PLI	SX	16.6	16.1	17.9		16.2		20.7			18.6
242	42	VA	Pine	S		PLI	SX	15.7	13.8	17.3		16.0		20.6		17.1	18.9
242	101	VA	Pine	PL	16.4	PL	SW	20.0	17.7	20.1		16.8		21.3	21.4	19.8	19.5
242	102	VA	Pine	S		PL		17.6		17.5		16.2		20.6	20.6	16.9	18.8
242	106	VA	Pine	PL	10.9	PLI		14.3		16.7		17.6		20.8	21.3	16.6	
024C	1186	VA	Pine	B	14.1	PL	SX	13.5	13.6	18.3		16.2		19.0		18.3	18.7
024C	1196	VA	Pine	S	14.3	PL	SX	18.9	15.6	18.5		17.4		19.0		16.0	18.6
024C	1216	VA	Pine	SB	14.1	PLI	SW	16.3	16.0	17.1		18.0		19.1	21.0	20.0	19.5
024C	1831	VA	Pine	S	11.1	PL	SX	15.9	17.9	18.5		17.7		19.4		18.2	18.5
024C	1836	VA	Pine	S	10.1	PL	SX	13.3	9.8	17.4		16.0		17.0			
024C	3666	VA	Pine	B	10.7	PL	BL	12.8	10.6	19.2		16.4		20.7	21.6	19.1	16.9
024C	3681	VA	Pine	B		PL	BL	15.9	11.7	16.9		17.3		20.4	21.4	17.1	
024C	4321	VA	Pine	S	12.0	PL	SW	15.5	16.1	18.9		19.8		21.1	19.9	19.9	18.3
024C	4326	VA	Pine	PL	19.5	PL	SW	14.6	13.7	19.1		15.6		20.2	21.9	19.1	18.9
024C	4331	VA	Pine	S	9.6	PL		15.0		19.8		16.5		20.8	21.7	19.4	18.9
024C	6796	VA	Pine	B	10.2	PLI	SW	18.5	15.4	19.5		16.1		20.6	21.7	19.4	
024C	8071	VA	Pine	B	17.5	PL	SX	17.1	14.4	19.0		17.7		19.4	19.8	16.7	18.8
024C	8091	VA	Pine	S	16.4	PL	AT	16.3	16.7	18.8		19.2		21.2	20.0	20.3	18.3
024C	9241	VA	Pine	AT	17.8	PLI	SX	18.9	16.3	16.8		16.0		20.3		17.1	18.9
024C	9906	VA	Pine	B		PL	SX	13.0	8.5	18.2		16.4		20.4	21.7	18.2	
024C	9911	VA	Pine	B		PL	SE	14.6	13.6	18.3		18.3		21.4	21.1	17.1	18.0
024C	9916	VA	Pine	SB		PL	BL	16.6	12.5	17.1		16.5		19.3	21.6	18.8	
CMI4	75	VA	Pine	S	8.2	PL	AT	20.7	18.8	18.8		15.9		20.2	21.8	18.8	19.2
CMI4	172	VA	Pine	S		PL	S	15.2	10.1	15.9				16.3			
CMI4	278	VA	Pine	S	10.2	PL	SX	20.2	21.4	18.3		17.4		18.8	19.6	16.2	18.3
CMI4	322	VA	Pine	S	17.7	PLI		18.1		17.0		17.4		20.7	21.4	17.0	19.2
CMI4	520	VA	Pine	SB		PL	SW	18.1	12.7	19.2		19.9		21.4	20.0	19.8	18.3
CMI4	548	VA	Pine	AT	18.8	PL	AT	18.9	19.6	20.0		18.3		21.0	22.3	20.2	20.1
242	43	VA	Spruce	S	24.2	SW	EP	14.3	14.9	21.2		21.5		21.6	24.2	22.0	17.9
242	44	VA	Spruce	B	11.6	SW	BL	14.1	13.2	18.3		21.5		20.0	25.3	21.8	20.7

			Sub	Phase	II	Phase	I			PSPL							
proj_id	**Samp**	**Strata**	**Strata**	**Spp1**	**SI1**	**Spp1**	**Spp2**	**SI1**	**SI2**	**SX**	**HW**	**BL**	**CW**	**PL**	**FD**	**AT**	**EP**
242	45	VA	Spruce	S	13.0	S	PL	9.4	14.1	16.0				16.7			
242	46	VA	Spruce	SB	7.3	SB	SXW	7.5	8.0	15.5		18.3		17.6	21.1	19.9	19.4
242	47	VA	Spruce	S	19.6	SXW	AT		18.1	20.2		21.3		22.1	24.0	21.8	20.7
242	48	VA	Spruce	B	11.9	SX	BL	10.6	8.1	12.3		14.5		20.3			
242	49	VA	Spruce	PL	9.6	SB		7.0		18.8		16.1		20.3	21.7	18.7	
242	50	VA	Spruce	S	9.4	S	BL	4.6	3.7	14.2		13.6		14.8			
242	51	VA	Spruce	SB	7.7	SB	SW	8.1	7.4	12.0		17.8		19.2	21.7	19.4	18.9
242	52	VA	Spruce	S	18.6	SW	PL	19.0	17.2	18.7		16.5		19.6	20.7	16.9	19.2
242	53	VA	Spruce	S	25.9	SW	EP	10.4	21.1	22.0	19.7	15.0	18.0	21.0	23.5	21.6	19.1
242	54	VA	Spruce	B	18.3	SX	BL	12.7	11.7	25.0	17.8	18.4	17.8	23.8	25.7		17.7
242	55	VA	Spruce	S	12.5	SW	PL	11.4	13.5	17.1		17.9		17.7		14.2	
242	56	VA	Spruce	B	22.6	SW	BL	16.7	15.5	20.8		22.5		22.3	25.3	21.8	19.6
242	57	VA	Spruce	B	21.0	SW	BL	24.5	19.2	20.5		22.5		22.3	25.3	21.8	20.7
242	58	VA	Spruce	S	23.5	SW		11.3				17.5		19.8		18.8	18.7
242	59	VA	Spruce	S	13.9	SX	BL	8.4	11.5	14.7		18.4		19.5			
242	60	VA	Spruce	S	10.3	SW	BL	13.9	10.6	19.7		16.3		20.9	21.6	19.6	18.5
242	61	VA	Spruce	B	17.1	SXW	BL	10.4	8.5	15.0		18.9		19.7	21.6		
242	62	VA	Spruce	S	5.6	SXW	BL	11.7	12.0	19.9		17.0		21.1	19.7	22.0	17.2
242	63	VA	Spruce	AT	18.4	SB	PL	11.9	12.7	18.5		15.0		20.7	22.9	19.9	19.6
242	64	VA	Spruce	S	18.7	SXW	BL	12.9	14.0	19.7		16.4		20.8	21.6	19.5	18.7
242	65	VA	Spruce	F	23.4	SW	BL	17.5	14.3	22.8	20.5	15.0	16.6	24.0	24.1		18.3
242	66	VA	Spruce	S	21.7	SXW	PL	19.6	21.2	16.4		17.1		19.6	21.2	18.0	19.5
242	67	VA	Spruce	S	20.5	SW	PLI	21.9	21.5	20.2		15.0		22.4	22.4	21.1	19.7
242	68	VA	Spruce	H	20.8	SW	HW	27.2	10.5	25.6	18.9	19.7	18.0	24.0	25.6	20.7	18.3
242	69	VA	Spruce	F	23.3	SW	FD	16.2	15.1	19.4		15.5		18.6	20.0	18.8	18.3
242	70	VA	Spruce	S	11.8	SX	PL	18.6		19.3		19.0		20.0	19.9	16.6	18.7
242	71	VA	Spruce	B	21.4	SW	BL	16.3	16.6	18.4		16.4		20.7	19.8	16.5	19.2
242	72	VA	Spruce	AT	21.0	SW	AT	21.4		21.6						21.8	20.3
242	73	VA	Spruce	S	17.6	SW	PLI	17.2	19.8	18.9		20.0		21.0	18.0	22.7	20.0
242	74	VA	Spruce	S	15.5	SW	PL	13.2	17.2	20.3		20.8		21.8	25.3	21.8	20.7
242	75	VA	Spruce	AT	23.3	SXW	AT	19.9	18.3	18.9		19.7		21.5	25.3	21.8	20.7
242	76	VA	Spruce	S	20.2	SXW	AT	15.6	15.5	20.5		20.4		22.0	23.0	21.8	18.0
242	77	VA	Spruce	S	15.7	SW	BL	15.3	12.7	19.8		19.6		21.0	18.0	18.7	18.6
024C	1826	VA	Spruce	SB	7.5	SB		6.4		18.5		18.1		19.5	20.3	17.6	18.2
024C	1856	VA	Spruce	S	23.6	SW	SB	10.6	8.9	22.8		15.0		20.7	21.1	23.9	19.5
024C	1866	VA	Spruce	B	11.2	SW	BL	15.6	15.7	20.6		18.9		21.3	21.5	22.0	17.2
024C	1881	VA	Spruce	B	9.4	SW	BL	13.0	9.0	19.9		19.0		21.0	18.0	18.1	17.4
024C	2356	VA	Spruce	B	12.7	SX	BL	12.3	11.7	14.2		14.9		16.2			
024C	2466	VA	Spruce	B		SX	PL	8.3	14.1	18.7		16.2		15.9			
024C	3006	VA	Spruce	S	17.4	SW	PL	15.9	17.1	17.0		16.0		20.5		18.4	18.5
024C	3701	VA	Spruce	S	21.0	SXW	BL	15.4	15.6	20.6		22.5		22.3	25.3	21.8	20.7
024C	3706	VA	Spruce	S		SX	BL	10.9	9.9	19.3		20.5		20.7	18.0	22.5	19.6
024C	4361	VA	Spruce	B		SX	BL	10.9	9.7	19.7		21.0		21.0	18.0	23.8	19.3
024C	4371	VA	Spruce	S	15.9	SX	BL	5.4	7.2	19.5		20.8		21.0	18.0	22.7	19.0
024C	6141	VA	Spruce	S		SX	PLI	10.1	15.2	6.6		6.6		9.8			
024C	6791	VA	Spruce	S	15.5	SW	BL	17.5	16.7	19.5		16.1		20.6	21.7	19.4	
024C	7416	VA	Spruce	B		SW	BL	15.9	10.5	20.3		17.7		19.5		17.4	17.8
024C	7466	VA	Spruce	S	9.5	SXW	BL	11.5	10.2	21.5		19.4		20.6	22.8	22.3	17.6
024C	7481	VA	Spruce	S		SX	BL	8.9	8.3	19.7		21.0		21.0	18.0	23.6	18.9
024C	8061	VA	Spruce	F	16.0	SX	PL	24.7	19.2	18.6		16.2		19.1	19.9	16.8	19.1

			Sub	Phase II		Phase I				PSPL							
proj_id	**Samp**	**Strata**	**Strata**	**Spp1**	**SI1**	**Spp1**	**Spp2**	**SI1**	**SI2**	**SX**	**HW**	**BL**	**CW**	**PL**	**FD**	**AT**	**EP**
024C	8711	VA	Spruce	B	7.0	SB	SW	11.7	12.9	17.6		17.4		18.4		17.1	
024C	8761	VA	Spruce	S		SW	BL	12.9	10.0	17.1		17.3		19.6	19.8		
024C	9251	VA	Spruce	B	13.5	SX	BL	10.1	10.4	13.8		12.0		15.9			
024C	9256	VA	Spruce	AT	16.5	SX	AT	10.2	12.7	12.6		12.0		16.8			
024C	9886	VA	Spruce	B	9.9	SW	BL	12.0	13.3	17.2		16.3		20.5		17.0	
024C	241	Non		S	24.4					22.1		20.1		22.3	22.3		18.4
024C	541	Non		B	20.7	SW	BL	16.3	12.4	17.9		16.2		20.7	19.7	15.8	18.0
024C	546	Non		AC	18.9	SW	PLI	16.3	18.6	19.6		16.8		19.1	20.1	16.9	19.2
024C	561	Non		PL	19.9					19.2		19.9		21.4	20.0	19.8	18.3
024C	566	Non		S	12.4					21.2		18.1		21.6	21.3	19.9	18.8
024C	576	Non		B				20.0		19.6		16.3		20.5	21.8	19.3	18.9
024C	1231	Non		B	17.6					21.9		21.0		23.3	23.5	23.0	19.3
024C	1851	Non		SB	3.9	PLI		15.0		15.0		12.2		15.2			
024C	2471	Non				PLI	SX	15.0		16.4				17.2			
024C	3676	Non		S	5.8			17.0		15.8		18.1		20.2	21.2	16.0	
024C	4946	Non						18.0				16.1		18.4		17.3	18.4
024C	4971	Non		SB		PLI	SX	20.0		19.6		19.3		21.4	20.1	20.3	18.3
024C	4981	Non		B	14.2	AT	PLI	21.5	21.6	18.9		19.8		21.1	19.9	19.9	18.3
024C	5586	Non								18.7		16.1		15.9			
024C	5596	Non		SB	4.8	SW	SB	4.9	4.5	16.7		17.5		17.7		15.9	
024C	5631	Non				SX	PLI	18.0		20.6		15.0		20.0	21.0	20.8	19.1
024C	6776	Non				SW	AC	18.2	22.8	20.0		18.0		19.8	21.1	17.3	18.9
024C	6781	Non		PL		PLI	SX	18.0		18.7		17.3		20.5	21.3	18.7	18.3
024C	6821	Non		S	22.4			20.0		19.7		21.0		21.0	18.0	19.8	18.8
024C	7426	Non		B		SX	PLI	19.0	20.1	19.1		15.5		18.0		17.5	18.7
024C	8716	Non				PLI	AT	15.0	14.9	17.9		18.0		18.5		15.5	
024C	8721	Non		S	9.4	SB		6.0		18.7		15.0		19.3		17.7	
024C	8736	Non								19.2		19.3		19.6	20.8	17.0	19.4
024C	8751	Non		S		SX	BL	15.1	15.3	18.9		15.0		21.0	21.9	20.8	18.9
024C	9901	Non		S		SW	BL	12.9	11.7	20.3		17.1		20.7	21.9	19.1	18.7
CMI4	42	Non		B	22.8	AT	SX	17.4	15.6	19.3		17.5		20.3	20.8	19.0	19.6
CMI4	83	Non		B	10.5			15.0		19.6		16.3		20.5	21.8	19.3	19.1
CMI4	86	Non		S		SXW	AT	15.4	14.7	19.9		20.2		21.9	22.7	21.8	20.7
CMI4	131	Non		PL		PLI	SX	15.0		18.6		20.4		21.2	19.9	19.5	18.3
CMI4	156	Non		S	19.7					21.0		19.3		21.7	22.4	20.7	19.3
CMI4	203	Non		B	13.0	PL	SXW	16.5	15.1	19.8		17.2		21.4	19.6	21.8	18.5
CMI4	251	Non		S	21.6					21.5		20.0		22.6	23.1	22.2	19.3
CMI4	264	Non		F	23.0	SX	FD	19.3	24.8	20.0		15.0		22.4	22.6	21.4	19.7
CMI4	298	Non		AT	20.4	PL		16.0		17.5		18.6		18.0		14.5	
CMI4	301	Non				PLI		21.0		19.8		17.6		20.6	22.6	20.6	20.4
CMI4	365	Non		SE		BL	SW	9.6	8.3	15.0		18.0		19.8			
CMI4	381	Non		S	21.6			16.0		20.5		19.2		21.8	21.5	20.3	19.8
CMI4	436	Non		S	24.6					21.9		21.0		23.3	23.5	23.0	19.7

12. Appendix D: Scatterplots to find potential outliers

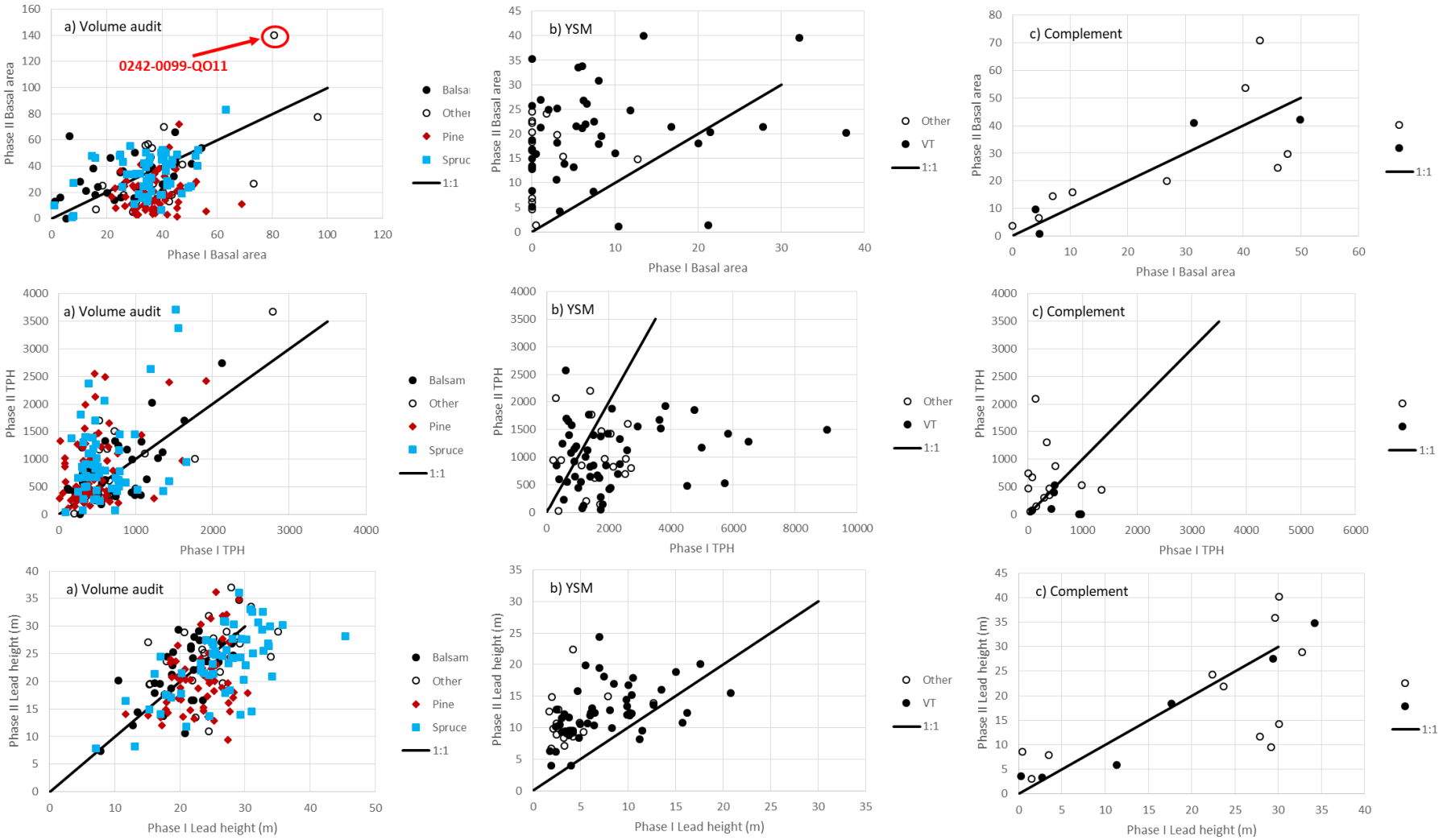

Figure 7. The Phase I inventory and Phase II Ground data are plotted for the seven attributes of interest. Some potential outliers are identified (see section 5.3).

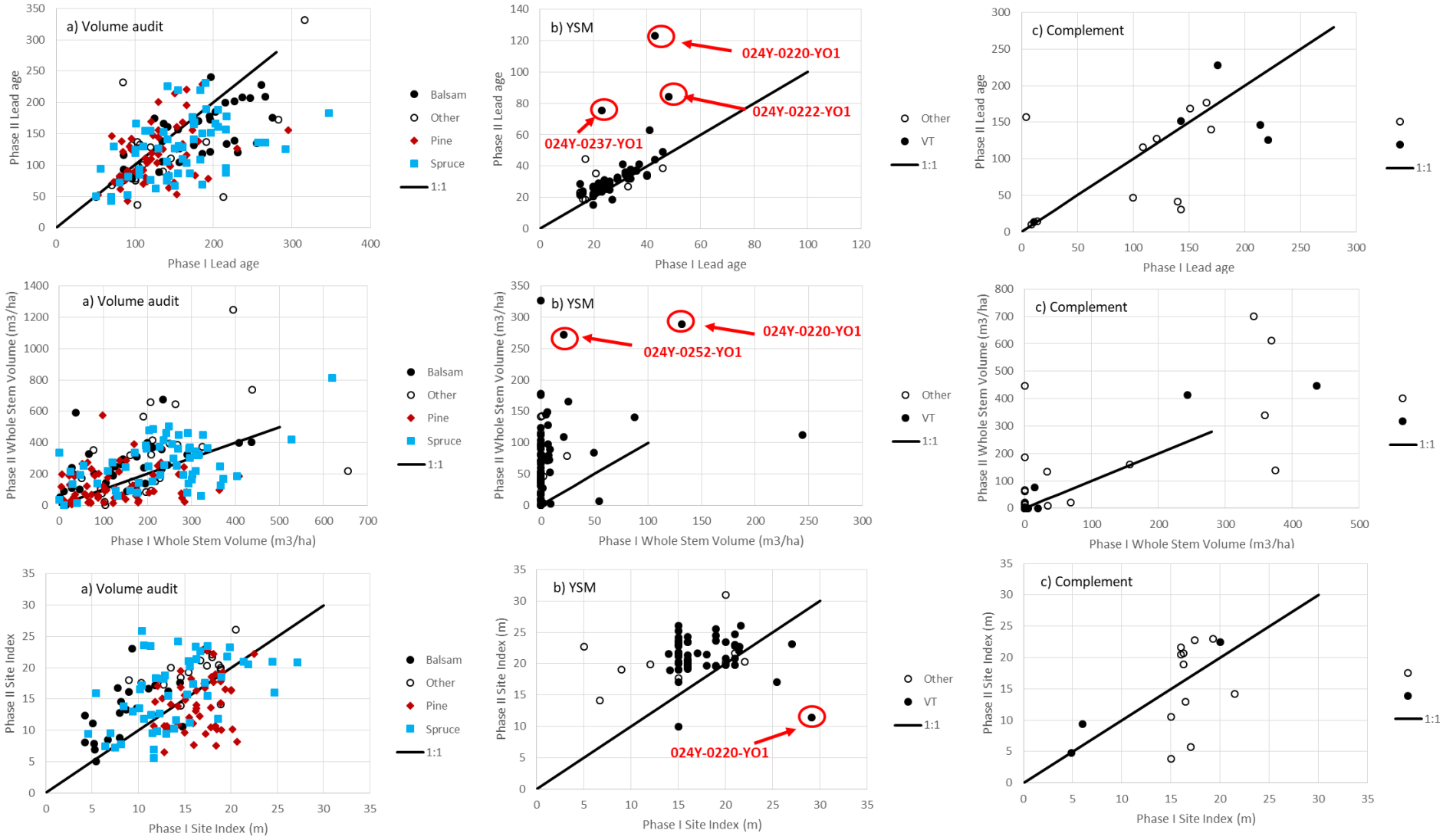

Figure 7 (cont.).

13. 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 27. The Sp0 groupings are given. The changes to the spruce matching are highlighted.

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
SB	SB	Black spruce
SE	SE	Engelmann spruce
SS	SS	Sitka spruce
S	S, SW, SX, SXW	Spruce
Y	Y	Yellow Cedar

Table 28. The results of matching the Phase I inventory and Phase II ground heights and ages.

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
024Y	200	YSM	Other	PL		22.4	0	1	PLI	SX	1		
024Y	201	YSM	Other	PL	23.1	8.6	5	4	PLI	BL	1		
024Y	204	YSM	Other	S	30.4	7.1	3	3	SX	BL	1		
024Y	205	YSM	Other	PL	20.8	8.4	4	3	SX	PLI	2	22	11.2
024Y	210	YSM	Other	PL	31.6	13.9	5	5	PLI	SX	1		
024Y	212	YSM	Other	PL	23.0	9.1	5	5	PL	AT	1	17	4.6
024Y	225	YSM	Other	S	27.0	9.4	3	3	SW		1	35	5.9
024Y	232	YSM	Other	AT	38.7	10.8	4	4	PL		5		
024Y	234	YSM	Other	PL	18.8	6.7	5	5	PLI		1		
024Y	236	YSM	Other	S					FDI	PLI	3		
024Y	238	YSM	Other	AC					BL	SW	3		
024Y	239	YSM	Other	B	44.5	15.0	4	4	AT	PL	4		
024Y	240	YSM	Other	PL	22.8	8.9	4	4	PLI		1		
024Y	244	YSM	Other	PL	26.6	12.9	4	4	SXW	FDI	3	22	2.3

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
024Y	255	YSM	Other	S	28.9	10.7	4	4	S	BL	1	25	3.0
024Y	256	YSM	Other	AT	18.7	14.9	4	4	SXW		5		
024Y	262	YSM	Other	S	34.5	12.5	4	4	SXW	BL	1	42	1.8
024Y	273	YSM	Other	B	35.4	9.8	3	3	SW	AT	3		
024Y	202	YSM	VT	PL	23.9	9.2	5	5	PL		1		
024Y	206	YSM	VT	PL	32.0	11.9	5	5	PL	S	1		
024Y	207	YSM	VT	S	18.5	4.0	4	4	SX	BL	1		
024Y	208	YSM	VT	S	25.0	9.4	3	3	S	BL	1	24	4.2
024Y	211	YSM	VT						PL		2		
024Y	213	YSM	VT	S	37.0	16.1	2	2	PL	SX	2	38	8.7
024Y	214	YSM	VT	PL	25.2	9.3	3	3	S	PL	2		
024Y	215	YSM	VT	S	35.0	12.0	4	4	SW	FDI	1	35	6.8
024Y	216	YSM	VT	S	26.3	9.5	2	2	SW	AT	1	25	4.6
024Y	217	YSM	VT	F		24.4	0	1	EP	FD	2		
024Y	218	YSM	VT	PL	22.9	9.5	5	5	PL		1		
024Y	219	YSM	VT	PL	28.5	11.6	4	3	PL		1		
024Y	220	YSM	VT	S	123.0	15.5	3	3	SW	BL	1	45	21.9
024Y	221	YSM	VT	PL	26.1	10.2	2	2	SW		3	22	3.0
024Y	222	YSM	VT	B	84.3	20.1	3	3	BL	S	1	50	18.4
024Y	223	YSM	VT	S	36.1	12.0	4	4	PL	SX	2		
024Y	224	YSM	VT	S	23.5	9.6	3	2	EP	SX	2	25	4.5
024Y	226	YSM	VT	AT	37.0	18.1	2	2	SX	PLI	5		
024Y	227	YSM	VT	PL	15.1	4.0	5	4	SX	BL	3		
024Y	228	YSM	VT	PL	21.7	8.8	4	4	PLI	AT	1		
024Y	229	YSM	VT	PL	27.3	13.4	3	2	PLI	SX	1	25	10.9
024Y	230	YSM	VT	PL	33.6	10.8	1	1	SW	SB	3	42	16.8
024Y	231	YSM	VT	S					SX	BL	1		
024Y	233	YSM	VT	S	49.0	18.8	1	1	SW	BL	1	48	15.9
024Y	235	YSM	VT	PL	24.5	12.3	3	3	PL	AT	1	24	7.2
024Y	237	YSM	VT	B	75.3	12.9	2	3	SX	BL	2	25	3.6
024Y	241	YSM	VT	S	44.0	17.0	1	1	S	BL	1	45	9.1
024Y	242	YSM	VT	PL	32.6	13.7	4	4	PLI	BL	1	31	13.5
024Y	243	YSM	VT	PL	27.1	10.6	4	4	PL	SX	1		
024Y	245	YSM	VT	AT	26.2	15.2	3	3	PL	AT	2	26	12.6
024Y	246	YSM	VT	PL	31.3	12.3	4	4	PL	AT	1	26	11.3
024Y	247	YSM	VT	S	22.3	6.2	4	4	SX		1	22	3.0
024Y	248	YSM	VT	PL	25.2	12.4	5	5	AT	PL	2	26	15.0
024Y	249	YSM	VT	S	28.4	11.6	4	4	S	AC	1	27	3.6
024Y	250	YSM	VT	S	24.7	9.1	4	4	S	EP	1	28	4.1
024Y	251	YSM	VT	S	34.3	10.5	3	3	SXW	AT	1	34	5.6
024Y	252	YSM	VT	B	62.9	19.5	5	5	SXW	PL	3	43	7.6
024Y	253	YSM	VT	PL	29.5	14.5	5	4	PL	SXW	1	27	10.7
024Y	254	YSM	VT	PL	29.4	12.4	4	4	PL	S	1	28	11.1
024Y	257	YSM	VT	F	41.2	15.8	5	5	SXW	FD	2	33	9.0
024Y	258	YSM	VT	PL	37.8	17.9	3	3	PL	AT	1	36	11.1
024Y	259	YSM	VT	S	37.6	13.1	3	3	SXW	EP	1	38	6.8
024Y	260	YSM	VT	S	29.0	10.4	4	4	SXW	PLI	1	24	2.8
024Y	261	YSM	VT	S	41.0	16.7	4	4	SW	BL	1	39	10.9
024Y	263	YSM	VT	S	29.9	9.5	4	4	SXW	EP	1	28	3.9

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
024Y	264	YSM	VT	PL	28.3	12.2	4	4	SW	PL	2	28	9.1
024Y	265	YSM	VT	E	35.3	19.9	4	4	SW	PLI	5		
024Y	266	YSM	VT	AT	25.8	12.8	3	3	PLI	SW	5		
024Y	267	YSM	VT	PL	31.8	12.3	3	3	SX	PLI	2	31	12.8
024Y	268	YSM	VT	S	29.8	8.2	2	2	AT	SXW	2	28	5.2
024Y	269	YSM	VT	PL	20.6	9.9	3	3	PLI	AT	1	22	9.4
024Y	272	YSM	VT	PL	32.1	10.4	4	4	BL	PL	2	36	11.5
CMI4	81	YSM	VT	S	29.2	8.4	4	2	S	AT	1	27	5.7
CMI4	111	YSM	VT	SE	22.6	6.3	4	4	S		3	23	2.2
242	78	VA	Balsam	B	133.5	27.4	5	5	BL	SX	1	218	23.1
242	79	VA	Balsam	B	93.2	20.1	5	5	BL	EP	1	87	10.8
242	80	VA	Balsam	B	126.3	14.5	5	5	BL	SX	1	158	13.6
242	81	VA	Balsam	B	104.2	27.1	4	4	BL	SX	1	159	26.6
242	82	VA	Balsam	H	117.6	23.6	4	4	BL	SW	3	187	24.2
242	83	VA	Balsam	B	88.6	23.2	5	5	BL	SW	1	133	26.0
242	84	VA	Balsam	B	185.4	16.6	5	5	BL	SX	1	205	23.6
242	85	VA	Balsam	S	166.0	29.1	5	5	BL	SX	2	149	25.2
242	86	VA	Balsam	E					BL	SX	5		
242	87	VA	Balsam	S	157.1	24.8	5	5	BL	SX	2	157	29.7
242	88	VA	Balsam	B	177.2	22.0	5	5	BL	SX	1	197	22.2
024C	591	VA	Balsam	B	170.7	12.0	4	4	BL		1	183	12.9
024C	596	VA	Balsam	B	207.0	25.3	2	2	BL	SX	1	249	19.1
024C	1246	VA	Balsam	S	161.1	29.4	2	2	BL	SX	2	169	28.9
024C	1386	VA	Balsam	PL	120.2	18.8	5	5	BL	SE	3	232	18.8
024C	1876	VA	Balsam	B	240.9	26.9	2	2	BL	SW	1	199	28.1
024C	1886	VA	Balsam	B	172.7	23.5	3	3	BL		1	198	26.1
024C	2361	VA	Balsam	B	137.5	25.9	2	2	BL	SX	1	137	21.9
024C	2366	VA	Balsam	B	131.7	28.0	4	4	BL	SX	1	176	22.3
024C	3011	VA	Balsam	B	209.2	16.6	3	3	BL	SE	1	268	21.9
024C	3021	VA	Balsam	B	227.4	23.0	4	4	BL		1	262	18.9
024C	3026	VA	Balsam	B	103.2	13.7	4	4	BL		1	167	17.6
024C	3711	VA	Balsam						BL		2		
024C	4346	VA	Balsam	B	115.9	17.7	4	4	BL	SXW	1	87	17.9
024C	4366	VA	Balsam	B	207.8	24.5	3	2	BL	SX	1	239	18.2
024C	6131	VA	Balsam	B	174.4	19.6	4	4	BL		1	127	17.1
024C	6136	VA	Balsam	S	105.5	26.4	3	3	BL	SX	2	156	22.8
024C	6826	VA	Balsam	B	139.4	17.8	3	3	BL		1	229	16.2
024C	6831	VA	Balsam	B	78.4	7.4	2	2	BL		1	99	8.0
024C	8131	VA	Balsam	B	175.2	21.2	3	3	BL	SX	1	277	18.9
024C	8766	VA	Balsam	B	121.1	16.6	1	1	BL	SW	1	198	22.2
024C	9236	VA	Balsam	B	134.3	10.6	4	4	BL		1	257	20.9
024C	9246	VA	Balsam	B	199.2	24.2	4	4	BL	SX	1	217	22.1
CMI4	177	VA	Balsam	B	201.6	19.7	4	4	BL	SX	1	229	16.2
242	89	VA	Other	AT	131.5	27.1	5	5	AT	S	1	97	15.2
242	90	VA	Other	AC	128.9	37.1	2	2	AT	AC	2	92	22.7
242	91	VA	Other	PL	74.8	23.7	5	5	AT	PLI	2	86	17.9
242	92	VA	Other						AT	SXW	5		
242	93	VA	Other	B	132.3	28.9	5	5	HW	CW	3	108	20.8
242	94	VA	Other	H	49.3	10.9	5	5	HW	CW	1	215	24.5

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
242	95	VA	Other	S	76.2	25.1	5	5	AT	SXW	2	73	23.7
242	96	VA	Other	AT	97.2	19.7	5	5	AT	PLI	1	107	26.8
242	97	VA	Other	B	136.4	28.2	5	5	FDI	SW	3	193	28.7
242	98	VA	Other	AT	88.8	27.8	5	5	AT	EP	1	103	25.4
242	99	VA	Other	C	331.6	33.6	5	5	CW	HW	1	318	31.0
242	100	VA	Other	AT	89.1	25.8	5	5	EP	AT	2	93	23.6
024C	551	VA	Other	AT	110.7	29.1	5	5	AT	SW	1	147	27.3
024C	1211	VA	Other	AT	78.6	27.0	1	1	AT	EP	1	102	25.3
024C	1221	VA	Other	AT	74.9	21.7	3	3	AT	SW	1	102	26.3
024C	3671	VA	Other	AT	99.8	20.2	3	3	AT	SW	1	112	22.1
024C	4951	VA	Other	S	136.6	31.9	3	2	AT	SX	2	104	28.5
024C	4996	VA	Other	F	48.5	19.6	5	5	HW	BL	3	53	16.0
024C	5006	VA	Other	C	172.1	29.0	4	3	CW	HW	1	284	35.1
024C	5011	VA	Other	B	89.3	26.8	1	1	AT	EP	5		
024C	7436	VA	Other	S	68.3	19.4	3	3	AT	SW	2	69	16.3
024C	8706	VA	Other	PL	36.5	13.4	3	3	AT	PL	2	105	21.4
CMI4	40	VA	Other	AT	129.9	34.8	3	3	AT	EP	1	113	29.3
CMI4	449	VA	Other	S	232.5	24.4	4	3	FDI	SW	2	92	33.0
242	1	VA	Pine	S	78.0	20.3	5	5	PL	SW	2	195	24.2
242	2	VA	Pine	PL	52.9	14.6	5	5	PL	SW	1	155	23.7
242	3	VA	Pine	B	126.1	17.1	5	5	PL	SW	3	232	28.2
242	4	VA	Pine	S					PL	SXW	2		
242	6	VA	Pine	PL	89.8	25.1	5	5	PL	SW	1	92	24.5
242	7	VA	Pine	PL	80.8	16.2	5	5	PL		1	115	18.1
242	8	VA	Pine	S	161.0	23.4	5	5	PL	S	2	155	20.6
242	9	VA	Pine	B	130.0	12.0	5	5	PL	SX	3	94	17.4
242	11	VA	Pine	S	80.9	23.6	5	5	PL	SXW	2	73	18.3
242	12	VA	Pine	S	142.0	26.4	6	5	PL	AT	3	97	19.8
242	13	VA	Pine	S	83.2	13.6	5	5	PL		3	93	24.5
242	14	VA	Pine	S	169.9	22.4	6	5	PL	S	2	165	24.5
242	15	VA	Pine	PL	52.6	14.1	5	5	PL		1	55	12.1
242	16	VA	Pine	AT	103.4	25.2	5	5	PL	SX	5		
242	17	VA	Pine	F	74.6	27.3	5	5	PL	AT	3	117	23.9
242	18	VA	Pine	S	103.0	22.0	5	5	PL	SX	2	107	23.0
242	19	VA	Pine	PL	82.2	17.3	4	5	PL	SB	1	83	18.9
242	20	VA	Pine	S	101.7	20.8	5	5	PL	S	2	135	23.9
242	21	VA	Pine	E					PL	AT	4		
242	23	VA	Pine	B	144.4	23.9	5	5	PL	BL	2	121	23.4
242	24	VA	Pine	S	116.7	27.1	5	5	PL	SW	2	132	30.3
242	25	VA	Pine	AT	73.3	20.3	5	5	PL	AT	2	74	21.3
242	26	VA	Pine	PL	80.3	13.8	5	5	PLI	SB	1	87	15.3
242	27	VA	Pine	AT	79.0	13.2	5	5	PLI	AT	2	87	16.4
242	28	VA	Pine	S	125.7	31.8	3	3	PL	SW	2	142	18.4
242	29	VA	Pine	B	146.9	16.9	5	5	PL	SX	3	124	19.9
242	30	VA	Pine	S	109.6	31.4	5	5	PLI	AT	3	122	24.8
242	31	VA	Pine	S	83.8	16.1	4	4	PL	AT	3	178	27.5
242	32	VA	Pine	SE	214.6	23.3	5	5	PL	SW	3	153	25.6
242	33	VA	Pine	B	138.2	18.0	4	4	PL	SXW	3	183	28.3
242	34	VA	Pine	S	116.3	20.0	5	5	PL	SW	2	167	28.1

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
242	35	VA	Pine	S	169.0	24.4	5	5	PLI	SW	2	132	30.5
242	36	VA	Pine	S	142.1	17.3	5	5	PL	SW	2	162	32.5
242	37	VA	Pine	F	90.5	30.3	5	5	PLI	SW	3	93	23.4
242	38	VA	Pine	F	126.0	34.9	3	3	PLI	FDI	2	103	36.5
242	39	VA	Pine	B					PL	SXW	3		
242	40	VA	Pine	S	110.8	18.2	5	5	PLI		3	114	25.4
242	41	VA	Pine	PL	121.1	20.3	5	5	PLI	SX	1	86	21.0
242	42	VA	Pine	S	155.9	32.1	5	5	PLI	SX	2	177	30.3
242	101	VA	Pine	PL	42.2	12.9	3	3	PL	SW	1	93	25.5
242	102	VA	Pine	S	155.6	36.1	4	4	PL		3	132	25.7
242	106	VA	Pine	PL	82.2	14.3	5	5	PLI		1	87	18.4
024C	1186	VA	Pine	B	61.9	13.5	4	4	PL	SX	3	84	17.2
024C	1196	VA	Pine	S	63.6	14.6	2	2	PL	SX	2	144	29.5
024C	1216	VA	Pine	SB	91.4	18.7	1	1	PLI	SW	3	112	22.9
024C	1831	VA	Pine	S	76.7	13.6	3	3	PL	SX	2	90	24.2
024C	1836	VA	Pine	S	125.1	20.3	1	1	PL	SX	2	145	21.7
024C	3666	VA	Pine	B	89.5	14.9	2	2	PL	BL	2	97	15.8
024C	3681	VA	Pine	B	200.6	15.3	5	5	PL	BL	2	132	22.2
024C	4321	VA	Pine	S	85.8	16.7	3	3	PL	SW	2	92	22.5
024C	4326	VA	Pine	PL	69.5	22.2	3	3	PL	SW	1	112	20.9
024C	4331	VA	Pine	S	124.4	18.9	3	3	PL		3	97	20.2
024C	6796	VA	Pine	B	72.1	9.5	4	4	PLI	SW	3	152	27.5
024C	8071	VA	Pine	B	84.2	22.9	2	2	PL	SX	3	144	25.6
024C	8091	VA	Pine	S	145.9	20.8	4	4	PL	AT	3	72	18.9
024C	9241	VA	Pine	AT	97.8	24.4	4	4	PLI	SX	5		
024C	9906	VA	Pine	B	195.6	14.8	4	4	PL	SX	3	167	21.6
024C	9911	VA	Pine	B	220.8	21.1	5	5	PL	SE	3	167	23.6
024C	9916	VA	Pine	SB	229.2	18.8	4	4	PL	BL	3	188	26.6
CMI4	75	VA	Pine	S	133.3	17.9	4	4	PL	AT	3	163	30.5
CMI4	172	VA	Pine	S	155.9	19.7	4	3	PL	S	2	175	25.4
CMI4	278	VA	Pine	S	137.5	22.4	3	3	PL	SX	2	80	25.9
CMI4	322	VA	Pine	S	84.5	24.1	4	3	PLI		3	93	23.4
CMI4	520	VA	Pine	SB	168.3	19.7	3	3	PL	SW	3	163	27.5
CMI4	548	VA	Pine	AT	119.5	27.7	3	3	PL	AT	2	124	29.1
242	43	VA	Spruce	S	52.1	21.5	5	5	SW	EP	1	93	20.7
242	44	VA	Spruce	B	93.8	16.5	6	5	SW	BL	2	58	11.8
242	45	VA	Spruce	S	109.1	21.4	5	5	S	PL	1	185	25.4
242	46	VA	Spruce	SB	168.6	17.6	5	5	SB	SXW	1	177	18.0
242	47	VA	Spruce	S	76.6	24.2	5	5	SXW	AT	1	122	28.3
242	48	VA	Spruce	B	81.3	14.9	5	5	SX	BL	2	94	11.8
242	49	VA	Spruce	PL	49.1	7.8	6	5	SB		3	72	7.3
242	50	VA	Spruce	S	166.4	21.3	5	5	S	BL	1	205	16.3
242	51	VA	Spruce	SB	125.9	14.1	5	5	SB	SW	1	153	17.2
242	52	VA	Spruce	S	42.2	11.8	5	5	SW	PL	1	71	21.3
242	53	VA	Spruce	S	156.6	36.1	5	5	SW	EP	1	218	29.2
242	54	VA	Spruce	B	152.6	26.6	5	5	SX	BL	2	119	20.6
242	55	VA	Spruce	S	176.6	25.7	5	5	SW	PL	1	175	27.4
242	56	VA	Spruce	B	129.3	30.9	5	5	SW	BL	2	112	24.7
242	57	VA	Spruce	B	50.2	17.8	5	5	SW	BL	2	62	19.9

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
242	58	VA	Spruce	S	136.0	32.6	5	5	SW		1	268	32.8
242	59	VA	Spruce	S	182.8	29.3	5	5	SX	BL	1	349	32.7
242	60	VA	Spruce	S	154.8	21.1	5	5	SW	BL	1	122	24.8
242	61	VA	Spruce	B	68.4	17.9	5	5	SXW	BL	2	183	22.0
242	62	VA	Spruce	S	141.1	13.7	5	5	SXW	BL	1	144	24.7
242	63	VA	Spruce	AT	128.4	27.5	3	3	SB	PL	5		
242	64	VA	Spruce	S	109.5	27.6	6	5	SXW	BL	1	163	28.3
242	65	VA	Spruce	F	85.0	30.8	5	5	SW	BL	3	108	27.3
242	66	VA	Spruce	S	103.5	30.2	4	4	SXW	PL	1	167	35.9
242	67	VA	Spruce	S	119.3	32.6	5	5	SW	PLI	1	103	31.4
242	68	VA	Spruce	H	87.7	28.2	5	5	SW	HW	2	197	26.0
242	69	VA	Spruce	F	150.5	26.3	5	5	SW	FD	2	177	28.8
242	70	VA	Spruce	S	166.0	23.3	5	5	SX	PL	1	103	27.7
242	71	VA	Spruce	B	86.2	25.6	4	4	SW	BL	2	131	28.2
242	72	VA	Spruce	AT	62.9	20.9	5	5	SW	AT	2		
242	73	VA	Spruce	S	105.7	25.0	5	5	SW	PLI	1	143	31.4
242	74	VA	Spruce	S	188.7	33.1	5	5	SW	PL	1	192	30.9
242	75	VA	Spruce	AT	71.6	27.1	5	5	SXW	AT	2	93	24.9
242	76	VA	Spruce	S	74.9	24.4	5	5	SXW	AT	1	143	29.5
242	77	VA	Spruce	S	161.1	30.0	5	5	SW	BL	1	208	34.0
024C	1826	VA	Spruce	SB	82.7	8.2	3	3	SB		1	145	13.3
024C	1856	VA	Spruce	S	123.8	24.4	3	3	SW	SB	1	102	17.2
024C	1866	VA	Spruce	B	80.7	14.0	4	4	SW	BL	2	132	27.3
024C	1881	VA	Spruce	B	130.5	18.4	4	4	SW	BL	2	137	18.9
024C	2356	VA	Spruce	B	219.9	24.6	4	4	SX	BL	2	157	24.6
024C	2466	VA	Spruce	B	219.0	23.2	3	3	SX	PL	3	185	23.4
024C	3006	VA	Spruce	S	92.6	25.1	4	4	SW	PL	1	107	25.2
024C	3701	VA	Spruce	S	66.9	22.9	2	1	SXW	BL	1	153	30.3
024C	3706	VA	Spruce	S	225.6	22.0	2	2	SX	BL	1	144	23.5
024C	4361	VA	Spruce	B	151.5	30.4	2	2	SX	BL	2	178	23.4
024C	4371	VA	Spruce	S	125.2	23.2	4	4	SX	BL	1	294	25.1
024C	6141	VA	Spruce	S	165.3	24.8	4	4	SX	PLI	1	177	25.7
024C	6791	VA	Spruce	S	126.2	27.6	4	4	SW	BL	1	132	30.4
024C	7416	VA	Spruce	B	230.5	26.8	1	1	SW	BL	2	182	24.8
024C	7466	VA	Spruce	S	188.4	20.3	5	5	SXW	BL	1	208	29.9
024C	7481	VA	Spruce	S	135.4	27.7	2	2	SX	BL	1	258	29.6
024C	8061	VA	Spruce	F	129.8	24.2	4	4	SX	PL	3	74	28.5
024C	8711	VA	Spruce	B	154.4	17.1	3	3	SB	SW	3	115	18.9
024C	8761	VA	Spruce	S	178.0	30.6	3	3	SW	BL	1	219	32.1
024C	9251	VA	Spruce	B	140.8	25.4	3	3	SX	BL	2	177	24.4
024C	9256	VA	Spruce	AT	86.8	21.5	3	3	SX	AT	2	147	22.2
024C	9886	VA	Spruce	B	94.5	14.5	3	3	SW	BL	2	167	27.2
024C	241	Non		S	21.4	7.4	4	4			5		
024C	541	Non		B	41.0	14.2	4	4	SW	BL	2	141	24.1
024C	546	Non		AC	140.0	28.9	2	2	SW	PLI	3	171	32.9
024C	561	Non		PL	15.8	5.7	4	4			5		
024C	566	Non		S	139.6	21.0	2	2			5		
024C	576	Non		B							5		
024C	1231	Non		B	113.8	27.4	4	4			5		

					Phase II				Phase I				
			Sub		Mean		Sample	size	leading	Second	Case of	age for	height for
proj_id	Samp	strata	strata	Species	age	height	age	height	species	Species	match	match	match
024C	1851	Non		SB	156.7	8.6	3	2	PLI		3	6	0.8
024C	2471	Non							PLI	SX	5		
024C	3676	Non		S	104.4	9.5	1	1			5		
024C	4946	Non									1		
024C	4971	Non		SB					PLI	SX	3		
024C	4981	Non		B	46.5	9.5	2	2	AT	PLI	4	101	28.1
024C	5586	Non									1		
024C	5596	Non		SB	151.9	5.9	3	3	SW	SB	2	145	9.0
024C	5631	Non							SX	PLI	5		
024C	6776	Non							SW	AC	5		
024C	6781	Non		PL	13.5	3.3	3	3	PLI	SX	1	12	3.1
024C	6821	Non		S	21.2	6.1	4	3			5		
024C	7426	Non		B		3.6	0	1	SX	PLI	3		0.4
024C	8716	Non							PLI	AT	5		
024C	8721	Non		S	125.4	18.4	2	2	SB		3	222	17.8
024C	8736	Non									1		
024C	8751	Non		S	146.4	34.9	2	2	SX	BL	1	216	34.3
024C	9901	Non		S	227.4	27.5	5	5	SW	BL	1	178	29.6
CMI4	42	Non		B	30.3	11.6	3	3	AT	SX	4	144	29.6
CMI4	83	Non		B	82.8	12.3	2	2			5		
CMI4	86	Non		S	168.8	40.2	2	2	SXW	AT	1	153	30.3
CMI4	131	Non		PL	9.9	3.1	2	2	PLI	SX	1	11	2.0
CMI4	156	Non		S	24.8	6.1	3	2			5		
CMI4	203	Non		B	127.4	21.9	2	1	PL	SXW	3	123	23.8
CMI4	251	Non		S	28.0	8.7	5	5			5		
CMI4	264	Non		F	115.3	35.9	3	3	SX	FD	2	111	38.1
CMI4	298	Non		AT	14.5	7.9	4	2	PL		5		
CMI4	301	Non							PLI		2		
CMI4	365	Non		SE	176.4	24.3	2	1	BL	SW	3	168	22.6
CMI4	381	Non		S	32.7	10.9	3	3			5		
CMI4	436	Non		S	43.0	18.0	4	3			5		

14. Appendix F: Scatterplots and residuals

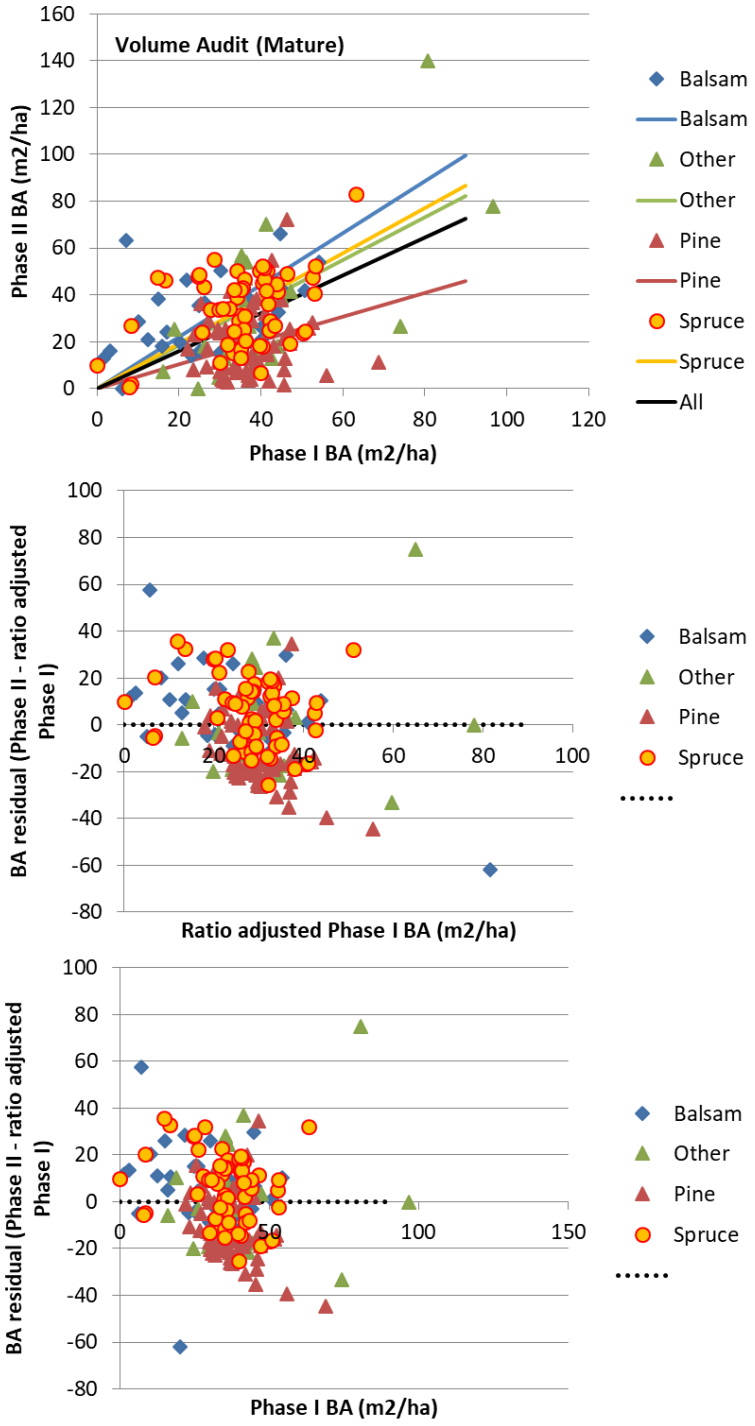

Figure 8. The scatterplots for BA are given. The top graph gives the Phase I photo and Phase II ground estimates of basal area for the Volume audit sub population. The coloured lines give the ratios by strata while the black line is the ratio for all Volume Audit (mature) samples. The middle graph plots the residuals against the adjusted Phase I BA. The bottom 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).

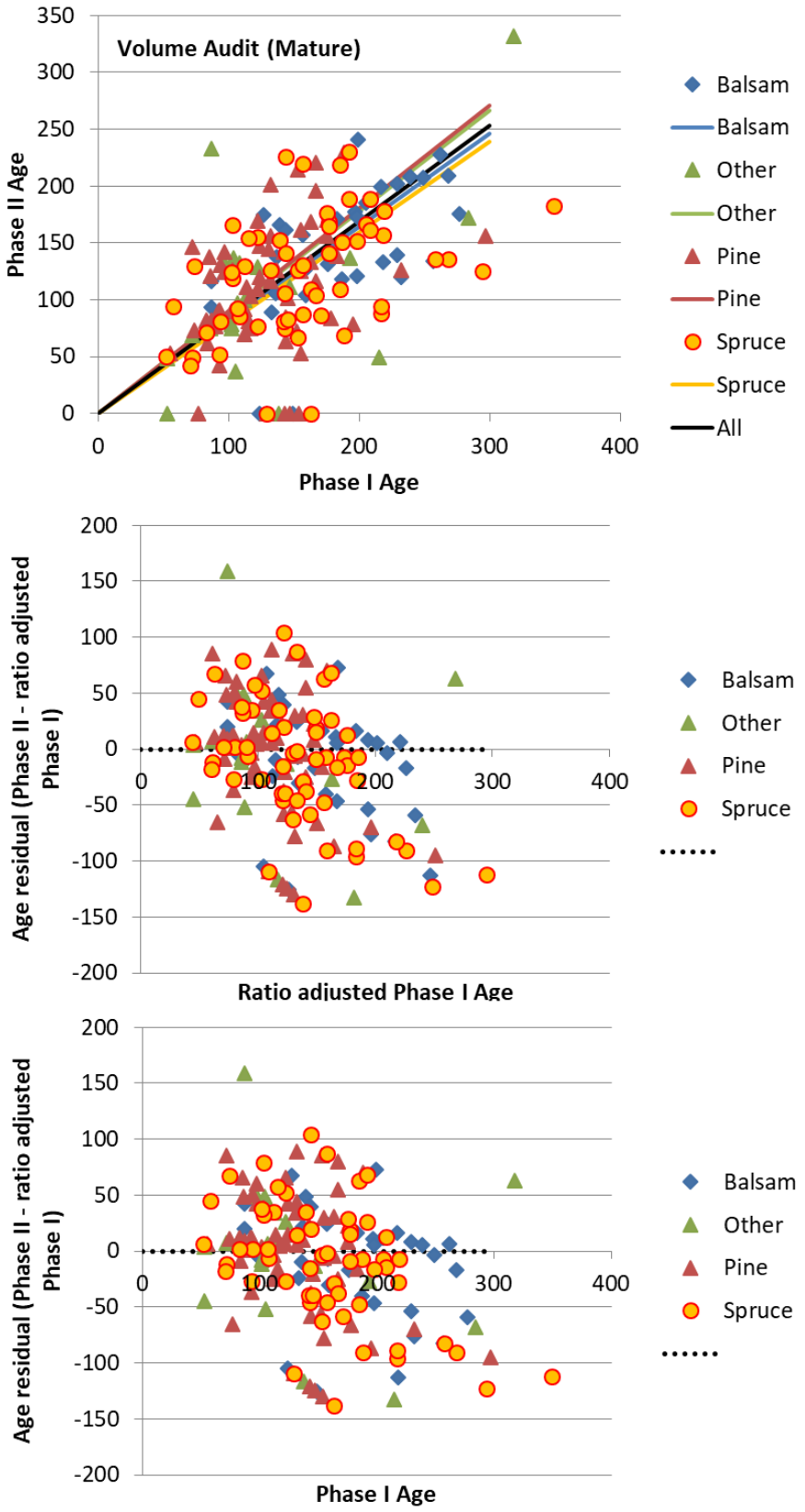

Figure 9. The scatterplots for Age are given.

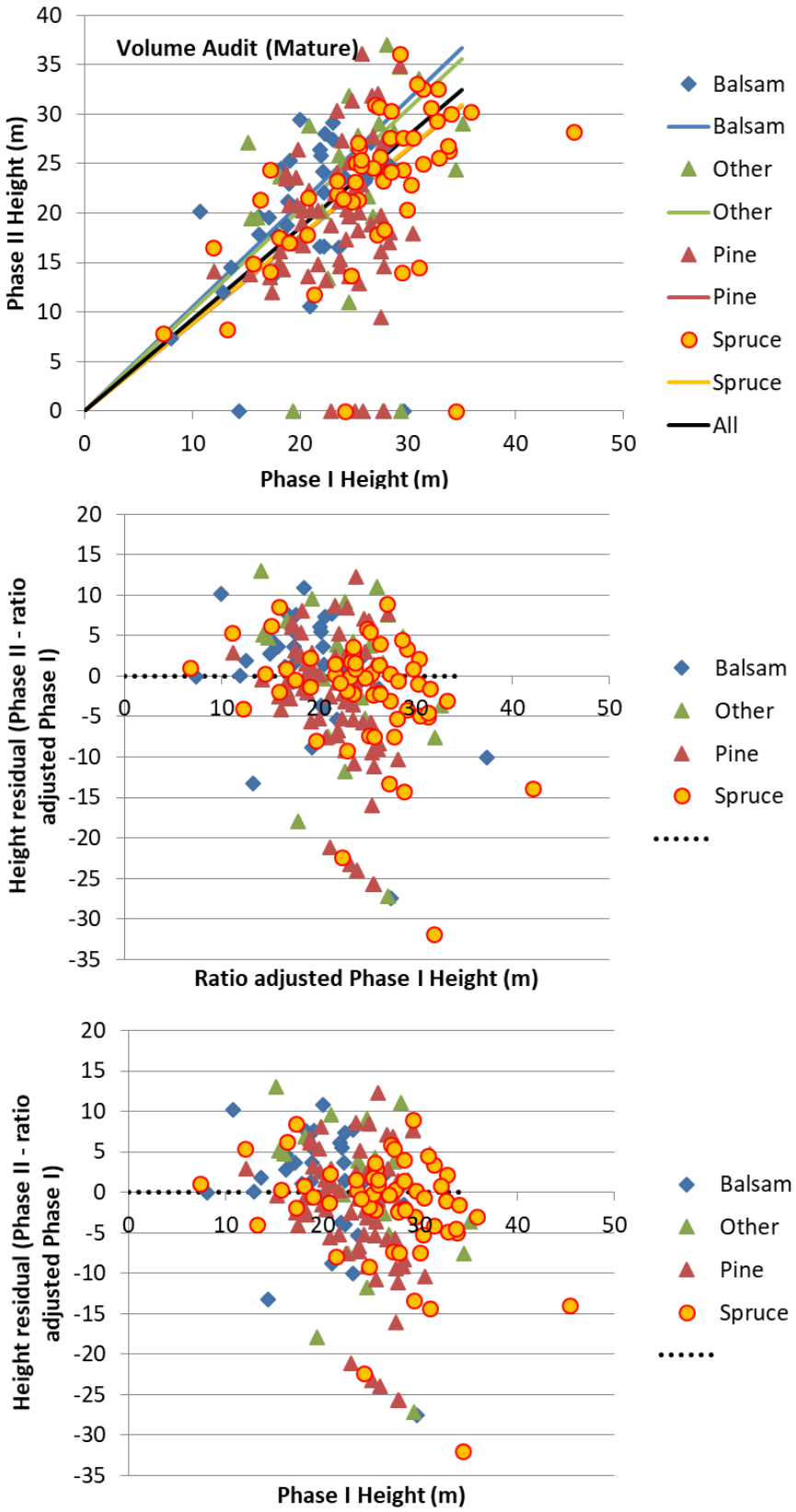

Figure 10. The scatterplots for Height are given.

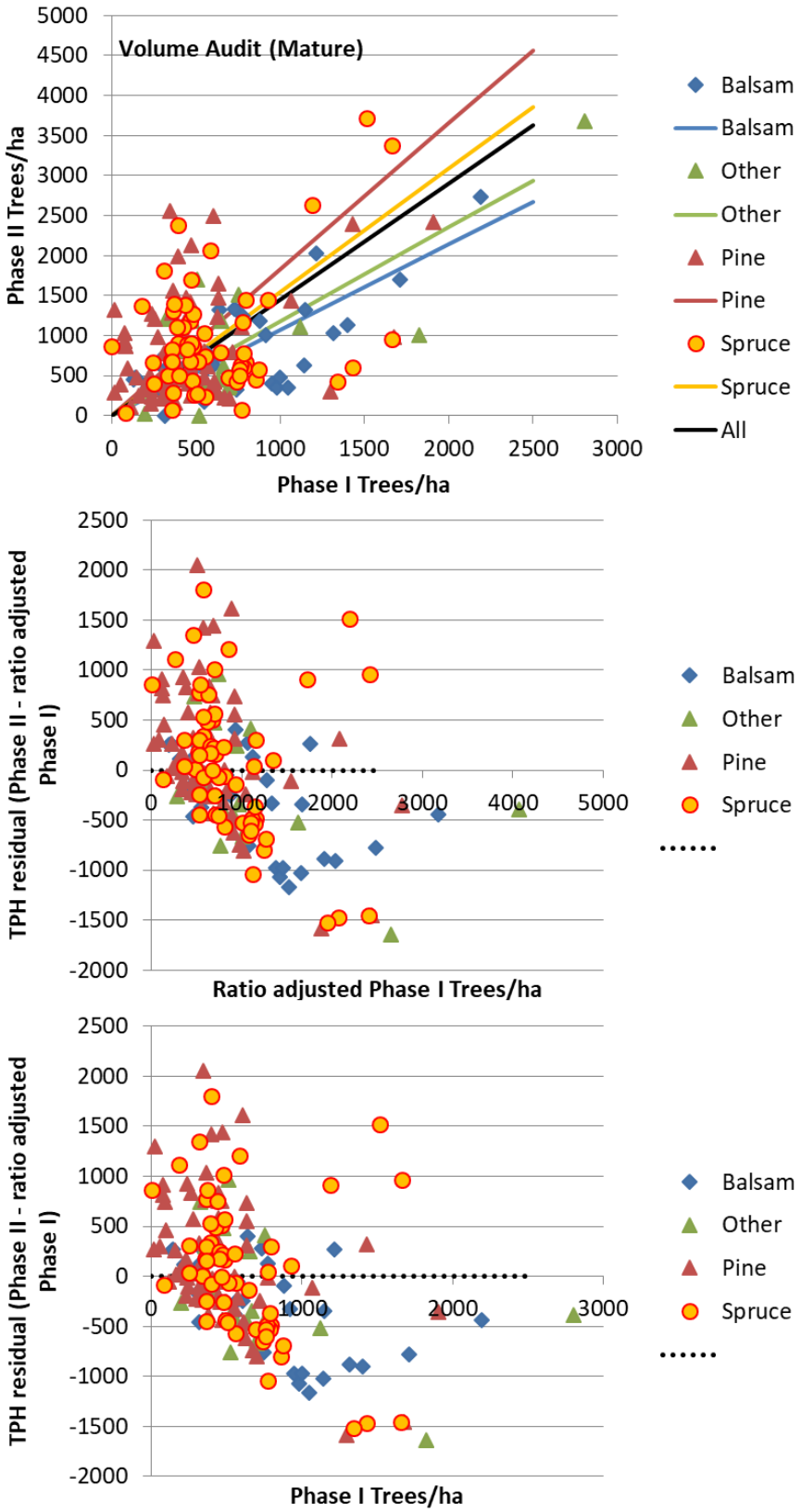

Figure 11. The scatterplots for Trees/ha are given.

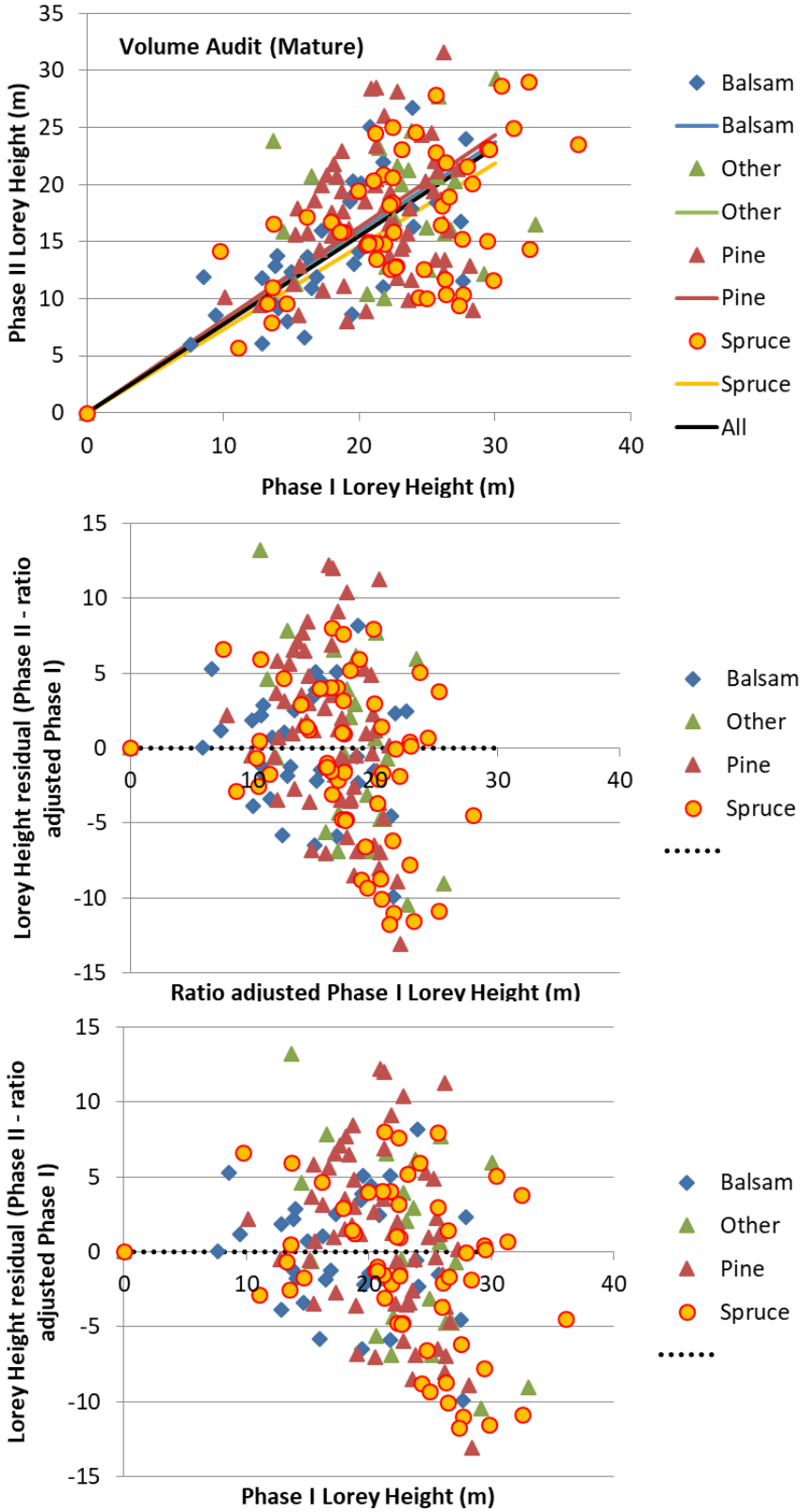

Figure 12. The scatterplots for Lorey height are given.

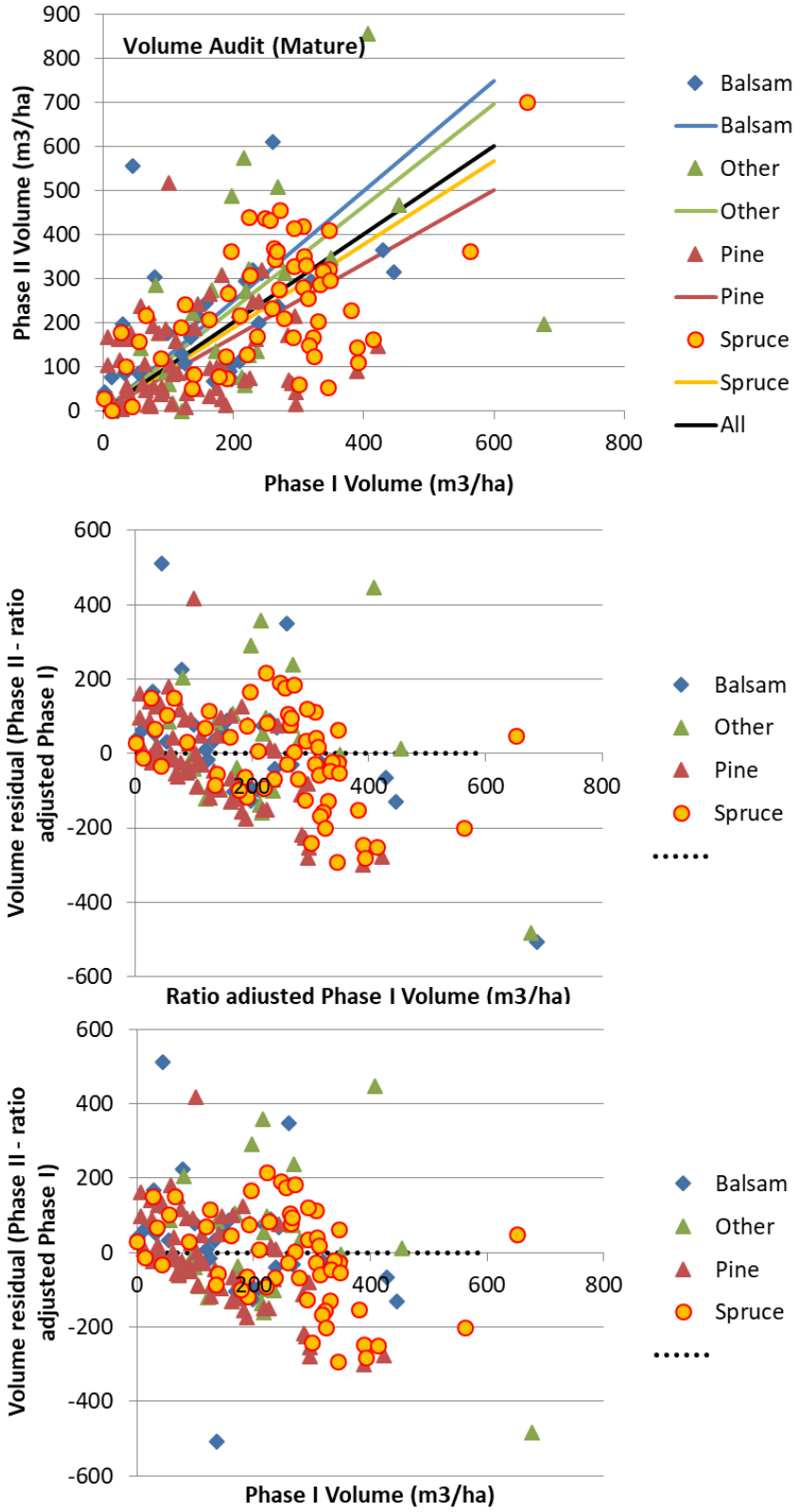

Figure 13. The scatterplots for Volume net of decay, waste and breakage are given.

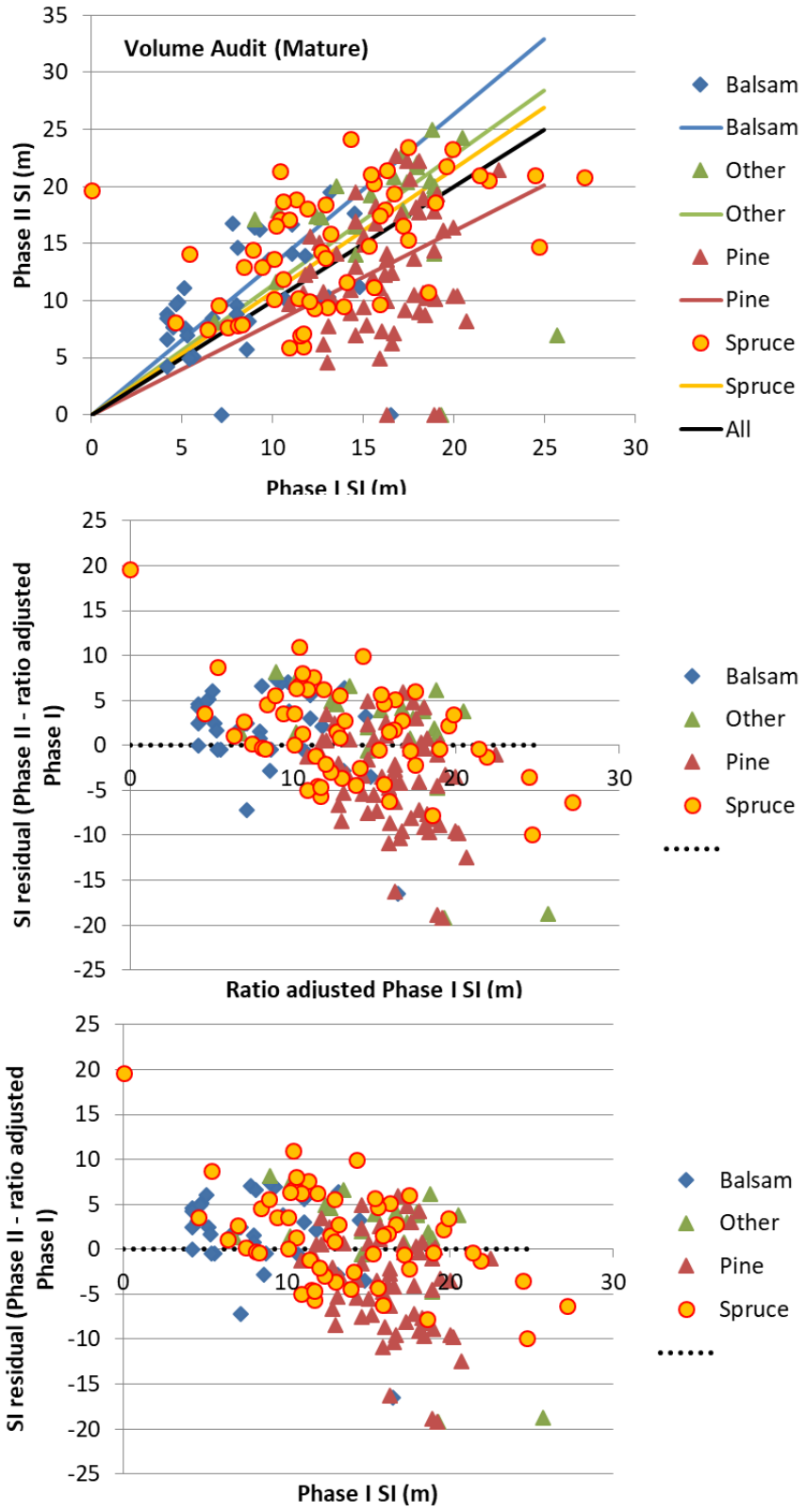

Figure 14. The scatterplots for Site index are given. The Phase II estimates have not been screened for age.

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

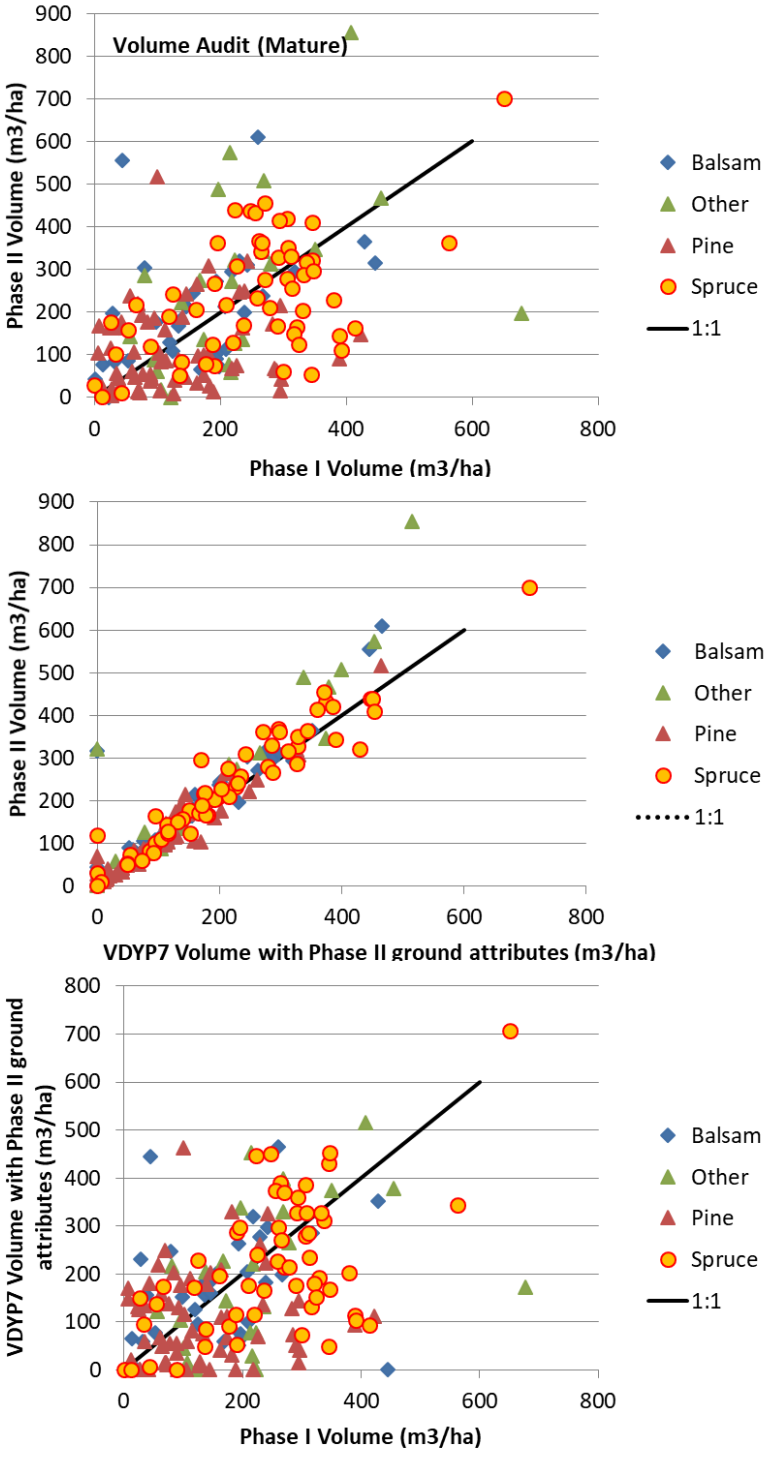

Figure 15. The top graph illustrates the total volume error (Phase I vs. Phase II volume). There are two potential sources of volume error in Phase I. First, the attributes fed into VDYP7 could be incorrect (attributed-related volume error). Second, the volume estimation routines in VDYP7 could be biased (model-related volume error). Total volume error = attribute-related volume error + model-related volume error. The middle graph 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 bottom graph 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.

16. Appendix H – New MPB adjustment algorithm – sample results

The current and new MPB adjustment algorithms were run on two scenarios to illustrate the differences (Table 29). In Scenario 1, the leading species does not change. In Scenario 2, the leading species changes from PL to S.

Table 29. The scenarios used to illustrate the MPB adjustment algorithm are described. The year of MPB attack was assumed to be 2005. The base case was projected to 2005 and then the new MPB adjustment algorithm applied.

Scenario	Year	Description	MPB kill %
Base	1960	Age = 52, height = 20.0 m, BA = 30 m^2/ha, TPH = 800 and PL 60 S 40	
Base - projection	2005	Age = 97, height = 26.8 m, BA = 40.9 m^2/ha,, TPH = 595 and PL 60 S 40	
Scenario 1	2005	Age = 97, height = 26.8 m, BA = 32.7 m^2/ha,, TPH = 476 and PL 50 S 50	33%
Scenario 2	2005	Age = 97, height = 26.8 m, BA = 20.4 m^2/ha,, TPH = 297 and S 80 PL 20	83%

The biggest changes between the adjustment algorithms is adjustment of basal area (Figure 16) and species composition and applying the MPB reduction during the year of peak MPB attack. The old algorithm does not adjust BA.

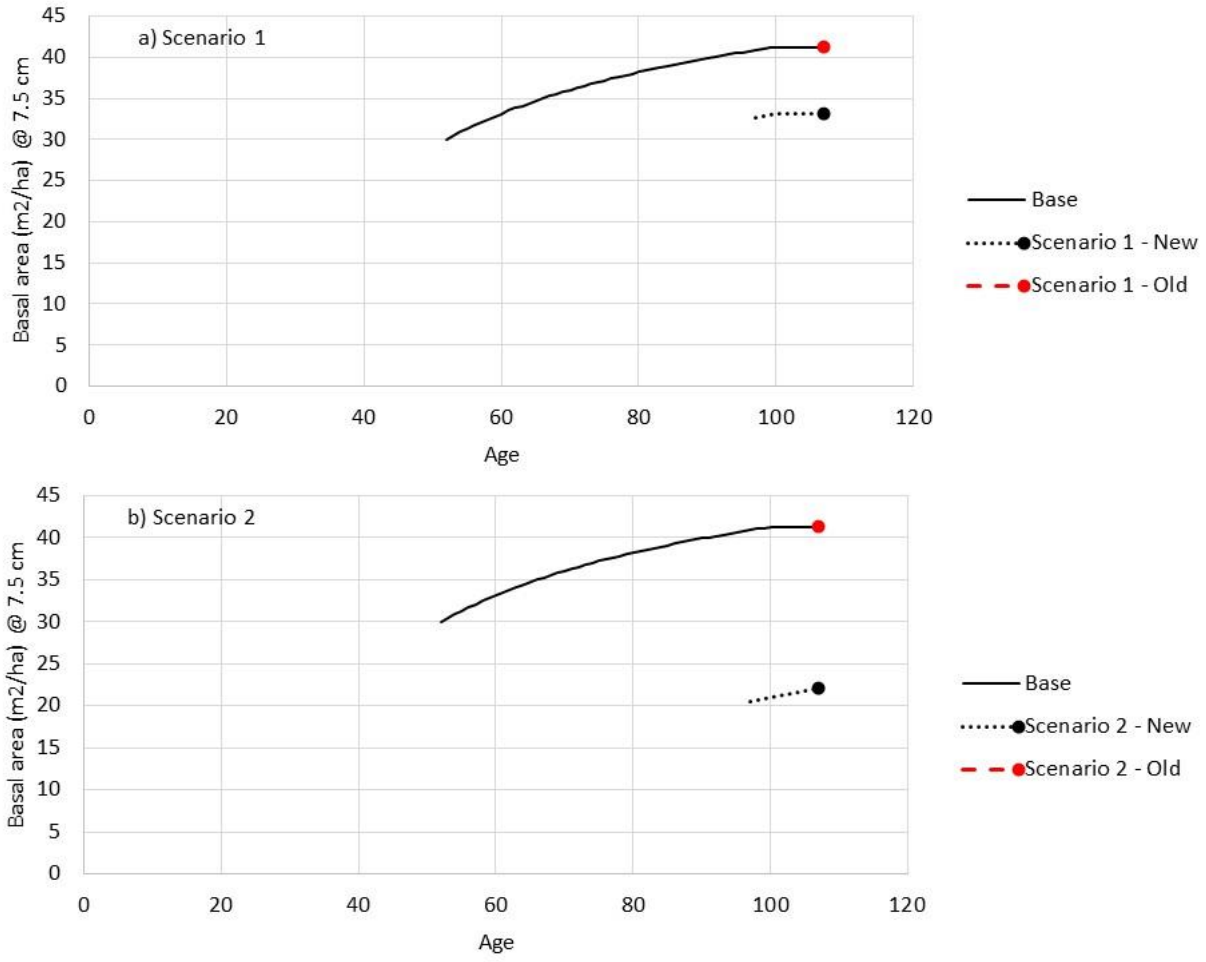

Figure 16. The basal area projections associated with the scenarios in Table 29 are given. The old adjustment algorithm does not adjust BA so the base case and Scenarios with the old MPB adjustment algorithms have the same BA.

For scenario 1, the differences in volume estimates between the old and new MPB adjustments are minor (Figure 17a) but, for scenario 2, the new MPB algorithm shows slightly more volume (Figure 17b).

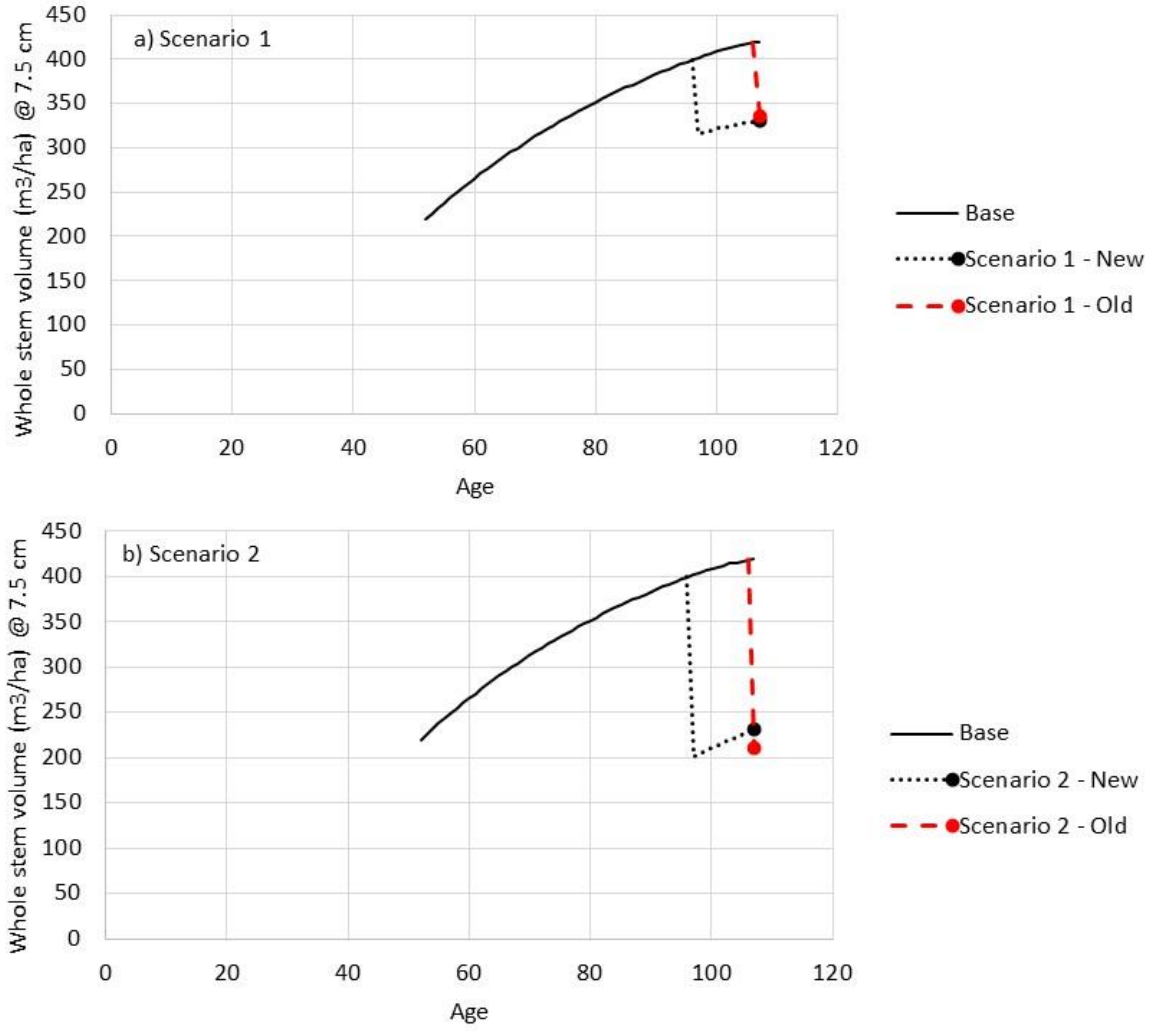

Figure 17. The whole stem volume projections associated with the scenarios in Table 29 are given.

The increase in volume associated with the new algorithm may be associated with the change in leading species from pine to spruce. For scenario 2, when the leading species switches from pine to spruce, the dominant height growth accelerates (Figure 18b).

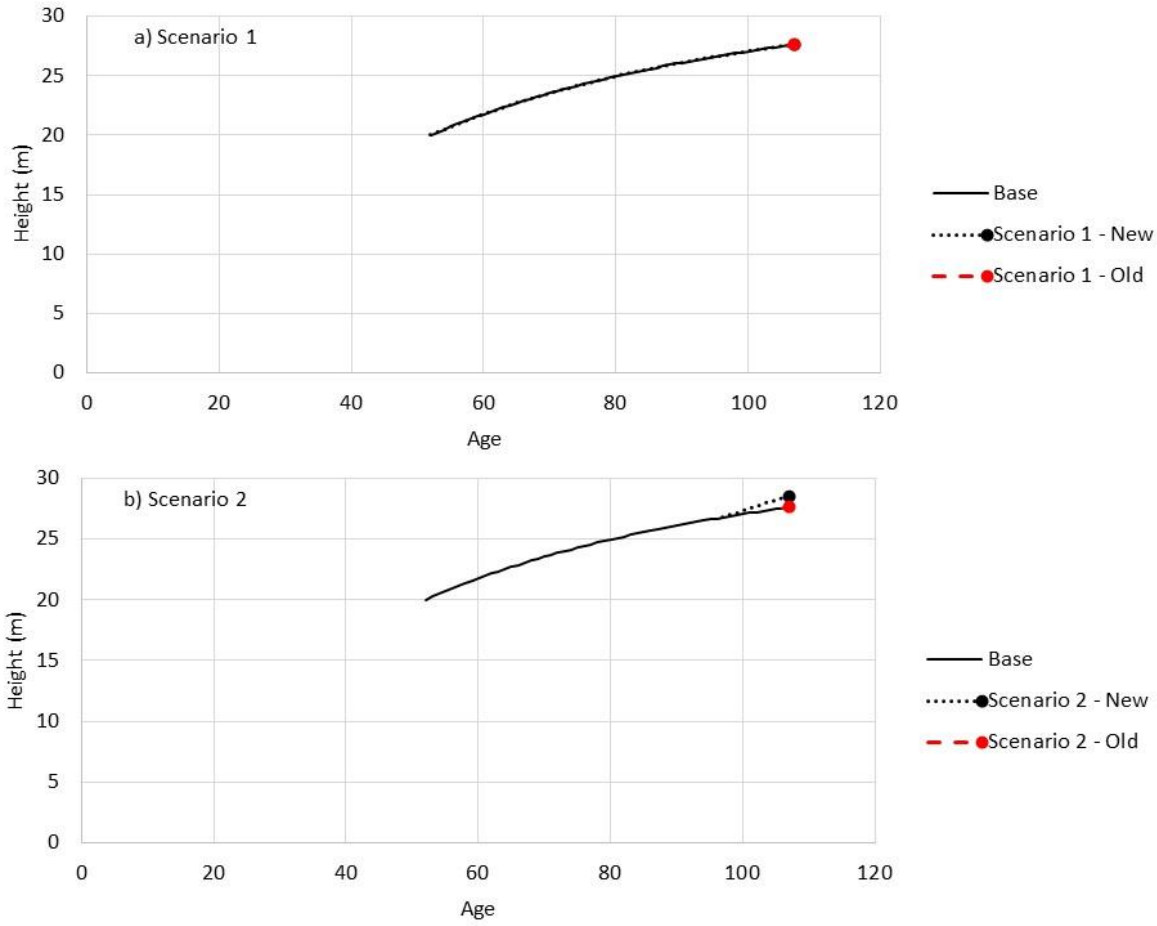

Figure 18. The dominant height associated with the scenarios in Table 29 are given.