Lakes TSA

Documentation of Analysis for NVAF and Vegetation Resources Inventory Statistical Adjustment

PREPARED FOR:

MINISTRY OF FORESTS AND RANGE

PREPARED BY:

Jahraus & Associates Consulting Inc.
Maple Ridge BC

&

Churlish Consulting Ltd.
Victoria BC

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EXECUTIVE SUMMARY

The objective of this project was to provide statistical adjustment factors for the mature (61+ years of age) component of the Lakes TSA in the vegetated treed (VT) portion of the landbase, excluding private land, Indian reserves, parks and protected areas. Within this population, a total of 100 samples were selected using Probability Proportional to Size with Replacement (PPSWR) techniques. The adjustment was based on the new Ministry of Forests & Range (MFR) interim methodological standards for VRI statistical adjustment using the VDYP7 yield model. In addition, a parallel analysis was carried out using the VDYP6 yield model however this portion of the analysis was restricted to a comparison of the estimated volume impact of a VDYP6 versus VDYP7 adjustment. A basic analysis and summary description was also provided for 15 samples established in an "immature" stratum (stands up to 60 years of age). However, no statistical adjustment was carried out in this stratum.

The adjustment incorporated new NVAF values computed from the pooled 2001 Babine and 2007 Lakes NVAF samples. The resulting NVAF values, by stratum, and associated sampling error are shown below:

Lakes TSA Net Volume Adjustment Factors			
Stratum	***NVAF Value***	***% Sampling Error***	***sample size***
All Deciduous Spp	0.97315	30.4	7
Pine	1.00268	4.5	21
All Conifer spp excepting pine and balsam	1.02453	5.0	36
Balsam	1.03168	12.3	19
All Dead spp	1.00484	9.4	18

These NVAF corrections indicated that the taper equations and the VRI net factoring process area performing adequately in this unit.

At the time of sample selection, the 100 mature samples (i.e. those >60 years of age) were allocated proportionally by area to one of three strata:

- Mature, Other Conifer leading, Deciduous leading, and Pine <50%
- Mature, Pine – 50 to 80%
- Mature, Pine – 81% +

For this analysis, the samples were restratified to provide more targeted adjustment factors. Deciduous leading samples were moved to a separate stratum, as were non-pine, coniferous leading samples. The lodgepole pine leading samples were then split into those with 80% or more pine and those that were leading in pine but had <80% of this species. To account for the

restratification, sampling weights were computed and were carried with each sample throughout the analysis.

The VDYP7 adjustment process occurs in two stages, similar in this respect to the VDYP6 "Fraser Protocol" adjustment. At the first stage, age and height are adjusted. However with VDYP7, two additional inventory attributes, basal area per hectare (BA) and trees per hectare (TPH) at 7.5cm+ dbh utilization are also adjusted. The VDYP7 "Stage 1" adjustment factors (and their associated sampling errors at the 95% confidence level) are shown in the table below:

VDYP7 "Stage 1" Adjustment Factors and Sampling Error (at 95% confidence level)								
Stratum	n	Age Adjustment Factor	n	Height Adjustment Factor	n	Basal area/ha Adjustment Factor	n	Trees/ha Adjustment Factor
Mat-PL <80%	16	0.911 ± 14%	15	1.108 ± 15%	17	1.045 ± 20%	17	1.098 ± 22%
Mat-PL 80+	44	0.919 ± 6%	44	0.963 ± 7%	45	0.987 ± 11%	45	1.170 ± 19%
Mat-conif	28	0.955 ± 12%	28	0.980 ± 7%	28	1.063 ± 10%	28	1.446 ± 21%
Mat-decid	6	0.854 ± 35%	6	0.915 ± 41%	9	1.216 ± 43%	9	1.452 ± 35%

The adjustment factors for height, age, BA and TPH were input into the VDYP7 model which then produced an expanded output set of inventory attributes. Only one adjustment factor, that for volume net decay & waste 2 at the 12.5cm+dbh utilization level, was directly developed from the available attributes produced by VDYP7 at this stage. The ratios developed for this particular volume were applied to volumes at other utilizations. Although the VDYP7 software has been designed to also accept second stage adjustment factors for other attributes, including Lorey height and basal area at 12.5cm+ dbh, adjustment factors for these additional attributes were not computed at this time.

VDYP7 "Stage 2" Adjustment Factors: Volume/ha @12.5cm+ dbh utilization net DW2			
Stratum	n	Volume adjustment factor (after Stage 1 attribute adjustment)	SE % at 95%
Mat-PL <80%	17	0.937	27%
Mat-PL 80+	45	1.101	12%
Mat-conif	28	1.143	11%
Mat-decid	9	1.434	53%

The VRI Phase 2 ground sample indicated that the VDYP7 volume in the Lakes TSA is underestimated by about 10% overall, with a sampling error of ±9.1%. This level of sampling error met the target specified in the VPIP for this unit.

In all strata, the adjustment is expected to increase volume, with the “Mat-PL 80+” stratum showing the smallest increase (~2%) and the “Mat-decid” stratum showing the largest increase (nearly 60%). For the larger strata, the sampling errors for the estimated volume impacts were quite small. Although the sampling error for the “Mat-decid” stratum was high, this stratum accounts for a relatively small proportion of the area. Stakeholders should consider the relative importance of the mature deciduous leading area when assessing the risk associated with the adjustment in this stratum.

Mountain Pine Beetle devastation is widespread in this unit. To facilitate the current TSR approach for representing the effect of Mountain Pine Beetle on the inventory and to ensure consistency with that approach, timber supply requested that dead pine volume be included with live volume in the adjustment. Hence the Phase 2 compiled values for all per hectare-based adjustments (i.e. basal area/ha, trees/ha, volume/ha) included dead pine. The magnitude of the dead pine component in the resulting total volumes (and basal areas etc.) was significant. In the samples where the inventory indicates “pure” pine (leading in pine by more than 80% by basal area), dead pine accounts for more than half of the total volume for live trees (of all species i.e. including spruce, balsam, etc.) plus dead pine. Even in stands where pine is not the leading species, the sample suggests that pine mortality accounts for close to 20% of the total volume of live trees of all species plus dead pine.

In addition, many of the samples may have contained MPB attacked pine that was still green in 2006 or 2007 but which will be dead by the time the TSR process is complete. The impact of including dead pine volume in the analysis should be considered in terms of degradation of volume and value in the pine component and therefore pine volumes should not continue to be projected. Pine volume should actually be reduced according to shelf-life findings but this portion of the analysis would not be possible through existing versions of VDYP and could only be done during the TSR netdown. A process is currently being developed for dealing with the dead pine component of the inventory in a more systematic and consistent manner.

ACKNOWLEDGEMENTS

A number of people were involved in implementing the VRI statistical adjustment for the Lakes TSA including: Graham Hawkins, (MPB Inventory and Monitoring Team Leader, MFR) who managed this analysis project; Will Smith (Volume and Decay Sampling Forester, MFR) who analyzed the destructive sampling data and provided the NVAF values applied in this project; Sam Otukol (Biometrician, MFR) and Gary Johansen (VRI Audit Coordinator, MFR) who provided guidance and statistical advice; and Carolyn Krawchuk (VRI MPB Sampling Forester, NIFR, MFR) and Dick Nakatsu (Forest Analyst/Inventory Team Leader, NIFR, MFR) who provided input and review of the final report. Their contributions were all significant in the completion of this project.

We would like to also acknowledge Nona Phillips of Nona Phillips Forestry Consulting, to whom we were subcontracted on this project. Through her involvement in the VSIP and VPIP process for the Lakes TSA, Nona provided us with important background information for this project.

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1. INTRODUCTION

1.1 Background

The Vegetation Resources Inventory Strategic Inventory Plan (VSIP) for the Lakes TSA[1] identified completion of Phase 2 ground sampling followed by analysis and adjustment of the current photo-interpreted inventory as being among the priority VRI activities for the TSA. In anticipation of ground sampling activities in the Lakes TSA, a detailed project implementation plan (VPIP) was completed in November 2006 by Nona Phillips Forestry Consulting. This document, entitled *Lakes Timber Supply Area: Vegetation Resources Inventory Project Implementation Plan for Ground Sampling*, specified details of ground sampling activities including NVAF[2] sampling.

According to the VPIP, the main objective of the ground sampling was to sample the vegetated treed (VT) portion of the landbase, excluding private land, Indian reserves, parks and protected areas. Out of a total of 115 samples, 15 were to be allocated to stands up to 60 years of age (immature) with the remaining 100 samples to be allocated to stands 61 years of age and older. The sampling error target of ±10% (at a 95% confidence level) was specified for total volume in the mature (61+ years of age) stands.

Ground sampling activities were carried out in the summers of 2006 and 2007 and the data was made available for analysis later in the fall of 2007. NVAF destructive sampling was completed in 2006/07 and was analyzed by the Ministry of Forests and Range (MFR).

1.2 Description of the Inventory Unit

The following description and map of the inventory unit is taken from the "*Lakes TSA Vegetation Resources Inventory Project Implementation Plan for Ground Sampling*", prepared by Nona Phillips Forestry Consulting, November 11, 2006.

The Lakes TSA is located in north central BC and is bounded roughly by Babine Lake in the north and the Entiako River in the south. It is administered from Burns Lake as part of the Nadina Forest District and is adjacent to the Prince George TSA to the north and east, the Morice TSA to the west and the Mid-Coast TSA to the south. The predominant biogeoclimatic zone is Sub-Boreal Spruce (SBS), found in valley bottoms and characterized by the prevalence of lodgepole pine, hybrid white spruce and subalpine fir. Higher elevations are largely within the Englemann Spruce-Subalpine Fir (ESSF) biogeoclimatic zone.

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[1] *Lakes Timber Supply Area: Vegetation Resources Inventory Strategic Plan.* Nona Phillips Forestry Consulting, September 2006.

[2] Net Volume Adjustment Factor

Figure 1: Map of the Lakes TSA.

1.3 Scope and Objectives

The objective of this project was to provide statistical adjustment factors for the mature (61+ years of age) component of the Lakes TSA based on the new Ministry of Forests & Range (MFR) interim methodological standards for VRI statistical adjustment using the VDYP7 yield model. In addition, a parallel analysis was to be carried out using the VDYP6 yield model however the VDYP6 analysis was restricted to a comparison of the estimated volume impact of a VDYP6 adjustment. It is anticipated that the VDYP7 adjustment will become the official adjustment as the VRIMS data system and VDYP7 become fully operational. A basic analysis and summary description of the immature data was also to be provided. However, no statistical adjustment was planned for this stratum.

The adjustment was to incorporate new NVAF values based on pooled data collected from 2 previous projects[3] in the TSA. The computation of the NVAF was completed by MFR staff (Will Smith), who provided the NVAF values for this analysis.

As a result of widespread Mountain Pine Beetle damage in this unit, timber supply requested that dead pine volume be included with live volume in the adjustment. This was to facilitate the current

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TSR approach to representing the effect of Mountain Pine Beetle on the inventory whereby an external modeling process is used to "kill off" the pine.

2. METHODS

2.1 Overview of NVAF analysis

The NVAF values applied to the compiled Phase 2 ground sample volumes in the Lake TSA were provided by Will Smith, MFR. They were computed from the pooled 2001 Babine and 2007 Lakes NVAF samples and used design-based weighting procedures. All Babine pine were excluded since they were pre-MPB attack and did not represent the current population. The resulting NVAF values and associated sampling error is shown in Table 1 below. Details of the NVAF analysis are provided in Appendix I.

Table 1: Lakes TSA NVAF values, by stratum.

Stratum	***NVAF Value***	***% Sampling Error***	***sample size***
All Deciduous Spp	0.97315	30.4	7
Pine	1.00268	4.5	21
All Conifer spp excepting pine and balsam	1.02453	5.0	36
Balsam	1.03168	12.3	19
All Dead spp	1.00484	9.4	18

2.2 Population for Adjustment

The target population for VRI statistical adjustment was the vegetated treed (VT) landbase excluding private land, Indian reserves, parks and protected areas[4]. The adjustment was further restricted to polygons greater than 60 years of age. Although there were 15 ground samples established in an "immature" stratum (i.e. polygons ≤60 years of age), this portion of the population was not adjusted.

2.3 Sample Selection

The Phase 2 ground samples were selected by Churlish Consulting Ltd. using Probability Proportional to Size With Replacement (PPSWR) procedures. Out of the total sample size of 115, 15

[4] Private land, Indian reserves, parks and protected areas are generally classified as "non-contributing" ownerships, that is, they typically do not contribute to the forest landbase. Hence, for brevity, later sections of this report refer to "contributing ownerships" to describe that portion of the landbase that is NOT in private land, Indian reserve, park or protected areas.

samples were allocated to an "immature" stratum i.e. polygons ≤60 years of age. The remaining 100 samples were allocated proportionally by area to one of three strata[5]:

- Mature, Other Conifer leading, Deciduous leading, and Pine <50%
- Mature, Pine – 50 to 80%
- Mature, Pine – 81% +

Each of these strata was, in turn, subdivided into 3 volume classes at time at sample selection to ensure good representation[6].

The distribution of samples, by sample selection stratum, is shown in Table 2 below:

Table 2: Distribution of samples, by stratum.

Stratum	***Population area (ha)***	***Number of samples***	***Area represented by each sample (ha)***
Mature, Pine – 81% +	241611	35	6903
Mature, Pine – 50 to 80%	174713	25	6989
Mature, Other Conifer, Deciduous, and Pine <50%	282630	40	7066
Immature	72730	15	4849

2.4 Data Sources

2.4.1 Phase 1 photo-interpreted inventory data

The Phase 1 photo-interpreted data was obtained from the MFR as a cut from the INCOSADA database[7]. An analysis subset of the Phase 1 data, corresponding to the list of Phase 2 sample polygons was then prepared. The resulting dataset is provided in Appendix A. The reference years Phase 1 photo-interpreted sample data ranged between 1965 and 1998, with 1990 being the median year. Samples with photo-inventory reference dates prior to 1996 (56 samples) were from FIP-type inventories and hence did not include V-type inventory attributes like height and age of second species, basal area or trees/hectare.

[5] Sample selection is based on Rank 1 attributes however, for two samples, #207 and #140, the Rank 2 attributes were inadvertently used for stratum assignment. Based on their Rank 1 attributes, these samples would have been allocated to the immature stratum. However, after discussions with Sam Otukol, MFR, it was decided to keep these samples in their originally assigned strata.

[6] As per the MFR standard procedures, each stratum is sub-divided into three volume classes such that each volume class has approximately the same number of polygons. A roughly equal number of samples are then allocated to each volume class.

[7] In the new VRIMS system, the data would be obtained as a Personal GeoDataBase (PGDB) from the LRDW.

In preparation for the adjustment analysis, the Phase 1 data was projected to the year of ground sampling, either 2006 or 2007. For samples from V-type inventories, the second species heights and ages were also projected.

2.4.2 Phase 2 ground sample data

The Phase 2 ground samples were compiled using the NVAF values for the Lakes TSA as provided by the Ministry (see section 2.1). Important analysis attributes from the final Phase 2 compilation are shown in Appendix A, along with the corresponding Phase 1 data.

Note that the data collection procedures were modified in 2007 to include dead trees in the auxiliary plots. For the Lakes TSA, 87 of the Phase 2 ground samples were established in 2007 and hence included dead trees in the auxiliary plots. However, 28 samples were established in 2006, under the old data collection procedures. This required changes to the compiler to accommodate both data collection standards so that live/dead volume could be correctly computed. To maintain consistency with the treatment of MPB in the upcoming timber supply analysis for the Lakes TSA, timber supply analysts, requested that adjustment include dead lodgepole pine volume. Hence this analysis included dead lodgepole pine in the compilation of the Phase 2 ground sample basal area/ha, trees/ha and volume/ha.

2.4.3 Data matching

The data matching used to determine the appropriate heights and ages upon which to base the adjustment ratios followed the standard procedures outlined by the MFR. The results have been included in the Appendix A cut of the analysis spreadsheet.

For each VRI sample polygon, the ground sample data was matched with the corresponding inventory data for the same polygon. The ground heights and ages used in the adjustment were based on the average values for the T, S & L[8] trees for the leading species (by basal area at 4cm + dbh utilization) on the ground. Since the Lakes TSA includes a mix of FIP (F-type) and VRI (V-type) inventory data height and age may or may not have been available for both the leading and second species. The objective in the matching process 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 match could not be made at the sp0[9] level, conifer-to-conifer matches were allowed. However, conifer-

[8] T or "top height" tree is the largest DBH in 0.01 ha plot, regardless of species; L or "leading species" tree is the largest DBH in 0.01 ha plot, of leading species; S or "second species" is the largest DBH in 0.01 ha plot, of second species. T and S trees are selected and measured at the IPC only whereas L trees are selected at the IPC and all auxiliary plots. For details, refer to the MSRM document "Vegetation Resources Inventory Procedures and Standards for Data Analysis Attribute Adjustment and Implementation of Adjustment in a Corporate Database Version 2.0", March 2004.

[9] sp0 refers to the 16 major species codes and is roughly equivalent to the genus level.

deciduous matches were not considered acceptable. Note that where second species inventory ages and heights were required and were available, these attributes were also projected to the year of ground sampling.

There were a number of height and age data collection issues (specific details are provided in Appendix B) related to site tree data collected from lodgepole pine trees which in some cases were dead or had been attacked by MBP. These issues were discussed on a sample-by-sample basis with Sam Otukol, MFR, for resolution.

For 52 of the 99 samples, the inventory leading species matched the ground leading species at 4cm+ dbh utilization. For a further 11 samples, the ground leading species matched the inventory second species. Thirty-one samples were matched based on conifer-to-conifer or deciduous-to-deciduous. The remaining 5 samples could not be matched and were excluded from the development of the age and height adjustment factors.

2.5 Data issues related to the statistical adjustment (data screening)

Data issues and assumptions made in the analysis were discussed and approved at meetings and calls with Ministry staff. These issues/questions and their associated resolutions are documented in Appendix B.

One issue of note, that has not been mentioned elsewhere, regarded Sample #74. The compilation for this sample showed no basal area or volume and field card annotations indicated that the polygon had been logged. As a result, Sample #74 was excluded from the analysis since it was now vegetated non-treed and did not meet the VT population of interest criterion.

2.6 Stratification and weights for analysis

To provide a more focused adjustment, the original sample selection strata for the mature samples were modified for the analysis. However, sample weights were computed based on the original sample selection strata and these weights were carried with each individual sample when the new analysis strata were assigned. The sample weights were computed as shown in Table 3. Note that the weight assigned to each sample is provided in Appendix A.

Table 3: Sample selection strata and sampling weight calculation.

Stratum	***Volume class sub-stratum***	***Area (ha)***	***n***	***Sample weight (area/n)***
Mature, Pine – 81% +	0	74316	11	6756
	1	78689	12	6557
	2	88606	12[10]	7384
Mature, Pine – 50 to 80%	0	50493	8	6312
	1	56761	9	6307
	2	67459	8	8432
Mature, Other Conifer, Deciduous, and Pine <50%	0	81590	13	6276
	1	95295	14	6807
	2	105746	13	8134
Immature	0	36712	5	7342
	1	19359	5	3872
	2	16659	5	3332

In the new analysis stratification for the mature (i.e. ≥61 years of age), deciduous leading samples were moved to a separate stratum, as were non-pine, coniferous leading samples. The lodgepole pine leading samples were then split into those with 80% or more pine and those that were leading in pine but had <80% of this species[11]. The new distribution of the samples is shown in Table 4 below.

Table 4: Allocation of mature (≥61 years of age) samples to new analysis strata.

New stratum for analysis (stratum acronym)	***n***
Mature polygons leading in pine but with <80% pine (Mat-PL <80%)	17
Mature polygons with 80% or more pine (Mat-PL 80+)	45
Mature polygons, other coniferous species (i.e. non-pine) leading (Mat-conif)	28
Mature polygons, deciduous leading (Mat-decid)	9

[10] Sample #74, which was excluded from the analysis since it was found to have been logged, was part of this original stratum. Sampling weights were not recomputed after this sample was excluded.

[11] Note that the stratum assignment was based on the species composition reported in the MFR's INCOSADA inventory files. In these files, the species composition for F-type (old FIP) inventory records is volume based. When these records are processed through VDYP7, the volume-based species composition is converted to basal area-based species composition and, as a result, the species percentages may change slightly.

2.7 Overview of statistical adjustment

For the VDYP6 analysis, the statistical adjustment follows the MFR interim process often referred to as the "Fraser Protocol". In this process, the age and height attributes are adjusted first and used as inputs to generate an interim or "attribute-adjusted" VDYP6 volume. This volume is then used to develop a final volume adjustment factor. Hence the adjustment process occurs sequentially in two stages.

The VDYP7 statistical adjustment process is similar to the "Fraser Protocol" in that it is a sequential process, involving adjustment at two stages. However, in addition to height and age, two new attributes, basal area at 7.5cm+ dbh utilization (BA7.5) and trees per hectare at 7.5cm+ dbh utilization (TPH7.5) are adjusted at the first stage of the process. These adjusted attributes are then used as inputs to VDYP7 to generate an expanded set of attributes which include an interim or "attribute-adjusted" VDYP7 volume.

Although the VDYP7 adjustment process has the flexibility to adjust multiple attributes at the second stage, only volume net decay and waste at the 12.5cm+ dbh utilization is adjusted at the current time. It is anticipated that more attributes may be added to the adjustment process in the future.

Within the VDYP7 context, various internal modules of VDYP7 are used to project the polygons, generate additional attributes, and adjust attributes. Hence the VDYP7 model itself takes a much larger role in the statistical adjustment process than did VDYP6.

3. RESULTS AND DISCUSSION

3.1 VDYP7 Adjustment for the Mature Strata

VDYP7 adjustment factors are provided for the mature strata only. Results for immature stratum are summarized in section 3.6 but as indicated in the Lakes TSA VSIP and VPIP, there were no plans for this stratum to be adjusted.

The PPSWR formula for computation of the adjustment ratio of means is the same for the VDYP7 adjustment as it was for the "Fraser Protocol". In most situations[12], the PPSWR formula for computation of the adjustment ratio of means in each stratum can be simplified to the following:

$$\hat{R}_h = \frac{\bar{y}_h}{\bar{x}_h} \qquad [1]$$

[12] If the PPSWR pre-stratification is maintained, sample weights (selection probabilities) are generally the same for all samples within a stratum.

where $\bar{y}_h$ is the mean ground height (or age) in stratum h and $\bar{x}_h$ is the mean inventory height (or age) in stratum h. Since the sample selection pre-stratification was not maintained in this analysis, the samples within each new analysis stratum (see Table 4) may not have had the same sample weight (i.e. selection probability). As a result, the sample weights were incorporated into equation [1] by computing the adjustment factor as a ratio of the weighted mean ground i.e. Phase 2 value, over the weighted mean inventory i.e. Phase 1 value, using the weights assigned to each sample as per Table 3.

3.1.1 First stage VDYP7 adjustment: Height, age, basal area & trees per hectare

The VDYP7 adjustment process occurs in two stages, similar in this respect to the VDYP6 "Fraser Protocol" adjustment. At the first stage, age and height are adjusted. However, two additional inventory attributes, basal area per hectare (BA) and trees per hectare (TPH) at 7.5cm+ dbh utilization are also adjusted. The data matching process for the height and age adjustment is the same for VDYP7 as it was for VDYP6 and the "Fraser Protocol".

Tables 5 and 6 show the weighted mean values and the ratio of means for the age and height adjustment factors, respectively, for the VT, greater than 60 years of age, and "contributing ownerships" population of interest in the Lakes TSA. Scatterplots of the Phase 1 and 2 relationships for these attributes are provide in Appendix C. Plots of the residual[13] values were examined within each stratum for potential trends in adjustment bias (see Appendix D). The residuals did not indicate any notable bias trends with the adjustment.

For a sample to be included in the calculation of the age (or height) adjustment factor, it must have an available ground age (or height) and a suitable inventory species match. There were five and six samples, for age and height respectively, that could not be used for the development of the age and/or height adjustment factors. Note, however, that these samples still contributed to the development of the remaining adjustment factors.

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[13] Plots of "residual" values for adjusted attributes (ground value minus the adjusted value) can be used to assess potential bias problems associated with an adjustment model.

Table 5: Mean ages and ratio of means adjustment factors, by stratum, for the population of interest defined as VT, ≥ 61 years of age, and in "contributing ownerships", for the VDYP7 adjustment.

Age: VDYP7 Adjustment Factors					
Stratum	n	Wt'd Mean Phase 2 Age	Wt'd Mean Phase 1 Age	Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	16	110	121	0.911	14%
Mat-PL 80+	44	122	132	0.919	6%
Mat-conif	28	134	140	0.955	12%
Mat-decid	6	82	96	0.854	35%

Table 6: Mean heights and ratio of means adjustment factors, by stratum, for the population of interest defined as VT, ≥ 61 years of age, and in "contributing ownerships", for the VDYP7 adjustment.

Height: VDYP7 Adjustment Factors					
Stratum	n	Wt'd Mean Phase 2 Height	Wt'd Mean Phase 1 Height	Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	15	22.7	20.5	1.108	15%
Mat-PL 80+	44	20.5	21.2	0.963	7%
Mat-conif	28	21.9	22.4	0.980	7%
Mat-decid	6	19.9	21.7	0.915	41%

In the VDYP7 adjustment procedure, adjustment factors for two additional attributes, basal area/ha and trees/ha (at 7.5cm+ dbh utilization) are also computed at the first stage of the adjustment. These adjustment factors are shown in Tables 7 and 8. Note that for both basal area/ha and trees/ha, the Phase 2 ground sample compilation includes dead lodgepole pine. Scatterplots of the Phase 1 and 2 relationships for these attributes are provide in Appendix E. Residuals plots for these adjustment factors are shown in Appendix F.

Table 7: Mean basal area/ha and ratio of means adjustment factors, by stratum, for the population of interest defined as VT, ≥ 61 years of age, and in "contributing ownerships", for the VDYP7 adjustment. Note that the Phase 2 ba/ha includes live ba/ha (all species) plus dead ba/ha for lodgepole pine only.

Basal Area/ha @7.5cm+ dbh utilization: VDYP7 Adjustment Factors					
Stratum	n	Wt'd Mean Phase 2 BA/ha (LIVE + Dead PL)	Wt'd Mean Phase 1 BA/ha	Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	17	35.6	34.1	1.045	20%
Mat-PL 80+	45	35.9	36.4	0.987	11%
Mat-conif	28	32.1	30.2	1.063	10%
Mat-decid	9	34.4	28.3	1.216	43%

Table 8: Mean trees/ha and ratio of means adjustment factors, by stratum, for the population of interest defined as VT, ≥ 61 years of age, and in "contributing ownerships", for the VDYP7 adjustment. Note that the Phase 2 trees/ha includes live trees/ha (all species) plus dead trees/ha for lodgepole pine only.

Trees/ha @7.5cm+ dbh utilization: VDYP7 Adjustment Factors					
Stratum	n	Wt'd Mean Phase 2 TPH (LIVE + Dead PL)	Wt'd Mean Phase 1 TPH	Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	17	1,184	1,078	1.098	22%
Mat-PL 80+	45	1,434	1,226	1.170	19%
Mat-conif	28	1,144	791	1.446	21%
Mat-decid	9	1,038	715	1.452	35%

The adjustment ratios in Table 5 indicate that age is consistently overestimated in the inventory. For most strata, height is also overestimated. However, the sample indicates that for stands ≥ 61 years of age, where pine is leading but <80%, height is underestimated by about 10% (or about 2m on average). Basal area is underestimated in all strata except where pine is greater than 80%. This stratum showed a small (<2%) basal area overestimation. As is to be expected, photo-interpreted trees per hectare is underestimated in all strata.

For the most part, strata level sampling errors are all at reasonable levels, with the larger strata (those with more samples) showing particularly low sampling error. However, sampling errors for the deciduous leading stratum were relatively high, reflecting the small sample size in this stratum and the larger inherent variability in the deciduous leading stands.

3.1.2 Second stage VDYP7 adjustment: Volume

The adjustment factors for height, age, BA and TPH (Tables 5-8) were input into the VDYP7 model which then produced an expanded output set of inventory attributes. Only one adjustment factor, that for volume net decay & waste 2 at the 12.5cm+dbh utilization level, was directly developed from the available attributes produced by VDYP7 at this stage. The ratios developed for this particular volume were applied to volumes at other utilizations[14]. Although the VDYP7 software has been designed to also accept second stage adjustment factors for other attributes, including Lorey height and basal area at 12.5cm+ dbh, adjustment factors for these additional attributes were not computed at this time[15].

Table 9 below shows the VDYP7 volume adjustment factors by strata for the population defined as VT, operable, ≥61 years of age, in "contributing" ownerships. The ground volumes used to compute the adjustment ratio of means were based on net factored volumes to which the NVAF values had been applied in the compilation. The adjustment was based on a ground volume that included dead lodgepole pine (i.e. live volume for all species plus dead volume for lodgepole pine). All volumes are net decay and waste2 only, at the 12.5cm+ dbh utilization level for all polygons.

Scatterplots showing the volume relationship and the residuals from the adjustment are provided in Appendix G. There were some potential trends in bias observed for the volume residuals in the "Mat-PL <80%" and the "Mat-conif" strata which suggested that the adjustment may underestimate volume in younger stands. However, with only 17 samples in the "Mat-PL <80%" stratum, there was limited opportunity for post-stratification by age. Similarly, post-stratification by age in the "Mat-conif" stratum would have resulted in a sample size of only 8 for a younger sub-stratum (<121 years of age). In addition, the residuals plots for the stage 1 adjustment attributes did not exhibit the same age-related bias in these strata. As a result, further post-stratification by age was not pursued.

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[14] VDYP7 produces volumes at numerous utilization levels. Any adjustments input into VDYP7 must be harmonized, that is, care must be taken to ensure that the utilization relationships (e.g. volume at 12.5cm+ always less than or equal to volume at 7.5cm+) are not contorted by the adjustment ratios. As a simple approach to ensure harmonization, only one volume adjustment factor was computed and this factor was applied to all of the other volumes. This approach was approved by Sam Otukol, Forest Biometrician, MFR.

[15] The VDYP7 adjustment procedures are still under development and are being tested. At the recommendation of Sam Otukol (Forest Biometrician, MFR), Lorey height and BA at 12.5cm+ dbh were assigned an adjustment factor of 1.0. That is, no adjustment was made for these attributes.

Table 9: Mean volumes and volume adjustment ratios, by stratum, for the population of interest defined as VT, ≥ 61 years of age and in a "contributing ownership", for the VDYP7 adjustment. Utilization: 12.5cm+dbh net dw2. Note that the Phase 2 volume includes live volume (all species) plus dead volume for lodgepole pine only.

Volume/ha @12.5cm+ dbh utilization net DW2: VDYP7 Adjustment Factors					
Stratum	n	Wt'd Mean Phase 2 Vol/ha (LIVE + Dead PL)	Wt'd Mean Phase 1 Attribute-adjusted vol/ha	Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	17	252.2	269.0	0.937	27%
Mat-PL 80+	45	252.5	229.3	1.101	12%
Mat-conif	28	239.1	209.3	1.143	11%
Mat-decid	9	225.2	157.1	1.434	53%

3.2 Estimated volume impact for the VDYP7 statistical adjustment

Timber supply analyses are typically done on a net decay, waste and breakage volume basis. Hence, a special unadjusted run of VDYP7 was done to provide unadjusted volumes net decay, waste & breakage so that the estimated volume impact of the VDYP7 adjustment and its associated sampling error could be computed. The estimated volume impacts of the adjustment were computed as ratios of the ground volume to the unadjusted VDYP7 volume. The results, by stratum, are shown in Table 10.

Table 10: Estimated VDYP7 volume impact by stratum for the population of interest defined as VT, ≥ 61 years of age and in a "contributing ownership", based on the Phase 2 samples. Utilization: 12.5cm+dbh net dwb. Note that the Phase 2 volume includes live volume (all species) plus dead volume for lodgepole pine only.

Volume/ha @12.5cm+ dbh utilization net DWB: VDYP7 Adjustment Impact					
Stratum	n	Wt'd Mean Phase 2 Vol/ha (LIVE + Dead PL)	Wt'd Mean Phase 1 Unadjusted vol/ha	Estimated Adjustment IMPACT Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	17	246.8	220.6	1.119	26%
Mat-PL 80+	45	247.4	242.9	1.019	15%
Mat-conif	28	234.2	202.1	1.159	10%
Mat-decid	9	218.9	137.4	1.593	54%

In all strata, the adjustment is expected to increase volume, with the "Mat-PL 80+" stratum showing the smallest increase (~2%) and the "Mat-decid" stratum showing the largest increase (nearly 60%). For the larger strata, the sampling error for the estimated volume impact was quite small. Although the sampling error for the "Mat-decid" stratum was high, this stratum accounts for a relatively small proportion of the area. Stakeholders should consider the relative importance of the mature deciduous leading area when assessing the risk associated with the adjustment in this stratum.

3.2.1 Sampling error

The VPIP for the Lakes TSA specified a target sampling error of ±10% (at a 95% probability level) for total volume for the mature (≥61 years of age) portion of the VT landbase in "contributing" ownerships. To provide an indication of the sampling error achieved in the VDYP7 adjustment process, a comparison of the overall estimated adjusted inventory volume and the overall estimated VDYP7 unadjusted sample inventory volume was made. The overall ratio of these values and its standard error were computed using the formula for a separate ratio estimate after a pre-stratified PPSWR sample. The results are summarized in Table 11 below.

Table 11: Estimated adjusted VDYP7 total volume and sampling error (for a 95% confidence interval) for the Lakes TSA based on separate ratio estimators (for the population of VT, ≥ 61 years of age polygons from "contributing" ownerships). Utilization: 12.5cm+dbh. Volumes are net decay, waste & breakage. Note that the adjusted inventory volume represents live volume (all species) plus dead volume for lodgepole pine only.

Volume	*n*	*Total area (ha)*	*Overall estimated total adjusted inventory volume (m^3)*	*Overall estimated total unadj'd VDYP7 inventory volume (m^3)*	*Overall adjustment impact Ratio*	*Sampling error for total adjusted volume (as % of total adjusted volume)*
Overall	*99*	*698,955*	*166,673,174*	*150,921,401*	*1.104*	*9.1%*

The overall impact of a VDYP7 adjustment was estimated to be 1.104 with a 9.1% sampling error (at the 95% confidence level). This sampling error met the target set in the project VPIP.

3.3 Inventory file adjustment for the VDYP7 statistical adjustment

The Phase 1 inventory files for the population of interest (VT, ≥61 years of age, "contributing ownerships") were adjusted using the factors in Tables 5 through 9. The adjustment was performed using MFR's VDYP7 Attribute Adjustment interface for the VDYP7 model.

Appendix H shows the volume and area distribution by age class, for the population of interest, before and after the VDYP7 adjustment. The pre- and post-adjustment comparisons are based on an inventory file projected to 2007, the majority year of ground sampling.

The unadjusted total VDYP7 population volume was compared with the final adjusted total VDYP7 population volume[16]. The ratio of the adjusted to unadjusted VDYP7 volume in the population was 1.104, which was essentially the same as the volume impact ratio that was estimated from the sample and shown in Table 11. This close correspondence between the sample-estimated volume impact and the actual population volume impact may indicate that the sample was a good representation of the population distribution and that the adjustment was applied correctly. A comparison of the estimated volume impact from the sample and the actual volume impact for the population is shown by stratum in Table 12.

Table 12: Sample-estimated volume impact of the VDYP7 adjustment compared with actual population volume impact, by stratum.

Volume/ha @12.5cm+ dbh utilization net DWB: VDYP7 Adjustment Impact			
Stratum	Area (ha)	Sample estimated volume impact ratio	Actual population volume impact ratio
Mat-PL <80%	155,085	1.119	1.125
Mat-PL 80+	294,870	1.019	1.013
Mat-conif	197,027	1.159	1.161
Mat-decid	51,973	1.593	1.562

3.4 Estimated volume impact for the VDYP6 statistical adjustment

The estimated volume impact for the VDYP7 adjustment was provided in section 3.2. For comparison, the unadjusted inventory VDYP6 inventory volumes were also compared with the ground volumes to estimate the volume impact of a VDYP6 adjustment. The results are shown in Table 13. The results in each stratum were reasonably close with the exception of the “Mat-conif” stratum where the sample indicated that VDYP7 underestimates volume more than VDYP6[17]. The overall impact of a VDYP6 adjustment was estimated to be 1.061 with an 8.8% sampling error (at the 95% confidence level).

The analysis of a VDYP6 adjustment was restricted to an estimated volume impact comparison with VDYP7. A set of VDYP6 adjustment factors were not produced nor was the inventory population adjusted in a VDYP6 context.

[16] Sum of the polygon volumes/ha times the polygon areas. The population volumes in this comparison were based on net dwb volumes at the 12.5cm+ dbh utilization.

[17] The VDYP7 volume impact ratio in this stratum was 1.159 compared with 1.015 for VDYP6.

Table 13: Estimated VDYP6 volume impact by stratum for the population of interest defined as VT, ≥ 61 years of age and in a "contributing ownership", based on the Phase 2 samples. Utilization: 12.5cm+dbh net dwb. Note that the Phase 2 volume includes live volume (all species) plus dead volume for lodgepole pine only.

Volume/ha @12.5cm+ dbh utilization net DWB: VDYP6 Adjustment Impact					
Stratum	n	Wt'd Mean Phase 2 Vol/ha (LIVE + Dead PL)	Wt'd Mean Phase 1 Unadjusted vol/ha	Estimated Adjustment IMPACT Ratio of Wt'd Means	SE % at 95%
Mat-PL <80%	17	246.8	212.5	1.161	21%
Mat-PL 80+	45	247.4	246.7	1.003	15%
Mat-conif	28	234.2	230.7	1.015	10%
Mat-decid	9	218.9	140.2	1.561	55%

3.5 Impact of including dead pine in the VDYP7 adjustment

As a result of widespread Mountain Pine Beetle damage in this unit, timber supply requested that dead pine volume be included with live volume in the adjustment. This was to facilitate the current TSR approach to representing the effect of Mountain Pine Beetle on the inventory whereby an external modeling process is used to "kill off" the pine. The magnitude of the dead pine component of the volume and basal area is summarized in Tables 14 and 15 below[18].

Table 14: Impact of Dead Pl volume, by stratum

Volume/ha @12.5cm+ dbh utilization net DWB: Estimated VDYP7 Adjustment Impact and Dead Pine %							
Stratum	n	Wt'd Mean Phase 2 Vol/ha (LIVE + Dead PL)	Wt'd Mean Phase 2 Vol/ha (LIVE only)	Wt'd Mean Phase 2 DEAD PL vol/ha	Wt'd Mean Phase 1 Unadjusted vol/ha	Estimated vol impact ratio based on LIVE volume only	Dead pine vol/ha as a % of LIVE+ dead Pl
Mat-PL <80%	17	247	139	108	221	0.631	44%
Mat-PL 80+	45	247	119	129	243	0.488	52%
Mat-conif	28	234	191	43	202	0.947	18%
Mat-decid	9	219	165	54	137	1.199	25%

[18] The dead pine % in Table 14 (and 15 for basal area) must *NOT* be interpreted as the *percentage of the pine that is dead* since the total LIVE volume reported here includes pine and all other species as well. Note that, for example, over half of the samples for which the inventory indicated "pure pine" (i.e. PL 80%+) were *not* leading in pine based on the ground sample compilation. Hence many of the samples in this stratum included significant percentages of live non-pine volume (e.g. spruce, balsam). If other species are ignored and the examination is restricted to pine volume only, the proportion of dead among the pine trees is higher.

This summary shows that dead pine comprises a significant portion of the volume in the pine leading strata. In the samples where the inventory indicates “pure” pine (leading in pine by more than 80% by basal area), dead pine accounts for more than half of the total volume for live trees (all species) plus dead pine. Even in stands where pine is not the leading species, the sample suggests that pine mortality accounts for close to 20% of the total volume. A similar comparison by basal area is shown in Table 15.

Table 15: Impact of Dead Pl basal area/ha (@7.5cm+ dbh utilization), by stratum

Basal area/ha @7.5cm+ dbh utilization: Estimated VDYP7 Adjustment Impact and Dead Pine %							
Stratum	n	Wt'd Mean Phase 2 BA/ha (LIVE + Dead PL)	Wt'd Mean Phase 2 BA/ha (LIVE only)	Wt'd Mean Phase 2 DEAD PL BA/ha	Wt'd Mean Phase 1 Unadjusted BA/ha	Estimated BA/ha impact ratio based on LIVE BA/ha only	Dead pine BA/ha as a % of LIVE+ dead Pl
Mat-PL <80%	17	35.6	22.2	13.4	34.1	0.651	38%
Mat-PL 80+	45	35.9	20.1	15.8	36.4	0.553	44%
Mat-conif	28	32.1	27.5	4.7	30.2	0.908	15%
Mat-decid	9	34.4	28.2	6.3	28.3	0.994	18%

3.6 Results for the immature samples

The Phase 2 ground sampling in the Lakes TSA included establishing 15 samples in stands ≤60 years of age. This portion of the inventory population was not adjusted. However, some basal area summary statistics are provided for these samples in Table 16. Dead pine comprised about 15% of the total basal area for the immature samples. Ten of the fifteen samples in this stratum were leading in pine. The analysis indicates that the basal area in the immature samples is significantly underestimated in the inventory. However, caution is advised when interpreting this result since it may be at least partially impacted by the fact that VDYP7 will not report basal areas (or volumes) until a stand reaches certain minimum threshold values for height and quadratic mean diameter.

Table 16: Immature samples (note: immature stratum was NOT adjusted), weighted mean basal area/ha

Basal area/ha @7.5cm+ dbh utilization: Estimated VDYP7 Adjustment Impact and Dead Pine %								
Stratum	n	Wt'd Mean Phase 2 BA/ha (LIVE + Dead PL)	Wt'd Mean Phase 2 BA/ha (LIVE only)	Wt'd Mean Phase 2 DEAD PL BA/ha	Wt'd Mean Phase 1 Unadjusted BA/ha	Estimated BA/ha impact ratio (LIVE + Dead PL)	Estimated BA/ha impact ratio based on LIVE BA/ha only	Dead pine BA/ha as a % of LIVE+ dead Pl
Immature	15	19.6	16.8	2.9	7.1[19]	2.755	2.354	14.6%
Immature[20]	12	22.1	18.4	3.7	10.2	2.163	1.805	16.6%

4. CONCLUSIONS AND RECOMMENDATIONS

The analysis of the Lakes TSA VRI Phase 2 ground sampling data indicated that ages are consistently overestimated in this unit but this overestimation is typically less than 10% in the pine leading strata. In most strata, height is also overestimated. A notable exception however is the stratum where pine is leading but is <80% of the basal area. In this stratum, the sample indicated that height was underestimated by 10% or about 2m on average. The sampling error for all strata, except deciduous leading, was generally acceptable. For deciduous leading, where there were only 9 samples, the sampling error for the adjustment factors was high (between 35% and 53%).

In all strata, the adjustment is expected to increase volume, with the “Mat-PL 80+” stratum showing the smallest increase (~2%) and the “Mat-decid” stratum showing the largest increase (nearly 60%). For the larger strata, the sampling errors for the estimated volume impacts were quite small. Although the sampling error for the “Mat-decid” stratum was again high, this stratum accounts for a relatively small proportion of the area. Stakeholders should consider the relative importance of the mature deciduous leading area when assessing the risk associated with the adjustment in this stratum.

The VRI Phase 2 ground sample indicated that the VDYP7 volume in the Lakes TSA is underestimated by about 10% overall, with a sampling error of ±9.1%. This level of sampling error met the target specified in the VPIP for this unit.

By comparison, the volume impact analysis showed that VDYP6 underestimated volume by about 6% in this unit. These volume impact ratios not only reflect potential bias in the yield models but

[19] For VDYP7 to produce a basal area, a polygon must meet certain minimum thresholds in terms of height, QMD, etc. There were three immature samples for which VDYP7 did not produce a basal area. If a basal area value of zero is assumed for these samples, the mean BA/ha for immature is 7.1 m2/ha.

[20] Samples for which VDYP7 produced a non-zero basal area.

they also reflect bias in the underlying inventory attributes such as height and basal area that are required inputs for the yield model. VDYP7 relies, in part, on a different set of input attributes (e.g. basal area) compared with VDYP6 (e.g. crown closure). Hence it is important to be aware that the overall volume bias implied by the impact ratios is influenced by bias in the inventory attributes as well as the bias in the yield models themselves.

The NVAF correction in this unit indicated that the taper equations and the VRI net factoring process are performing adequately in this unit. There was minimal taper-related bias in the compiled volume estimation and net factoring was shown to provide much more accurate estimates of decay and waste compared with alternative decay estimation systems such as loss factors, particularly for dead trees. The NVAF analysis for the Lakes TSA also included testing a new sampling procedure to measure merchantable wood. It is recommended that this procedure for estimating merchantability be investigated further and refined.

Mountain Pine Beetle devastation is widespread in this unit. To facilitate the current TSR approach for representing the effect of Mountain Pine Beetle on the inventory and to ensure consistency with that approach, timber supply requested that dead pine volume be included with live volume in the adjustment. Hence the Phase 2 compiled values for all per hectare-based adjustments (i.e. basal area/ha, trees/ha, volume/ha) included dead pine. The magnitude of the dead pine component in the resulting total volumes (and basal areas etc.) was significant. In the samples where the inventory indicates “pure” pine (leading in pine by more than 80% by basal area), dead pine accounts for more than half of the total volume for live trees (all species) plus dead pine. Even in stands where pine is not the leading species, the sample suggests that pine mortality accounts for close to 20% of the total volume. In addition, many of the samples may have contained MPB attacked pine that was still green in 2006 or 2007 but which will be dead by the time the TSR process is complete. The impact of including dead pine volume in the analysis should be considered in terms of degradation of volume and value in the pine component and therefore pine volumes should not continue to be projected. Pine volume should actually be reduced according to shelf-life findings but this portion of the analysis would not be possible through existing versions of VDYP and could only be done during the TSR netdown. A process is currently being developed for dealing with the dead pine component of the inventory in a more systematic and consistent manner.

Dead pine also comprised about 15% of the total basal area (live trees of all species plus dead pine) for the immature samples. The analysis indicates that the basal area in the immature samples is significantly underestimated in the inventory. However, caution is advised when interpreting this result since it may be at least partially impacted by the fact that VDYP7 will not report basal areas (or volumes) until a stand reaches certain minimum threshold values for height and quadratic mean diameter.

5. APPENDIX A: INVENTORY AND GROUND ATTRIBUTES USED IN THE ADJUSTMENT

															PHASE I VDYP7 Inventory attributes projected to Phase II measurement year											
distr_id	PROJ_ID	SAMP_NO	map_no	polygon	poly_area	original selection strata	vol_cls	new_strata	vol_cls_area	sample_wt	meas_year	bc_lev12	inventory_standard	Unadjusted VDYP6 vol net dwb @ 12.5cm	sp01	sp02	sp03	sp04	sp05	sp06	pct1	pct2	pct3	pct4	pct5	pct6
0141-0016-QO1	0141	0016	093E089	80	17.87	Mat-PL 50-80%	0	Mat-PL < 80%	50492.83	6311.604	2007	VT	F	77.2	PL	SW	AT				60	30	10			
0141-0018-TO1	0141	0018	093K024	1163	54.4	Mat-PL 50-80%	0	Mat-PL < 80%	50492.83	6311.604	2006	VT	V	111.3	PL	SX	BL				75	23	2			
0141-0019-QO1	0141	0019	093K024	1135	64.76	Mat-PL 50-80%	0	Mat-PL < 80%	50492.83	6311.604	2007	VT	V	128.8	PL	SX	BL				55	40	5			
0141-0020-TO1	0141	0020	093L050	1199	9.46	Mat-PL 50-80%	0	Mat-PL 80+	50492.83	6311.604	2006	VT	V	159.4	PL	SX	BL				80	12	8			
0141-0021-TO1	0141	0021	093E040	279	15.5	Mat-PL 50-80%	0	Mat-PL < 80%	50492.83	6311.604	2006	VT	F	161.8	PL	SW					66	34				
0141-0022-TO1	0141	0022	093K042	381	24.36	Mat-PL 50-80%	0	Mat-PL < 80%	50492.83	6311.604	2006	VT	V	177.8	PL	SX	BL				60	35	5			
0141-0023-TO1	0141	0023	093K031	1518	23.91	Mat-PL 50-80%	0	Mat-PL 80+	50492.83	6311.604	2007	VT	V	216.3	PL	SX	AT				80	15	5			
0141-0024-QO1	0141	0024	093F073	128	16.7	Mat-PL 50-80%	1	Mat-PL 80+	56760.73	6306.748	2007	VT	F	231.1	PL	SW					77	23				
0141-0026-QO1	0141	0026	093F061	750	28.36	Mat-PL 50-80%	1	Mat-PL 80+	56760.73	6306.748	2007	VT	F	249.1	PL	SW					78	22				
0141-0028-QO1	0141	0028	093F061	312	250.05	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2007	VT	F	258	PL	SW					68	32				
0141-0029-TO1	0141	0029	093K035	652	1.09	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2006	VT	V	262.2	PL	SX					75	25				
0141-0030-TO1	0141	0030	093F072	1361	3.65	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2007	VT	V	271.1	PL	SX	AT				70	20	10			
0141-0031-QO1	0141	0031	093F061	157	50.28	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2007	VT	F	279.8	PL	SW					67	33				
0141-0033-QO1	0141	0033	093F042	304	81.41	Mat-PL 50-80%	2	Mat-PL 80+	67458.92	8432.365	2007	VT	F	314.8	PL	BL	SW				77	11	12			
0141-0034-QO1	0141	0034	093F053	596	7.1	Mat-PL 50-80%	2	Mat-PL < 80%	67458.92	8432.365	2007	VT	F	315.6	PL	SW					66	34				
0141-0035-TO1	0141	0035	093K034	1004	11.67	Mat-PL 50-80%	2	Mat-PL < 80%	67458.92	8432.365	2006	VT	V	314	PL	SX	BL				55	35	10			
0141-0037-TO1	0141	0037	093F084	607	55.34	Mat-PL 50-80%	2	Mat-PL 80+	67458.92	8432.365	2006	VT	F	326.6	PL	SW					77	23				
0141-0038-QO1	0141	0038	093L040	238	20.91	Mat-PL 50-80%	2	Mat-PL 80+	67458.92	8432.365	2007	VT	F	331.3	PL	SW					77	23				
0141-0039-QO1	0141	0039	093E098	916	19.08	Mat-PL 50-80%	2	Mat-PL 80+	67458.92	8432.365	2007	VT	F	339.4	PL	S					77	23				
0141-0042-QO1	0141	0042	093E040	111	576.07	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	F	98.9	PL	SW					90	10				
0141-0043-TO1	0141	0043	093F085	577	3.54	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2006	VT	F	103.3	PL	SW					83	17				
0141-0044-QO1	0141	0044	093K033	1164	19.51	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	V	117.5	PL	SX					98	2				
0141-0045-TO1	0141	0045	093F083	1099	22.17	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2006	VT	V	162.1	PL						100					
0141-0046-QO1	0141	0046	093F054	802	14.92	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	F	170.4	PL	SW					83	17				
0141-0047-QO1	0141	0047	093K033	829	9.82	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	V	170.9	PL	SX					99	1				
0141-0048-TO1	0141	0048	093E040	136	100.42	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2006	VT	F	178.5	PL	SW					90	10				
0141-0049-TO1	0141	0049	093F061	304	3.6	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2006	VT	F	184.7	PL						100					
0141-0050-QO1	0141	0050	093F063	298	48.76	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	F	101.1	PL						100					
0141-0051-QO1	0141	0051	093F073	1920	9.25	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	V	203.6	PL	SX					90	10				
0141-0052-TO1	0141	0052	093F032	31	58.35	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2006	VT	F	223.4	PL	SW					84	16				
0141-0053-QO1	0141	0053	093L010	1481	2.22	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	255.5	PL						100					
0141-0054-TO1	0141	0054	093K021	1545	7.59	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2006	VT	V	253.6	PL	SX					85	15				
0141-0055-QO1	0141	0055	093K034	759	12.81	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	259.7	PL	SX	BL				85	10	5			
0141-0058-QO1	0141	0058	093E060	307	4.43	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	F	270.8	PL						100					
0141-0059-QO1	0141	0059	093F061	227	255.51	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	F	278.6	PL	SW					89	11				
0141-0060-TO1	0141	0060	093L050	105	25.97	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2006	VT	F	275.9	PL	SW					88	12				
0141-0064-QO1	0141	0064	093F053	485	7.12	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	300.9	PL	SW					89	11				
0141-0065-TO1	0141	0065	093K032	547	19.1	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	301.5	PL	SW					88	12				
0141-0067-QO1	0141	0067	093F051	360	72.01	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	326.7	PL						100					
0141-0069-TO1	0141	0069	093F051	661	66.3	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2006	VT	F	330.4	PL						100					
0141-0070-QO1	0141	0070	093F051	86	101.45	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	331.8	PL						100					
0141-0076-QO1	0141	0076	093K042	637	11.34	Mat-misc	0	Mat-conif	81589.54	6276.118	2007	VT	V	0	SB	PL					85	15				
0141-0077-QO1	0141	0077	093K052	824	2.63	Mat-misc	0	Mat-conif	81589.54	6276.118	2007	VT	V	29.1	SB	SX	PL				70	20	10			
0141-0079-QO1	0141	0079	093K035	762	74.37	Mat-misc	0	Mat-decid	81589.54	6276.118	2007	VT	V	96.5	AT	SX	AC	PL	EP		50	20	10	10	10	
0141-0083-QO1	0141	0083	093F053	226	4.97	Mat-misc	0	Mat-PL < 80%	81589.54	6276.118	2007	VT	F	94.1	PL	S	AT				35	32	33			
0141-0085-QO1	0141	0085	093K073	177	1.7	Mat-misc	0	Mat-conif	81589.54	6276.118	2007	VT	V	127	SX						100					
0141-0087-TO1	0141	0087	093K034	1122	3.09	Mat-misc	0	Mat-conif	81589.54	6276.118	2006	VT	V	150	BL	SX	PL				85	10	5			
0141-0088-TO1	0141	0088	093F074	378	27.81	Mat-misc	0	Mat-decid	81589.54	6276.118	2006	VT	F	150.4	AT	SW					68	32				
0141-0089-QO1	0141	0089	093F053	128	6.72	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	F	154.8	S	PL					80	20				
0141-0090-TO1	0141	0090	093F073	1977	8.7	Mat-misc	1	Mat-decid	95295.28	6806.806	2006	VT	V	157.8	AT	PL	SX				85	10	5			
0141-0093-TO1	0141	0093	093F082	175	3.87	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	F	168.5	SW	SB					50	50				
0141-0094-QO1	0141	0094	093K025	728	24.36	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	V	178.9	SX	PL	BL				50	30	20			
0141-0095-TO1	0141	0095	093L050	48	13.46	Mat-misc	1	Mat-decid	95295.28	6806.806	2007	VT	F	181.2	AT	SW	PL	EP			39	32	17	12		
0141-0096-TO1	0141	0096	093K023	207	40.53	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	F	188.5	BL	SW	PL				65	26	9			
0141-0097-QO1	0141	0097	093K001	560	17.63	Mat-misc	1	Mat-decid	95295.28	6806.806	2007	VT	F	202.9	AT	SW	PL				69	22	9			
0141-0098-QO1	0141	0098	093L049	111	5.91	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	F	235.4	S	PL					75	25				
0141-0099-QO1	0141	0099	093K061	775	12.97	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	V	241.4	SX	BL					55	45				
0141-0100-TO1	0141	0100	093K035	788	10.56	Mat-misc	1	Mat-conif	95295.28	6806.806	2006	VT	V	249.9	SX	PL	BL				65	20	15			
0141-0102-QO1	0141	0102	093K071	118	13.67	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	V	257.2	SX	SB					60	40				
0141-0103-QO1	0141	0103	093F073	1135	6.21	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	280.6	SX	PL					55	45				
0141-0104-QO1	0141	0104	093K031	1479	16	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	298.6	SX	AT	PL				50	40	10			
0141-0105-QO1	0141	0105	093K072	278	12.6	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	293.2	SX	PL	AT				55	40	5			
0141-0106-QO1	0141	0106	093K062	449	30.6	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	294.7	SX	BL	AT	PL			90	5	4	1		
0141-0107-TO1	0141	0107	093F055	64	8.04	Mat-misc	2	Mat-PL < 80%	105745.6	8134.274	2006	VT	F	306.7	SW	PL					55	45				
0141-0108-QO1	0141	0108	093K035	257	49.63	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	309.8	SX	PL	BL				50	25	25			
0141-0109-QO1	0141	0109	093K035	257	49.63	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	309.8	SX	PL	BL				50	25	25			
0141-0110-QO1	0141	0110	093E099	274	21.48	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	F	322.9	SW	PL	AT				51	28	21			
0141-0111-QO1	0141	0111	093F042	446	105.65	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	F	333.1	SW	PL					64	36				
0141-0112-TO1	0141	0112	093L010	256	13.67	Mat-misc	2	Mat-conif	105745.6	8134.274	2006	VT	F	350.6	SW	PL					73	27				
0141-0114-QO1	0141	0114	093L050	75	30.58	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	F	358.6	SW	PL	AT				62	27	11			
0141-0115-QO1	0141	0115	093F073	1142	5.88	Mat-misc	2	Mat-conif	105745.6	8134.274	2007	VT	V	375.5	SX	BL	PL				80	15	5			
0141-0131-TO1	0141	0131	093F084	548	94.15	Mat-PL 50-80%	0	Mat-PL 80+	50492.83	6311.604	2007	VT	F	100.1	PL	SW					78	22				
0141-0139-QO1	0141	0139	093E030	121	37.48	Mat-PL 50-80%	1	Mat-PL 80+	56760.73	6306.748	2007	VT	F	244.4	PL	SW					77	23				
0141-0140-QO1	0141	0140	093E090	397	62.91	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2007	VT	F	0	PL	SW					60	40				
0141-0141-QO1	0141	0141	093F075	681	7.48	Mat-PL 50-80%	1	Mat-PL < 80%	56760.73	6306.748	2007	VT	F	252.1	PL	SW					55	45				
0141-0149-TO1	0141	0149	093K044	634	29.43	Mat-PL 50-80%	2	Mat-PL 80+	67458.92	8432.365	2006	VT	V	324.1	PL	SX					80	20				
0141-0151-QO1	0141	0151	093F074	650	11.39	Mat-PL 50-80%	2	Mat-PL < 80%	67458.92	8432.365	2007	VT	F	342.8	PL	SW					55	45				
0141-0156-QO1	0141	0156	093K023	282	10.27	Mat-PL 80+%	0	Mat-PL 80+	74316.35	6756.031	2007	VT	F	43.2	PL	BL					92	8				
0141-0167-TO1	0141	0167	093K024	1233	82.69	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	211.4	PL	SX					98	2				
0141-0168-QO1	0141	0168	093K043	655	74.93	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	203.5	PL	SX					98	2				
0141-0170-TO1	0141	0170	093E098	464	14.01	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2006	VT	F	214.6	PL	S					89	11				
0141-0171-QO1	0141	0171	093K053	544	6.17	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	212	PL	SX					95	5				
0141-0172-TO1	0141	0172	093K025	807	36.06	Mat-PL 80+%	1	Mat-PL 80+	78689.03	6557.419	2007	VT	V	229.4	PL	SX					90	10				
0141-0179-QO1	0141	0179	093F084	49	11.81	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	295.2	PL	SW					89	11				
0141-0182-TO1	0141	0182	093L040	158	18.39	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	318.8	PL						100					
0141-0186-QO1	0141	0186	093K083	336	51.73	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	V	340.6	PL	SX	AT				88	8	4			
0141-0187-TO1	0141	0187	093L050	47	53.67	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	356.9	PL	SW					88	12				
0141-0190-QO1	0141	0190	093F075	18	3.88	Mat-PL 80+%	2	Mat-PL 80+	88605.66	7383.805	2007	VT	F	428	PL						100					
0141-0191-TO1	0141	0191	093L050	156	19.85	Mat-misc	0	Mat-conif	81589.54	6276.118	2006	VT	F	0	SB						100					

	PHASE I VDYP7 Inventory attributes projected to Phase II measurement year												Compiled ground sample data -- January 2008				
distr_id	Ref_yr	V7_age1 projected to meas yr=2006	V7_ht1 projected to meas yr=2006	V7_age2 projected to meas yr=2006	V7_ht2 projected to meas yr=2006	V7_ba @7.5 projected to meas yr	V7_tph @7.5 projected to meas yr	init_ba	init_tph	V7 vol_dw_125 unadjusted (meas yr)	V7 vol_dwb_125 unadjusted (meas yr)	V7_vol_dw_125_2006_after STAGE 1 adjustment Jan/08	NO_PLOT (number of plots compiled for the sample)	SPB_CPCT @4cm+dbh	BA_HA @4cm+dbh	STEMS_HA @4cm+dbh	QMD @4cm+dbh
0141-0016-QO1	1965	72	13.56	.	.	15.6191	1342.95			34.4	33.6	36.8	4	S 100	1.75	36.52198	24.7
0141-0018-TO1	1997	69	15.37	74	17.8	25.316	1262.15	23	1300	111.3	109.1	127.8	5	Pl 100	22	1170.077	15.47245
0141-0019-QO1	1997	75	16.38	75	17	24.8363	1274.58	23	1350	108.3	106.1	131.7	5	Pl 33 Sx 33 At 17 Bl 17	10.8	401.4384	18.50791
0141-0020-TO1	1996	150	16.44	145	17	26.8205	998.11	26	1000	121.7	119.2	108.9	5	Pl 50 Bl 38 Sx 12	16	1246.442	12.78436
0141-0021-TO1	1989	97	17.67			26.2098	1183.06			132.6	129.9	150.2	3	Sb 50 Pl 25 Sw 25	9.333333	2293.395	7.198367
0141-0022-TO1	1996	66	19.02	84	19	41.6506	753.14	38	806	253.4	248.2	305.3	5	Pl 72 Bl 17 Sx 11	40.6	1206.041	20.70318
0141-0023-TO1	1997	160	19.39	150	19	41.0845	1001.74	41	1000	240.8	235.3	233.1	5	Sw 65 At 20 Bl 10 Pl 05	36	1947.581	15.34117
0141-0024-QO1	1989	128	21.12			31.5512	1017.31			212.1	207.6	188.9	5	Sw 80 Pl 20	6.25	495.3208	12.67511
0141-0026-QO1	1989	218	22.39			41.5936	1136.13			285.8	279.6	268.4	5	Sw 71 Bl 21 Pl 08	33.6	1663.773	16.03532
0141-0028-QO1	1989	158	20.75			40.8634	1379.34			259.5	254	319	5	Sw 73 Bl 27	39.6	1744.667	16.9999
0141-0029-TO1	1997	119	21.61	119	22.2	38.7368	825.53	38	870	274	268.3	336.2	3	Bl 73 Pl 20 Sx 07	35	3730.847	10.92912
0141-0030-TO1	1998	134	22.48	119	25.1	38.4951	840.06	38	870	278.7	272.1	336.3	5	At 47 Sw 33 Pl 20	18.75	814.4427	17.12085
0141-0031-QO1	1989	118	22.32			41.242	1277.63			300.9	294.6	362.5	5	Sw 50 Bl 42 Pl 08	28.8	1330.213	16.60316
0141-0033-QO1	1989	218	25.37			44.6764	1110.04			348.9	341.1	329.8	5	Sw 80 Pl 20	14	429.9581	20.36132
0141-0034-QO1	1989	168	23.64			40.6595	1164.45			302.6	296.1	358.8	5	Bl 80 Sw 20	9	383.9211	17.27648
0141-0035-TO1	1997	217	25.68	217	29.5	64.9503	1028.09	65	1035	525.1	513.5	636.5	5	Sx 60 Bl 36 Pl 04	35	1074.886	20.36142
0141-0037-TO1	1989	187	25.48			42.7868	1081.77			347.3	339.8	328.6	3	Bl 80 Sx 20	20	2631.706	9.836745
0141-0038-QO1	1990	157	25.69			39.8063	963.93			338.7	331.5	311.6	5	Pl 57 Sw 43	9.8	1724.448	8.506346
0141-0039-QO1	1991	136	24.88			43.6865	1206.98			361	353.4	335.2	5	Ac 50 S 50	3.6	1206.611	6.163433
0141-0042-QO1	1989	178	15.62			32.4966	1758.55			113.4	111.1	97.1	5	Bl 67 Pl 33	5.4	124.8944	23.46284
0141-0043-TO1	1989	72	14.59			23.35	1678.7			71.6	70.2	54.2	3	Pl 67 Sx 33	28	1906.751	13.67373
0141-0044-QO1	1997	80	15.23	80	15.8	35.9766	953.21	34	1010	170.1	166.6	160.7	5	Pl 55 Sx 35 Bl 10	48	7484.481	9.036387
0141-0045-TO1	1998	80	17			43.5848	4686.09	42	5100	84.6	82.9	54	3	Sx 86 Pl 14	32.66667	4248.892	9.893948
0141-0046-QO1	1989	98	18.8			24.274	978.81			140.2	137.3	122	5		0	0	0
0141-0047-QO1	1996	76	19.09	76	18.2	33.9303	1012.64	32	1100	208.3	204.1	188.9	5	Pl 100	21	1166.783	15.13804
0141-0048-TO1	1989	117	17.21			33.5485	1609.85			153.8	150.6	131	4	Bl 80 Pl 20	8.75	1756.167	7.964824
0141-0049-TO1	1989	107	17.42			35.3781	1789.14			161.6	158.3	138.2	3	Sx 55 Pl 45	60	4951.608	12.42103
0141-0050-QO1	1989	73	14.72			20.4521	1453.64			65	63.6	47.8	5	Pl 57 S 43	14	1281.208	11.79531
0141-0051-QO1	1998	124	18.55	114	19.2	30.7452	936.59	30	970	181.2	177.4	166.6	5	Pl 50 Sx 50	5	211.8271	17.33602
0141-0052-TO1	1976	171	19.64			36.1748	1314.93			205.7	201.4	190	4	Bl 93 Sx 07	31.5	1145.717	18.70991
0141-0053-QO1	1996	91	22.22			37.5459	892.57	36	970	282.4	276.5	263.7	5	Pl 84 Sx 16	26.6	2211.189	12.37608
0141-0054-TO1	1997	124	20.54	124	21.1	42.8026	1094.53	42	1140	287.6	281.5	269.5	3	Pl 100	51	2094.677	17.60685
0141-0055-QO1	1997	190	22.28	190	21.8	34.1576	848.05	34	850	236.4	231.3	230	5	Sx 53 Bl 41 Pl 06	40.8	672.5985	27.79119
0141-0058-QO1	1965	160	20.59			38.1595	1434.66		1236	237.9	232.9	221.1	5	Pl 57 Sw 43	9.8	385.3922	17.99354
0141-0059-QO1	1989	118	21.31			44.1217	1623.65			297.6	291.4	272.1	5	Pl 100	18	2171.169	10.27412
0141-0060-TO1	1990	146	22.76			33.5662	963.55			249.9	244.6	224.6	5	Sx 80 Pl 20	21	510.2333	22.89182
0141-0064-QO1	1989	138	22.98			39.1137	1189.97			293.5	287.3	271.7	5	Sw 89 Pl 11	21.6	2185.662	11.21735
0141-0065-TO1	1990	197	24.44			39.6217	1018.96			306.2	299.5	286.8	5	Bl 82 Sx 14 Pl 04	39.6	2770.28	13.4909
0141-0067-QO1	1989	148	22.85			47.8132	1524			356.5	349	329.1	5	Sw 80 Pl 20	9	169.3539	26.0123
0141-0069-TO1	1990	210	25.37			43.8148	1079.59		594	354.9	347	335.1	5	Sx 83 Pl 17	16.8	655.6623	18.06216
0141-0070-QO1	1965	149	23.33			41.1768	1235.89			313.5	306.9	295.8	5	Pl 65 Sw 35	30.6	949.7565	20.25395
0141-0076-QO1	1996	101	6.76	101	16.8	12	1088.05	12	1250	16.3	16	0	5	Sb 75 Sx 25	24	1605.228	13.79724
0141-0077-QO1	1998	149	12.7	144	25.9	7.2007	499.04	7	520	16	15.7	13.4	5	Bl 50 Sx 31 Sb 19	16	1577.151	11.36523
0141-0079-QO1	1997	130	16.7	105	22.5	26.9153	802.54	26	883	101.1	96.6	115.4	5	Sx 63 At 25 Ep 12	8	118.4738	29.32168
0141-0083-QO1	1989	73	15.77			22.2874	1350.52			75.2	73.1	85.1	5	S 48 Sb 29 Pl 23	37.8	2380.296	14.21954
0141-0085-QO1	1996	116	17.7			14.8869	437.52	14	450	67.2	65.8	64.8	5	Pl 75 Ep 25	4	226.9571	14.98005
0141-0087-TO1	1997	109	16.29	109	26.3	33.5462	1698.41	30	1800	128.5	125.8	119.7	3	Bl 85 Sx 15	39	1698.785	17.09693
0141-0088-TO1	1989	147	23.1			23.2523	451.07			115.1	109.1	122.4	4	Ac 93 Sx 07	49	462.9412	36.71049
0141-0089-QO1	1989	168	26.8			2.2116	41.47			19.1	18.7	18	5	Sx 100	11.63859	1100.74	11.60281
0141-0090-TO1	1998	108	22.77	123	21.4	37.9345	892.58	36	970	188.5	178.2	205.9	2	At 83 Sx 17	30	1416.714	16.42005
0141-0093-TO1	1989	128	19.6			6.6021	235.11			37.5	36.7	34.5	5	Sx 100	16	1431.108	11.93106
0141-0094-QO1	1997	65	19.57	65	16.5	39.5862	1302.14	34	1400	217	212.6	201.9	5	Pl 52 Sx 45 Bl 03	55.8	3113.998	15.10473
0141-0095-TO1	1990	107	22.75			28.266	737.01			171.6	165.3	185.7	5	Sw 81 At 12 Ac 04 Pl 03	46.8	1232.647	21.98663
0141-0096-TO1	1990	207	20.2			34.216	1119.25			175.6	171.8	181.9	5	Bl 88 Sw 12	35	1559.914	16.90202
0141-0097-QO1	1989	128	25.45			34.3327	636.73			205.5	195.4	229.1	5	Sw 69 At 31	31.2	1401.166	16.83789
0141-0098-QO1	1991	91	22.71			31.5689	1033.92			210.8	206.5	205.4	5	S 69 Pl 25 Ep 06	22.4	2321.574	11.08378
0141-0099-QO1	1996	161	25.15	106	16.3	33.0177	783.58	33	820	177.2	173.4	170.9	5	Pl 47 Sx 35 Bl 18	23.8	1075.392	16.7865
0141-0100-TO1	1997	153	23.03	165	22.8	28.5956	491.73	28	496	192.3	188.2	196.4	5	Sx 65 Bl 35	30.6	670.2221	24.11051
0141-0102-QO1	1997	145	25.18	170	19.3	28.1658	705.41	28	750	187.3	183.4	186.8	5	Sb 100	44.8	4692.294	11.02558
0141-0103-QO1	1997	145	24.2	155	23.4	33.9397	789.19	33	820	259.7	254.3	255.4	5	Sx 100	9.108	681.87	13.04115
0141-0104-QO1	1997	150	29.04	140	26.5	44.7604	478.29	44	500	340	328.1	356.9	5	S 87 At 13	27	655.5483	22.89995
0141-0105-QO1	1996	186	25.97	171	24.3	35.7598	842.11	36	850	268.4	262.3	277.1	5	Bl 44 Sx 39 Ac 11 Pl 06	43.2	1030.653	23.10152
0141-0106-QO1	1998	129	27.19	109	21.1	39.5785	565.22	39	600	301.5	294.9	304.8	5	Pl 57 Sx 36 At 07	25.2	1005.597	17.86255
0141-0107-TO1	1989	157	24.7			40.0423	950.82			324.4	317.5	373	2	Sx 45 Ep 36 Ac 19	49.5	981.2707	25.34331
0141-0108-QO1	1998	144	26.04	144	24.4	38.7675	839.14	38	870	296.9	290.5	300.2	5	Bl 68 Sx 32	34.2	1130.141	19.62916
0141-0109-QO1	1998	144	26.04	144	24.4	38.7675	839.14	38	870	296.9	290.5	300.2	5	Sx 84 Bl 12 Pl 04	45	674.5109	29.14519
0141-0110-QO1	1989	168	30.62			34.9608	530.77			307.1	298.5	313.9	5	S 89 Ac 05 Sw 06	26.6	412.743	28.64547
0141-0111-QO1	1965	202	26.65			43.3633	1116.21			319.2	312.4	380.5	5	Sw 67 Bl 22 Pl 11	25.2	2598.705	11.11161
0141-0112-TO1	1989	167	28.62			38.0853	722.68			329	322.1	329.4	5	Sx 100	41.4	771.0005	26.14736
0141-0114-QO1	1990	167	29.58			40.4225	731.18			354.6	345.9	366.2	5	Sw 71 Ep 21 Ac 08	25.2	312.1294	32.06181
0141-0115-QO1	1997	125	33.27	110	24.2	40.3869	302.89	40	300	380.7	372.5	395.4	5	Sx 95 Bl 05	25	1188.733	16.36375
0141-0131-TO1	1990	70	14.38			24.9082	1869.18		10833	71.3	69.9	55.4	5	Pl 65 Sw 35	0.79544	35.02353	17.00508
0141-0139-QO1	1989	108	21.56			36.8096	1272.37			253.2	247.9	227.3	5	Sw 56 Pl 22 At 22	32.4	1910.753	14.6935
0141-0140-QO1	1988	42	12.82			13.1228	1300.13		3711	23.1	22.6	26.2	5	Pl 63 S 37	24	1911.925	12.64228
0141-0141-QO1	1991	155	21.38			35.3985	1135.79			229.9	225	272.6	5	Sw 100	12.5	504.7796	17.75657
0141-0149-TO1	1998	128	25.46	128	26.9	40.4839	863.67	40	900	357.2	349.7	340.1	5	Sx 48 Pl 31 Bl 21	52.2	6354.373	10.22713
0141-0151-QO1	1989	158	26.73			37.9999	813.15			329.7	322.7	392.6	5	Sw 60 Bl 40	6.25	71.17985	33.43617
0141-0156-QO1	1990	97	11.45			17.905	1650.91			24.6	24.1	17	5	Bl 86 S 10 Pl 04	29.4	7648.282	6.995951
0141-0167-TO1	1997	75	20.51	75	21.2	40.1027	1018.11	38	1100	274.1	268.5	259	5	Pl 89 Cw 11	1.532812	75.05043	16.12586
0141-0168-QO1	1996	106	19.91	111	22.6	24.9735	812.65	24	870	160.9	157.6	150.5	5	Pl 100	37.8	1997.242	15.52336
0141-0170-TO1	1991	75	20.4			35.6524	1590.34			221.5	217	192.6	2	Pl 100	10.5	315.9871	20.56909
0141-0171-QO1	1996	91	21.2	86	22.1	25.2936	809.33	24	870	178.9	175.2	164.7	5	Pl 100	46.8	1689.718	18.77893
0141-0172-TO1	1997	80	22.39	80	23.1	29.6462	801.17	28	860	228.9	224.2	212.2	5	Pl 40 Sx 40 Bl 20	6.25	238.7373	18.25723
0141-0179-QO1	1991	192	23.54			41.0534	1176.85			301.8	295.2	289.5	5	Bl 75 Sw 19 Pl 06	22.4	2272.46	11.20291
0141-0182-TO1	1990	117	24.25			39.4354	1126.15			324.6	317.8	300.3	5	Pl 72 Sx 28	22.5	1251.14	15.13189
0141-0186-QO1	1996	130	26.63	101	25.2	42.2871	648.51	42	689	370	361.8	356	5	Sx 47 At 29 Pl 24	23.8	381.359	28.1888
0141-0187-TO1	1990	147	27.81			35.0256	693.24			335.8	328.7	309.6	5	Sw 100	7	603.8498	12.14897
0141-0190-QO1	1989	198	30.44			45.0649	802.1			459.5	449.3	432.4	5	S 100	10.8	210.8008	25.54059
0141-0191-TO1	1990	126	9.16			0.2113	18.64			0.3	0.3	2.8	5	Sb 100	11	3015.809	6.814743

Compiled ground sample data -- January 2008

SAMP_NO	SPB_CPCT @7.5cm+dbh	TOTAL LIVE BA_HA + dead PL only @7.5cm+dbh	BA_HA LIVE @7.5cm+dbh	BA_HA @7.5cm+dbh FOR DEAD PL	TOTAL LIVE STEMS_HA + dead PL ONLY @7.5cm+dbh	STEMS_HA LIVE @7.5cm+dbh	STEMS_HA @7.5cm+dbh FOR DEAD PL	QMD @7.5cm+dbh	SPB_CPCT @12.5cm+dbh	BA_HA @12.5cm+dbh	STEMS_HA @12.5cm+dbh
0016	S 100	12.25	1.75	10.5	206.6832	36.52198	170.1613	24.7	S 100	1.75	36.52198
0018	Pl 100	37	22	15	1487.274	1170.077	317.1967	15.47245	Pl 100	19	819.7292
0019	Pl 33 Sx 33	28.8	10.8	18	662.931	401.4384	261.4926	18.50791	Pl 40 Sx 40	9	142.0641
0020	Pl 53 Bl 33	20	15	5	738.8967	644.7221	94.17452	17.21133	Pl 62 Bl 23	13	296.6132
0021	Sb 50 Sw 5	46.66667	4.666667	42	1631.144	185.7546	1445.389	17.88499	Sb 50 Sw 5	4.666667	185.7546
0022	Pl 72 Bl 17	47.6	40.6	7	1353.373	1206.041	147.3313	20.70318	Pl 71 Bl 18	39.2	1068.881
0023	Sw 63 At 2	34.2	34.2		1030.848	1030.848		20.55279	Sw 61 At 2	32.4	806.1808
0024	Sw 100	38.75	5	33.75	957.3763	170.5148	786.8615	19.32231	Sw 100	5	170.5148
0026	Sw 71 Bl 2	50.4	33.6	16.8	1893.109	1663.773	229.3361	16.03532	Sw 67 Bl 2	28.8	748.9446
0028	Sw 73 Bl 2	52.2	39.6	12.6	2002.942	1744.667	258.2748	16.9999	Sw 78 Bl 2	32.4	818.6849
0029	Bl 67 Pl 25	28	28		1373.865	1373.865		16.10876	Bl 64 Pl 27	25.66667	932.0307
0030	At 47 Sw 3	33.75	18.75	15	1179.659	814.4427	365.2161	17.12085	Sw 42 At 3	15	378.1733
0031	Sw 50 Bl 4	28.8	28.8		1330.213	1330.213		16.60316	Sw 60 Bl 3	24	705.8846
0033	Sw 80 Pl 2	32.2	14	18.2	792.3616	429.9581	362.4035	20.36132	Sw 80 Pl 2	14	429.9581
0034	Bl 80 Sw 2	36	9	27	983.082	383.9211	599.1609	17.27648	Bl 80 Sw 2	9	383.9211
0035	Sx 63 Bl 33	33.6	33.6		731.0323	731.0323		24.19115	Sx 65 Bl 30	32.2	533.5214
0037	Bl 67 Sx 33	48	12	36	1607.978	541.4575	1066.52	16.79823	Bl 67 Sx 33	12	541.4575
0038	Sw 50 Pl 5	22.4	8.4	14	889.027	664.0461	224.9808	12.69099	Pl 67 Sw 3	4.2	69.42407
0039	S 100	37.8	1.8	36	908.5	211.8927	696.6073	10.4		0	0
0042	Bl 67 Pl 33	34.2	5.4	28.8	538.4909	124.8944	413.5965	23.46284	Bl 67 Pl 33	5.4	124.8944
0043	Pl 73 Sx 27	25.66667	25.66667		992.3488	992.3488		18.14712	Pl 73 Sx 27	25.66667	992.3488
0044	Pl 73 Sx 27	48	36	12	2564.104	2199.93	364.1748	14.43451	Pl 73 Sx 27	26.4	1213.884
0045	Sx 92 Pl 08	28	28		2560.844	2560.844		11.79893	Sx 100	9.333333	503.8201
0046		16.8	0	16.8	630.139	0	630.139	0		0	0
0047	Pl 100	30.8	21	9.8	1458.254	1166.783	291.4712	15.13804	Pl 100	18.2	880.9396
0048	Bl 100	35	7	28	2433.303	605.2533	1828.049	12.13488	Bl 100	3.5	129.4882
0049	Sx 53 Pl 47	57	57		3890.575	3890.575		13.65795	Pl 58 Sx 42	36	1181.62
0050	Pl 54 S 46	27	13	14	1604.282	1035.598	568.6839	12.64245	Pl 50 S 50	8	333.7892
0051	Pl 50 Sx 50	30	5	25	844.0187	211.8271	632.1916	17.33602	Sx 67 Pl 33	3.75	104.8969
0052	Bl 93 Sx 07	31.5	31.5		1145.717	1145.717		18.70991	Bl 91 Sx 09	31.5	1145.717
0053	Pl 83 Sx 17	43.4	25.2	18.2	2537.505	1762.074	775.4306	13.49408	Pl 93 Sx 07	21	1222.964
0054	Pl 100	51	51		2094.677	2094.677		17.60685	Pl 100	48	1601.428
0055	Sx 53 Bl 41	52.8	40.8	12	854.9882	672.5985	182.3897	27.79119	Sx 53 Bl 41	40.8	672.5985
0058	Pl 57 Sw 4	30.8	9.8	21	841.4466	385.3922	456.0545	17.99354	Pl 50 Sw 5	8.4	257.3733
0059	Pl 100	43.2	14.4	28.8	2150.933	1015.43	1135.503	13.43728	Pl 100	12.6	781.5938
0060	Sx 80 Pl 20	21	21		510.2333	510.2333		22.89182	Sx 80 Pl 20	21	510.2333
0064	Sw 88 Pl 1	52.8	19.2	33.6	2522.582	1336.836	1185.747	13.5228	Sw 86 Pl 1	16.8	859.3707
0065	Bl 85 Sx 10	43.2	36	7.2	1849.097	1743.03	106.0671	16.21638	Bl 81 Sx 12	28.8	750.4045
0067	Sw 80 Pl 2	45	9	36	883.7961	169.3539	714.4422	26.0123	Sw 80 Pl 2	9	169.3539
0069	Sx 83 Pl 17	23.8	16.8	7	736.0371	655.6623	80.37476	18.06216	Sx 89 Pl 11	12.6	234.9838
0070	Pl 65 Sw 3	54	30.6	23.4	1807.732	949.7565	857.9757	20.25395	Pl 65 Sw 3	30.6	949.7565
0076	Sb 74 Sx 2	23	23		1274	1274		15.16122	Sb 65 Sx 3	17	634.2954
0077	Bl 57 Sx 36	15	14	1	678.8899	669.6394	9.250438	16.31543	Bl 58 Sx 42	12	391.8054
0079	Sx 63 At 2	10	8	2	136.4894	118.4738	18.01554	29.32168	Sx 63 At 2	8	118.4738
0083	S 50 Sb 30	43.2	36	7.2	2051.932	1925.658	126.2736	15.42825	S 56 Sb 31	28.8	1107.849
0085	Pl 75 Ep 2	21	4	17	467.9056	226.9571	240.9485	14.98005	Pl 67 Ep 3	3	128.9855
0087	Bl 85 Sx 15	39	39		1698.785	1698.785		17.09693	Bl 85 Sx 15	39	1698.785
0088	Ac 93 Sx 0	49	49		462.9412	462.9412		36.71049	Ac 93 Sx 0	49	462.9412
0089	Sx 100	9.999183	9.999183		420.2824	420.2824		17.40471	Sx 100	8.120174	120.0807
0090	At 83 Sx 1	30	30		1416.714	1416.714		16.42005	At 80 Sx 2	25	816.6389
0093	Sx 100	12	12		233.425	233.425		25.58421	Sx 100	12	233.425
0094	Pl 52 Sx 45	61.2	55.8	5.4	3930.982	3113.998	816.9842	15.10473	Pl 55 Sx 41	52.2	2661.725
0095	Sw 81 At 1	46.8	46.8		1232.647	1232.647		21.98663	Sw 79 At 1	43.2	839.6721
0096	Bl 88 Sw 1	35	35		1559.914	1559.914		16.90202	Bl 87 Sw 1	32.2	1130.992
0097	Sw 69 At 3	31.2	31.2		1401.166	1401.166		16.83789	Sw 64 At 3	26.4	807.3198
0098	S 62 Pl 31	18.2	18.2		728.1263	728.1263		17.83969	S 58 Pl 33	16.8	530.6154
0099	Pl 50 Sx 38	22.4	22.4		596.3445	596.3445		21.86908	Pl 53 Sx 40	21	446.3121
0100	Sx 65 Bl 35	30.6	30.6		670.2221	670.2221		24.11051	Sx 69 Bl 31	28.8	303.0003
0102	Sb 100	37.8	37.8		2137.172	2137.172		15.00656	Sb 100	30.8	1087.002
0103	Sx 100	23.276	8.096	15.18	633.2256	433.3132	199.9124	15.42373	Sx 100	6.072	153.8655
0104	S 87 At 13	27	27		655.5483	655.5483		22.89995	S 86 At 14	25.2	435.2647
0105	Bl 44 Sx 39	43.2	43.2		1030.653	1030.653		23.10152	Sx 44 Bl 38	38.4	454.5813
0106	Pl 57 Sx 36	36	25.2	10.8	1277.471	1005.597	271.8744	17.86255	Pl 67 Sx 25	21.6	601.4401
0107	Sx 45 Ep 3	49.5	49.5		981.2707	981.2707		25.34331	Sx 45 Ep 3	49.5	981.2707
0108	Bl 68 Sx 32	41.4	34.2	7.2	1275.257	1130.141	145.116	19.62916	Bl 68 Sx 32	34.2	1130.141
0109	Sx 84 Bl 12	63	45	18	1091.2	674.5109	416.6887	29.14519	Sx 84 Bl 12	45	674.5109
0110	S 89 Ac 05	30.8	26.6	4.2	448.9298	412.743	36.1868	28.64547	S 89 Ac 05	26.6	412.743
0111	Sw 67 Bl 2	36.4	21	15.4	1049.194	828.1347	221.0594	17.9686	Sw 71 Bl 2	19.6	638.6846
0112	Sx 100	41.4	41.4		771.0005	771.0005		26.14736	Sx 100	39.6	532.3676
0114	Sw 71 Ep 2	30.6	25.2	5.4	417.771	312.1294	105.6416	32.06181	Sw 71 Ep 2	25.2	312.1294
0115	Sx 95 Bl 05	33.75	23.75	10	995.7287	863.9273	131.8014	18.7089	Sx 94 Bl 06	20	351.6568
0131	Pl 65 Sw 3	3.802142	0.79544	3.006702	125.0841	35.02353	90.06052	17.00508	Pl 62 Sw 3	0.749605	30.02017
0139	Sw 56 Pl 2	32.4	32.4		1910.753	1910.753		14.6935	Sw 43 Pl 2	25.2	942.4662
0140	Pl 68 S 32	22	22		1249.47	1249.47		14.97282	Pl 65 S 35	17	777.1369
0141	Sw 100	42.5	12.5	30	1360.879	504.7796	856.0992	17.75657	Sw 100	10	128.7046
0149	Sx 48 Pl 36	45	45		3342.336	3342.336		13.09291	Pl 64 Sx 29	25.2	823.5937
0151	Sw 60 Bl 4	28.75	6.25	22.5	422.4993	71.17985	351.3195	33.43617	Sw 60 Bl 4	6.25	71.17985
0156	Bl 75 S 17	16.8	16.8		2195.028	2195.028		9.871647	Bl 33 Pl 33	4.2	255.4753
0167	Pl 89 Cw 1	4.85214	1.532812	3.319328	155.1042	75.05043	80.05379	16.12586	Pl 88 Cw 1	1.39472	60.04034
0168	Pl 100	61.2	37.8	23.4	3295.392	1997.242	1298.15	15.52336	Pl 100	32.4	1379.583
0170	Pl 100	38.5	10.5	28	870.3125	315.9871	554.3254	20.56909	Pl 100	10.5	315.9871
0171	Pl 100	46.8	46.8		1689.718	1689.718		18.77893	Pl 100	43.2	1252.659
0172	Pl 40 Sx 40	28.75	6.25	22.5	574.1424	238.7373	335.4052	18.25723	Pl 40 Sx 40	6.25	238.7373
0179	Bl 71 Sw 2	54.6	19.6	35	2122.548	1158.833	963.7154	14.67482	Bl 80 Pl 10	14	400.8495
0182	Pl 76 Sx 24	56.25	21.25	35	1981.02	952.4822	1028.538	16.85412	Pl 81 Sx 19	20	742.2102
0186	Sx 47 At 2	40.6	23.8	16.8	628.8764	381.359	247.5174	28.1888	Sx 47 At 2	23.8	381.359
0187	Sw 100	29.4	5.6	23.8	333.2732	124.8024	208.4709	23.90219	Sw 100	5.6	124.8024
0190	S 100	12.6	10.8	1.8	239.2156	210.8008	28.41489	25.54059	S 100	10.8	210.8008
0191	Sb 100	5	5		350.3604	350.3604		13.47977	Sb 100	3	106.9185

SAMP_NO	QMD @12.5cm+dbh	SPB_CPCT @17.5cm+dbh	BA_HA @17.5cm+dbh	STEMS_HA @17.5cm+dbh	QMD @17.5cm+dbh	NVL_NW2 @12.5cm+dbh ALL SPP LIVE + DEAD PL	nvl_nw2_125	PL_dead_nvaf_nw2_125	NVL_NWB @12.5cm+dbh ALL SPP LIVE + DEAD PL	nvl_nwb_125	PL_dead_nvaf_nwb_125
0016	24.7	S 100	1.75	36.52198	24.7	100.338	7.938	92.39997	98.33046	7.779	90.55146
0018	17.17895	Pl 100	8	248.2535	20.25594	228.0237	120.588	107.4357	223.462	118.175	105.287
0019	28.40103	Pl 40 Sx 40	9	142.0641	28.40103	262.9024	81.361	181.5414	257.6423	79.733	177.9093
0020	23.62281	Pl 73 Bl 18	11	206.3029	26.05546	108.5295	97.56	10.96949	106.1402	95.608	10.53219
0021	17.88499	Sw 100	2.333333	63.67653	21.6	270.753	25.448	245.305	265.3379	24.939	240.3989
0022	21.60894	Pl 74 Bl 19	37.8	1002.606	21.90967	378.2946	315.487	62.80757	370.7216	309.168	61.55361
0023	22.62098	Sw 56 At 2	28.8	566.5997	25.43977	231.197	231.197		225.671	225.671	
0024	19.32231	Sw 100	3.75	83.18699	23.95758	329.0331	36.572	292.4611	322.3521	35.84	286.5121
0026	22.1272	Sw 73 Bl 1	26.4	621.7531	23.25134	373.2624	202.376	170.8864	365.7935	198.326	167.4675
0028	22.44756	Sw 86 Bl 1	25.2	465.8613	26.24382	339.3424	236.802	102.5404	332.55	232.061	100.489
0029	18.72512	Bl 57 Pl 43	16.33333	369.4014	23.72702	172.457	172.457		169.004	169.004	
0030	22.4727	At 36 Sw 3	13.75	307.4378	23.86315	238.2633	99.947	138.3163	232.878	97.329	135.549
0031	20.80625	Sw 67 Bl 2	21.6	527.8195	22.82649	159.054	159.054		155.87	155.87	
0033	20.36132	Sw 88 Pl 1	11.2	235.7769	24.59311	257.6107	98.744	158.8667	252.3577	96.767	155.5907
0034	17.27648	Bl 67 Sw 3	5.4	154.572	21.09048	290.3042	47.421	242.8832	284.4962	46.472	238.0242
0035	27.72088	Sx 65 Bl 30	32.2	533.5214	27.72088	285.394	285.394		279.68	279.68	
0037	16.79823		0	0	0	329.4015	65.675	263.7265	322.813	64.361	258.452
0038	27.75394	Pl 67 Sw 3	4.2	69.42407	27.75394	171.4968	39.865	131.6318	168.0655	39.067	128.9985
0039	0		0	0	0	343.5645	0	343.5645	336.685	0	336.685
0042	23.46284	Bl 67 Pl 33	5.4	124.8944	23.46284	370.1684	36.937	333.2314	362.76	36.198	326.562
0043	18.14712	Pl 71 Sx 29	16.33333	419.4512	22.26649	155.815	155.815		152.698	152.698	
0044	16.64058	Pl 86 Sx 14	16.8	547.04	19.77426	226.4619	159.043	67.41892	221.931	155.861	66.07003
0045	15.35804	Sx 100	2.333333	65.48287	21.3	43.26	43.26		42.393	42.393	
0046	0		0	0	0	133.7951	0	133.7951	131.1183	0	131.1183
0047	16.21876	Pl 100	7	265.7518	18.31327	190.4405	116.745	73.69553	186.6312	114.41	72.22115
0048	18.55129	Bl 100	1.75	22.03403	31.8	90.60791	17.391	73.21691	88.79357	17.041	71.75257
0049	19.69552	Pl 67 Sx 33	27	767.9621	21.15763	261.133	261.133		255.909	255.909	
0050	17.46883	S 100	4	60.97712	28.90025	144.4515	51.475	92.97649	141.5489	50.444	91.10492
0051	21.33484	Sx 67 Pl 33	3.75	104.8969	21.33484	226.2942	26.654	199.6402	221.7448	26.121	195.6238
0052	18.70991	Bl 91 Sx 09	24.75	624.137	22.46998	203.629	203.629		199.55	199.55	
0053	14.78624	Pl 67 Sx 33	4.2	150.426	18.85464	234.9838	114.974	120.0098	230.2828	112.674	117.6088
0054	19.53538	Pl 100	36	829.4446	23.50783	366.113	366.113		358.789	358.789	
0055	27.79119	Sx 56 Bl 38	38.4	561.7053	29.50302	486.8435	371.212	115.6315	477.0951	363.777	113.3181
0058	20.38511	Sw 60 Pl 4	7	175.9938	22.50377	235.3176	57.243	178.0746	230.6101	56.098	174.5121
0059	14.32682	Pl 100	1.8	55.07092	20.4	273.0377	76.692	196.3457	267.5761	75.158	192.4181
0060	22.89182	Sx 77 Pl 23	18.2	285.6761	28.48091	214.059	214.059		209.777	209.777	
0064	15.77682	Sw 100	4.8	139.2358	20.95078	334.5978	93.468	241.1298	327.9039	91.598	236.3059
0065	22.10567	Bl 79 Sx 14	25.2	552.2332	24.10427	320.1064	244.085	76.02141	313.6894	239.196	74.49338
0067	26.0123	Sw 80 Pl 2	9	169.3539	26.0123	397.7754	82.85	314.9254	389.8055	81.192	308.6135
0069	26.12892	Sx 89 Pl 11	12.6	234.9838	26.12892	157.517	94.242	63.275	154.3115	92.302	62.0095
0070	20.25395	Pl 54 Sw 4	23.4	571.4542	22.83349	408.9512	225.679	183.2722	400.7698	221.164	179.6058
0076	18.47284	Sb 50 Sx 5	12	299.3146	22.59341	105.601	105.601		103.488	103.488	
0077	19.74742	Sx 63 Bl 37	8	147.0826	26.31597	98.06943	88.842	9.227432	96.10588	87.063	9.042884
0079	29.32168	Sx 63 At 2	8	118.4738	29.32168	90.45975	69.171	21.28875	88.33289	67.47	20.86289
0083	18.19328	S 100	16.2	387.9554	23.058	226.8211	175.589	51.23207	222.2626	172.075	50.18763
0085	17.20859	Ep 50 Pl 5	2	57.0063	21.13531	189.9926	12.665	177.3276	186.1319	12.352	173.7799
0087	17.09693	Bl 71 Sx 29	21	574.151	21.58001	230.6	230.6		225.984	225.984	
0088	36.71049	Ac 93 Sx 0	49	462.9412	36.71049	321.665	321.665		308.152	308.152	
0089	29.34277	Sx 100	7.803226	100.0672	31.50984	69.621	69.621		68.227	68.227	
0090	19.74286	At 75 Sx 2	20	451.2694	23.75484	120.966	120.966		116.783	116.783	
0093	25.58421	Sx 100	12	233.425	25.58421	93.294	93.294		91.426	91.426	
0094	15.80188	Pl 56 Sx 44	16.2	472.2387	20.8993	290.507	290.507	0	284.695	284.695	0
0095	25.59423	Sw 77 At 1	39.6	681.0678	27.20868	364.974	364.974		356.476	356.476	
0096	19.0394	Bl 79 Sw 2	19.6	396.6197	25.08395	209.892	209.892		205.688	205.688	
0097	20.40489	Sw 57 At 4	16.8	253.9477	29.02268	156.912	156.912		152.834	152.834	
0098	20.07797	S 63 Pl 25	11.2	228.5484	24.979	112.962	112.962		110.598	110.598	
0099	24.47628	Pl 54 Sx 46	18.2	305.2943	27.55062	178.173	178.173		174.605	174.605	
0100	34.78802	Sx 69 Bl 31	28.8	303.0003	34.78802	299.625	299.625		293.627	293.627	
0102	18.99395	Sb 100	22.4	602.5639	21.75592	194.227	194.227		190.339	190.339	
0103	22.4156	Sx 100	5.06	101.5908	25.18275	210.3795	45.849	164.5305	206.167	44.931	161.236
0104	27.15055	S 86 At 14	25.2	435.2647	27.15055	230.705	230.705		225.655	225.655	
0105	32.79555	Sx 47 Bl 33	36	330.6097	37.23476	381.123	381.123		372.676	372.676	
0106	21.38384	Pl 67 Sx 22	16.2	320.4477	25.37079	288.0745	179.038	109.0365	281.9514	175.096	106.8554
0107	25.34331	Ep 40 Sx 4	45	631.565	30.11982	323.522	323.522		312.886	312.886	
0108	19.62916	Bl 71 Sx 29	25.2	643.0077	22.33815	283.2594	222.302	60.95742	277.5085	217.85	59.65851
0109	29.14519	Sx 83 Bl 13	43.2	587.1831	30.60625	585.7782	439.34	146.4382	573.9666	430.546	143.4206
0110	28.64547	S 89 Ac 06	25.2	346.4679	30.43153	288.3202	240.485	47.83522	282.2867	235.419	46.8677
0111	19.76696	Sw 60 Bl 3	14	294.6803	24.59481	306.4199	144.481	161.9389	300.282	141.583	158.699
0112	30.77492	Sx 100	39.6	532.3676	30.77492	376.106	376.106		368.579	368.579	
0114	32.06181	Sw 71 Ep 2	25.2	312.1294	32.06181	257.0832	236.102	20.98116	250.7324	230.211	20.52137
0115	26.90981	Sx 93 Bl 07	18.75	283.668	29.01019	333.5875	202.745	130.8425	326.9087	198.687	128.2217
0131	17.83054	Pl 53 Sw 4	0.594612	20.01345	19.44961	27.75905	4.647	23.11205	27.20365	4.554	22.64965
0139	18.45111	At 50 Sw 3	14.4	400.8095	21.38786	144.505	144.505		140.801	140.801	
0140	16.68902	Pl 78 S 22	9	264.0279	20.83298	101.997	101.997		99.956	99.956	
0141	31.45271	Sw 100	10	128.7046	31.45271	330.615	87.847	242.768	324	86.089	237.911
0149	19.7378	Pl 73 Sx 18	19.8	471.4386	23.12465	194.076	194.076		190.192	190.192	
0151	33.43617	Sw 60 Bl 4	6.25	71.17985	33.43617	283.4066	71.399	212.0076	277.7326	69.971	207.7616
0156	14.46789	Pl 100	1.4	56.8973	17.7	15.428	15.428		15.119	15.119	
0167	17.19796	Pl 79 Cw 2	0.79588	25.01681	20.12625	41.01765	10.3	30.71765	40.16915	10.066	30.10315
0168	17.29234	Pl 100	19.8	659.0046	19.55886	335.2946	209.419	125.8756	328.5864	205.229	123.3574
0170	20.56909	Pl 100	10.5	315.9871	20.56909	382.8711	93.549	289.3221	375.2136	91.678	283.5356
0171	20.95465	Pl 100	32.4	676.226	24.69913	361.407	361.407		354.177	354.177	
0172	18.25723	Sx 67 Pl 33	3.75	106.4048	21.18313	242.1993	36.926	205.2733	237.3545	36.188	201.1665
0179	21.08766	Bl 89 Pl 11	12.6	339.8893	21.72559	371.9418	95.869	276.0728	364.4946	93.949	270.5456
0182	18.5228	Pl 85 Sx 15	16.25	553.3427	19.3368	420.0295	137.477	282.5525	411.6257	134.726	276.8997
0186	28.1888	Sx 47 At 2	23.8	381.359	28.1888	382.3801	205.724	176.6561	373.8448	200.723	173.1218
0187	23.90219	Sw 100	4.2	38.83907	37.1061	357.9678	50.129	307.8388	350.8051	49.125	301.6801
0190	25.54059	S 100	9	81.23825	37.55744	126.8841	107.982	18.90212	124.3451	105.821	18.52408
0191	18.90119	Sb 100	3	106.9185	18.90119	16.369	16.369		16.041	16.041	

Height and Age Case Matching (smy_cs.csv from January 4, 2008)

SAMP_NO	Grd lead @ 4cm+dbh	Phase II ht/age comments (e.g. Sp1=sp2; age but no height; etc.)	AGE_TLS	HT_TLS	N_AG_TLS	N_HT_TLS	V7 lead SP01	V7 sp02	V7 case for match	V7 age for ratio (AGE1 or AGE2 depending on case)	V7 ht for ratio (HT1 or HT2 depending on case)	Phase 2 AGE_TLS for ratio	Phase 2 HT_TLS for ratio
0016	S		49.57112	13.7	1	1	PL	SW	3	72	13.56	49.57112	13.7
0018	PLI		52.13901	17.4	4	4	PL	SX	1	69	15.37	52.13901	17.4
0019	S		59.71793	20.9	1	1	PL	SX	2	75	17	59.71793	20.9
0020	PLI		142.1195	15.06667	3	3	PL	SX	1	150	16.44	142.1195	15.06667
0021	SB		133.7654		1	0	PL	SW	3	97	.	133.7654	.
0022	PLI		65.29828	27.225	4	4	PL	SX	1	66	19.02	65.29828	27.225
0023	SW		71.04981	22	5	5	PL	SX	2	150	19	71.04981	22
0024	S		143.8216	26.5	1	1	PL	SW	3	128	21.12	143.8216	26.5
0026	SW		182.8052	21.075	4	4	PL	SW	3	218	22.39	182.8052	21.075
0028	SW		94.35279	20.125	5	4	PL	SW	3	158	20.75	94.35279	20.125
0029	BL		147.7187	17.25	2	2	PL	SX	3	119	21.61	147.7187	17.25
0030	AT		81.79035	18.66667	0	0	PL	SX	5	.	.	.	.
0031	SW		92.36907	17.42	5	5	PL	SW	3	118	22.32	92.36907	17.42
0033	S		222.3992	20.82	5	5	PL	BL	1	218	25.37	222.3992	20.82
0034	BL		141.184	23.025	4	4	PL	SW	1	168	23.64	141.184	23.025
0035	SX		176.0813	24.6	3	3	PL	SX	2	217	29.5	176.0813	24.6
0037	BL		219.6459	18.1	1	1	PL	SW	3	187	25.48	219.6459	18.1
0038	PLI	S	123.7813	22.3	1	1	PL	SW	1	157	25.69	123.7813	22.3
0039	AC				0	0	PL	S	5	.	.	.	.
0042	BL		105.1401	20.1	1	1	PL	SW	3	178	15.62	105.1401	20.1
0043	PLI		69.97201	19.33333	3	3	PL	SW	1	72	14.59	69.97201	19.33333
0044	PLI		71.2188	19.175	4	4	PL	SX	1	80	15.23	71.2188	19.175
0045	SX		160.5774	15.7	1	1	PL		3	80	17	160.5774	15.7
0046	MSG	PL	51.88415	13.15	2	2	PL	SW	1	98	18.8	51.88415	13.15
0047	PLI		75.89188	17.54	5	5	PL	SX	1	76	19.09	75.89188	17.54
0048	BL		148.3987	12.95	2	2	PL	SW	3	117	17.21	148.3987	12.95
0049	SX		102.0239	25.2	1	1	PL		3	107	17.42	102.0239	25.2
0050	PLI		72.94718	13.34	5	5	PL		1	73	14.72	72.94718	13.34
0051	PLI		61.76489	17.4	1	1	PL	SX	1	124	18.55	61.76489	17.4
0052	BL		178.6197	19.03333	4	3	PL	SW	1	171	19.64	178.6197	19.03333
0053	PLI		69.0056	18.675	4	4	PL		1	91	22.22	69.0056	18.675
0054	PLI		113.4541	21.73333	3	3	PL	SX	1	124	20.54	113.4541	21.73333
0055	SX	TIE	233.1933	22.85	5	4	PL	SX	2	190	21.8	233.1933	22.85
0058	PLI		120.3949	16.85	3	2	PL		1	160	20.59	120.3949	16.85
0059	PLI		101.763	18	5	5	PL	SW	1	118	21.31	101.763	18
0060	SX		124.7884	30.15	2	2	PL	SW	3	146	22.76	124.7884	30.15
0064	Sw		120.3242	19.875	4	4	PL	SW	3	138	22.98	120.3242	19.875
0065	BL		118.9828	19.38	5	5	PL	SW	3	197	24.44	118.9828	19.38
0067	SW		138.0406	25.16667	3	3	PL		3	148	22.85	138.0406	25.16667
0069	SX		194.0039	20.13333	3	3	PL		3	210	25.37	194.0039	20.13333
0070	PLI		134.0115	19.225	3	4	PL		1	149	23.33	134.0115	19.225
0076	SB		122.5865	13.275	5	4	SB	PL	1	101	6.76	122.5865	13.275
0077	SB		186.1096	20	1	1	SB	SX	3	149	12.7	186.1096	20
0079	SX		77.7584	18.55	2	2	AT	SX	2	105	22.5	77.7584	18.55
0083	S		140.9976	20.5	1	2	PL	S	3	73	15.77	140.9976	20.5
0085	PLI		121.6704	21.425	5	4	SX		3	116	17.7	121.6704	21.425
0087	BL		107.2682	18.2	3	3	BL	SX	1	109	16.29	107.2682	18.2
0088	ACT		145.7533	32.25	2	2	AT	SW	1	147	23.1	145.7533	32.25
0089	SX		72.41476	12.54	5	5	S	PL	1	168	26.8	72.41476	12.54
0090	AT		46.18161	10.05	2	2	AT	PL	1	108	22.77	46.18161	10.05
0093	SX		168.5973	20.225	4	4	SW	SB	1	128	19.6	168.5973	20.225
0094	PLI		54.09207	16.18	5	5	SX	PL	2	65	16.5	54.09207	16.18
0095	SW		110.4861	28.025	4	4	AT	SW	5	.	.	.	.
0096	BL		228.2073	19.225	4	4	BL	SW	1	207	20.2	228.2073	19.225
0097	SW		98.5236	21.5	2	2	AT	SW	5	.	.	.	.
0098	S		82.47218	18.1	4	4	S	PL	1	91	22.71	82.47218	18.1
0099	PLI		101.2022	22.76667	4	3	SX	BL	3	161	25.15	101.2022	22.76667
0100	SX		220.5966	32.75	4	4	SX	PL	1	153	23.03	220.5966	32.75
0102	SB		190.1336	16.625	5	4	SX	SB	2	170	19.3	190.1336	16.625
0103	Sx		144.6597	19.84	2	5	SX	PL	1	145	24.2	144.6597	19.84
0104	S		109.5468	24.65	4	4	SX	AT	1	150	29.04	109.5468	24.65
0105	BL		132.7664	25.65	4	4	SX	PL	3	186	25.97	132.7664	25.65
0106	PLI		153.034	25.73333	3	3	SX	BL	3	129	27.19	153.034	25.73333
0107	SX		137.73	37.7	1	1	SW	PL	1	157	24.7	137.73	37.7
0108	BL		132.9012	20.15	4	4	SX	PL	3	144	26.04	132.9012	20.15
0109	SX		123.0364	29.9	5	4	SX	PL	1	144	26.04	123.0364	29.9
0110	S		67.1219	24.8	2	2	SW	PL	1	168	30.62	67.1219	24.8
0111	SW	TIE	135.9245	19.55	2	2	SW	PL	1	202	26.65	135.9245	19.55
0112	SX		166.3385	27.16	5	5	SW	PL	1	167	28.62	166.3385	27.16
0114	SW		112.162	32.63333	3	3	SW	PL	1	167	29.58	112.162	32.63333
0115	SX		129.4486	33.6	3	2	SX	BL	1	125	33.27	129.4486	33.6
0131	PL		67.14753	20.5	3	2	PL	SW	1	70	14.38	67.14753	20.5
0139	SW		98.06608	17.55	4	4	PL	SW	3	108	21.56	98.06608	17.55
0140	PLI		44.9616	15.7	4	4	PL	SW	1	42	12.82	44.9616	15.7
0141	Sw		119.2584	25.5	3	2	PL	SW	3	155	21.38	119.2584	25.5
0149	SX		94.46981	20.23333	3	3	PL	SX	2	128	26.9	94.46981	20.23333
0151	Sw		141.45	32.3	1	1	PL	SW	3	158	26.73	141.45	32.3
0156	BL		83.49155	9.26	5	5	PL	BL	3	97	11.45	83.49155	9.26
0167	PL		73.80715	23.34	5	5	PL	SX	1	75	20.51	73.80715	23.34
0168	PLI		109.5802	18.6	5	5	PL	SX	1	106	19.91	109.5802	18.6
0170	PLI		68.0981	25.5	1	1	PL	S	1	75	20.4	68.0981	25.5
0171	PLI		96.43809	21.56	5	5	PL	SX	1	91	21.2	96.43809	21.56
0172	PLI		69.49325	18.75	4	4	PL	SX	1	80	22.39	69.49325	18.75
0179	BL		183.1661	20.13333	1	1	PL	SW	1	192	23.54	183.1661	20.13333
0182	PL		144.0147	22.36	5	5	PL		1	117	24.25	144.0147	22.36
0186	Sx		116.1965	28.06	5	5	PL	SX	2	101	25.2	116.1965	28.06
0187	S	PL	96.77599	26	4	4	PL	SW	1	147	27.81	96.77599	26
0190	S		225.7123	32.85	3	2	PL		3	198	30.44	225.7123	32.85
0191	SB		138.5159	11.42	5	5	SB		1	126	9.16	138.5159	11.42

clstr_id	PROJ_ID	SAMP_NO	map_no	polygon	Feature ID	poly_area	original selection strata	vol_cls	new_strata	vol_cls_area	sample_wt	meas_year	bc_lev12	inventory_standard	Unadjusted VDYP6 vol net dwb @ 12.5cm
0141-0194	0141	0194	093K044	383	972EACEA4	70.45	Mat-misc	0	Mat-decid	81589.54	6276.118	2006	VT	V	34.7
0141-0197	0141	0197	093K012	505	8FD7812F4	16.37	Mat-misc	0	Mat-decid	81589.54	6276.118	2007	VT	F	114
0141-0198	0141	0198	093L030	1342	710DFB924	9.77	Mat-misc	0	Mat-PL < 8(	81589.54	6276.118	2007	VT	V	118.2
0141-0199	0141	0199	093K004	25	5ACB874F4	65.55	Mat-misc	0	Mat-decid	81589.54	6276.118	2007	VT	F	128.3
0141-0200	0141	0200	093F053	246	1AAC1C694	5.36	Mat-misc	0	Mat-conif	81589.54	6276.118	2007	VT	F	131.5
0141-0205	0141	0205	093F082	410	66B2EA794	188.09	Mat-misc	1	Mat-conif	95295.28	6806.806	2006	VT	F	169
0141-0207	0141	0207	093L040	1307	19DF08374	2.49	Mat-misc	1	Mat-conif	95295.28	6806.806	2007	VT	V	97.5
0141-0208	0141	0208	093L049	1245	6C74FF464	9.3	Mat-misc	1	Mat-decid	95295.28	6806.806	2007	VT	F	182.6
0141-0218	0141	0218	093K035	79	DCADA3F3	12.14	Mat-misc	2	Mat-conif	105745.6	8134.274	2006	VT	V	277.2
0141-0294	0141	0294	093K011	742	F6431CEA4	19.83	Mat-PL 80+	2	Mat-PL 80+	88605.66	7383.805	2007	VT	V	303.9
IMMATURE DATA															
0141-0001	0141	0001	093F073	163	311577634438C086B6		Immature	0	Immature	36711.67	7342.333	2007	VT	F	
0141-0003	0141	0003	093K041	217	06CED22B497C9B7D6		Immature	0	Immature	36711.67	7342.333	2007	VT	V	
0141-0004	0141	0004	093L029	177	810B8E2C4C8237E0EA		Immature	0	Immature	36711.67	7342.333	2007	VT	F	
0141-0005	0141	0005	093L050	225	2002215E4566829E93		Immature	0	Immature	36711.67	7342.333	2007	VT	F	
0141-0006	0141	0006	093F093	587	9D37BDBD4D8A3A4DE		Immature	1	Immature	19359.42	3871.884	2007	VT	F	
0141-0008	0141	0008	093F061	97	C4A2D0FA4A504214D		Immature	1	Immature	19359.42	3871.884	2007	VT	F	
0141-0009	0141	0009	093L030	953	7FA37F424D6000BB48		Immature	1	Immature	19359.42	3871.884	2007	VT	V	
0141-0010	0141	0010	093K023	597	3977C9B8415BA1445C		Immature	1	Immature	19359.42	3871.884	2007	VT	F	
0141-0011	0141	0011	093K023	270	C704A4C7429B54B633		Immature	2	Immature	16659.36	3331.872	2006	VT	F	
0141-0012	0141	0012	093K023	596	04E44A2943BF8CB1FE		Immature	2	Immature	16659.36	3331.872	2007	VT	F	
0141-0014	0141	0014	093F092	210	A762A7934027A58C7		Immature	2	Immature	16659.36	3331.872	2007	VT	F	
0141-0015	0141	0015	093K033	159	21BFA1734F54B79B74		Immature	2	Immature	16659.36	3331.872	2007	VT	V	
0141-0116	0141	0116	093F051	316	3270752A4244D72D9		Immature	0	Immature	36711.67	7342.333	2007	VT	F	
0141-0121	0141	0121	093K023	597	3977C9B8415BA1445C		Immature	1	Immature	19359.42	3871.884	2007	VT	F	
0141-0126	0141	0126	093E090	481	8A2288BA49D21EF8E7		Immature	2	Immature	16659.36	3331.872	2007	VT	F	

clstr_id	PHASE I VDYP7 Inventory attributes projected to Phase II measurement year												
	sp01	sp02	sp03	sp04	sp05	sp06	pct1	pct2	pct3	pct4	pct5	pct6	Ref_yr
0141-0194	AT	SX	PL				75	20	5				1998
0141-0197	AT	SW					90	10					1990
0141-0198	PL	SX	BL				50	45	5				1997
0141-0199	AT	SW					85	15					1989
0141-0200	SW	PL					55	45					1989
0141-0205	SW	PL					77	23					1989
0141-0207	SX	BL					70	30					1997
0141-0208	AT	PL	S				62	26	12				1991
0141-0218	SX	BL					90	10					1998
0141-0294	PL						100						1996
0141-0001	PL	AT	S				63	25	12				2000
0141-0003	PL	SX	BL				91	5	4				1998
0141-0004	PL						100						1981
0141-0005	PL	S					50	50					1993
0141-0006	PL	SW	BL	AT			85	8	6	1			1997
0141-0008	AT	SW					90	10					1989
0141-0009	PL	BL					60	40					1997
0141-0010	S	PL					73	27					1992
0141-0011	PL	BL	SW				70	20	10				1990
0141-0012	PL	SW					60	40					1988
0141-0014	BL	S	PL				73	20	7				1992
0141-0015	SX	PL	AT				90	8	2				1997
0141-0116	PL	SW					70	30					1988
0141-0121	S	PL					73	27					1992
0141-0126	PL						100						1979

clstr_id	v7_age1 projected to meas yr=2006	v7_ht1 projected to meas yr=2006	v7_age2 projected to meas yr=2006	v7_ht2 projected to meas yr=2006	V7_ba @7.5 projected to meas yr	V7_tph @7.5 projected to meas yr	init_ba	init_tph	V7 vol_dw_125 unadjusted (meas yr)	V7 vol_dwb_125 unadjusted (meas yr)	V7 vol_dw_125 2006 after STAGE 1 adjustment Jan/08	Compiled ground sample data -- NO_PLOT (number of plots compiled for the sample)	SPB_CPCT @4cm+dbh	BA_HA @4cm+dbh	STEMS_HA @4cm+dbh	QMD @4cm+dbh
0141-0194	83	16.98	61	20.2	14.4529	305.47	12	300	62.7	59.9	72.2	5	Pl 53 Sx 27	21	509.5684	22.90675
0141-0197	87	21.32			26.6979	721.48			127.3	120.4	133.3	5	At 100	25	949.5823	18.30875
0141-0198	113	15.7	158	17	15.9461	565.88	15	580	77.4	75.7	95.3	5	Pl 88 Bl 12	11.2	806.6963	13.29563
0141-0199	68	20.49			34.4062	1271.89			158.5	150.8	166.6	5	At 73 Sw 2	30.8	1517.783	16.07406
0141-0200	73	16.89			24.8575	1550.65			98.5	96.5	84.8	5	Sw 68 Pl 2	23.75	1233.717	15.65594
0141-0205	87	17.78			31.5424	1726.64			135.4	132.7	118.1	3	Sx 100	45	1890.93	17.40699
0141-0207	55	14.46	55	10.9	22.4523	993.94	15	850	73	71.5	63.9	5	Bl 58 Sx 42	21.6	3930.467	8.364883
0141-0208	136	23.17			27.5	615.68			156.2	149.1	169.8	5	S 89 Ep 11	12.6	1266.192	11.25617
0141-0218	198	24.68	178	21.5	39.723	875.52	40	880	270.5	264.8	277.8	3	Bl 88 Sx 12	48	3473.993	13.26359
0141-0294	112	23.84			41.0529	831.5	40	900	331.6	324.7	316.7	5	Pl 50 Bl 33	10.8	1190.72	10.74638
0141-0001	17	5.87						2878				5	Pl 59 Sx 41	8.027357	1240.834	9.075792
0141-0003	17	4.89	17	1.6			0	2181				5	Pl 96 Sx 03	13.9956	1581.062	10.61638
0141-0004	36	7			5.3527	682.18			2.4	2.4		5	Sw 92 Bl 0	12	1180.074	11.37866
0141-0005	22	6.45			5.7819	932.32		3571	0.8	0.8		5	Pl 50 S 45	20	3350.971	8.717355
0141-0006	21	6.08			4.2786	620.03		1213	1.1	1.1		5	Pl 88 Bl 06	17.204	1576.434	11.78777
0141-0008	58	13.28			2.4151	167.67			4.8	4.6		5	At 100	29.4	1439.999	16.12306
0141-0009	26	8.47	26	9	7.4981	838.99	4	2400	7.8	7.7		5	Pl 67 Sx 32	11.85818	1060.713	11.93068
0141-0010	48	11.24			8.4318	915.48		1189	11.7	11.5		5	Sw 100	7	186.7955	21.84343
0141-0011	56	12.21			13.298	1241.7			22.5	22		4	Pl 69 Sx 31	28	3148.092	10.64168
0141-0012	49	12.77			10.8525	976.82			22	21.6		5	Sw 71 Pl 2	14	2319.607	8.76621
0141-0014	59	15.7			35.0978	2023.14		7111	126	123.3		5	Sw 52 Pl 2	25	2440.147	11.42134
0141-0015	60	19.67	60	17.8	23.7719	842.96	19	850	125	122.4		5	S 48 Ac 28	52.2	2534.632	16.19321
0141-0116	21	6.08						1229				5	Pl 100	19	2368.568	10.10622
0141-0121	48	11.24			8.4318	915.48		1189	11.7	11.5		5	Bl 56 S 38	32	2211.934	13.572
0141-0126	60	12.77			11.8255	1250.81		1600	17.4	17.1		5	Pl 100	5.6	245.8062	17.03149

Compiled ground sample data -- January 2008

SAMP_NO	SPB_CPCT @7.5cm+dbh	TOTAL LIVE BA_HA + dead PL only @7.5cm+dbh	BA_HA LIVE @7.5cm+dbh	BA_HA @7.5cm+dbh FOR DEAD PL	TOTAL LIVE STEMS_HA + dead PL ONLY @7.5cm+dbh	STEMS_HA LIVE @7.5cm+dbh	STEMS_HA @7.5cm+dbh FOR DEAD PL	QMD @7.5cm+dbh	SPB_CPCT @12.5cm+dbh	BA_HA @12.5cm+dbh	STEMS_HA @12.5cm+dbh	QMD @12.5cm+dbh	SPB_CPCT @17.5cm+dbh	BA_HA @17.5cm+dbh	STEMS_HA @17.5cm+dbh	QMD @17.5cm+dbh	NVL_NW2 @12.5cm+dbh ALL SPP LIVE + DEAD PL	nvl_nw2_125	PL_dead_nvaf_nw2_125	NVL_NWB @12.5cm+dbh ALL SPP LIVE + DEAD PL	nvl_nwb_125	PL_dead_nvaf_nwb_125
0194	Pl 53 Sx 27	56	21	35	970.0773	509.5684	460.509	22.90675	Pl 57 Sx 21	19.6	377.097	25.72507	Pl 57 Sx 21	19.6	377.097	25.72507	454.82	161.66	293.16	445.0628	157.766	287.2968
0197	At 100	25	25		949.5823	949.5823		18.30875	At 100	24	831.8642	19.16613	At 100	18	494.6495	21.52497	118.022	118.022		113.076	113.076	
0198	Pl 88 Bl 12	33.6	11.2	22.4	1668.221	806.6963	861.5244	13.29563	Pl 100	9.8	489.8011	15.96093	Pl 100	1.4	43.25597	20.3	239.8533	61.387	178.4663	235.0549	60.159	174.8959
0199	At 73 Sw 2	44.8	30.8	14	1771.451	1517.783	253.6683	16.07406	At 68 Sw 3	26.6	911.8	19.27286	At 67 Sw 3	21	593.3943	21.22721	263.5735	151.164	112.4095	256.3186	146.158	110.1606
0200	Sw 68 Pl 2	36.25	23.75	12.5	1723.092	1233.717	489.3749	15.65594	Sw 69 Pl 2	20	785.0411	18.01042	Sw 88 Sx 1	10	182.0029	26.4494	213.8749	129.737	84.13791	209.5904	127.14	82.45038
0205	Sx 100	45	45		1890.93	1890.93		17.40699	Sx 100	42	1621.195	18.16194	Sx 100	21	464.3916	23.9951	274.497	274.497		269.004	269.004	
0207	Bl 67 Sx 33	19.8	16.2	3.6	1793.255	1778.587	14.668	10.76899	Bl 100	7.2	272.9625	18.32609	Bl 100	3.6	77.02958	24.39369	101.4102	51.733	49.67718	99.38255	50.697	48.68555
0208	S 88 Ep 12	18.2	11.2	7	932.4069	856.9777	75.42915	12.89969	S 83 Ep 17	8.4	287.4556	19.28898	S 67 Ep 33	4.2	46.21468	34.01651	145.3288	62.627	82.70182	142.2984	61.251	81.04739
0218	Bl 87 Sx 13	45	45		2480.31	2480.31		15.19877	Bl 83 Sx 17	36	1175.127	19.74986	Bl 75 Sx 25	24	446.6108	26.15749	251.354	251.354		246.323	246.323	
0294	Pl 75 Sx 25	28.8	7.2	21.6	751.2156	196.8674	554.3482	21.57915	Pl 75 Sx 25	7.2	196.8674	21.57915	Pl 75 Sx 25	7.2	196.8674	21.57915	252.0908	59.636	192.4548	247.0538	58.443	188.6108
0001	Pl 53 Sx 47	6.67899	6.67899		700.4707	700.4707		11.01832	Sx 66 Pl 34	2.667607	180.121	13.732		0	0	0	9.207	9.206893		9.023	9.02262	
0003	Pl 99 Sx 01	13.0918	13.0918		1200.807	1200.807		11.78198	Pl 100	4.692923	300.2017	14.10815		0	0	0	22.447	22.44714		21.998	21.99803	
0004	Sw 91 Bl 0	11	11		869.2241	869.2241		12.69362	Sw 88 Bl 1	8	313.5787	18.02299	Sw 100	4	102.7197	22.26681	39.887	39.88726		39.089	39.08902	
0005	Pl 63 S 31	16	16		1128.756	1128.756		13.4343	Pl 58 S 33	12	656.6281	15.25408	Ep 50 S 50	2	52.928	21.93448	60.007	60.00689		58.688	58.68844	
0006	Pl 88 Bl 06	16.192	16.192		1334.641	1334.641		12.42863	Pl 91 Bl 09	11.132	604.1939	15.31629	Pl 67 Bl 33	3.036	79.42524	22.06108	55.186	55.18595		54.082	54.08187	
0008	At 100	29.4	29.4		1439.999	1439.999		16.12306	At 100	28	1316.212	16.45778	At 100	9.8	307.9595	20.12896	149.434	149.4341		143.305	143.3047	
0009	Pl 70 Sx 29	11.10364	10.8214	0.282242	700.4707	680.4572	20.01345	14.22972	Pl 83 Sx 17	8.327675	360.2421	17.15615	Pl 90 Sx 10	5.296514	180.121	19.34942	45.97122	44.59409	1.377219	45.05166	43.70184	1.349664
0010	Sw 100	14	7	7	316.5156	186.7955	129.7201	21.84343	Sw 100	7	186.7955	21.84343	Sw 100	5.6	76.27808	30.57378	107.2529	51.46192	55.7909	105.1067	50.43181	54.67471
0011	Pl 71 Sx 29	24.5	24.5		1692.624	1692.624		13.57556	Pl 100	17.5	658.4943	18.39493	Pl 100	12.25	355.9016	20.93429	113.629	113.6294		111.356	111.3561	
0012	Sw 56 Pl 4	10	9	1	255.3312	230.8383	24.49291	22.28037	Sw 56 Pl 4	9	230.8383	22.28037	Sw 63 Pl 3	8	188.7839	23.22831	72.87815	66.33343	6.545153	71.42025	65.00581	6.41425
0014	Sw 52 Pl 2	40	23	17	2538.011	1927.107	610.9042	12.32725	Sw 57 Pl 3	14	645.0289	16.62377	Sw 71 Pl 2	7	234.4495	19.49752	198.0428	83.5147	114.5278	193.9805	81.74362	112.2365
0015	S 46 Ac 29	52.2	50.4	1.8	1904.336	1898.012	6.323968	18.38742	S 46 Ac 27	46.8	1492.797	19.97918	S 50 Ac 33	32.4	721.5957	23.91006	316.2584	300.3583	15.90039	308.1664	292.5842	15.58238
0116	Pl 100	22	19	3	2680.845	2368.568	312.2769	10.10622	Pl 100	1	74.19379	13.1		0	0	0	3.953161	1.184201	2.769161	3.846247	1.160517	2.685247
0121	Bl 57 S 37	38	30	8	1791.626	1530.572	261.0547	15.79752	Bl 54 S 38	26	830.6929	19.9628	Bl 50 S 40	20	488.6107	22.82909	306.6489	256.7655	49.8839	300.4939	251.625	48.86893
0126	Pl 100	23.8	5.6	18.2	936.3555	245.8062	690.5493	17.03149	Pl 100	5.6	245.8062	17.03149	Pl 100	2.8	106.9234	18.25987	156.1253	37.19125	118.9343	153.0065	36.44724	116.5595

Height and Age Case Matching (smy_cs.csv from January 4, 2008)

SAMP_NO	Grd lead @ 4cm+dbh	Phase II ht/age comments (e.g. Sp1=sp2; age but no height; etc.)	AGE_TLS	HT_TLS	N_AG_TLS	N_HT_TLS	V7 lead SP01	V7 sp02	V7 case for match	V7 age for ratio (AGE1 or AGE2 depending on case)	V7 ht for ratio (HT1 or HT2 depending on case)	Phase 2 AGE_TLS for ratio	Phase 2 HT_TLS for ratio
0194	PLI		74.37962	22.33333	3	3	AT	SX	4	61	20.2	74.37962	22.33333
0197	AT		83.03657	16.1	5	5	AT	SW	1	87	21.32	83.03657	16.1
0198	PLI		108.7242	18.76	5	5	PL	SX	1	113	15.7	108.7242	18.76
0199	AT		68.62233	20.95	4	4	AT	SW	1	68	20.49	68.62233	20.95
0200	SW		63.26465	19.325	3	4	SW	PL	1	73	16.89	63.26465	19.325
0205	SX		127.719	23.36667	3	3	SW	PL	1	87	17.78	127.719	23.36667
0207	BL		88.56821	12.9	2	1	SX	BL	2	55	10.9	88.56821	12.9
0208	S		103.5229	21.35	5	4	AT	PL	5	.	.	.	.
0218	BL		249.6316	21.5	3	2	SX	BL	2	178	21.5	249.6316	21.5
0294	PLI		81.69084	22.3	3	3	PL		1	112	23.84	81.69084	22.3
0001	PLI		19.27162	7.38	5	5	PL	AT					
0003	PLI		21.66951	8.42	5	5	PL	SX					
0004	SW		128.7257	13.875	4	4	PL						
0005	PLI		31.45124	12.04	5	5	PL	S					
0006	PLI		25.64872	8.55	5	2	PL	SW					
0008	AT		45.05923	14.22	5	5	AT	SW					
0009	PL		28.45319	9.6	1	1	PL	BL					
0010	SW		44.72851	14.46	5	5	S	PL					
0011	PLI		49.77966	14	4	4	PL	BL					
0012	SW		148.2325	18.26667	3	3	PL	SW					
0014	PL		62.55144	18.5	1	1	BL	S					
0015	S		51.91167	18.45	4	4	SX	PL					
0116	PLI		21.2319	6.9	5	5	PL	SW					
0121	BL		45.1033	7.8	1	1	S	PL					
0126	PLI		71.60781	19.7	1	1	PL						

6. APPENDIX B: DATA ISSUES

This table documents issues and assumptions regarding the Lakes TSA VRI data that were made during the course of the analysis.

Sample #	***Issue***	***Action/Resolution***
10 & 121	Polygon sampled twice.	Sampling was done with replacement so this is OK. No action necessary.
all	Pre-stratification differed from post-stratification	Sample weights were computed based on original sample selection criteria (original strata and volume classes). Weights were carried forward with samples into their new strata.
207, 140	These samples were inadvertently selected based on Rank 2 attributes (instead of rank 1).	Keep sample in original sample selection stratum for analysis.
74	Field crew indicated polygon was logged. No BA or volume on compilation.	Exclude sample as logged VN (as per Sam).
76	VDYP7 did not produce an "attribute-adjusted" volume for this sample.	Volume assigned zero in analysis.
187	PL ht and age but spp comp was S100. Looks like crews collected dead pine age/ht but no live spruce.	Discussed with Sam; decided to use dead pine ht/age.
38	no age/ht for leading pine. Site tree data collected for spruce (second spp).	Used age/ht for 2nd spruce as per Sam.
46	100% dead pine; age/ht collected on dead pine.	discussed with Sam; USE DEAD PINE HT/AGE

7. APPENDIX C: VDYP7 AGE AND HEIGHT SCATTERPLOTS (STAGE 1 ADJUSTMENT)

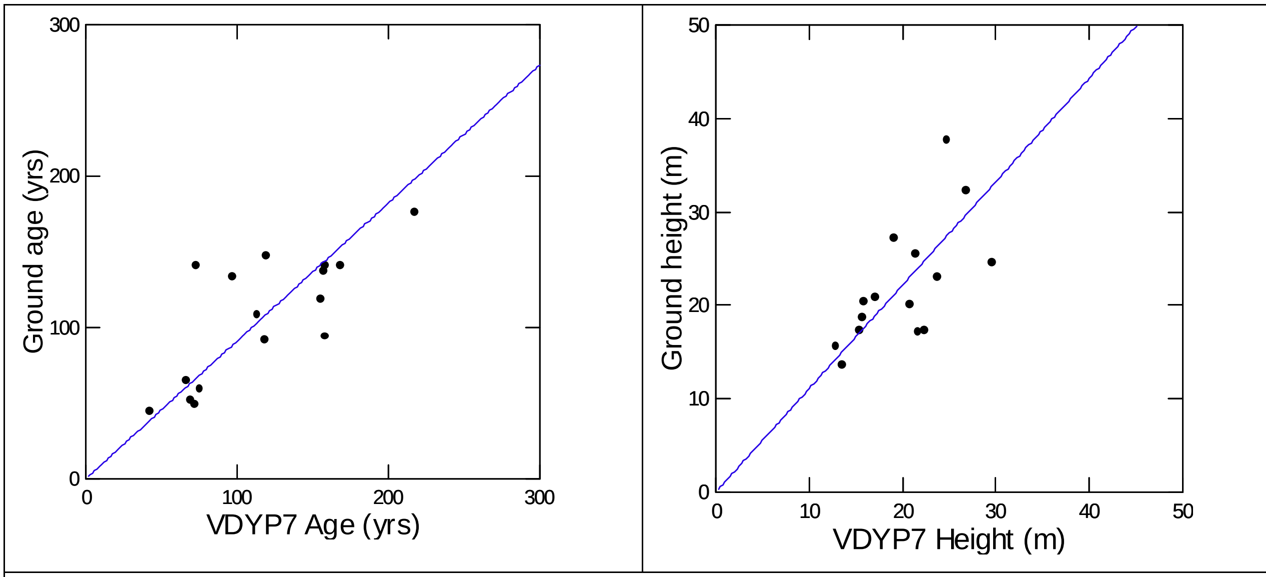


Fig. 1: Mature, Pl <80% stratum. Age and height relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

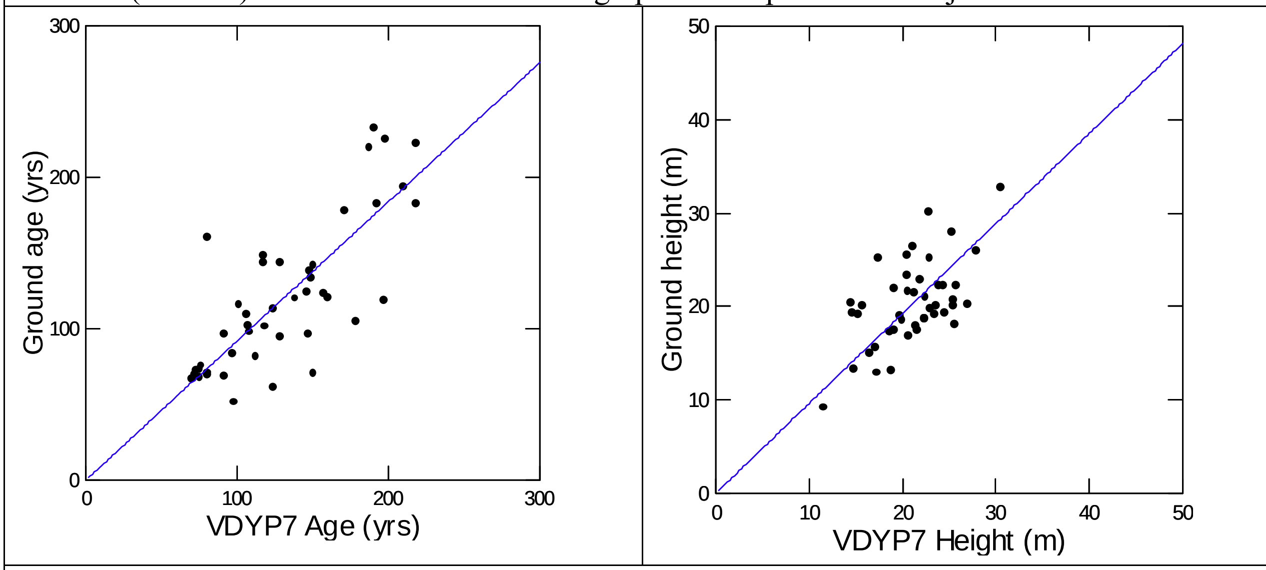


Fig. 2: Mature, Pl 80+% stratum. Age and height relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

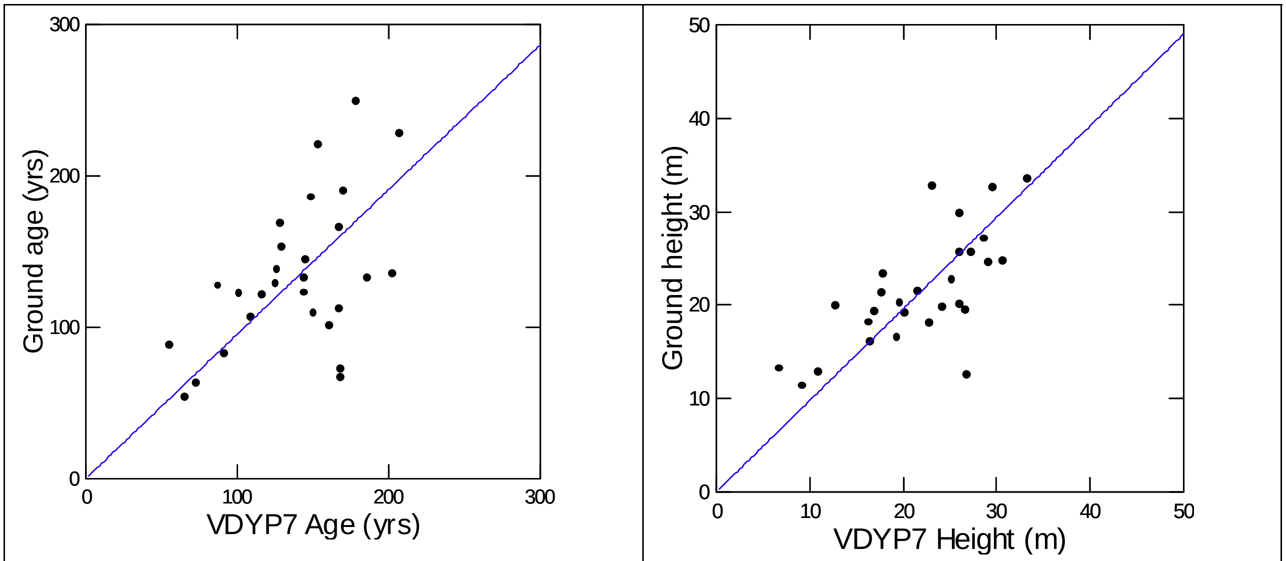


Fig. 3: Mature, other coniferous leading stratum. Age and height relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

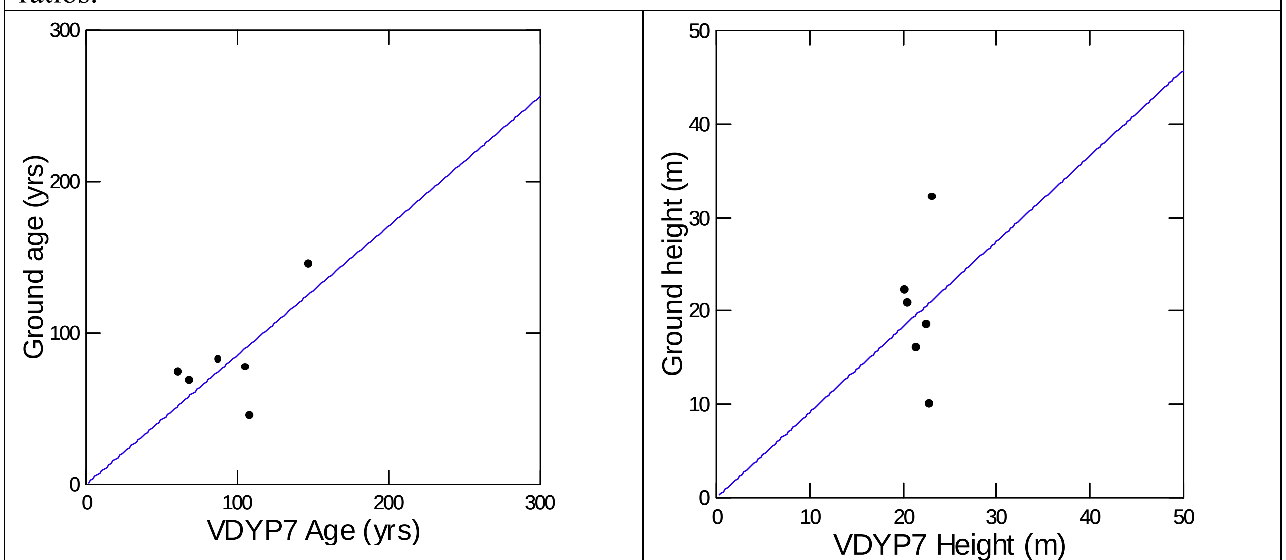


Fig. 4: Mature, deciduous leading stratum. Age and height relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

8. APPENDIX D: VDYP7 AGE AND HEIGHT RESIDUALS (STAGE 1 ADJUSTMENT)

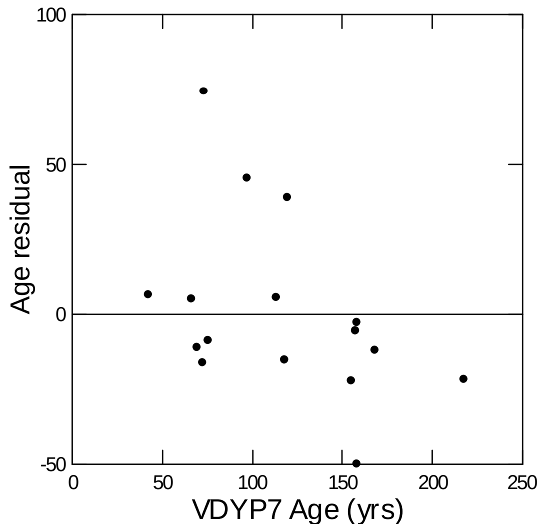


Fig. 1: Mature, Pl <80% stratum. Age residuals (Phase 2 ground age – adjusted Phase 1 inventory age) versus unadjusted VDYP7 (Phase 1) age.

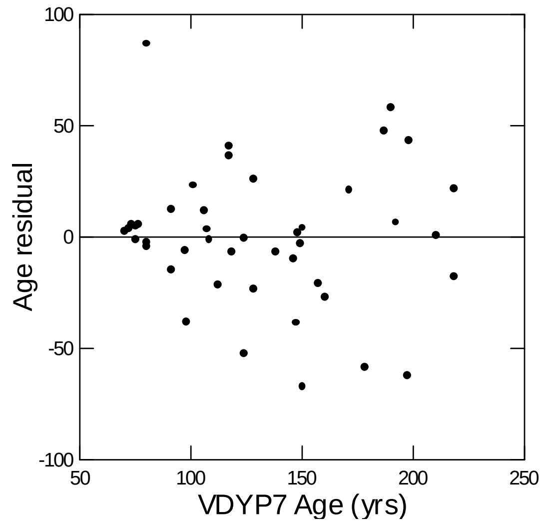


Fig. 2: Mature, Pl 80+% stratum. Age residuals (Phase 2 ground age – adjusted Phase 1 inventory age) versus unadjusted VDYP7 (Phase 1) age.

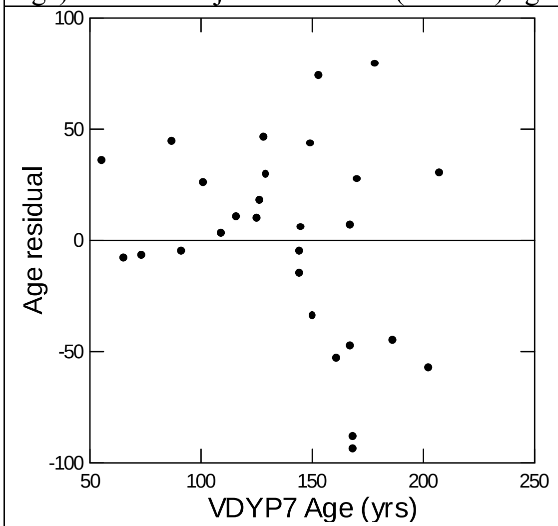


Fig. 3: Mature, other coniferous leading stratum. Age residuals (Phase 2 ground age – adjusted Phase 1 inventory age) versus unadjusted VDYP7 (Phase 1) age.

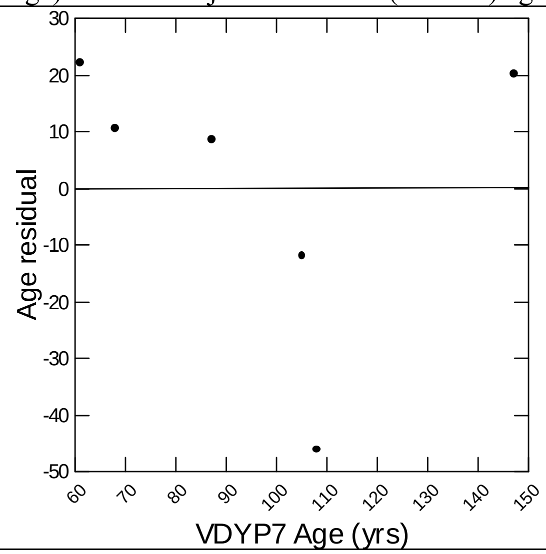


Fig. 4: Mature, deciduous leading stratum. Age residuals (Phase 2 ground age – adjusted Phase 1 inventory age) versus unadjusted VDYP7 (Phase 1) age.

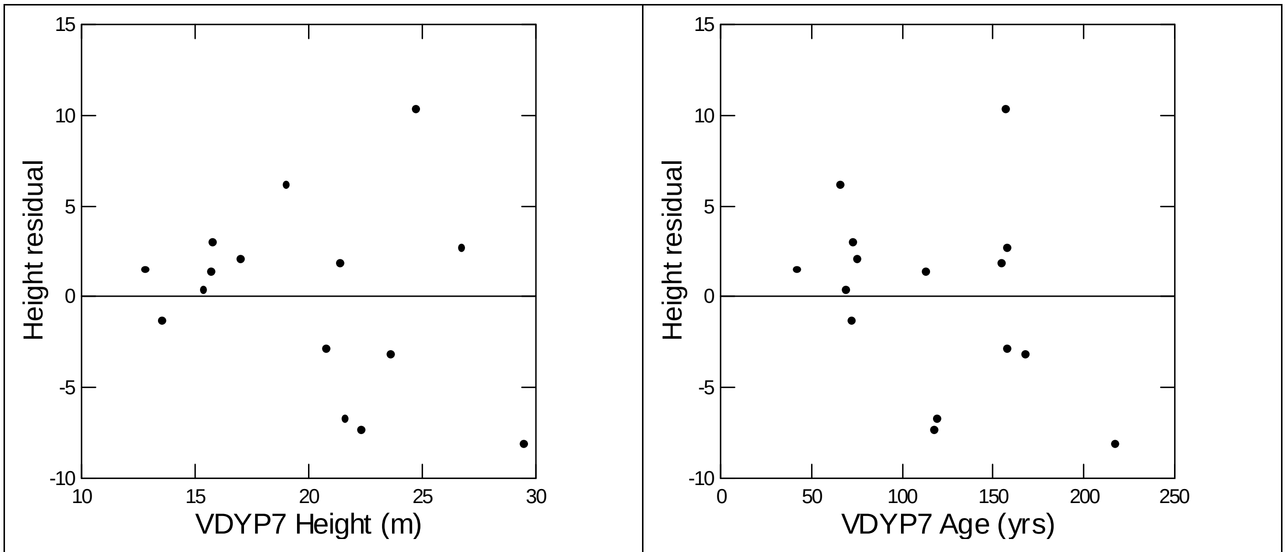


Fig. 5: Mature, Pl <80% stratum. Height residuals (Phase 2 ground height – adjusted Phase 1 inventory height) versus unadjusted VDYP7 (Phase 1) height and age, respectively.

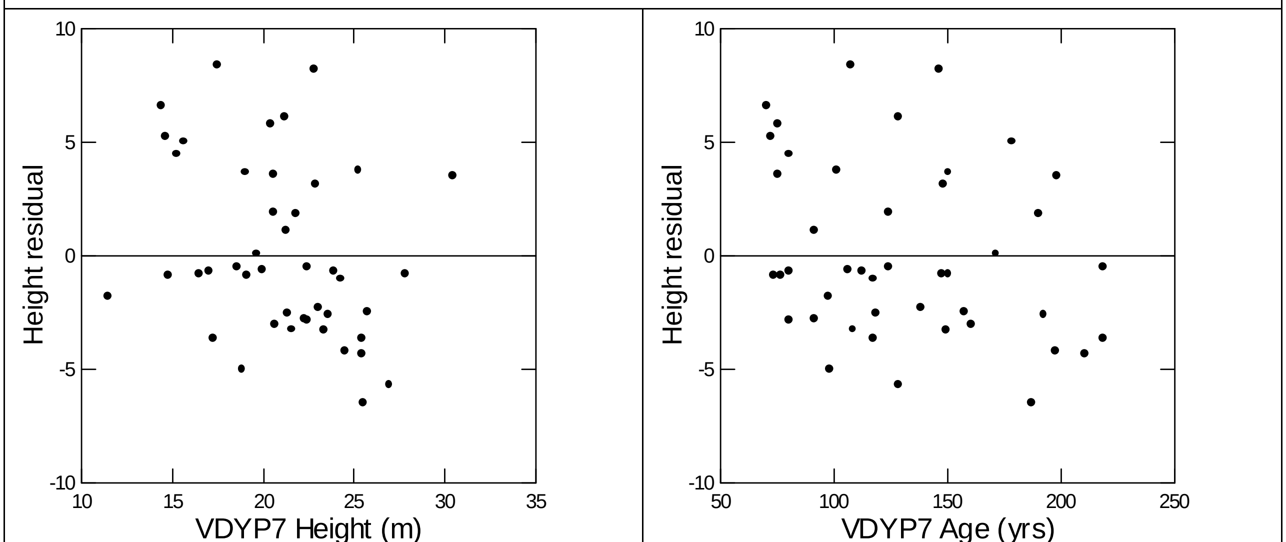


Fig. 6: Mature, Pl 80+% stratum. Height residuals (Phase 2 ground height – adjusted Phase 1 inventory height) versus unadjusted VDYP7 (Phase 1) height and age, respectively.

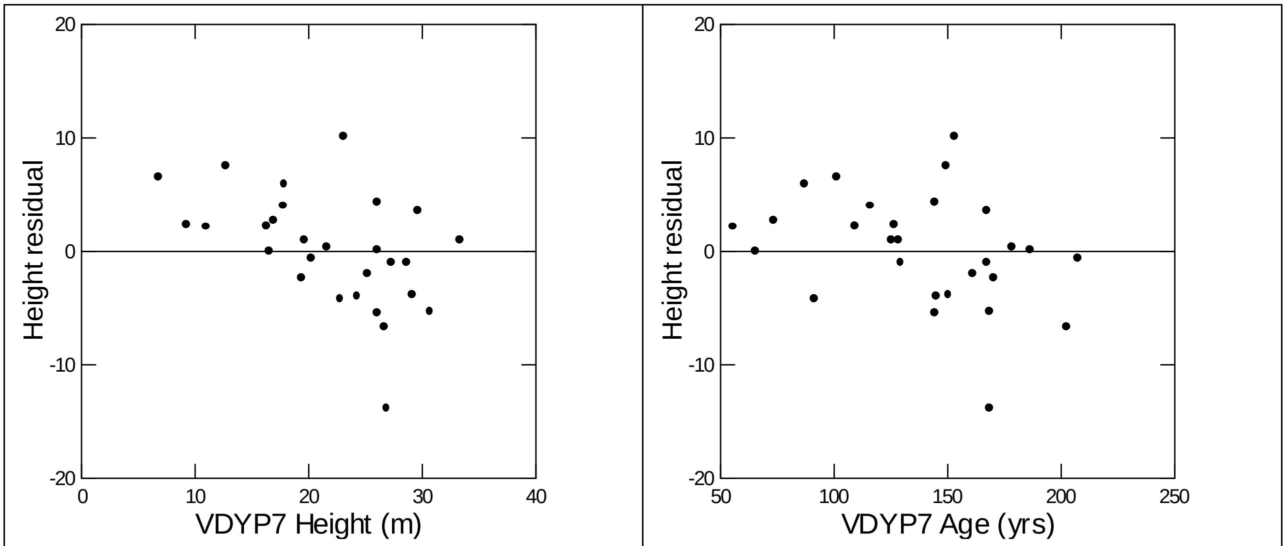


Fig. 7: Mature, other coniferous leading stratum. Height residuals (Phase 2 ground height – adjusted Phase 1 inventory height) versus unadjusted VDYP7 (Phase 1) height and age, respectively.

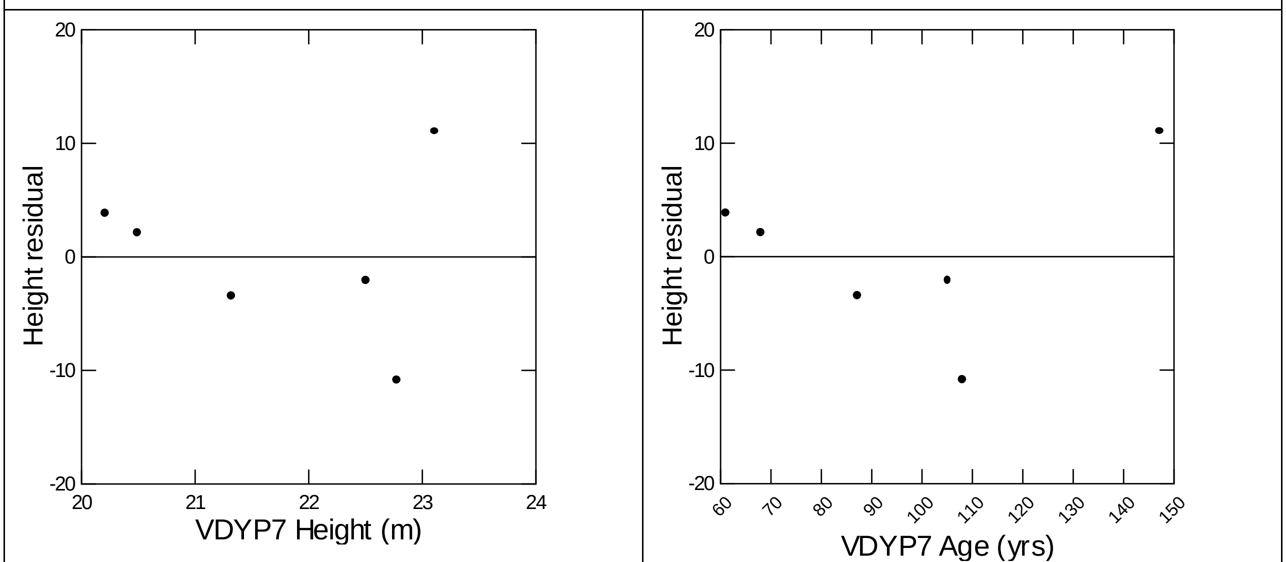


Fig. 8: Mature, deciduous leading stratum. Height residuals (Phase 2 ground height – adjusted Phase 1 inventory height) versus unadjusted VDYP7 (Phase 1) height and age, respectively.

9. APPENDIX E: VDYP7 BA AND TPH SCATTERPLOTS (STAGE 1 ADJUSTMENT)

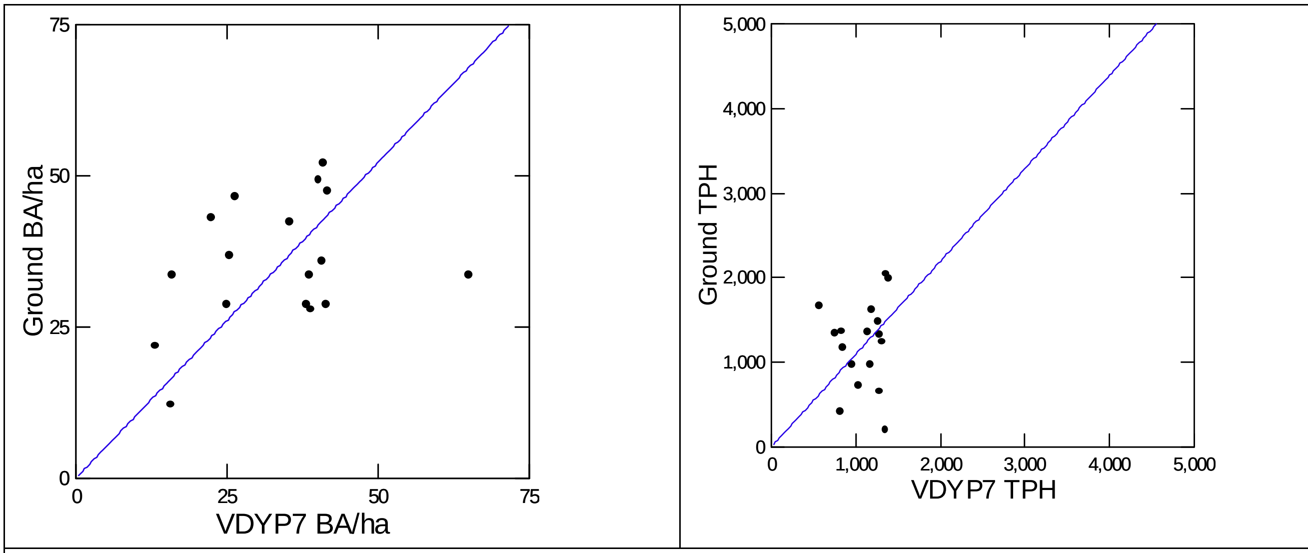


Fig. 1: Mature, Pl <80% stratum. Basal area/ha and trees/ha (@7.5cm+dbh) relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

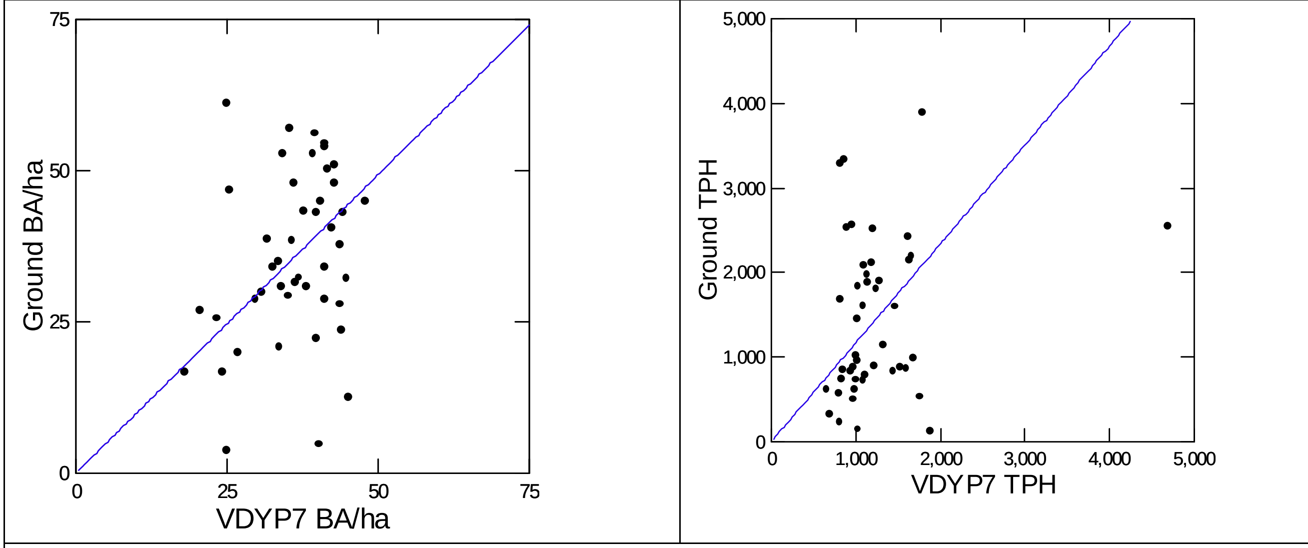


Fig. 2: Mature, Pl 80+% stratum. Basal area/ha and trees/ha (@7.5cm+dbh) relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

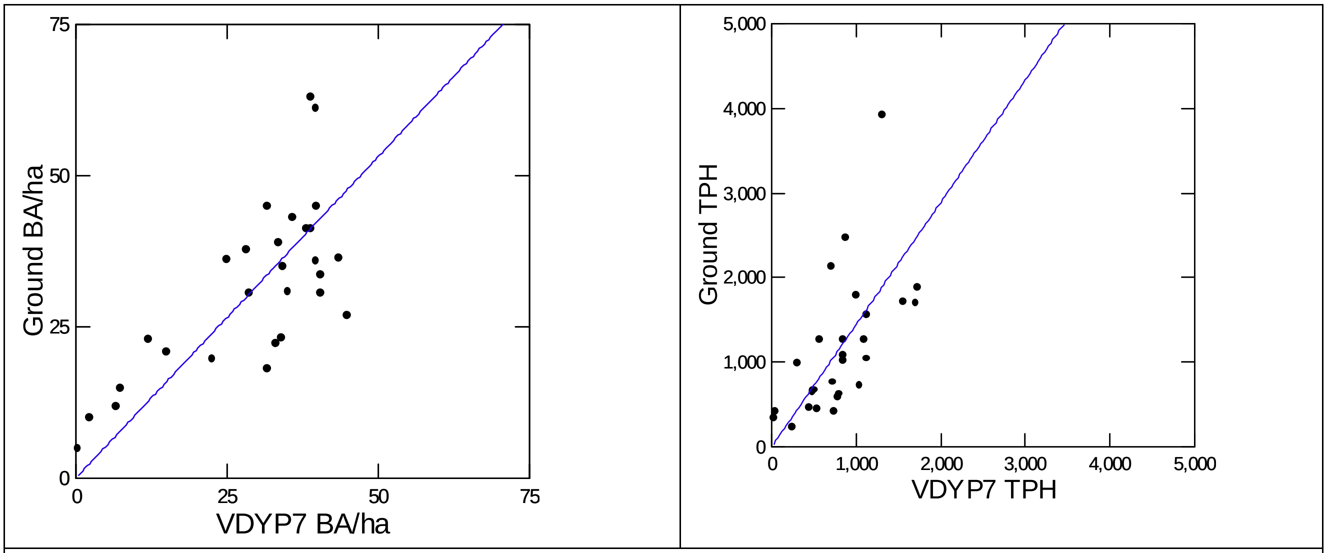


Fig. 3: Mature, other coniferous leading stratum. Basal area/ha and trees/ha (@7.5cm+dbh) relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

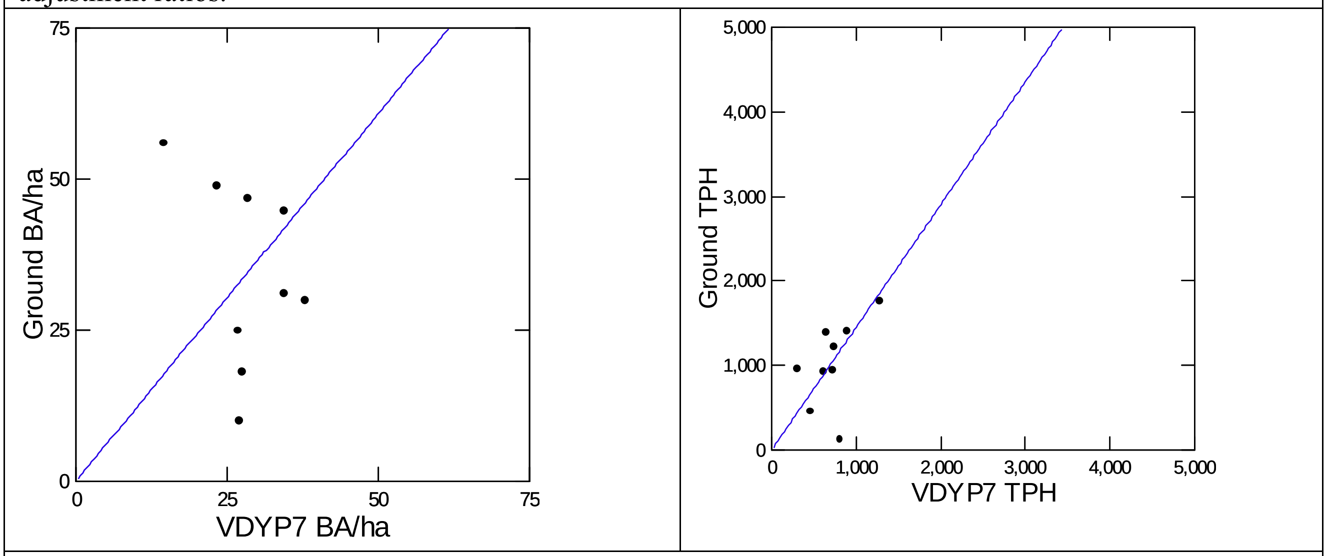


Fig. 4: Mature, deciduous leading stratum. Basal area/ha and trees/ha (@7.5cm+dbh) relationships: ground (Phase 2) attribute versus VDYP7 (Phase 1) attribute. The lines on the graphs correspond to the adjustment ratios.

10. APPENDIX F: VDYP7 BA AND TPH RESIDUALS (STAGE 1 ADJUSTMENT)

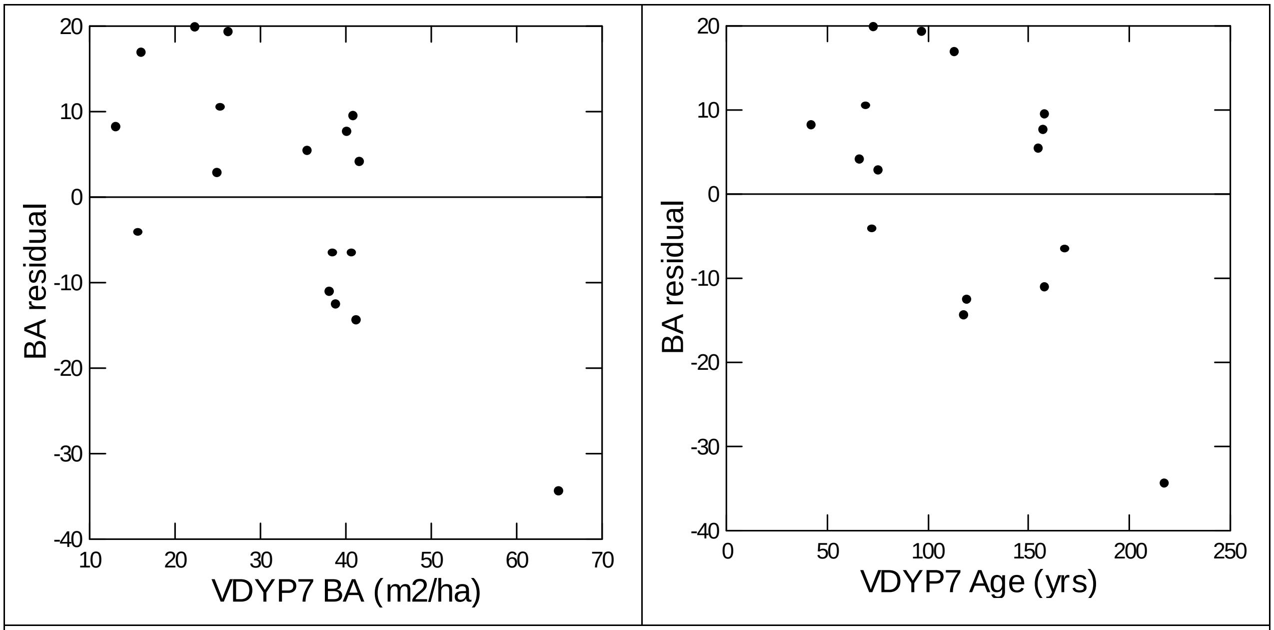


Fig. 1: Mature, Pl <80% stratum. Basal area/ha @ 7.5cm+ dbh residuals (Phase 2 ground BA – adjusted Phase 1 inventory BA) versus unadjusted VDYP7 (Phase 1) BA and age, respectively.

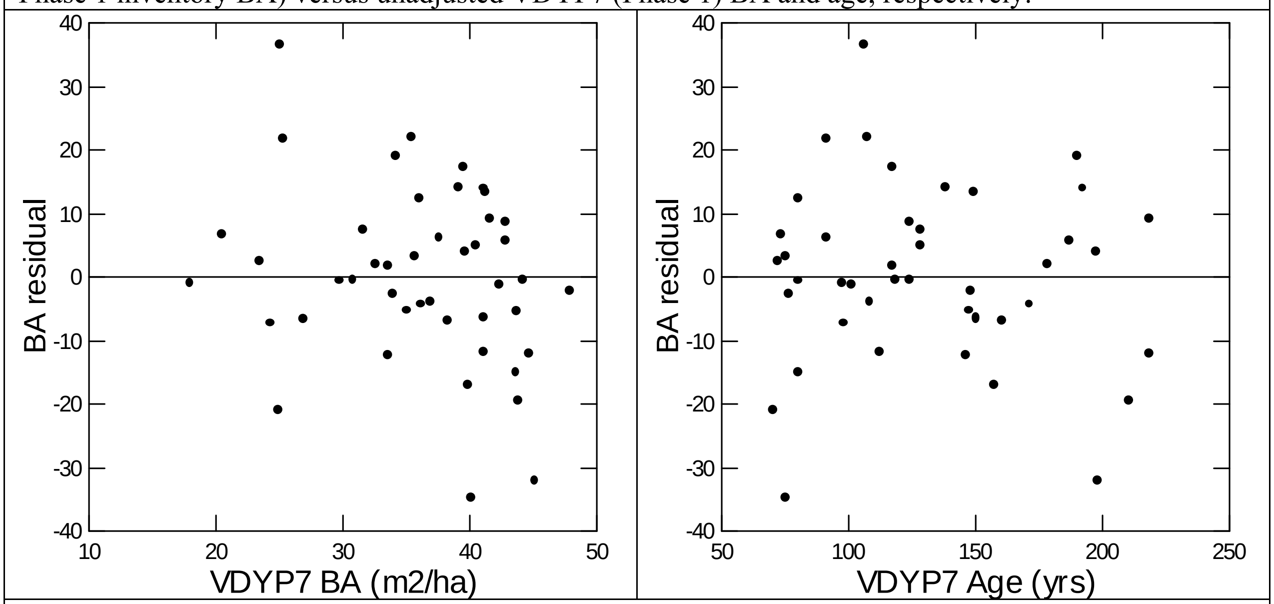


Fig. 2: Mature, Pl 80+% stratum. Basal area/ha @ 7.5cm+ dbh residuals (Phase 2 ground BA – adjusted Phase 1 inventory BA) versus unadjusted VDYP7 (Phase 1) BA and age, respectively.

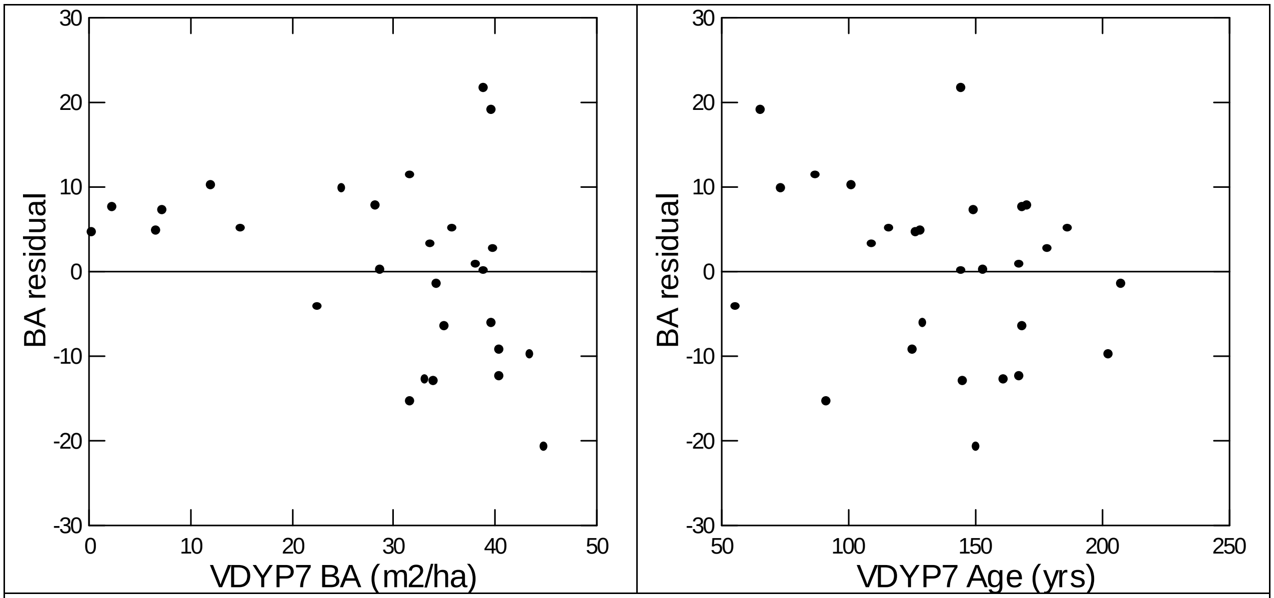


Fig. 3: Mature, other coniferous leading stratum. Basal area/ha @ 7.5cm+ dbh residuals (Phase 2 ground BA – adjusted Phase 1 inventory BA) versus unadjusted VDYP7 (Phase 1) BA and age, respectively.

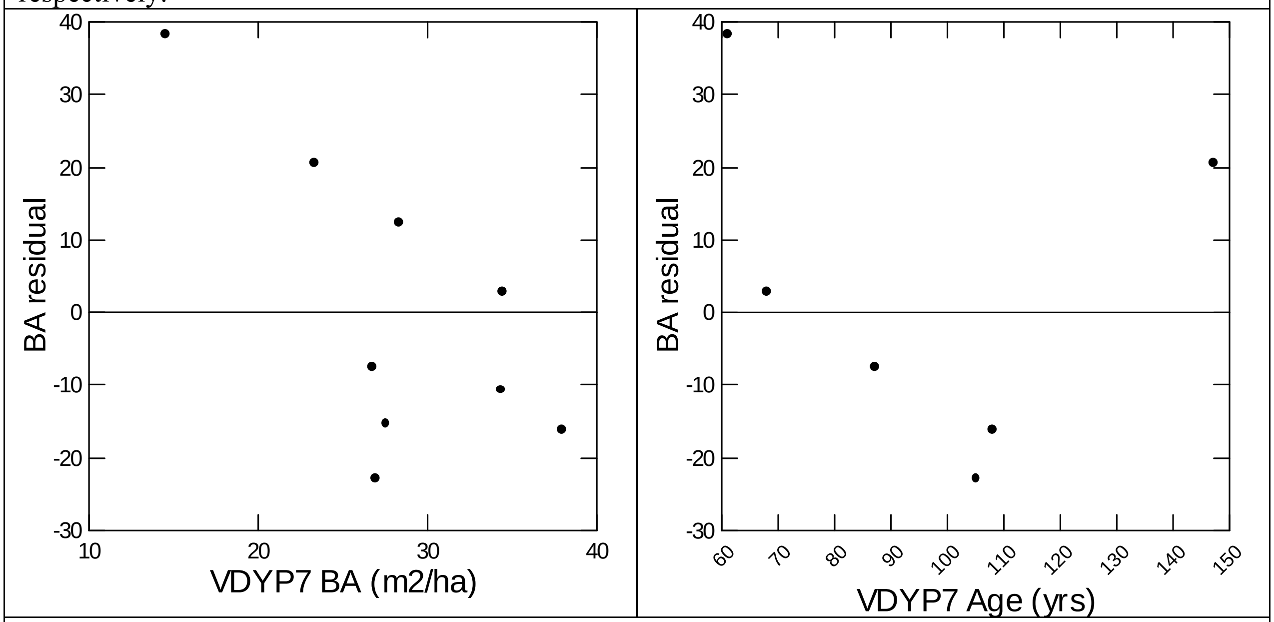


Fig. 4: Mature, deciduous leading stratum. Basal area/ha @ 7.5cm+ dbh residuals (Phase 2 ground BA – adjusted Phase 1 inventory BA) versus unadjusted VDYP7 (Phase 1) BA and age, respectively.

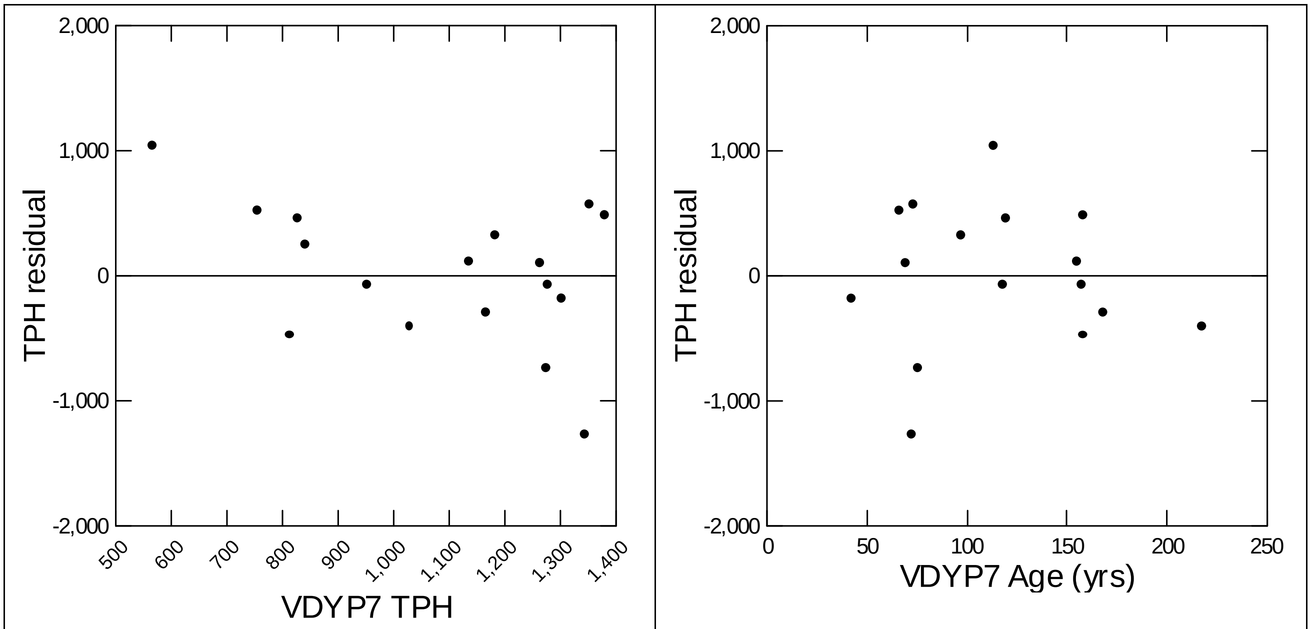


Fig. 5: Mature, Pl <80% stratum. Trees/ha @ 7.5cm+ dbh residuals (Phase 2 ground TPH – adjusted Phase 1 inventory TPH) versus unadjusted VDYP7 (Phase 1) TPH and age, respectively.

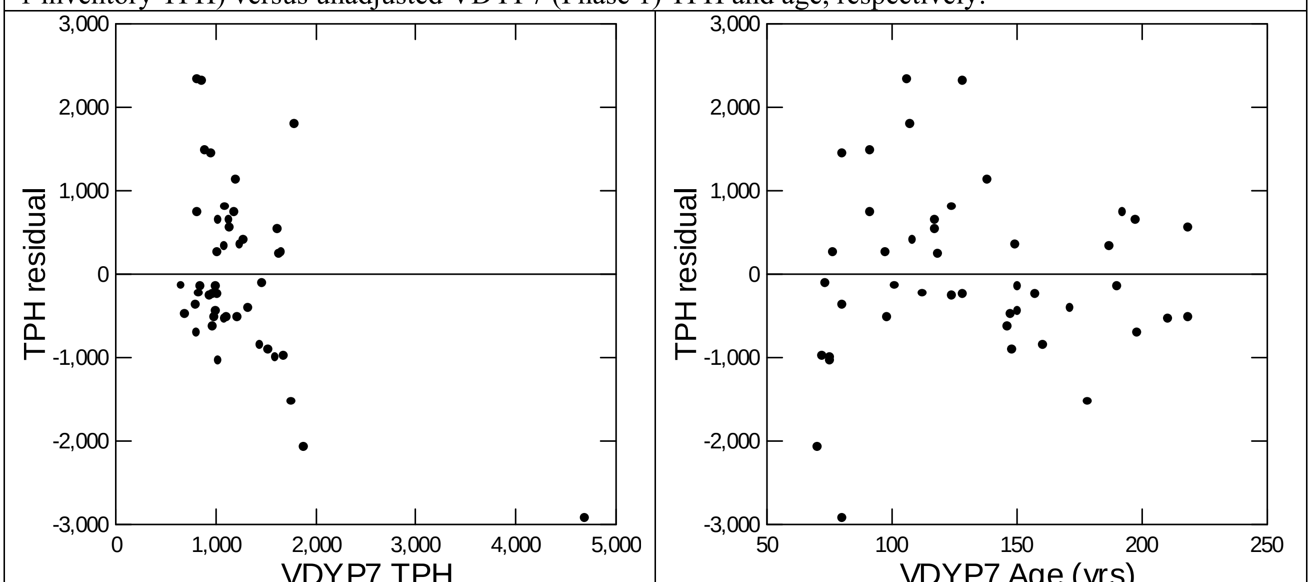


Fig. 6: Mature, Pl 80+% stratum. Trees/ha @ 7.5cm+ dbh residuals (Phase 2 ground TPH – adjusted Phase 1 inventory TPH) versus unadjusted VDYP7 (Phase 1) TPH and age, respectively.

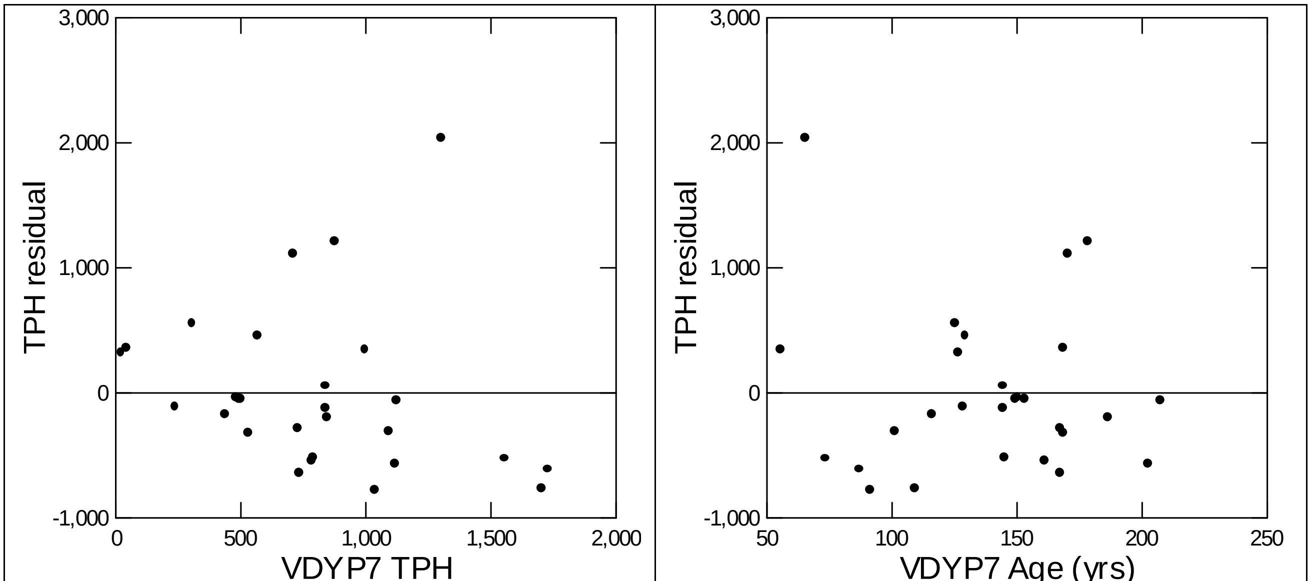


Fig. 7: Mature, other coniferous leading stratum. Trees/ha @ 7.5cm+ dbh residuals (Phase 2 ground TPH – adjusted Phase 1 inventory TPH) versus unadjusted VDYP7 (Phase 1) TPH and age, respectively.

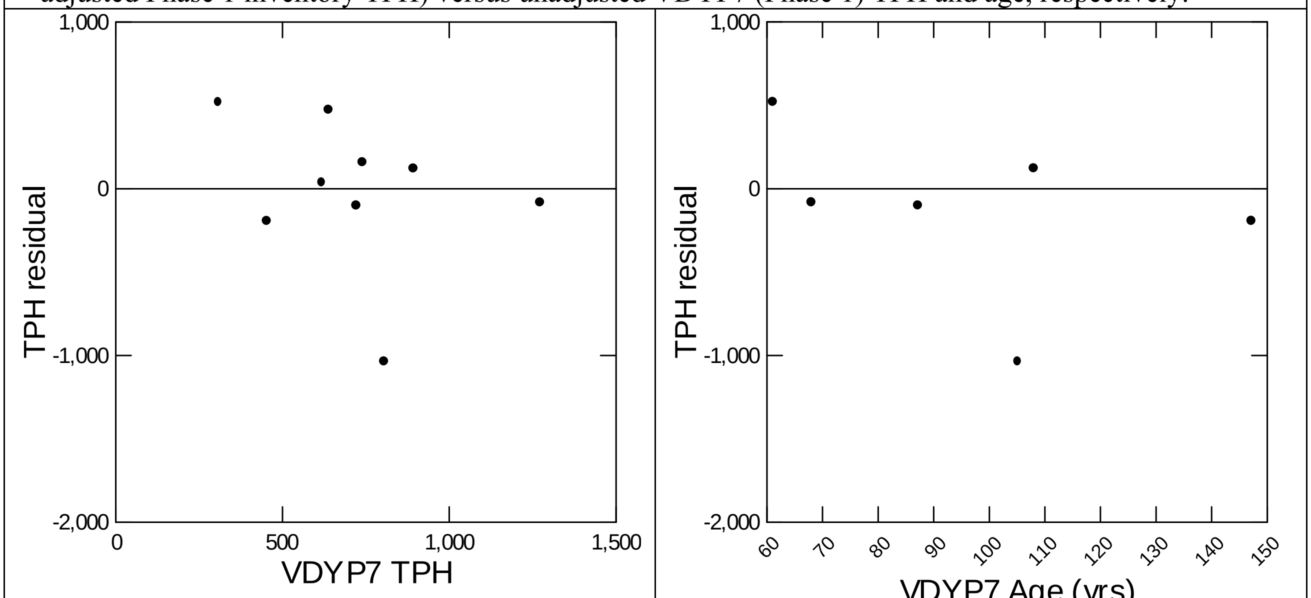


Fig. 8: Mature, deciduous leading stratum. Trees/ha @ 7.5cm+ dbh residuals (Phase 2 ground TPH – adjusted Phase 1 inventory TPH) versus unadjusted VDYP7 (Phase 1) TPH and age, respectively.

11. APPENDIX G: VDYP7 SCATTERPLOTS & RESIDUALS FOR VOLUME (STAGE 2 ADJUSTMENT)

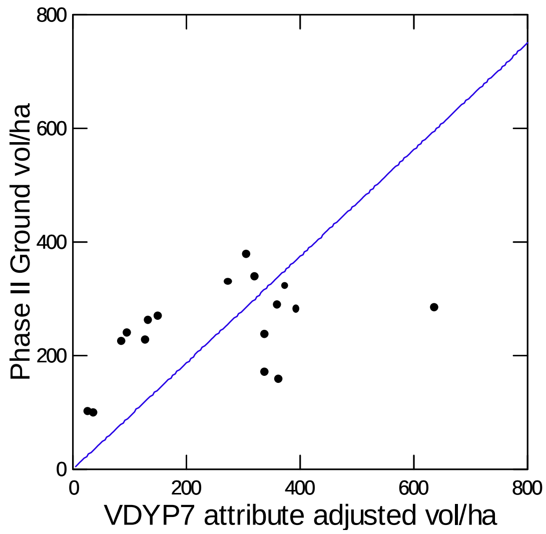


Fig. 1: Mature, Pl <80% stratum. Volume/ha (@12.5cm+dbh net dw2) relationship: ground (Phase 2) vol/ha versus attribute-adjusted VDYP7 (Phase 1) vol/ha. The line on the graph corresponds to the adjustment ratio.

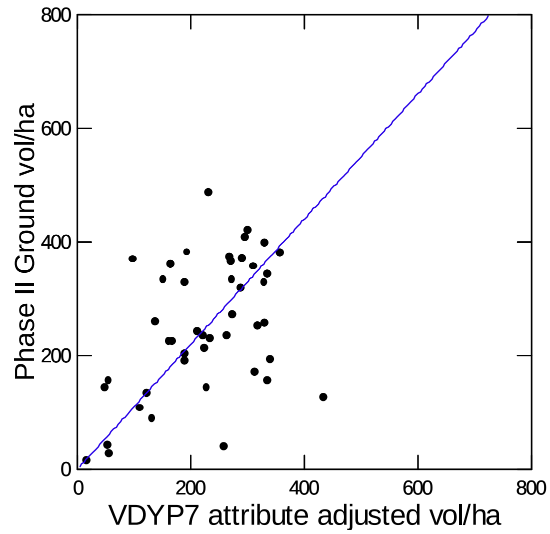


Fig. 2: Mature, Pl 80+% stratum. Volume/ha (@12.5cm+dbh net dw2) relationship: ground (Phase 2) vol/ha versus attribute-adjusted VDYP7 (Phase 1) vol/ha. The line on the graph corresponds to the adjustment ratio.

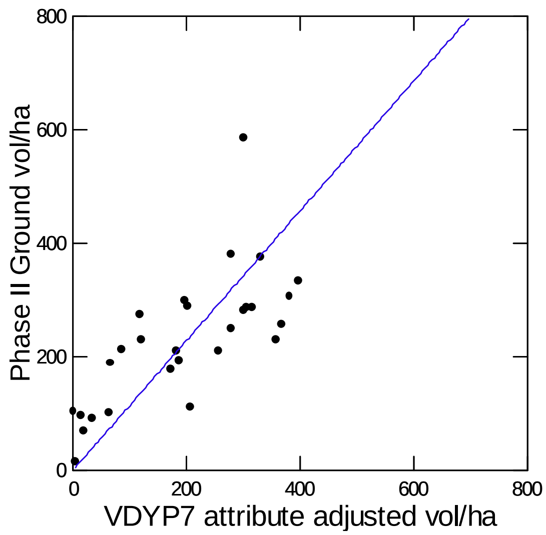


Fig. 3: Mature, other coniferous leading stratum. Volume/ha (@12.5cm+dbh net dw2) relationship: ground (Phase 2) vol/ha versus attribute-adjusted VDYP7 (Phase 1) vol/ha. The line on the graph corresponds to the adjustment ratio.

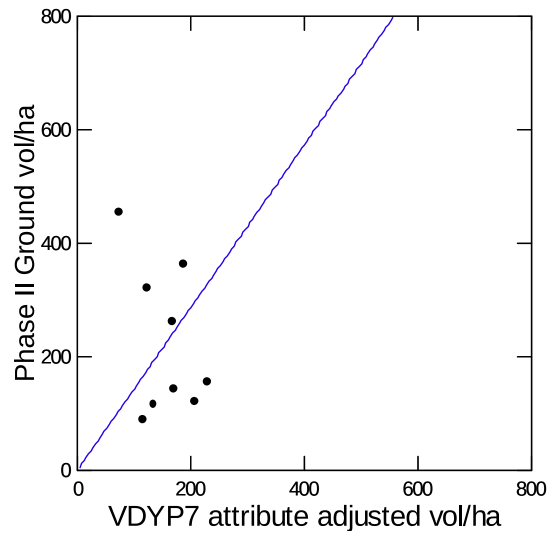


Fig. 4: Mature, deciduous leading stratum. Volume/ha (@12.5cm+dbh net dw2) relationship: ground (Phase 2) vol/ha versus attribute-adjusted VDYP7 (Phase 1) vol/ha. The line on the graph corresponds to the adjustment ratio.

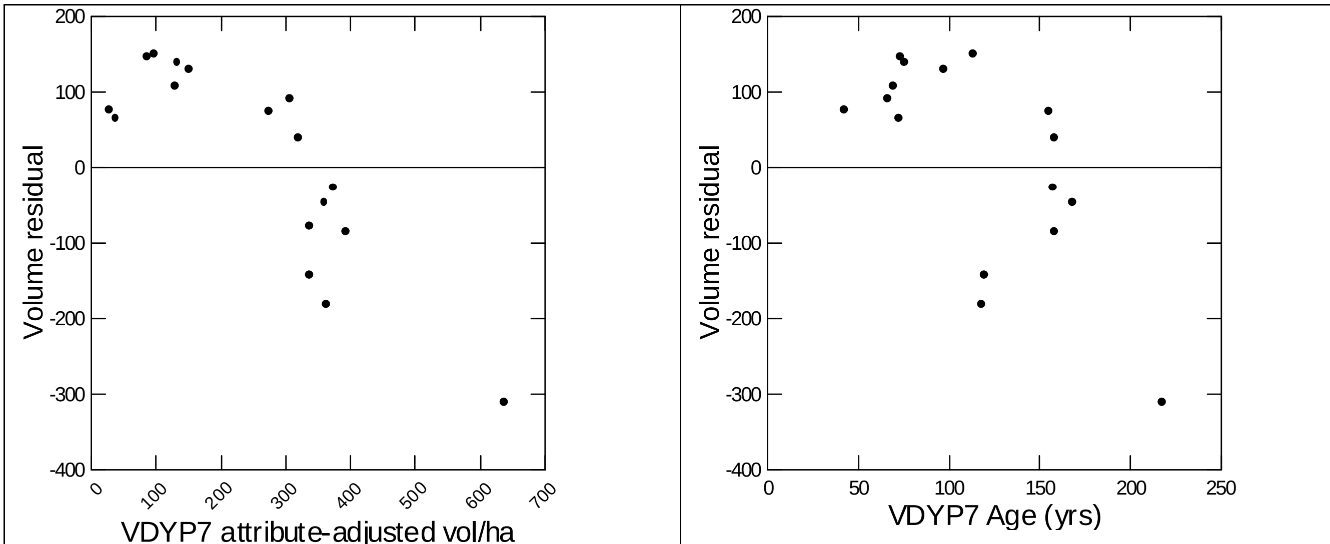


Fig. 5: Mature, Pl <80% stratum. Volume/ha @ 12.5cm+ dbh net dw2 residuals (Phase 2 ground vol/ha – adjusted Phase 1 inventory vol/ha) versus attribute-adjusted VDYP7 (Phase 1) vol/ha and Phase 1 inventory age, respectively.

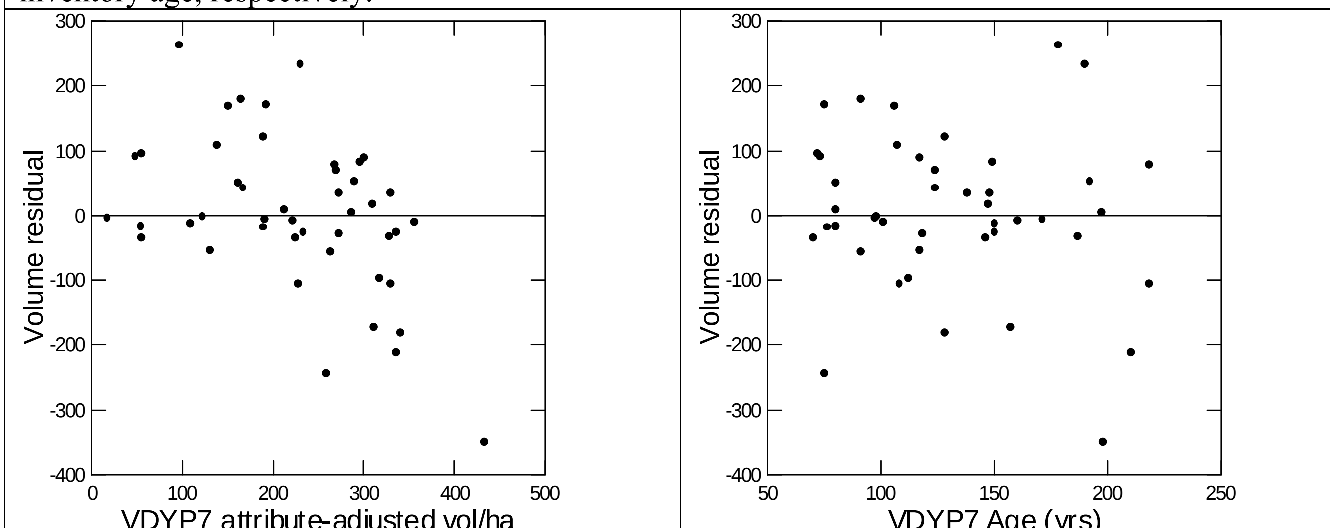


Fig. 6: Mature, Pl 80+% stratum. Volume/ha @ 12.5cm+ dbh net dw2 residuals (Phase 2 ground vol/ha – adjusted Phase 1 inventory vol/ha) versus attribute-adjusted VDYP7 (Phase 1) vol/ha and Phase 1 inventory age, respectively.

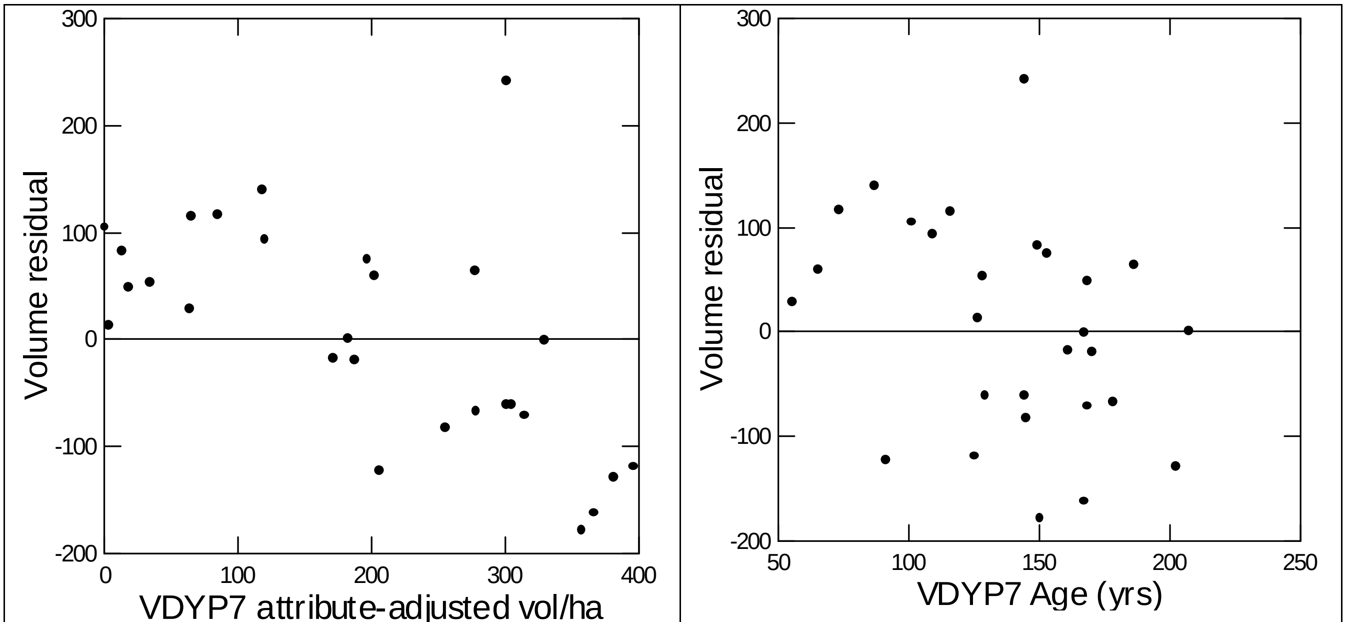


Fig. 7: Mature, other coniferous leading stratum. Volume/ha @ 12.5cm+ dbh net dw2 residuals (Phase 2 ground vol/ha – adjusted Phase 1 inventory vol/ha) versus attribute-adjusted VDYP7 (Phase 1) vol/ha and Phase 1 inventory age, respectively.

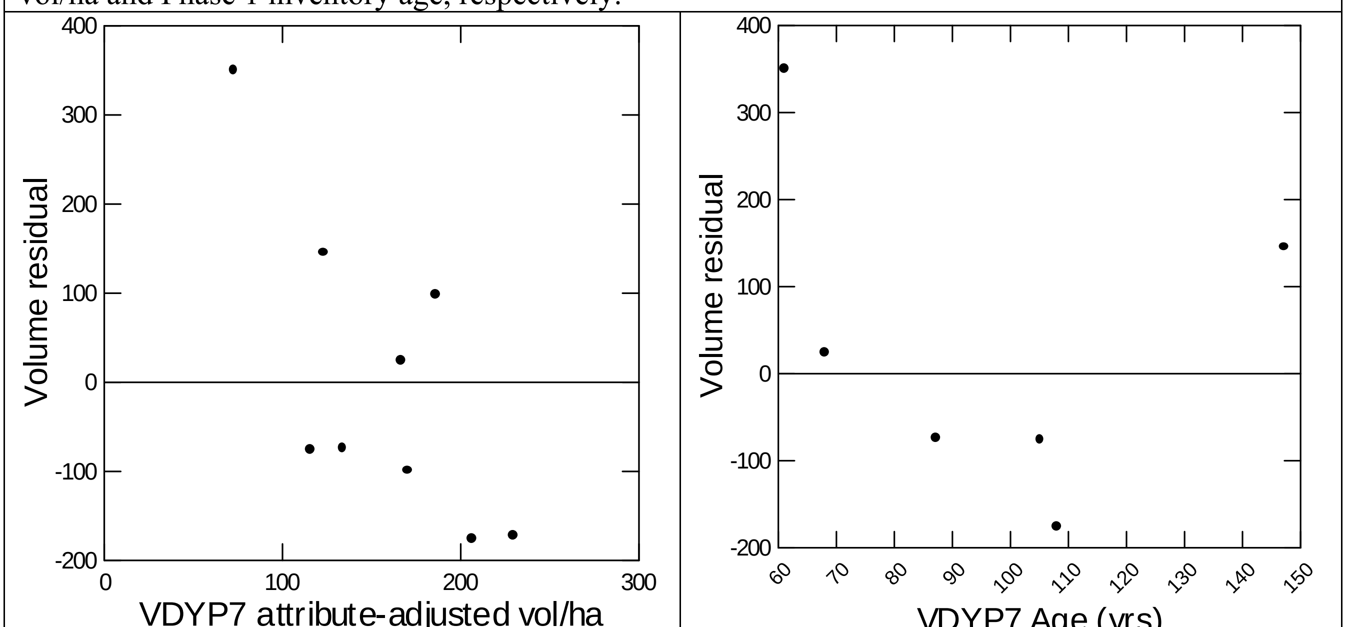


Fig. 8: Mature, deciduous leading stratum. Volume/ha @ 12.5cm+ dbh net dw2 residuals (Phase 2 ground vol/ha – adjusted Phase 1 inventory vol/ha) versus attribute-adjusted VDYP7 (Phase 1) vol/ha and Phase 1 inventory age, respectively.

12. APPENDIX H: POPULATION DISTRIBUTIONS PRE- AND POST-ADJUSTMENT

The population was projected to 2007 and the VDYP7 adjustment factors were applied in two stages. The adjusted population inventory files were then compared with the original (unadjusted) population inventory files. The pre & post-adjustment comparison excluded polygons where VDYP7 did not generate either a pre- or a post-adjustment volume (i.e. both volumes had to have been generated to be included in the comparison). This is typically for stands that do not meet VDYP7's minimum QMD threshold. As a result, the comparison is based on an area that is 0.9% smaller than the population total area.

Figure 1: VDYP7 average vol/ha by age class, pre- and post-adjustment.

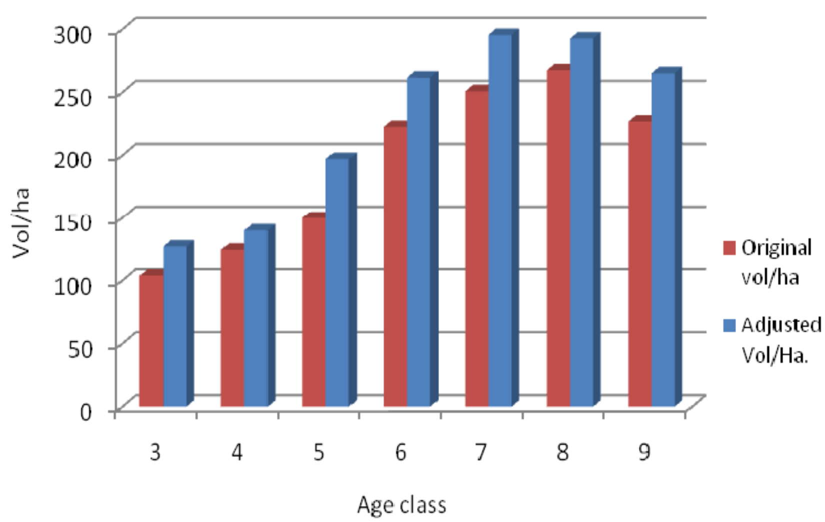
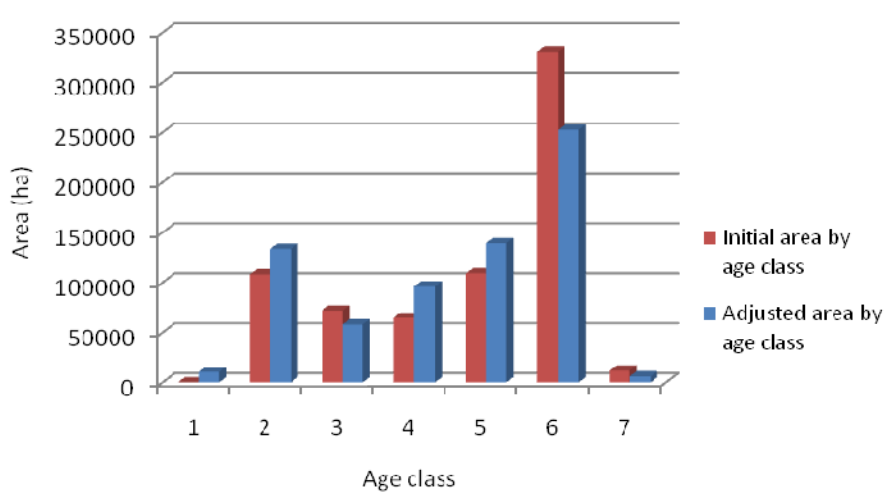


Figure 2: VDYP7 area by age class pre- and post-adjustment.



13. APPENDIX I: NVAF ANALYSIS REPORT

Lakes TSA NVAF Analysis
Will Smith, RPF
Forest Analysis and Inventory Branch

Executive Summary:

Two Net Volume Adjustment Factor, NVAF, sampling projects were conducted in the Lakes TSA: the Babine EFFMPP in 2001 and the Lakes TSA in 2007. The NVAF is a statistically based volume correction based on the difference between actual net close utilization tree volume determined from destructive sampling and the estimated net close utilization volume based on the BEC based taper equation and net factoring. The determination of net volume in this analysis and for NVAF in general is based on deductions for decay and waste. NVAFs were calculated using the pooled data from both datasets and used to correct the VRI ground sample volumes as per the following table.

Net Volume Adjustment Factors for the Lakes TSA

Stratum	NVAF Value	Sample Size in trees	Sampling Error in %
All Deciduous	0.97315	7	30.4
Lodgepole Pine	1.00268	21	4.5
All Conifers other than pine and balsam	1.02453	36	5.0
Balsam	1.03168	19	12.3
All dead	1.00484	18	9.4

The live NVAF corrections are typical for spruce and pine and indicate that the taper equations and VRI net factoring process are performing adequately. The NVAF corrections for deciduous and balsam species are uncertain as evidenced by their high sampling errors; the uncertainties around their NVAFS can be reduced with additional sampling.

A new sampling procedure to measure unmerchantable wood was tested in the Lakes NVAF sample project. The new process measured the combined area of decay and sound wood considered to be uneconomic for sawmilling using scaling procedures for grade reduction and trim allowance. The results of the test were positive in terms of ease and the costs of the additional sampling. The results

should be of interest for timber supply and valuation applications and are summarized in the analysis section.

A detailed analysis comparing the different taper equations and decay estimation processes by tree species and risk group is included in this analysis.

NVAF Calculation Process:

1. Sample selection probability weights using the 'Design' method were calculated for each sample tree.
2. The NVAF, which is the ratio of the sum of the weighted actual to estimated net close utilization volumes (less decay, waste, 30 cm stump and 10 cm top), was calculated for each species and broad age group.
3. Depending on sample size, tree species were grouped or separated into strata. In this case, the sample sizes for live lodgepole pine, balsam and spruce were abundant enough to warrant stand alone species strata. Because all tree species must have an NVAF adjustment, uncommon species such as Douglas-fir and birch were assigned to a like stratum: uncommon conifers to the spruce stratum and uncommon deciduous to the deciduous stratum.
4. Broad age group was used in the selection of sample trees using a cut-off age of 120 years and was used to allocate the majority of the sample to mature trees. Age grouping was not found to be a useful stratification criterion for the calculation of the NVAF.
5. Due to the active MPB infestation, the Lodgepole pine became a special case. The Babine sample trees were sampled prior to the infestation and therefore represented a population that does not exist today and were eliminated from the calculation.
6. Sampling statistics are based on the error in corrected volume to actual volume were calculated to arrive at the sampling error for a 95% probability 19 times out of 20.

Analysis Process:

Four different estimates of net close utilization volume were calculated for the NVAF sample trees and include:

- The VRI method based on gross volume using the BEC based taper equation and net volume using net factoring.
- The appraisal cruise method based on gross volume using the FIZ based taper equation and net volume using the 1976 loss factors.
- An estimate based on gross volume using the FIZ based taper equation and net volume using net factoring.
- An estimate based on gross volume using the BEC based taper equation and net volume using the BEC based loss factors.

Risk group was chosen as a stratification criterion because recent unbiased destructive sampling has shown that the error in the estimates of decay differ by the external characteristics of the tree; risk group serves to separate the trees likely to have errors in decay estimation.

Two NVAFs were calculated for each analysis stratum, one based on net close utilization (CU) volume and the other on close utilization volume. The NVAFs were transformed into percentage errors and the gross CU error was subtracted from the net CU error to obtain error in the decay and waste estimate.

To give one example using the 'all balsam stratum' and estimates of tree volume using the BEC based taper equation and net factoring:

- The NVAF for net CU volume is 1.0317 which amounts to an underestimate of volume of approximately 3.2%. The error in the estimate comes from two sources: the taper equation and net factoring.
- The NVAF for gross CU volume is 1.0098 which amounts to an underestimate of volume of approximately 1%. This error is due solely to the taper equation.
- The difference between these two errors is 2.2% and this amounts to the error that is attributable to the estimation of decay and waste using the net factoring system. The error indicates that net factoring is underestimating the amount of sound wood in some of the sample trees.

Using the same balsam stratum but estimates of tree volume using the FIZ based taper equation and the 1976 Loss Factors for decay and waste:

- The NVAF for net CU volume is 1.2571 which amounts to an underestimate of volume of approximately 25.7%. The error in the estimate comes from two sources: the taper equation and loss factors.
- The NVAF for gross CU volume is 1.016 which amounts to an underestimate of volume of approximately 1.6%. This error is due solely to the taper equation.
- The difference between these two errors is 24.1% and this amounts to the error that is attributable to the estimation of decay and waste using the 1976 loss factors. The error indicates that the loss factors are overestimating the amount of decay and waste in some of the sample trees.

Analysis of the Results:

Taper Equations: Both versions of the taper equation are performing well with the BEC based taper providing a slightly more accurate estimate of close utilization volume. The improvements are likely due to shift to a biological basis to the stratification and to the inclusion of thousands of additional sample trees, particularly deciduous and balsam, for the fitting of the BEC equation.

% Error in Gross Close Utilization Volume

species	Ac	At	B	Pl	S
risk group	All	All	All	All	All
N	3	4	19	45	36
FIZ taper error	-12%	-3%	2%	1%	-3%
BEC taper error	-1%	-2%	1%	1%	0%

A positive % error indicates an underestimate of volume.

Decay Estimation System: Net factoring provided a more accurate estimate of decay and waste than the loss factors, particularly for dead trees. Loss factors were found to consistently overestimate the levels of decay and waste for mature trees. One apparent reason for the better accuracy of net factors is that trees with no apparent visible decay were assumed to be 100% sound; this amounted to 78% of the sample trees, of which most (83%) of these trees had no actual decay as determined by the destructive sampling. Loss factors, however, assign trees with no visible decay, (risk group 1), loss factor deductions ranging from 4% to 55% depending on species and risk group amounting to a consistent and often substantial under estimation of sound wood volume.

The following table shows the error in the estimate of net volume attributed to over or under estimation of decay and waste.

% Error in Decay and Waste Estimation

species	Ac	At	B	B	B	Pl	Pl	Pl	S	S	S	All	B	Pl
risk group	All	All	All	1	2	All	1	2	All	1	2	Dead	Dead	Dead
N	3	4	19	5	13	45	13	32	36	24	10	18	5	9
net factor error (% sound wood)	5%	-8%	3%	0%	0%	-3%	-1%	-3%	2%	0%	0%	-10%	-5%	-2%
1976 loss factor error (% decay and waste)	-163%	-97%	-24%	-16%	-26%	-8%	-4%	-8%	-10%	-6%	-11%	-50%	-65%	-53%
N	3	4	19	4	14	45	10	35	36	21	13	18	5	9
BEC loss factor error (% decay and waste)	-2%	-41%	-11%	-8%	-9%	-1%	-3%	-1%	-8%	-2%	-6%	-116%	-51%	-141%

net factor error: a positive value indicates an underestimate of sound wood; a negative value indicates hidden decay
loss factor error: a positive value indicates an underestimate of decay and waste loss

Merchantable Wood: This is a new concept for VRI and NVAF because merchantable volume is only indirectly measured in VRI ground samples via log grade predictions and is not a standard measurement in NVAF nor its predecessor, the historic decay sampling. NVAF sampling is a classic strategic inventory tool in that its primary objective is to provide a stable measurement of total sound wood fibre and not one for an ever shifting definition of merchantability that is dependent on current market conditions. However, the interest around shelf life due to the MPB infestation and the collapse of the pulp market in the northwest has provided a renewed interest in merchantable wood and the testing of a possible new tool in the VRI toolkit. The results must be cautiously interpreted due to a small sample size and this measurement of unmerchantable wood represents an underestimate of mill recovery as it was captured for 2 meter long logs from the destructive sample in the absence of yarding, loading, hauling and milling. The following table shows values that would correct the net close utilization estimate of volume to obtain an estimate of sawable merchantable volume. One caveat: the sample size for all but the live pine and spruce strata is too small too place any certainty in the results.

% Difference between Estimates of net CU Volume and Sawable Volume from the NVAF Sample

species risk group N	Ac All 3	At All 2	B All 15	Pl All 21	S All 16	All Dead 10	Pl Dead 6
BEC taper & net factor merchantability correction	-40.1%	-67.9%	-7.9%	0.0%	0.7%	-13.5%	-11.8%
FIZ taper & 1976 Loss Factor merchantability correction	47.5%	-30.8%	17.5%	9.9%	6.2%	40.0%	38.1%

A negative value indicates a volumes reduction, a positive value indicates a volume increase
* The non merch measure was captured for Lakes NVAF sample trees only.
[highlighted] Sampling error is > 10%

Lakes NVAF Recommendations:

1. Continue to test and refine the estimates of merchantability in other management units with decay prone species, such as cedar and hemlock.
2. Regrade the NVAF sample trees using the destructive sample merchantability information, quantify the differences in volume by grade and relate to the overall VRI results.
3. Conduct additional sampling in the Lakes unit in the strata with high sampling errors, particularly dead pine. Consider an overall sample size of 50 trees as per the original plan for the 2007 Lakes NVAF sample.

PROJECT SPECIFICATIONS AND REQUIREMENTS

Unmerchantable wood data collection in NVAF Sampling Projects

Overview

The Ministry of Forests and Range has been investigating the quantity of unmerchantable wood in order to better predict shelf life of MPB killed Lodgepole pine stands and to verify the estimates of sawlog volumes made from call grading of trees in VRI ground samples. The MOFR has tested the procedures in two NVAF sampling projects in 2007 and is recommending that the process become a standard procedure for NVAF sampling for the 2008 field season. The new process is based on MOFR scaling procedures for grade reduction. This document describes how the area of unmerchantable sound wood can be collected at each section of every NVAF sample tree.

Tree & Section Requirements

All sections for all trees will have an area of unmerchantable wood and defect and twist recorded.

Unmerchantable Wood Definition

MOFR scaling procedures capture the area of sound wood and associated defect that are considered to be uneconomic for milling; known as grade reduction. Grade reduction is composed of two parts: a 10 cm spacing between defects is too small to mill and a 2 cm wide trim allowance adjacent to defects which is lost to lumber recovery when squaring up the areas adjacent to the defect (see pages 6-17 to 6-23 of the April 1, 2006 Scaling Manual). Twist and knots which are normally considered in the scaling determination of merchantable wood will not be considered. Details are:

- Trim allowance:
    - 2 cm on each side of check (excluding inner point of check)
    - 2 cm around all sides of shake, bark seam, decay or hole (excluding sap rot and shallow scars)
- Unmerchantable sound wood size:
    - A 10 cm spacing between defects measured from defect to defect (not trim allowance to trim allowance).
    - Where all or portions of the soundwood collar are less than 15 cm thick for heart centered defects, rots or holes,
    - Otherwise where the soundwood collar (or portions) is less than 10 cm thick.
    - Sound hearts with a diameter less than 10 cm.

Attribute Definition: Weather Checks

A weather check is defined as a radial split from the outside of the bole of the tree that is at least 2 cm deep.

Measurement of Unmerchantable Wood

The area of the unmerchantable wood (trim and grade allowance) and the associated defects will be coalesced into one ellipse and captured as a stain using the DVHand software.   Do not attempt to record each cause of unmerchantable wood separately, instead combine into one measure. Use a compound decay description to identify the principle cause of the degrade, use: CHK for checking, SHK for shake and DKY for decay. The length of the stain within a section would match that of the check as evidenced by the outside of the section or that of the existing decay – there will be no intermediate bucks required for unmerchanatable wood.

Figure 1. Unmerchantable wood due to checks.

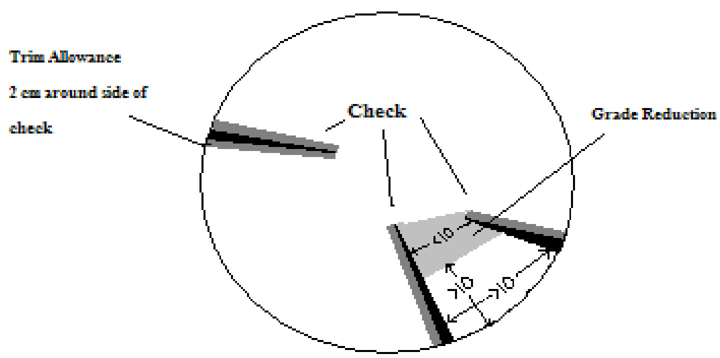
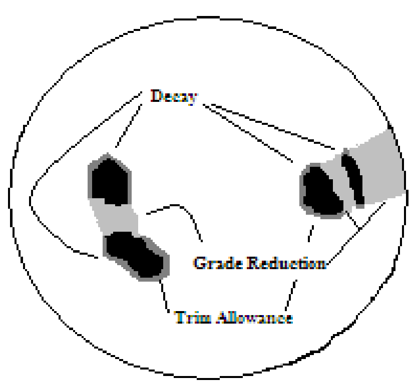


Figure 2. Unmerchantable wood due to decay.



Measurement of Twist

The maximum twist found in each section will be measured as the displacement over a 30 cm length. The displacement will be measured to the nearest millimeter and will be recorded for all sections above 1.3 m with a twist displacement >= 2 cm. The portion of the tree between 0.3 and 1.3 m will be considered as one log. Capture section twist using DVHand by creating a stain with a compound decay description of ‘FPD’, a separate solid shape and record the displacement as width and breadth. For example: the width and breadth of a spiral for a section with a displacement of 2.3 cm would be recorded as 2.3 by 2.3; the top and bottom lengths would be recorded as 0.