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**Prince George Forest District  
Vegetation Resources Inventory  
Project Implementation Plan  
Version 4.0**

Prepared for  
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On Behalf Of

Forest Licencees in the  
Prince George Timber Supply Area

Project: CFP-017

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## 1. INTRODUCTION

### 1.1 BACKGROUND

The Vegetation Resources Inventory (VRI) is the Ministry of Forests and Range (MoFR) forest inventory standard on public lands in BC. Where possible, forest licencees must use the VRI standard in their data package when preparing the submission for Timber Supply Review (TSR).

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

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

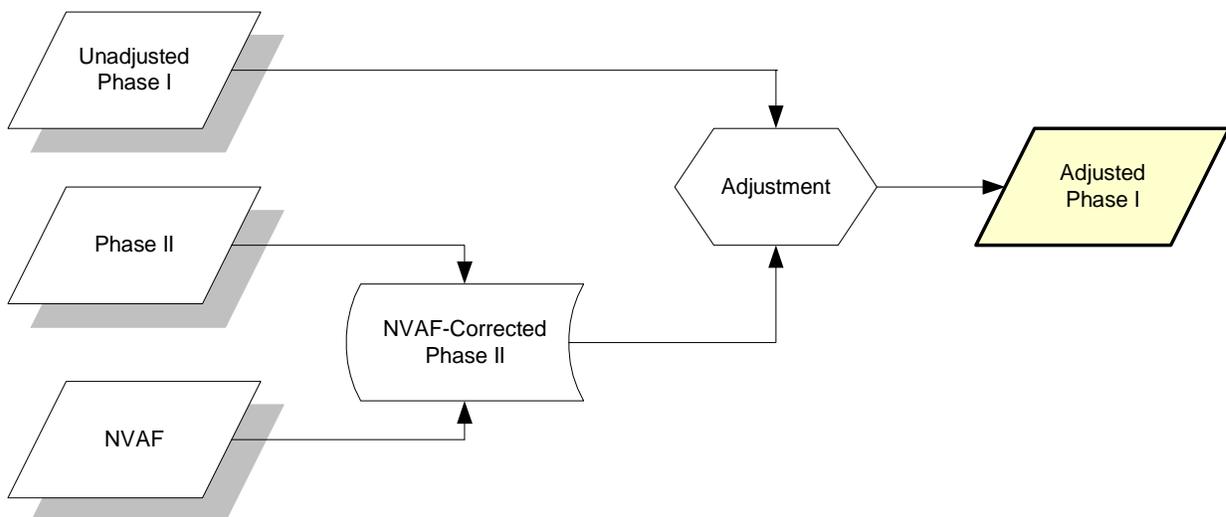


Figure 1. VRI flow-chart.

The Prince George Forest District Phase I was recently completed. The next step is to develop a VRI project implementation plan (VIP) to guide implementation of the Prince George Forest District licencees proposed Phase II and NVAF field sampling projects.

### 1.2 PRINCE GEORGE TSA VRI BACKGROUND

The Prince George Timber Supply Area (TSA) VRI program is being completed separately by the respective Forest Districts (Vanderhoof, Prince George, and Fort St. James). The VRI Phase I program for all three Forest Districts was completed in 2005. The Vanderhoof VRI Phase II program was

<sup>1</sup> VRI technical terms are explained in Appendix I.

completed by Timberline Forest Inventory Consultants in 2001 and J.S. Thrower & Associates Ltd. (JST) completed the statistical adjustment in 2003.

This Prince George Forest District Phase II VPIP is being developed concurrently with the Fort St. James Forest District VPIP. These two initiatives are being treated as separate stratum that will be implemented independently.

### 1.3 VPIP OBJECTIVES

The objective of this VPIP is to:

1. *Develop the Phase II sampling methods and NVAF program to address the Prince George Forest District inventory issues.*
2. *Outline the strategy for Phase II implementation and the proposed budget and timelines.*

The intent is that MoFR will review and approve the proposed Phase II and NVAF sampling program.

### 1.4 TERMS OF REFERENCE

This VPIP was prepared for Kerry Deschamps, *RPF* of Canadian Forest Products Ltd. The document was prepared by Guillaume Thérien, *PhD*, and Hamish Robertson, *RPF* (JST project manager). Version 2 of this initiative was reviewed and approved by MoFR prior to implementation of the Phase II field program. Version 3 includes updated information on the NVAF sampling component and will be approved by MoFR prior to beginning the NVAF field program. It is likely that the Prince George Forest District licencees will embark on a program to improve the inventory estimates of deciduous stands. These methods will be updated in a future version of the VPIP.

### 1.5 PRINCE GEORGE FOREST DISTRICT LAND BASE

Prince George Forest District is located around the city of Prince George, along the Fraser River, in the BC Central Interior (Figure 2). The Prince George Forest District covers approximately 3.4 million ha, of which 2.1 million ha (62%) are Vegetated Treed (VT) (Table 1). Most of the Prince George Forest District is located in the in the Sub-Boreal Spruce (SBS) (65%) or in the Engelmann Spruce-Subalpine Fir (ESSF) (25%) biogeoclimatic zones.

Table 1. Prince George Forest District net down.

Land Class	Area (ha)	% District
Total District	3,360,457	
Not Public	662,278	20%
Public	2,698,179	80%
Parks	201,618	6%
Non-Parks	2,496,561	74%
Non-Vegetated	80,786	2%
Vegetated	2,415,774	72%
Non-Treed	346,389	10%
Treed	2,069,385	62%



Figure 2. Location of the Prince George Forest District.

## 2. STRATEGIC PLAN

### 2.1 PROJECT OVERVIEW

The overall goal of the project is to complete the VRI Phase II and NVAF programs in the 2006/07 and 2007/08 fiscal years. Phase II plots will be established during the 2006 field season. The NVAF destructive sampling will occur during the 2007 field season. Field data compilation, analysis, statistical adjustment, and reporting is intended to be completed by September 30, 2007.

### 2.2 GOAL & OBJECTIVE

The goal of this project is to provide the Provincial Chief Forester with the necessary confidence in the Prince George Forest District forest inventory to support the Prince George TSA TSR. The Prince George Forest District licencees' project objectives are to:

1. *Develop statistically unbiased volume estimates for stands at least 30 years old in the Prince George Forest District VT landbase; and*
2. *Collect coarse woody debris on all Phase II plots.*

As a secondary objective, the VRI Phase II sampling program will also provide the opportunity to collect information on old-growth stands that can be used in the balsam intermediate utilization (BI-IU) sampling program that will also take place in 2006/07.<sup>2</sup>

### 2.3 TARGET POPULATION

The target population for this project was defined as the VT landbase, 30 years and older in 2006 (that is, stands established before 1977). The target population represents approximately 1.6 million ha (49% of the total Prince George Forest District) (Table 2). The Prince George Forest District includes all forest cover polygons with more than 50% of the polygon area in the Forest District.

Table 2. Target population stratification for VRI sampling.

Land Class	Area (ha)	% District
Total District	3,360,457	
Vegetated Treed	2,069,385	62%
Stands < 30 years	436,233	13%
Target Population	1,633,152	49%

### 2.4 STRATIFICATION

Stratification of the target population improves sampling efficiency by grouping similar sub-populations that might exist within a general population. In the Prince George Forest District, we can assume that the adjustment ratio between ground volume and photo-interpreted volume will be different in stands with a large component of lodgepole pine (PI) compared to stands with no or little PI, due to the impact of the Mountain Pine Beetle (MPB) infestation. Past inventory adjustment projects in BC also often showed

Table 3. Target population stratification.

Stratum	Sub-Stratum	Area (ha)	%	
			Stratum	Target
Minor-Immature	30-80 yrs	178,965	43%	
	81-100 yrs	95,353	23%	
	101+ yrs	143,489	34%	
	<i>Total</i>	417,807		26%
Minor-Mature	0-200 m <sup>3</sup> /ha	302,974	35%	
	200-300 m <sup>3</sup> /ha	276,515	32%	
	300+ m <sup>3</sup> /ha	283,199	33%	
	<i>Total</i>	862,687		53%
Major	30-100 yrs	145,553	41%	
	101-140 yrs	113,490	32%	
	141+ yrs	93,614	27%	
	<i>Total</i>	352,657		22%

<sup>2</sup> J.S. Thrower & Associates Ltd. 2006. A sample plan to quantify old-growth characteristics of balsam-IU stands in the Prince George Forest District. Unpublished Report, Contract No. CFP-018, March 31, 2006. 14 p.

different adjustment ratios in mature and immature stands.

For these reasons, the target population of the Prince George Forest District was stratified based on the PI proportion in a stand and age class. The strata were defined as follows:

1. Polygons containing less than 31% PI volume and less than 141 years old (Minor-Immature).
2. Polygons containing less than 31% PI volume and 141 years or older (Minor-Mature).
3. Polygons containing more than 30% PI volume (Major).

There was not enough area in stands with a major PI component to warrant further stratification by age class.

Inventory adjustment ratios will be computed at the stratum level. Each stratum was subdivided into sub-strata to ensure a representative distribution of the samples within each stratum. The sub-strata in the Minor-Immature and Major strata were based on age class; those in the Minor-Mature stratum were based on stand volume. Sub-stratification is for spatial distribution of plots only. No adjustment ratios will be applied at the sub-strata level.

## 2.5 PHASE II SAMPLING

### 2.5.1 Overview

The MoFR initiated in 2000 a VRI Phase II sample plan where 120 sample plots were to be established throughout the Vegetated Treed population of the Prince George Forest District with equal sampling intensity.<sup>3</sup> One hundred nine (109) of these plots were actually established,<sup>4</sup> and 83 of these plots are in the 2006 target population.<sup>5</sup>

After consultation with the MoFR and the licencees, a mixed sampling design is proposed where new plots will be established and a few 2000 plots will be remeasured. This sampling technique is called *sampling on two occasions* by Cochran (1977)<sup>6</sup> or *sampling with partial replacement* (SPR) by many other authors (see Schreuder *et al.* for instance).<sup>7</sup> Remeasuring some of the old plots will give us the information needed to update to 2006 the attributes on the old plots that were not remeasured. Using remeasured, updated, and new plots increases the sample size at a fraction of the cost.

SPR works best when there is a strong correlation between the first and the second measurement. In the Major stratum, it is very likely that the 2006 volume will poorly correlate with the 2000 volume due to the MPB infestation. Only new sample plots will be used in this stratum. In Minor-Immature and Minor-Mature strata, 2000 and 2006 volumes should strongly correlate and SPR should provide a cost-efficient sampling design.

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<sup>3</sup> [http://www.for.gov.bc.ca/hts/vri/reports&pub/tsa\\_vpips/pgeorgefd\\_vriqs\\_vpip.pdf](http://www.for.gov.bc.ca/hts/vri/reports&pub/tsa_vpips/pgeorgefd_vriqs_vpip.pdf)

<sup>4</sup> Matt Matar, MoFR – Prince George Forest Region, personal communication, March 15, 2006.

<sup>5</sup> 24 plots were in stands less than 30 years old, one plot was in a reserve area, and one plot was in a polygon now considered Vegetated Non-Treed.

<sup>6</sup> Cochran, W.G. 1977. Sampling Techniques. 3<sup>rd</sup> ed., Wiley, New York. pp. 346-347.

<sup>7</sup> Schreuder, H.T., Gregoire, T.G., and Wood, G.B. Sampling Methods for Multiresource Forest Inventory. Wiley, New York. pp. 178-182.

### 2.5.2 Sampling Objective

The sampling objective is to install a sufficient number of plots to achieve an overall minimum sampling error of  $\pm 10\%$  (at a 95% confidence level) for use in the next Timber Supply Review. Assuming a coefficient of variation of 60%, 150 samples should be sufficient to achieve the target sampling error. If the coefficients of variation is larger than 60%, more plots will be required to achieve the sampling objective.

### 2.5.3 Sample Size

The sample size of 150 plots was allocated proportionally to area across all sub-strata. Once the overall sample size was allocated, we refined the sample size by allocating eight re-measured plots in the Minor-Immature stratum and 12 in Minor-Mature. The re-measured plots were assigned within each sub-stratum proportionally to area. The number of new plots was determined by subtracting the number of re-measured plots from the total sample size.

Table 4. Phase II sample size for total, new, and re-measured plots.

Stratum	Sub Stratum	Area (ha)	Total Plots	New Plots	Remeasured Plots	2000 Plots	% Remeasured
Minor-Immature	30-80	178,965	16	13	3	9	33%
	81-100	95,353	8	6	2	4	50%
	101+	143,489	14	11	3	4	75%
	<i>Total</i>	<i>417,807</i>	<i>38</i>	<i>30</i>	<i>8</i>	<i>17</i>	<i>47%</i>
Minor-Mature	0-200	302,974	28	24	4	15	27%
	200-300	276,515	26	22	4	15	27%
	300+	283,199	26	22	4	19	21%
	<i>Total</i>	<i>862,687</i>	<i>80</i>	<i>68</i>	<i>12</i>	<i>49</i>	<i>24%</i>
Major	30-100	145,553	14	14	0	6	0%
	101-140	113,490	10	10	0	6	0%
	141+	93,614	8	8	0	5	0%
	<i>Total</i>	<i>352,657</i>	<i>16</i>	<i>32</i>	<i>0</i>	<i>17</i>	<i>0%</i>

## 2.6 NET VOLUME ADJUSTMENT FACTOR SAMPLING

### 2.6.1 Overview

The Prince George Forest District licencees are pursuing a NVAF program whereby the 2006 Phase II field data will be used to develop a NVAF tree matrix from which the trees for destructive sampling will be selected. A sub-sample of the VRI Phase II plots must be selected for NVAF-enhancement to build the NVAF tree matrix.

Fifty (50) (or one-third) of the VRI Phase II plots (16 immature and 34 mature)<sup>8</sup> were randomly selected to be NVAF-enhanced. The VRI Phase II plots were sorted by stratum and sub-stratum within each maturity class and plots were selected using a systematic sampling design with a random start. Net factoring and call grading will be completed on all auxiliary plots for the NVAF-enhanced plots. If more Phase II plots are needed after the first batch is complete, one-third of these additional plots will be selected for NVAF-enhancement. Another 17 plots will be NVAF-enhanced within the BI-IU project, for a total of 42 NVAF-enhanced Phase II plots.

<sup>8</sup> Stands 120 years old or younger (2006 age) were considered immature, and mature otherwise.

### 3. IMPLEMENTATION PLAN

#### 3.1 SAMPLE SELECTION

Sample polygons were selected using probability proportional to size with replacement (PPSWR) for the new plots. Each polygon in the sampling frame was listed only once and size was the total area of the polygon. The sample points within the sample polygons were selected from the provincial 100 m grid in a Geographic Information System (GIS) using the simple random sampling (SRS) method. The sampling frame for the re-measured plots was the list of plots established in 2000/01. The plots that will be re-measured were selected using the SRS method. The plot list is given in Appendix II and the comparisons between target population and sample is shown in Appendix III.

The Prince George TSA licencees are concurrently completing a project to collect ground information on BI-IU stands.<sup>2</sup> Part of this project requires data in the general old-growth population. Twenty-four (24) of the 150 VRI Phase II plots (16 new plots, eight remeasured plots) have been identified as located in the population of interest for the BI-IU project. These plots will require additional measurements not needed for other VRI plots.

#### 3.2 SAMPLE PACKAGES

Field sample packages include:

1. An ortho-photo (1:5,000) showing plot location and Global Positioning System (GPS) points.
2. Access maps using ortho-photos (1:20,000) showing polygon and plot location.
3. Overview map (approx 1:100,000) for general polygon location.

#### 3.3 FIELD SAMPLING

##### 3.3.1 Field Crews

Field work is scheduled to begin early in the 2006 field season. A project pre-work meeting will be held on the first day and sampling should begin immediately thereafter. All plots will be installed at the random locations selected by the GIS. If a plot location is unsafe or is no longer part of the target population (due to harvesting or fire), the Prince George Forest District licencees and MoFR representatives will try to locate an alternate location. If an alternate location cannot be found, the plot will be dropped.

##### 3.3.2 VRI Measurements

The project priority is to measure timber attributes and coarse woody debris at each plot. Data will be collected to provincial VRI ground sampling standards.<sup>9</sup> Additional attributes beyond VRI requirements will be measured (Section 3.3.3). Certified crews will gather the data using VRI Card Types 1, 2, 3, 6, 7, 8, 9, 10, and 11. For the BI-IU plots, information on VRI Card Types 12, 13, and 16 will also be recorded. All BI-IU plots will be NVAF-enhanced plots.

##### 3.3.3 Non-Standard VRI Data

The Prince George Forest District licencees will collect additional, non-standard, VRI data to supplement the information normally provided by the VRI Phase II sampling. Additional measurements will include (Appendix IV):

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<sup>9</sup> VRI ground sampling procedures are available: [http://srmwww.gov.bc.ca/risc/pubs/teveg/vri\\_gs\\_2k4/vri\\_gs\\_2k4.pdf](http://srmwww.gov.bc.ca/risc/pubs/teveg/vri_gs_2k4/vri_gs_2k4.pdf)

1. Collecting species and diameter data on dead standing trees in the auxiliary plots.
2. Measuring the bearing and distance from the sample point to the tree in the auxiliary plots.
3. Recording borderline trees that are outside the normal prism plot.

For the BI-IU Enhanced plots, the following modifications to VRI standards will be used (Appendix V):

1. All four auxiliary plots will be installed in all Phase II plots.
2. Coarse woody debris intersect line will be full-length (no bouncing back).
3. Small trees and stump information will be collected on auxiliary plots.
4. No soil information will be collected on Card Type 12 and 13.<sup>10</sup>

### **3.3.4 Core Counting**

Tree ages from sample cores will be counted by the field contractor completing the plot. Ages will be counted in the lab using a microscope and entered into the MoFR data entry program TIMVEG.

### **3.3.5 Data Entry**

Standard VRI field data will be entered into TIMVEG. Validation reports will be generated for each plot to ensure data integrity. All standard VRI data will be provided to the MoFR to be included in the provincial VRI database. Non-standard data will also be provided to the MoFR in a Microsoft Access™ database.

All tree cores will be counted in the lab by the field contractor and included in TIMVEG. GPS data will be post-processed by the field contractors, entered into TIMVEG, and delivered with the data at the end of the project.

### **3.3.6 Pre-work and Quality Assurance**

All field crews should attend a pre-work session with the client and auditor to review the plot methods and ensure that all questions are resolved at the beginning of the project. The Prince George Forest District licencees will hire a third party auditor to audit a minimum of 10% of all plots following the *VRI Ground Sampling Quality Assurance Standards*.<sup>11</sup> Auditing will be done by batch, and failed plots may result in a failed batch. Crews may be required to revisit failed plots at their own expense.<sup>12</sup>

### **3.3.7 Plot Supplies**

Supplies such as aluminum stakes, field maps, photos, plot cards, handheld data recorders, GPS units, and other required equipment are supplied by the field contract crews.

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<sup>10</sup> Soil information will not be collected because it is not consistent with the objectives of the BI-IU data collection program

<sup>11</sup> Minimum standards for VRI sampling are located at: [http://srmwww.gov.bc.ca/risc/PUBS/TEVEG/VRI\\_QA/VRI\\_Ground\\_Sampling\\_2K2/QA\\_Standards\\_for\\_VRI-02.pdf](http://srmwww.gov.bc.ca/risc/PUBS/TEVEG/VRI_QA/VRI_Ground_Sampling_2K2/QA_Standards_for_VRI-02.pdf)

<sup>12</sup> The requirement to revisit plots at the consultants will be at the discretion of the Prince George TSA stakeholders.

### 3.4 NET VOLUME ADJUSTMENT FACTOR SAMPLING

Twenty-six (26) NVAF-enhanced plots were randomly sub-selected from the list of NVAF plots available. The intent was to increase sampling efficiency by limiting the number of plots where destructive sampling will occur. All trees from these 26 plots with a diameter at breast height 12.5 cm or larger were included in the sampling frame to develop the tree matrix. The tree matrix was stratified into six strata:

1. Dead trees
2. Immature Trees
3. Mature – Spruce (Sx)
4. Mature – Balsam (BI)
5. Mature – Cedar (Cw)
6. Mature – Others.

All Cw trees in the NVAF plots were from the same sample. To increase the number of plots to select Cw, the sample size was increased by selecting all plots where Cw had been identified.

This provided an additional six plots.<sup>13</sup>

Table 5. NVAF sample size distribution.

Species Group	Spp	Net Merch Volume		Sample Trees		
		%Total	% Group	n	% Total	%Group
Dead	Decid.	0%	2%	0	0%	0%
	BI	0%	4%	10	9%	40%
	PI	4%	51%	10	9%	40%
	Sx	3%	42%	5	5%	20%
	Xc	0%	1%	0	1%	0%
	<i>Total</i>		7%	100%	25	22%
Immature	Decid.	3%	10%	5	4%	25%
	BI	6%	24%	5	4%	25%
	Fd	4%	16%	3	3%	15%
	PI	2%	8%	0	0%	0%
	Sb	2%	7%	0	0%	0%
	Sx	9%	35%	7	6%	35%
<i>Total</i>		27%	100%	20	18%	100%
Mature-B	BI	21%	100%	20	18%	100%
Mature-C	Cw	12%	100%	12	11%	100%
Mature-S	Sx	22%	100%	20	18%	100%
Mature-Others	Decid.	2%	21%	3	3%	15%
	Fd	1%	14%	1	1%	5%
	Hw	1%	11%	2	2%	10%
	L	1%	12%	2	2%	10%
	PI	4%	35%	5	4%	25%
	Sb	1%	7%	2	2%	10%
<i>Total</i>		11%	100%	15	13%	100%
<i>Total</i>	<i>Total</i>	100%		112	100%	

The NVAF sampling frame was not representative of the population. To ensure that the sample was as representative of the population as possible, the Dead, Immature, and Mature were further subdivided into the following:

- Dead species group: Dead-PI and Dead-Others
- Immature group: Immature-BI, Immature-Sx, and Immature-Others.
- Mature-Others group: Mature-Others-Deciduous, Mature-Others-PI, and Mature-Others-Others.

One hundred and twelve (112) trees were selected following the NVAF tree selection methodology (Table 5, Appendix VI). The sample size within each stratum was assigned in consultation with the MoFR based on estimates of net merchantable volume and expert knowledge about the variability within the stratum. A NVAF-certified crew will be hired to completed the destructive sampling during the 2007 field season.

The NVAF program will follow MoFR VRI standards and involves five steps:<sup>14</sup>

1. Create a tree matrix using data from the enhanced Phase II plots.

<sup>13</sup> The decision to proceed with this approach was made in consultation with the MoFR Volume & Decay Sampling Officer.

<sup>14</sup> NVAF sampling standards can be found at: [http://srmwww.gov.bc.ca/risc/pubs/teveg/nvaf2k2/nvaf\\_02.pdf](http://srmwww.gov.bc.ca/risc/pubs/teveg/nvaf2k2/nvaf_02.pdf)

2. Select sample trees from the tree matrix.
3. Complete stem analysis of the sample trees.
4. Complete a third-party audit of the sample trees.
5. Analyze the data to develop net volume adjustment factors.

A VRI-certified cruiser will be needed on the NVAF crew to enhance the Cw trees that have not been enhanced yet. There were eight Cw trees in three plots that need to be enhanced at sampling time.

The Prince George Forest District licencees will hire a third party auditor to audit a minimum of 10% of all plots following the NVAF quality assurance standards.<sup>15</sup>

### **3.5 STATISTICAL ADJUSTMENT**

#### **3.5.1 Data Compilation, Analysis and Adjustment**

The Prince George Forest District licencees will use the MoFR SAS compiler to compile all Phase II plots and NVAF trees. An interim analysis will be completed before the end of the 2006/07 fiscal year. The licencees will complete the analysis and statistical adjustment of the Phase I data to MoFR standards at the conclusion of the field program. The analysis will:

- Use the MoFR standard adjustment method.
- Calculate ground sample average volumes and inventory volumes for the Prince George Forest District.
- Adjust inventory height and age.
- Generate new *VDYP* volumes using the adjusted heights and ages.
- Adjust new volume estimates using the ratio of means method.
- Compute sampling errors for the Prince George Forest District area.

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<sup>15</sup> The NVAF quality assurance standards are described in the NVAF sampling standards, chapter 10.

### 4. SCHEDULE

#### 4.1 2006/07 TIMELINES

The licencees will seek approval of the VPIP by the MoFR early in the 2006/07 fiscal year, and solicit bids from consultants with VRI-certified field personnel to install the Phase II plots. Sampling will start early in the field season, immediately following the pre-work meeting. Crews will be audited at the start of the project and as the auditor deems necessary throughout the project. Data will be entered into TIMVEG and non-standard data entered into Microsoft Access™.

The goal is to have all Phase II plots installed during the 2006 field season. The NVAF tree matrix, sample size, and VPIP update will be completed in the winter of 2006/07. The NVAF program (destructive sampling and data entry) will be completed in 2007. Data compilation, inventory adjustment, and reporting will be completed by September 30, 2007.

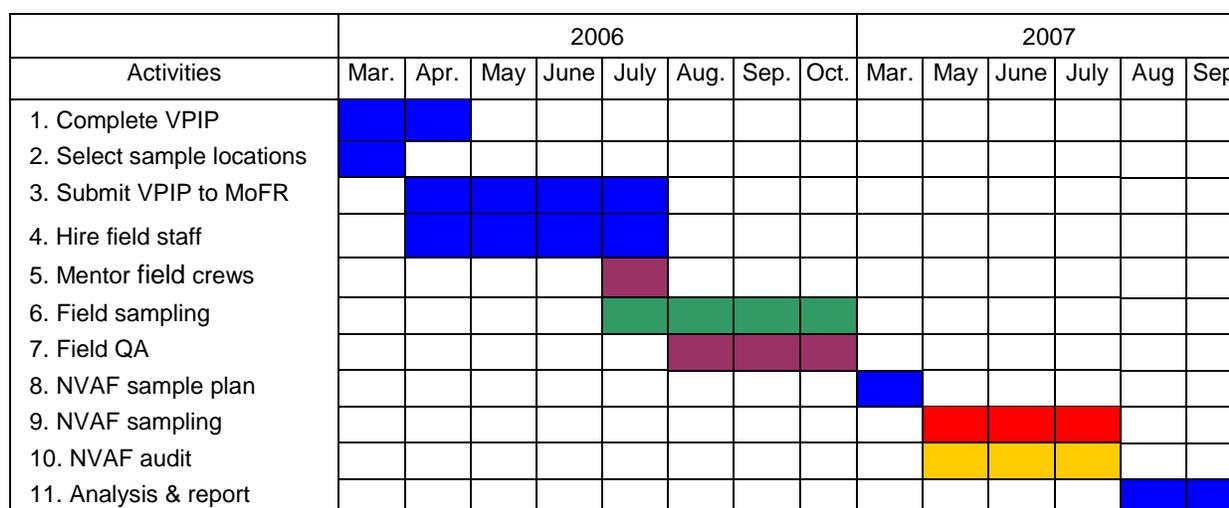


Figure 3. Proposed program implementation schedule. █ Stakeholders █ Field Crew █ VRI Mentor Auditor  
█ NVAF Crew █ NVAF Auditor

#### 4.2 PROPOSED BUDGET

The proposed Phase II program should cost approximately \$290,000, including audit, helicopter costs, and the statistical adjustment. The proposed NVAF program costs are approximately \$139,000.<sup>16</sup> Of the total program costs, approximately 93% of these costs are for implementation of the field program and the remaining 7% is allocated to analysis and reporting.

Table 6. Proposed Phase II and NVAF program cost.

Phase	Cost	%
Field Sampling	\$225,000	53
Helicopter	\$25,000	6
Field Audit	\$15,000	4
Statistical Adjustment & Report	\$25,000	6
<i>Sub-total</i>	<i>\$290,000</i>	<i>69</i>
NVAF Sampling	\$85,000	20
Helicopter	\$40,000	9
Field Audit	\$8,500	2
NVAF Analysis	\$5,000	1
<i>Sub-total</i>	<i>\$138,500</i>	<i>32</i>
<i>Program Total</i>	<i>\$428,500</i>	<i>100</i>

<sup>16</sup> The helicopter costs for the NVAF program were increased to be consistent with the observed costs of the 2006-07 Phase II program.

### 4.3 ROLES & RESPONSIBILITIES

#### **The Prince George Forest District licencees**

- Develop and update VPIP (as necessary).
- Coordinate project activities.
- Select sample polygons and locations within polygons.
- Prepare sample packages.
- Check data after initial compilation.
- Validate and compile data.
- Provide all QA reports to MoFR.
- Provide data to MoFR.
- Complete interim analyses.
- Complete statistical adjustment.
- Complete final report.

#### **Field Contractors**

- Complete field sampling.
- Enter the standard and non-standard sample data (incl. full cores and GPS of plot locations).
- Complete internal quality control and submit data to the Prince George Forest District licencees at the conclusion of field sampling.

#### **NVAF Field Contractor**

- Complete destructive sampling.
- Enter the sample data and provide to the Prince George Forest District licencees.

#### **VRI Phase II Auditor**

- Third party check-cruiser will audit a minimum of 10% of the Phase II samples.

#### **NVAF Auditor**

- NVAF-certified auditor will audit a minimum of 10% of the NVAF sample trees.

#### **MoFR**

- Review and approve the current version of the VPIP and the updated version in 2006.
- Review and approve the final analysis & the statistical attribute adjustment.
- Be the custodian of the VRI standard and non-standard sample & population data.
- Audit the VRI process to ensure that VPIP commitments and MoFR standards were met.

### 4.4 PROJECT DELIVERABLES

The VRI Phase II and NVAF program deliverables include the following submissions to MoFR:

- Data from 150 Phase II plots entered into TIMVEG and submitted;
- A third party audit of a minimum of 10% of the Phase II plots;
- Data from 112 NVAF trees entered into DVHand and submitted;
- A third party audit of a minimum of 10% of the NVAF trees;
- The adjusted Phase I and NVAF data; and
- A final report detailing the results of the statistical adjustment and NVAF program.

### 5. SIGN-OFF SHEET

I have read and concur that the Prince George Forest District VRI Phase II Project Implementation Plan dated March 31, 2007 meets current VRI standards and business needs and considerations. It is understood that this is an agreement-in-principle and does not commit the signatories to completing the inventory activities outlined within the plan.

\_\_\_\_\_  
*Canadian Forest Products Ltd.*  
*(lead proponent)*

\_\_\_\_\_  
Date

\_\_\_\_\_  
*Jon Vivian, RPF*  
*Manager Vegetation Resources Inventory*  
*Forest Analysis and Inventory Branch*  
*Ministry of Forests and Range*

\_\_\_\_\_  
Date

## APPENDIX I – GLOSSARY OF TERMS

### **Ground Sampling**

VRI ground sampling (Phase II) is the field measurement of timber, ecology, range, and/or coarse woody debris values at one or more locations within each sample polygon. To accommodate the wide variety of resources, various types and sizes of sampling units (e.g., fixed and variable plots, transects) are used to make the measurements.

### **Landcover Classification**

The BC Landcover Classification Scheme (BCLCS) was designed specifically to meet the requirements of the VRI, in addition to providing general information useful for “global vegetation accounting” and “integrated resource management.” The BCLCS is hierarchical and reflects the current state of the landcover (e.g., presence or absence of vegetation, type and density of vegetation) and such fixed characteristics as landscape position (i.e., wetland, upland, alpine). There are two main classes of polygons: Vegetated and Non-Vegetated.

### **Net Volume Adjustment Factor (NVAF) Sampling**

NVAF sampling provides factors to adjust net tree volume estimated from net factoring and taper equations. The adjustment accounts for hidden decay and possible taper equation bias. NVAF sampling involves detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimate net volume is obtained from net factoring and taper equations).

### **Photo-Interpretation (Phase I)**

Photo-interpretation (Phase I) involves the subjective delineation of polygons and the photo estimation of attributes for all polygons in an inventory unit. Medium scale aerial photographs (1:15,000) are most often used in the photo-interpreted estimates inventory.

### **Post-Stratification**

Post-stratification involves the division of an inventory unit into mutually exclusive sub-populations (strata) *after* ground sampling has been completed. Samples that fall in each post-stratum are analyzed separately and the results are applied to the corresponding population post-strata.

### **Pre-Stratification**

Pre-stratification involves the division of an inventory unit into mutually exclusive sub-populations (strata) *before* ground sampling to provide estimates for specific areas, or to increase the confidence in the overall estimates by considering the special characteristics of each stratum.

### **Sample Size**

The sample size for an inventory is the minimum number of ground samples to be established in an inventory unit to meet specified target precision or cost.

### **Statistical Adjustment**

Statistical adjustment (or analysis) is the process of adjusting the values of the photo-interpreted estimates variables using the ground sampling observations. For each sampled polygon, the ground observations are compared to the photo-estimated values to develop an adjustment factor. This factor is then applied to all polygons in the photo-interpreted estimates database to produce the final adjusted database.

**Sub-unit**

The term sub-unit describes the inventory unit of a management inventory (i.e., the management inventory target population is a subset of the provincial VRI inventory unit). A sub-unit may be defined by a specific geographic area (e.g., operable landbase) or stand type (e.g., problem forest types) within the Forest District.

**Target Population**

The target population is the unit from which the samples are chosen. For management inventories, the inventory unit is a TSA, TFL or other geographic area or specific attribute set, depending upon the sampling objectives.

**Target Precision**

Target precision expresses the amount of variation in key attributes (e.g., timber volume) desired in the final results. The target precision, usually expressed as the coefficient of variation (CV), is used to calculate the minimum sample size for subsequent ground sampling.

**Vegetation Resources Inventory (VRI)**

The VRI is an improved vegetation inventory process for assessing the quantity and quality of BC's vegetation resources. The VRI process is designed to include a flexible set of sampling procedures for collecting vegetation resource information. The VRI is essentially a toolbox of procedures, which include:

- BC Landcover classification scheme (BCLCS).
- *Photo-interpreted estimates (Phase I)*: the delineation of polygons from aerial photography and the estimation of resource attributes.
- *Ground sampling (Phase II)*: the establishment of plot clusters in selected polygons to measure timber, ecological, and/or range attributes. The data are used for the adjustment of the photo-interpreted estimates for all polygons in an inventory unit or management unit.
- *NVAF Sampling*: Stem analysis sampling of individual trees for net volume adjustment.
- *WPV Sampling*: Intensive sampling of selected polygons to determine the error between the estimated attribute values and the "true" attribute values.
- *Change Monitoring Inventory (CMI)*

The VRI can be deployed over the entire province (provincial VRI) measuring timber and non-timber resources, or over a large management unit (management VRI) measuring selected resources in specific portions of the landbase. The VRI sampling process produces spatial and non-spatial databases that can be used in multiple resource management applications including timber, ecosystem, and wildlife habitat management.

## APPENDIX II – PLOT LIST

Table 7. Prince George Forest District first batch new Phase II plots.

Plot No	NVAF	Maturity	Stratum	Sub Stratum	Feature ID	Area (ha)	Height (m)	Age (yrs)	Volume (m <sup>3</sup> /ha)	UTM		
										Zone	East.	North.
1	Yes	Mature	Minor-Mature	0-200	198353074BA13ED90D0444AEE8BD9C5E	17.0	18.5	305	132.3	10	640130	5990600
2	No	Immature	Minor-Immature	101+	6AB210D74538E3CBC5F40A8EACFB8CA4	12.0	27.4	114	241.5	10	518921	5950381
3	Yes	Mature	Minor-Mature	200-300	87AAB66F483CC462641FDCAD40E0DEF8	134.1	29.6	230	297.1	10	478646	6087017
4	Yes	Mature	Minor-Mature	300+	1D2FC8A8444A3DF3F3436CAAD5098C98	36.8	30.6	220	318.3	10	630043	5993840
5	Yes	Mature	Minor-Immature	101+	606D6AE94CACCD19EC134395EF709017	28.6	24.8	122	224.6	10	487048	6084252
6	No	Immature	Minor-Immature	30-80	B5B0A9B94BD72B0664A7E79D64929161	44.7	22.9	73	156.2	10	531317	6081060
7	No	Mature	Minor-Mature	200-300	35B1ADF749CB550109FAFA8DFC674301	17.1	27.5	310	249.1	10	602678	5998621
8	No	Mature	Minor-Mature	300+	A46406604CC00F82423DF2B18D023355	26.3	30.4	164	359.8	10	476386	5935358
9	Yes	Mature	Minor-Mature	300+	CE41FC054340552F4773EA9C9BFCCE2C	147.9	33.1	219	324.8	10	488868	6065831
10	Yes	Mature	Minor-Mature	200-300	687243894C7E477EBB63E5A4A3AD1B21	36.7	21.5	269	205.1	10	574192	6033421
11	No	Mature	Minor-Mature	300+	7D6731EA4FD0A987E919E6BE2F493868	24.1	35.4	309	452.5	10	619914	5956379
15	Yes	Mature	Major	141+	20A64A4E47531C389538F6B13B5D967F	5.8	28.4	164	312.6	10	471713	5907997
16	Yes	Immature	Major	30-100	81538F5E447ED46A6AA5EF84D0C857B2	4.0	19.8	79	116.3	10	482948	6032805
17	Yes	Mature	Minor-Mature	0-200	AD1060A148168FF4CC6F889647598B99	15.8	20.7	190	179.9	10	571943	5938691
19	No	Immature	Minor-Immature	81-100	4BFC782E40C1CA19C8EC3CA347B8F2B3	19.5	20.5	84	102.6	10	551430	5958212
21	No	Mature	Minor-Mature	200-300	55A517854E2A2C44FE8224855E642AC4	21.1	25.8	166	231	10	626671	5964310
22	No	Mature	Major	141+	A8CFC0F742BF073A54579DA1D1B25D88	19.1	31.3	194	402.8	10	554134	5960502
24	Yes	Mature	Minor-Mature	300+	132F12BB4A8F3CF840908DB8680FBF9A	166.9	37.3	179	435.5	10	501458	6069604
26	No	Immature	Major	30-100	1F8FC2734DC6A66A779708AA6334040F	10.5	20.4	92	178.4	10	484894	5939806
27	No	Immature	Major	30-100	B1B38A944FFA3AC02B7DE299C31278F8	52.1	24.5	84	284.5	10	488113	5944780
28	Yes	Mature	Minor-Mature	0-200	8917E8634D4AF78D5E8C7E8B139C1058	39.9	17.1	214	75.3	10	433034	5922270
29	Yes	Mature	Minor-Mature	0-200	81C90EB546239EBC67AD1A91C9370CD6	15.7	12.8	159	38.7	10	609103	5949726
30	Yes	Mature	Minor-Mature	0-200	786528264D0D8BB4A44631A444348A27	12.1	20.6	209	168.4	10	620943	5915035
32	Yes	Mature	Minor-Mature	200-300	A60B0FA84D67A2B37282289A89D133D8	91.1	28.6	260	292.1	10	622422	5984442
33	Yes	Immature	Major	30-100	C74861874B6ED4ACE4D48F87099072BB	49.4	23.6	74	225.2	10	489258	5959866
34	Yes	Mature	Minor-Mature	300+	D4FE3F374EBFE43D0B4D88BF95332184	6.6	33.2	198	338.8	10	558240	6054251
35	No	Immature	Minor-Immature	30-80	6BF6101248DE34C25B3A3788CE346D43	7.3	14	44	5	10	531041	5971312
36	Yes	Mature	Minor-Mature	200-300	C59A35F543559006BD5AD3ABF821D362	7.4	24.6	210	219	10	618770	6018584
38	Yes	Mature	Minor-Mature	200-300	EDD407674A019998BF3CE0871C65B70F	57.3	25.2	284	210.5	10	579509	6014749
39	No	Mature	Major	141+	48BAFC7A4714CFE6C3AF218205E05EA9	27.8	29.6	174	405.2	10	505475	6046278
40	No	Immature	Minor-Immature	81-100	CA1DA59B41DE9AD22B5D1EBD13A75002	27.5	23.7	89	100.4	10	504076	6081621
42	No	Immature	Minor-Immature	30-80	A843EBFD4C881D10F598B897D0AE508A	23.4	23.4	79	108.9	10	503440	6066713
45	No	Mature	Major	101-140	174B9B9F4D961DD66C3C03886DF8E452	16.8	27.2	129	332.9	10	472255	5970113
46	No	Immature	Major	101-140	ADC74D4947D1D078C2876390DF046A2A	4.7	24.3	114	295.4	10	495079	5936566
48	Yes	Mature	Minor-Mature	300+	90B2C78F4EB142B3EEBDAE83DC4DF292	10.0	32.3	164	342.8	10	540080	5983455
49	Yes	Immature	Minor-Immature	30-80	7B923D6E4AB1CE0C74BDE7819F12228C	6.1	16.4	50	7.2	10	576321	5989423
50	No	Immature	Major	30-100	7C7DE8A642F59D282A9971A1BBEDCE45	18.3	20.6	74	195.6	10	465286	5954774
51	No	Immature	Major	30-100	8AEF137C4209C03F1124F7B9061F8F73	9.9	22.6	74	217.1	10	479323	5950167
53	No	Mature	Major	141+	0B6025B947D40C2BEECCD6B008FCBEC	31.7	30.7	169	424.1	10	491452	6032442

Plot No	NVAF	Maturity	Stratum	Sub Stratum	Feature ID	Area (ha)	Height (m)	Age (yrs)	Volume (m <sup>3</sup> /ha)	UTM		
										Zone	East.	North.
54	Yes	Mature	Minor-Mature	0-200	5D11846448333DDED98182E9E3030EBF1	98.2	22.9	155	93.6	10	608117	6022649
55	No	Immature	Major	30-100	F56EBD0E422FEFA18D966AA994E268C1	5.3	19.6	74	171.7	10	461320	5925176
57	Yes	Mature	Minor-Mature	0-200	5F20E62947110F52E11E6B9E38F384E6	3.5	23	158	176.1	10	525618	6081404
58	No	Mature	Minor-Mature	300+	22616F0E44C473000ECA4187BD7A6BAE	39.5	30.2	304	316.7	10	619452	6001712
59	Yes	Immature	Minor-Immature	101+	0A9F93AC40D03C813820418D9BC7AFB9	15.0	19.2	109	129.3	10	648180	5946944
63	Yes	Mature	Minor-Mature	200-300	0DFE4325477D40A40BF4A096A97DC034	20.3	26.6	190	275.7	10	573567	5936817
64	Yes	Mature	Minor-Mature	300+	1574E567466621F157926D8F8D800D38	3.3	33.6	210	357.4	10	575438	5936035
65	Yes	Immature	Minor-Immature	30-80	D6D2837A45723CB65F323C85A78A9F32	25.4	21	65	64.8	10	528457	6077474
66	No	Mature	Major	101-140	FC35405544F06FBDA13E4D83294971C4	184.5	29.9	127	430.1	10	506004	5931890
67	No	Immature	Major	101-140	742DCEDD48006DDA5D8050B5E52A44A0	5.6	30.4	119	334.5	10	496026	6085573
68	No	Immature	Minor-Immature	101+	27A908CF401F998C5113588BE3D5DD12	21.7	27.6	114	232.3	10	515630	5960143
69	Yes	Mature	Minor-Mature	0-200	F509430940E333ABB979BBAFF26F68C	15.2	26.2	149	190.6	10	465575	5928603
70	No	Mature	Minor-Mature	0-200	8DE2D1AF42D888A29BA1F6B54F8DF89B	14.5	17.6	230	139.4	10	580713	6075847
73	Yes	Mature	Minor-Mature	200-300	0E4DD0A347D24C92713B98B37B025100	6.2	27.2	320	270.9	10	624539	5994076
74	Yes	Mature	Major	101-140	3672DEE2469F7C753B8CAD8DB679D8D6	17.4	31.2	134	413.8	10	478080	5932780
75	Yes	Mature	Minor-Mature	0-200	41EED0B34762C123DB7D40ABBD5AF1C8	33.7	19.6	209	170.8	10	619037	5935967
76	N	Mature	Major	101-140	192A661D4D4B6F548416ACB9DA036A7F	17.5	24.2	124	322.4	10	467441	5918301
77	N	Immature	Minor-Immature	030-080	6F6F96AB4BA791F463E0999A7D1CE8D6	14.1	11.7	44	31.5	10	545341	5944741
78	N	Mature	Minor-Mature	200-300	974D88FC453B85BAB7E20FB235449996	12.4	27.4	154	279.5	10	554864	5935413
79	N	Immature	Minor-Immature	101+	1359E3324C6563FFD01A61BED699F649	9.6	22.4	104	171.6	10	538702	5965272
80	N	Immature	Minor-Immature	101+	F8B5A38424757E57B9F20A1094CE70E	10.9	16.3	109	119.9	10	601437	5950957
81	Y	Mature	Major	101-140	29F28B1F45BD01C725C3A59125C8B4BC	49.3	29.9	136	375.6	10	466828	6068476
82	Y	Mature	Minor-Mature	300+	011E96014F8617709104C5B762D071F6	33.5	32.6	210	374.5	10	609785	5925940
83	Y	Mature	Minor-Mature	200-300	AD1C72934D29838FA1BF25B352786AFA	4.2	26.5	310	224.9	10	619579	6007020
84	Y	Immature	Major	030-100	214DA45A44BC0B2CB4D3C88C9DA6BE9E	55.5	20.6	74	177.2	10	485060	5938997
85	Y	Immature	Major	030-100	EF4E3C2B4E3D34E5647D9D9D560C62A0	30.5	25.4	94	291.3	10	503486	5980909
86	N	Immature	Major	030-100	BE3BB58D45BE8A7E284229A4EBB630DA	20.5	22.8	64	233	10	485695	5982069
87	N	Mature	Minor-Mature	200-300	40311B464DA844A24C3D07AB2253433A	29.0	28.3	230	262.3	10	560308	6093357
88	N	Immature	Minor-Immature	081-100	D87059424581EAAA3438478BB2F11C08	27.3	28.6	84	211.2	10	508044	5998455
89	N	Mature	Minor-Mature	300+	331961F3441377DB87CEF886E173A5CC	2.7	32.3	199	339.9	10	511252	6057158
90	Y	Mature	Minor-Mature	300+	64C38CBE433C8E9990150992492CCB24	26.4	32.6	200	339	10	639644	6002652
91	N	Mature	Minor-Mature	300+	8FF816EE4C8A40AA12F0AD8AC909BD25	38.0	40.4	243	442.6	10	515679	6090448
92	N	Mature	Major	101-140	1FA53B2545FAC4D96395988DE918E1D5	46.5	26.2	129	349.8	10	470155	5918486
93	N	Immature	Minor-Immature	030-080	55F9BCB14A72316A1AA9EA9685BDEB89	14.0	19.5	80	92.8	10	608971	5974693
94	Y	Mature	Minor-Mature	300+	CAAECD7B4A8ED09330D86EBA0F1F99AB	51.3	40.2	310	487.2	10	569162	6040051
95	Y	Immature	Minor-Immature	030-080	89974C4740CB93507FEA3B90D742ED26	13.3	4.6	31	0	10	482753	5946011
96	N	Immature	Minor-Immature	030-080	E87A6BDF43C39595F5A240900BD3EC32	27.8	18.8	78	59.3	10	532659	6034994

Plot No	NVAF	Maturity	Stratum	Sub Stratum	Feature ID	Area (ha)	Height (m)	Age (yrs)	Volume (m <sup>3</sup> /ha)	UTM		
										Zone	East.	North.
97	N	Mature	Major	141+	232234CC441E322EB47EDCAC534EF955	2.6	26.2	144	355.3	10	453309	6061736
98	Y	Mature	Minor-Mature	000-200	4AFE80C145A71A3E79381DB71DDB8102	23.2	16.3	184	111.1	10	623866	6022878
99	N	Mature	Minor-Mature	000-200	C0ACD36343E0E855C66D54AEC7698B6D	26.3	15.7	210	111.3	10	570041	6055952
100	N	Mature	Minor-Mature	200-300	163ED112439A0E23A4FBF1B2B08C7CAE	3.3	28.9	235	292.2	10	642413	6025193
101	Y	Immature	Minor-Immature	081-100	A2753A0A4073AE7F861D0BA1504FB736	25.6	20.7	96	168.7	10	561058	5934947
102	N	Mature	Minor-Mature	300+	2C25A5BD42DB9EA4981A4298D41B117E	59.3	33.5	229	398.3	10	576031	5947536
103	Y	Mature	Minor-Mature	000-200	3620659F48072749F212B78CBAA69005	40.0	21.7	250	196.6	10	579296	6059066
104	N	Immature	Major	101-140	2D9587774E035450638AF7B986B1B5F8	66.9	27.3	114	303.5	10	517957	5937192
105	Y	Mature	Minor-Mature	200-300	E6E1DB09426D31396335CCB76A30D7CE	38.5	26.7	209	267	10	568733	6074653
106	N	Immature	Major	030-100	3DFB99A64B72C5CA3BDEA28A465703F8	16.0	24.4	94	281.3	10	455076	6011541
107	N	Mature	Minor-Mature	200-300	3BADBA61428EEFD55BFFB3A686DD30F2	8.2	29.7	200	280.4	10	626024	5970252
108	N	Mature	Minor-Mature	200-300	B7A44879491F75B18648F3910D6472C4	16.8	28.6	239	268.6	10	566805	6076440
109	N	Mature	Major	101-140	9B48B0504B7AEF7A551905B9150897B4	134.0	26	138	302.3	10	522010	6034446
110	N	Immature	Minor-Immature	030-080	0ACF66A14A4228D4151DDF93EBA00865	127.0	13.6	31	0	10	566272	5937330
111	Y	Mature	Major	141+	203069E94687EAF20E010F9F018713D3	123.0	28.2	154	386.5	10	485494	5935070
112	N	Immature	Minor-Immature	030-080	8467B190455DC094241727AB6636B4AB	77.6	12.8	44	0.8	10	610760	5915975
113	N	Mature	Minor-Mature	000-200	40364CF843869B26973A1D81DB17139D	7.9	15.7	210	116.7	10	576687	6073111
114	N	Mature	Minor-Mature	200-300	F963240A4DB7530B224910A7BCDE0B5A	69.8	27.5	199	241.8	10	505541	6033745
115	Y	Mature	Minor-Mature	300+	86935703457E21293328609C1C841E42	15.9	33.3	189	396.1	10	507566	6090594
116	N	Mature	Minor-Immature	101+	9CEA99CD4AE3298B49B45CA5A9EBED69	22.6	30.3	139	270	10	484667	6075433
117	N	Mature	Minor-Mature	000-200	3EAA6F9E425C159BA2589BB15897697C	45.9	14	145	83.7	10	579580	6072788
118	Y	Immature	Minor-Immature	101+	FD72CDDA416680DCE594B6BC3491FF48	45.9	29.6	114	293.2	10	520670	5920941
119	Y	Immature	Minor-Immature	101+	58D79819472F782E3A31308DF8557D6F	62.9	20.4	113	173.3	10	555860	5986790
120	N	Mature	Minor-Mature	300+	9D3687C940BCD6FBFF24D98716F1505C	5.5	23.9	149	300.5	10	570092	5949294
121	N	Immature	Major	030-100	A232F1A0457D35CF00EF99E7AC8858	44.2	17	44	26.7	10	513189	5949924
122	Y	Mature	Minor-Mature	000-200	CBA900D440A75692839B7F99B5161D4D	14.5	19.6	209	80.5	10	617493	5935031
123	N	Mature	Minor-Mature	000-200	A55D99CA460952036F06AAA18DAD2771	17.2	17.8	159	148.3	10	576487	5941803
124	N	Mature	Minor-Mature	300+	663B48504770F4816B7D5BA478D94D19	38.1	31	149	326.4	10	512543	6031041
125	N	Mature	Minor-Mature	300+	E15BB6EA44D9BDA018DCB7BC3FBCC8E9	20.4	32.3	164	360.4	10	557043	5941835
126	N	Mature	Minor-Mature	000-200	EE5FA15C409553085EAE19A95EB91DF5	21.2	17.1	173	134	10	587456	6055310
127	N	Mature	Minor-Mature	000-200	4B3461B34A5FA5A8D0F2D3A5AD66F4E3	13.2	20.8	209	152	10	661892	5962696
128	N	Immature	Minor-Immature	081-100	256EFFB9498F9CC9672430A3617B68BD	47.2	25.9	84	225.1	10	496763	5952530
129	N	Mature	Major	141+	25CE782A40EEE75F264D318E7A54CCFF	147.8	24.2	149	332.5	10	448300	5927734

Plot No	NVAF	Maturity	Stratum	Sub Stratum	Feature ID	Area (ha)	Height (m)	Age (yrs)	Volume (m <sup>3</sup> /ha)	UTM		
										Zone	East.	North.
130	Y	Immature	Major	030-100	7D42716C4F2C74DE0DA3E1AEE6E9260E	17.0	6.9	34	0.3	10	509443	6000701
131	Y	Mature	Minor-Mature	200-300	571BBBF34B31782E477FE6A59CEBD296	16.0	22.7	190	207.7	10	614186	5984093
132	N	Immature	Minor-Immature	030-080	ADB1DF5B4574F07E10DF1281F0ADB82F	28.3	19.9	45	1.3	10	514547	5948864
133	N	Immature	Minor-Immature	081-100	182E62274ADCB9A23A91C58A7803A9B9	93.2	22.7	99	207.6	10	623027	5961158
134	Y	Mature	Minor-Immature	101+	0775B60D4F39571C44E248B38AC25ECD	68.5	28.3	138	263	10	519276	6064333
135	N	Mature	Minor-Mature	200-300	D089567C48403FE03552EEBE5FA0125A	2.5	22.1	195	207.4	10	614865	5918204
136	N	Mature	Minor-Mature	200-300	9B41FD854876141DA0F6C3B27FA462E1	19.6	22.6	189	204.1	10	647522	5959604
137	Y	Mature	Minor-Mature	200-300	28A3E1DE457021E4BC442E82BDC44B3D	13.8	26.6	170	271.4	10	527742	6095948
138	N	Mature	Minor-Mature	000-200	0CDFC0C049392B1D6EAC8AA303DF4F43	3.4	18.5	305	130.8	10	630536	5998330
139	Y	Mature	Minor-Mature	000-200	906447AC4793FC1D69D127A05F4D9F20	4.2	16.6	260	63.9	10	529983	6115598
140	N	Mature	Minor-Mature	200-300	F2ABA3464A1F0CF16017B6BFAC0188E3	50.5	25.6	190	226.4	10	542911	6084976
141	N	Mature	Minor-Mature	300+	6B99A1A9492F4889DC5F63BE9582004C	32.4	28.5	166	302.9	10	607876	5972534
142	N	Mature	Minor-Mature	000-200	8516CF9D4E06D703A164AF8F426E6CAC	8.3	12.8	170	28.3	10	581914	6054644
143	Y	Immature	Minor-Immature	030-080	35697FC0405CF3E79D601A870093A4B0	13.4	1.6	80	0	10	581388	6054065
144	Y	Mature	Minor-Mature	300+	E39ED80C42AE993C71890CA9EF02CDDA	37.6	30.6	210	308.5	10	559233	6094004
145	N	Mature	Minor-Mature	300+	CEABC2DB4E4F7E8E53F827BC9D6B4556	24.1	30.2	224	322	10	528499	6111351
146	N	Mature	Major	141+	0C69D888405A4EBFD5D695AE617943EE	15.9	23.3	159	247.5	10	566557	5967388
147	N	Mature	Minor-Mature	000-200	F8A236CE4E8F404B53192A8F45DEE64D	4.4	20.3	184	189.8	10	545428	5937421
148	N	Immature	Major	030-100	5DE8E24D4E424D155BCB3EA6195C2F71	4.7	24.5	84	212.7	10	472067	5970422
149	Y	Mature	Minor-Mature	000-200	F375F0F144BF03B71B8A05BB032B6024	11.1	12.8	159	35.4	10	638763	5933113
150	N	Immature	Minor-Immature	101+	963378914306FC5557A46496DA314E92	12.4	16.7	108	84.5	10	524292	6052692

Note: Shaded plot will be enhanced following the BI-IU project's measurement standards.

Table 8. Prince George Forest District first batch of remeasured Phase II plots.

Plot No	NVAF	Maturity	Stratum	Sub Stratum	Feature ID	2000 Plot No.	Height (m)	Age (yrs)	Volume (m <sup>3</sup> /ha)	UTM		
										Zone	East.	North.
12	Yes	Mature	Minor-Mature	0-200	6C56A3BC40D3A6CA81BA01804A77B765	241S-382	15.4	154	119.8	10	555272	5933210
13	Yes	Mature	Minor-Mature	0-200	C303BDFD4A72A752157E9EA9AF9A8FE7	241S-062	30.6	230	144.4	10	606907	6029799
14	Yes	Mature	Minor-Mature	200-300	E6E57DEC474FE07D65CAC68F5FAD3992	0241-217	22.6	209	211	10	625519	5944925
18	Yes	Mature	Minor-Mature	200-300	80A9661649D816DADB5CF6A1E2C3592F	241S-367	24.8	210	218.9	10	538909	6091507
20	Yes	Mature	Minor-Mature	0-200	7D52D1C0463002C62C853795D1A8482D	0241-031	11.6	230	32	10	538884	6108500
23	No	Immature	Minor-Immature	30-80	DE2E23D5483107ADFDE0BE9123FFB613	241S-051	11.1	52	0	10	606059	6005185
25	No	Mature	Minor-Mature	300+	CD30ED9C4BD43F9A50DD89839C94A7C4	0241-213	25.8	170	327	10	566490	5960109
31	Yes	Immature	Minor-Immature	101+	0FECF10E4CC6DBFCA5B7CEB2C1B0A53A	241S-257	21.2	108	127.5	10	537388	6030779
37	Yes	Immature	Minor-Immature	81-100	50EEF640466A6BAC962D5EAC74D263E5	0241-205	10.2	94	36.1	10	593048	6054771
41	Yes	Mature	Minor-Mature	200-300	724F15D54EF304568F0F6AA7B9F7FF76	0241-209	28.6	250	285.3	10	583981	6072604
43	No	Mature	Minor-Immature	101+	23E63DE14FACD386A39BEAB4E0AF21B0	241S-061	28.7	133	325.9	10	463955	6066888
44	Yes	Mature	Minor-Mature	200-300	A8002B1D483EC165C9D04ABA8D3E95D2	241S-260	26.8	189	253.1	10	573648	5971696
47	Yes	Immature	Minor-Immature	30-80	BD0F5CBF43E37EFE7D2F60AD3B42AF8F	0241-221	21	79	52.3	10	507618	6070645
52	No	Immature	Minor-Immature	30-80	72726D4B4D012ED6AA1D4CBC7E5C26F9	0241-231	18.1	69	113.8	10	554442	5958510
56	No	Mature	Minor-Immature	101+	7E1CA7C94823EAE4BFDEBB9526387A28	241S-265	29.2	138	281.1	10	527376	6054557
60	No	Mature	Minor-Mature	300+	D49486CA4A00B87B8ED407941872D07F	241S-383	33.2	224	422.3	10	559756	5942120
61	Yes	Mature	Minor-Mature	300+	316D742646185381C0215FBAD9190315	241S-385	31.3	164	388.6	10	543351	5966175
62	Yes	Mature	Minor-Mature	0-200	8AC273A941E8B60C68664C85BED0F82C	241S-256	21.7	190	177.9	10	635310	5969241
71	No	Mature	Minor-Mature	300+	1A708FD642791BAA2DB2CDBB25E827CF	241S-068	28.8	169	322.7	10	507144	6092421
72	No	Immature	Minor-Immature	81-100	5E555BA2433AD97467ADEEA5B18EB1F4	0241-204	16	95	89	10	564972	5932776

Note: Shaded plot will be enhanced following the BI-IU project's measurement standards.

### APPENDIX III – TARGET AND SAMPLE COMPARISONS

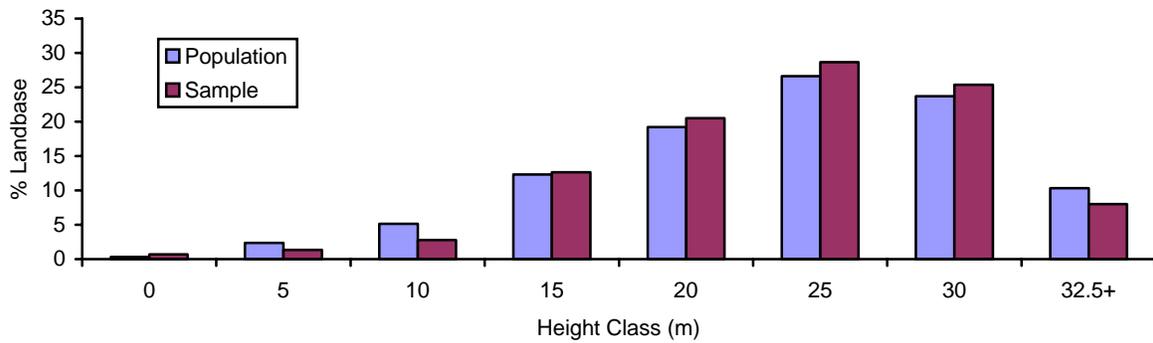


Figure 4. Target and sample population comparison by height class.

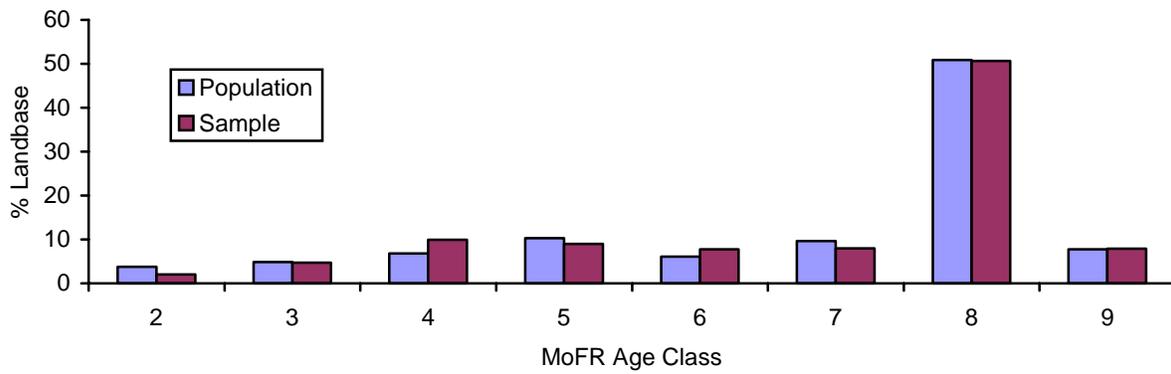


Figure 5. Target and sample population comparison by age class.

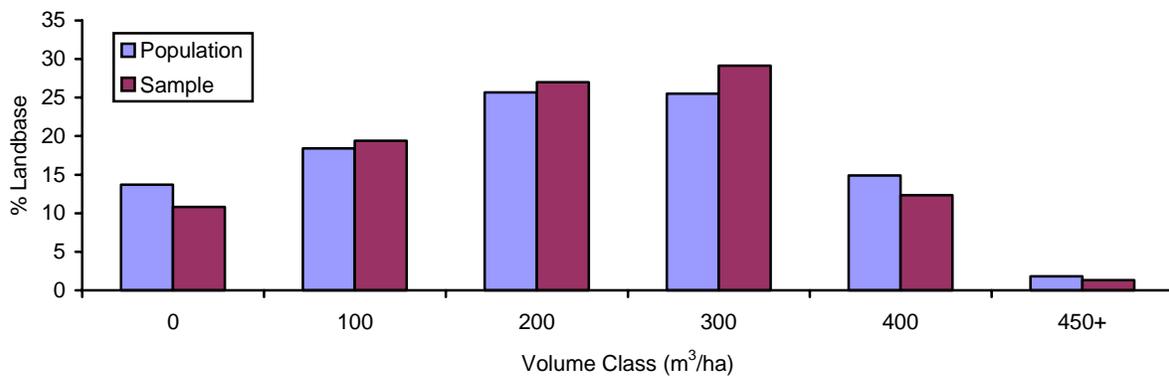


Figure 6. Target and sample population comparison by volume class.

## APPENDIX IV – ADDITIONS TO STANDARD VRI METHODS

In order to provide data that better meets the Prince George Forest District licencees' inventory needs, additional field data is being collected beyond provincial VRI standards. The additions to current VRI methods include:

- Tallying all dead standing trees in all plots.
- Recording the distance plot centre-tree on auxiliary plots.
- Recording borderline trees that are outside the prism plot.
- Establishing the regeneration plot on all points.

### **Tallying dead standing trees in auxiliary plots**

In order to record incidence of MPB on the TFL, we propose tallying the species and diameter of dead standing trees in all plots.

### **Recording the distance plot centre-tree on auxiliary plots**

Tree distances are only recorded on the Integrated Plot Centre (IPC). We propose recording this attribute on all auxiliary plots to increase the information on tree distances.

### **Recording borderline trees outside the prism plot**

Recording borderline trees will decrease the likelihood of missing a tree. In the current system, trees are dropped from compilation if the tree was mistakenly recorded as in tree, but it is impossible to know if missed trees should have been included.

### **Establishing the regeneration plot on all points.**

Collecting regeneration information will be used in the BI-IU project.

**APPENDIX V – MODIFICATIONS TO VRI STANDARDS FOR BL-IU ENHANCED PLOTS**

Card	Name	Include	Card Description	Modifications / Notes
3 – CL	Cluster Layout	Yes	Plot and cluster diagrams.	Maps all four auxiliary plots to be located at 50 m from IPC.
6 – EW	CWD Transect 1	Yes	CWD data along first random azimuth.	Don't bounce-back when transect extends beyond polygon. Note details in comments section.
7 – EC	CWD Transect 2	Yes	CWD data along transect at 90° to the first.	As above.
11 – TA	Auxiliary Plot	Yes	Tree attributes, damage agents, loss indicators, and site tree data for aux plots.	Install all four plots; map those in and out of the target polygon (Card X); enhance dead trees; stem map all trees; complete small tree and stump Cards (9/10)
12 – EP	Ecological Description 1	Yes	Site and soil classification for pin location.	Do not take detailed soil information.
13 – ED	Ecological Description 2	Yes	Site and soil classification if pin location is not in dominant site.	Do not take detailed soil information.

## APPENDIX VI – NVAF SAMPLE LIST

Table 9. NVAF sample list for the Prince George Forest District.

Stratum	Sample No.	Plot	Tree			DBH (cm)	Weight1	Weight2	Weight3
			No.	Spp	Live/Dead				
Dead	DPG1-0005-NO1	W	7	SXW	D	28.1	58,327	48.4	1.733
Dead	DPG1-0016-NO1	W	12	S	D	13	58,327	678.1	1.733
Dead	DPG1-0020-NR2	E	8	BL	D	43.4	58,327	8.4	1.733
Dead	DPG1-0020-NR2	N	11	BL	D	31.1	58,327	16.5	1.733
Dead	DPG1-0037-NR2	E	8	BL	D	15.8	58,327	119.0	1.733
Dead	DPG1-0037-NR2	S	5	XC	D	20.5	58,327	70.7	1.733
Dead	DPG1-0037-NR2	S	8	BL	D	36.1	58,327	22.8	1.733
Dead	DPG1-0103-NO1	N	5	BL	D	54.5	58,327	12.9	1.733
Dead	DPG1-0103-NO1	S	4	BL	D	59.7	58,327	10.7	1.733
Dead	DPG1-0137-NO1	S	9	SXW	D	26.5	58,327	81.6	1.733
Dead	DPG1-0137-NO1	W	6	SXW	D	33	58,327	52.6	1.733
Dead	DPG1-0139-NO1	W	4	BL	D	27.7	58,327	29.0	1.733
Dead	DPG1-0144-NO1	E	12	BL	D	31.7	58,327	28.5	1.733
Dead	DPG1-0144-NO1	S	2	BL	D	23.4	58,327	52.3	1.733
Dead	DPG1-0144-NO1	S	7	SXW	D	93.5	58,327	3.3	1.733
Dead	DPG1-0005-NO1	N	5	PLI	D	34.1	58,327	32.8	1.000
Dead	DPG1-0005-NO1	N	6	PLI	D	37.9	58,327	26.6	1.000
Dead	DPG1-0081-NO1	E	4	PLI	D	28.9	58,327	26.7	1.000
Dead	DPG1-0081-NO1	N	5	PLI	D	28.7	58,327	27.1	1.000
Dead	DPG1-0081-NO1	S	10	PLI	D	16.3	58,327	83.9	1.000
Dead	DPG1-0081-NO1	W	5	PLI	D	21.2	58,327	49.6	1.000
Dead	DPG1-0081-NO1	W	6	PLI	D	14.8	58,327	101.7	1.000
Dead	DPG1-0081-NO1	W	7	PLI	D	14.8	58,327	101.7	1.000
Dead	DPG1-0081-NO1	W	8	PLI	D	13.6	58,327	120.5	1.000
Dead	DPG1-0081-NO1	W	10	PLI	D	17.6	58,327	71.9	1.000
Immature	DPG1-0037-NR2	E	6	BL	L	23.1	64,898	55.7	3.000
Immature	DPG1-0037-NR2	N	8	BL	L	36.4	64,898	44.8	3.000
Immature	DPG1-0037-NR2	S	1	BL	L	56.3	64,898	9.4	3.000
Immature	DPG1-0049-NO1	N	1	BL	L	27.8	64,898	49.4	3.000
Immature	DPG1-0049-NO1	N	5	BL	L	31	64,898	39.7	3.000
Immature	DPG1-0033-NO1	E	2	FDI	L	38.1	64,898	20.5	4.000
Immature	DPG1-0033-NO1	E	6	FDI	L	44.2	64,898	15.2	4.000
Immature	DPG1-0049-NO1	N	7	EP	L	29.1	64,898	45.1	4.000
Immature	DPG1-0049-NO1	S	3	EP	L	17.6	64,898	123.3	4.000
Immature	DPG1-0049-NO1	S	4	EP	L	19.3	64,898	102.5	4.000
Immature	DPG1-0085-NO1	S	1	AT	L	26.1	64,898	65.4	4.000
Immature	DPG1-0085-NO1	S	2	FDI	L	78.4	64,898	7.3	4.000
Immature	DPG1-0095-NO1	N	8	EP	L	21.7	64,898	33.8	4.000
Immature	DPG1-0033-NO1	S	1	SXW	L	12.8	64,898	181.3	1.429
Immature	DPG1-0033-NO1	W	2	SXW	L	32.8	64,898	27.6	1.429
Immature	DPG1-0037-NR2	S	3	SE	L	41.1	64,898	17.6	1.429
Immature	DPG1-0049-NO1	N	2	SX	L	38.1	64,898	26.3	1.429
Immature	DPG1-0095-NO1	E	1	SXW	L	12.9	64,898	95.6	1.429
Immature	DPG1-0095-NO1	N	3	SXW	L	19	64,898	44.1	1.429
Immature	DPG1-0095-NO1	N	6	SXW	L	15.2	64,898	68.9	1.429
Mature-B	DPG1-0004-NO1	E	3	BL	L	51.8	55,698	19.0	5.000
Mature-B	DPG1-0005-NO1	S	1	BL	L	15.3	55,698	163.2	5.000
Mature-B	DPG1-0014-NO2	E	2	BL	L	28	55,698	36.5	5.000
Mature-B	DPG1-0014-NO2	E	5	BL	L	39.8	55,698	18.1	5.000
Mature-B	DPG1-0014-NO2	N	1	BL	L	27	55,698	39.3	5.000
Mature-B	DPG1-0014-NO2	S	2	BL	L	45.8	55,698	13.7	5.000

Stratum	Sample No.	Plot	Tree			DBH (cm)	Weight1	Weight2	Weight3
			No.	Spp	Live/Dead				
Mature-B	DPG1-0020-NR2	E	2	BL	L	32	55,698	15.5	5.000
Mature-B	DPG1-0020-NR2	E	5	BL	L	29.2	55,698	18.7	5.000
Mature-B	DPG1-0020-NR2	N	1	BL	L	46.7	55,698	7.3	5.000
Mature-B	DPG1-0020-NR2	S	2	BL	L	23.9	55,698	27.9	5.000
Mature-B	DPG1-0020-NR2	S	3	BL	L	35.6	55,698	12.6	5.000
Mature-B	DPG1-0020-NR2	W	3	BL	L	21.5	55,698	34.4	5.000
Mature-B	DPG1-0020-NR2	W	4	BL	L	42.5	55,698	8.8	5.000
Mature-B	DPG1-0036-NO1	W	4	BL	L	33.4	55,698	34.2	5.000
Mature-B	DPG1-0103-NO1	S	2	BL	L	37.9	55,698	26.6	5.000
Mature-B	DPG1-0131-NO1	E	4	BL	L	44.6	55,698	14.4	5.000
Mature-B	DPG1-0131-NO1	E	6	BL	L	58.6	55,698	8.3	5.000
Mature-B	DPG1-0137-NO1	S	4	BL	L	18.6	55,698	165.6	5.000
Mature-B	DPG1-0137-NO1	S	10	BL	L	13	55,698	339.0	5.000
Mature-B	DPG1-0144-NO1	S	6	BL	L	40.8	55,698	17.2	5.000
Mature-C	DPG1-0004-NO1	N	3	CW	L	50.6	42,845	19.9	5.333
Mature-C	DPG1-0004-NO1	S	1	CW	L	117.1	42,845	3.7	8.333
Mature-C	DPG1-0004-NO1	S	6	CW	L	42.1	42,845	28.7	5.333
Mature-C	DPG1-0004-NO1	W	8	CW	L	17.5	42,845	166.3	5.333
Mature-C	DPG1-0011-DO1	N	7	CW	L	164	42,845	1.1	7.000
Mature-C	DPG1-0011-DO1	N	14	CW	L	207.5	42,845	0.7	7.000
Mature-C	DPG1-0011-DO1	S	5	CW	L	66.7	42,845	6.9	8.333
Mature-C	DPG1-0058-DO1	S	2	CW	L	85.2	42,845	4.2	8.333
Mature-C	DPG1-0058-DO1	W	3	CW	L	78.5	42,845	9.9	8.333
Mature-C	DPG1-0141-DO1	E	3	CW	L	60.6	42,845	6.2	8.333
Mature-C	DPG1-0141-DO1	E	7	CW	L	92	42,845	2.7	8.333
Mature-C	DPG1-0141-DO1	S	4	CW	L	136.6	42,845	2.5	7.000
Mature-S	DPG1-0005-NO1	W	2	SXW	L	24.3	55,698	64.7	2.700
Mature-S	DPG1-0036-NO1	S	1	SXW	L	50.5	55,698	15.0	2.700
Mature-S	DPG1-0081-NO1	E	1	SXW	L	22.5	55,698	44.0	2.700
Mature-S	DPG1-0082-NO1	E	2	SXW	L	57	55,698	15.7	2.700
Mature-S	DPG1-0082-NO1	E	3	SXW	L	55.4	55,698	16.6	2.700
Mature-S	DPG1-0082-NO1	N	1	SXW	L	53	55,698	18.1	2.700
Mature-S	DPG1-0082-NO1	S	3	SXW	L	63.2	55,698	12.8	2.700
Mature-S	DPG1-0111-NO1	E	3	SXW	L	32	55,698	58.0	2.700
Mature-S	DPG1-0134-NO1	S	1	SXW	L	37.2	55,698	27.6	2.700
Mature-S	DPG1-0134-NO1	S	2	SXW	L	41.3	55,698	22.4	2.700
Mature-S	DPG1-0134-NO1	S	4	SXW	L	25.3	55,698	59.7	2.700
Mature-S	DPG1-0134-NO1	W	3	SXW	L	47.3	55,698	17.1	2.700
Mature-S	DPG1-0137-NO1	S	11	SXW	L	16.4	55,698	213.0	2.700
Mature-S	DPG1-0144-NO1	E	3	SXW	L	44.5	55,698	14.5	2.700
Mature-S	DPG1-0144-NO1	E	9	SXW	L	66	55,698	6.6	2.700
Mature-S	DPG1-0144-NO1	W	1	SXW	L	40	55,698	17.9	2.700
Mature-S	DPG1-0144-NO1	W	8	SXW	L	79	55,698	4.6	2.700
Mature-S	DPG1-0154-NO1	E	1	SX	L	20.1	55,698	94.5	2.700
Mature-S	DPG1-0154-NO1	E	3	SX	L	35.2	55,698	30.8	2.700
Mature-S	DPG1-0154-NO1	W	5	SX	L	47.8	55,698	16.7	2.700
Mature-Others	DPG1-0005-NO1	W	4	AT	L	32.6	55,698	35.9	3.667
Mature-Others	DPG1-0069-NO1	W	3	AT	L	45.6	55,698	21.4	3.667
Mature-Others	DPG1-0081-NO1	S	2	AT	L	23.2	55,698	41.4	3.667
Mature-Others	DPG1-0004-NO1	E	5	HW	L	31.4	55,698	51.7	1.857
Mature-Others	DPG1-0004-NO1	E	9	HW	L	27.7	55,698	66.4	1.857
Mature-Others	DPG1-0005-NO1	N	4	SB	L	22.9	55,698	72.8	1.857
Mature-Others	DPG1-0028-NO1	E	2	LT	L	33.5	55,698	18.9	1.857
Mature-Others	DPG1-0028-NO1	E	9	SB	L	20	55,698	53.1	1.857
Mature-Others	DPG1-0028-NO1	W	1	LW	L	37.8	55,698	14.9	1.857
Mature-Others	DPG1-0134-NO1	W	5	FDI	L	44.2	55,698	19.6	1.857

Stratum	Sample No.	Plot	Tree			DBH (cm)	Weight1	Weight2	Weight3
			No.	Spp	Live/Dead				
Mature-Others	DPG1-0005-NO1	N	2	PLI	L	32.9	55,698	35.3	2.000
Mature-Others	DPG1-0081-NO1	N	2	PLI	L	19.1	55,698	61.1	2.000
Mature-Others	DPG1-0081-NO1	N	3	PLI	L	23.9	55,698	39.0	2.000
Mature-Others	DPG1-0081-NO1	N	4	PLI	L	25.4	55,698	34.5	2.000
Mature-Others	DPG1-0081-NO1	S	6	PLI	L	21	55,698	50.5	2.000

Note: Weight1 is the area (ha) each sample represents, Weight2 is the number of trees/ha each tree represents, and Weight3 is the number of trees within the stratum each tree represents.