FORT ST. JOHN TIMBER SUPPLY AREA VEGETATION RESOURCES INVENTORY PHASE II PROJECT IMPLEMENTATION PLAN

VERSION 2.1

Prepared for
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On Behalf Of
Forest Licencees in the
Fort St. John Timber Supply Area

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1. INTRODUCTION

1.1 VRI 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[1], generally using photo-interpretation.
2. Phase II (ground sample data) – Measurements are taken from randomly located ground samples for 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.

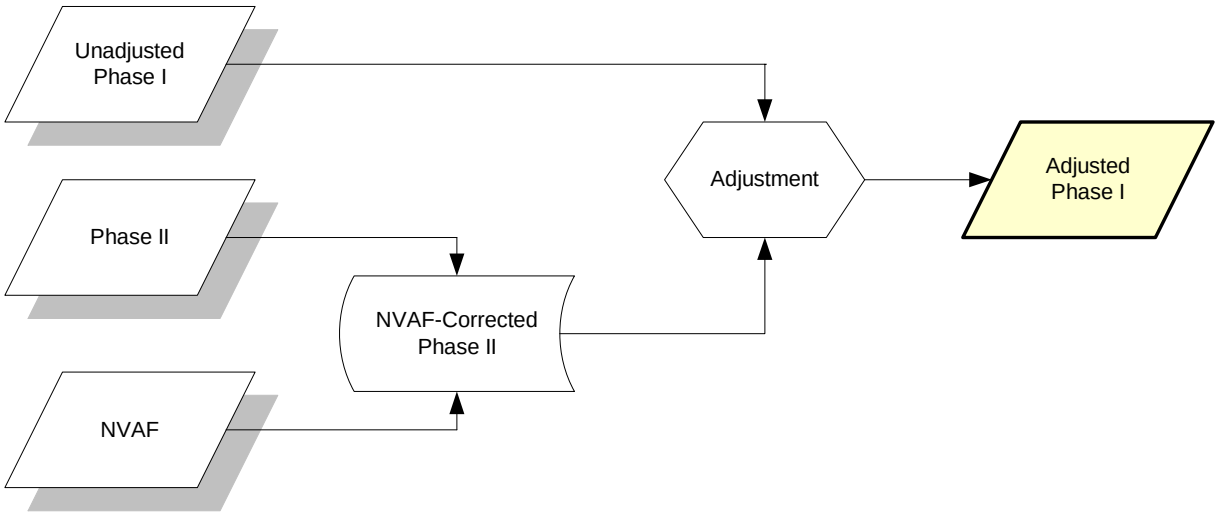

Figure 1. VRI flow-chart.

The Fort St. John Timber Supply Area (TSA) stakeholders have been implementing a Phase I program since 2001. Currently the stakeholders have completed approximately 90% of Phase I on the land base and it is expected to be completed during the 2007/2008 fiscal year. The next step is to develop a VRI project implementation plan (VPIP) to guide implementation of the proposed Phase II and NVAF programs in the Fort St. John TSA. The data used for the Phase II VPIP is a combination of recently completed Phase I on the land base and forest cover roll over information where VRI is not complete.

[1] VRI technical terms are explained in Appendix I.

1.2 Fort St. John TSA Inventory Background

The Phase I VPIP was completed in November 2005 and documented the proposed Phase I activities for each of the six geographic units.[2] Photo-interpretation used scanned 1:40,000 black & white Terrain Resource Information Management (TRIM) II aerial photography and 1:30,000 colour photography. Mapping was done in the Softcopy environment using TRIM II as a base.

The Phase I program was completed in May 2008. Phase I data used for sample selection was the data available as of June 2008. This data had not been processed by the MoFR however its use was approved by Carolyn Krawchuk and Gary Johansen of the MoFR as it represented little risk to the outcome of the sample selection. At the time of adjustment the most current Phase I data will be used. Along with the Phase I inventory, bio-terrain mapping is being done using Terrestrial Ecosystem Mapping (TEM) standards.

1.3 VPIP Objectives

The objective of this VPIP is to:

1. *Present the proposed stratification and sample sizes for the Phase II sampling program.*
2. *Present the proposed NVAF program.*
3. *Outline the strategy for Phase II implementation and the proposed budget and timelines.*
4. *Document the roles and responsibilities, deliverables, and an estimated budget.*

The intent is that the MoFR will review and approve the proposed Phase II sampling program. The Fort St. John TSA licencees will update this VPIP with the final NVAF program once the Phase II sampling is complete.

1.4 Terms of Reference

This VPIP was prepared for John Rowe, RPF of Canadian Forest Products Ltd. and the Fort St. John TSA licencees. The document was prepared by Hugh Carter, MSc, RFT of Timberline Natural Resource Group Ltd. (project manager/analyst). This document will be approved by the MoFR prior to sampling.

[2] FDI Forest Dimensions Inc. and Canadian Forest Products Ltd. 2005. Fort St. John TSA Vegetation Resources Inventory Project Implementation Plan. November 28, 2005. 10pp.

1.5 Fort St. John TSA Land Base

The Fort St. John TSA is located within the Northern Interior Forest Region (Figure 2). The TSA is bounded by the Alberta border to the east, the height of the Rocky Mountains to the west, the Fort Nelson TSA to the north and the Dawson Creek TSA to the south. The TSA covers approximately 4.7 million ha, of which approximately 3.11 million ha (67%) are Vegetated Treed (VT) (Table 1).

The TSA is located in the north-eastern portion of BC and contains four biogeoclimatic (BGC) zones, including, in order of relative proportion within the timber harvesting land base (THLB): Boreal White and Black Spruce (BWBS), Englemann Spruce-Subalpine Fir (ESSF), Spruce-Willow-Birch (SWB), and Alpine Tundra (AT). White spruce, lodgepole pine, aspen, black spruce, and sub-alpine fir are the main species on the TSA and frequently occur as mixed-wood stands (Table 2). The age distribution is relatively uniform across all age classes (Appendix III Figure 4.).

Table 1. Fort St. John TSA net down.

Land Classification	***Area***	***% of TSA***
Total Area	4,674,644	100.0
Parks	191,795	4.1
Other protected areas	10,615	0.2
Private	522,313	11.2
First Nations	13,964	0.3
Woodlots	18,150	0.4
Cutblocks	73,280	1.6
Reduced TSA	3,844,527	82.2
Nonvegetated	195,658	4.2
Vegetated	3,648,870	78.1
Vegetated nontreed	387,219	8.3
Vegetated treed (VT)	3,261,651	69.8
VT less than 30 yrs	59,093	1.3
VT greater than 30yrs	3,202,557	68.5
Target area	***3,202,557***	***68.5***

Table 2. Species distribution by age class as % area of the target population.

	MoFR Age Class								
Species	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Total***
Sb	0.3	7.1	7.2	7.8	7.2	5.4	4.6	0.2	39.8
Pl	0.3	0.6	1.3	2.6	2.6	4.1	7.3	0.3	19.0
Sw	0.3	4.6	2.9	2.8	3.3	2.9	2.0	0.0	18.8
At	0.5	3.4	4.0	3.8	2.9	2.2	0.6	0.0	17.5
E	0.1	0.8	0.6	0.4	0.0	0.0	0.0	0.0	1.9
L	0.0	0.3	0.3	0.3	0.2	0.1	0.1	0.0	1.3
B	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.0	0.8
A	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.8
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	***1.5***	***16.9***	***16.4***	***18.0***	***16.5***	***15.1***	***15.1***	***0.5***	***100.0***

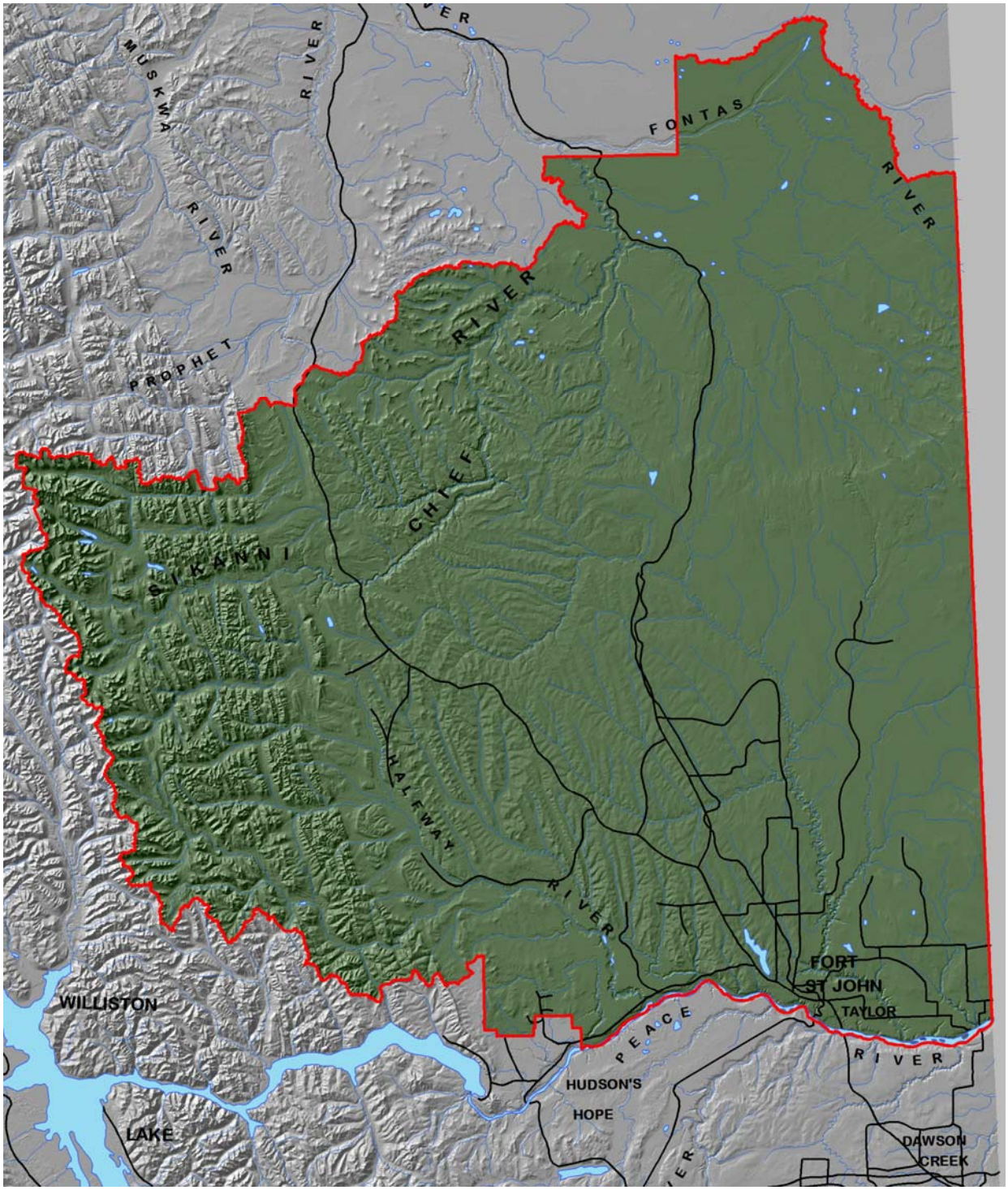

Figure 2. Map of the Fort St. John TSA.

2. STRATEGIC PLAN

2.1 Project Overview

The overall goal of the project is to complete the entire VRI Phase II and NVAF programs in the 2009/10 fiscal year and adjust the inventory using the collecting field data. The first batch of Phase II plots (80 samples) will be established in the 2008 field season, and include measurement of all NVAF enhanced plots. Preliminary compilations will be completed soon after, and the VPIP will be updated to include the sample plan for the NVAF program. NVAF destructive sampling will run concurrently with the establishment of additional plots in the late summer. Data compilation, analysis, statistical adjustment, and reporting are intended to be completed before March 31, 2010.

2.2 Goals & Objectives

The goal of this project is to provide the Provincial Chief Forester with the necessary confidence in the Fort St. John TSA forest inventory to support the Fort St. John TSA Timber Supply Review (TSR). The Fort St. John licencees' project objectives are to:

1. *Develop statistically unbiased volume estimates for stands at least 30 years old in the Fort St. John TSA VT land base and achieve a target sampling error of ±10% (95% confidence)..*
2. *Collect coarse woody debris information in all Phase II plots to support landscape level biodiversity objectives.*
3. *Develop strata that help address the uncertainty around estimates in mixed wood and smallwood stands.*

2.3 Target Population

The target population for this project was defined as the VT land base (i.e. species 1 exists with >= 10% crown closure), 30 years and older in 2008 (i.e. stands established before 1979). The target population represents approximately 3.3 million ha (70% of the total Fort St. John TSA) (Table 3). The Fort St. John TSA includes all forest cover polygons that are inside the TSA boundaries.

Table 3. Fort St. John TSA VRI Phase II target population.[3]

Land Class	Area (ha)	% TSA
Total TSA	4,674,644	100.0
Vegetated Treed	3,261,651	69.8
Stands < 30 years	59,093	1.3
Target Population	3,202,557	68.5
Operable	3,174,926	67.9
Inoperable	27,631	0.6

2.4 Stratification

Stratification of the target population improves sampling efficiency by grouping similar sub-populations that might exist within a general population. Strata were created based on similarity of sub-populations, strata areas large enough to install a minimum of 10 plots, ability to provide information in the areas that have mixed-wood and smallwood stands, isolating black spruce stands, while still gathering information outside of the operable area and in areas of low productivity to provide vegetation data over the entire land base.

[3] Data used was obtained from the LRDW received January 2008; this included both recently completed Phase I and old inventory roll over data. The data for the Blueberry and Milligan areas as well as all coverages used for the net down was provided by Kim Verbruggen of Canfor in January and February of 2008. The data for the MK-Sikanni and Kahntah areas were provided in an unprocessed format by Tim Salkeld of the MoFR in June 2008.

Using the above criteria, the target population was stratified based on species (aspen, black spruce, lodgepole pine, and spruce, balsam and larch) and site productivity (Table 4). The strata were defined as follows:

1. Aspen and poplar leading polygons with a site index greater than 6.0 m.
2. Lodgepole pine leading polygons with a site index greater than 6.0 m.
3. Spruce and balsam leading polygons with a site index greater than 6.0 m.
4. Black spruce leading stands and all other areas within the VT area greater than 30 years. This includes areas with site index less than or equal to 6.0 m.

This strata separation scheme groups the species in areas of importance in timber supply, and addresses landscape level diversity, mixed-wood stands, and small-wood stands, while reducing sampling cost and safety risks.

Table 4. Target population stratification.

Stratum	Sub-Stratum	Area (ha)	% Stratum	% Target
Aspen and poplars*. SI > 6.0	30-80 yrs	262,447	45%	8%
	> 80 yrs	321,143	55%	10%
	Total	**583,590**	**100%**	**18%**
Lodgepole pine, SI > 6.0	30- 80 yrs	71,284	14%	2%
	> 80 yrs	440,291	86%	14%
	Total	**511,574**	**100%**	**16%**
Spruce, balsam, SI > 6.0	30- 80 yrs	243,062	42%	7%
	> 80 yrs	340,389	58%	11%
	Total	**583,452**	**100%**	**18%**
Black spruce and all other area in the VT > 30 yrs	30- 80 yrs	539,720	35%	17%
	> 80 yrs	984,221	65%	31%
	Total	**1,523,941**	**100%**	**48%**
Total		***3,202,557***		***100.00%***

* Poplars include Ac and A

The intention is that inventory adjustment ratios will be computed at the stratum level, however this may change based on the data and variability observed at the time of analysis.[4] Each stratum was subdivided into sub-strata to ensure a representative distribution of samples within each stratum. The sub-strata in all strata were based on age class. 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

Phase II plot installation will be completed in the 2009 field season by VRI-certified timber emphasis cruisers. The choice of field samplers will be determined early in the fiscal year following a competitive bid process. The goal is to complete all field work (Phase II and NVAF) before the end of the 2009 field season; however this will depend upon availability of Forest Investment Account (FIA) funding and field crews throughout the field season.

2.5.2 Sampling Objectives

The sampling objective is to install a sufficient number of plots to achieve an overall average net merchantable volume minimum sampling error of ±10% (at a 95% confidence level) for use in the TSR. The 1996 inventory audit information produced a coefficient of variation (CV) of 44%.[5] Using a CV of

[4] Upon examination of the final data, some post stratification may be necessary and is a possibility when compiling the data. Decisions regarding appropriate adjustment scenarios should be open for discussion. Especially when addressing mixed-wood and small-wood stands.

[5] The 1995 inventory audit information was used for the CV calculation.

55%, 120 samples should be sufficient to achieve the target sampling error. If the CV is larger than 55%, more plots will be required to achieve the sampling objective.

2.5.3 Sample Size

A batch of 120 plots was selected from the target population and will be installed in the four strata (Table 5). The stakeholders suggest that aspen and cottonwood (At and poplar) leading polygons are a key part of the timber supply and will be sampled with greater intensity. Deciduous stands are highly variable so increasing the sampling intensity should capture much of the variability, providing confidence in the estimates in these areas. The lodgepole pine strata and the spruce, balsam strata sample sizes are representative of their proportional area in the TSA.

Table 5. Phase II sample size by stratum.

Stratum	Sub-Stratum	Area (ha)	No. Plots	Sampling Weight (ha)
Aspen and poplars*, SI > 6.0	30-80 yrs	262,447	22	11,929
	> 80 yrs	321,143	28	11,469
	Total	***583,590***	***50***	***11,672***
Lodgepole Pine, operable, SI > 6.0	30- 80 yrs	71,284	3	23,761
	> 80 yrs	440,291	17	25,899
	Total	***511,574***	***20***	***25,579***
Spruce, Balsam, operable, SI > 6.0	30- 80 yrs	243,062	10	24,306
	> 80 yrs	340,389	15	22,693
	Total	***583,452***	***25***	***23,338***
Black spruce and all other area in the VT > 30 yrs	30- 80 yrs	539,720	9	59,969
	> 80 yrs	984,221	16	61,514
	Total	***1,523,941***	***25***	***60,958***

* Poplars include Ac and A.

The sample size in the remaining stratum was allocated based on area occupied by each sub-stratum, and represents, species of minor significance, areas with marginal importance in timber supply, and areas of low productivity (SI < 6.0). Refer to Figure 3 for the percentage of the target population by SI class. Black spruce leading stands comprise a large proportion of the TSA (Table 2) and are of marginal importance in the timber supply. This area will be sampled with a lesser intensity than its proportional area would warrant. However it was important to include this area in the sample design to ensure all the VT greater than 30 years target area was sampled.

The sample and target population were compared by height class, age class, and volume class and are provided in Appendix III.

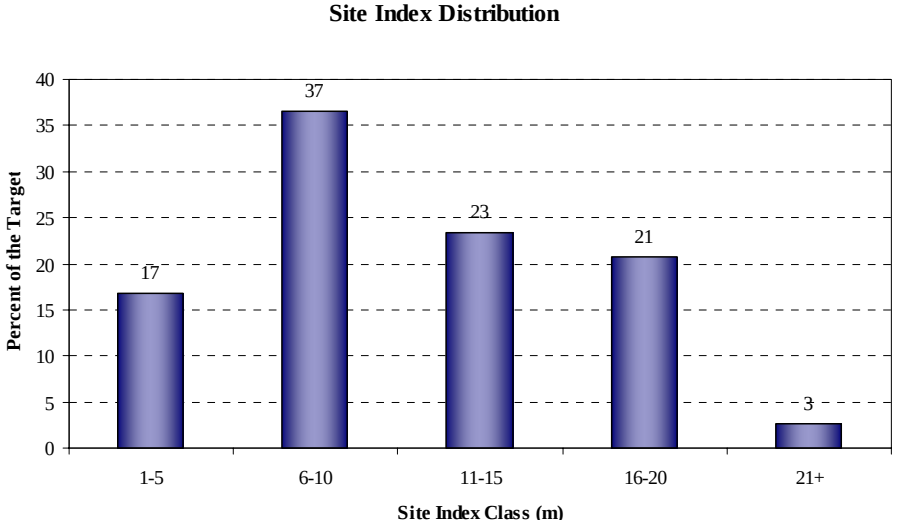

Figure 3. Site Index Distribution

2.6 Net Volume Adjustment Factor Sampling

2.6.1 Overview

The Fort St. John TSA licencees will implement a NVAF program whereby the first batch of Phase II field data will be used to develop the 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. The overall NVAF target sampling error for live trees is 7.5% (95% confidence).

Thirty (30) VRI Phase II plots (11 immature and 19 mature)[6] were selected to be NVAF-enhanced (one plot for every three trees being destructively sampled). 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 have been completed on all auxiliary plots for the NVAF-enhanced plots. Table 6 shows the area by maturity class and the weights of the NVAF-enhanced samples.

Table 6. NVAF plot-level maturity and weights.

Maturity[6]	Area (ha)	Plots	Plot Weight (ha/plot)
Immature	1,828,787	11	166,253
Mature	1,373,770	19	72,304
Total	*3,202,557*	*30*	*106,752*

The NVAF sample size and species distribution of the NVAF field program was finalized following review of the Phase II field data at the end of the 2008 field season. This updated VPIP outlines details of the NVAF program and the NVAF trees. Sample selection was approved prior to NVAF implementation. Destructive sampling will be completed in the 2009 field season by NVAF-certified cruisers.

[6] Stands 120 years or younger (2008 age) for conifers and 60 years or younger (2008 age) for deciduous were considered immature for NVAF. All other stands were considered mature. Proportions of enhanced plots by maturity were based on the volume proportions presented in Table 6. There are typically 10 immature, and 20 mature plots, however, as mature At trees could be found in immature conifer stands, an additional immature plot was selected to ensure enough mature At was sampled.

3. IMPLEMENTATION PLAN

3.1 Sample Selection

Sample polygons were selected using probability proportional to size with replacement (PPSWR). 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.

3.2 Sample Packages

Field sample packages include at a minimum[7]:

1. An ortho-photo[8] (1:5,000) showing plot location and its Global Positioning System (GPS) points;
2. An ortho-photo (1:10,000) showing plot location and access;
3. A forest cover map (1:10,000) showing target polygon and plot locations with roads, contours and water features;
4. Access maps using ortho-photos (1:20,000) showing polygon and plot location; and
5. Overview map (approx 1:100,000) for general polygon location.

3.3 Phase II Sampling

3.3.1 Field Crews

Fieldwork is scheduled to begin in the 2008 field season.[9] 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 Fort St. John TSA licencees will work with the MoFR representatives to try to locate an alternate location. If an alternate location cannot be found, the plot will be dropped as per ground sampling procedures (sect 2.5 and 2.6).[10] All 30 NVAF enhanced plots should be completed in the first batch of 80 plots to facilitate the creation of the NVAF sample plan within the 2008/2009 fiscal year. The second batch of 40 samples will be installed in the 2009 field season concurrently with the NVAF destructive sampling.

Twenty (20) extra phase II samples have been selected in the event that a sample needs to be replaced. In all cases where a sample needs to be replaced the field contractor must contact the project manager to select the proper sample and to ensure that this plot is accounted for future adjustment.

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[7] Sample packages may also include laser copied stereo pairs of photos and an access plan.

[8] This assumes that the orthophotos are of usable quality. If orthos are found to be unacceptable for use, document photos will need to be pin pricked.

[9] The stakeholders may complete detailed access evaluation prior to putting the field work contract out to tender.

[10] http://ilmbwww.gov.bc.ca/risc/pubs/teveg/vri_gs_2k8/vri_gs_4.8.pdf

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.[11] 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.

3.3.3 Non-Standard VRI Data

The Fort St. John licencees will collect additional, non-standard, VRI data to supplement the information normally provided by the VRI Phase II sampling. The value of the additional measurements will be assessed during the tendering of field crews, and a separate quote for these activities may be requested. The TSA stakeholders recognize that these additional measurements will not be included as a part of the FIA Land base – VRI budget. Additional measurements will include (Appendix IV contains rationales and utility of measuring these values):

1. Measure the distance from the sample point to the tree in the auxiliary plots.[12]

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 the MoFR data entry program 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 digital format.

GPS data will be post-processed by the field contractors and entered with the tree data into TIMVEG, and delivered when all other digital data is submitted.

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 Fort St. John TSA licencees will hire a Phase II certified third party auditor to audit a minimum of 10% [13] of all plots following the VRI Ground Sampling Quality Assurance Standards.[14] 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.[15]

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[11] VRI ground sampling procedures are available: http://srmwww.gov.bc.ca/risc/pubs/teveg/vri_gs_2k4/vri_gs_2k4.pdf. Some changes to the sampling procedures may be approved prior to the 2008/2009 field season. Any new changes will be incorporated into the VPIP if work has not started prior to their approval.

[12] This has been completed on several inventories throughout BC and at minimal cost.

[13] A minimum of 10% of all Phase II plots will be audited; however, going beyond this minimum should be left to the discretion of the auditor. This has been done on many land bases in past VRI projects.

[14] Minimum standards for VRI sampling are located at: http://ilmbwww.gov.bc.ca/risc/pubs/teveg/vri_qa_gs_2k8/VRI%20GS%20QA%20Procedures%20and%20Standards_March%202008.pdf

[15] The requirement to revisit plots will be explicitly outlined in the contract between the TSA stakeholders and the field contractor.

3.3.7 Plot Supplies

Supplies such as aluminum stakes, field maps, field equipment, photos, plot cards, handheld data recorders, GPS units, and other required equipment will be supplied by the field contract crews. The MoFR will supply VRI tags for each sample.

3.4 Net Volume Adjustment Factor Sampling

Upon completion of the 80 batch 1 Phase II plots (including the thirty NVAF-enhanced plots), all trees in the NVAF-enhanced plots with a diameter at breast height 12.5 cm or larger were included in the sampling frame to develop the tree matrix.[16] The tree matrix was stratified into five strata (or "species groups"):

1. Dead
2. Immature
3. Mature – Deciduous (At, Ac, Ep)
4. Mature – Lodgepole pine (Pl, Lt)
5. Mature – Spruce (Sw, Sb)

As per MoFR standards, one hundred (100) trees were selected following the NVAF tree selection standard methodology (Table 7). The sample size within each stratum was assigned in consultation with the MFR, based on estimates of net merchantable volume and expert knowledge about the variability within the stratum. An NVAF-certified crew will be hired to complete the destructive sampling early in the 2009 field season.

The NVAF program will continue to follow MoFR VRI standards, which involves five steps:[17]

1. Create a tree matrix using data from the enhanced Phase II plots.
2. Select sample trees from the tree matrix.
3. Complete stem analysis of the sample trees.
4. Complete a third-party audit of

Table 7. NVAF tree sample size distribution. [a]

		Total Merch Vol (m^3) [b]		No. Trees	
Stratum	Spp	% Total	% Group	Total	% Group
Dead	Pl	48%	48%	5	50%
	Sw	21%	21%	2	20%
	At	20%	20%	2	20%
	Sb	9%	9%	1	10%
	Lt	3%	3%	0	0%
	Total	**100%**	**100%**	**10**	**100%**
Immature [d]	Pl	21%	44%	13	44
	Sw	17%	37%	11	37
	Sb	6%	12%	4	12
	Other	3%	7%	2	7
	Total	**47%**	**100%**	**30**	**100%**
Mature - Dec		23%	43%	25	42%
Mature - S		25%	47%	25	42%
Mature - Pl		5%	10%	10	17%
	Total	**77%**	**100%**	**60**	**100%**
Total	**Total**	**100%**		**100**	

[a] This distribution is based on the ground data, and varies from the expected distribution from version 1.1, which was based on the inventory data.

[b] Total merch volumes were taken from the compiled volumes of all Phase II samples in the 2009 Batch 1.

[d] All deciduous 60 years or younger were considered immature. Conifers 120 years or younger were considered immature. Tree maturity and plot maturity may differ.

[e] All deciduous greater than 60 years were considered mature. Conifers greater than 120 years were considered mature. Tree maturity and plot maturity may differ.

[16] The final NVAF strata allocations were based on proportions of volume using the first batch of 80 plots which will include the 30 NVAF enhanced plots.

[17] NVAF sampling standards can be found at: http://srmwww.gov.bc.ca/risc/pubs/teveg/nvaf2k2/nvaf 02.pdf

the sample trees.

5. Analyze the data to develop net volume adjustment factors.

The Fort St. John TSA licencees will hire a third party auditor to audit approximately[18] 10% of all plots following the NVAF quality assurance standards.[19]

3.5 Statistical Adjustment

3.5.1 Data Compilation, Analysis and Adjustment

The Fort St. John TSA licencees will use the MoFR SAS compiler to compile all Phase II plots and NVAF trees. 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 Fraser adjustment method (or equivalent).
- Calculate ground sample average volumes and inventory volumes for the Fort St. John TSA.
- Adjust inventory height and age.
- Generate new VDYP volumes using the adjusted heights and ages.
- Adjust ground volumes using NVAF ratios.
- Adjust new volume estimates with the NVAF-adjusted ground volumes using the ratio of means method.
- Compute sampling errors for the Fort St. John TSA.

The ground samples were selected using recently completed Phase I data that had not been processed by the MoFR. This was done to expedite the sampling process and do ground sampling in the 2008 filed season. At the time of final adjustment the most recent data available will be used. It is anticipated that the data will have been processed by the MoFR at this time and will be available through the LRDW.

[18] A minimum of 10% of all NVAF sampled trees will be audited.

[19] The NVAF quality assurance standards are described in the NVAF sampling standards, chapter 10.

4. SCHEDULE

4.1 2008-2010 Timelines

The Fort St. John TSA licencees will seek approval of the VPIP by the MoFR. Upon approval of the VPIP the sample packages will be created. The next step is to solicit bids from consultants with VRI-certified field personnel to install the Phase II plots.

Sampling will begin in the 2008 field season, immediately following the pre-work meeting. The field sampling will be completed in the 2009 field season. Crews will be audited at the start of the project and as the auditor deems necessary throughout the project as expressed in a Quality Assurance plan. Data will be entered into TIMVEG and non-standard data entered into a database or spreadsheet.

The goal is to have the first batch of 80 plots completed by the end of the 2008 field season (including all NVAF enhanced plots). Upon completion of the first batch of plots, the NVAF tree matrix, sample size, and VPIP update will be completed. An interim analysis will be completed prior to the 2009 field season to determine the sample size required to achieve the desired sampling error. The NVAF program (destructive sampling and data entry) will be completed early in the 2009 field season and will run concurrently with the establishment of the remaining Phase II plots. Final data compilation, inventory adjustment, and reporting will be completed before March 31, 2010.

	2008												2009		
Activities	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1. Complete VPIP															
2. Select sample locations															
3. Submit VPIP to MoFR															
4. Hire field staff															
5. Mentor field crews															
6. Field sampling															
7. Field QA															
8. NVAF sample selection															
9. Submit updated VPIP to MoFR															
12. Interim compilation and analysis															

Figure 4. Proposed 2008/09 implementation schedule. Stakeholders Phase II Crew VRI Auditor

	2009										2010		
Activities	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1. Hire field staff													
2. Mentor field crews													
3. Field sampling													
4. NVAF Destructive Sampling													
5. VRI Phase II Audit													
6. NVAF audit													
7. Compilation, analysis, and report													

Figure 5. Proposed 2009/10 implementation schedule. Stakeholders, Phase II Crew, VRI Auditor, NVAF Crew, NVAF Auditor

4.2 Proposed Budget

The proposed Phase II program should cost approximately $591,500, including audit, quality control, helicopter costs and the statistical adjustment. The proposed NVAF costs and the final program will be updated once this program is defined after the first batch of samples is complete with all NVAF plots enhanced.

Table 8. Proposed Phase II and NVAF program cost.

Phase	**Cost**	**% in Fiscal**	**% of Total**
2008/2009 Fiscal Year			
Field Sampling*	$136,000	48	23
Helicopter**	$107,200	37	18
Field Audit	$13,000	5	2
Quality Control & Interim analysis***	$30,000	10	5
Subtotal	*$286,200*	*100*	*48*
2009/2010 Fiscal Year			
Field Sampling	$68,000	22	11
NVAF Sampling	$75,000	25	13
Helicopter**	$112,800	37	19
Phase II Field Audit	$6,500	2	1
Quality Control	$10,000	3	2
NVAF Field Audit	$7,500	2	2
NVAF Analysis	$5,000	2	1
Statisical Adjustment & Report	$20,000	7	3
Sub-total	*$304,800*	*100*	*52*
Total	***$591,500***		***100***

* These costs are based on a field crew rate of $1,700/day.

** The helicopter costs are estimates based on the generally poor access throughout the TSA.

*** Interim analysis includes NVAF sample selection, VPIP update, sample size and statistical analysis. Quality control includes technical support, and ground sampling program management.

4.3 Roles & Responsibilities

Fort St. John TSA 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 data to MoFR.
- Complete statistical adjustment and submit to MoFR for review.
- Complete final report and submit to MoFR for review.

Phase II Field Contractors

- Complete field sampling.
- Enter the standard data (include tree cores and GPS of plot locations) into TIMVEG and non-standard data into database or spreadsheet and submit to the licensees.
- Complete internal quality control and submit data to the licensees at the conclusion of field sampling.

NVAF Field Contractor

- Complete destructive sampling.
- Enter the sample data and provide to the licensees.

VRI Phase II Auditor

- Third party Phase II certified auditor 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 VPIP.
- 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 MoFR Deliverables

The deliverables for the MoFR upon completion of the ground sampling program include:

1. The VPIP.
2. A digital copy of the Phase 1 target population map.
3. A digital copy of the Phase 1 target population data.
4. The Phase 1 data used to determine adjustment factors.
5. Sample list modifications (if any).
6. The sample packages.

7. The plot cards.
8. The validated TIMVEG ground sampling field data.
9. The NVAF destructive sampling data in a digital format accepted by the MOFR.
10. Corrected GPS data.
11. A copy of the quality assurance report.
12. An interim analysis memo.
13. A final analysis and adjustment report.

5. SIGN-OFF SHEET

I have read and concur that the Fort St. John TSA VRI Phase II Project Implementation Plan dated June 2008 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. *Date*
(Lead proponent)

_____ _____

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

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 land base) 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.
- *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 land base. 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 – VRI PHASE II PLOT LIST

Table 9. Fort St. John TSA Batch 1 Phase II plots. Shading indicates NVAF enhanced plots.

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM Zone	UTM East.	UTM North
1	1		1	1	094A018	104	5.8	Inoperable	At	15	38	0	17	10	659497	6229685
2	1	Y	1	1	094A018	189	44.7	Operable	At	15	40	25	18	10	658272	6229135
3	1		1	1	094A030	372	10.0	Operable	At	20	73	125	17	10	682144	6236755
5	1		1	1	094A043	702	41.6	Operable	At	15	72	75	14	10	595838	6257614
8	1		1	1	094A053	342	51.7	Operable	At	20	67	125	17	10	594432	6271800
9	1		1	1	094A064	78	46.4	Operable	At	20	53	100	19	10	604954	6283779
10	1	Y	1	1	094A067	842	61.7	Operable	At	20	63	125	19	10	641389	6275839
11	1		1	1	094A069	352	27.1	Operable	At	20	78	150	17	10	669959	6283363
12	1	Y	1	1	094A069	999	15.0	Operable	At	10	38	0	13	10	669804	6277257
13	1		1	1	094A087	680	14.1	Operable	At	20	53	100	18	10	636584	6299884
14	1		1	1	094A092	525	8.3	Operable	At	15	61	75	16	10	577136	6312996
18	1		1	1	094H025	821	8.8	Operable	At	15	63	75	14	10	608883	6341606
19	1		1	1	094H040	514	25.0	Operable	At	20	58	150	21	10	675185	6361082
22	1	Y	1	1	094I026	182	37.0	Operable	At	25	71	175	21	10	627317	6462348
24	1		1	2	094A052	620	8.8	Operable	At	25	112	250	19	10	578592	6269162
25	1		1	2	094A073	535	7.2	Operable	At	25	122	225	16	10	585965	6289587
26	1		1	2	094A089	328	24.3	Operable	At	25	103	125	18	10	661677	6305850
27	1	Y	1	2	094B058	213	9.7	Operable	At	20	94	125	15	10	532823	6271802
29	1		1	2	094B079	101	17.6	Operable	At	25	99	200	18	10	541728	6295164
30	1		1	2	094B087	1462	15.5	Operable	At	20	89	75	14	10	523106	6304768
31	1		1	2	094G026	289	14.6	Operable	At	15	84	75	12	10	509077	6349226
33	1		1	2	094G043	383	7.8	Operable	At	15	119	75	9.9	10	471555	6368450
34	1	Y	1	2	094G059	30	5.0	Operable	At	20	136	75	12	10	537713	6382346

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM		
														Zone	East.	North
35	1		1	2	094G069	543	71.3	Operable	At	10	81	0	6.8	10	546170	6390596
38	1		1	2	094G079	333	23.1	Operable	At	25	96	200	17	10	545390	6402939
40	1	Y	1	2	094G099	947	16.4	Operable	At	20	81	150	16	10	540291	6421967
41	1		1	2	094H062	996	11.2	Operable	At	20	96	200	16	10	574656	6384891
42	1		1	2	094H075	500	66.0	Operable	At	30	123	300	22	10	610500	6401908
43	1		1	2	094H080	138	22.3	Operable	At	30	123	225	20	10	674053	6408988
45	1	Y	1	2	094H085	49	1.9	Operable	At	30	92	375	25	10	609813	6419050
46	1		1	2	094H086	1010	74.5	Operable	At	25	91	125	18	10	623834	6409661
48	1		1	2	094H097	796	66.5	Operable	At	25	102	200	17	10	638109	6423281
49	1		1	2	094I012	770	4.5	Operable	At	25	82	175	18	10	581835	6443931
51	1		2	1	094B028	1761	3.8	Operable	Sw	10	65	0	10	10	536214	6236093
52	1		2	1	094G038	1061	11.1	Operable	Sw	15	64	125	17	10	535920	6354192
53	1	Y	2	1	094H033	369	10.7	Operable	Sw	10	58	0	9.9	10	592102	6356929
54	1		2	2	094A053	441	4.0	Operable	Sx	25	117	225	14	10	588505	6269044
55	1	Y	2	2	094A069	262	93.8	Operable	Sx	25	132	300	14	10	662907	6284859
57	1	Y	2	2	094B030	692	2.6	Operable	Sx	25	113	250	15	10	553747	6231340
59	1		2	2	094B055	83	2.8	Operable	Sw	20	94	125	12	10	489584	6272643
60	1	Y	2	2	094B055	984	7.2	Operable	Sw	25	129	275	13	10	495366	6267287
61	1	Y	2	2	094B082	282	2.2	Operable	Sw	20	169	225	8.4	10	462235	6302962
62	1	Y	2	2	094B086	355	83.0	Operable	Sw	30	169	375	15	10	505990	6304996
63	1	Y	2	2	094B091	72	11.0	Operable	Sw	20	135	200	9.5	10	448368	6315877
64	1	Y	2	2	094G014	493	8.0	Operable	Sx	15	129	50	6.3	10	475924	6334922
65	1	Y	2	2	094G025	1264	47.9	Operable	Sw	15	94	125	11	10	490882	6340490
66	1		2	2	094G077	1050	6.0	Operable	Sw	20	81	200	17	10	519909	6399115
69	1	Y	2	2	094I008	991	7.9	Operable	Sw	30	122	300	17	10	652196	6432407

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM		
														Zone	East.	North
70	1	Y	2	2	094I035	795	59.6	Operable	Sx	30	110	350	22	10	615998	6466817
71	1	Y	3	1	094A092	425	6.4	Operable	Pl	20	61	150	18	10	584461	6315692
74	1	Y	3	1	094H017	809	79.1	Operable	Pl	20	62	175	18	10	634350	6335135
76	1		3	1	094H020	1077	10.0	Operable	Pl	15	58	125	17	10	673140	6333423
77	1		3	1	094H020	846	21.6	Operable	Pl	15	58	125	16	10	673915	6335194
78	1		3	1	094H035	419	25.8	Operable	Pl	10	48	25	13	10	619951	6359669
79	1		3	1	094H037	374	15.7	Operable	Pl	15	73	100	13	10	637344	6361347
80	1		3	1	094H054	45	8.1	Operable	Pl	15	73	100	12	10	598392	6385197
82	1		3	2	094B075	852	25.7	Operable	Pl	15	94	125	11	10	494333	6287666
87	1	Y	3	2	094G009	273	17.4	Operable	Pl	15	101	50	9.5	10	539205	6325416
88	1		3	2	094G013	339	17.3	Operable	Pl	15	114	150	10	10	467537	6335482
89	1	Y	3	2	094G019	901	11.0	Operable	Pl	15	121	150	11	10	540489	6332071
91	1	Y	3	2	094G040	735	16.0	Operable	Pl	15	124	100	9	10	554172	6354921
94	1		3	2	094H021	93	23.1	Operable	Pl	20	89	200	15	10	564814	6350868
95	1	Y	3	2	094H042	935	23.7	Operable	Pl	15	121	175	11	10	579440	6362967
97	1		4	1	094H009	254	3392.5	Operable	Sb	5	57	0	4.3	10	665179	6327442
98	1		4	1	094H017	661	862.0	Operable	Sb	5	62	0	5	10	639769	6337813
99	1		4	1	094H089	778	12.1	Operable	Sb	5	58	0	6.7	10	659707	6413082
100	1	Y	4	1	094H098	888	15.7	Operable	Sb	10	62	0	9.1	10	647098	6420407
101	1		4	1	094H099	461	52.6	Operable	Sb	5	62	0	7.1	10	658193	6427356
106	1		4	2	094B084	219	2.7	Operable	Bl	5	129	25	4	10	483011	6303975
107	1		4	2	094G006	288	17.2	Operable	Pl	10	119	0	4.6	10	500084	6326179
108	1	Y	4	2	094G034	251	34.8	Operable	Sx	15	159	75	5.7	10	480371	6359262
109	1	Y	4	2	094G036	709	20.5	Operable	Sb	10	89	0	6.5	10	505209	6354797
110	1		4	2	094G055	1274	12.6	Operable	Pl	10	114	25	5.7	10	499097	6375780

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM Zone	UTM East.	UTM North
111	1		4	2	094G060	162	386.7	Operable	Sb	10	101	25	6.9	10	548721	6382281
112	1		4	2	094H028	68	14.1	Operable	Sb	5	163	0	3.3	10	647999	6352693
113	1		4	2	094H037	213	29.7	Operable	Sb	10	93	0	6.2	10	642929	6363218
115	1		4	2	094H055	809	50.5	Operable	Sb	5	93	0	4.1	10	617512	6377992
116	1	Y	4	2	094H061	195	13.5	Operable	Sb	15	171	125	6.3	10	569355	6394523
117	1		4	2	094H087	2	2.0	Operable	Sb	15	122	100	8.2	10	630489	6418092
118	1	Y	4	2	094H089	367	11.1	Operable	Sb	15	127	100	7.6	10	662070	6416988

Table 9. Fort St. John TSA Batch 2 Phase II plots.

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM		
														Zone	East.	North
4	2		1	1	094A030	405	44.3	Operable	At	20	58	100	18	10	685559	6236913
6	2		1	1	094A044	786	5.5	Operable	Ac	20	52	100	19	10	605780	6255792
7	2		1	1	094A049	731	35.7	Operable	At	20	44	75	22	10	660807	6253783
15	2		1	1	094A092	794	18.0	Operable	At	20	61	125	19	10	582242	6310578
16	2		1	1	094B089	596	20.2	Operable	At	20	59	125	19	10	542049	6300358
17	2		1	1	094G099	397	33.5	Operable	At	20	61	100	17	10	538471	6426247
20	2		1	1	094I003	768	54.0	Operable	At	25	71	175	22	10	585953	6432354
21	2		1	1	094I025	408	8.9	Operable	At	20	62	125	20	10	608723	6460217
23	2		1	2	094A051	88	32.3	Operable	At	25	102	225	19	10	563932	6273088
28	2		1	2	094B065	482	19.1	Operable	At	25	124	200	16	10	497080	6281639
32	2		1	2	094G029	198	8.1	Operable	At	25	134	125	17	10	547031	6349416
36	2		1	2	094G069	930	6.5	Operable	At	15	81	50	11	10	542355	6387955
37	2		1	2	094G077	1480	2.3	Operable	At	20	96	150	15	10	519802	6396618
39	2		1	2	094G099	1147	44.6	Operable	At	25	131	175	15	10	536539	6418424
44	2		1	2	094H085	304	5.0	Operable	At	25	107	225	17	10	612078	6415754
47	2		1	2	094H092	1083	18.7	Operable	At	25	131	200	15	10	575054	6420603
50	2		1	2	094I038	222	34.0	Operable	At	25	83	150	18	10	643959	6472965
56	2		2	2	094B027	1142	17.2	Operable	Sw	25	212	275	7	10	520783	6236048
58	2		2	2	094B050	324	6.0	Operable	Sx	20	88	200	16	10	552743	6259637
67	2		2	2	094G080	278	11.3	Operable	Sw	35	151	425	18	10	547717	6403541
68	2		2	2	094H072	447	8.9	Operable	Sw	25	96	275	18	10	581668	6404114
72	2		3	1	094A096	232	37.9	Operable	Pl	20	57	175	20	10	626116	6315447
73	2		3	1	094G036	1213	49.6	Operable	Pl	10	54	50	13	10	503617	6357368
75	2		3	1	094H019	217	5.7	Operable	Pl	15	58	75	14	10	657986	6339961

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM Zone	UTM East.	UTM North
81	2		3	2	094B046	1139	16.1	Operable	Pl	15	94	100	12	10	506417	6251588
83	2		3	2	094B076	65	71.1	Operable	Pl	15	129	75	9.9	10	503847	6294672
84	2		3	2	094B092	845	5.4	Operable	Pl	15	99	150	12	10	463307	6306923
85	2		3	2	094B092	854	2.0	Operable	Pl	15	99	75	8.7	10	463415	6307118
86	2		3	2	094B094	61	10.2	Operable	Pl	20	119	125	11	10	480668	6317095
90	2		3	2	094G028	192	27.5	Operable	Pl	20	96	125	13	10	535454	6350307
92	2		3	2	094G077	1272	3.2	Operable	Pl	15	116	100	11	10	514229	6397355
93	2		3	2	094H013	40	19.2	Operable	Pl	20	103	150	15	10	586536	6338839
96	2		4	1	094B098	1007	32.1	Operable	Sb	5	69	0	5	10	527150	6308002
102	2		4	1	094H100	10	96.7	Operable	Sb	5	42	0	9.4	10	666042	6430837
103	2		4	1	094I037	163	19.0	Operable	Sb	10	72	0	7.9	10	636843	6475058
104	2		4	1	094I045	329	4.0	Operable	Sb	10	72	25	8.7	10	615687	6481032
105	2		4	2	094A060	577	68.7	Operable	Sb	5	103	0	5	10	674731	6268033
114	2		4	2	094H044	630	23.3	Operable	Sb	5	103	0	3.8	10	605976	6365459
119	2		4	2	094H089	881	9.3	Operable	Sb	10	93	25	7.4	10	664803	6412872
120	2		4	2	094I013	268	33.1	Operable	Sb	5	92	0	4.8	10	585010	6448100

Table 10. Fort St. John TSA Contingency Phase II plots.

Plot No	Batch	NVAF	Stratum	Sub Stratum	Map ID	Polygon ID	Area (ha)	Operability	Ldg Spp	Ht Class (m)	Age (yrs)	Vol Class (m3/ha)	SI (m)	UTM		
														Zone	East.	North
121	Contingency		1	1	094B068	133	6.1	Operable	At	25	77	175	18.8	10	530833	6283907
122	Contingency		1	1	094I008	966	53.2	Operable	At	20	62	150	19.6	10	650968	6431757
123	Contingency		1	1	094I019	689	16.2	Operable	At	15	62	50	15.8	10	663474	6448755
124	Contingency		1	2	094A053	1010	25.0	Operable	At	25	108	225	18.7	10	592707	6264158
125	Contingency		1	2	094A083	348	10.3	Operable	At	20	112	125	14.2	10	594104	6302066
126	Contingency		1	2	094A100	156	7.1	Operable	Ac	25	103	225	13.7	10	678122	6320695
127	Contingency		1	2	094G079	278	17.4	Operable	At	20	81	125	15.3	10	541494	6403104
128	Contingency		2	1	094G046	593	12.5	Operable	Sw	15	64	125	16.5	10	502746	6365113
129	Contingency		2	2	094A053	913	15.2	Operable	Sx	20	117	225	12.5	10	588065	6263352
130	Contingency		2	2	094A062	176	9.5	Operable	Sx	25	137	275	14.1	10	582234	6284235
131	Contingency		2	2	094H078	108	12.2	Operable	Sw	30	123	350	18.6	10	649280	6407806
132	Contingency		3	1	094A073	114	7.6	Operable	Pl	15	65	125	15.8	10	590592	6294801
133	Contingency		3	1	094H007	478	180.7	Operable	Pl	20	58	150	18.6	10	640990	6323841
134	Contingency		3	2	094B038	237	11.2	Operable	Pl	25	137	275	14.5	10	533367	6249238
135	Contingency		3	2	094B096	651	60.9	Operable	Pl	15	128	75	7.7	10	507288	6311952
136	Contingency		3	2	094G046	1011	32.1	Operable	Pl	15	129	75	8.7	10	511004	6366263
137	Contingency		4	1	094H071	608	16.7	Operable	Ep	15	51	25	13.9	10	566773	6402137
138	Contingency		4	2	094A100	770	20.0	Operable	Lt	10	163	25	2.2	10	682200	6312712
139	Contingency		4	2	094G028	692	33.4	Operable	Sb	25	191	275	10.9	10	531385	6344072
140	Contingency		4	2	094H100	619	108.9	Operable	Sb	10	132	50	5.9	10	672250	6428481

APPENDIX III – TARGET AND SAMPLE COMPARISONS

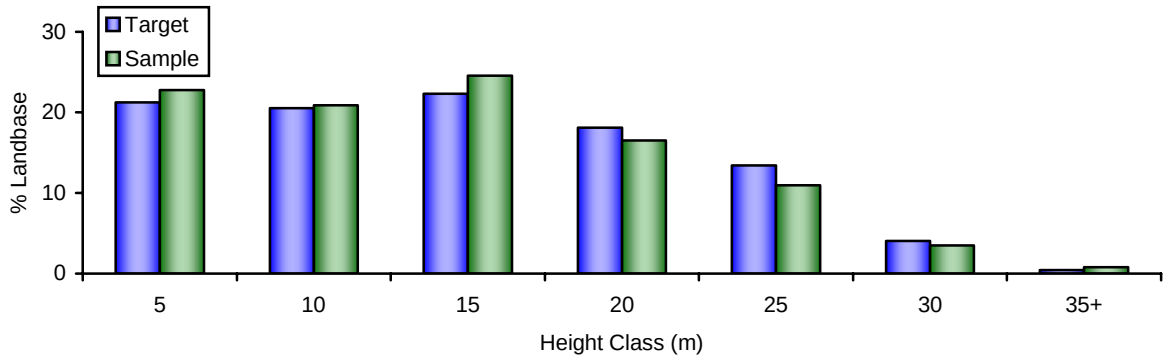

Figure 6. Target and sample population comparison by height class.

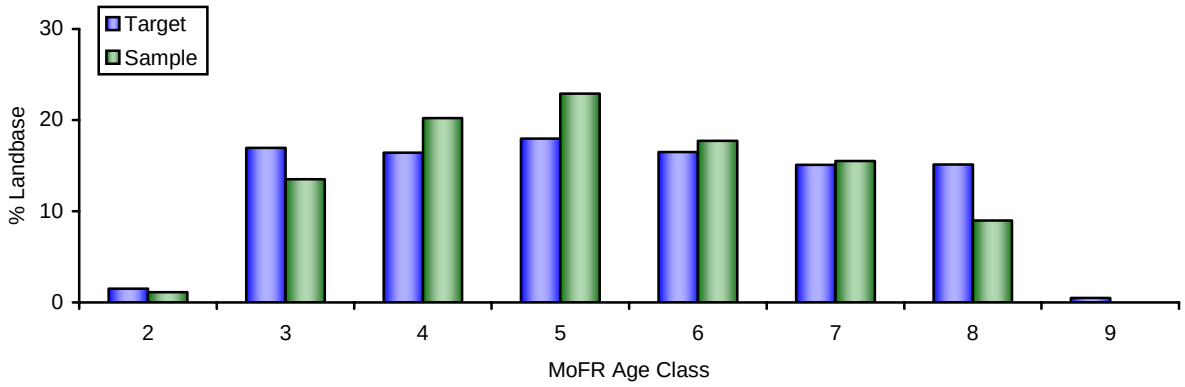

Figure 7. Target and sample population comparison by age class.

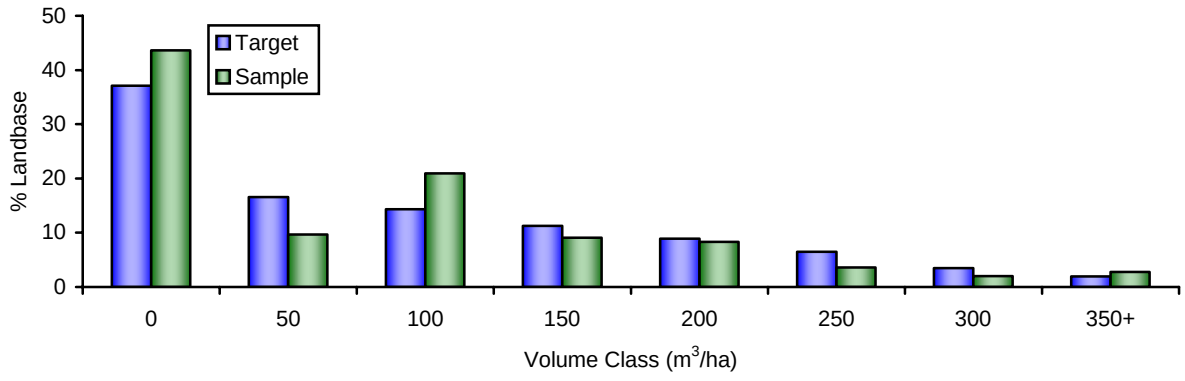

Figure 8. Target and sample population comparison by volume class.

Note: All "Sample" distributions were weighted using the area per plot for the stratum in which the plot was located.

APPENDIX IV – ADDITIONS TO STANDARD VRI METHODS

In order to provide data that better meets the Fort St. John TSA licencees' inventory needs, additional field data is being collected beyond provincial VRI standards. The additions to current VRI methods include:

- Recording the plot centre to tree distance on auxiliary plots.

Record the distance from plot centre to each live tree on the 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. These distance measurements could facilitate the remeasurement of the entire VRI cluster which could then be used to assess changes in the land base for future TSR's. The cost of completing this measurement has historically been low. This minimal cost is easily justified considering the potential gains in the future.

APPENDIX V – NVAF SAMPLE TREE LIST

Sample Number	Species Group	Plot Maturity	Plot	Tree Number	Species	Live / Dead	DBH (cm)	Height (m)	age (yrs)
2	Immature-O	Immature	E	001	At	Live	25.7	27.6	40
10	Mature-Decid	Mature	S	003	At	Live	14	12.8	63
10	Mature-Decid	Mature	E	005	At	Live	17	19.7	63
10	Mature-Decid	Mature	N	003	At	Live	20.6	20	63
10	Mature-Decid	Mature	W	001	At	Live	21.2	21.3	63
10	Mature-Decid	Mature	N	004	At	Live	21.3	21.3	63
10	Mature-Decid	Mature	E	003	At	Live	22.1	22.5	63
10	Mature-Decid	Mature	N	002	At	Live	22.7	24.9	63
12	Immature-O	Immature	W	002	Ep	Live	18.5	14	38
22	Immature-Sw	Mature	N	001	Sw	Live	14.7	15	71
22	Immature-Sw	Mature	N	004	Sw	Live	20.2	17.4	71
22	Immature-Sw	Mature	E	001	Sw	Live	21.5	19.8	71
22	Mature-Decid	Mature	S	007	At	Live	30.9	36.9	71
22	Mature-Decid	Mature	E	002	At	Live	34.6	31	71
22	Mature-Decid	Mature	N	005	At	Live	35.6	29.8	71
22	Mature-Decid	Mature	W	001	Act	Live	38.3	25.8	71
22	Mature-Decid	Mature	S	008	At	Live	40.5	35.5	71
22	Mature-Decid	Mature	W	002	Act	Live	50.5	30.1	71
27	Mature-Decid	Mature	W	002	At	Live	13.6	16.8	94
27	Mature-Decid	Mature	W	001	At	Live	15.2	17.1	94
27	Mature-Decid	Mature	N	005	Act	Live	15.3	16	94
27	Mature-Decid	Mature	E	001	Act	Live	17.1	15.4	94
27	Mature-Decid	Mature	S	002	Act	Live	22.8	18.1	94
40	Dead-PL	Mature	N	003	Pl	Dead	40.9	20.2	81
40	Immature-Sw	Mature	N	005	Sw	Live	16.1	13	81
40	Immature-Sw	Mature	W	001	Sw	Live	57.7	33.2	81
40	Mature-Decid	Mature	S	006	At	Live	28	16.9	81
40	Mature-Decid	Mature	S	001	At	Live	29.7	21.4	81
40	Mature-Decid	Mature	S	002	At	Live	33.9	22.2	81
40	Mature-Decid	Mature	S	003	At	Live	34.7	21.6	81
45	Dead-At	Mature	W	001	At	Dead	22.9	16.6	92
45	Dead-At	Mature	E	006	At	Dead	36	1.4	92
45	Mature-Decid	Mature	S	001	At	Live	37.7	26.2	92
53	Immature-Sb	Immature	E	001	Sb	Live	15	11.1	58
53	Immature-Sb	Immature	S	001	Sb	Live	16.5	11.2	58
53	Immature-Sb	Immature	S	005	Sb	Live	17.6	11.9	58
55	Dead-Sw	Mature	W	004	Sw	Dead	25.1	20.3	132
55	Mature-S	Mature	E	006	Sw	Live	16.2	18.8	132
55	Mature-S	Mature	E	001	Sw	Live	21.4	19.6	132
55	Mature-S	Mature	W	002	Sw	Live	26.9	28.6	132

Sample Number	Species Group	Plot Maturity	Plot	Tree Number	Species	Live / Dead	DBH (cm)	Height (m)	age (yrs)
55	Mature-S	Mature	W	001	Sw	Live	28.6	25.1	132
55	Mature-S	Mature	N	002	Sw	Live	44.7	27.1	132
55	Mature-S	Mature	S	002	Sw	Live	46.4	36.7	132
57	Immature-Pl	Immature	S	004	Pl	Live	30.7	18.8	113
57	Immature-Pl	Immature	S	005	Pl	Live	34.7	21.2	113
57	Immature-Pl	Immature	S	003	Pl	Live	37.7	19.3	113
57	Immature-Sw	Immature	N	003	Sw	Live	33.5	15	113
57	Immature-Sw	Immature	E	003	Sw	Live	41.6	17.8	113
57	Immature-Sw	Immature	E	001	Sw	Live	44.6	21.5	113
57	Mature-Decid	Immature	S	001	At	Live	74.2	23.5	113
60	Mature-Pl	Mature	S	006	Pl	Live	21.6	20.7	129
60	Mature-Pl	Mature	N	001	Pl	Live	25.9	19.5	129
60	Mature-S	Mature	W	002	Sw	Live	34.5	24.4	129
61	Mature-Pl	Mature	W	005	Pl	Live	20	16	169
61	Mature-Pl	Mature	W	002	Pl	Live	23.5	15.6	169
61	Mature-Pl	Mature	N	001	Pl	Live	28.3	11.6	169
61	Mature-Pl	Mature	E	004	Pl	Live	29.6	13.1	169
61	Mature-Pl	Mature	N	002	Pl	Live	30	15.2	169
61	Mature-Pl	Mature	E	008	Pl	Live	33.5	14.9	169
61	Mature-S	Mature	E	002	Sw	Live	25.5	7.2	169
62	Mature-S	Mature	E	002	Sw	Live	18.8	11.1	169
63	Mature-S	Mature	E	005	Sw	Live	18.2	8.2	135
63	Mature-S	Mature	W	004	Sw	Live	20.5	13.9	135
64	Mature-S	Mature	W	005	Sw	Live	22.6	8.4	129
64	Mature-S	Mature	E	003	Sw	Live	30.5	13.4	129
64	Mature-S	Mature	E	006	Sw	Live	32.6	14.3	129
64	Mature-S	Mature	W	004	Sw	Live	39.5	14	129
64	Mature-S	Mature	N	004	Sw	Live	41.7	15.7	129
65	Immature-Pl	Immature	N	001	Pl	Live	28.8	14.6	94
65	Immature-Sw	Immature	S	003	Sw	Live	28.8	16.7	94
65	Immature-Sw	Immature	W	001	Sw	Live	34.2	15	94
65	Immature-Sw	Immature	W	003	Sw	Live	35.9	16.9	94
69	Mature-S	Mature	W	004	Sw	Live	38.2	25.6	122
70	Mature-Decid	Immature	E	001	Ac	Live	22.3	18.1	110
74	Immature-Pl	Immature	N	009	Pl	Live	13.2	18.3	62
74	Immature-Pl	Immature	E	007	Pl	Live	14.9	16.7	62
74	Immature-Pl	Immature	N	011	Pl	Live	16.3	18.7	62
74	Immature-Pl	Immature	N	008	Pl	Live	19.2	19.4	62
74	Immature-Pl	Immature	E	006	Pl	Live	20.8	19.6	62
87	Immature-Pl	Immature	N	002	Pl	Live	17.2	13.5	101
87	Immature-Pl	Immature	E	004	Pl	Live	22	13.6	101
87	Immature-Pl	Immature	W	001	Pl	Live	23.9	15.1	101
87	Immature-Sb	Immature	E	003	Sb	Live	14.8	11.3	101

Sample Number	Species Group	Plot Maturity	Plot	Tree Number	Species	Live / Dead	DBH (cm)	Height (m)	age (yrs)
89	Mature-S	Mature	W	002	Sb	Live	21.1	15.8	121
91	Dead-Pl	Mature	N	006	Pl	Dead	15.2	14.9	124
91	Dead-Pl	Mature	N	003	Pl	Dead	16.2	4.9	124
91	Dead-Pl	Mature	S	006	Pl	Dead	17.5	12	124
91	Dead-Sb	Mature	E	003	Sb	Dead	14.5	16.3	124
91	Mature-Pl	Mature	E	005	Pl	Live	20.8	16.2	124
91	Mature-S	Mature	N	005	Sb	Live	24.7	19.2	124
109	Immature-Pl	Immature	S	002	Pl	Live	14.9	6.5	89
116	Dead-Pl	Mature	E	001	Pl	Dead	23.8	7.7	171
116	Dead-Sw	Mature	S	001	Sw	Dead	16.2	10.4	171
116	Mature-Pl	Mature	N	005	Pl	Live	16.1	14.4	171
116	Mature-S	Mature	N	001	Sw	Live	15.1	15.5	171
116	Mature-S	Mature	W	006	Sw	Live	23.8	17.7	171
118	Mature-S	Mature	N	009	Sb	Live	12.6	11.3	127
118	Mature-S	Mature	S	005	Sb	Live	14.9	14	127
118	Mature-S	Mature	N	010	Sb	Live	16.5	15	127
118	Mature-S	Mature	E	001	Sb	Live	18.9	15.5	127