Lakes Timber Supply Area

Vegetation Resources Inventory Project Implementation Plan for Ground Sampling

Nona Phillips Forestry Consulting

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Executive Summary

This Vegetation Resource Inventory (VRI) Project Implementation Plan (VPIP) has been written to detail specific activities associated with a VRI project in the Lakes TSA. It is the 'operational' planning document that will guide the VRI activities during the next two field seasons.

The following VRI work is planned for the Lakes TSA:

1. A total of 115 VRI ground samples will be established randomly throughout the selected TSA landbase, their location based on the Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling v3.3. In addition to the regular Timber Emphasis data collection, field crews will be collecting non-VRI ecology to a level that supports the shelf life study, shelf life attributes in pine leading stands, and additional 'small tree plot' data.
2. Destructive sampling will be carried out on 120 trees on a 30 sample sub-set of the original 115 samples in a Net Volume Adjustment Factor sampling project. There will be a scaler at each NVAF sample, scaling the trees to be destructively sampled using modified coastal and the draft interior log grades.
3. There will be an Analysis & Adjustment of the current Photo Interpreted Inventory based on the ground sampling and NVAF data.
4. Data collected for additional attributes will be analyzed or incorporated in model development or research work.
5. Twenty-five (25) samples will be established as a long-term Monitoring project, with both certified timber and ecology data collection.

This plan also documents other critical decisions that have been made in preparation for the project. The target population is the 'Vegetated Treed' land base excluding private land, Indian reserves, parks and protected areas. The Ground Sample selection has been completed based on four strata:

- Strata 1: Immature
- Strata 2: Mature, Other Conifer, Deciduous, and Pine < 50%
- Strata 3: Pine - 50 to 80%
- Strata 4: Pine - 81% +

Immature includes all stands up to 60 years of age.
Mature includes all stands 61 years of age and older.

The VRI Samples will be distributed as follows:

- Strata 1 = 15 samples
- Strata 2, 3 & 4 = 100 samples, distributed proportionately to strata areas
- Total sample size = 115

Each stratum will also be subdivided into 3 volume classes, or "sub strata".

Costs and timelines for this project have been outlined in this plan.

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1.0 Introduction

The Vegetation Resources Inventory (VRI) was designed to answer two questions: Where is, and how much of, a vegetation resource is located in an inventory unit? This inventory expands upon previous types of inventories which focused on timber, to include the entire vegetation resource. Another critical element is the statistically based ground sampling program that results in the establishment of randomly located samples across the selected landbase.

The initial step in any effective inventory process is planning. VRI planning involves three parts:

- Consultation with stakeholders to identify issues that can be addressed by executing part or all of the VRI Standards and Procedures.

- Developing a VRI Strategic Inventory Plan (VSIP) to identify VRI products that would address the above noted issues.

- **Development of a VRI project Implementation Plan (VPIP) which provides operational details based on the direction given in the VSIP. A VPIP identifies the steps, specific timelines, roles and responsibilities, and deliverables for the project.**

There are two phases in the VRI. Phase 1 involves photo interpretation to identify polygons of homogenous land cover types and estimating vegetation attributes for each polygon. Phase 2 is ground sampling to verify or adjust Phase 1 vegetation attributes. The VSIP written for the Lakes TSA assessed the current forest cover inventory needs for this TSA in the context of the VRI. The project that will be detailed further in this document is an attempt to satisfy some of the Stakeholders' information needs through VRI activities.

1.1 Document Objectives

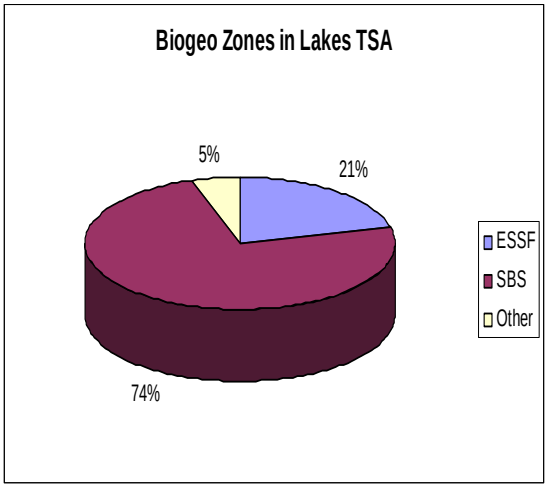
Based on the direction provided in the VSIP, this VPIP describes proposed activities associated with Phase 2 ground sampling and NVAF, references subsequent analyses and outlines the establishment of plots to support a monitoring project. It will also provide documentation to future users of data from these projects, when investigating the activities completed under its guidance.

1.2 Landbase (adapted from the Lakes TSA AAC Rationale – October, 2004)

The Lakes TSA is located in north central BC between Babine Lake in the north and the Entiako River in the South. It is administered from Burns Lake as part of the Nadina Forest District which is part of the Northern Interior Forest Region. Water bodies comprise almost 10% of the TSA area, the three largest being Babine Lake, Francois

Lake, and Ootsa Lake. Tweedsmuir Park is partially located in the southern end of the TSA. Figure 1 is an overview map of the area.

The TSA is on the western edge of BC's interior plateau with terrain that is characterized by gently rolling uplands. The predominant biogeoclimatic zone is Sub-Boreal Spruce (SBS) found in the valley bottoms dominated by lodgepole pine, hybrid white spruce, and subalpine fir. The climate here includes severe, snowy winters, and relatively short warm, moist summers. Above this, in steeper terrain, is the Englemann Spruce-Subalpine Fir (ESSF) zone with Englemann spruce and subalpine fir predominating climax forests. Pine is common in pioneer stands establishing following fire. The weather here is cooler and wetter/snowier than SBS. At the highest elevations is the largely treeless, rugged, Alpine Tundra (AT).



The gross area of the Lakes TSA has been confirmed to be 1,577,481 hectares[1] Included in this area is a large part of Tweedsmuir Park. The landbase of the Lakes TSA for this project is 844,457 hectares in the Vegetated Treed land cover classification, with 771,660 hectares in the Mature Stratum for all species (age 61+). This area excludes private land, Indian reserve, parks, and protected areas. More details on the project landbase can be found in Appendix B.

There are several First Nations within the TSA. They are as follows:

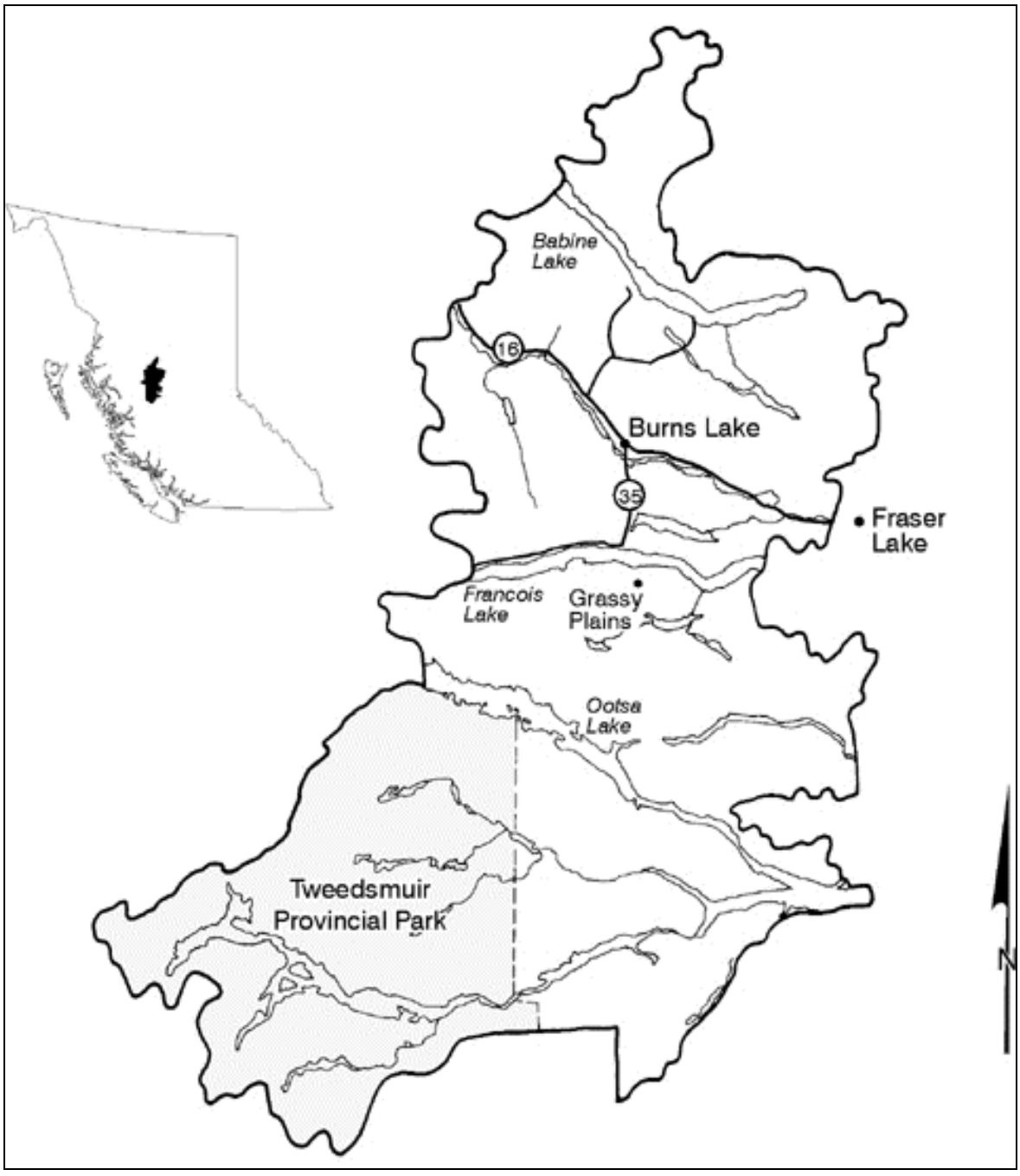
- Cheslatta Carrier Nation
- Burns Lake Band
- Nee Tahi Buhn Band
- Skin Tyee Band
- Wet'suwet'en First Nation
- Babine Nation.

In addition, there are seven other First Nations, that don't have reserve land or communities within the TSA, but claim traditional territories that overlap the area. They are:

- Nadleh Whut'en Band
- Office of the Wet'suwet'en
- Stellat'en First Nation
- Tl'azt'en Nation
- Ulkatcho Band
- Yekooche First Nation
- Carrier-Sekani First Nation.

[1] Personal Communication, Stafford Shuman, GIS Operator, MoFR, Northern Interior Forest Region, July 26, 2006.

Figure 1. Lakes TSA



1.3 State of the Inventory

The Lakes TSA's photo interpretation inventory was completed in 1989-90. The most current update year for the vegetation inventory files in the Provincial Data Warehouse is 2000.

The Inventory Audit program was a program undertaken in the 1990s by the Ministry of Forests to test the overall accuracy of estimates of the total standing volume in a timber supply area. The primary audit findings for this TSA were as follows:

- For the mature component, the inventory is statistically acceptable
- In the operable forested area, there is a similar level of acceptability.

There have been two previous plans written for VRI activities that incorporate part or all of this TSA:

1. Lakes Morice IFPA Timber Emphasis VRI Ground Sampling Project Implementation Plan
2. Babine Forest Products Co. Enhanced Forest Management Pilot Project VRI Sampling Plan

Both suggested they were conducting VRI activities in the Lakes TSA but there are no maps or landbase summaries provided in either editions published on the Ministry of Forests & Range (MoFR) VRI website The new plans being written for the Lakes TSA will be independent of these plans and guide current VRI activities.

The MoFR, Forest Analysis & Inventory Branch (FAIB), VRI section, will have to determine how to integrate any previous data (ground sampling or NVAF destructive sampling) when analyzing the data collected under this current project.

2.0 Ground Sampling Plan

2.1 Sampling objectives

The primary objective is to install an adequate number of VRI sample clusters to statistically adjust the timber inventory for stands greater than 60 years of age in the vegetated treed (VT) portion of the Lakes TSA (not including areas in parks, private land, Indian reserves and protected areas), to achieve a sampling error of $\pm$ 10% (95% probability) for overall net timber volume. Sampling and a statistical adjustment will also be carried out in the immature (less than or equal to 60 years of age) portion of the VT population where 15 VRI samples will be established. No sampling error objectives have been specified for this immature stratum.

This project was initiated by the MoFR FAIB. An important objective is to collect current inventory data on the Lakes TSA to provide information to assist with decision-making in this Mountain Pine Beetle (MPB) infested Timber Supply Area. Data additional to the standard VRI Timber Emphasis procedure will be collected to supply the information needs of various Stakeholders. Stakeholders include licensees and MoFR (both District and FAIB in Victoria).

The MoFR provided the objectives of collecting specific data to answer questions around:

- Shelf life
- Mid-term timber supply
- Mortality in immature pine

Additional objectives have been identified through this planning process. This involves data collection to support:

- Studying 'dead potential' trees
- Research initiatives on the presence of secondary structure[2] in lodgepole pine stands

2.2 Target Population

The population of interest for this study includes polygons of all ages (in as much as the current inventory can identify these) and all species in the Vegetated Treed (VT) land classification of the BC Land Cover Classification Scheme.

The following will be excluded from sampling:

- Private land
- Indian Reserves
- Parks
- Protected Areas

All Community Forests, woodlots (Crown land only) and identified caribou high use migration corridors are included. There are no operability exclusions in the District.

The target population encompasses a total area of 844,457 hectares.

2.3 Sample Size

To obtain an estimate of the coefficient of variation (CV), the MoFR Guidelines for the Preparation of a VPIP recommends using the CV from the inventory audit,

[2] Seedlings, saplings, sub-canopy and canopy trees that will likely survive a pine beetle attack (Coates 2006)

increased by an additional 10% to account for differences in the sampling methodology. The 1999 inventory audit for the mature component (>60 years of age) of the Lakes TSA indicated a CV of 33%. However, inventory audits from adjacent areas (Morice TSA, Vanderhoof Forest District) both had CVs of 39%. If the audit showed a 33-39% CV, the Ministry's guidelines would suggest that we use 43-49% for the VRI CV. The increase from the audit CV by 10% reflects the fact that we expect more variability in the VRI results than we would in the audit results." (This is based on the different sample design - the audit 9 point cluster compared with the VRI 5 point cluster.) Hence a reasonable estimate of the CV for this project is likely between 43% and 49%. Based on the target sampling error of 10% and a 95% probability level ($t \approx 2$), estimated CVs of between 43% and 49% would produce sample sizes of between 74 and 96[3].

These sample size estimates were used to indicate the minimum number of samples necessary to achieve the target sampling error objective for this project. To allow for sufficient sample size within sub-strata, it was decided to allocate 100 samples to the mature deciduous/coniferous stratum. An additional 15 samples were allocated to the immature (<60 years of age) deciduous/conifer stratum to address a requirement for information specific to these stands.

The planned distribution of samples is shown in Table 1 below.

Table 1[4]: Planned Distribution of Samples

Stratum	Population Area (ha)	Planned number of samples	Number of hectares represented by each sample
Immature	72797.2	15	4853.15
Mature – Other coniferous leading, Pl<50%, Deciduous	306393.5	40	7659.84
Mature – Pl (50-80%)	190523.6	25	7620.94
Mature – Pure Pl (>80%)	274742.5	35	7849.78

[3] Inventory audit CVs and calculated samples sizes were provided by Karen Jahraus, RPF (Jahraus & Associates Consulting Inc.).

[4] The actual number of samples and the number of hectares represented by each sample will not be known until after the ground sampling has been completed. A revised Table 1 will be provided in the final analysis documentation.

2.4 Strata

2.4.1 Ground Sampling

The population was stratified for sample selection. The first assessment of strata was made during a lengthy discussion at the Stakeholders' meeting. A Discussion Paper incorporating input from this meeting was circulated amongst the Stakeholders. All comments were collated and additional discussions were held with FAIB, VRI Section staff. As a result of this process, the following strata have been identified for VRI ground sample selection:

- Strata 1: Immature
- Strata 2: Mature, Other Conifer, Deciduous, and Pine < 50%
- Strata 3: Mature Polygons with 50 to 80% Pine
- Strata 4: Mature Polygons with 81% + Pine

Immature includes all stands up to 60 years of age.

Mature includes all stands 61 years of age and older.

There will be a total of 115 samples of which 15 will be in strata 1 (immature) and 100 will be in strata 2, 3, and 4.

The strata were further separated into sub-strata based on 3 volume classes.

Appendix A shows how strata and volume class sub strata are defined and how samples were distributed among them.

2.4.2 NVAF

NVAF sample sizes were approved by Will Smith, Volume and Decay Sampling Officer for FAIB. Gitte Churlish used a systematic sampling method that "selects units at a fixed interval throughout the sampling frame or stratum after a random start"[5] – as per standards. Table 2 below shows the distribution of ground samples for NVAF by age class. The complete NVAF profile can be found in Appendix G. The large sample size is being recommended to address any issues around volume error and shelf life. There will be a total of 120 trees sampled of which 30 will be dead.

[5] From the SAS manual.

The existing Babine NVAF sample will be pooled with the new NVAF data to produce TSA wide application strata. Statistical weights based on the selection probabilities will be calculated to allow for the data pooling. The sample size for the new sample strata is based on a guideline that a minimum of 20 trees per stratum will allow for some confidence in the resulting NVAFs. Due to the higher variation in the volume errors associated with dead trees, the sample size has been increased to 30 trees. The live mature Pl stratum has been reduced to 10 trees due to the expectation that this stratum is in decline and is not expected to be a component of the mature inventory in the near future. The sample size by species in the mixed species strata immature and mature other strata will be proportional to either the area of leading species or the per hectare volumes of the NVAF ground samples depending on availability of the information. The NVAF (destructive) sample plan will be produced after the NVAF ground samples are established.

Table 2. NVAF Ground Sample Distribution

Age Class (years)	**NVAF Samples**
0-30	0
31-60	1
60-120	11
121+	18
Total	**30**

Table 2.1. NVAF Stratum Sample Size

Age Grouping	No of New Sample Trees	Existing Babine NVAF Sample Trees
Immature	20	20
Mature S	20	10
Mature B	20	2
Mature Other (At and minor species)	10	1
Mature Pl	10	17
Dead	30	10
Total	120	60

2.5 Sample Selection

Gitte Churlish of Churlish Consulting has considerable experience in the Sample Selection process. Gitte was sub-contracted by Nona Phillips Forestry Consulting to complete the sample selection for both the Ground Sampling and the NVAF. She conferred with FAIB staff including Sam Otukol, Gary Johansen and Will Smith to ensure that the process meets the expectations of FAIB. The

Standard 'VRI Sample Selection Procedures for Ground Sampling' outlines the process in detail and will be used as a guideline for this work.

Documentation of the Sample Selection process is included in Appendix A.

2.5.1 Ground Sampling

The initial step was to properly identify the population of the Lakes TSA. A series of excel spreadsheets provided in Appendix B provides a District Distribution and summarizes the vegetated treed landbase as follows by:

- Strata
- Strata by Species by Age Group (Immature or Mature)
- Species distribution
- Projected Age Classes
- Species by Projected Age Class
- Mapsheet

Six sampling lists were developed, each with 115 samples. More than one list was required to allow replacement of rejected samples with ones in the same stratum and volume class sub stratum. The number of rejected samples was a concern due to the current inventory's update status (2000) and the doubling of the Allowable Cut in 2001. It was likely, particularly in the mature pine strata, that many samples would be rejected because the intended sample location had been harvested.

Sample polygons were reviewed for overlaps with private land, Indian Reserves, parks, protected areas, and cutblocks. Polygons were only rejected if there was a 100% overlap with one or more of the above noted issues. Sample polygons were reviewed and selected first from list 1. Polygons to replace those rejected in list 1 were selected from the same stratum and sub-stratum as those rejected, in order of sample number, from the "non-rejected" polygons in list 2.

Sample points were located randomly within the sample polygon using GIS techniques according to procedures outlined in *Vegetation Resources Inventory –Sample Selection Procedures for Ground Sampling-Section 4.0*. This work was done by Meridian Mapping Limited.

Sample locations were then reviewed to determine if they were in private land, Indian Reserves, parks, protected areas or cutblocks. If the Integrated Plot Center (IPC) was located in any one of these areas it was rejected. Replacement of samples was again done according to the stratum and sub stratum from which the rejected stratum came by order of sample number, from lists 2, 3, or 4 as necessary.

In addition to the initial 115 samples, there were “contingency” samples identified for each sub stratum in the likely event that some of the initial ones are rejected in the field for reasons described in Appendix C. This appendix also describes the systematic process of sample replacement.

2.5.2 NVAF

Will Smith, the Volume & Decay Sampling Officer in the VRI Section of FAIB, will oversee all phases of the NVAF sampling.

The NVAF samples are a subset of the VRI sample selection. The selection of 30 NVAF samples will be derived from the ‘final’ ground sample list. NVAF sample selections will be proportional to area for all stands greater than 30 years.

The ground sampling priority in the 2006 field season will be samples associated with NVAF. Enhancement of auxiliary plots can either be done at the time of ground sampling or during NVAF sampling. For this project, the NVAF samples will be enhanced at the time of establishment.

Specific NVAF trees cannot be selected until the associated ground sample has been completed and the data is compiled. If the data is collected in the fall of 2006, the tree selection can occur over the winter months. The work can be bid, and the destructive sampling phase started, early in the 2007 field season. If the data collection is delayed until early 2007 then NVAF would occur later in the 2007 field season. Completing the data collection for the NVAF samples could be made a priority.

2.5.3 Monitoring

In 2006/07, the Ministry of Forests & Range has undertaken a series of monitoring projects throughout the province, related to studying the effects of the Mountain Pine Beetle infestation. The goal of these projects to monitor the changes and trends of the timber and non-timber resources in MPB affected stands, over time. The Monitoring project in the Lakes TSA will be undertaken with a similar objective.

On these projects, the monitoring protocols currently in use were developed for the National Forest Inventory. Modifications have included:

- Adding shelf life study work in pine leading stands
- Increasing the size and classes in the ‘small tree plot’
- Changing the Coarse Woody Debris (CWD) to a 30 metre transect with a larger size class minimum for the first 10 metres
- Reducing VRI certified ecology data collection to follow the protocols of the VRI manual

At the time of the writing of the VPIP for the Lakes, some aspects of the Monitoring project component have not been finalized. The intent is to establish 25 monitoring plots on the TSA but the protocol for establishing these monitoring plots is being investigated for field work in 2007. If new protocols are developed prior to the 2007 field season, they will be incorporated into the Lakes TSA work through an amendment to the VPIP.

The preferred option for the location of the monitoring plots on the land base is also undecided at this time. Several lists have been developed and one will be followed with direction from Victoria VRI staff. They are available in Appendix E and include:

1. A random sample selection from the total VRI list of 115 VRI samples.
2. A random sample selection from the VRI list of samples, greater than 60 years of age. (This is list of 100 samples.)
3. A random sample selection from a new list developed specifically for the monitoring project for the population greater than 60 years of age.
4. A random sample selection from a new list developed specifically for the monitoring project for the population greater than 60 years of age, divided equally between two strata. One stratum is pine leading (greater than 50%). The second stratum is “pine other” (pine less than 50% and other leading species).

2.6 Sampling Approach

This planning work is being accelerated in an attempt to begin ground sampling in the 2006/07 fiscal year. The completion of 115 VRI ground samples will require 115 crew days based on an average of 1 sample per day. Mentoring will occur on actual samples to focus the interaction on operational procedures and maintain production.

It is the intention to bid the work to certified VRI staff by early September of 2006. While it is recognized that VRI ground sampling activity has currently escalated across the province, it is hoped that a plan can be developed with field crews to get the timber data collected for a minimum of 30 samples in the 2006 field season. The priority is completing the ground samples associated with subsequent NVAF data collection.

The logistics of the ecology work will need further assessment. Since it is an abridged ecology data collection that does not require full VRI Ecology data collection, it may be an option to have a separate ecology crew collect the data systematically. The Regional Ecologist will be consulted regarding an appropriate seasonal window for collection of the ecological attributes in general and site series in particular.

Under section 2.5.2 – NVAF Sample Selection, there is some discussion about the timing of the collection of enhanced plot data related to the NVAF sampling.

Overall, it is believed that with secure financial commitment for the 2007/08 fiscal year, all field work including the establishment of ground samples with timber and ecology data, the NVAF destructive sampling, including interior cruising grades and the establishment of the monitoring plots, with VRI timber and certified ecology can occur by the end of the 2007 field season. Where there is some overlap, the Project Manager will sort out the logistics prior to the finalization of contracts.

2.7 Sample Type

The ground sampling for the Lakes TSA will be the Timber Emphasis type with Succession by certified VRI Timber contractors and the addition of non-certified ecology. The non-standard data collection will involve the following:

Timber Crew

1. Bark stripping will occur on dead pine trees as per the protocol in Appendix F.
2. The regeneration plot will be increased in size to a 3.99 meter radius. In addition to the current 3 classes, there will be a dot count of:
    i) 4 to 7.4 cm. dbh trees
    ii) 7.5 cm+ dbh trees.
3. The auxiliary plot data will be enhanced to include live and dead trees.

Ecologist

4. A Ground Inspection Form will be used to identify site series. Its completion should supply attributes of interest for MPB analysis - slope, slope position, aspect, soil nutrient, moisture grid position and site series.

3.0 Implementation Plan

3.1 Scheduling

Table 3 – Schedule of Activities

Timing	VRI Activity
Year 1 – 2006/07	VSIP and VPIP preparation -includes Sampling plan development and package preparation 30-Timber Emphasis Plots – timber data collection on NVAF samples Contract administration & materials-Year 2 Mentoring – additional attributes Quality Assurance -10% or 3 samples Helicopter, as required to access samples
Year 2 – 2007/08	Contract administration 85 Timber Emphasis Plots – timber and ecology data collection. 30 – Ecology follow up on Year 1 Timber plots Mentoring – additional attributes, as required QA-10% or 9 samples NVAF destructive sampling - includes scaler Quality Assurance-NVAF Final Compilation/analysis and inventory file adjustment based on Ground Sampling work Monitoring project – All phases, from preparation of packages to establishment Helicopter, as required to access any of these samples for various activities

3.2 Sample Packages

The crews will be provided with a large scale overview map of the project area. There will be a project list that includes the geographic location (UTMs) for each sample IPC, highlight of the NVAF samples, and a rough estimate of the access type (i.e. heli, truck – 4X4, quad).

Sample packages will be prepared for each sample for each Ground Sampling activity. These will contain the information required for field crews to navigate to, and establish the sample. Depending on whether the Monitoring sample locations are unique from the Ground Samples, there may be separate packages prepared for this part of the project.

The crews will be provided with overall project information in the bid packages, in their contract and at the pre-work including the data to be collected, both standard and additional for this project and directions on how to record the data.

Sample packages will include:

- an envelope with sample details on the outside, including sample number, basemap number, UTM coordinates of the IPC and a line each for crew initials and completion date.
- one 8 ½ X 14 map at a 1:10,000 scale showing the IPC and potential auxiliary plots locations, as well as the Forest Cover polygons. TRIM features including contours, BGC (legacy or Big BEC, as available), major roads
- one 8 ½ X 14 orthophoto with the IPC marked

Other items that will help with the locating samples may also be made available.

3.3 Standards

The most recent edition of the Vegetation Resources Inventory Standards and Procedures will be followed for the completing this project. These are located at the website:
http://ilmbwww.gov.bc.ca/risc/pubs/teveg/index.htm

The following is a list for the critical Standards and Procedures for the Burns Lake TSA VRI project:

Ground Sampling:

Vegetation Resources Inventory Guidelines for Preparing a Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling Version 2.0, March 2006

Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling Version 3.3, December 2002

Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling Version 3.3 Errata No. 1, April 2005

Vegetation Resources Inventory Ground Sampling Procedures Version 4.5, March 2004

Vegetation Resources Inventory Ground Sampling Procedures Version 4.5 Errata No. 1, February 2005

Vegetation Resources Inventory Quality Assurance Procedures for VRI Ground Sampling Version 3.0, March 2004

Vegetation Resources Inventory Data Collection Standards for VRI Ground Sampling Version 2.1, March 2006
Vegetation Resources Inventory Ground Sampling Data Collection Procedures for Inaccessible Samples Version 1.0, March 2003

Net Volume Adjustment Factor Sampling Standards and Procedures Version 4.1, March 2006

VRI – Analysis and Adjustment

Vegetation Resources Inventory Procedures and Standards for Data Analysis Attribute Adjustment and Implementation of Adjustment in a Corporate Database Version 2.0, March 2004

Monitoring

National Forest Inventory BC Change Monitoring Procedures for Provincial and National Reporting Version 1.4, March 2005

Change Monitoring Inventory Ground Sampling Quality Assurance Procedures Version 1.1, March 2002

Change Monitoring Inventory Ground Sampling Quality Assurance Standards Version 1.1, March 2002

3.4 Roles and Responsibilities

Since this is a Ministry of Forests and Range-lead initiative, the main participants in the project are from within government. They include:

MoFR Forest Analysis and Inventory Branch, VRI section contacts:
Planning: Gary Johansen, VRI Audit Coordinator
NVAF: Will Smith, Volume & Decay Sampling Officer

MoFR Regional staff contacts, Northern Interior Forest Region:
Planning: Dick Nakatsu, Forest Analyst & Inventory Team Leader
Operational: Carolyn Krawchuk, VRI MPB Sampling Forester

MoFR District contact and representative, Nadina Forest District:
Barry Elliott, Tenures Forester

The preparation of the VRI planning documents for the Lakes TSA has been contracted out to Nona Phillips Forestry Consulting. It is Nona Phillips' understanding that she will follow through with coordinating the field activities

undertaken on this project as the Project Manager, QA contractor and liaison with the field crews.

In regard to supplies for the Ground sampling, the MoFR will provide:

- VRI numbered tags
- Aluminum pins
- Helicopter access as required

For the Monitoring work, in addition to these items, crews will also be supplied with numbered trees tags.

As part of the Project Management contract, with MoFR support for data acquisition, Nona Phillips Forestry Consulting will sub-contract technical support for the sample selection and GIS work including sample location and maps. This contractor will prepare the maps for the sample packages.

3.4.1 Field Work

Fieldwork will be tendered and contracted out as follows:

1. 2006/07 – Ground sampling – Certified Timber data collection only on a sub-set of the 115 samples, with priority on the NVAF samples
2. 2007/08 – Ground sampling – Certified Timber and non-certified ecology on the remaining ground samples not completed in the 2006 field season.
3. 2007/08 – Ground sampling – Non-certified ecology on any samples established in the 2006 field season with timber data collection only.
4. 2007/08 – NVAF ground sampling. Certified NVAF destructive sampling with a qualified scaler on the crew.
5. 2007/08 – Monitoring project – Certified Timber and Ecology samplers to establish and collect data on these samples. If the Monitoring Project is to use a subset of the 115 VRI samples, then every effort will be made to have the Monitoring group precede the Timber Emphasis sampling. This is to minimize the damage to the ecology plot. Only certified ecology data collection will occur for the Monitoring project. If the decision is to go to alternate locations, then the Monitoring project can be carried out independently.

3.4.2 Quality Assurance

The bidding for Ground Sampling activity on this project will indicate the requirement for the field crew's presence on each QA plot. This has been done on other projects and has proved to be effective with little cost increase. Nona Phillips Forestry Consulting will be the primary QA contractor representing the government, unless an alternate program decision is made.

Will Smith, the Volume & Decay Sampling Officer from Forest Analysis and Inventory Branch will be part of the Quality Assurance team for this project. Depending on his availability, he may contract out a portion of this work.

The QA for the Monitoring project will involve Nona Phillips Forestry Consulting for the timber data collection and a Certified Ecology contractor. It will be up to the MoFR to decide how the ecologist will be selected, either through a direct award or a bid process.

3.4.3 Data Compilation, Analysis and Adjustment

It is Nona Phillips Forestry Consulting's understanding that FAIB would like this project to be completed in 2007/08 including the following components:

- Final review of data through the validation process to identify any errors before the samples are compiled;
- Data compilation
- Statistical analysis
- Inventory file adjustment

The current plan would be to have Karen Jahraus & Associates complete this work under Nona Phillips' contract, if the funding is available and if this fulfills the MoFR's direction.

3.5 Sample List

- A complete sample list is provided in Appendix C. A description of how samples were distributed across the polygon is included in Appendix A.

3.6 Deliverables

One of the underlying tasks of the Project Manager is to insure that all deliverables for the ground sampling projects are delivered to the appropriate MoFR, FAIB, and VRI section staff and that they follow RISC Procedures and meet the appropriate Standards.

All project files will be provided including:

From the Field contractors

- Completed Project packages
- Digital sample data on CD and provided directly to the MoFR
- Additional data collected as per this project, in the format specified in the contract and at the pre-work

- Documentation of any modifications to the sample lists

From Nona Phillips Forestry Consulting

- Project files regarding the planning processes and the Sample selection
- All project records related to the field work, including the competitive bidding process
- Quality Assurance records including spreadsheets on the work completed and the QA reports
- Documentation of any modifications to the sample lists

3.7 Costs

Table 4 – VRI Costs Based on Activities and Sample Size

VRI Activity	Sample Size	Unit Cost	Total Cost
GROUND SAMPLING			
Contract administration & materials-Year 2			$11,000
Year 1-VSIP and VPIP preparation -includes Sampling plan development and package preparation and contract Administration			$35,000
Timber Emphasis Plot – timber and ecology data collection	85	$1,800/sample	$153,000
Year 1-Timber Emphasis Plots – timber data collection	30	$2,000/sample	$60,000
Yr.2Timber Emphasis Plots – ecology data collection	30	$600/sample	$18,000
NVAF destructive sampling - includes scaler	120	$750/tree	$90,000
Helicopter access-VRI Est. Year 1-$14,000 and Year 2-$30,000			$44,000
Helicopter access-NVAF			$35,000
Mentoring (crew training) Year 1-$3,000 Year 2-$4,000			$7,000
Quality Assurance-Timber Year 1-$3,000 Year 2-$9,000			$12,000
Quality Assurance-NVAF			$7,000
Final Compilation/analysis and inventory file adjustment			$15,000
Total Phase II			**$487,000**

Costs will be incurred in Year 2 unless otherwise indicated.

NOTE: Non-standard ecology data collection will be reduced by 25 plots if the Monitoring plots are located on a sub-set of the VRI Timber Emphasis samples.

ALSO PLEASE NOTE: Helicopter and Crew costs were higher than anticipated in Year 1. Crew availability and the requirement for helicopter access may result in higher project costs overall.

Table 5 – VRI Monitoring Project Costs

MONITORING			
Contract Administration – includes GIS work			$7,000
Sample Establishment	25	$2,500/sample	$62,500
Helicopter Access			$5,000
Mentoring	1 crew	$2,000	$2,000
Quality Assurance		$3000	$3,000
Total Monitoring			**$79,500**

Table 6 - Estimated funding breakdown by year, based on timing of VRI activities

Year	Activity	Costs
1-2006/07	All costs for plan preparation and establishment of 30 Ground sampling – timber	$115,000
Year 1 total		**$115,000**
2-2007/08	Contract Administration	$11,000
	Ground sampling – timber & ecology	$183,000
	Timber mentoring & QA	$13,000
	Ground sampling – ecology	$18,000
	NVAF	$125,000
	NVAF QA	$7,000
	Analysis & Adjustment	$15,000
	Monitoring	$79,500
Year 2 total		**451,500**
Grand Total		**$566,500**

3.8 Sign-off sheet

Lakes Timber Supply Area Vegetation Resources Inventory Project Implementation Plan for Ground Sampling, Net Volume Adjustment Factor Sampling & Monitoring

It is the intention of the Ministry of Forest & Range (MOFR) to implement the Lakes Timber Supply Area Vegetation Resources Inventory Project Implementation Plan for Ground Sampling (VPIP) as described. As a key stakeholder in the inventory, MOFR VRI staff has been consulted throughout the development of this plan.

I have reviewed the Lakes Timber Supply Area Vegetation Resources Inventory Project Implementation Plan for Ground Sampling (VPIP). The work proposed in this plan meets Vegetation Resources Inventory Standards and MOFR business needs.

Jon Vivian, R.P.F. date
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Vegetation Resources Inventory Section
Forest Analysis and Inventory Branch
Ministry of Forests and Range
Victoria, British Columbia

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7. MoFR website for VRI - http://www.for.gov.bc.ca/hts/vri/reports&pub/vri_vripub.html#top

8. Timberline Forest Inventory Consultants. September 1, 2000. Babine Forest Products Co. Enhanced Forest Management Pilot Project Vegetation Resources Inventory Sampling Plan.

9. Timberline Forest Inventory Consultants. March 31, 2005. A User's Guide to the Vegetation Resources Inventory. FIA/ Tolko Industries Limited.

The most recent edition of the **Vegetation Resources Inventory Standards and Procedures** will be followed for the completing this project. These are located at the website:
http://ilmbwww.gov.bc.ca/risc/pubs/teveg/index.htm

The following is a list for the critical Standards and Procedures for the Burns Lake TSA VRI project:

Ground Sampling:

Vegetation Resources Inventory Guidelines for Preparing a Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling Version 2.0, March 2006

Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling Version 3.3, December 2002

Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling Version 3.3 Errata No. 1, April 2005

Vegetation Resources Inventory Ground Sampling Procedures Version 4.5, March 2004

Vegetation Resources Inventory Ground Sampling Procedures Version 4.5 Errata No. 1, February 2005

Vegetation Resources Inventory Quality Assurance Procedures for VRI Ground Sampling Version 3.0, March 2004

Vegetation Resources Inventory Data Collection Standards for VRI Ground Sampling Version 2.1, March 2006
Vegetation Resources Inventory Ground Sampling Data Collection Procedures for Inaccessible Samples Version 1.0, March 2003

Net Volume Adjustment Factor Sampling Standards and Procedures Version 4.1, March 2006

VRI – Analysis and Adjustment

Vegetation Resources Inventory Procedures and Standards for Data Analysis Attribute Adjustment and Implementation of Adjustment in a Corporate Database Version 2.0, March 2004

Monitoring

National Forest Inventory BC Change Monitoring Procedures for Provincial and National Reporting Version 1.4, March 2005

Change Monitoring Inventory Ground Sampling Quality Assurance Procedures Version 1.1, March 2002

Change Monitoring Inventory Ground Sampling Quality Assurance Standards Version 1.1, March 2002

Appendix A

Sampling Selection Process and Methodology for Lakes TSA

Appendix A: Sampling Process and Methodology for Lakes TSA

The process followed is outlined in the document "Sample Selection Procedures for Ground Sampling" produced by the Ministry of Forests, Forests Analysis and Inventory Branch, in December 2002.

The Inventory attribute data was obtained from Forests Analysis Inventory Branch. The 239 MS/Access files covered all the map sheets within the Burns Lake (DLA) district. The files also covered a few adjoining districts, where the districts shared map sheets.

The data used covers only the DLA district, and excludes Tweedsmuir Provincial Park where it was identified by Special Cruise number (PSYU) 567. The population has not been confirmed by a GIS exercise. The total area selected covers an area of 1121562.05 ha.

The tasks undertaken to prepare the data and do the sample selection were:

- Select only the VT (vegetated treed) polygons

- Project data to 2006 (original projection years ranged from 2001 to 2005). This was accomplished using VDYP6 batch.

- Assign strata as determined by the July 7, 2006 meeting of the Stakeholders. (This had been reviewed in a Discussion Paper sent to all Stakeholders, but remained the same.) The strata were: Immature, Mature PL 81%, Mature PL 50-80%, and all other Mature polygons. Strata were assigned based on the Rank 1 layer leading species, percent of leading species, and projected age of the Rank 1 leading species. Age was projected to 2006.

- Determine the strata sizes: Immature was assigned 15 samples; Mature was assigned 100 samples distributed proportionally by area across the 3 strata. The table below illustrates the mature strata proportions and the number of samples selected.

strata	# of polygons	Strata Area	% of total area	Total area	samples
Mat-PL 80+%	15941	274742.5	35.6	771659.7	35
Mat-PL 50-80%	13523	190523.6	24.69	771659.7	25
Mat-other	27555	306393.5	39.71	771659.7	40
					100

- Within each strata, 3 volume classes are assigned[6], as follows

strata	Volume Class	# of polygons	Volume range from	To
Immature	0	1527	0	0
Immature	1	1008	0.1	51.1
Immature	2	1267	51.2	258.5
Mat-PL 80+%	0	5317	0	198.2
Mat-PL 80+%	1	5317	198.3	282.4
Mat-PL 80+%	2	5308	282.5	564.1
Mat-PL 50-80%	0	4508	0	211.8
Mat-PL 50-80%	1	4515	211.9	294.7
Mat-PL 50-80%	2	4500	294.8	525.1
Mat-other	0	9187	0	153
Mat-other	1	9188	153.1	261.1
Mat-other	2	9180	261.2	521.9

- Each strata volume class now requires a sampling rate. This was determined as equally as possible.

strata	vol_cls	# of samples
Immature	0	5
Immature	1	5
Immature	2	5
Mat-PL 80+%	0	11
Mat-PL 80+%	1	12
Mat-PL 80+%	2	12
Mat-PL 50-80%	0	8
Mat-PL 50-80%	1	9
Mat-PL 50-80%	2	8
Mat-other	0	13
Mat-other	1	14
Mat-other	2	13

- Samples were then selected[7] by the probability of selection proportional to size with replacement (PPSWR) method as specified in the standards.

- Six lists were run using unique random numbers[8]. . The six lists will allow for replacement samples, as some samples may be not be suitable.

- Sample statistics illustrating the similarity of the samples to the population are available upon request.

[6] Volume class was assigned using SAS® procedure Proc Rank which was instructed to determine 3 equal and unique volume classes per strata

[7] Samples were selected using SAS® procedure Proc Surveyselect using PPSWR and the sampling plan above

[8] The random numbers were generated in MS/Excel® using the RAND() function

Appendix B

Detailed Population Tables

District distribution

district	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
DLA	60821	844456.9	100	844456.9

Strata breakdown for the Lakes TSA landbase

strata	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
Immature	3802	72797.2	8.62	844456.9
Mat-PL 50-80%	13523	190523.6	22.56	844456.9
Mat-PL 80+%	15941	274742.5	32.53	844456.9
Mat-misc	27555	306393.5	36.28	844456.9

Mature only

strata	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area	samples
Mat-PL 50-80%	13523	190523.6	24.69	771659.7	25
Mat-PL 80+%	15941	274742.5	35.6	771659.7	35
Mat-misc	27555	306393.5	39.71	771659.7	40
					100

VT by Strata by Species by Age group

strata	sspcs1	age_grp	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
Immature	AC	Imm	6	42.7	0.01	844456.9
Immature	AT	Imm	625	7048.9	0.83	844456.9
Immature	BL	Imm	185	2446.2	0.29	844456.9
Immature	EP	Imm	2	6.4	0	844456.9
Immature	FD	Imm	7	58.7	0.01	844456.9
Immature	PL	Imm	2432	53935.5	6.39	844456.9
Immature	S	Imm	132	3497.5	0.41	844456.9
Immature	SB	Imm	51	467.5	0.06	844456.9
Immature	SW	Imm	173	2801.8	0.33	844456.9
Immature	SX	Imm	189	2491.9	0.3	844456.9
Mat-PL 50-80%	PL	Mat	13523	190523.6	22.56	844456.9
Mat-PL 80+%	PL	Mat	15941	274742.5	32.53	844456.9
Mat-misc	AC	Mat	151	1370.3	0.16	844456.9
Mat-misc	AT	Mat	4963	61951.6	7.34	844456.9
Mat-misc	B	Mat	110	1448.7	0.17	844456.9
Mat-misc	BL	Mat	3722	43104.6	5.1	844456.9
Mat-misc	EP	Mat	29	279.4	0.03	844456.9
Mat-misc	FD	Mat	102	1179.2	0.14	844456.9
Mat-misc	PL	Mat	2568	34612.1	4.1	844456.9
Mat-misc	S	Mat	551	4868	0.58	844456.9
Mat-misc	SB	Mat	1034	6461.8	0.77	844456.9
Mat-misc	SW	Mat	5700	77952.7	9.23	844456.9
Mat-misc	SX	Mat	8625	73165.1	8.66	844456.9

Species distribution in VT

sspcs1	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
AC	157	1413	0.17	844456.9
AT	5588	69000.4	8.17	844456.9
B	110	1448.7	0.17	844456.9
BL	3907	45550.8	5.39	844456.9
EP	31	285.8	0.03	844456.9
FD	109	1237.9	0.15	844456.9
PL	34464	553813.8	65.58	844456.9
S	683	8365.6	0.99	844456.9
SB	1085	6929.3	0.82	844456.9
SW	5873	80754.6	9.56	844456.9
SX	8814	75657	8.96	844456.9

Project age class in VT

ageclprj	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
1	942	26253.2	3.11	844456.9
2	1077	23894	2.83	844456.9
3	1783	22650	2.68	844456.9
4	8840	121491.3	14.39	844456.9
5	6227	84734.5	10.03	844456.9
6	6493	78222.4	9.26	844456.9
7	10033	129601.7	15.35	844456.9
8	24669	346252	41	844456.9
9	757	11357.8	1.34	844456.9

By Species by Projected Aged Class in VT

sspcs1	ageclprj	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
AC	3	6	42.7	0.01	844456.9
AC	4	7	25.2	0	844456.9
AC	5	18	101.7	0.01	844456.9
AC	6	18	376.8	0.04	844456.9
AC	7	44	299.3	0.04	844456.9
AC	8	64	567.3	0.07	844456.9
AT	1	58	824.3	0.1	844456.9
AT	2	126	1420.5	0.17	844456.9
AT	3	441	4804.1	0.57	844456.9
AT	4	1354	16197.8	1.92	844456.9
AT	5	1548	20496	2.43	844456.9
AT	6	783	9404.4	1.11	844456.9
AT	7	981	12260.5	1.45	844456.9
AT	8	297	3592.9	0.43	844456.9
B	6	1	8.8	0	844456.9
B	7	7	62.9	0.01	844456.9
B	8	66	710	0.08	844456.9
B	9	36	666.9	0.08	844456.9
BL	1	20	477.8	0.06	844456.9
BL	2	53	844.5	0.1	844456.9
BL	3	112	1124	0.13	844456.9
BL	4	203	1627.2	0.19	844456.9
BL	5	238	1792.7	0.21	844456.9
BL	6	330	2714.6	0.32	844456.9
BL	7	560	6195	0.73	844456.9
BL	8	2171	27456.7	3.25	844456.9
BL	9	220	3318.4	0.39	844456.9
EP	2	1	2.8	0	844456.9
EP	3	1	3.7	0	844456.9
EP	4	8	128.9	0.02	844456.9
EP	5	8	69.3	0.01	844456.9
EP	6	6	41	0	844456.9
EP	7	7	40.2	0	844456.9
FD	1	3	39.2	0	844456.9
FD	3	4	19.5	0	844456.9
FD	4	15	111.9	0.01	844456.9
FD	5	7	85.1	0.01	844456.9
FD	6	11	89.8	0.01	844456.9
FD	7	10	30	0	844456.9
FD	8	54	795.3	0.09	844456.9
FD	9	5	67.1	0.01	844456.9
PL	1	753	22450.5	2.66	844456.9
PL	2	796	19607.4	2.32	844456.9
PL	3	883	11877.7	1.41	844456.9
PL	4	6003	92211.3	10.92	844456.9
PL	5	3240	50819.5	6.02	844456.9
PL	6	3815	53465	6.33	844456.9
PL	7	5888	87035	10.31	844456.9

PL	8	12955	213718.2	25.31	844456.9
PL	9	131	2629.3	0.31	844456.9
S	1	56	1112.3	0.13	844456.9
S	2	44	943.6	0.11	844456.9
S	3	32	1441.6	0.17	844456.9
S	4	85	733	0.09	844456.9
S	5	51	382.7	0.05	844456.9
S	6	38	350.1	0.04	844456.9
S	7	73	628.9	0.07	844456.9
S	8	289	2564.3	0.3	844456.9
S	9	15	209.1	0.02	844456.9
SB	2	2	25.3	0	844456.9
SB	3	49	442.2	0.05	844456.9
SB	4	146	816.3	0.1	844456.9
SB	5	159	941.3	0.11	844456.9
SB	6	190	1233.7	0.15	844456.9
SB	7	236	1529.9	0.18	844456.9
SB	8	300	1919.1	0.23	844456.9
SB	9	3	21.5	0	844456.9
SW	1	10	322.7	0.04	844456.9
SW	2	38	846.2	0.1	844456.9
SW	3	125	1632.9	0.19	844456.9
SW	4	535	6078.6	0.72	844456.9
SW	5	401	5861.1	0.69	844456.9
SW	6	273	3314	0.39	844456.9
SW	7	620	7737.6	0.92	844456.9
SW	8	3786	53095	6.29	844456.9
SW	9	85	1866.5	0.22	844456.9
SX	1	42	1026.5	0.12	844456.9
SX	2	17	203.7	0.02	844456.9
SX	3	130	1261.8	0.15	844456.9
SX	4	484	3561.1	0.42	844456.9
SX	5	557	4185.1	0.5	844456.9
SX	6	1028	7224.2	0.86	844456.9
SX	7	1607	13782.5	1.63	844456.9
SX	8	4687	41833.2	4.95	844456.9
SX	9	262	2579.1	0.31	844456.9

VT area by Mapsheet for Lakes TSA VRI project area

district	map_no	No_of_Polygons	Summary_area	Pct_of_total_area	Total_area
DLA	093E030	200	2922.9	0.35	844456.9
DLA	093E040	237	5602.7	0.66	844456.9
DLA	093E050	197	5760.7	0.68	844456.9
DLA	093E060	251	4949.5	0.59	844456.9
DLA	093E070	334	5401.6	0.64	844456.9
DLA	093E079	8	253.5	0.03	844456.9
DLA	093E080	148	2785.6	0.33	844456.9
DLA	093E088	18	196.8	0.02	844456.9
DLA	093E089	591	6558.2	0.78	844456.9
DLA	093E090	775	11162.9	1.32	844456.9
DLA	093E098	207	2396.3	0.28	844456.9
DLA	093E099	556	9023.9	1.07	844456.9
DLA	093E100	790	10810.5	1.28	844456.9
DLA	093F002	5	14.3	0	844456.9
DLA	093F012	503	9337.1	1.11	844456.9
DLA	093F013	48	724.1	0.09	844456.9
DLA	093F021	588	12090.8	1.43	844456.9
DLA	093F022	663	13342.3	1.58	844456.9
DLA	093F023	250	7084.3	0.84	844456.9
DLA	093F031	580	11217.8	1.33	844456.9
DLA	093F032	537	10421.2	1.23	844456.9
DLA	093F033	633	11930.9	1.41	844456.9
DLA	093F034	137	3144.7	0.37	844456.9
DLA	093F041	435	11783	1.4	844456.9
DLA	093F042	533	9511.9	1.13	844456.9
DLA	093F043	608	9861.7	1.17	844456.9
DLA	093F044	422	5650.2	0.67	844456.9
DLA	093F045	74	670.6	0.08	844456.9
DLA	093F051	466	10526.2	1.25	844456.9
DLA	093F052	539	9981.4	1.18	844456.9
DLA	093F053	609	9120.4	1.08	844456.9
DLA	093F054	311	2801.4	0.33	844456.9
DLA	093F055	66	456.8	0.05	844456.9
DLA	093F061	475	10199.7	1.21	844456.9
DLA	093F062	497	9819.8	1.16	844456.9
DLA	093F063	592	11916.8	1.41	844456.9
DLA	093F064	691	11194.1	1.33	844456.9
DLA	093F065	421	6232.2	0.74	844456.9
DLA	093F071	580	8560.8	1.01	844456.9
DLA	093F072	892	10644	1.26	844456.9
DLA	093F073	1129	11456.8	1.36	844456.9
DLA	093F074	651	12237.9	1.45	844456.9
DLA	093F075	357	5530.9	0.65	844456.9
DLA	093F081	642	9575.8	1.13	844456.9
DLA	093F082	794	11809.7	1.4	844456.9
DLA	093F083	933	10596.3	1.25	844456.9

DLA	093F084	734	10267.9	1.22	844456.9
DLA	093F085	444	7151.3	0.85	844456.9
DLA	093F091	679	9086.5	1.08	844456.9
DLA	093F092	666	10294.2	1.22	844456.9
DLA	093F093	586	10649.8	1.26	844456.9
DLA	093F094	195	3457.3	0.41	844456.9
DLA	093K001	704	8352.6	0.99	844456.9
DLA	093K002	449	7119.5	0.84	844456.9
DLA	093K003	553	9015.9	1.07	844456.9
DLA	093K004	518	8104.6	0.96	844456.9
DLA	093K005	242	2717.9	0.32	844456.9
DLA	093K011	1126	13353.8	1.58	844456.9
DLA	093K012	749	11629.2	1.38	844456.9
DLA	093K013	811	12675.4	1.5	844456.9
DLA	093K014	891	11414.2	1.35	844456.9
DLA	093K015	498	5060.7	0.6	844456.9
DLA	093K021	829	12146.6	1.44	844456.9
DLA	093K022	885	11043.4	1.31	844456.9
DLA	093K023	785	12730.4	1.51	844456.9
DLA	093K024	1210	12934.5	1.53	844456.9
DLA	093K025	818	10902.5	1.29	844456.9
DLA	093K026	56	442	0.05	844456.9
DLA	093K031	780	9040.6	1.07	844456.9
DLA	093K032	800	12330.7	1.46	844456.9
DLA	093K033	1148	12253	1.45	844456.9
DLA	093K034	990	11595.3	1.37	844456.9
DLA	093K035	920	11422.7	1.35	844456.9
DLA	093K036	132	1208.5	0.14	844456.9
DLA	093K041	957	11971.9	1.42	844456.9
DLA	093K042	1031	11912.2	1.41	844456.9
DLA	093K043	890	9059.2	1.07	844456.9
DLA	093K044	1144	9942.7	1.18	844456.9
DLA	093K045	1200	12635.4	1.5	844456.9
DLA	093K046	409	4765.1	0.56	844456.9
DLA	093K051	1095	12521.8	1.48	844456.9
DLA	093K052	948	8683.3	1.03	844456.9
DLA	093K053	748	6828.4	0.81	844456.9
DLA	093K054	556	5801.4	0.69	844456.9
DLA	093K055	149	1953.3	0.23	844456.9
DLA	093K061	703	7289.7	0.86	844456.9
DLA	093K062	773	9621.8	1.14	844456.9
DLA	093K063	41	250.3	0.03	844456.9
DLA	093K071	173	2201.4	0.26	844456.9
DLA	093K072	1022	10468.7	1.24	844456.9
DLA	093K073	526	4736	0.56	844456.9
DLA	093K081	46	347.5	0.04	844456.9
DLA	093K082	811	8434.1	1	844456.9
DLA	093K083	504	5093.4	0.6	844456.9
DLA	093K092	258	2747.1	0.33	844456.9
DLA	093K093	298	3597.1	0.43	844456.9

DLA	093L009	232	2671.7	0.32	844456.9
DLA	093L010	842	8525.7	1.01	844456.9
DLA	093L019	125	1445.5	0.17	844456.9
DLA	093L020	882	12402.1	1.47	844456.9
DLA	093L029	260	6275.1	0.74	844456.9
DLA	093L030	688	12705.9	1.5	844456.9
DLA	093L039	427	8228.2	0.97	844456.9
DLA	093L040	673	10164.3	1.2	844456.9
DLA	093L049	332	3305.8	0.39	844456.9
DLA	093L050	832	10359.3	1.23	844456.9
DLA	093L060	768	9316.9	1.1	844456.9
DLA	093L070	307	2522.8	0.3	844456.9

Appendix C

Sample lists for Ground Samples

Sample List

The following is a list of 115 planned samples (identified as "Y" and "R") and 57 contingency samples. The contingency samples are provided to replace those samples rejected during field sampling. Samples replacing rejected one must be from the same stratum and sub-stratum.

Samples can be rejected during the sampling phase if they are in an unsafe location or in a cutover at the Integrated Plot Centre (IPC) that was not identified at the time of sample selection. The project manager must be consulted if samples are rejected.

Y=planned sample from sample list #1
R=replacement sample for those rejected[9] from list #1
C=contingency samples to replace those rejected during field sampling

strata	vol_cls	sample_number	List	map_no	polygon	sspcs1	polyarea	Selected?
Mat-PL 80+%	0	42	list1	093E040	111	PL	576	Y
Mat-PL 80+%	0	43	list1	093F085	577	PL	4	Y
Mat-PL 80+%	0	44	list1	093K033	1164	PL	20	Y
Mat-PL 80+%	0	45	list1	093F083	1099	PL	22	Y
Mat-PL 80+%	0	46	list1	093F054	802	PL	15	Y
Mat-PL 80+%	0	47	list1	093K033	829	PL	10	Y
Mat-PL 80+%	0	48	list1	093E040	136	PL	100	Y
Mat-PL 80+%	0	49	list1	093F061	304	PL	4	Y
Mat-PL 80+%	0	50	list1	093F063	298	PL	49	Y
Mat-PL 80+%	0	51	list1	093F073	1920	PL	9	Y
Mat-PL 80+%	0	156	list2	093K023	282	PL	10	R
Mat-PL 80+%	0	157	list2	093F084	560	PL	30	C
Mat-PL 80+%	0	162	list2	093F075	28	PL	160	C
Mat-PL 80+%	0	163	list2	093F062	299	PL	61	C
Mat-PL 80+%	0	164	list2	093F084	64	PL	126	C
Mat-PL 80+%	0	166	list2	093K011	899	PL	43	C
Mat-PL 80+%	1	52	list1	093F032	31	PL	58	Y

[9] Samples were rejected if they were located in private land, Indian reserve, parks, or protected areas.

Mat-PL 80+%	1	53	list1	093L010	1481	PL	2	Y
Mat-PL 80+%	1	54	list1	093K021	1545	PL	8	Y
Mat-PL 80+%	1	55	list1	093K034	759	PL	13	Y
Mat-PL 80+%	1	58	list1	093E060	307	PL	4	Y
Mat-PL 80+%	1	59	list1	093F061	227	PL	256	Y
Mat-PL 80+%	1	60	list1	093L050	105	PL	26	Y
Mat-PL 80+%	1	167	list2	093K024	1233	PL	83	R
Mat-PL 80+%	1	168	list2	093K043	655	PL	75	R
Mat-PL 80+%	1	170	list2	093E098	464	PL	14	R
Mat-PL 80+%	1	171	list2	093K053	544	PL	6	R
Mat-PL 80+%	1	172	list2	093K025	807	PL	36	R
Mat-PL 80+%	1	175	list2	093F065	612	PL	379	C
Mat-PL 80+%	1	176	list2	093E060	6	PL	437	C
Mat-PL 80+%	1	177	list2	093F051	498	PL	6	C
Mat-PL 80+%	1	173	list2	093F041	7	PL	60	C
Mat-PL 80+%	1	174	list2	093F053	67	PL	17	C
Mat-PL 80+%	2	64	list1	093F053	485	PL	7	Y
Mat-PL 80+%	2	65	list1	093K032	547	PL	19	Y
Mat-PL 80+%	2	67	list1	093F051	360	PL	72	Y
Mat-PL 80+%	2	69	list1	093F051	661	PL	66	Y
Mat-PL 80+%	2	70	list1	093F051	86	PL	101	Y
Mat-PL 80+%	2	72	list1	093F073	1134	PL	6	Y
Mat-PL 80+%	2	74	list1	093E099	151	PL	7	Y
Mat-PL 80+%	2	179	list2	093F084	49	PL	12	R
Mat-PL 80+%	2	182	list2	093L040	158	PL	18	R
Mat-PL 80+%	2	184	list2	093E090	990	PL	9	R
Mat-PL 80+%	2	186	list2	093K083	336	PL	52	R

Mat-PL 80+%	2	187	list2	093L050	47	PL	54	R
Mat-PL 80+%	2	188	list2	093K031	148	PL	6	C
Mat-PL 80+%	2	190	list2	093F075	18	PL	4	C
Mat-PL 80+%	2	294	list3	093K011	742	PL	20	C
Mat-PL 80+%	2	295	list3	093E090	636	PL	131	C
Mat-PL 80+%	2	297	list3	093K021	1435	PL	17	C
Mat-PL 80+%	2	298	list3	093F075	688	PL	7	C
Mat-PL 80+%	2	299	list3	093K062	147	PL	58	C
Mat-PL 80+%	2	301	list3	093F075	982	PL	17	C
Mat-PL 80+%	2	302	list3	093F062	157	PL	9	C
Mat-PL 80+%	2	303	list3	093E100	666	PL	4	C
Mat-PL 50-80%	0	16	list1	093E089	80	PL	18	Y
Mat-PL 50-80%	0	18	list1	093K024	1163	PL	54	Y
Mat-PL 50-80%	0	19	list1	093K024	1135	PL	65	Y
Mat-PL 50-80%	0	20	list1	093L050	1199	PL	9	Y
Mat-PL 50-80%	0	21	list1	093E040	279	PL	16	Y
Mat-PL 50-80%	0	22	list1	093K042	381	PL	24	Y
Mat-PL 50-80%	0	23	list1	093K031	1518	PL	24	Y
Mat-PL 50-80%	0	131	list2	093F084	548	PL	94	R
Mat-PL 50-80%	0	132	list2	093K024	1163	PL	54	C
Mat-PL 50-80%	0	133	list2	093F085	527	PL	11	C
Mat-PL 50-80%	0	134	list2	093F092	205	PL	88	C
Mat-PL 50-80%	0	135	list2	093F061	486	PL	10	C
Mat-PL 50-80%	0	136	list2	093F085	504	PL	53	C
Mat-PL 50-80%	1	24	list1	093F073	128	PL	17	Y
Mat-PL 50-80%	1	26	list1	093F061	750	PL	28	Y

Mat-PL 50-80%	1	27	list1	093K022	96	PL	10	Y
Mat-PL 50-80%	1	28	list1	093F061	312	PL	250	Y
Mat-PL 50-80%	1	29	list1	093K035	652	PL	1	Y
Mat-PL 50-80%	1	30	list1	093F072	1361	PL	4	Y
Mat-PL 50-80%	1	31	list1	093F061	157	PL	50	Y
Mat-PL 50-80%	1	139	list2	093E030	121	PL	37	R
Mat-PL 50-80%	1	140	list2	093E090	397	PL	63	R
Mat-PL 50-80%	1	141	list2	093F075	681	PL	7	C
Mat-PL 50-80%	1	142	list2	093K013	834	PL	27	C
Mat-PL 50-80%	1	143	list2	093K001	333	PL	51	C
Mat-PL 50-80%	1	144	list2	093L030	1213	PL	12	C
Mat-PL 50-80%	1	145	list2	093F051	50	PL	917	C
Mat-PL 50-80%	1	146	list2	093F041	87	PL	66	C
Mat-PL 50-80%	1	147	list2	093K021	230	PL	14	C
Mat-PL 50-80%	2	33	list1	093F042	304	PL	81	Y
Mat-PL 50-80%	2	34	list1	093F053	596	PL	7	Y
Mat-PL 50-80%	2	35	list1	093K034	1004	PL	12	Y
Mat-PL 50-80%	2	37	list1	093F084	607	PL	55	Y
Mat-PL 50-80%	2	38	list1	093L040	238	PL	21	Y
Mat-PL 50-80%	2	39	list1	093E098	916	PL	19	Y
Mat-PL 50-80%	2	148	list2	093F082	433	PL	107	R
Mat-PL 50-80%	2	149	list2	093K044	634	PL	29	R
Mat-PL 50-80%	2	151	list2	093F074	650	PL	11	C
Mat-PL 50-80%	2	152	list2	093L050	474	PL	50	C
Mat-PL 50-80%	2	153	list2	093K011	278	PL	70	C
Mat-PL 50-80%	2	154	list2	093F065	379	PL	94	C
Mat-PL 50-80%	2	155	list2	093K072	617	PL	172	C

Mat-PL 50-80%	2	264	list3	093E070	157	PL	161	C
Mat-PL 50-80%	2	265	list3	093E070	157	PL	161	C
Mat-PL 50-80%	2	266	list3	093F051	223	PL	584	C
Mat-PL 50-80%	2	268	list3	093K045	19	PL	33	C
Mat-PL 50-80%	2	269	list3	093F073	687	PL	21	C
Mat-misc	0	76	list1	093K042	637	SB	11	Y
Mat-misc	0	77	list1	093K052	824	SB	3	Y
Mat-misc	0	79	list1	093K035	762	AT	74	Y
Mat-misc	0	83	list1	093F053	226	PL	5	Y
Mat-misc	0	85	list1	093K073	177	SX	2	Y
Mat-misc	0	87	list1	093K034	1122	BL	3	Y
Mat-misc	0	88	list1	093F074	378	AT	28	Y
Mat-misc	0	191	list2	093L050	156	SB	20	R
Mat-misc	0	194	list2	093K044	383	AT	70	R
Mat-misc	0	197	list2	093K012	505	AT	16	R
Mat-misc	0	198	list2	093L030	1342	PL	10	R
Mat-misc	0	199	list2	093K004	25	AT	66	R
Mat-misc	0	200	list2	093F053	246	SW	5	R
Mat-misc	0	201	list2	093K002	329	AT	11	C
Mat-misc	0	202	list2	093K013	720	AT	2	C
Mat-misc	1	89	list1	093F053	128	S	7	Y
Mat-misc	1	90	list1	093F073	1977	AT	9	Y
Mat-misc	1	93	list1	093F082	175	SW	4	Y
Mat-misc	1	94	list1	093K025	728	SX	24	Y
Mat-misc	1	95	list1	093L050	48	AT	13	Y
Mat-misc	1	96	list1	093K023	207	BL	41	Y
Mat-misc	1	97	list1	093K001	560	AT	18	Y
Mat-misc	1	98	list1	093L049	111	S	6	Y
Mat-misc	1	99	list1	093K061	775	SX	13	Y
Mat-misc	1	100	list1	093K035	788	SX	11	Y
Mat-misc	1	102	list1	093K071	118	SX	14	Y
Mat-misc	1	205	list2	093F082	410	SW	188	R
Mat-misc	1	207	list2	093L040	1307	SX	2	R
Mat-misc	1	208	list2	093L049	1245	AT	9	R
Mat-misc	1	209	list2	093L019	556	B	14	C
Mat-misc	1	210	list2	093K062	358	SX	47	C
Mat-misc	1	211	list2	093K023	8	BL	49	C
Mat-misc	1	212	list2	093K022	350	SW	30	C
Mat-misc	2	103	list1	093F073	1135	SX	6	Y
Mat-misc	2	104	list1	093K031	1479	SX	16	Y
Mat-misc	2	105	list1	093K072	278	SX	13	Y
Mat-misc	2	106	list1	093K062	449	SX	31	Y

Mat-misc	2	107	list1	093F055	64	PL	8	Y
Mat-misc	2	108	list1	093K035	257	SX	50	Y
Mat-misc	2	109	list1	093K035	257	SX	50	Y
Mat-misc	2	110	list1	093E099	274	SW	21	Y
Mat-misc	2	111	list1	093F042	446	SW	106	Y
Mat-misc	2	112	list1	093L010	256	SW	14	Y
Mat-misc	2	114	list1	093L050	75	SW	31	Y
Mat-misc	2	115	list1	093F073	1142	SX	6	Y
Mat-misc	2	218	list2	093K035	79	SX	12	R
Mat-misc	2	219	list2	093K061	236	SX	98	C
Mat-misc	2	221	list2	093L060	306	PL	152	C
Mat-misc	2	222	list2	093K034	807	SX	14	C
Immature	0	1	list1	093F073	163	PL	227	Y
Immature	0	3	list1	093K041	217	PL	104	Y
Immature	0	4	list1	093L029	177	PL	54	Y
Immature	0	5	list1	093L050	225	PL	8	Y
Immature	0	116	list2	093F051	316	PL	194	R
Immature	0	117	list2	093F083	1097	PL	3	C
Immature	0	118	list2	093F083	1120	PL	10	C
Immature	1	6	list1	093F093	587	PL	80	Y
Immature	1	8	list1	093F061	97	AT	40	Y
Immature	1	9	list1	093L030	953	PL	82	Y
Immature	1	10	list1	093K023	597	S	966	Y
Immature	1	121	list2	093K023	597	S	966	R
Immature	1	125	list2	093K071	17	AT	13	C
Immature	1	123	list2	093E090	543	AT	4	C
Immature	2	11	list1	093K023	270	PL	28	Y
Immature	2	12	list1	093K023	596	PL	107	Y
Immature	2	14	list1	093F092	210	BL	42	Y
Immature	2	15	list1	093K033	159	SX	38	Y
Immature	2	126	list2	093E090	481	PL	18	R
Immature	2	127	list2	093L050	150	PL	25	C
Immature	2	128	list2	093L050	647	PL	13	C

Appendix D

Comparison of the Sample and Population

The SAS System

'final stats for Burns Lake run 1'
Population Area Class distribution

Area_cls	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1. < 10	33	28.70	38418	165846.0	19.64
2. 10-25	32	27.83	14356	225594.7	26.71
3. 26-50	22	19.13	5184	178215.7	21.10
4. 51-100	16	13.91	2117	143078.6	16.94
5. 101-250	8	6.96	642	90902.89	10.76
6. 251-500	2	1.74	84	27841.18	3.30
7. 501-1000	2	1.74	20	12977.79	1.54
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population Species Distribution

Leading Species	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
AC	.	.	157	1412.96	0.17
AT	13	11.30	5588	69000.45	8.17
B	.	.	110	1448.69	0.17
BL	3	2.61	3907	45550.79	5.39
EP	.	.	31	285.78	0.03
FD	.	.	109	1237.89	0.15
PL	75	65.22	34464	553813.8	65.58
S	3	2.61	683	8365.57	0.99
SB	2	1.74	1085	6929.34	0.82
SW	6	5.22	5873	80754.58	9.56
SX	13	11.30	8814	75657.02	8.96
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population Rank 1 - non forest descriptor codes distribution

Non forest descriptor	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	115	100.00	60746	843654.1	99.90
NC	.	.	45	411.51	0.05
NSR	.	.	30	391.30	0.05
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population Non productive codes Distribution

Non productive code	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	112	97.39	59209	833771.0	98.73
10	.	.	29	719.17	0.09
12	3	2.61	1583	9966.76	1.18
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by BC LAND CLASSIFICATION codes

BC Land Classification System	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
VTUTBDE	1	0.87	367	4901.53	0.58
VTUTBOP	6	5.22	3194	40902.38	4.84
VTUTBSP	1	0.87	457	4927.29	0.58
VTUTCDE	12	10.43	5833	106376.8	12.60
VTUTCOP	78	67.83	40770	577645.7	68.40
VTUTCSP	9	7.83	5728	64595.63	7.65
VTUTMDE	.	.	230	2967.03	0.35
VTUTMOP	6	5.22	2740	31281.14	3.70
VTUTMSP	2	1.74	539	5308.21	0.63
VTWTBSP	.	.	3	32.57	0.00
VTWTCDE	.	.	6	87.15	0.01
VTWTCOP	.	.	256	1579.73	0.19
VTWTCSP	.	.	694	3837.41	0.45
VTWTMOP	.	.	1	3.83	0.00
VTWTMSP	.	.	3	10.44	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by projected age

Age class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1	3	2.61	1191	32214.34	3.81
2	5	4.35	906	18858.75	2.23
3	7	6.09	1866	24553.44	2.91
4	18	15.65	8976	123545.4	14.63
5	7	6.09	6264	84890.09	10.05
6	14	12.17	6668	79670.39	9.43
7	15	13.04	10147	133627.1	15.82
8	45	39.13	24052	335838.2	39.77
9	1	0.87	751	11259.16	1.33
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by projected height class

Height Class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1	10	8.70	2997	58441.12	6.92
2	36	31.30	18210	243863.3	28.88
3	63	54.78	35186	487902.6	57.78
4	6	5.22	4408	53950.67	6.39
5	.	.	19	268.60	0.03
6	.	.	1	30.67	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by site index

Site Index Class in intervals of 5	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	.	.	15	130.44	0.02
5	3	2.61	2788	29201.03	3.46
10	27	23.48	15287	189992.4	22.50
15	72	62.61	34778	513549.0	60.81
20	12	10.43	7659	107020.2	12.67
25	1	0.87	273	4232.21	0.50
30	.	.	13	263.88	0.03
35	.	.	7	37.04	0.00
40	.	.	1	30.67	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by CROWN CLOSURE CLASS

Crown Closure class	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	.	.	54	948.52	0.11
1	7	6.09	4298	49707.36	5.89
2	6	5.22	4193	43190.93	5.11
3	10	8.70	6912	72367.64	8.57
4	20	17.39	12541	147860.8	17.51
5	34	29.57	16086	222233.4	26.32
6	27	23.48	12851	227041.8	26.89
7	8	6.96	3302	66904.71	7.92
8	3	2.61	569	13531.35	1.60
9	.	.	6	440.35	0.05
10	.	.	9	230.13	0.03
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by BEC ZONE - source FIP georef

Bio Geo Climatic zone	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	115	100.00	60821	844456.9	100.0
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for Burns Lake run 1'
Comparison of Sample and Population by PSYU

Special cruise number	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
.	.	.	29	0.54	0.00
134	10	8.70	13582	142834.2	16.91
154	45	39.13	22551	297780.7	35.26
155	60	52.17	24659	403841.5	47.82
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Population Area Class distribution

Area_cls	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1. < 10	32	27.83	38418	165846.0	19.64
2. 10-25	33	28.70	14356	225594.7	26.71
3. 26-50	16	13.91	5184	178215.7	21.10
4. 51-100	20	17.39	2117	143078.6	16.94
5. 101-250	9	7.83	642	90902.89	10.76
6. 251-500	2	1.74	84	27841.18	3.30
7. 501-1000	3	2.61	20	12977.79	1.54
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population Species Distribution

Leading Species	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
AC	.	.	157	1412.96	0.17
AT	10	8.70	5588	69000.45	8.17
B	.	.	110	1448.69	0.17
BL	3	2.61	3907	45550.79	5.39
EP	.	.	31	285.78	0.03
FD	.	.	109	1237.89	0.15
PL	73	63.48	34464	553813.8	65.58
S	4	3.48	683	8365.57	0.99
SB	3	2.61	1085	6929.34	0.82
SW	7	6.09	5873	80754.58	9.56
SX	15	13.04	8814	75657.02	8.96
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population Rank 1 - non forest descriptor codes distribution

Non forest descriptor	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	115	100.00	60746	843654.1	99.90
NC	.	.	45	411.51	0.05
NSR	.	.	30	391.30	0.05
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population Non productive codes Distribution

Non productive code	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	111	96.52	59209	833771.0	98.73
10	.	.	29	719.17	0.09
12	4	3.48	1583	9966.76	1.18
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by BC LAND CLASSIFICATION codes

BC Land Classification System	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
VTUTBDE	1	0.87	367	4901.53	0.58
VTUTBOP	3	2.61	3194	40902.38	4.84
VTUTBSP	1	0.87	457	4927.29	0.58
VTUTCDE	16	13.91	5833	106376.8	12.60
VTUTCOP	77	66.96	40770	577645.7	68.40
VTUTCSP	9	7.83	5728	64595.63	7.65
VTUTMDE	.	.	230	2967.03	0.35
VTUTMOP	6	5.22	2740	31281.14	3.70
VTUTMSP	1	0.87	539	5308.21	0.63
VTWTBSP	.	.	3	32.57	0.00
VTWTCDE	.	.	6	87.15	0.01
VTWTCOP	.	.	256	1579.73	0.19
VTWTCSP	1	0.87	694	3837.41	0.45
VTWTMOP	.	.	1	3.83	0.00
VTWTMSP	.	.	3	10.44	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by projected age

Age class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1	4	3.48	1191	32214.34	3.81
2	3	2.61	906	18858.75	2.23
3	8	6.96	1866	24553.44	2.91
4	17	14.78	8976	123545.4	14.63
5	10	8.70	6264	84890.09	10.05
6	15	13.04	6668	79670.39	9.43
7	17	14.78	10147	133627.1	15.82
8	41	35.65	24052	335838.2	39.77
9	.	.	751	11259.16	1.33
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by projected height class

Height Class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1	11	9.57	2997	58441.12	6.92
2	35	30.43	18210	243863.3	28.88
3	63	54.78	35186	487902.6	57.78
4	6	5.22	4408	53950.67	6.39
5	.	.	19	268.60	0.03
6	.	.	1	30.67	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by site index

Site Index Class in intervals of 5	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	.	.	15	130.44	0.02
5	3	2.61	2788	29201.03	3.46
10	29	25.22	15287	189992.4	22.50
15	70	60.87	34778	513549.0	60.81
20	13	11.30	7659	107020.2	12.67
25	.	.	273	4232.21	0.50
30	.	.	13	263.88	0.03
35	.	.	7	37.04	0.00
40	.	.	1	30.67	0.00
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by CROWN CLOSURE CLASS

Crown Closure class	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
0	.	.	54	948.52	0.11
1	10	8.70	4298	49707.36	5.89
2	5	4.35	4193	43190.93	5.11
3	9	7.83	6912	72367.64	8.57
4	23	20.00	12541	147860.8	17.51
5	29	25.22	16086	222233.4	26.32
6	26	22.61	12851	227041.8	26.89
7	10	8.70	3302	66904.71	7.92
8	3	2.61	569	13531.35	1.60
9	.	.	6	440.35	0.05
10	.	.	9	230.13	0.03
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by BEC ZONE - source FIP georef

Bio Geo Climatic zone	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	115	100.00	60821	844456.9	100.0
	115	**100.00**	**60821**	**844456.9**	**100.0**

The SAS System

'final stats for final list'
Comparison of Sample and Population by PSYU

Special cruise number	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
.	.	.	29	0.54	0.00
134	13	11.30	13582	142834.2	16.91
154	48	41.74	22551	297780.7	35.26
155	54	46.96	24659	403841.5	47.82
	115	**100.00**	**60821**	**844456.9**	**100.0**

Appendix E

Monitoring Sample Lists

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The following lists have been developed for the Monitoring project. All except option #4 are included in this Appendix.

1) A random sample selection from the total VRI list of 115 VRI samples.

2) A random sample selection from the VRI list of samples, greater than 60 years of age. (This is list of 100 samples.)

3) A random sample selection from a new list developed specifically for the monitoring project for the population greater than 60 years of age.

4) A random sample selection from a new list developed specifically for the monitoring project for the population greater than 60 years of age, divided equally between two strata. One stratum is pine leading (greater than 50%). The second stratum is "pine other" (pine less than 50% and other leading species).

Option #1 –Monitoring Plots All Age Classes

Strata	vol_cls	sample	list	map_no	polygon	sspcs1	polyarea	VRI select?	age_cl	Monitor select?
Mat-PL 80+%	0	42	list1	093E040	111	PL	576.07	Y	all	Yes
Mat-PL 50-80%	0	16	list1	093E089	80	PL	17.87	Y	all	Yes
Mat-PL 80+%	1	170	list2	093E098	464	PL	14.01	R	all	Yes
Mat-PL 80+%	1	52	list1	093F032	31	PL	58.35	Y	all	Yes
Immature	0	116	list2	093F051	316	PL	194.25	R	all	Yes
Mat-misc	0	83	list1	093F053	226	PL	4.97	Y	all	Yes
Mat-PL 50-80%	2	34	list1	093F053	596	PL	7.1	Y	all	Yes
Mat-PL 50-80%	1	31	list1	093F061	157	PL	50.28	Y	all	Yes
Mat-PL 50-80%	1	26	list1	093F061	750	PL	28.36	Y	all	Yes
Immature	0	1	list1	093F073	163	PL	226.77	Y	all	Yes
Mat-PL 80+%	0	51	list1	093F073	1920	PL	9.25	Y	all	Yes
Mat-misc	1	205	list2	093F082	410	SW	188.09	R	all	Yes
Mat-PL 80+%	2	179	list2	093F084	49	PL	11.81	R	all	Yes
Immature	2	14	list1	093F092	210	BL	42.02	Y	all	Yes
Mat-misc	0	197	list2	093K012	505	AT	16.37	R	all	Yes
Immature	2	11	list1	093K023	270	PL	27.51	Y	all	Yes
Immature	1	121	list2	093K023	597	S	966.17	R	all	Yes

Mat-misc	1	94	list1	093K025	728	SX	24.36	Y	all	Yes
Mat-PL 50-80%	0	23	list1	093K031	1518	PL	23.91	Y	all	Yes
Mat-PL 80+%	0	44	list1	093K033	1164	PL	19.51	Y	all	Yes
Mat-misc	2	218	list2	093K035	79	SX	12.14	R	all	Yes
Mat-misc	0	79	list1	093K035	762	AT	74.37	Y	all	Yes
Mat-misc	0	76	list1	093K042	637	SB	11.34	Y	all	Yes
Mat-misc	0	77	list1	093K052	824	SB	2.63	Y	all	Yes
Mat-misc	2	106	list1	093K062	449	SX	30.6	Y	all	Yes
Mat-PL 80+%	2	186	list2	093K083	336	PL	51.73	R	all	Yes
Immature	1	9	list1	093L030	953	PL	82.42	Y	all	Yes
Mat-misc	1	207	list2	093L040	1307	SX	2.49	R	all	Yes
Mat-misc	1	95	list1	093L050	48	AT	13.46	Y	all	Yes
Immature	0	5	list1	093L050	225	PL	8.46	Y	all	Yes
Mat-PL 50-80%	1	139	list2	093E030	121	PL	37.48	R	all	No
Mat-PL 80+%	0	48	list1	093E040	136	PL	100.42	Y	all	No
Mat-PL 50-80%	0	21	list1	093E040	279	PL	15.5	Y	all	No
Mat-PL 80+%	1	58	list1	093E060	307	PL	4.43	Y	all	No
Mat-PL 50-80%	1	140	list2	093E090	397	PL	62.91	R	all	No
Immature	2	126	list2	093E090	481	PL	17.94	R	all	No
Mat-PL 80+%	2	184	list2	093E090	990	PL	9.33	R	all	No
Mat-PL 50-80%	2	39	list1	093E098	916	PL	19.08	Y	all	No
Mat-PL 80+%	2	74	list1	093E099	151	PL	6.63	Y	all	No
Mat-misc	2	110	list1	093E099	274	SW	21.48	Y	all	No
Mat-PL 50-80%	2	33	list1	093F042	304	PL	81.41	Y	all	No
Mat-misc	2	111	list1	093F042	446	SW	105.65	Y	all	No
Mat-PL 80+%	2	70	list1	093F051	86	PL	101.45	Y	all	No
Mat-PL 80+%	2	67	list1	093F051	360	PL	72.01	Y	all	No
Mat-PL 80+%	2	69	list1	093F051	661	PL	66.3	Y	all	No
Mat-misc	1	89	list1	093F053	128	S	6.72	Y	all	No
Mat-misc	0	200	list2	093F053	246	SW	5.36	R	all	No
Mat-PL 80+%	2	64	list1	093F053	485	PL	7.12	Y	all	No
Mat-PL 80+%	0	46	list1	093F054	802	PL	14.92	Y	all	No
Mat-misc	2	107	list1	093F055	64	PL	8.04	Y	all	No
Immature	1	8	list1	093F061	97	AT	40.22	Y	all	No
Mat-PL	1	59	list1	093F061	227	PL	255.51	Y	all	No

80+%										
Mat-PL 80+%	0	49	list1	093F061	304	PL	3.6	Y	all	No
Mat-PL 50-80%	1	28	list1	093F061	312	PL	250.05	Y	all	No
Mat-PL 80+%	0	50	list1	093F063	298	PL	48.76	Y	all	No
Mat-PL 50-80%	1	30	list1	093F072	1361	PL	3.65	Y	all	No
Mat-PL 50-80%	1	24	list1	093F073	128	PL	16.7	Y	all	No
Mat-PL 80+%	2	72	list1	093F073	1134	PL	5.69	Y	all	No
Mat-misc	2	103	list1	093F073	1135	SX	6.21	Y	all	No
Mat-misc	2	115	list1	093F073	1142	SX	5.88	Y	all	No
Mat-misc	1	90	list1	093F073	1977	AT	8.7	Y	all	No
Mat-misc	0	88	list1	093F074	378	AT	27.81	Y	all	No
Mat-misc	1	93	list1	093F082	175	SW	3.87	Y	all	No
Mat-PL 50-80%	2	148	list2	093F082	433	PL	106.96	R	all	No
Mat-PL 80+%	0	45	list1	093F083	1099	PL	22.17	Y	all	No
Mat-PL 50-80%	0	131	list2	093F084	548	PL	94.15	R	all	No
Mat-PL 50-80%	2	37	list1	093F084	607	PL	55.34	Y	all	No
Mat-PL 80+%	0	43	list1	093F085	577	PL	3.54	Y	all	No
Immature	1	6	list1	093F093	587	PL	80	Y	all	No
Mat-misc	1	97	list1	093K001	560	AT	17.63	Y	all	No
Mat-misc	0	199	list2	093K004	25	AT	65.55	R	all	No
Mat-PL 80+%	1	54	list1	093K021	1545	PL	7.59	Y	all	No
Mat-PL 50-80%	1	27	list1	093K022	96	PL	10.19	Y	all	No
Mat-misc	1	96	list1	093K023	207	BL	40.53	Y	all	No
Mat-PL 80+%	0	156	list2	093K023	282	PL	10.27	R	all	No
Immature	2	12	list1	093K023	596	PL	107.09	Y	all	No
Immature	1	10	list1	093K023	597	S	966.17	Y	all	No
Mat-PL 50-80%	0	19	list1	093K024	1135	PL	64.76	Y	all	No
Mat-PL 50-80%	0	18	list1	093K024	1163	PL	54.4	Y	all	No
Mat-PL 80+%	1	167	list2	093K024	1233	PL	82.69	R	all	No
Mat-PL 80+%	1	172	list2	093K025	807	PL	36.06	R	all	No
Mat-misc	2	104	list1	093K031	1479	SX	16	Y	all	No
Mat-PL 80+%	2	65	list1	093K032	547	PL	19.1	Y	all	No
Immature	2	15	list1	093K033	159	SX	37.54	Y	all	No
Mat-PL	0	47	list1	093K033	829	PL	9.82	Y	all	No

80+%										
Mat-PL 80+%	1	55	list1	093K034	759	PL	12.81	Y	all	No
Mat-PL 50-80%	2	35	list1	093K034	1004	PL	11.67	Y	all	No
Mat-misc	0	87	list1	093K034	1122	BL	3.09	Y	all	No
Mat-misc	2	108	list1	093K035	257	SX	49.63	Y	all	No
Mat-misc	2	109	list1	093K035	257	SX	49.63	Y	all	No
Mat-PL 50-80%	1	29	list1	093K035	652	PL	1.09	Y	all	No
Mat-misc	1	100	list1	093K035	788	SX	10.56	Y	all	No
Immature	0	3	list1	093K041	217	PL	103.94	Y	all	No
Mat-PL 50-80%	0	22	list1	093K042	381	PL	24.36	Y	all	No
Mat-PL 80+%	1	168	list2	093K043	655	PL	74.93	R	all	No
Mat-misc	0	194	list2	093K044	383	AT	70.45	R	all	No
Mat-PL 50-80%	2	149	list2	093K044	634	PL	29.43	R	all	No
Mat-PL 80+%	1	171	list2	093K053	544	PL	6.17	R	all	No
Mat-misc	1	99	list1	093K061	775	SX	12.97	Y	all	No
Mat-misc	1	102	list1	093K071	118	SX	13.67	Y	all	No
Mat-misc	2	105	list1	093K072	278	SX	12.6	Y	all	No
Mat-misc	0	85	list1	093K073	177	SX	1.7	Y	all	No
Mat-misc	2	112	list1	093L010	256	SW	13.67	Y	all	No
Mat-PL 80+%	1	53	list1	093L010	1481	PL	2.22	Y	all	No
Immature	0	4	list1	093L029	177	PL	53.64	Y	all	No
Mat-misc	0	198	list2	093L030	1342	PL	9.77	R	all	No
Mat-PL 80+%	2	182	list2	093L040	158	PL	18.39	R	all	No
Mat-PL 50-80%	2	38	list1	093L040	238	PL	20.91	Y	all	No
Mat-misc	1	98	list1	093L049	111	S	5.91	Y	all	No
Mat-misc	1	208	list2	093L049	1245	AT	9.3	R	all	No
Mat-PL 80+%	2	187	list2	093L050	47	PL	53.67	R	all	No
Mat-misc	2	114	list1	093L050	75	SW	30.58	Y	all	No
Mat-PL 80+%	1	60	list1	093L050	105	PL	25.97	Y	all	No
Mat-misc	0	191	list2	093L050	156	SB	19.85	R	all	No
Mat-PL 50-80%	0	20	list1	093L050	1199	PL	9.46	Y	all	No

Option #2 -Monitoring Plots 60+ Years

Strata	vol_cls	Sample	list	map_no	polygon	sspcs1	polyarea	VRI Select ?	age_cl	Monitor select?
Mat-PL 80+%	0	42	list1	093E040	111	PL	576.07	Y	> 60	Yes
Mat-PL 50-80%	0	16	list1	093E089	80	PL	17.87	Y	> 60	Yes
Mat-PL 80+%	1	170	list2	093E098	464	PL	14.01	R	> 60	Yes
Mat-misc	2	110	list1	093E099	274	SW	21.48	Y	> 60	Yes
Mat-PL 80+%	2	70	list1	093F051	86	PL	101.45	Y	> 60	Yes
Mat-misc	1	89	list1	093F053	128	S	6.72	Y	> 60	Yes
Mat-PL 80+%	2	64	list1	093F053	485	PL	7.12	Y	> 60	Yes
Mat-PL 50-80%	1	31	list1	093F061	157	PL	50.28	Y	> 60	Yes
Mat-PL 50-80%	1	28	list1	093F061	312	PL	250.05	Y	> 60	Yes
Mat-PL 50-80%	1	30	list1	093F072	1361	PL	3.65	Y	> 60	Yes
Mat-misc	2	115	list1	093F073	1142	SX	5.88	Y	> 60	Yes
Mat-misc	0	88	list1	093F074	378	AT	27.81	Y	> 60	Yes
Mat-PL 50-80%	2	148	list2	093F082	433	PL	106.96	R	> 60	Yes
Mat-PL 50-80%	2	37	list1	093F084	607	PL	55.34	Y	> 60	Yes
Mat-misc	0	199	list2	093K004	25	AT	65.55	R	> 60	Yes
Mat-PL 50-80%	1	27	list1	093K022	96	PL	10.19	Y	> 60	Yes
Mat-PL 50-80%	0	18	list1	093K024	1163	PL	54.4	Y	> 60	Yes
Mat-PL 80+%	1	172	list2	093K025	807	PL	36.06	R	> 60	Yes
Mat-PL 80+%	2	65	list1	093K032	547	PL	19.1	Y	> 60	Yes
Mat-PL 50-80%	2	35	list1	093K034	1004	PL	11.67	Y	> 60	Yes
Mat-misc	2	108	list1	093K035	257	SX	49.63	Y	> 60	Yes
Mat-misc	0	79	list1	093K035	762	AT	74.37	Y	> 60	Yes
Mat-PL 80+%	1	168	list2	093K043	655	PL	74.93	R	> 60	Yes
Mat-misc	0	77	list1	093K052	824	SB	2.63	Y	> 60	Yes
Mat-misc	2	106	list1	093K062	449	SX	30.6	Y	> 60	Yes
Mat-PL 80+%	2	186	list2	093K083	336	PL	51.73	R	> 60	Yes
Mat-misc	0	198	list2	093L030	1342	PL	9.77	R	> 60	Yes
Mat-misc	1	207	list2	093L040	1307	SX	2.49	R	> 60	Yes
Mat-misc	1	95	list1	093L050	48	AT	13.46	Y	> 60	Yes
Mat-misc	0	191	list2	093L050	156	SB	19.85	R	> 60	Yes
Mat-PL 50-80%	1	139	list2	093E030	121	PL	37.48	R	> 60	No

Mat-PL 80+%	0	48	list1	093E040	136	PL	100.42	Y	> 60	No
Mat-PL 50-80%	0	21	list1	093E040	279	PL	15.5	Y	> 60	No
Mat-PL 80+%	1	58	list1	093E060	307	PL	4.43	Y	> 60	No
Mat-PL 50-80%	1	140	list2	093E090	397	PL	62.91	R	> 60	No
Mat-PL 80+%	2	184	list2	093E090	990	PL	9.33	R	> 60	No
Mat-PL 50-80%	2	39	list1	093E098	916	PL	19.08	Y	> 60	No
Mat-PL 80+%	2	74	list1	093E099	151	PL	6.63	Y	> 60	No
Mat-PL 80+%	1	52	list1	093F032	31	PL	58.35	Y	> 60	No
Mat-PL 50-80%	2	33	list1	093F042	304	PL	81.41	Y	> 60	No
Mat-misc	2	111	list1	093F042	446	SW	105.65	Y	> 60	No
Mat-PL 80+%	2	67	list1	093F051	360	PL	72.01	Y	> 60	No
Mat-PL 80+%	2	69	list1	093F051	661	PL	66.3	Y	> 60	No
Mat-misc	0	83	list1	093F053	226	PL	4.97	Y	> 60	No
Mat-misc	0	200	list2	093F053	246	SW	5.36	R	> 60	No
Mat-PL 50-80%	2	34	list1	093F053	596	PL	7.1	Y	> 60	No
Mat-PL 80+%	0	46	list1	093F054	802	PL	14.92	Y	> 60	No
Mat-misc	2	107	list1	093F055	64	PL	8.04	Y	> 60	No
Mat-PL 80+%	1	59	list1	093F061	227	PL	255.51	Y	> 60	No
Mat-PL 80+%	0	49	list1	093F061	304	PL	3.6	Y	> 60	No
Mat-PL 50-80%	1	26	list1	093F061	750	PL	28.36	Y	> 60	No
Mat-PL 80+%	0	50	list1	093F063	298	PL	48.76	Y	> 60	No
Mat-PL 50-80%	1	24	list1	093F073	128	PL	16.7	Y	> 60	No
Mat-PL 80+%	2	72	list1	093F073	1134	PL	5.69	Y	> 60	No
Mat-misc	2	103	list1	093F073	1135	SX	6.21	Y	> 60	No
Mat-PL 80+%	0	51	list1	093F073	1920	PL	9.25	Y	> 60	No
Mat-misc	1	90	list1	093F073	1977	AT	8.7	Y	> 60	No
Mat-misc	1	93	list1	093F082	175	SW	3.87	Y	> 60	No
Mat-misc	1	205	list2	093F082	410	SW	188.09	R	> 60	No
Mat-PL 80+%	0	45	list1	093F083	1099	PL	22.17	Y	> 60	No
Mat-PL 80+%	2	179	list2	093F084	49	PL	11.81	R	> 60	No
Mat-PL 50-80%	0	131	list2	093F084	548	PL	94.15	R	> 60	No

Mat-PL 80+%	0	43	list1	093F085	577	PL	3.54	Y	> 60	No
Mat-misc	1	97	list1	093K001	560	AT	17.63	Y	> 60	No
Mat-misc	0	197	list2	093K012	505	AT	16.37	R	> 60	No
Mat-PL 80+%	1	54	list1	093K021	1545	PL	7.59	Y	> 60	No
Mat-misc	1	96	list1	093K023	207	BL	40.53	Y	> 60	No
Mat-PL 80+%	0	156	list2	093K023	282	PL	10.27	R	> 60	No
Mat-PL 50-80%	0	19	list1	093K024	1135	PL	64.76	Y	> 60	No
Mat-PL 80+%	1	167	list2	093K024	1233	PL	82.69	R	> 60	No
Mat-misc	1	94	list1	093K025	728	SX	24.36	Y	> 60	No
Mat-misc	2	104	list1	093K031	1479	SX	16	Y	> 60	No
Mat-PL 50-80%	0	23	list1	093K031	1518	PL	23.91	Y	> 60	No
Mat-PL 80+%	0	47	list1	093K033	829	PL	9.82	Y	> 60	No
Mat-PL 80+%	0	44	list1	093K033	1164	PL	19.51	Y	> 60	No
Mat-PL 80+%	1	55	list1	093K034	759	PL	12.81	Y	> 60	No
Mat-misc	0	87	list1	093K034	1122	BL	3.09	Y	> 60	No
Mat-misc	2	218	list2	093K035	79	SX	12.14	R	> 60	No
Mat-misc	2	109	list1	093K035	257	SX	49.63	Y	> 60	No
Mat-PL 50-80%	1	29	list1	093K035	652	PL	1.09	Y	> 60	No
Mat-misc	1	100	list1	093K035	788	SX	10.56	Y	> 60	No
Mat-PL 50-80%	0	22	list1	093K042	381	PL	24.36	Y	> 60	No
Mat-misc	0	76	list1	093K042	637	SB	11.34	Y	> 60	No
Mat-misc	0	194	list2	093K044	383	AT	70.45	R	> 60	No
Mat-PL 50-80%	2	149	list2	093K044	634	PL	29.43	R	> 60	No
Mat-PL 80+%	1	171	list2	093K053	544	PL	6.17	R	> 60	No
Mat-misc	1	99	list1	093K061	775	SX	12.97	Y	> 60	No
Mat-misc	1	102	list1	093K071	118	SX	13.67	Y	> 60	No
Mat-misc	2	105	list1	093K072	278	SX	12.6	Y	> 60	No
Mat-misc	0	85	list1	093K073	177	SX	1.7	Y	> 60	No
Mat-misc	2	112	list1	093L010	256	SW	13.67	Y	> 60	No
Mat-PL 80+%	1	53	list1	093L010	1481	PL	2.22	Y	> 60	No
Mat-PL 80+%	2	182	list2	093L040	158	PL	18.39	R	> 60	No
Mat-PL 50-80%	2	38	list1	093L040	238	PL	20.91	Y	> 60	No
Mat-misc	1	98	list1	093L049	111	S	5.91	Y	> 60	No
Mat-misc	1	208	list2	093L049	1245	AT	9.3	R	> 60	No
Mat-PL 80+%	2	187	list2	093L050	47	PL	53.67	R	> 60	No

Mat-misc	2	114	list1	093L050	75	SW	30.58	Y	> 60	No
Mat-PL 80+%	1	60	list1	093L050	105	PL	25.97	Y	> 60	No
Mat-PL 50-80%	0	20	list1	093L050	1199	PL	9.46	Y	> 60	No

Option 3 –Monitoring List New (not associated with VRI plots) List 1

Note: There are no UTMs identified for these sample polygons since it is not known at this time if this list will be used.

sample #	age_grp	map_no	polygon	sspcs1	strata	vol_cls	polyarea
1	Mat	093L029	327	BL	Mat-misc	0	76.6
2	Mat	093L050	100	PL	Mat-PL 50-80%	0	14.15
3	Mat	093K024	1253	PL	Mat-PL 80+%	0	41.93
4	Mat	093F031	643	PL	Mat-PL 80+%	0	87.52
5	Mat	093K022	419	BL	Mat-misc	1	5.03
6	Mat	093K011	84	PL	Mat-PL 80+%	1	20.03
7	Mat	093E050	304	PL	Mat-PL 80+%	1	22.36
8	Mat	093F041	387	PL	Mat-PL 50-80%	1	181.58
9	Mat	093F022	258	PL	Mat-PL 80+%	1	84.38
10	Mat	093E099	268	AT	Mat-misc	1	47.61
11	Mat	093K021	1528	PL	Mat-PL 80+%	1	703.01
12	Mat	093F045	286	PL	Mat-misc	1	11.67
13	Mat	093F051	497	PL	Mat-PL 50-80%	1	12.4
14	Mat	093F073	1498	SX	Mat-misc	1	9.46
15	Mat	093F053	552	SW	Mat-misc	2	40.27
16	Mat	093F061	531	PL	Mat-PL 50-80%	2	17.29
17	Mat	093K061	640	PL	Mat-PL 50-80%	2	19.81
18	Mat	093F022	72	PL	Mat-PL 80+%	2	101.73
19	Mat	093F072	395	SW	Mat-misc	2	38.7
20	Mat	093F052	391	SW	Mat-misc	2	39.31
21	Mat	093L050	723	PL	Mat-PL 80+%	2	23.52
22	Mat	093K034	87	PL	Mat-PL 50-80%	2	13.38
23	Mat	093K014	869	PL	Mat-PL 50-80%	2	16.27
24	Mat	093K036	18	PL	Mat-PL 80+%	2	54.01
25	Mat	093K062	371	PL	Mat-PL 80+%	2	340.16
26	Mat	093K055	129	PL	Mat-PL 50-80%	2	16.52
27	Mat	093F012	479	PL	Mat-PL 50-80%	2	65.59
28	Mat	093F071	640	PL	Mat-PL 50-80%	2	25.62
29	Mat	093K062	349	PL	Mat-PL 50-80%	2	79.57
30	Mat	093F062	367	PL	Mat-misc	2	74.41

Option 3 –Monitoring List New
(not associated with VRI plots)
List 2

Note: There are no UTMs identified for these sample polygons since it is not known at this time if this list will be used.

Sample	age_grp	map_no	polygon	sspcs1	strata	vol_cls	polyarea
31	Mat	093K031	157	SB	Mat-misc	0	2
32	Mat	093K043	4	AT	Mat-misc	0	141.65
33	Mat	093K042	595	PL	Mat-PL 80+%	0	57.97
34	Mat	093L030	290	BL	Mat-misc	0	144.2
35	Mat	093K002	71	AT	Mat-misc	0	8.86
36	Mat	093K043	228	AT	Mat-misc	0	36.41
37	Mat	093K012	213	PL	Mat-PL 80+%	0	19.05
38	Mat	093F041	532	SW	Mat-misc	0	19.31
39	Mat	093K022	1023	AT	Mat-misc	0	53.76
40	Mat	093F062	51	SW	Mat-misc	0	4.02
41	Mat	093K002	201	AT	Mat-misc	0	19.21
42	Mat	093F031	566	PL	Mat-PL 80+%	0	56.16
43	Mat	093F022	476	PL	Mat-PL 80+%	0	237.62
44	Mat	093K024	580	BL	Mat-misc	1	9.73
45	Mat	093K045	223	AT	Mat-misc	1	24.61
46	Mat	093L060	310	SX	Mat-misc	1	65.27
47	Mat	093L020	2668	PL	Mat-PL 80+%	1	352.16
48	Mat	093F022	544	SW	Mat-misc	1	56.2
49	Mat	093K044	373	SX	Mat-misc	1	164.86
50	Mat	093K046	188	PL	Mat-PL 50-80%	1	6.47
51	Mat	093L030	117	PL	Mat-PL 50-80%	1	67.08
52	Mat	093F073	1480	PL	Mat-PL 80+%	1	6.51
53	Mat	093F093	366	PL	Mat-PL 80+%	2	278.6
54	Mat	093F031	574	PL	Mat-PL 80+%	2	11.77
55	Mat	093F033	275	PL	Mat-PL 80+%	2	123.17
56	Mat	093K062	69	PL	Mat-PL 50-80%	2	89.34
57	Mat	093K011	691	PL	Mat-PL 80+%	2	120.76
58	Mat	093F052	562	PL	Mat-PL 50-80%	2	13.05
59	Mat	093F075	828	PL	Mat-PL 80+%	2	46.76
60	Mat	093F041	571	PL	Mat-PL 50-80%	2	7.91

Appendix F

Shelf Life Protocol

Shelf Life Study Protocol

Weather Check/Spiral Grain Standards: DRAFT 1.2

Ministry of Forests & Range Proposal

Overview

The Ministry of Forests and Range is investigating the effect of Mountain Pine Beetle on Log merchantability in order to predict the shelf life of MPB killed lodgepole pine stands. To assist in existing shelf life studies, more information is needed on weather checks and spiral grain. Where possible the MOFR is providing funding to collect these attributes on existing sampling projects such as VRI sampling, NFI style monitoring projects, and Growth and Yield Permanent Sample plots. This document describes how weather checks and spiral grain attributes can be collected on VRI clusters and NFI type monitoring plots.

Tree Requirements

Bark stripping, check depth and spiral grain measurements will only be done on dead standing MPB killed lodgepole pine where dead trees are determined through the use of the VRI procedures. Therefore all red and grey attack trees will qualify for these measurements; however it is possible that some green attack may also qualify if found to be dead using the VRI procedures. Trees must be greater than or equal to 12.5cm DBH.

Plot Selection

VRI plots
All dead Lodgepole Pine greater than or equal to 12.5cm dbh are measured from the Integrated Plot Centre for weather checks and spiral grain.
Monitoring Plots – NFI style
The first 6 dead lodgepole pine trees encountered in the 5.64m circular plot that are greater than or equal to 12.5cm in DBH are measured for weather checks and spiral grain. No more than 6 trees need to be collected. If there are less than 6 dead Pl in the 5.64m radius plot, no additional trees will be collected from outside the 5.64m plot.

Attribute Definition: Weather Checks

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

Procedure:

Check depth will be measured by the use of a stainless steel putty knife that is 0.5mm thick and 4 cm wide. The checks will be coded based on depth and frequency. Use a metal scale ruler for check depths greater than 9 cm.

Step 1

If applicable, measure and record the DBH, net factors, call grades of the tree, before stripping the bark.

Step 2

In order to measure the checks remove the bark from the tree in the area between 1.0 metre and 1.3 metres (DBH) above high side ground. All measurements of checks must be done in this 30 cm area around the stem. A draw knife has been found to work the best at bark stripping and a hatchet may be required for furrowed areas. If the cruiser determines that a given tree is unsafe to strip the bark with a draw knife they may drop the tree and put comments in the notes as to why the tree was dropped (EG tree 2 dropped as it is close to toppling)

Step 3

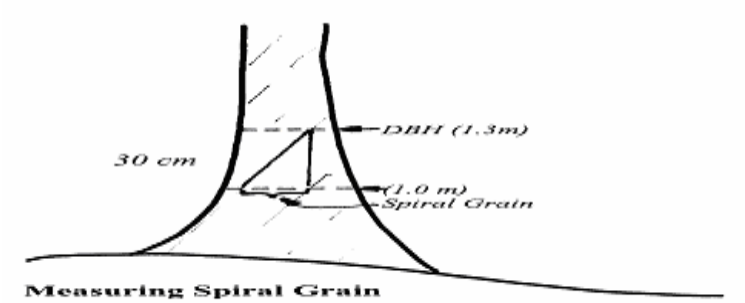
In the bark stripped area, conduct a cursory inspection of the checks with depths greater than 2 cm and orientate the quadrants to maximize the number of check free quadrants. Mark the quadrants on the tree with a felt marker. Use a diameter tape to determine quadrant boundaries by dividing the diameter by 4. Quadrant 1 will be the one facing plot center, the remaining quadrants are numbered to the right of quadrant 1.

Step 4
Measure the depths of the deepest check in each quadrant to the nearest centimetre for all checks with depths greater than 2 cm

Step 5
Record the depth in centimetres of the deepest check in each quadrant.

Spiral Grain Procedure:

The deflection of spiral grain is measured anywhere along the 30 cm area from 1.0 to 1.3 metres as per the diagram below. Measure the displacement of the grain to the nearest centimetre along a 30 cm transect and record in the spiral grain column on the attached tally card. Spiral grain deflection of 9 cm or more will be recorded as 9 cm.



Measuring Spiral Grain

Data Recording – VRI/Monitoring

Record check depth and spiral grain in the comments section of TD 8 card and in the IPC notes field of TIMVEG as per the character string:
Tree number, - delimitter, depth of check in quadrant 1 to 4 with no delimiters, / delimitter, spiral grain offset, ; delimiter, next tree ;

For example, Tree # 2 has a 3 cm check in quadrant 1, a 5 cm check in quadrant 3 and a 5 cm spiral grain offset; Tree #5 has a 4cm check in quadrant 1, a 5 cm check in quadrant 2, an 11 cm check in quadrant 3, a 7 cm check in quadrant 4 and a 2 cm spiral grain offset: 2-03000500/5;5-04051107/2;

Appendix G

NVAF Profile

The FREQ Procedure

age_cl	Frequency	Percent	Cumulative Frequency	Cumulative Percent
120+	18	60.00	18	60.00
31-60	1	3.33	19	63.33
60-120	11	36.67	30	100.00

age_cl	strata	Frequency	Percent	Cumulative Frequency	Cumulative Percent
120+	Mat-PL 50-80%	4	13.33	4	13.33
120+	Mat-PL 80+%	6	20.00	10	33.33
120+	Mat-misc	8	26.67	18	60.00
31-60	Immature	1	3.33	19	63.33
60-120	Mat-PL 50-80%	3	10.00	22	73.33
60-120	Mat-PL 80+%	5	16.67	27	90.00
60-120	Mat-misc	3	10.00	30	100.00

age_cl	vol_cls	Frequency	Percent	Cumulative Frequency	Cumulative Percent
120+	0	3	10.00	3	10.00
120+	1	4	13.33	7	23.33
120+	2	11	36.67	18	60.00
31-60	2	1	3.33	19	63.33
60-120	0	7	23.33	26	86.67
60-120	1	4	13.33	30	100.00

age_cl	sspcs1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
120+	AT	1	3.33	1	3.33
120+	PL	11	36.67	12	40.00
120+	SB	1	3.33	13	43.33
120+	SW	1	3.33	14	46.67
120+	SX	4	13.33	18	60.00
31-60	PL	1	3.33	19	63.33
60-120	AT	2	6.67	21	70.00
60-120	PL	8	26.67	29	96.67
60-120	SW	1	3.33	30	100.00

Appendix H

Glossary of Terms

Glossary of Terms (From 14 March 2006 RISC Standard, VRI Guidelines for Preparing a Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling)

Ground Sampling
Ground sampling is the field measurement of timber, ecology, range, and/or coarse woody debris values at one or more locations within each sample polygon. The sample polygons are selected proportional to their area from a sorted list. 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.

Inventory Unit
An inventory unit is the target population from which the samples are chosen. For management unit inventories, the unit is usually a TSA or TFL.

Land Cover Classification
The BC Land Cover Classification Scheme (BCLCCS) 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 BCLCCS is hierarchical and reflects the current state of the land cover (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.

Management Unit.
A management unit is an administrative area used for inventory reporting purposes. The most common inventory units are TFLs and TSAs. However, forest districts or provincial parks could also be considered as inventory units if they were identifies as areas of interest for reporting purposes.

Net Volume Adjustment Factor (NVAF) Sampling
NVAF sampling provides factors to adjust net tree volume from the ground sampling, where net tree volume is estimated from the VRI net factoring process and taper equations. The factors account for hidden decay and possible taper equation bias. Sampling involves detailed stem analysis of sample trees to calculate actual net volume. The actual net volume is compared to the estimated net volume. March 2004 13 Preparing a VRI Project Implementation Plan for Ground Sampling

Photo Interpretation
Photo-interpretation involves the subjective delineation of polygons and the photo estimation of attributes for all polygons in an inventory unit. Medium scale aerial photographs are most often used in the photo-interpretation process.
March 2006 13 Preparing a VRI Project Implementation Plan for Ground Sampling
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 may be applied to the corresponding population post-strata to improve the precision of the inventory's overall averages and totals. In the VRI, these strata (leading species) are usually pre-defined in the sample selection phase.

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
A set of sampling units selected randomly to represent a population.

Sample Size
The sample size for an inventory is the minimum number of ground samples to be established in an inventory unit to meet the target precision. The current sampling error requirement for a management unit is +/- 10% at the 95% level of probability.

Sampling Unit
The smallest indivisible unit in the population that is eligible for sample selection.

Statistical Adjustment
Statistical adjustment is the application of adjustment factors, computed from a random sample, to adjust timber attributes.

Sub-unit
A sub-unit is a small area or stratum of interest within an inventory unit such as a TSA or a TFL

Target Population
The population is the portion of a forest district, TFL, or TSA, for which statistical estimates are required. For instance, in a TSA where vegetated treed, vegetated non-treed and non vegetated polygons are delineated, the target population may be only the vegetated treed (VT) polygons.

Target Sampling Error
Is the precision we expect a sample of a given sample size to produce. This precision depends on confidence we wish to place on a sample and the variability (CV) within the population.

Vegetation Resources Inventory (VRI)

The VRI is the MOFR standard 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:

- *Photo Interpretation*: the delineation of polygons from aerial photography and the estimation of resource attributes.
- *Ground Sampling*: the establishment of plot clusters in selected polygons to measure timber, ecological, and/or range attributes.
- *NVAF Sampling*: Stem analysis sampling of individual trees for net volume adjustment.
- *Statistical Adjustment*: the adjustment of the photo-interpreted estimates for all polygons in an inventory unit or management unit using the values measured during ground sampling.

The VRI can be deployed over a management unit 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.