

Revelstoke Timber Supply Area – TSA 27

Vegetation Resources Inventory Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling

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Executive Summary

This Vegetation Resources Inventory (VRI) Project Implementation Plan (VIP) is the 'operational' planning document that will guide the Stakeholders for the Revelstoke Timber Supply Area (TSA) through a VRI ground sampling project.

The VIP documents critical decisions that have been made regarding the project landbase and the activities included in the project, including the following:

1. The target population for the Revelstoke project is the 'Vegetated Treed' land base greater than 29 years of age. Private land, woodlots and parks have been excluded.
2. The sampling and analysis and adjustment of the landbase will be divided based on operability. The delineation of the Operable and Inoperable Landbase is based on data provided by the GIS staff at the Columbia District of the Ministry of Forests & Range (MFR). For the purpose of sample establishment for sample selection, all polygons that 'touch the operability line' provided by the District have been considered to be part of the operable land base.
3. A total of 125 VRI ground samples will be established randomly throughout the TSA landbase. There will be 100 samples in the Operable Landbase and 25 samples in the Inoperable Landbase, their location following the Vegetation Resources Inventory Sample Selection Procedures for Ground Sampling v3.3. In addition to following the protocol for the Timber Emphasis (TE) plot type, field crews will be collecting data on Coarse Woody Debris (CWD) and Succession.
4. Net Volume Adjustment Factor (NVAF) destructive sampling will be carried out on 140 trees selected from a 44 sample sub-set of the original 125 samples.
5. The current Photo Interpreted Inventory will be adjusted based on the analysis of the Phase II ground sampling and NVAF sampling data.
6. Scaling data will be collected during the NVAF activity due to local interest in merchantability. It will be analyzed or incorporated in model development or research work. The licensees will seek Forest Investment Account (FIA) funding for this activity through a variance to the existing VRI Standard.
7. A Monitoring project is not included in this plan but is being investigated and may be undertaken as a future project, through an amendment.

In the Operable Landbase, ground sample selection has been completed based on five strata and sample numbers will be proportional to the species or species grouping representation:

- Strata 1: Hemlock
- Strata 2: Cedar
- Strata 3: Spruce-Balsam
- Strata 4: Douglas Fir-Pine
- Strata 5: Deciduous

The Inoperable Landbase forms a single stratum. Similar to the Operable Landbase, the samples will be distributed according to species representation in the population.

Each stratum will be subdivided into 3 volume classes, or “sub strata”.

Costs and timelines for the activities in this project have been provided in this plan, based on the licensee Stakeholders receiving FIA VRI Inventory focused funding.

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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 given vegetation resource is located in an inventory unit?¹ An essential element of the VRI ground sampling program is its statistical foundation that results in the establishment of randomly located samples across a management unit in an effort to answer these questions. The protocols developed for the ground sampling enable forest managers to select from several options to collect timber and ecology data, dependent on their objectives.

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

- Consultation with licensee and government stakeholders to identify issues that can be addressed by executing part or all of the Vegetation Resources Inventory, according to its Procedures and Standards.
- Developing a VRI Strategic Inventory Plan (VSIP) that provides background on the various VRI activities and draws on the consultation process to evaluate which ones would address local needs.
- **Development of a VRI Project Implementation Plan (VPIP). “The VPIP is a working document that details the specific operational activities associated with implementation and documentation of the inventory project.”² This includes the population, strata and sample lists, activity specifics, steps in the process and timelines, costs and deliverables for the project.**

1.1 Document Objectives

The Revelstoke Timber Supply Area (TSA) Strategic Inventory Plan³ provided background on the Vegetation Resources Inventory. Phase 1 or photo interpretation delineates polygons of homogenous land cover types and provides estimates of the vegetation attributes for each polygon. Phase 2 is ground sampling to verify or adjust Phase 1 vegetation attributes.

This initial plan also assessed the current forest cover inventory needs for this TSA in the context of the VRI. In the VSIP the Stakeholders of this management unit developed a Business Case for undertaking a VRI Phase II ground sampling program and Net Volume Adjustment Factor (NVAF) destructive sampling. This VPIP picks up

¹ From the MFR Vegetation Resources Inventory website – Overview -

<http://www.for.gov.bc.ca/hts/vri/intro/index.html>

² From the Executive Summary of the VRI Standard – Guidelines for Preparing a Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling.

³ This plan can be found on the Ministry of Forests and Range website:

http://www.for.gov.bc.ca/hts/vri/reports&pub/tsa_vsips/revelstoketsa_vri_vsip.pdf

the discussion on the proposed activities, involving technical experts to develop the details of the associated work. It references the requirements of subsequent analyses and proposes future consideration of a monitoring project.

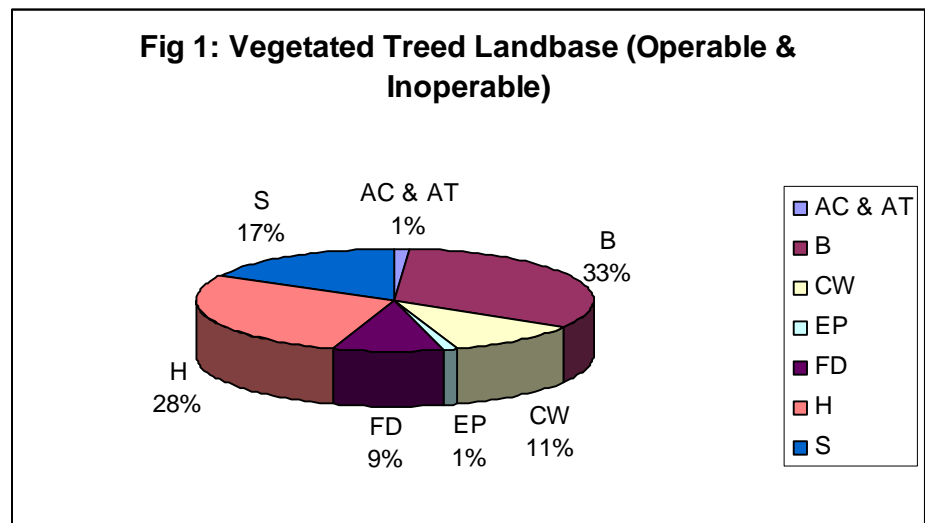
The Revelstoke TSA VIP will be stored on the Ministry of Forest & Range (MFR) VRI website⁴ and will be available to provide a record of the steps undertaken to develop this project and to serve as a guideline for undertaking this project.

1.2 Project Landbase (adapted from the Revelstoke TSA Allowable Annual Cut (AAC) Rationale – September 1, 2005)

The Revelstoke TSA is located in the eastern portion of the Southern Interior Forest Region (SIFR). It is bordered by Golden to the east, Robson Valley to the north, Kamloops to the west and TFL23 to the south. It comprises approximately 549,420 hectares of the Columbia Forest District which is administered from the Ministry of Forests and Range office in Revelstoke. Revelstoke is the largest community in the TSA (8,049 residents⁵). Figure 2 is an overview map of the area.

The terrain is quite rugged and mountainous. About 41 percent of the total TSA area is considered forested land managed by the Ministry of Forests & Range. The area defined as the Timber Harvesting Land Base (THLB) is approximately 78,000 hectares or 35 percent of the productive forest land base, following area exclusions for factors such as poor operability, environmental sensitivity and unmerchantable forest types.

There are three biogeoclimatic zones (BGC) in the TSA including Alpine Tundra (At), Engelmann Spruce-Subalpine Fir (ESSF) and Interior Cedar-Hemlock (ICH). The main commercial tree species include western hemlock, Engelmann spruce, western red cedar, subalpine fir (balsam) and Douglas-fir. Over 50% of the stands are greater than 140 years of age.



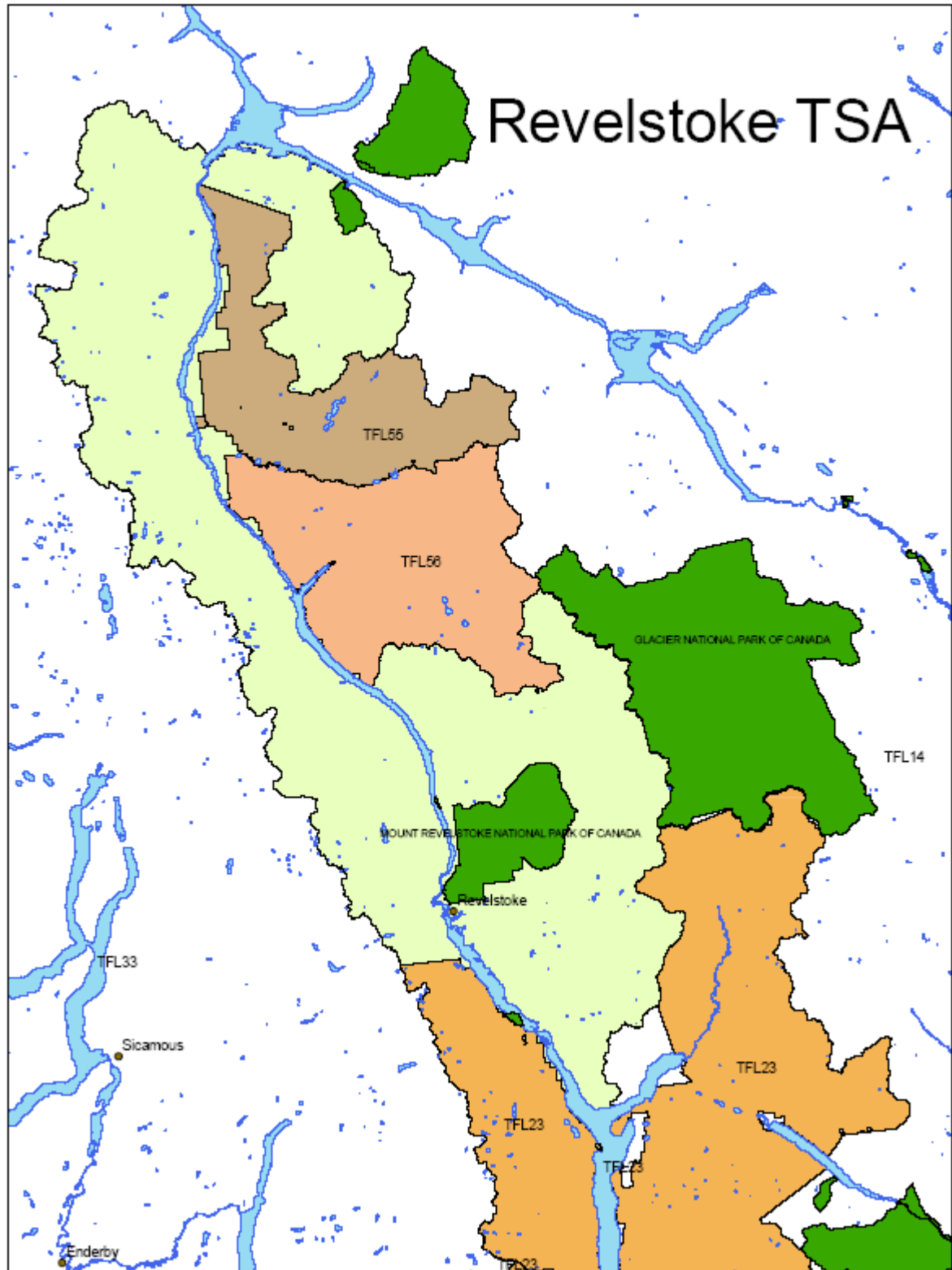
⁴http://www.for.gov.bc.ca/hts/vri/reports&pub/vri_vripub.html#top

⁵ 1996 census on City of Revelstoke website – Community profile, Population characteristics, <http://www.cityofrevelstoke.com>

There are no First Nation communities in the TSA but the following assert territorial interests in the area:

- Ktunaxa Nation Council
- Akisq'nuk First Nation
- Shuswap Indian Band
- Shuswap Nation Tribal Council
- Adams Lake Indian Band
- Little Shuswap Indian Band
- Neskonlith Indian Band
- Simpcw First Nation
- Splatsh First Nation
- Okanagan Nation Alliance
- Okanagan Indian Band
- Lower Similkameen Indian Band

Figure 2. Revelstoke TSA



Tables 1&2. Land Base of the Revelstoke TSA

Table 1: Total Vegetated Treed (VT) Landbase in Inoperable Area, greater than 29 years

SPECIES	Area (hectares)	percent
B	63,465	50
H	30,961	24
S	20,398	16
CW	6381	5
FD	5476	4
AC & AT	900	1
EP	625	0
Pine SPP	345	0
	128,551	100

Table 2: Total Vegetated Treed in Operable Area, greater than 29 years

SPECIES	Area (hectares)	Percent
H	31,006	33
CW	18,533	20
S	17,204	18
FD	13,529	14
B	10,081	11
EP & W	1684	2
AC & AT	1551	1
Pine Spp.	505	1
LW	37	0
	94,130	100

These landbase figures have been provided to support decisions regarding the VRI project area. The operable and inoperable area in the Vegetated Treed land cover classification⁶ greater than 29 years is approximately 222,681 hectares.⁷ The District has provided a locally developed operability line. To identify the operable landbase for the project, all polygons that 'touch the line' have been included in the operable population. More details can be found in Appendix A.

1.3 Discussion on Potential Addition to the TSA Landbase

The area north of the boundary between the Arrow Boundary and Columbia Forest Districts, commonly known as the 'Shelter Bay Block' is a British Columbia Timber Sales (BCTS) operating area with the exception of three Timber Licenses held by Pope & Talbot (P&T) in Tree Farm License (TFL) 23. It has been

⁶ B.C. Land Cover Classification Scheme

⁷ Numbers related to identifying the sampling population are the result of statistical work completed by Churlish Consulting Ltd, based on a GIS exercise conducted for this project by Meridian Mapping Ltd., Nanaimo B.C.

proposed that these licenses be reverted from Schedule “A” lands to Schedule “B” Crown lands and these areas would be added to BCTS’s Shelter Bay Block. As part of the VSIP, BCTS planning staff has asked that this block be considered as part of the landbase for the Revelstoke TSA VRI project.

This tenure change remains at the consultation stage at the time of the preparation of the Project Implementation Plan. To keep the VRI planning process moving forward, the Stakeholders supported basing the project on the landbase of the Revelstoke TSA used during the last timber supply review.

1.4 State of the Inventory

The Ministry of Forests completed a forest cover reinventory of the TSA in 1996. The most current update for the Veg files for the Revelstoke TSA in the Land & Resource Data Warehouse (LRDW) is February, 2004.

While an inventory audit occurred in the Revelstoke TSA in 1990’s as part of the provincial program to assess the accuracy of the forest inventory, it was undertaken on the inventory previous to the current one. In the 2005 Rationale for AAC Determination, the Chief Forester recommends that the Stakeholders collaborate to undertake a Phase II vegetation inventory prior to the next TSR to provide volume estimates for existing stands.

There was a VRI Strategic Inventory Plan written for the Columbia Forest District in 1999 that included this TSA.

2.0 Ground Sampling Plan

2.1 Sampling objectives

This project was initiated by Downie Street Sawmills Ltd. and has been supported by the local Licensees including BC Timber Sales, Okanagan Columbia Business Area. Various government agencies including the MFR inventory personnel in the Southern Interior Forest Region and Forest Analysis Inventory Branch (FAIB) have provided their expertise during the Stakeholders’ meeting and plan development.

The primary objective of the Phase II ground sampling project is to install an adequate number of VRI sample clusters to achieve a sampling error of $\pm 10\%$ (95% probability) for overall net timber volume. This will allow for the statistical adjustment of the timber inventory for the project population.

Through the completion of VRI ground sampling and NVAF activities data may be collected to provide information on the following issues of particular interest to the Stakeholder group:

- Provide improved data for stand attributes and overall inventory volume
- Provide good information on dead wood volume
- Improve accuracy of species-specific volumes in Cedar and Hemlock
- Improve knowledge regarding merchantability by providing an estimate of grade from standing timber and information on 'sawable' volume
- Provide an opportunity to post-stratify the population by developing attributes that allow better definition of "Problem Forest Types" (PFT)
- Improve current site index information

2.2 Target Population

The population of interest for this study includes polygons 30 years of age and greater and all species in the operable area (as defined in Section 1.2) of the Vegetated Treed land classification.

The following will be excluded from sampling:

- Private land
- Parks
- Woodlots
- Samples showing the forest to be harvested at the Integrated Plot Centre (IPC) during a pre-screening process

No Protected Areas, Indian Reserves or Community Forests are part of the Revelstoke TSA.

The target population in the operable landbase encompasses a total area of 94,130 hectares while the inoperable landbase is 128,551 hectares. Despite the discrepancy in sample weighting, the priority for sampling in the Operable Landbase was documented by the Stakeholders in the Revelstoke VSIP as follows:

- 80% of samples will be in the Operable VT landbase.
- 20% of samples will be located in the Inoperable VT landbase.

2.3 Sample Size

The RISC Standard 'Guidelines for the Preparation of a Project Implementation Plan for Ground Sampling and Net Factor Sampling' recommends using the coefficient of variation (CV) from the inventory audit for the unit, increased by an

additional 10% to account for differences in the sampling methodology, to determine the number of ground samples. The audit for this TSA was completed on the previous inventory and had a CV of 45. The recommended direction at the Stakeholders' meeting, considering adjacent TSAs and TFLs audits⁸, was that 100 ground samples in the operable landbase would be a reasonable number to achieve the sampling error objective.⁹ These 100 samples will be weighted according to the stratification of the population identified in Section 2.4 of this plan.

The 'inoperable' landbase in this TSA is valued for its contribution to non-timber values i.e. habitat, as well as its potential for future harvesting opportunities. By including the inoperable landbase in the project, the local Stakeholders have taken this opportunity to improve their knowledge of the inoperable landbase by obtaining ground sampling data (both Phase II samples and NVAF) in this portion of the TSA. The decision to select 25 samples in a single stratum in the inoperable landbase was documented in the VSIP.

There will be a total of 125 ground samples in the combined operable and inoperable areas.

2.4 Strata

2.4.1 Ground Sampling

Operable Landbase

Based on the local Stakeholder interests identified at the Stakeholder meeting and confirmed during this planning process, the polygons comprising the operable landbase population have been stratified into species and species groupings as follows:

- Strata 1: Hemlock
- Strata 2: Cedar
- Strata 3: Spruce-Balsam
- Strata 4: Douglas Fir-Pine
- Strata 5: Deciduous

To simplify analysis, the recommended option of distributing the 100 samples proportional to species representation in the population has been

⁸ The CV for the TFL55 audit was 42%, the CV for the TFL56 audit was 44% and for Golden TSA the CV for the inventory audit was 38%.

⁹ Karen Jahraus, Personal Communication, January 18, 2008. This sub-contractor to the project was contacted during the preparation of the VPIP and she made the following observation: "Based on observed variability in the Golden TSA and the Arrow TSA, we should have no trouble achieving the $\pm 10\%$ sampling error target for the Revelstoke TSA."

followed in the sample selection process.

Inoperable Landbase

As stated in Section 2.3, 25 ground samples will be established in the inoperable landbase to provide some overall information and trends. There will be no stratification of the samples, either before or after their selection. They will be representative of the overall population, proportional to species representation.

Following the decision to sample in the inoperable, a statistical contractor (Karen Jahraus, Jahraus & Associates Consulting Inc.) was consulted and she has recommended keeping the inoperable landbase separate. In regard to this sampling, Karen has made several points:

1. The inoperable should be maintained as a separate stratum for the analysis. Since we are choosing to establish only 25 samples in this portion of the landbase, weighting issues will arise if this practice is not followed.
2. Depending on the variability, the sampling error in this stratum may be high. However, since our goal is to observe trends in the inoperable landbase, the risk associated with estimates from this stratum is likely low.

The planned distribution of samples is shown in Table 3, below.

Table 3: Planned Distribution of Ground Samples

Landbase	Stratum	Population Area (ha)	% of area	Planned number of samples	Number of hectares represented by each sample
Operable	Hemlock	31006	33	33	940
	Cedar	18533	20	20	927
	Spruce-Balsam	27285	29	29	941
	Douglas Fir-Pine	14071	15	15	938
	Deciduous	3235	3	3	1078
	Total	94130	100	100	
Inoperable	All species	128,551	100	25	5142
	Sp-BI	83863	65		
	Hemlock	30961	24		
	Cedar	6381	5		
	Fd-PI	5821	5		
	Deciduous	1525	1		

For both the Operable and Inoperable areas, the strata have been separated into sub-strata based on 3 volume classes.

Table 4. Sample breakdown by Volume Class

Vol class	Cedar	Deciduous	Fd-Pl	Hemlock	Sp-BI	Inoperable
0	6	1	5	11	10	9
1	7	1	5	10	10	8
2	7	1	5	12	9	8
Total	20	3	15	33	29	25

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

2.4.2 NVAF

During the NVAF project, the pattern of sampling will be similar to the overall sample selection, with sampling in both the inoperable and operable populations¹⁰. The NVAF sampling in the inoperable landbase will again be a small sample that is not stratified by species or age class. The bulk of the sampling will be in the operable landbase where the population will be analysed by species and age class distribution. For NVAF sampling, age is broken down into two classes: Immature (age 30 to 120) and Mature (121+). In the Revelstoke TSA, the Vegetated Treed area of the Operable Landbase is 29% Immature and 71% Mature. This population will support an Immature (all species) and Mature (stratified by species) NVAF sample. Table 5.1 below shows the distribution of ground samples for NVAF by age class in the operable population.

In the development of the VRI plans, the licensee Stakeholders expressed a strong interest in the potential of the destructive sampling project. During the consultation process, they commented that having improved decay and waste information alone is not sufficient to their needs. The VSIP stated that knowing that there is rot in a log is only part of the equation. The addition of an on-site scaler has been proposed to provide estimates of log merchantability and log grades based on both the VRI and Interior log grades. This additional work will provide data regarding the remaining 'sawable volume', or what can be made from that log. Cedar and Hemlock are the two species that the local Stakeholders want more information about specifically. These species are highly variable and therefore the objective is to increase the sample size in the mature component of these two species to permit a more precise assessment of the accuracy of the taper equation and loss factors and the merchantability.

¹⁰ Personal Communication, Will Smith, March 6, 2008. The MFR VRI inventory staff discussed the issue and agreed that if the operable and inoperable are grouped together, then the inoperable must be weighted. It was decided that the best approach would be to create a separate stratum for the inoperable.

The use of a scaler in the NVAF work to assist in the assessment of merchantability is currently untested and is not part of the Standard. The licensee proponent will need to seek a variance to the VRI NVAF Standard at the time of undertaking this project if they are looking to include this in a Forest Investment Account (FIA) funded VRI project

In this project planning process, the NVAF sample size was approved by Forest Analysis & Inventory (FAIB) staff¹¹ and the selection of NVAF samples was completed to the Standard¹². There will be a total of 140 trees sampled of which 10 will be dead¹³.

Table 5: NVAF Stratum Sample Size

Landbase	Age Grouping	# of Sample Trees
Operable	Dead	10
Operable	Immature – All species	15
Operable	Mature Hemlock	45
Operable	Mature Cedar	28
Operable	Mature S and other species	18
Operable	Mature Balsam	14
Inoperable	All species and ages	10
	Total	140

Table 5.1: NVAF Ground Sample Distribution

Landbase	Age Class (years)	# of Live Sample trees	NVAF Samples
Operable	Immature 31-120	15	5
Operable	Mature 121+	105	35
Inoperable	All	10	4
	Total	130	44

The complete NVAF profile can be found in Appendix D.

The NVAF sample tree list will be produced after the NVAF ground samples are established.

¹¹ Will Smith, Volume and Decay Sampling Officer for the Forest Analysis & Inventory Branch.

¹² Net Volume Adjustment Factor Sampling Standards and Procedures, located at the website: http://ilmbwww.gov.bc.ca/risc/pubs/teveg/nvaf_2k6/nvaf_2k6.pdf

¹³ Based on personal communication with Will Smith on February 18, 2008. The minimum standard for dead trees is 10, so this follows the NVAF Standard.

2.5 Sample Selection

The Standard 'VRI Sample Selection Procedures for Ground Sampling' outlines the process in detail and has been 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 Revelstoke TSA for both the Operable and Inoperable Landbase. Details in the Appendices to this planning document provide a District Distribution and summarize the vegetated treed landbase by:

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

A number of sampling lists were developed for both the Operable and Inoperable areas. Each list contained the number of samples required plus approximately 50% more for each stratum. These additional samples in List 1 and the production of Lists 2 and 3 were to allow for 'contingency' sample selection. Where there was a need to replace a sample (i.e. due to logging), the replacement occurred within the same stratum and volume class. It is efficient to select extra samples at this point in the project – there is little extra cost compared to starting the process again later if the project runs short on samples.

An initial review of the sample selection was completed by the MFR Inventory staff. A copy of the sample lists was provided, as well as an overview map of the project area with the polygons from List 1 highlighted. No missed project area or concerns about the sample distribution were raised during this review.

Sample points were next 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'.¹⁴

The GIS contractor provided files to allow the sample locations to be reviewed to determine if they were in private land, parks, woodlots or cutblocks. If the Integrated Plot Centre was located in any of these land ownerships or types, it was rejected. Sample locations were reviewed and selected first from List 1. Samples to replace those not selected in List 1 were chosen from the

¹⁴ This GIS exercise was completed by Meridian Mapping Limited.

same stratum and sub-stratum as those rejected, in order of sample number, from 'contingency' polygons in List 1 and if required, from List 2.

In addition to the initial 100 samples for the Operable area and 25 samples for the Inoperable area, "contingency" samples were identified for each sub stratum in the likely event that some of the initial samples are rejected in the field for any of the above reasons or due to safety issues following field reconnaissance. Appendix B describes the systematic process of sample replacement and provides a complete list for the field project.

2.5.2 NVAF

Will Smith, MFR Volume & Decay Officer in the Inventory Branch, has been involved in decisions related to the NVAF sampling selection.

The NVAF samples are a subset of the VRI sample selection. The selection of 44 NVAF samples has been derived from the 'final' ground sample list. Enhancement of auxiliary plots will be completed at the time of the establishment of the ground samples according to the NVAF Sampling Standards and Procedures. For this project, all four auxiliary plots will be enhanced, with all live and dead trees 12.5 cm or greater included in the data collection. Also following this protocol, a tally of dead fallen trees will only be included at one auxiliary plot per sample. This data collection will occur on the north auxiliary only.

Specific NVAF trees cannot be selected until the associated ground samples have been established and the data collected. If the samples designated for the NVAF sample tree selection are made a priority to establish in the first year of sampling, the compilation and tree selection could occur in the first year of the project. Once this list is available, the work can be bid, and the destructive sampling phase started in the following field season. If the data collection is not prioritized and is part of the overall multi-year program to complete the ground samples, then the NVAF destructive sampling may be delayed for a year. The local Stakeholder group has expressed an interest in the completion of the data collection for the NVAF samples as a priority. The licensee leading the ground sampling project will ensure that support is provided for this aspect of the project either through the MFR staff or through a qualified NVAF Quality Assurance (QA) contractor.

During the preparation of the VIP, both Kurt Huettmeyer, Operations Manager at the Columbia Forest District and Peter Lishman, Project Director of the Mountain Caribou Implementation Recovery Plan have been contacted by either the lead licensee or the Project Implementation Plan author. There is follow up correspondence on file that would indicate that there are no issues related to the destructive sampling aspect of this activity from either the District's or Caribou management's perspective. Once the tree list is

developed, the District will be contacted with information regarding the location of sampling, in order to follow up on obtaining a 'license to cut' for the NVAF sampling.

2.5.3 Monitoring

The Monitoring project plan in the Revelstoke TSA has not been developed at this time. It is therefore proposed that a monitoring plan will be written as an amendment to the VPIP at a later date. At this time, a 'best estimate' for the number of monitoring samples would be 25. This will be reviewed when the monitoring plan is developed.

To establish a Monitoring project, the monitoring protocols that are the MFR standard would be followed. Currently the procedures developed for the National Forest Inventory are followed for monitoring projects. If new protocols are developed prior to undertaking a monitoring project, they will be incorporated into a plan for the Revelstoke TSA.

2.6 Sampling Approach

This planning work has been prepared based on the proponent's interest in obtaining better volume data for this TSA through a VRI ground sampling program. The completion of this Project Implementation Plan will include a review by the Stakeholders and sign-off by the Lead Licensee (Downie Street Sawmills Ltd.) and the Manager of the VRI Section, Forest Analysis and Inventory Branch of the MFR. The finalized plan and the accompanying overview map and field packages will form the foundation for undertaking this project. When assurance of the funding is secured, the proponent can undertake assigning the tasks outlined in the plan to staff or contractors, either through direct award or competitive bidding.

The only unknown issue related to planning of this project at the time of this VPIP's preparation is final acknowledgement and detail by the lead proponent regarding the TSA's receipt of 'focus funding' based on the Provincial prioritization for undertaking VRI projects.

Since the timing and amount of funding is not confirmed, as a precautionary step in the writing of this Project Implementation Plan, 'year 1 or year 2' has been used for the first and subsequent years of activity on the project, rather than a specific fiscal year. Due to the timing of the upcoming Timber Supply Review in this TSA, the local Stakeholders will want the data delivery within 2 years. (Ideally they would have preferred 1 year, but logistics of length of field season make achieving this option highly unlikely.)

The completion of 125 VRI ground samples will require 125 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. If ground sampling requires two field seasons to complete, a priority will be placed on completing the ground samples associated with NVAF data collection in Year 1.

2.7 Sample Type

The ground samples established for the Revelstoke TSA project will be 'Timber Emphasis' conducted by certified VRI Timber contractors. Both Coarse Woody Debris and Succession information will also be collected, based on an interview with the local licensee Stakeholders by the VPIP author's contractor. It was decided that this data may have value and since this is a minimal cost item, the clients expressed interest in collecting and analyzing it.

3.0 Implementation Plan

3.1 Scheduling

Table 6 – Schedule of Activities

Timing	VRI Activity
<u>Preliminary Year</u>	VSIP and VPIP preparation -includes Sampling plan development and package preparation
<u>Year 1</u>	Contract administration Minimum 50 Timber Emphasis Plots. Priority will be on NVAF samples in Year 1. Mentoring – as required QA-10% of the samples Analysis of NVAF samples and NVAF tree selection list to be developed.
<u>Year 2</u>	Contract administration Remainder of Timber Emphasis Plots Mentoring – additional attributes, as required QA – 10% of samples NVAF destructive sampling Mentoring & Quality Assurance-NVAF Final Compilation/analysis and inventory file adjustment based on Ground Sampling work
<u>To be determined</u>	Monitoring project – All phases, from preparation of packages to establishment
<u>Annually</u>	Helicopter, as required to access samples

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 Integrated Plot Centre (IPC) and an indication of which samples are the NVAF sub-set. The Project Manager will work with the licensees to provide an estimate of the access type to the crews prior to bidding (i.e. heli, truck – 4X4, quad).

Following the sample selection process that is part of this VIP, sample packages will be prepared for each sample that is part of this VRI ground sampling and NVAF program. These will contain the information required for field crews to navigate to, and establish the sample.

Requirements for the Monitoring program's sample packages will be assessed when this activity is undertaken. At that time it will be decided whether the Monitoring sample locations are unique from the Ground Samples. If this is the case, separate packages will need to be 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.

Sample packages will include:

- an envelope with a location for sample details on the outside, including sample number and basemap number. There will be a line on the label for the UTM coordinates of the IPC and a line each for crew initials and the sample completion date.
- one 8 ½ X 14 map at a 1:10,000 scale showing the IPC, as well as the Forest Cover polygons. TRIM features will include contours, BGC (legacy or Big BEC, as available) and major roads.
- one 8 ½ X 14 orthophoto with the IPC marked
- both of the above will include an outline of the forest cover polygon that the sample is in
- a stereo photo pair of the polygon of interest

Other items that help with the locating samples such as full orthophoto mapsheets (1:20,000 scale) will also be made available by the Licensees.

3.3 Standards

The most recent edition of the Vegetation Resources Inventory Standards and Procedures will be followed for the completing this project. The Standards relevant to this project at this point in time are listed following the Bibliography in this document. The most recent versions are located at the website:

<http://ilmbwww.gov.bc.ca/risc/pubs/teveg/index.htm>

3.4 Roles and Responsibilities

This is a Licensee-lead initiative. There is also support from the VRI inventory section of the Ministry of Forests & Range. The main participants in the project include:

Dieter Offermann, Lead Proponent, Forester for Downie Street Sawmills Ltd.
(Dieter will work with the other local Stakeholders and represents their interests)

MFR Forest Analysis and Inventory Branch, VRI section contacts:

Planning: Gary Johansen, VRI Audit Coordinator

NVAF: Will Smith, Volume & Decay Sampling Officer

MFR Regional staff contacts, Southern Interior Forest Region:

Operational: Chris Mulvihill, VRI Inventory Forester

MFR District contact and representative, Columbia Forest District:

Kevin Lavelle, Stewardship Officer

The lead proponent will provide the field contractor with copies of the VPIP, the overview maps and sample packages as described in Section 3.2. Obtaining aluminum pins is the responsibility of the contractor. Helicopter work may be awarded for the project separately and may not be part of the field contractor's bid.

The MFR Inventory group from Victoria will provide VRI numbered tags.

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

3.4.1 Field Work

Fieldwork will be tendered and contracted out as follows:

1. Year 1 – Ground sampling – Certified Timber data collection for up to 125 samples. Guidance from the MFR will come from the Region, with follow up on data input from the Branch.
2. Year 2 – Ground sampling – Certified Timber data collection on any remaining ground samples not completed in the initial field season. Again, with Regional VRI staff guidance for field work and the Branch for data input.
3. Year 2 – NVAF ground sampling. Certified NVAF destructive sampling with a scaler on the team. Guidance for this work will be provided by Regional and Branch (Victoria) staff.

3.4.2 Quality Assurance

Quality Assurance is a mandatory requirement for VRI field work, and it is conducted on a minimum of 10% of the sampling. As part of the overall project responsibility accepted by the Licensee undertaking this project, it is funded through the Forest Investment Account provided from the Inventory 'focus funding' allocation. It will be conducted by a 3rd party contractor, following the VRI QA procedures and standards. A requirement that may be included in the bidding for the Ground Sampling activity is the inclusion of a contractor representative of the field crews on each QA plot. This has been done on other projects and has proved to be effective with little cost increase.

Mentoring early in the field work is an option that can provide a critical first step in establishing Quality Control on the project. Lead by the QA 3rd party contractor, it can support the success and consistency of a VRI project's data collection, reinforcing the VRI Phase II and NVAF procedures, providing local knowledge and overall ensuring that the data collection standards are met. The Revelstoke TSA project will consider including mentoring in the start up for each activity, dependent on the skill level and recent experience of the field crews involved.

The QA for the Monitoring project will involve a contractor certified for the timber data collection and a certified ecology contractor, as required.

3.4.3 Data Compilation, Analysis and Adjustment

The local Stakeholders would like this project to be completed so that the data can be compiled, analysed and the inventory adjusted in time to be utilized for the next TSR process. This step in the overall VRI project will include 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

3.5 Sample List

A complete sample list is provided in Appendix B. A description of how samples were distributed across the population 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 Licensee and MFR, FAIB, and Regional 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 MFR
- Additional data collected as per this project, in the format specified in the contract and at the pre-work. (This will be primarily on the NVAF activity.)
- Documentation of any modifications to the sample lists

From the VRI Planning Contractor

- Project files regarding the planning processes and the Sample selection. This includes digital data used in sample selection.

From the VRI Ground Sampling & NVAF Project Manager

- 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 and sign off by the 3rd party contractor
- Documentation of any modifications to the sample lists

From the NVAF Tree Selection Contractor

- Tree list
- Documentation of the Tree list selection

3.7 Costs

Table 7. VRI Costs Based on Activities and Sample Size¹⁵

VRI Activity	Sample Size	Unit Cost	Total Cost
Ground Sampling			
Preliminary Year-VRI plans preparation & packages			\$35,000
Contract admin.	2 years	\$10,000	\$20,000
Year 1 -Timber Emphasis plots	75	\$1800	\$135,000
Year 2 - Timber Emphasis plots	50	\$1800	\$90,000

¹⁵ This table of costs breaks down the VRI ground sampling program into two years, based on logistics of timing and available funds.

Years 1 & 2 – VRI sampling Heli access-estimate			\$60,000
Year 1 & 2 - Mentoring & QA – TEP	17	\$1000	\$17,000
Year 1- NVAF tree selection			\$2,000
NVAF destructive sampling	140	\$800	\$112,000
NVAF – Scaler	44	\$400	\$17,600
Heli access-estimate			\$35,000
Mentoring & QA-NVAF			\$10,000
Final Compilation/analysis & inventory file adjustment			\$20,000
TOTAL PHASE II			\$553,600

Table 8. Sample size & estimated funding breakdown for VRI Monitoring project

VRI Activity	Sample Size	Unit Cost	Total Cost
MONITORING			
Contract Admin – includes GIS work			\$8,000
Sample Establishment	25	\$2,500	\$62,500
Helicopter Access			\$10,000
Mentoring & QA – includes some heli			\$5,000
TOTAL MONITORING			\$85,500

Table 9: Estimated funding breakdown by year¹⁶


Year	Activity	Costs
Preliminary year - 2007/08	All costs for plan preparation and package preparation	\$35,000
Preliminary Year Total		\$35,000
Year 1- fieldwork	Contract Administration	\$10,000
	Ground sampling – timber	\$225,000
	Timber mentoring & QA	\$17,000
	Helicopter	\$60,000
	NVAF sample tree selection	\$2,000
Year 1 total		\$314,000
Year 2- NVAF & Analysis	Contract Administration	\$10,000
	NVAF destructive sampling	\$112,000
	NVAF - scaler	\$17,600
	NVAF QA & Mentoring	\$10,000
	Helicopter	\$35,000
	Analysis & Adjustment	\$20,000
Year 2 total		\$204,600
Grand Total		\$553,600

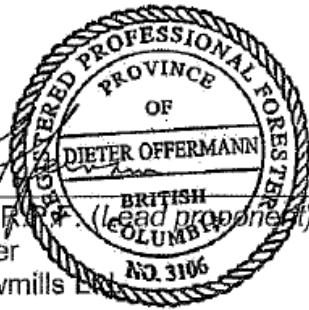
¹⁶ This table breaks down the project into two years. In Year 1, all VRI ground samples would be completed and in Year 2, the NVAF sampling and analysis would occur. If funding or timelines are insufficient for all ground sampling in Year 1, some could be deferred to Year 2 but it is recommended in Section 2.6 that all NVAF-enhanced ground sampling occurs in Year 1.

3.8 Sign-off sheet

Revelstoke Timber Supply Area Vegetation Resources Inventory Project Implementation Plan for Ground Sampling and NVAF Sampling

It is the intention of the proponent to implement the Revelstoke TSA Vegetation Resources Inventory Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling as described, subject to FIA funding and approval. As a key stakeholder in the inventory, Ministry of Forests and Range VRI staff has been consulted throughout the development of this plan.

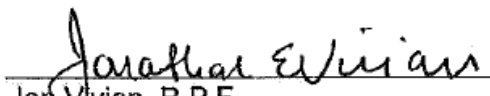

Dieter Offermann, R.P.F. (lead proponent)
Operations Forester
Downie Street Sawmills Ltd.
Revelstoke, B.C.



March 28, 2008

Date

I have reviewed the Revelstoke TSA Vegetation Resources Inventory Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling. I will be advising PricewaterhouseCoopers that the work proposed in this plan meets Vegetation Resources Inventory standards and MFR business needs.


Jon Vivian, R.P.F.
Manager
Vegetation Resource Inventory
Forest Analysis and Inventory Branch
Ministry of Forests and Range
Victoria, B.C.

08.03.28

Date

Bibliography

1. British Columbia Ministry of Forests Timber Supply Branch. September 1, 2005. Revelstoke TSA - Rationale for Allowable Annual Cut (AAC) Determination. Victoria.
2. British Columbia Ministry of Forests Timber Supply Branch. September, 2004. Revelstoke Timber Supply Area Analysis Report. Victoria.
3. British Columbia Ministry of Forests and Range Forest Analysis & Inventory Branch, VRI Section. October 16, 2007. VRI Revelstoke TSA Stakeholder Meeting – PowerPoint slides. Victoria.
4. British Columbia Ministry of Forests. March 3, 1999. Columbia Forest District (Golden TSA, Revelstoke TSA, TFL55 and TFL56) Vegetation Resources Inventory Strategic Plan. Victoria.
5. MFR website for VRI -
http://www.for.gov.bc.ca/hts/vri/reports&pub/vri_vripub.html#top
6. British Columbia Integrated Land Management Bureau website for Revelstoke land use planning –
<http://ilmbwww.gov.bc.ca/lup/lrmp/southern/revelstoke/index.html>
7. Ministry of Sustainable Resource Management, Terrestrial Information Branch. November, 2002. Revelstoke TSA – Documentation of Inventory Audit Restratified Analysis Draft 1.0.
8. Phillips, Nona. November, 2007. Revelstoke TSA Vegetation Resources Inventory Strategic Inventory Plan.
9. Phillips, Nona. Robson Valley and Lakes TSA Vegetation Resources Project Implementation Plans, November 2006 (Lakes) and November 2007 (Robson).
10. Timberline Forest Inventory Consultants. March 31, 2005. A User's Guide to the Vegetation Resources Inventory. FIA/ Tolko Industries Limited.
11. Various. Personal Communication with Stakeholders including Dieter Offermann, Colin Pike, Rein Kahlke, Kevin Lavelle, Chris Mulvihill, Will Smith, Gary Johansen and Laurence Bowdige regarding issues related to the preparing of this VPIP.

VRI Standards & Procedures

The most recent edition of the **Vegetation Resources Inventory Standards and Procedures** will be followed for the completing this project. They are located at the website:

<http://ilmbwww.gov.bc.ca/risc/pubs/teveg/index.htm>

The following is a list of the critical Standards and Procedures for a VRI project:

Ground Sampling:

Strategic Inventory Planning (VSIP), January 2005

Vegetation Resources Inventory Guidelines for Preparing a Project Implementation Plan for Ground Sampling and Net Volume Adjustment Factor Sampling Version 3.0, May 2007

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 4.7, July 2007

Vegetation Resources Inventory Ground Sampling Procedures Version 4.7 Addendum, July 2007

Ground Sampling Procedure Appendices Version 4.5, March 2004

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 4.2, June 2007

Net Volume Adjustment Factor Sampling Standards and Procedures Version 4.2, Addendum, April 2007

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 2.1, May 2007

Photo Interpretation

Vegetation Resources Inventory Guidelines for Preparing a Project
Implementation Plan for Photo Interpretation, Version 2.1, June 2007

Vegetation Resources Inventory Photo Interpretation Procedures Version 2.4,
March 2002

Vegetation Resources Inventory Photo Interpretation Standards and Quality
Assurance Procedures, Version 3.0, April 2006

Vegetation Resources Inventory Air Call Data Collection Procedures and
Standards, Version 2.1, June 2007

Vegetation Resources Inventory Ground Call Data Collection Procedures and
Standards Version 3.1, June 2007

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Appendix A

Sampling Selection Process and Methodology for Revelstoke TSA

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Sampling Process and Methodology for Revelstoke

The planning process determined that 100 samples should be selected proportionally by area, across the 5 strata in the operable area. These were Cedar (CW), Hemlock (H), Spruce/Balsam (Sp-BI), Douglas Fir/ Pine (Fd-P) and deciduous. A further 25 samples were to be selected in the inoperable stratum but without any breakdown by species. The table below illustrates the strata proportions and the distribution of samples selected.

The inventory files used were provided by Meridian Mapping Ltd. and were Ministry of Forests and Range inventory files, with additional information obtained through a GIS process. The additional information labeled each polygon as accessible (A) or inaccessible/ inoperable (I), and reviewed the ownership of each polygon. The file that was provided contained only those polygons that were eligible for selection based on ownership criteria as specified in the planning process. From this file, vegetated treed (VT) polygons with an age greater than 29 years in 2008 were extracted for sample selection.

Samples were selected¹⁷ by the probability of selection proportional to size with replacement (PPSWR) method as specified in the standards.¹⁸ Three lists were run using unique random numbers¹⁹. The three lists allow for replacement samples, as some samples may not be suitable. Sample statistics illustrating the similarity of the samples in the final sample list to the population are attached. (Appendix C).

An overview of the population and the volume classes used is listed in the tables below.

Table A: Strata Proportions and Samples to be Selected

Strata	Number of Polygons	Polygon Area	Proportional Distribution	Samples to be selected
CW	1558	18,532.87	20%	20
Decid	271	3,235.41	3%	3
FD-P	879	14,070.91	15%	15
H	2263	31,005.72	33%	33
Sp-BI	1811	27,284.60	29%	29
Total Operable Area	6782	94129.5	100	100
Inoperable	12086	128551.35		25

¹⁷Samples were selected using SAS® procedure Proc Surveyselect using PPSWR and the sampling plan above

¹⁸ Vegetation Resources Inventory Ground Sampling Procedures, Ministry of Forests and Range, Dec. 2002

¹⁹ The random numbers were generated in MS/Excel® using the RAND() function

Each of the strata was assigned to a Volume Class as set out in the following table.

Table B: Volume Classes and Sampling Rates by Stratum

Strata	Volume Class	Number of Samples Selected	Number of Polygons	Volume Range Minimum	Volume Range Maximum
CW	0	6	519	0.0	438.2
CW	1	7	520	438.7	533.2
CW	2	7	519	533.9	788.1
Decid	0	1	90	0.0	110.7
Decid	1	1	91	114.1	187.3
Decid	2	1	90	187.9	348.5
FD-P	0	5	293	0.0	206.8
FD-P	1	5	293	207.0	319.8
FD-P	2	5	293	321.6	726.5
H	0	11	754	0.0	392.6
H	1	10	755	392.8	476.8
H	2	12	754	476.9	699.5
Sp-BI	0	10	603	0.0	292.5
Sp-BI	1	10	605	293.0	409.2
Sp-BI	2	9	603	410.0	659.9
Total Operable		100			
Inoperable	0	9	4028	0.00	106.8
Inoperable	1	8	4029	107.10	291.6
Inoperable	2	8	4029	291.70	695.3
Total		25			

Appendix B

Sample lists for Ground Samples

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Sample Lists for the Operable and Inoperable Landbases

The following is a list of 125 planned samples (identified as “S” and “R”) and 75 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 that was not identified at the time of sample selection. The project manager must be consulted if samples are rejected.

Y=Selected sample during review without reason to reject.

S=Sample that should be attempted.

R=replacement sample for those rejected²⁰ from list #1. These are coming from Sample List #1.

C= contingency samples to replace those rejected during field sampling. These will come from Samples Lists #1 and #2.

BOLD=NVAF sample

strata	vol cls	sam p #	map_id	poly id	poly area	select	Comments	S, R or C	package
CW	0	1	082M089	313	7.01	Y		S	Y
CW	0	2	082M057	1327	11.3	Y		S	Y
CW	0	3	082M067	69	1.89	Y		S	Y
CW	0	4	082M077	432	6.9	Y		S	Y
CW	0	5	083D007	586	34.23	Y		S	Y
CW	0	6	082L060	1061	9.68	Y		S	Y
CW	0	7	082M048	376	5.99	Y		C	Y
CW	0	8	083D018	3005	11.48	Y		C	Y
CW	0	9	082K071	595	22.67	Y		C	Y
CW	0	10	082K071	331	15.43	Y		C	Y
CW	1	11	083D008	3322	34.22	Y	in CP-confirm IPC not logged	S	Y
CW	1	12	082M067	807	79.42	Y		S	Y
CW	1	13	082K091	197	24.8	Y		S	Y
CW	1	14	082N001	68	20.13	Y		S	Y
CW	1	15	082M067	190	10.67	Y		S	Y
CW	1	16	082M009	457	24.22	Y		S	Y
CW	1	17	082K081	881	9.97	Y		S	Y
CW	1	18	082M038	342	17.62	Y		C	Y
CW	1	19	082M048	445	12.13	N	on road		
CW	1	20	082M097	128	15.51	Y		C	Y

²⁰ Samples were rejected if they were located in private land, Indian reserve, parks, or protected areas.

CW	1	21	082M067	745	4.73	Y		C	Y
CW	1	211	082M067	790	18.3	Y		C	Y
CW	1	212	082N011	69	11.24	Y		C	Y
CW	2	22	083D009	3231	33.46	Y		S	Y
CW	2	23	082N011	290	8.46	Y		S	Y
CW	2	24	082N011	3183	58.05	Y		S	Y
CW	2	25	082M058	236	27.47	Y		S	Y
CW	2	26	082M077	342	8.73	Y		S	Y
CW	2	27	083D008	3349	33.13	Y		S	Y
CW	2	28	082M057	1632	27.17	Y		S	Y
CW	2	29	082M048	381	14.96	Y		C	Y
CW	2	30	082M058	302	5.48	Y		C	Y
CW	2	31	082K091	258	11.26	Y		C	Y
CW	2	32	083D008	3255	26.61	Y		C	Y
CW	2	222	082N022	12	6.52	Y		C	Y
Decid	0	33	082M029	547	12.36	Y		S	Y
Decid	0	34	082N012	67	55.38	Y		C	Y
Decid	1	35	082M020	107	47	Y		S	Y
Decid	1	36	082M010	101	14.68	Y		C	Y
Decid	1	235	082M010	406	11.64	Y	on edge of hwy but must be in polygon	C	Y
Decid	2	37	082M020	71	24.34	Y		S	Y
Decid	2	38	082L099	1207	27.71	Y		C	Y
Decid	2	237	082K071	269	29.03	Y	see licensee note	C	Y
FD-P	0	39	083D007	811	23.72	Y		S	Y
FD-P	0	40	082M030	914	35.62	Y		S	Y
FD-P	0	41	082L100	71	16.88	Y		S	Y
FD-P	0	42	082M029	421	25	Y		S	Y
FD-P	0	43	082M029	428	26.32	Y		S	Y
FD-P	0	44	082M089	379	28.42	Y		C	Y
FD-P	0	45	082K081	769	15.6	Y		C	Y
FD-P	0	46	082M010	134	27.44	Y		C	Y
FD-P	1	47	082N011	252	27.22	Y		S	Y
FD-P	1	48	082K081	830	45.64	Y		S	Y
FD-P	1	49	082L099	1219	54.19	Y		S	Y
FD-P	1	50	082L099	1286	13.44	Y		S	Y
FD-P	1	51	082M010	163	17.98	Y		S	Y
FD-P	1	52	082N001	235	3.04	Y		C	Y
FD-P	1	53	082K071	31	30.93	Y		C	Y
FD-P	1	54	082M029	418	38	Y		C	Y
FD-P	2	55	082M048	106	14.76	Y		S	Y
FD-P	2	56	082N012	400	10.58	Y		S	Y

FD-P	2	57	082N011	340	26.91	Y		S	Y
FD-P	2	58	082L090	57	7.22	Y		S	Y
FD-P	2	59	082M058	148	19.53	Y		S	Y
FD-P	2	60	082N001	228	23.35	Y		C	Y
FD-P	2	61	082K071	262	8.25	Y	See licensee note	C	Y
FD-P	2	62	082L090	28	66.45	Y		C	Y
H	0	63	082L090	452	98.74	Y		S	Y
H	0	64	082M039	264	41.55	Y		S	Y
H	0	65	082M039	262	31.9	Y		S	Y
H	0	66	082M039	77	36.5	Y		S	Y
H	0	67	082M039	263	35.12	Y		S	Y
H	0	68	082M038	63	26.81	Y		S	Y
H	0	69	082K081	411	16.54	Y		S	Y
H	0	70	082M038	427	19.69	Y		S	Y
H	0	71	082M038	427	19.69	Y		S	Y
H	0	72	082M019	2850	20.27	Y		S	Y
H	0	73	082K081	741	12.16	Y		S	Y
H	0	74	082M030	371	17.8	Y		C	Y
H	0	75	082M048	205	24.92	Y		C	Y
H	0	76	082M048	195	26.14	Y		C	Y
H	0	77	082M019	592	1.78	Y		C	Y
H	0	78	082M029	454	10.36	Y		C	Y
H	1	79	082M019	404	14.94	Y		S	Y
H	1	80	082N001	237	29.86	Y		S	Y
H	1	81	082N011	179	11.84	Y		S	Y
H	1	82	082M097	463	34.34	Y		S	Y
H	1	83	082M020	125	13.99	Y		S	Y
H	1	84	082N011	260	12.81	Y		S	Y
H	1	85	082M087	330	33.82	Y		S	Y
H	1	86	082M087	137	20.4	Y		S	Y
H	1	87	082M048	160	10.55	Y		S	Y
H	1	88	082M009	123	10.94	Y		S	Y
H	1	89	082M039	42	20.68	Y		C	Y
H	1	90	082K082	72	21.16	Y		C	Y
H	1	91	082M019	582	41.91	Y		C	Y
H	1	92	082M098	98	26.33	Y		C	Y
H	1	93	082M009	703	11.5	Y		C	Y
H	2	94	083D007	274	21.42	Y		S	Y
H	2	95	082M048	151	35.46	Y		S	Y
H	2	96	082L100	686	50.88	Y		S	Y
H	2	97	082M030	440	23.47	Y		S	Y
H	2	98	082M086	1139	15.29	Y		S	Y
H	2	99	082M029	206	6.64	Y		S	Y
H	2	100	083D009	3215	20.68	Y		S	Y
H	2	101	082M058	68	26.96	Y		S	Y

H	2	102	082M019	585	41.38	Y		S	Y
H	2	103	082M009	81	19.99	Y		S	Y
H	2	104	082M087	113	21.18	Y		S	Y
H	2	105	082M057	1603	31.52	Y		S	Y
H	2	106	082N012	352	6.41	Y		C	Y
H	2	107	082M058	258	15.21	Y		C	Y
H	2	108	082M029	671	67.07	Y		C	Y
H	2	109	082K091	234	13.05	Y		C	Y
H	2	110	082K091	242	9.31	Y		C	Y
In-op	0	111	082L100	457	8.95	Y		S	Y
In-op	0	112	082M019	98	150.38	Y		S	Y
In-op	0	113	082M097	562	30.05	Y		S	Y
In-op	0	114	082M067	500	19.08	Y		S	Y
In-op	0	115	082M087	435	34.55	Y		S	Y
In-op	0	116	082M038	309	6.51	Y		S	Y
In-op	0	117	083D007	492	23.72	N	Cutover		
In-op	0	118	082M086	1264	17.16	Y		S	Y
In-op	0	119	082M037	269	67.3	Y		S	Y
In-op	0	120	082M039	343	5.29	Y		R	Y
In-op	0	121	082M097	491	10.06	Y		C	Y
In-op	0	122	082M098	38	12.45	Y		C	Y
In-op	0	123	082N001	371	10.02	Y		C	Y
In-op	0	311	082M020	171	32.02	Y		C	Y
In-op	0	312	082N011	359	5.3	Y		C	Y
In-op	1	124	082M067	302	17.11	Y		S	Y
In-op	1	125	082N031	92	23.59	Y		S	Y
In-op	1	126	082M088	90	4.47	Y		S	Y
In-op	1	127	082M089	757	28.76	Y		S	Y
In-op	1	128	083D006	1026	5.38	Y		S	Y
In-op	1	129	082N001	344	5.12	Y		S	Y
In-op	1	130	083D007	455	29.97	Y		S	Y
In-op	1	131	082K081	547	19.49	Y		S	Y
In-op	1	132	082M076	1165	16.16	Y		C	Y
In-op	1	133	082M029	456	19.01	Y		C	Y
In-op	1	134	082N011	710	10.86	Y		C	Y
In-op	1	135	082M088	189	6.14	Y		C	Y
In-op	1	324	082N012	77	5.64	Y		C	Y
In-op	1	325	082N011	317	11.36	Y		C	Y
In-op	2	136	082M096	1423	17.51	Y		S	Y
In-op	2	137	082N012	144	35.6	Y		S	Y
In-op	2	138	082M019	271	8.59	Y		S	Y
In-op	2	139	082K081	810	22.69	Y		S	Y
In-op	2	140	082M086	1398	7.05	Y		S	Y
In-op	2	141	082M009	696	8.14	Y		S	Y
In-op	2	142	082M086	1214	21.89	N	Cutover		

In-op	2	143	082N011	310	13.66	Y		S	Y
In-op	2	144	082M057	1168	5.67	Y		R	Y
In-op	2	145	082M019	191	13.77	Y		C	Y
In-op	2	146	082N031	147	30.84	Y		C	Y
In-op	2	147	082M019	118	48.12	Y		C	Y
In-op	2	336	082M066	1055	6.23	Y		C	Y
In-op	2	337	082M057	1169	16.41	Y		C	Y
Sp-BI	0	148	082L060	1001	10.89	N	in lake/reservoir		
Sp-BI	0	149	083D008	3225	18.25	Y		S	Y
Sp-BI	0	150	082M038	90	9.75	Y		S	Y
Sp-BI	0	151	082K071	562	61.06	Y		S	Y
Sp-BI	0	152	082L060	1044	3.17	Y		S	Y
Sp-BI	0	153	082N001	386	11.02	Y		S	Y
Sp-BI	0	154	082L090	228	9.84	Y		S	Y
Sp-BI	0	155	082N021	196	26.3	Y		S	Y
Sp-BI	0	156	082M010	166	27.4	Y		S	Y
Sp-BI	0	157	083D007	260	35.69	Y		S	Y
Sp-BI	0	158	082M067	169	20.78	Y		R	Y
Sp-BI	0	159	082K071	216	7.41	Y		C	Y
Sp-BI	0	160	082M009	64	3.66	Y		C	Y
Sp-BI	0	161	082K071	658	9.5	Y		C	Y
Sp-BI	0	162	082N001	156	15.99	Y		C	Y
Sp-BI	0	348	082D007	807	4.25	Y		C	Y
Sp-BI	1	163	082M009	37	103.7	Y		S	Y
Sp-BI	1	164	082N001	175	14.77	Y		S	Y
Sp-BI	1	165	082L060	1013	40.07	Y		S	Y
Sp-BI	1	166	083D008	3224	15.35	Y		S	Y
Sp-BI	1	167	082M057	1333	11.47	Y		S	Y
Sp-BI	1	168	082L090	280	33.89	Y		S	Y
Sp-BI	1	169	083D008	3288	28.18	Y		S	Y
Sp-BI	1	170	082M009	287	13.09	Y		S	Y
Sp-BI	1	171	082M097	544	47.72	Y		S	Y
Sp-BI	1	172	082M057	1377	26.42	Y		S	Y
Sp-BI	1	173	082K081	330	23.89	Y		C	Y
Sp-BI	1	174	082N012	131	90.92	Y		C	Y
Sp-BI	1	175	082M067	513	35.92	Y		C	Y
Sp-BI	1	176	082M097	113	33.64	Y		C	Y
Sp-BI	1	177	082L060	1052	1.94	Y		C	Y
Sp-BI	1	363	082M030	142	16.39	Y		C	Y
Sp-BI	2	178	082M099	3276	54.42	Y		S	Y
Sp-BI	2	179	082M096	1292	32.82	Y		S	Y
Sp-BI	2	180	082M089	572	33.72	Y		S	Y
Sp-BI	2	181	082N021	201	5.01	Y		S	Y
Sp-BI	2	182	082M088	127	10.43	Y		S	Y
Sp-BI	2	183	082M096	1422	27.36	Y		S	Y

Sp-BI	2	184	082M019	478	24.23	Y		S	Y
Sp-BI	2	185	082M097	297	24.78	Y		S	Y
Sp-BI	2	186	082M097	361	5.39	Y		S	Y
Sp-BI	2	187	083D009	3149	32.79	Y	In CP-confirm IPC not logged	C	Y
Sp-BI	2	188	083D007	223	5.73	N	Cutover		
Sp-BI	2	189	082M009	609	23.76	Y		C	Y
Sp-BI	2	190	083D007	108	44.46	Y		C	Y
Sp-BI	2	191	082M098	222	38.04	Y		C	Y
Sp-BI	2	378	082L070	1074	1.9	Y		C	Y

Breakdown of samples

Species	Volume class	# in regular sample	# of Contingency
Cw	0	6	4
Cw	1	7	5
Cw	2	7	5
Decid	0	1	1
Decid	1	1	2
Decid	2	1	2
Fd-PI	0	5	3
Fd-PI	1	5	3
Fd-PI	2	5	3
Hw	0	11	5
Hw	1	10	5
Hw	2	12	5
Sp-BI	0	10	5
Sp-BI	1	10	6
Sp-BI	2	9	5
Inoperable	0	9	5
Inoperable	1	8	6
Inoperable	2	8	5
Total		125	75

Appendix C

Comparison of the Sample Characteristics to the Population

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Operability Area by Stratum

Operability	Stratum	Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Total Area	Total Area
A	CW	20	20.0	1,558	18,533	19.7	94,130
A	Decid	3	3.0	271	3,235	3.4	94,130
A	FD-P	15	15.0	879	14,071	15.0	94,130
A	H	33	33.0	2,263	31,006	32.9	94,130
A	Sp-BI	29	29.0	1,811	27,285	29.0	94,130
	Total	100	100.0			100.0	
I	CW			766	6,381	5.0	128,551
I	Decid			151	1,525	1.2	128,551
I	FD-P	1	4.0	526	5,821	4.5	128,551
I	H	6	24.0	3,102	30,961	24.1	128,551
I	Sp-BI	18	72.0	7,541	83,863	65.2	128,551
	Total	25	100.0			100.0	

Age Class

Operability	Age Class	Number of Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Area
A	2	2	2	218	3,742	4.0
A	3	7	7	194	3,165	3.4
A	4	5	5	396	5,230	5.5
A	5	11	11	531	7,480	7.9
A	6	8	8	550	7,443	7.9
A	7	4	4	268	3,627	3.9
A	8	32	32	2,213	29,795	31.7
A	9	31	31	2,412	33,647	35.7
	Total	100	100.0		94,130	100.0
I	2			196	1,854	1.3
I	3			496	4,592	3.6
I	4			534	5,490	4.3
I	5	2	8	869	8,599	6.7
I	6	1	4	1,457	13,370	10.4
I	7	3	12	487	4,580	3.6
I	8	15	60	5,690	63,213	49.2
I	9	4	16	2,357	26,854	20.9
	Total	25	100.0		128,551	100.0

Polygon Area Class

Operability	Polygon Area Class	Number of Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Area
A	1. < 10	14	14	3,291	17,704	18.8
A	2. 10-25	43	43	2,577	40,975	43.5
A	3. 26-50	35	35	765	25,651	27.3
A	4. 51-100	7	7	142	8,859	9.4
A	5. 101-250	1	1	7	942	1.0
	Total	100	100		94,130	100
I	1. < 10	10	40	7,745	38,680	30.1
I	2. 10-25	8	32	3,405	52,142	40.6
I	3. 26-50	5	20	770	25,571	19.9
I	4. 51-100	1	4	147	9,612	7.5
I	5. 101-250	1	4	18	2,271	1.8
I	6. 251-500			1	276	0.2
	Total	25	100		128552	100

Map ID

Operability	Map ID	Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Area
A	082K051			12	42	0
A	082K061			20	244	0.3
A	082K071	1	1	275	4,200	4.5
A	082K081	4	4	378	4,802	5.1
A	082K082			31	268	0.3
A	082K091	1	1	184	2,145	2.3
A	082K092			8	67	0.1
A	082L050			12	93	0.1
A	082L060	3	3	101	925	1
A	082L070			55	516	0.5
A	082L080			9	37	0
A	082L090	4	4	217	2,959	3.1
A	082L099	2	2	202	3,133	3.3
A	082L100	2	2	111	1,824	1.9
A	082M008			13	151	0.2
A	082M009	5	5	370	5,135	5.5
A	082M010	2	2	138	1,952	2.1
A	082M019	4	4	182	3,476	3.7
A	082M020	3	3	223	3,116	3.3
A	082M029	4	4	288	4,408	4.7
A	082M030	2	2	219	3,073	3.3
A	082M038	4	4	203	2,436	2.6
A	082M039	4	4	106	2,070	2.2
A	082M047			17	109	0.1
A	082M048	3	3	227	3,634	3.9
A	082M057	5	5	242	2,945	3.1
A	082M058	3	3	149	1,839	2
A	082M066			21	288	0.3
A	082M067	4	4	296	2,963	3.1
A	082M077	2	2	177	2,328	2.5
A	082M086	1	1	18	200	0.2
A	082M087	3	3	201	2,384	2.5
A	082M088	1	1	107	1,339	1.4
A	082M089	2	2	155	1,501	1.6
A	082M090			6	71	0.1
A	082M096	2	2	73	1,122	1.2
A	082M097	4	4	231	3,805	4
A	082M098			97	1,204	1.3
A	082M099	1	1	124	2,090	2.2
A	082M100			6	300	0.3
A	082N001	4	4	184	2,557	2.7
A	082N011	6	6	244	3,340	3.5
A	082N012	1	1	85	1,500	1.6
A	082N021	2	2	84	861	0.9

Operability	Map ID	Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Area
A	082N022			49	485	0.5
A	082N031			30	369	0.4
A	082N032			13	194	0.2
A	083D007	4	4	215	3,406	3.6
A	083D008	5	5	232	3,881	4.1
A	083D009	2	2	132	2,281	2.4
A	083D018			10	66	0.1
	Total	100			94,130	
I	082K061			8	54	0
I	082K071			152	1,791	1.4
I	082K081	2	8	413	4,588	3.6
I	082K082			54	435	0.3
I	082K091			346	3,392	2.6
I	082K092			162	1,374	1.1
I	082L050			2	10	0
I	082L060			15	131	0.1
I	082L070			6	36	0
I	082L080			2	11	0
I	082L090			102	1,052	0.8
I	082L099			161	2,617	2
I	082L100	1	4	276	3,635	2.8
I	082M008			109	1,183	0.9
I	082M009	1	4	243	3,941	3.1
I	082M010			124	1,356	1.1
I	082M018			133	1,265	1
I	082M019	2	8	325	5,591	4.3
I	082M020			196	2,312	1.8
I	082M028			143	836	0.7
I	082M029			311	3,556	2.8
I	082M030			579	5,842	4.5
I	082M037	1	4	12	130	0.1
I	082M038	1	4	340	2,997	2.3
I	082M039	1	4	207	3,777	2.9
I	082M040			201	2,058	1.6
I	082M047			133	1,184	0.9
I	082M048			245	3,233	2.5
I	082M049			1	3	0
I	082M056			22	559	0.4
I	082M057	1	4	339	3,989	3.1
I	082M058			49	636	0.5
I	082M066			168	1,689	1.3
I	082M067	2	8	282	3,050	2.4
I	082M076			166	1,120	0.9
I	082M077			198	2,124	1.7
I	082M078			46	219	0.2
I	082M079			214	1,850	1.4
I	082M086	2	8	456	3,841	3
I	082M087	1	4	316	3,016	2.3

Operability	Map ID	Samples	Percent of Samples	Number of Polygons	Polygon Area	Percent of Area
I	082M088	1	4	210	1,709	1.3
I	082M089	1	4	608	5,650	4.4
I	082M090			75	453	0.4
I	082M096	1	4	348	3,154	2.5
I	082M097	1	4	402	4,570	3.6
I	082M098			95	659	0.5
I	082M099			214	2,446	1.9
I	082M100			12	71	0.1
I	082N001	1	4	358	3,444	2.7
I	082N002			136	1,072	0.8
I	082N011	1	4	306	3,227	2.5
I	082N012	1	4	276	3,268	2.5
I	082N021			305	2,514	2
I	082N022			181	1,897	1.5
I	082N031	1	4	108	1,401	1.1
I	082N032			39	430	0.3
I	082N041			8	162	0.1
I	083D006	1	4	131	1,227	1
I	083D007	1	4	447	4,892	3.8
I	083D008			147	2,107	1.6
I	083D009			112	1,345	1
I	083D016			10	126	0.1
I	083D017			295	2,179	1.7
I	083D018			6	64	0.1
Total		25			128,551	

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Appendix D

**NVAF Profile - NVAF Sample Selection Process and Methodology for
Revelstoke TSA**

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In the planning, it was determined that 140 NVAF trees (130 live, 10 dead) would be required. A rule of thumb is that 1 sample will generate about 3 live NVAF trees. Therefore, 44 samples (130/3) are required. The age break between immature and mature strata is a polygon age of 120 years. The resultant breakdown of these 140 trees is:

Stratum		# of trees	# of samples
In-operable	Live	10	4
Operable	Immature Live	15	5
	Mature Live	105	35
	Dead	10	-
Total		140	44

The relationship between the 125 timber emphasis samples and the desired NVAF samples are illustrated below. Forty-four samples were selected from the existing sample list, using the desired distribution. The samples are selected systematically from an ordered list. The list is ordered by stratum, determined by leading species. This work was done in accordance with standards²¹

The tables below compare distribution of the NVAF samples by strata, volume class and species to the population.

Selection Category	Population Count	Sample Count
In-operable	25	4
Immature	33	5
Mature	67	35
Total	125	44

Strata			
In-operable	In-op	25	4
Immature	CW	3	
Immature	Decid	3	
Immature	FD-P	13	3
Immature	H	10	1
Immature	Sp-BI	4	1
Mature	CW	17	8
Mature	FD-P	2	1
Mature	H	23	12
Mature	Sp-BI	25	14

²¹ ²¹Net Volume Adjustment Factor Sampling Standards and Procedures, Ministry of Forests and Range, June 2007

Volume Class

In-operable	0	9	2
In-operable	1	8	
In-operable	2	8	2
Immature	0	21	3
Immature	1	8	2
Immature	2	4	
Mature	0	12	7
Mature	1	25	11
Mature	2	30	17

Leading Species

In-operable	B	5	1
In-operable	BL	7	1
In-operable	FD	1	
In-operable	H	2	1
In-operable	HM	3	
In-operable	HW	1	
In-operable	S	6	1
Immature	AT	3	
Immature	B	2	
Immature	BL	1	1
Immature	CW	3	
Immature	FD	12	2
Immature	H	5	1
Immature	HW	5	
Immature	PL	1	1
Immature	S	1	
Mature	B	3	2
Mature	BL	7	4
Mature	CW	17	8
Mature	FD	2	1
Mature	H	7	4
Mature	HM	3	2
Mature	HW	13	6
Mature	S	15	8

NVAF Sample Selection

Selected		strata	vol_cls	Sample_no	map_id	poly_id
age_cat	for NVAF					
Immature	No	Decid	0	33	082M029	547
Immature	No	Decid	2	37	082M020	71
Immature	No	Decid	1	35	082M020	107
Immature	No	Sp-BI	0	156	082M010	166
Immature	No	Sp-BI	0	151	082K071	562
Immature	Yes	Sp-BI	0	150	082M038	90
Immature	No	CW	0	1	082M089	313
Immature	No	CW	0	2	082M057	1327
Immature	No	CW	0	3	082M067	69
Immature	No	FD-P	0	39	083D007	811
Immature	No	FD-P	0	40	082M030	914
Immature	No	FD-P	0	43	082M029	428
Immature	Yes	FD-P	0	42	082M029	421
Immature	No	FD-P	1	47	082N011	252
Immature	No	FD-P	2	59	082M058	148
Immature	No	FD-P	2	57	082N011	340
Immature	No	FD-P	1	48	082K081	830
Immature	No	FD-P	1	50	082L099	1286
Immature	Yes	FD-P	1	51	082M010	163
Immature	No	FD-P	1	49	082L099	1219
Immature	No	FD-P	2	56	082N012	400
Immature	No	H	0	65	082M039	262
Immature	No	H	0	73	082K081	741
Immature	No	H	0	69	082K081	411
Immature	No	H	1	84	082N011	260
Immature	Yes	H	1	80	082N001	237
Immature	No	H	0	63	082L090	452
Immature	No	H	0	64	082M039	264
Immature	No	H	0	66	082M039	77
Immature	No	H	0	72	082M019	2850
Immature	No	H	0	67	082M039	263
Immature	Yes	FD-P	0	41	082L100	71
Immature	No	Sp-BI	0	153	082N001	386
In-op	No	In-op	0	111	082L100	457
In-op	No	In-op	1	129	082N001	344
In-op	Yes	In-op	0	112	082M019	98
In-op	No	In-op	2	137	082N012	144
In-op	No	In-op	0	119	082M037	269
In-op	No	In-op	0	114	082M067	500
In-op	No	In-op	1	124	082M067	302
In-op	Yes	In-op	0	113	082M097	562
In-op	No	In-op	0	118	082M086	1264

In-op	No	In-op	1	126	082M088	90
In-op	No	In-op	1	127	082M089	757
In-op	No	In-op	1	130	083D007	455
In-op	No	In-op	2	143	082N011	310
In-op	No	In-op	1	131	082K081	547
In-op	Yes	In-op	2	138	082M019	271
In-op	No	In-op	1	128	083D006	1026
In-op	No	In-op	0	115	082M087	435
In-op	No	In-op	2	144	082M057	1168
In-op	No	In-op	0	116	082M038	309
In-op	No	In-op	2	139	082K081	810
In-op	No	In-op	2	136	082M096	1423
In-op	Yes	In-op	2	141	082M009	696
In-op	No	In-op	2	140	082M086	1398
In-op	No	In-op	1	125	082N031	92
In-op	No	In-op	0	120	082M039	343
Mature	Yes	Sp-BI	0	154	082L090	228
Mature	No	Sp-BI	1	168	082L090	280
Mature	Yes	Sp-BI	1	163	082M009	37
Mature	No	Sp-BI	0	149	083D008	3225
Mature	Yes	Sp-BI	0	155	082N021	196
Mature	No	Sp-BI	0	157	083D007	260
Mature	Yes	Sp-BI	0	158	082M067	169
Mature	No	Sp-BI	1	166	083D008	3224
Mature	Yes	Sp-BI	1	171	082M097	544
Mature	Yes	Sp-BI	1	172	082M057	1377
Mature	No	CW	2	26	082M077	342
Mature	Yes	CW	0	4	082M077	432
Mature	No	CW	0	5	083D007	586
Mature	Yes	CW	2	22	083D009	3231
Mature	No	CW	1	17	082K081	881
Mature	Yes	CW	2	28	082M057	1632
Mature	No	CW	2	27	083D008	3349
Mature	Yes	CW	1	14	082N001	68
Mature	No	CW	1	13	082K091	197
Mature	Yes	CW	1	16	082M009	457
Mature	No	CW	2	25	082M058	236
Mature	Yes	CW	1	15	082M067	190
Mature	No	CW	2	23	082N011	290
Mature	Yes	CW	2	24	082N011	3183
Mature	No	CW	1	11	083D008	3322
Mature	Yes	CW	0	6	082L060	1061
Mature	No	CW	1	12	082M067	807
Mature	Yes	FD-P	2	58	082L090	57
Mature	No	FD-P	2	55	082M048	106
Mature	Yes	H	1	81	082N011	179
Mature	No	H	1	88	082M009	123
Mature	Yes	H	1	83	082M020	125
Mature	Yes	H	2	102	082M019	585

Mature	No	H	1	86	082M087	137
Mature	Yes	H	2	96	082L100	686
Mature	No	H	2	103	082M009	81
Mature	Yes	H	0	70	082M038	427
Mature	No	H	0	71	082M038	427
Mature	Yes	H	1	85	082M087	330
Mature	No	H	1	82	082M097	463
Mature	Yes	H	2	100	083D009	3215
Mature	No	H	0	68	082M038	63
Mature	Yes	H	1	79	082M019	404
Mature	No	H	2	99	082M029	206
Mature	Yes	H	2	104	082M087	113
Mature	No	H	2	105	082M057	1603
Mature	Yes	H	2	98	082M086	1139
Mature	No	H	1	87	082M048	160
Mature	Yes	H	2	95	082M048	151
Mature	No	H	2	97	082M030	440
Mature	Yes	H	2	101	082M058	68
Mature	No	H	2	94	083D007	274
Mature	Yes	Sp-BI	0	152	082L060	1044
Mature	No	Sp-BI	1	167	082M057	1333
Mature	Yes	Sp-BI	2	182	082M088	127
Mature	Yes	Sp-BI	2	183	082M096	1422
Mature	No	Sp-BI	1	170	082M009	287
Mature	Yes	Sp-BI	1	169	083D008	3288
Mature	No	Sp-BI	1	164	082N001	175
Mature	Yes	Sp-BI	2	178	082M099	3276
Mature	No	Sp-BI	1	165	082L060	1013
Mature	Yes	Sp-BI	2	186	082M097	361
Mature	No	Sp-BI	2	179	082M096	1292
Mature	Yes	Sp-BI	2	184	082M019	478
Mature	No	Sp-BI	2	185	082M097	297
Mature	Yes	Sp-BI	2	180	082M089	572
Mature	No	Sp-BI	2	181	082N021	201

NVAF Sample Selection List – NVAF Samples only

Class	Strata	Vol Class	Sample #	Basemap	Polygon #	Size
Mature	CW	0	4	082M077	432	6.9
Mature	CW	0	6	082L060	1061	9.68
Mature	CW	1	14	082N001	68	20.13
Mature	CW	1	15	082M067	190	10.67
Mature	CW	1	16	082M009	457	24.22
Mature	CW	2	22	083D009	3231	33.46
Mature	CW	2	24	082N011	3183	58.05
Mature	CW	2	28	082M057	1632	27.17
Immature	FD-P	0	41	082L100	71	16.88
Immature	FD-P	0	42	082M029	421	25
Immature	FD-P	1	51	082M010	163	17.98
Mature	FD-P	2	58	082L090	57	7.22
Mature	H	0	70	082M038	427	19.69
Mature	H	1	79	082M019	404	14.94
Immature	H	1	80	082N001	237	29.86
Mature	H	1	81	082N011	179	11.84
Mature	H	1	83	082M020	125	13.99
Mature	H	1	85	082M087	330	33.82
Mature	H	2	95	082M048	151	35.46
Mature	H	2	96	082L100	686	50.88
Mature	H	2	98	082M086	1139	15.29
Mature	H	2	100	083D009	3215	20.68
Mature	H	2	101	082M058	68	26.96
Mature	H	2	102	082M019	585	41.38
Mature	H	2	104	082M087	113	21.18
Inoperable	In-op	0	112	082M019	98	150.38
Inoperable	In-op	0	113	082M097	562	30.05
Inoperable	In-op	2	138	082M019	271	8.59
Inoperable	In-op	2	141	082M009	696	8.14
Immature	Sp-BI	0	150	082M038	90	9.75
Mature	Sp-BI	0	152	082L060	1044	3.17
Mature	Sp-BI	0	154	082L090	228	9.84
Mature	Sp-BI	0	155	082N021	196	26.3
Mature	Sp-BI	0	158	082M067	169	20.78

Mature	Sp-BI	1	163	082M009	37	103.7
Mature	Sp-BI	1	169	083D008	3288	28.18
Mature	Sp-BI	1	171	082M097	544	47.72
Mature	Sp-BI	1	172	082M057	1377	26.42
Mature	Sp-BI	2	178	082M099	3276	54.42
Mature	Sp-BI	2	180	082M089	572	33.72
Mature	Sp-BI	2	182	082M088	127	10.43
Mature	Sp-BI	2	183	082M096	1422	27.36
Mature	Sp-BI	2	184	082M019	478	24.23
Mature	Sp-BI	2	186	082M097	361	5.39

Revelstoke NVAF sample:

Overview:

Samples selected and cruised : 44

Of these 4 were deemed unsafe and not replaced. (annotated in spreadsheet)

Need to select 140 trees from 40 samples as described below

Stratum		# of trees	# of samples available
In-operable	Live	10	3
Operable	Immature Live	15	5
	Mature Live	105	32
	Dead	10	-
Total		140	40

Trees available

LV_D	sel_grp	spp_grp	available	selected
L	Imm	H	14	5
L	Imm	Ot	55	10
L	In-Op	Ot	41	10
L	Mat	B	59	14
L	Mat	C	109	28
L	Mat	H	169	45
L	Mat	Ot	81	18
D			91	10
total trees			619	140

Action:

To select 140 trees as specified. The immature trees were sub stratified to insure that a some Hemlock (33% of the VT landbase or 5 of 15 samples), are selected. As they comprise only 20% of the immature trees, it is unlikely that more than 3 would have been selected.

All trees were selected using a systematic unbiased process using SAS Proc surveyselect with a randomly chosen starting value generated by using the random function in MS/Excel

Information:

Initial Species Distribution:

LV_D	sel_grp	spp_grp	sp0	SPECIES	available	Need
L	Mat	B	B	BL	59	14
L	Mat	C	C	CW	109	28
L	Mat	H	H	HM	54	45
L	Mat	H	H	HW	115	
L	Mat	Ot	AC	ACT	1	18
L	Mat	Ot	F	FD	17	
L	Mat	Ot	F	FDI	1	
L	Mat	Ot	S	SE	62	
L	Imm	H	H	HW	14	5
L	Imm	Ot	AT	AT	1	10
L	Imm	Ot	B	BL	3	
L	Imm	Ot	C	CW	22	
L	Imm	Ot	F	FD	11	
L	Imm	Ot	PL	PL	7	
L	Imm	Ot	PW	PW	1	
L	Imm	Ot	S	SB	1	
L	Imm	Ot	S	SE	9	
L	In-Op	Ot	B	BL	12	
L	In-Op	Ot	C	CW	17	
L	In-Op	Ot	H	HM	9	
L	In-Op	Ot	S	SE	3	
D	Dead	Ot	AC	ACT	1	10
D	Dead	Ot	B	BL	27	
D	Dead	Ot	C	CW	10	
D	Dead	Ot	F	FD	6	
D	Dead	Ot	F	XC	7	
D	Dead	Ot	H	HM	4	
D	Dead	Ot	H	HW	10	
D	Dead	Ot	PL	P	1	
D	Dead	Ot	PL	PL	2	
D	Dead	Ot	PW	PW	5	
D	Dead	Ot	S	SE	18	

List is the of samples and the number of trees to be sampled

CLSTR_ID	Trees available	Trees selected
0271-0005-NO1	24	5
0271-0014-NO1	10	7
0271-0015-NO1	12	2
0271-0016-NO1	15	2
0271-0022-NO1	15	6
0271-0024-NO1	21	5
0271-0028-NO1	12	3
0271-0041-NO1	19	3
0271-0042-NO1	23	5
0271-0051-NO1	15	3
0271-0058-NO1	28	3
0271-0070-NO1	18	6
0271-0079-NO1	13	3
0271-0080-NO1	20	4
0271-0082-NO1	28	3
0271-0083-NO1	22	6
0271-0086-NO1	12	4
0271-0095-NO1	11	3
0271-0098-NO1	14	4
0271-0100-NO1	14	3
0271-0101-NO1	7	1
0271-0102-NO1	16	5
0271-0104-NO1	13	3
0271-0112-NO1	13	3
0271-0139-NO1	10	3
0271-0141-NO1	21	4
0271-0151-NO1	15	3
0271-0152-NO1	12	2
0271-0154-NO1	9	2
0271-0155-NO1	10	4
0271-0158-NO1	12	3
0271-0163-NO1	18	3
0271-0169-NO1	10	1
0271-0171-NO1	15	5
0271-0172-NO1	20	3
0271-0178-NO1	20	3
0271-0182-NO1	17	6
0271-0184-NO1	15	3
0271-0186-NO1	16	3

No trees are selected from sample 183.

List of trees selected

The list of trees is below:

clstr_id	samp_no	plot	tree_no	lv_d	s_f	dbh	tree_len	species	spp_grp	sel_grp
0271-0005-NO1	0005	E	008	L	S	21	15.5	HW	H	Mat
0271-0005-NO1	0005	N	004	D	S	52	27.8	HW	Ot	Dead
0271-0005-NO1	0005	S	006	L	S	42	29.1	HW	H	Mat
0271-0005-NO1	0005	W	005	L	S	48	18.5	CW	C	Mat
0271-0005-NO1	0005	W	006	L	S	24	27.6	HW	H	Mat
0271-0014-NO1	0014	N	002	L	S	45	33.2	HW	H	Mat
0271-0014-NO1	0014	N	004	L	S	41	34.5	HW	H	Mat
0271-0014-NO1	0014	N	006	L	S	96	44	FDI	Ot	Mat
0271-0014-NO1	0014	N	008	L	F	67	27	CW	C	Mat
0271-0014-NO1	0014	S	002	L	S	47	29.9	HW	H	Mat
0271-0014-NO1	0014	S	003	L	S	41	27.3	CW	C	Mat
0271-0014-NO1	0014	S	005	L	S	34	24	HW	H	Mat
0271-0015-NO1	0015	E	001	L	S	106	36.7	CW	C	Mat
0271-0015-NO1	0015	W	003	L	S	83	32.6	CW	C	Mat
0271-0016-NO1	0016	E	013	L	S	17	6	HM	H	Mat
0271-0016-NO1	0016	S	001	L	S	88	35.8	BL	B	Mat
0271-0022-NO1	0022	N	001	L	S	68	36.4	HW	H	Mat
0271-0022-NO1	0022	N	004	L	S	54	27.6	HW	H	Mat
0271-0022-NO1	0022	N	007	L	S	86	35.1	CW	C	Mat
0271-0022-NO1	0022	W	002	L	S	115	40.1	CW	C	Mat
0271-0022-NO1	0022	W	005	L	S	91	49	SE	Ot	Mat
0271-0022-NO1	0022	W	006	L	S	97	36.9	CW	C	Mat
0271-0024-NO1	0024	N	004	L	S	110	35.7	CW	C	Mat
0271-0024-NO1	0024	S	003	L	S	30	12	CW	C	Mat
0271-0024-NO1	0024	S	010	L	S	78	28.6	CW	C	Mat
0271-0024-NO1	0024	W	005	L	S	29	8	HW	H	Mat
0271-0024-NO1	0024	W	010	L	S	121	32.6	CW	C	Mat
0271-0028-NO1	0028	E	001	L	S	77	35.3	CW	C	Mat
0271-0028-NO1	0028	S	001	L	S	100	41.7	CW	C	Mat
0271-0028-NO1	0028	S	005	L	S	88	42.7	CW	C	Mat
0271-0041-NO1	0041	N	002	L	S	18	17.8	FD	Ot	Imm
0271-0041-NO1	0041	N	004	L	S	23	19	FD	Ot	Imm
0271-0041-NO1	0041	W	002	L	S	31	21.8	PL	Ot	Imm
0271-0042-NO1	0042	E	002	L	S	94	37.5	CW	Ot	Imm
0271-0042-NO1	0042	N	002	L	S	22	16.7	FD	Ot	Imm
0271-0042-NO1	0042	N	010	D	S	45	26.5	CW	Ot	Dead
0271-0042-NO1	0042	S	006	L	S	76	33	CW	Ot	Imm
0271-0042-NO1	0042	W	009	L	S	27	17.3	CW	Ot	Imm
0271-0051-NO1	0051	E	001	L	S	44	32.8	HW	H	Imm
0271-0051-NO1	0051	N	004	D	S	58	35.1	PW	Ot	Dead
0271-0051-NO1	0051	W	002	L	S	22	19.2	HW	H	Imm

0271-0058-NO1	0058	E	006	L	S	33	22.8	CW	C	Mat
0271-0058-NO1	0058	N	002	L	S	57	44	FD	Ot	Mat
0271-0058-NO1	0058	N	004	L	S	42	33.5	CW	C	Mat
0271-0070-NO1	0070	E	006	L	S	50	19.9	HM	H	Mat
0271-0070-NO1	0070	E	007	L	S	26	15.2	HM	H	Mat
0271-0070-NO1	0070	E	008	L	S	44	17.3	HM	H	Mat
0271-0070-NO1	0070	E	012	L	S	39	19.4	HM	H	Mat
0271-0070-NO1	0070	N	004	L	S	19	9.6	HM	H	Mat
0271-0070-NO1	0070	S	002	L	S	35	17.7	HM	H	Mat
0271-0079-NO1	0079	S	003	L	S	161	34.4	CW	C	Mat
0271-0079-NO1	0079	S	005	L	S	141	34	CW	C	Mat
0271-0079-NO1	0079	W	002	L	S	202	33.1	CW	C	Mat
0271-0080-NO1	0080	E	004	L	S	41	33	CW	Ot	Imm
0271-0080-NO1	0080	N	001	L	S	40	36.2	HW	H	Imm
0271-0080-NO1	0080	W	002	L	S	57	45.4	HW	H	Imm
0271-0080-NO1	0080	W	006	L	S	36	36.1	HW	H	Imm
0271-0082-NO1	0082	N	003	L	S	48	33.6	HW	H	Mat
0271-0082-NO1	0082	N	009	L	S	35	27.7	FD	Ot	Mat
0271-0082-NO1	0082	W	001	L	S	36	28.6	HW	H	Mat
0271-0083-NO1	0083	E	001	L	S	92	20.9	HW	H	Mat
0271-0083-NO1	0083	E	003	L	S	57	20.8	CW	C	Mat
0271-0083-NO1	0083	N	003	L	S	52	36.2	HW	H	Mat
0271-0083-NO1	0083	N	005	L	S	79	36.5	HW	H	Mat
0271-0083-NO1	0083	S	001	L	S	61	15.7	HW	H	Mat
0271-0083-NO1	0083	W	005	L	S	85	27.8	HW	H	Mat
0271-0086-NO1	0086	N	004	L	S	53	23.7	HM	H	Mat
0271-0086-NO1	0086	N	006	L	S	55	26.8	HM	H	Mat
0271-0086-NO1	0086	W	003	L	S	66	24	HM	H	Mat
0271-0086-NO1	0086	W	005	L	S	61	23.5	HM	H	Mat
0271-0095-NO1	0095	E	002	L	S	59	33.7	CW	C	Mat
0271-0095-NO1	0095	E	003	L	S	60	36.5	CW	C	Mat
0271-0095-NO1	0095	S	004	L	S	71	35.6	HW	H	Mat
0271-0098-NO1	0098	E	002	L	S	56	22.4	HW	H	Mat
0271-0098-NO1	0098	N	002	L	S	85	12.1	HM	H	Mat
0271-0098-NO1	0098	N	005	L	S	76	26.6	HM	H	Mat
0271-0098-NO1	0098	N	006	L	S	76	36.1	HM	H	Mat
0271-0100-NO1	0100	N	004	L	S	21	19.8	SE	Ot	Mat
0271-0100-NO1	0100	W	002	L	S	27	14.1	HW	H	Mat
0271-0100-NO1	0100	W	004	L	S	94	24.7	HW	H	Mat
0271-0101-NO1	0101	W	003	L	S	32	14	HW	H	Mat
0271-0102-NO1	0102	E	002	L	S	38	22	CW	C	Mat
0271-0102-NO1	0102	N	007	L	S	109	32.5	FD	Ot	Mat
0271-0102-NO1	0102	S	002	L	S	133	36.2	CW	C	Mat
0271-0102-NO1	0102	S	003	L	S	103	30.6	HW	H	Mat
0271-0102-NO1	0102	W	002	L	S	54	23.7	CW	C	Mat
0271-0104-NO1	0104	E	001	L	S	65	38.9	HW	H	Mat
0271-0104-NO1	0104	N	001	L	S	62	42.5	HW	H	Mat
0271-0104-NO1	0104	W	001	L	S	46	23.6	HW	H	Mat
0271-0112-NO1	0112	E	001	L	S	33	11.1	HM	Ot	In-Op
0271-0112-NO1	0112	E	002	L	S	25	8.2	HM	Ot	In-Op

0271-0112-NO1	0112	E	005	L	S	13	5.8	HM	Ot	In-Op
0271-0139-NO1	0139	E	001	L	S	48	27.1	BL	Ot	In-Op
0271-0139-NO1	0139	E	004	L	S	92	39	BL	Ot	In-Op
0271-0139-NO1	0139	E	005	L	S	56	34	BL	Ot	In-Op
0271-0141-NO1	0141	S	001	L	S	158	35.4	CW	Ot	In-Op
0271-0141-NO1	0141	S	002	L	S	120	41.8	CW	Ot	In-Op
0271-0141-NO1	0141	S	004	L	S	102	34.2	CW	Ot	In-Op
0271-0141-NO1	0141	W	003	L	S	66	42.7	SE	Ot	In-Op
0271-0151-NO1	0151	E	004	L	S	56	30.2	SE	Ot	Imm
0271-0151-NO1	0151	S	002	D	S	27	13.8	BL	Ot	Dead
0271-0151-NO1	0151	S	005	L	S	37	18	SE	Ot	Imm
0271-0152-NO1	0152	E	003	L	S	32	17.1	SE	Ot	Mat
0271-0152-NO1	0152	N	007	L	S	41	24.4	SE	Ot	Mat
0271-0154-NO1	0154	N	004	L	S	75	30.1	SE	Ot	Mat
0271-0154-NO1	0154	W	003	L	S	35	21.4	BL	B	Mat
0271-0155-NO1	0155	E	001	L	S	40	22.4	BL	B	Mat
0271-0155-NO1	0155	E	003	L	S	39	23.1	BL	B	Mat
0271-0155-NO1	0155	W	003	L	S	63	33.1	SE	Ot	Mat
0271-0155-NO1	0155	W	004	L	S	71	31.4	SE	Ot	Mat
0271-0158-NO1	0158	W	001	D	S	80	10.3	BL	Ot	Dead
0271-0158-NO1	0158	W	003	L	S	68	17.2	BL	B	Mat
0271-0158-NO1	0158	W	004	L	S	52	31.6	BL	B	Mat
0271-0163-NO1	0163	N	004	L	S	58	22.3	SE	Ot	Mat
0271-0163-NO1	0163	S	004	D	S	17	6.3	BL	Ot	Dead
0271-0163-NO1	0163	W	003	L	S	43	24.8	BL	B	Mat
0271-0169-NO1	0169	E	006	L	S	44	27.5	BL	B	Mat
0271-0171-NO1	0171	E	004	L	S	68	35.3	SE	Ot	Mat
0271-0171-NO1	0171	E	005	D	S	35	23.3	BL	Ot	Dead
0271-0171-NO1	0171	E	007	L	S	51	31.7	BL	B	Mat
0271-0171-NO1	0171	N	001	D	S	67	26.3	SE	Ot	Dead
0271-0171-NO1	0171	W	001	L	S	17	13.2	BL	B	Mat
0271-0172-NO1	0172	E	001	L	S	83	37.9	SE	Ot	Mat
0271-0172-NO1	0172	N	007	L	S	56	15.6	BL	B	Mat
0271-0172-NO1	0172	W	005	L	S	34	24.4	BL	B	Mat
0271-0178-NO1	0178	E	004	L	S	27	23.2	BL	B	Mat
0271-0178-NO1	0178	N	001	L	S	102	27.1	SE	Ot	Mat
0271-0178-NO1	0178	S	001	D	S	103	47	SE	Ot	Dead
0271-0182-NO1	0182	E	002	D	F	32	19	BL	Ot	Dead
0271-0182-NO1	0182	E	003	L	S	62	30.1	CW	C	Mat
0271-0182-NO1	0182	E	006	L	S	71	34.6	HW	H	Mat
0271-0182-NO1	0182	S	001	L	S	58	30	HW	H	Mat
0271-0182-NO1	0182	S	002	L	S	23	12.9	CW	C	Mat
0271-0182-NO1	0182	W	001	L	S	40	19.7	HW	H	Mat
0271-0184-NO1	0184	E	002	L	S	112	40.4	HM	H	Mat
0271-0184-NO1	0184	E	004	L	S	82	35.4	HM	H	Mat
0271-0184-NO1	0184	N	005	L	S	50	26	SE	Ot	Mat
0271-0186-NO1	0186	N	007	L	S	29	9.5	BL	B	Mat
0271-0186-NO1	0186	W	001	L	S	53	32.6	SE	Ot	Mat
0271-0186-NO1	0186	W	002	L	S	47	30.8	SE	Ot	Mat