Lakes Morice IFPA

Timber Emphasis
VRI Ground Sampling
Project Implementation Plan

DRAFT1

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EXECUTIVE SUMMARY

This is a VRI Ground Sampling Project Implementation Plan (VPIP) for the VRI in the Lakes Morice IFPA. This preliminary plan was prepared by Resources Inventory Branch after discussions with Larry MacCullough, who is a consultant working for the IFPA stakeholders. The purpose of this plan is to provide a summary of the minimum number of VRI ground sampling plots and cost estimates. This information may be used by the IFPA group to assist in long term IFPA budgeting. This plan was not prepared using the standard VRI planning process (development of a Strategic Inventory Plan /VSIP) and therefore it is recommended that prior to any formal ground sampling activities, this plan should be reviewed by the stakeholders to ensure it meets their business needs.

The recommended minimum target population is the Vegetated Treed (VT) portion of the Lakes/ Morice IFPA. Stakeholders should decide if they wish to include private lands, Parks and other legally recognized Protected Areas and woodlots in the sample population. Sample polygons should be selected over the entire target population using stratified probability proportional to size with replacement (PPSWR) sampling, with the strata based on forest type (leading-species groups) and total polygon volume. NVAF and WPV sampling should be also be completed. The estimated total cost of the ground sampling VRI inventory is approximately $369,000. This cost includes, ground sample project plan review (this plan), sample selection, installation of the VRI sample clusters, NVAF, WPV, quality assurance and statistical analysis.

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1. INTRODUCTION

1.1 Background

This VRI Project Implementation Plan (VPIP) outlines ground sampling activities for the timber emphasis VRI in the Lakes/Morice IFPA. It is assumed the stakeholders are primarily interested in timber volume related attributes and therefore do not wish to collect the full suite of ecological data available in the VRI. The Ministry of Forests (MOF) Resources Inventory Branch (RIB) prepared this VPIP in consultation with Larry McCullough of Laing and McCullough Forest Management Services and Ministry of Forests Regional and District staff. Lakes/Morice IFPA stakeholders did not formally agree to this plan as per the standard VRI planning process. A glossary of terms is provided in Appendix A.

1.2 Rationale

The IFPA stakeholders have agreed to begin a retrofit VRI photointerpreation inventory for the Lakes/Morice IFPA. This inventory will change the current inventory attributes such as volume and species composition. When complete, it is assumed the new information will improve the inventory estimates, however this assumption must be tested by establishing a minimum number of timber emphasis ground samples. These samples could then be used to check and adjust the strata level attribute totals using inventory standard VRI adjustment protocols.

2. SAMPLING PLAN

2.1 Overview

The landbase area, species distribution information included in this section is summarized from the most recent Lakes and Morice timber supply analysis. It represents the timber harvesting land base and does not necessarily represent the entire forested, or vegetated treed land base that is recommended for standard sample selection. Prior to development of a final ground sample plan, the correct area figures and potentially revised plot distribution summaries must be verified.

Additional information is presented here for easy reference and includes, assumed inventory objectives, target population, sample size and selection, and the VRI tools to be used.

2.2 Landbase

The total Lakes/ Morice IFPA (based on TSR THLB summaries) is approximately 1,869,786 ha). The main tree species in the IFPA are pine (61%), spruce (21%), balsam /fir (13%), and deciduous (mostly aspen; 5%)

2.3 Inventory Objectives

The main objective of the timber emphasis inventory is to:

> *Install an adequate number of VRI sample clusters to verify and adjust the timber inventory in the Lakes/Morice IFPA Vegetated Treed (VT) areas and to achieve a sampling error of ±10% (95% probability) for overall net timber volume in the VT areas..*

Net timber volume is gross volume minus stumps, tops, decay, waste, and breakage. Decay and waste are normally estimated using VRI call grading/net factoring and NVAF sampling. If NVAF is not completed in this management unit, the 1976 MOF Forest Inventory Zone Decay, Waste and Breakage factors will be used to net down gross merchantable volume. It should be noted that these factors may be incorrect, which would provide an inaccurate assessment of merchantable volume.

2.4 Target Population

The target population is the VT portion of the IFPA. It is recommended that the new VRI, MoF standard, retrofitted photo-interpreted inventory file be sampled. For the purposes of this draft sampling plan, this area to be sampled is assumed to be 1,869,786 ha.

2.5 Sample Size

To meet the inventory objectives (section 2.3), a minimum sample size of 113 VRI sample clusters is recommended. (Table 1). This sample size will provide a sampling error slightly less than 10% @ the 95% level of probability for the entire population. It is recommended that these samples are distributed amongst the largest strata represented in the management unit. This distribution should provide the minimum number of samples required for reliable strata level adjustments.

It should be noted however that this sample distribution does not identify deciduous stands, that represent approximately 5% of the

Table 1. Sample cluster distribution in the (assumed) VT landbase.

Landbase	Area (%)	Number of clusters
Pine	65	73
Spruce	22	25
Balsam/fir	*13*	*15*
Total	*100*	*113*

population, as an individual strata. Due the weighting requirements of the PPSWR sample selection process, if decidious stands are to sampled as an individual strata, the total sample size increases to 300 plots. The sample plot distribution would then become pine (61%) 184 samples, Spruce (21%) 63 samples, balsam/fir (13%) 38 samples and decidious (5%) 15 samples. The additional samples are based on the requirement for a minimum sample sample size per strata of 15.

Figure 1 is included to demonstrate the impact of reducing overall target sampling error and the impact of sample size, assuming a CV of 50%. The CV for the Morice/Lakes IFPA was assumed to be 49% based on the inventory audit analysis.

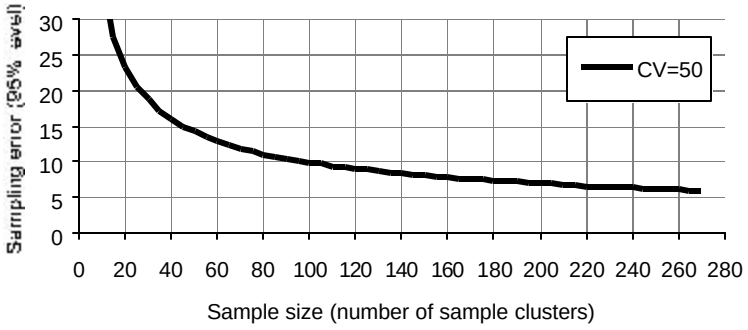

Figure 1. Decreasing sampling error with increasing sample size.[1]

2.6 Sample Selection

When the retrofit inventory is complete, the sample polygons must be selected using the new stratified probability proportional to size with replacement (PPSWR) sample selection method. Stratification should be based on leading species and polygon volume per hectare. Sample allocation to individual leading-species strata and substrata must be proportional to strata or sub-strata areas. PPSWR must be applied to each sub-stratum. The final ground samples must be compared to the reported VT population to ensure a correct representative sample has been selected. Prior to the start of ground sampling , the sample comparison summary and other project plan logistics must be approved by MoF RIB and regional staff.

2.7 Measurements

VRI certified crews must be used to gather data – measuring timber attributes - following the current VRI *Ground Sampling Manual*. For the purposes of this draft plan it assumed that timber only attributes are

[1]The CV, or coefficient of variation, is estimated from the inventory audit data.

being measured. Stakeholders should review the ground sampling procedures and decide if other (ecological, coarse woody debris etc) measurements are of benefit.

2.8 Net Volume Adjustment Factor Sampling

NVAF sampling involves detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimated net volume is obtained from net factoring and taper equations). NVAF data is used to adjust the estimated net tree volume to account for hidden decay and possible taper equation bias (e.g. in pine stands). The recommended minimum sample size is sixty trees (50 live, 10 dead) selected from 15 VT polygons (selected at random from the Phase II sample clusters). The trees are destructively sampled for NVAF. Stakeholders may wish to consider expanding this sample size if species/age specific business issues merit the expense.

This sampling is optional, however, the NVAF sample design is recommended as the existing 1976 loss factors and tree taper models may be in error.

2.9 Within Polygon Variation Sampling

WPV sampling provides information to estimate individual polygon error, assessed as the difference between adjusted polygon value and "true" value for that polygon based on intensive sampling of sample polygons. Typically, 20-30 polygons selected from a target population are intensively cruised using a combination of 20-50 full measure and count plots per sample polygon. This plan assumes that WPV sampling will be undertaken.

3. IMPLEMENTATION PLAN

3.1 Overview

It is recommended the stakeholders adopt a two-stage approach to implement the timber emphasis VRI. Stage 1 requires the stakeholders review this plan to ensure it meets their business needs. Following this review and the completion of the retrofitted VRI photointerpreted inventory the samples should be selected. The second stage involves installing sample clusters in the target VT population.

3.2 Schedule

A suggested schedule:

1. Select the sample polygons(Resources Inventory Branch *may* be able to perform this process or at the very least provide assistance).
2. Prepare and submit a VPIP (this Plan) for approval by the stakeholders. (stakeholders/RIB review)
3. Select sample locations in polygons using GIS. (stakeholders)
4. Prepare sample packages; each to include photo stereo-pair for access, document photo photocopies, sample cluster location map (1:10,000), and access maps (1:20,000) (stakeholdsers).
5. Decide whether NVAF sampling is to take place. (stakeholders)
6. Tender and select contract crews, and award contracts. (stakeholders)
7. Select at random a sub-sample of sample polygons for NVAF sampling from the sample clusters; identify these NVAF sample polygons and ensure they are sampled early in the field season, to enable sample tree selection (stakeholders).
8. Locate and measure the sample clusters in the first batch; enter and edit the data (Field contract crew). The Prince Rupert Forest region or independent contractor should spot-check the data (compare field card data to the entered data).
9. Conduct quality assurance (10% check) (PG Forest Region or QA contractor).
10. Sample NVAF sample clusters (Expert Cruiser)
11. Complete stem analysis (Contract crew).
12. Validate and compile data from completed sample clusters and prepare inventory summary reports (Resources Inventory Branch).
13. Conduct statistical analysis and adjust inventory files (if necessary) prior to timber supply analysis (Analysis to be completed by contractor / RIB to review and adjust base VIF inventory files).

3.3 Sample Packages

Field sample packages should include most current photo stereo-pairs for access, copy of document photo (where possible), sample cluster location maps (1:10,000), and access maps (1:20,000) clearly indicating sample cluster location and polygon boundaries; and overview maps (1:250,000) for general polygon location. Maps will be plotted showing the VRI grid overlays and selected sample locations. Sample locations within a polygon will be selected using GIS.

3.4 Project Support

The MOF may provide aluminum stakes, field maps, photos, and field cards to the contract crews. Provision of other equipment such as GPS will be the responsibility of the contract crews.

3.5 Fieldwork

Fieldwork will be completed using VRI measurement protocols and VRI certified crews (timber and potentially ecology). The VRI Card Types 1-3 and 8-11 should be completed to address timber emphasis only issues using the VRI Ground Sampling version 4 or later. Cards types 6&7 should be used to collect coarse woody debris information, card type 12 for site series data and card type 16 for old growth.

3.6 Quality Assurance

Quality assurance must be conducted. The VRI quality assurance standards require inspection of at least 10% of the samples. The field crews are responsible for the quality control of their own work.

3.7 Data Compilation, Analysis, and Adjustment

The Resources Inventory Branch will complete data compilation; contract field crews will do data entry. The Resources Inventory Branch will review the statistical analysis and perform the final database adjustment.

3.8 Roles and Responsibilities*s*

General:

- Select or review the sample polygons (Resources Inventory Branch).
- Select sample locations within polygons (contractor).
- Prepare all sample packages (contractor)
- Mentor NVAF crews (Resources Inventory Branch/contractor) (Optional).
- Conduct NVAF quality assurance (Resources Inventory Branch/contractor)
- Conduct sample cluster quality assurance (contractor / PRupert Forest Region/contractor)
- Check data after initial compilation (contractor / PR Forest Region).
- Validate and compile data (Resources Inventory Branch).
- Provide inventory attribute files (RIB or contractor)
- Minimum standards for statistical analysis (Resources Inventory Branch).
- Prepare and sign-off Standards Agreement and Schedule A (Agreement between IFPA stakeholders and the MOF Prince Rupert Regional Office).
- Award fieldwork contracts (IFPA stakeholders)

- Provide mentor for field crews at the start of fieldwork. (RIB, PRupert region or contractor.
- Coordinate project activities, and ensure all contractors are qualified and certified; and tender and manage fieldwork contracts (contractor/IFPA stakeholders).
- Assess access and coordinate the use of helicopters (contractor) .
- Identify access routes and potential tie points (contractor / MoF District staff).
- Ensure sample packages are assembled and complete (contractor)
- Ensure quality assurance (QA) is complete (PG Forest Region/IFPA stakeholders).

Field work contractors

- Complete field sampling.
- Conduct internal quality control.
- Enter the sample data.

Check-cruiser (contractor or PRupert Forest Region)

- Complete QA work for 10% of the VRI samples, and issue quality certificates.
- Complete call grading/net factoring of the NVAF samples (contractor) (*optional*).
- Enter the sample data.
- Prepare the QA report.

3.9 Approximate Costs

Estimated sample sizes and costs for the spruce stratum are listed in Table 2. The estimated total cost is 369,000.

Table 2. Estimated minimum sample sizes and costs for the timber emphasis VRI in the Lakes/Morice IFPA.

VRI Activity	Sample size	Unit Cost($)	Total Cost ($)
Revise Ground PIP (potential cost)	1	3000	3000
Sample selection (potential cost)	1	5000	5000
Sample Clusters (TEP only)	113 samples	2000	226,000
NVAF	60 trees	500	30,000
WPV	30 polygons	2500	75000
QA/contract admin (potential cost)	1	20,000	20000
Analysis	1	10,000	10000
Total			*369,000*

3.10 Monitoring

The RIB is responsible for monitoring this VPIP and its approval.

4. APPENDIX A – GLOSSARY OF TERMS

District-wide VRI

This is synonymous with provincial VRI; see Provincial VRI.

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. Sample polygons are selected proportional to their area from a sorted list. To accommodate a 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 the provincial VRI, the inventory unit is the Forest District, which includes the timber harvesting landbase, parks, recreational areas, private, and federal lands. For management inventories, the inventory unit is a subset of the provincial VRI inventory unit that focuses on a geographic area or specific attribute set, depending upon sampling objectives.

Landcover Classification

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

Management VRI

Management VRI are specialized inventories that provide detailed information required for specific resource management, i.e., day-to-day forest management. One or more VRI sampling procedures may be used for management inventories. Management inventories may focus on specific resource types (e.g., timber, range, ecology), geographic areas (e.g., landscape unit, TFL), attribute sets (e.g., Douglas-fir

leading stands, age class 4+). They may use one or more of the following tools (e.g., photo-interpretation, ground sampling, NVAF sampling).

National Forest Inventory (NFI)

The NFI provides information on Canada's resources across all provinces and allows the Federal Government a consistent framework for reporting on Canada's inventory. The inventory unit for the NFI is the entire country, although it is implemented province-by-province.

Net Volume Adjustment Factor (NVAF) Sampling

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

Photo-Interpretation

Photo-interpretation involves subjective delineation of polygons and photo estimation of attributes for all polygons in an inventory unit. Medium scale aerial photographs (1:15,000) are most often used in photo-interpretation. However, if existing photo-based inventory is acceptable, the database can be translated into VRI format and upgraded to include the additional VRI attributes.

Post-Stratification

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

Pre-Stratification

Pre-stratification divides 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 special characteristics of each stratum.

PPSWR (Probability Proportional to Size With Replacement)

This is a sample selection method in which samples (polygons) are selected with probability proportional to their size. That is, the larger polygons have a higher chance of being included in the sample.

Provincial VRI

The provincial VRI provides baseline data for provincial inventory reporting, monitoring, and research. All sampling procedures from the VRI toolbox are used for this inventory at the Forest District level. The databases generated from each District inventory will be compiled to create the provincial VRI database. The provincial VRI has also been referred to in the past as the District VRI.

Resource-Specific Interpretations

Resource-Specific Interpretations (RSI) use the Resource Inventory Committee (RIC) standard VRI baseline data products (provincial VRI or management inventory), in combination with other data sets and analysis (outside of that required to produce VRI), to produce information to address specific-resource management issues (e.g., TSR review, important ecosystems, important habitats). These interpretations include ecosystem interpretations and habitat interpretations.

Retrofit

Retrofitting is the process of translating and upgrading an existing photo-based inventory to VRI standards. If the polygon linework and attributes are of acceptable quality, the existing FIP (Forest Inventory Planning) databases are translated to VIF (Vegetation Inventory Files) databases and the additional attributes required by the VRI are re-estimated from aerial photographs.

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.

Statistical Analysis

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

Sub-unit

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

Target Precision

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

Vegetation Resources Inventory (VRI)

VRI is an improved vegetation inventory process for assessing 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.
- *WPV Sampling*: intensive sampling of selected polygons to determine the error between the estimated attribute values and the "true" attribute values.
- *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 the entire province (provincial VRI) measuring timber and non-timber resources, or over a large management unit (management VRI) measuring selected resources in specific portions of the landbase. The VRI sampling process produces spatial and non-spatial databases that can be used in multiple resource management applications including timber, ecosystem, and wildlife habitat management.

Within Polygon Variation Sampling

WPV sampling provides information for expressing the true individual polygon error, assessed as the difference between the adjusted polygon value and the "true" value for that polygon. The "true" value for

the polygon is an estimate derived from a small sample of polygons that are intensively sampled on the ground.

5. APPENDIX B - SAMPLE SELECTION

[Dr. Sam Otukol, MOF Resources Inventory Branch, provided the text in this appendix.]

The data inventory data (population list) for Prince George District is now ready for sample selection. The VRI sampling plan for this district has unique characteristics. It calls for the implementation of the district VRI (full VRI), and 60 samples are allocated to this task. Then it requires the implementation of a timber-emphasis sample, using 120 samples. The plan identifies spruce as a stratum of special interest, and requires that 45 samples be established there.

The following steps should be followed in the sample selection process:

1. Assemble all polygons constituting the population eligible for sample selection.
2. Classify the population list into the following strata and substrata:
   a) non vegetated polygons(N_V)
   b) vegetated non-treed polygons (V_N_T)
   c) vegetated tree polygons (V_T)
      i) within the V_T stratum stratify by leading species
      ii) within each leading species, sub-stratify polygons by size of average volume/ha
3. Compute total area of all polygons belonging to each of the strata, and sub-strata specified above.
4. Determine sample allocation for the 60 district VRI samples for all strata
5. For the V_T stratum, determine sample allocation for 120 TEP samples.
6. For the spruce stratum, sum the allocations based on the district VRI and the allocation based on the TEP sample. Determine how many additional samples are required to make up the required 45 samples.
7. For the other species, sum the district VRI and the TEP sample allocations.
8. After obtaining total allocations, select the specified samples from each of the strata listed in 2 above. This can be accomplished in one SAS run. Alternatively, it can be accomplished in two SAS runs, one for the Non Vegetated and vegetated non-treed, and the second for the vegetated treed.
9. After the selection, a random selection process should be used to determine district VRI samples in among the TEP samples.
10. Within the spruce stratum, a random selection process should be used to identify the additional samples that were required to make up the allocated 45 samples.

In step #8 the selection of samples should be proportional to polygon area. The process takes place as follows:

a) create a new attribute in the population data to contain accumulated polygon areas.
    i) For the N_V and V_N_T strata, the accumulation should be undertaken separately for each of the two strata. The accumulation should be from the first to the last polygon in the stratum.
    ii) For the V_T, the accumulation should be by "volume class" within each leading species.
b) Using the sample allocations determined in step 7 above, generate random numbers between 0 and the total area of a volume class of interest. The number of random numbers should be equal to the number of allocated samples.
c) The random numbers and the accumulated polygon areas will identify the sample polygons. A polygon is selected if a generated random number is larger than the accumulated area of the polygon preceding it, but is smaller or equal to its own accumulated area.
d) A file of selected polygons is created.

These steps describe the complete process for sample selection for Prince George District. Please contact me (Sam Otukol) if there are steps that need clarification.

6. APPENDIX C – EXAMPLE : LIST OF SAMPLE POLYGONS

Sample # -	Leading Species	Area (ha)	BCLCS	MAP_NO	POLYGON
254	S	85.88	VTUTCOP	093i016	0255
250	S	30.44	VTUTCOP	093j006	0857
55	S	67.80	VTUTCSP	093j076	0083
256	S	41.72	VTUTCOP	093h086	0234
271	S	22.36	VTUTCOP	093g060	0669
246	S	67.20	VTUTMSP	093h051	0489
248	SB	20.20	VTWTCOP	093j067	0347
258	S	29.76	VTUTCOP	093h096	0280
261	SW	79.68	VTUTCSP	093j059	0489
255	S	47.32	VTUTCOP	093o010	0309
67	S	144.48	VTUTCOP	093h035	0163
56	S	114.80	VTUTCSP	093i004	0278
266	S	44.80	VTUTCOP	093h044	0381
252	S	293.76	VTUTCSP	093h054	0243
272	S	5.20	VTUTCOP	093j097	0698
243	S	10.48	VTUTCSP	093j080	0328
247	S	34.16	VTUTCSP	093i024	0529
60	SW	2.32	VTUTCOP	093j086	0061
257	SW	22.36	VTUTCOP	093j048	0829
62	S	218.76	VTUTCOP	093i044	0336
57	SW	9.36	VTUTCSP	093j063	0273
270	S	28.76	VTUTCOP	093g058	0535
265	SW	7.08	VTUTCOP	093j068	0175
262	S	18.00	VTUTCOP	093h062	0444
251	S	47.88	VTUTCSP	093h042	0340
66	S	7.64	VTUTCOP	093j016	0392
65	S	59.88	VTUTCOP	093i033	0417
61	S	8.04	VTUTCDE	093j073	0184
69	SW	14.96	VTUTMOP	093j047	0627
58	S	279.12	VTUTCOP	093i051	0263
68	SW	21.88	VTUTCOP	093j096	0224
53	S	35.64	VTUTCSP	093i014	0729
245	S	157.40	VTUTCSP	093o019	0322
267	S	21.60	VTUTCOP	093g089	0090

Sample # -	Leading Species	Area (ha)	BCLCS	MAP_NO	POLYGON
51	S	23.88	VTUTCSP	093i014	0030
264	S	31.16	VTUTCOP	093h085	0526
63	S	90.12	VTUTCOP	093h062	0214
54	S	184.52	VTUTCSP	093i033	0140
253	S	121.52	VTUTCOP	093h055	0195
259	S	55.40	VTUTCSP	093j083	0181
269	S	21.92	VTUTCOP	093h094	0389
52	SW	33.76	VTUTCSP	093i007	0301
244	S	6.52	VTUTCSP	093j067	0806
263	S	53.48	VTUTCOP	093h032	0202
260	S	39.24	VTUTCOP	093h081	0380
70	S	146.84	VTUTCOP	093i061	0254
249	S	67.24	VTUTCSP	093j036	0942
59	S	46.88	VTUTCOP	093o018	0376
268	S	24.72	VTUTCOP	093g084	0142

7. APPENDIX D:EXAMPLE : LIST OF ALL SAMPLES IN THE VT LANDBASE

Observ. #	Map#	Poly. #	Stratum
1	093g034	0485	vt pine vol.cls 2
2	093g042	0151	TEP Pine Vol.cls 2
3	093g043	0449	TEP Pine Vol.cls 2
4	093g044	0141	vt pine vol.cls 2
5	093g044	0178	TEP Pine Vol.cls 2
6	093g044	0965	TEP Pine Vol.cls 2
7	093g045	0406	TEP Pine Vol.cls 2
8	093g054	0332	TEP Pine Vol.cls 2
9	093g055	0642	TEP Pine Vol.cls 0
10	093g058	0535	TEP Spruce Vol.cls 2
11	093g059	0147	TEP Balsam Vol.cls 1
12	093g060	0669	TEP Spruce Vol.cls 2
13	093g060	0825	TEP Balsam Vol.cls 0
14	093g064	0614	vt pine vol.cls 2
15	093g069	0122	TEP Balsam Vol.cls 0
16	093g074	0694	vt pine vol.cls 1
17	093g075	1055	TEP Pine Vol.cls 1
18	093g080	0047	TEP Pine Vol.cls 1
19	093g080	0300	TEP Pine Vol.cls 0
20	093g084	0142	TEP Spruce Vol.cls 2
21	093g086	0301	TEP Pine Vol.cls 1
22	093g089	0090	TEP Spruce Vol.cls 2
23	093g089	0848	TEP Pine Vol.cls 0
24	093g090	0740	vt pine vol.cls 2
25	093g096	0196	vt Decid vol.cls 0
26	093g097	0430	TEP Decid Vol.cls 0
27	093g098	0214	vt Decid vol.cls 2
28	093g100	0680	TEP Decid Vol.cls 0
29	093h032	0202	TEP Spruce Vol.cls 2
30	093h035	0163	vt spruce vol.cls 2
31	093h042	0340	TEP Spruce Vol.cls 0
32	093h044	0381	TEP Spruce Vol.cls 2
33	093h045	0267	vt balsam vol.cls 2
34	093h051	0489	TEP Spruce Vol.cls 0
35	093h052	0203	TEP Balsam Vol.cls 1
36	093h054	0243	TEP Spruce Vol.cls 0
37	093h055	0195	TEP Spruce Vol.cls 1
38	093h062	0214	vt spruce vol.cls 2

Observ. #	Map#	Poly. #	Stratum
39	093h062	0444	TEP Spruce Vol.cls 2
40	093h064	0209	vt balsam vol.cls 2
41	093h065	0440	TEP Balsam Vol.cls 2
42	093h071	0027	vt balsam vol.cls 2
43	093h071	0890	TEP Balsam Vol.cls 2
44	093h072	0406	vt pine vol.cls 0
45	093h079	0471	TEP Balsam Vol.cls 1
46	093h081	0380	TEP Spruce Vol.cls 1
47	093h082	0585	vt balsam vol.cls 2
48	093h085	0526	TEP Spruce Vol.cls 2
49	093h086	0234	TEP Spruce Vol.cls 1
50	093h086	0369	TEP Balsam Vol.cls 2
51	093h087	0112	TEP Balsam Vol.cls 2
52	093h089	0301	vt balsam vol.cls 1
53	093h092	0784	TEP Decid Vol.cls 2
54	093h094	0068	vt balsam vol.cls 2
55	093h094	0389	TEP Spruce Vol.cls 2
56	093h096	0280	TEP Spruce Vol.cls 1
57	093i004	0278	vt spruce vol.cls 0
58	093i005	0462	vt pine vol.cls 1
59	093i006	0104	vt balsam vol.cls 0
60	093i007	0301	vt spruce vol.cls 0
61	093i014	0030	vt spruce vol.cls 0
62	093i014	0729	vt spruce vol.cls 0
63	093i016	0255	TEP Spruce Vol.cls 1
64	093i017	0224	TEP Balsam Vol.cls 0
65	093i024	0529	TEP Spruce Vol.cls 0
66	093i031	0218	TEP Balsam Vol.cls 2
67	093i032	0084	TEP Balsam Vol.cls 2
68	093i033	0140	vt spruce vol.cls 0
69	093i033	0417	vt spruce vol.cls 2
70	093i035	0306	TEP Balsam Vol.cls 1
71	093i044	0336	vt spruce vol.cls 1
72	093i046	0143	vt balsam vol.cls 1
73	093i051	0263	vt spruce vol.cls 1
74	093i061	0254	vt spruce vol.cls 2
75	093i062	0032	vt balsam vol.cls 0
76	093i063	0144	TEP Balsam Vol.cls 0
77	093i072	0140	TEP Balsam Vol.cls 1
78	093j006	0857	TEP Spruce Vol.cls 0
79	093j013	0663	vt pine vol.cls 1

Observ. #	Map#	Poly. #	Stratum
80	093j014	0122	TEP Pine Vol.cls 1
81	093j014	0800	vt pine vol.cls 0
82	093j015	0694	vt Decid vol.cls 0
83	093j016	0392	vt spruce vol.cls 2
84	093j023	0800	vt Decid vol.cls 1
85	093j025	0856	TEP Pine Vol.cls 0
86	093j035	0771	TEP Pine Vol.cls 0
87	093j035	0886	vt pine vol.cls 1
88	093j036	0942	TEP Spruce Vol.cls 0
89	093j037	0221	vt pine vol.cls 2
90	093j045	0981	vt pine vol.cls 0
91	093j047	0627	vt spruce vol.cls 2
92	093j047	0729	TEP Pine Vol.cls 1
93	093j047	0769	TEP Pine Vol.cls 0
94	093j048	0829	TEP Spruce Vol.cls 1
95	093j052	0423	TEP Pine Vol.cls 2
96	093j056	0549	TEP Balsam Vol.cls 0
97	093j059	0489	TEP Spruce Vol.cls 1
98	093j063	0273	vt spruce vol.cls 1
99	093j067	0347	TEP Spruce Vol.cls 0
100	093j067	0806	TEP Spruce Vol.cls 0
101	093j068	0175	TEP Spruce Vol.cls 2
102	093j073	0184	vt spruce vol.cls 1
103	093j074	0465	TEP Pine Vol.cls 1
104	093j076	0083	vt spruce vol.cls 0
105	093j076	0338	TEP Decid Vol.cls 1
106	093j080	0328	TEP Spruce Vol.cls 0
107	093j080	0659	TEP Balsam Vol.cls 2
108	093j083	0181	TEP Spruce Vol.cls 1
109	093j086	0061	vt spruce vol.cls 1
110	093j088	0640	TEP Decid Vol.cls 1
111	093j096	0224	vt spruce vol.cls 2
112	093j097	0698	TEP Spruce Vol.cls 2
113	093j098	0230	vt pine vol.cls 0
114	093o010	0309	TEP Spruce Vol.cls 1
115	093o018	0109	vt balsam vol.cls 1
116	093o018	0376	vt spruce vol.cls 1
117	093o018	0421	vt balsam vol.cls 0
118	093o018	0551	TEP Balsam Vol.cls 1
119	093o019	0109	vt balsam vol.cls 1

120 093o019 0322 TEP Spruce Vol.cls

8. APPENDIX E – EXAMPLE : COMPARISON BETWEEN THE POPULATION AND THE SAMPLE POLYGONS

This **example** of comparison is for the entire VT sample (Appendix D). The sample (% number of sample polygons) appears representative of the target VT population (% area) in terms of site index and age class profiles (Figure 2). The total number of sample polygons is 120 and the total area of the population is 2,184,046 ha.

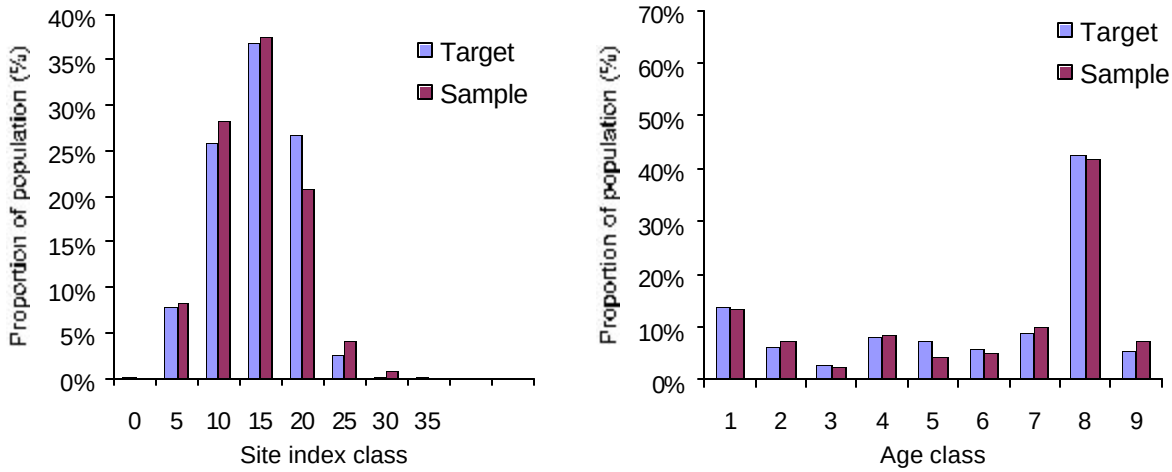

Figure 2. Distribution of target and sample populations by site index class and age class.