Boundary Forest District

Dense Pine Sub-unit Inventory Plan

MINISTRY OF FORESTS
RESOURCES INVENTORY BRANCH

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INTRODUCTION

1.1 Background

This revised inventory plan was initially prepared by Sam Otukol of the Ministry of Forests (MOF) Resources Inventory Branch in March 1997, in consultation with the Nelson Forest Region, Boundary Forest District, and Pope & Talbot staff. It was reviewed and revised by A.Y. Omule (J.S. Thrower & Associates Ltd.) and Sam Otukol. This plan outlines the dense pine project issues, objectives, sampling plan, and implementation strategy. It will become an addendum to the overall VRI Inventory Plan for the Boundary Forest District that is now being developed.

1.2 Issues

The Boundary Forest District has large areas of dense pine forest within its jurisdiction. In the past, this component of the forest inventory was relegated to a position of no significance, and was sometimes described as a "problem forest type. The dense pine grows on relatively low productivity sites at such a high density, that the individual tree stems are quite often very small. For this reason, extraction of the material for commercial use has been considered to be uneconomical because it requires the use of highly specialized equipment.

The growing demand for scarce wood fiber and changing technology has led to revisiting the value of dense pine forests. This change in attitude is reflected in the Chief Foresters' Rationale statement for the Boundary Timber Supply Area (TSA) for the 1995 Timber Supply Review (TSR). In the AAC Rationale for the Boundary TSA, the Chief Forester states:

> "… these areas do present an opportunity to increase future timber supplies since many of these dense pine stands are currently immature ... I am directing BCFS staff to develop a management strategy for dense pine stands including an examination of merchantability, appropriate utilization standards, and appropriate minimum harvest ages, leading to clarification of the areas which should be included in the timber harvesting land base; policy requirements to ensure consistency between cut control administration and the AAC determination should be evaluated; and assess the potential to implement a thinning or rehabilitation to increase their contribution to the timber supply"

This Rationale statement highlights the need to address the dense pine issue for the Boundary TSA specifically. The planned dense pine study will address the issues raised by the Rationale statement.

1.3 Objectives

The objectives of the dense pine study, using the TSR Rationale statement as the guide, are to:

1. Determine the site productivity potential for dense pine stands by sampling to estimate site index.
2. Evaluate the merchantability of the dense pine timber.
3. Determine the "piece size" distribution and quantify the proportion of sawlog and smallwood components of the inventory.
4. Develop a management strategy regarding the dense pine component of the inventory by establishing the following:

    a) minimum harvest ages

    b) thinning/rehabilitation potential

In addition to the objectives stated above, the Boundary Forest District would like to address the following more specific issues:

1. Obtain reliable diameter distributions to allow an evaluation of product potential.
2. Collect data on growth rates, i.e., rate of basal area increase, and evaluate tree crown characteristics.
3. Evaluate the feasibility of determining stocking class conversion, e.g., movement from stocking class 3 to stocking class 4.
4. Update dense pine inventory through statistical adjustment.
5. Confirm the characteristics of the dense pine component of the District inventory.
6. Collect data to allow evaluate site index / site series relationships with the hope of more reliable indicators of site productivity.

2. INVENTORY PLAN

2.1 Overview

The purpose of the study is to collect ground data from the dense pine stratum and use it to adjust the existing inventory information, if any biases are detected. The existing inventory attributes will be considered as estimates, while the ground values will be considered as measures of the "truth". If the ground measurements indicate the inventory attributes are biased, the ground data will be used to develop ratio or regression relationship to adjust the inventory attribute estimates.

2.2 Land base

The Boundary Forest District consists of the Boundary TSA and TFL 8. The TSA area is about 580,110 ha, of which 298,991 ha contributed to the timber harvesting land base in the last timber supply review. The TFL 8 area is about 77,664 ha, most of which (96% or 74,239 ha) is classified as productive forest.

According to the last AAC Rational report, about 23% (68,768 ha) of the timber harvesting land base consists of dense pine forests. Approximately 61,000 ha of this area was included in the last timber supply analysis.

2.3 Population of Interest

The potential population of interest is based on the 1989 Timber Supply Review documentation. The potential dense pine land base that was considered for inclusion in this study consisted of all polygons that are in the Boundary TSA that correspond to dense pine in Inventory Type Groups 28-31 in stocking class 4, and others (Table 1).

Table 1. Potential dense pine population in the Boundary Forest District.

ITG	Age	Height Class	Stocking Class	Site Class
28-31	Any	Any	4	Any
28-31	3	1	0	P
28-31	3	2	0	P
28-31	4	2	0	P
28-31	Any	Any	3	Any

However, for the present dense pine study, the District designated only about 2,479 polygons (50,000 ha) as the population of interest to be sampled. The composition and area of this target population by landscape unit are shown in Tables 2 and 3. The area proportions of the population by Landscape Unit, Inventory Type Group (ITG), Height Class, Site Class, and Age Class are depicted graphically in Appendix B. We cannot rationalize the difference between the potential population (68,768 ha) and the sampled population (50,000 ha), or why some potential areas were excluded from the target population.

Table 2. Sampled dense pine population in the Boundary Forest District.

ITG	Age Class	Height Class
28-31	3,4	1,2
28-31	5,6,7,8	2,3
28-31	9	2

Table 3. Areas by Landscape Unit of the sampled dense pine population.

Landscape Unit	Area (ha)	Area (%)
B1	2880.44	5.76
B2	130.44	0.26
B3	5938.16	11.86
B4	2885.08	5.76
B5	9362.32	18.70
B6	9572.40	19.12
B7	161.32	0.32
B8	2487.84	4.97
B9	5462.68	10.92
B10	7106.68	8.13
B11	4071.52	8.13
Total	*50058.88*	*100.00*

The intent of the present study is to obtain answers with reasonable precision for both the management unit as a whole and for each landscape unit (where possible). Landscape units that are too small to warrant a separate answer will be merged with neighboring ones during analysis to gain some efficiencies.

2.4 Sample Size

The Resources Inventory Branch recommended a minimum total sample size of 150 sample clusters (polygons) in the District for planning, training, and logistic considerations. This sample size was distributed proportionally to the different landscape units, depending on the area of the unit (Table 4). The proportional allocation produces roughly equal weight for each sample polygon.

Table 4. Sample size distribution by Landscape Units

Landscape Unit	Sample Size
B1	10
B2	1
B3	15
B4	4
B5	32
B6	31
B7	1
B8	6
B9	14
B10	22
B11	14
Total	*150*

Some stakeholders indicated that there was no need to sample the parks, however, the District staff did express interest. Out of the total 150 samples, 27 fell in Granby and Gladstone Park. Rather than measure all the 27 samples in the park, a sub-sample of 11 polygons out of the total 27 should be measured in the parks. Each sub-sample in the park will carry a weight of 27/11 = 2.45. The remaining park samples would be re-distributed to the areas outside the parks, resulting in a total of 139 samples outside the park areas. Information is thenobtained for the entire target population (including the parks) while allocating more sampling effort to areas outside the park.

The sample size determination was based on theoretical and practical considerations. Theoretical sample size depends on the variability in volume (CV) of the dense pine stands, the margin of error (E) we can tolerate for the sample, and the level of confidence (t-value at a specified level of probability) we wish to attach to the results from the sample. These factors are expressed in the form of an equation that is provided below (Figure 1):

$$n = \frac{t^2.(CV)^2}{E^2}$$

where: t = the student's t-value at a desired level of probability (in most cases 1.96 or 2 is used)

CV = the perceived or known coefficient of variation for the target population or stratum (%)

E = allowable sampling error (%) or in graphical form (Figure 1).

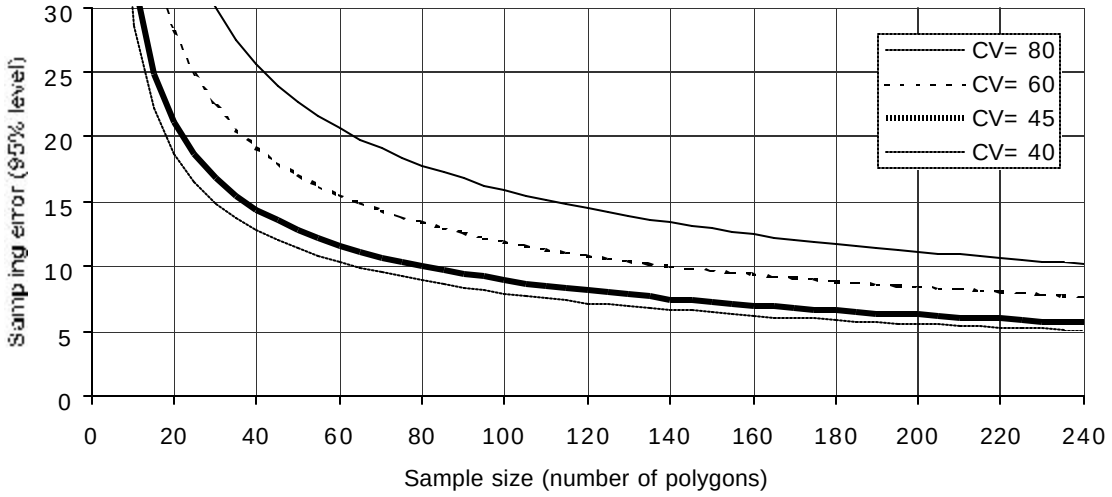

Figure 1. Decreasing sample size as coefficient of variation decreases.

An example computation based on the Inventory Audit results is provided below. Based on data collected during the Inventory Audits, the CVs for volume/ha for several forest management units vary between 30% and 70%. If we assume the CV for volume/ha to be 60%, and use the standard allowable sampling error of 10%, the sample size for the sample for adjustment should be approximately 144 polygons (4*3600/100=144).

2.5 Sample Selection

The selection of polygons to be sampled used the principles of probability selection. The target stratum (dense pine polygons) was identified, and a complete list was created to constitute the sampling framework for the target population. The unique polygon identification number, the map sheet on which the polygon is located, the landscape unit, the species composition, age, height and site index, and the area of the polygon were required to make the sample selection. Sample polygons were selected systematically from the target population list using the usual Inventory Audit approach. The list was not sorted.

Initially 172 samples were selected by the Resources Inventory Branch. Of these, 4 were dropped because they were logged, leaving 168 samples. Then 150 samples were selected out of the 168 at random as follows:

1. A random number between 0 and 1 was generated using MS Excel for each of the 168 samples. The file was sorted in ascending order by the generated random number, and the first 150 samples from the sorted file were selected as the samples.
2. Of the 150 samples, 27 samples fell in Granby and Gladstone Park, leaving 123 samples outside the parks. Eleven out of the 27 were selected at random (about 40% subsampling rate) as the park samples. The remaining 16 park samples were discarded.
3. Extra 16 samples outside the park were taken from those left in the original list of 168 (after we selected 150). Therefore, there are 11 samples inside the parks and 139 outside the parks.

2.6 Weighting

Data must be weighted appropriately to account for the sample selection probabilities. For samples outside the park areas, each sample cluster has a weight of:

$$w = \frac{50058.88}{150} = 333.726ha$$

For samples inside the parks, each sample cluster has weight:

$$w = \frac{27}{11} * \frac{50058.88}{150} = 819.145ha$$

2.7 Sampling Unit

The ground sampling will be based on *Timber Emphasis Plots* (TEPs). These TEPs can use the same five-point cluster configuration as the VRI (Figure 2), however, measurements should be restricted to tree attributes only with possible enhancements for timber volume and site index, and possibly site series. These attributes are contained in the VRI Card Types 8 to 11 and 12. Measurements of other vegetation characteristics taken on VRI plots should not be taken in these TEP plots. However, as with the VRI plots, these TEPs provide a sampling framework for any additional sampling that may be required in the future.

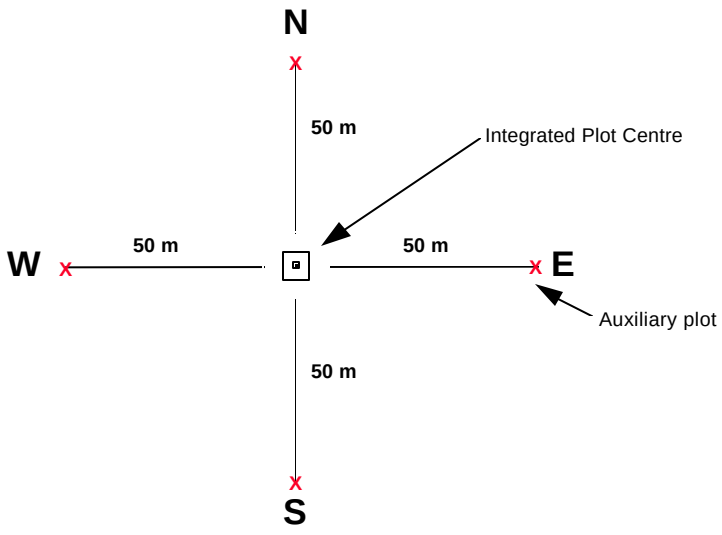

Figure 2. The five-point cluster layout for the Vegetation Resources Inventory.

2.8 Data Compilation and Analysis

Upon completion of the data collection, the raw data will be submitted to a contractor for compilation. If site series data compilation is required, special instructions may be required to obtain the desired information.

For the key attributes such as tree height, age, volume, and site index, statistical tests will be performed to determine if there are differences between the map label values, and the ground measured value. Tests such as the t-test and the ratio test for differences between means will be performed. If these tests indicate a significant bias of the map label attributes, correlation analysis will be performed to determine the strengths of the relationships between the ground measured values and the map label attributes.

Depending on the strength of the correlation relationships and the general appearance of the scatter plots of the ground values against the map label attributes, a method for adjusting the inventory attributes will be chosen. The options may include regression, ratio or other simpler adjustments. Each attribute will be considered separately, but reconciliation may be necessary for the derived attributes.

The derivation of site index / site series relationships may require some exploration to develop statements regarding general relationships between site index and site series based on the sample data. However, extrapolation of this information beyond the sample may be problematic since the relationships may not be strong.

The Resources Inventory Branch will provide advice on the analysis and preparation of portions of the final report.

The following is a synopsis of the steps involved in the proposed data analysis process, including some specific suggestions on the analysis to be performed:

1. Perform tests for differences between means for height, age, volume, and site index.
2. Perform correlation analysis to determine the strength of the relationships between the ground measurement and map label estimates for height, age, volume, and site index.
3. Evaluate rate of mis-classification, i.e., do all the polygons in the sample confirm a dense pine classification?
4. Perform the detailed analysis. Evaluate the following:
    a. Develop ratio or regression relationships to be used in adjusting the inventory attributes.
    b. Analyze the diameter and piece size distributions based on the sample.
    c. Assess the utilization requirements for the small pine timber.
    d. Analyze site index / site series relationships and determine the feasibility of improving site index estimation using these relationships.
    e. Assess the forest management strategy options that would optimize the production and exploitation of the dense pine wood fiber.

2.9 Adjustment of Inventory Files

After the data analysis is complete, a process for adjusting the inventory files will be established. The participation of the Timber Supply Branch staff is required to ensure the acceptability of the new data for Timber Supply Review.

2.10 Management Strategy

Many objectives have been defined for this study in the Introduction section of this report. The aim of the final phase of this study is to examine the results of the dense pine inventory and determine if there is a viable source of timber available in these pine types and to determine a management strategy for utilizing and enhancing this forest resource.

This phase of the study will examine:

1. The merchantability, appropriate utilization standards, and appropriate minimum harvest ages, leading to clarification of the areas which should be included in the timber harvesting land base.
2. Policy requirements to ensure consistency between cut control administration and AAC determination.
3. The opportunities for thinning/rehabilitation to increase their contribution to the timber supply.

The results of the examination will help guide the future management of these dense pine types and provide an indication of how these types could be included in future timber supply analyses.

3. IMPLEMENTATION STRATEGY

3.1 Sample Selection

Sample polygons have already been selected based on the Inventory Audit selection process. This audit selection process is based on a sorted list of polygons. The Resources Inventory Branch (Sam Otukol) completed the sample selection. A.Y. Omule, in consultation with Sam Otukol, has reviewed and revised the sample selection process to reflect the sub-sampling in the parks. The list of sample polygons is given in Appendix A. Comparisons of the population and sample distributions are depicted in Appendix B.

3.2 Sample Packages

Field sample packages have already been prepared. However, the sample cluster locations inside polygons, which were identified based on the Inventory Audit program process, should be revised to meet VRI standards. The Region and Resources Inventory Branch will ensure the maps are re-plotted with the VRI grid overlay and new sample locations inside polygons selected. The District will review the revised sample locations and amend the access notes if required.

3.3 Project Coordinator

Pope & Talbot Ltd. and the District will hire a project coordinator. The project coordinator will oversee the field sampling (quality assurance and administration) component of the project, analyze data to provide the appropriate adjustment factors, prepare an inventory report, and develop a management strategy for the dense pine stands.

3.4 Fieldwork

Fieldwork will be completed on contract using the VRI measurement protocols. The VRI Card Types 8-11 will be completed according the VRI Ground Sampling manual (March 1997). No Net Volume Adjustment Factor sampling will be done. Existing loss factors will be used to compile net volume and compared to the net volume based on net factoring. The call grading will determine the log populations by grade. Site series information should also be collected (VRI Card Type 12), as originally envisaged to develop site index / site series correlations. The Region will manage the field work contracts.

3.5 Quality Assurance

Quality assurance will be conducted by the Region with assistance from the District using the VRI standards. The VRI quality assurance standards require inspection of at least 10% of the samples (15 polygons in this case).

3.6 Data Compilation, Analysis, and Adjustment

Data compilation, analysis, and database adjustment will be contracted out (Project Coordinator). The Resources Inventory Branch and the Region will check the results of the analyses. Pope & Talbot will arrange the contractor for the adjustment process.

3.7 Costs

The estimated costs, for planning purposes, are summarized in Table 5.

Table 5. Estimated costs required to complete the dense pine sub-unit inventory project.

Cost Item	Number of items	Unit Cost* ($)	Total Cost ($)
Project Coordinator	1	-	20,000
SampleCluster (VRI – trees only)	150	1,000	150,000
Helicopter Sample Clusters	45	700	31,500
Data compilation & analysis	-	-	10,000
Database adjustment	-	-	10,000
Total			*$221,500*

3.8 Monitoring

The Resources Inventory Branch is responsible for monitoring this Inventory Plan.

APPROVAL

I have read and concur with the Dense Pine Sub-unit Inventory Plan, June 8, 1998. It is understood that this is an agreement-in-principle and does not commit the signatories to completing the inventory activities outlined within the plan. Modifications to this plan or more detailed plans need to be reviewed and approved by the signatories.

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District Manager
Boundary Forest District

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Regional Manager
Nelson Forest Region

_____

Director
Resources Inventory Branch

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Pope & Talbot Ltd.

5. Appendix A

SELECTED SAMPLE POLYGONS

Mapsheet	Polygon	Lnd_unit	ITG	Age Cl	Ht Cl	SI	Area	Siclass
82E014	53	B1	30	4	2	11.9	10.16	10
82E004	753	B1	29	3	2	14.7	24.36	15
82E005	2	B1	29	4	2	11.9	153.92	10
82E014	147	B1	28	4	2	11.9	82.64	10
82E014	219	B1	28	3	2	12.8	30.52	15
82E014	81	B1	30	3	2	13.7	98.84	15
82E015	169	B1	28	5	3	17.1	10.2	15

Mapsheet	Polygon	Lnd_unit	ITG	Age Cl	Ht Cl	SI	Area	Siclass
82E015	186	B1	28	4	2	13	314.96	15
82E015	255	B1	28	4	2	11.9	90.2	10
82E015	514	B1	29	4	2	11.9	97.56	10
82E049	58	B10	28	4	2	13.2	130.4	15
82E048	225	B10	29	4	2	14.1	68.4	15
82E058	310	B10	29	4	2	14.1	151.88	15
82E049	297	B10	29	4	2	14.7	9.52	15
82E069	518	B10	29	4	2	15	8.8	15
82E048	477	B10	28	4	2	13.2	5.8	15
82E048	504	B10	29	4	2	13.2	13.28	15
82E049	117	B10	30	4	2	14.1	46.92	15
82E049	137	B10	28	4	2	13.7	38.2	15
82E049	202	B10	28	4	2	14.4	263.44	15
82E049	209	B10	28	4	2	12.8	29.76	15
82E049	33	B10	28	4	2	13.2	37.72	15
82E049	434	B10	28	6	3	16.3	108.92	15
82E049	465	B10	29	4	2	14.7	10.56	15
82E058	145	B10	28	4	2	13.2	6.48	15
82E059	136	B10	29	4	2	14.7	61.36	15
82E059	417	B10	28	4	2	14.7	2.76	15
82E079	676	B10	31	4	2	13.7	80.8	15
82E079	689	B10	30	4	2	10.5	101.04	10
82E079	719	B10	28	4	2	13.7	223.64	15
82E079	791	B10	30	5	2	14.7	133	15
82E079	793	B10	28	5	2	13.8	5.84	15
82E077	183	B11	28	4	2	13.2	10.36	15
82E066	38	B11	28	3	2	11.6	12.36	10
82E067	521	B11	28	5	3	17.1	76.88	15
82E067	533	B11	28	4	2	13.2	2.2	15
82E076	109	B11	28	6	2	12.9	101.76	15
82E077	102	B11	29	4	2	13.8	10.6	15
82E077	29	B11	28	4	2	11.9	14.32	10
82E077	317	B11	28	4	2	14.9	767.96	15
82E077	323	B11	28	4	2	14.7	12.88	15
82E077	345	B11	28	4	2	14.1	48.52	15
82E077	440	B11	29	4	2	13.8	12.72	15
82E078	377	B11	30	4	2	14.7	49.88	15
82E087	634	B11	28	4	2	13.7	98.96	15
82E088	259	B11	30	3	2	13.7	47.04	15
82E008	49	B2	28	5	3	16.4	2.24	15
82E029	772	B3	28	4	2	14.7	17.04	15
82E039	512	B3	28	4	2	13.2	22.04	15
82E039	253	B3	28	4	2	14.7	238.32	15

Mapsheet	Polygon	Lnd_unit	ITG	Age Cl	Ht Cl	SI	Area	Siclass
82E029	715	B3	28	5	2	14.7	74.6	15
82E018	548	B3	29	5	3	16.2	26.2	15
82E019	276	B3	30	6	3	16	11.24	15
82E019	8	B3	29	4	2	14.7	0.6	15
82E028	371	B3	28	4	2	14.7	8.12	15
82E028	419	B3	29	4	2	14.1	140.36	15
82E028	712	B3	29	4	2	13.2	24.84	15
82E028	815	B3	29	5	2	13.6	7.96	15
82E038	188	B3	28	4	2	15	287.84	15
82E038	28	B3	29	4	2	14.1	29.8	15
82E038	453	B3	29	6	3	16.2	15	15
82E038	46	B3	28	4	2	14.7	24.8	15
82E020	1346	B4	28	4	2	14.1	12.04	15
82E019	81	B4	29	4	2	15	6.56	15
82E029	676	B4	29	4	2	14.7	66.8	15
82E010	1449	B4	30	4	2	15	12.36	15
82E035	248	B5	28	4	2	14.7	86.6	15
82E035	161	B5	28	4	2	12.8	72.04	15
82E025	470	B5	28	8	2	10.4	14.88	10
82E026	145	B5	29	5	3	17.1	5.28	15
82E025	367	B5	29	4	2	14.9	126.6	15
82E025	141	B5	29	3	2	11.6	22.16	10
82E025	152	B5	30	4	2	14.7	9.44	15
82E025	174	B5	28	3	2	14.7	16.24	15
82E025	251	B5	28	4	2	14.3	47	15
82E025	255	B5	28	3	2	11.6	20.44	10
82E025	398	B5	28	3	1	9.5	49.32	10
82E025	402	B5	29	4	2	11.9	22.52	10
82E025	432	B5	28	3	2	11.6	8.08	10
82E025	592	B5	29	4	2	14.7	10.32	15
82E026	137	B5	28	4	2	11	37.4	10
82E026	174	B5	29	7	2	10.9	83.48	10
82E034	264	B5	29	3	2	12.6	200.28	15
82E035	163	B5	28	3	2	14	13.48	15
82E035	235	B5	29	4	2	13.9	23.76	15
82E035	236	B5	28	4	2	13.9	259	15
82E035	337	B5	29	3	2	13.7	69.8	15
82E035	406	B5	29	3	2	13.7	150.6	15
82E035	446	B5	29	4	2	14.7	29.68	15
82E035	481	B5	28	3	2	11.6	4.96	10
82E035	498	B5	28	4	2	12.8	173.56	15
82E035	550	B5	29	4	2	11.9	174.92	10
82E035	674	B5	29	4	2	12.8	2.36	15

Mapsheet	Polygon	Lnd_unit	ITG	Age Cl	Ht Cl	SI	Area	Siclass
82E035	687	B5	28	5	2	13.7	94.16	15
82E035	74	B5	29	3	2	13.7	54.92	15
82E036	5	B5	28	4	2	14.6	187.84	15
82E045	437	B5	28	3	2	14.7	7.28	15
82E045	586	B5	29	3	2	12.9	31.28	15
82E037	33	B6	30	3	2	11.6	24.8	10
82E026	277	B6	28	5	3	15.3	81.2	15
82E026	529	B6	29	5	2	13.8	40.76	15
82E036	662	B6	29	4	2	14.1	17.48	15
82E036	89	B6	28	5	2	13.4	76.52	15
82E037	314	B6	28	5	2	13.4	348.16	15
82E037	359	B6	28	5	2	13.4	93.12	15
82E037	370	B6	28	4	2	13.8	80.48	15
82E046	322	B6	28	6	2	11.8	28.68	10
82E046	424	B6	29	4	2	15	48.4	15
82E046	482	B6	29	3	1	11.6	22.04	10
82E046	537	B6	28	4	2	14.6	342.16	15
82E046	552	B6	29	3	2	13.7	17.4	15
82E047	148	B6	28	4	2	14.7	66.12	15
82E047	193	B6	28	3	2	14	29.24	15
82E047	406	B6	30	4	2	14.1	60.08	15
82E047	424	B6	30	7	3	15.3	38	15
82E047	6	B6	28	4	2	14.1	299.2	15
82E056	162	B6	28	4	2	15	70.16	15
82E056	414	B6	28	5	3	16.4	60.48	15
82E056	762	B6	28	4	2	14.7	78.4	15
82E057	193	B6	29	5	3	17.1	6.8	15
82E057	298	B6	29	4	2	15	21.52	15
82E057	318	B6	28	4	2	13.4	414.32	15
82E057	541	B6	28	4	2	14.5	110.8	15
82E057	594	B6	28	4	2	13.4	146.44	15
82E057	647	B6	30	5	2	11.1	21.56	10
82E066	273	B6	28	4	2	14.9	266.68	15
82E066	415	B6	28	4	2	14.9	44.12	15
82E066	466	B6	28	5	3	17.1	6.24	15
82E066	72	B6	29	5	2	11.1	9.12	10
82E017	415	B7	28	5	3	20	31.56	20
82E046	229	B8	29	3	2	14.7	17.6	15
82E066	321	B8	28	4	2	14.1	376.24	15
82E045	234	B8	28	4	2	10.3	71.2	10
82E046	521	B8	29	4	2	10.9	37.56	10
82E056	272	B8	28	4	2	13.2	8.32	15
82E056	60	B8	30	4	2	15	12.56	15

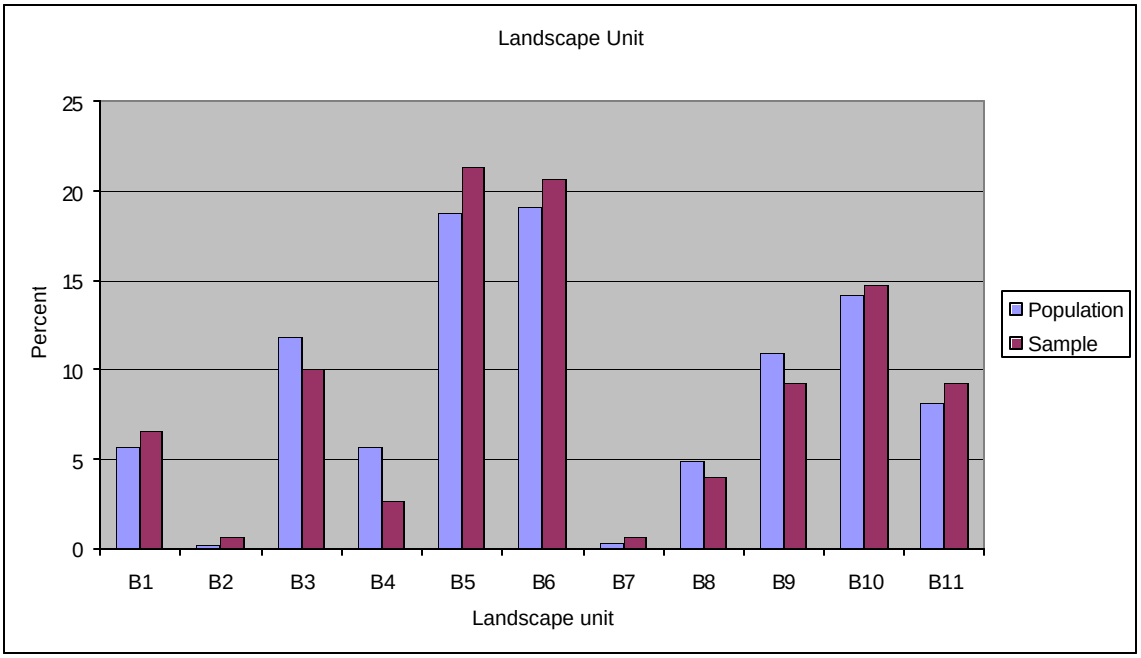
Mapsheet	Polygon	Lnd_unit	ITG	Age Cl	Ht Cl	SI	Area	Siclass
82E088	350	B9	30	3	2	13.7	28.92	15
82E078	301	B9	29	4	2	14.1	99.96	15
82E068	87	B9	30	3	1	9.5	39.8	10
82E058	38	B9	28	3	1	4	66.64	5
82E037	115	B9	30	5	2	12	5.12	10
82E037	68	B9	29	4	2	10.5	198.68	10
82E047	329	B9	28	5	3	15.4	12.12	15
82E047	370	B9	30	3	1	6.5	24.4	5
82E048	399	B9	28	3	2	14.6	79.6	15
82E058	128	B9	29	3	2	14.7	14.52	15
82E058	17	B9	28	4	2	14.7	100.56	15
82E058	388	B9	28	5	3	15.9	46.04	15
82E058	426	B9	30	4	2	13.8	78.12	15
82E078	460	B9	28	4	2	15	12.32	15

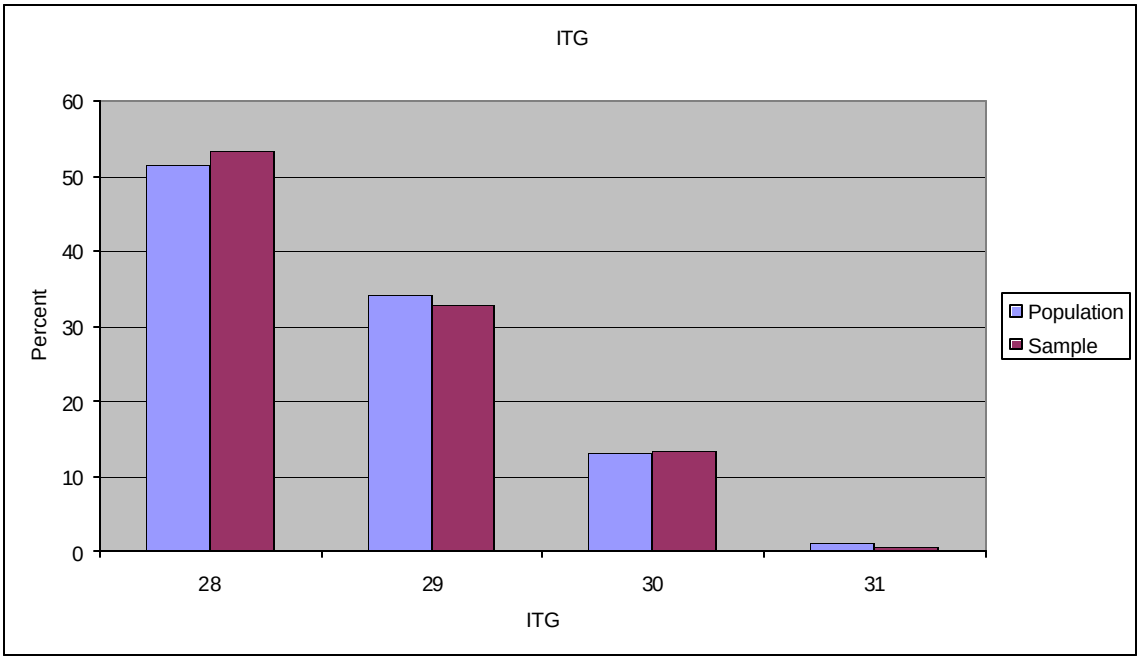
6.

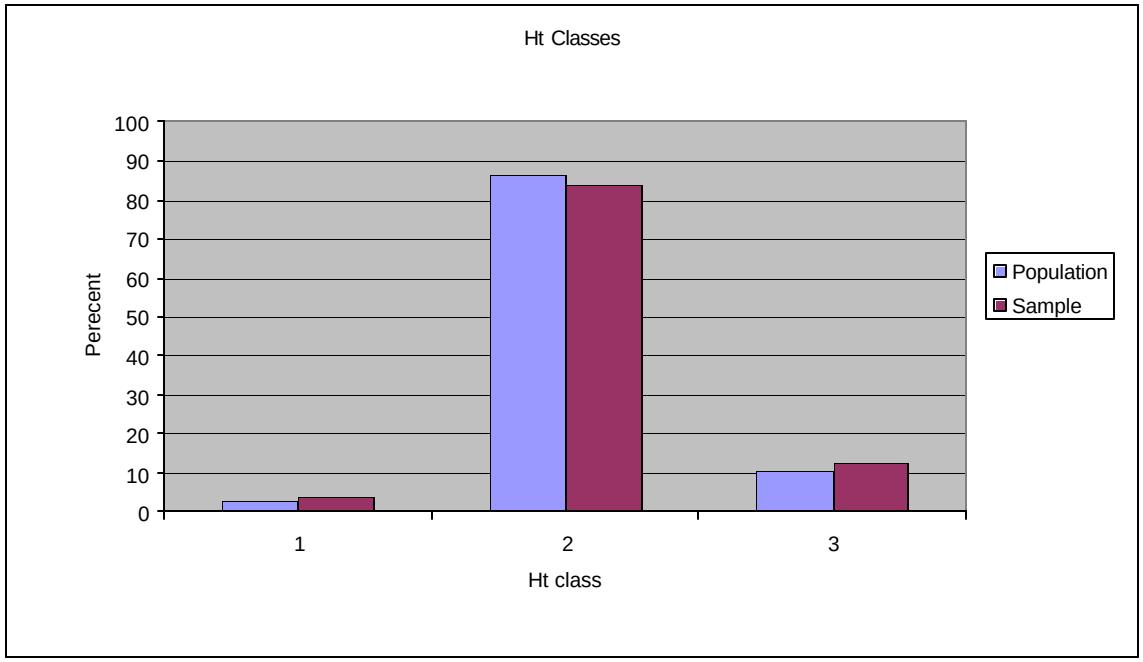
Appendix B

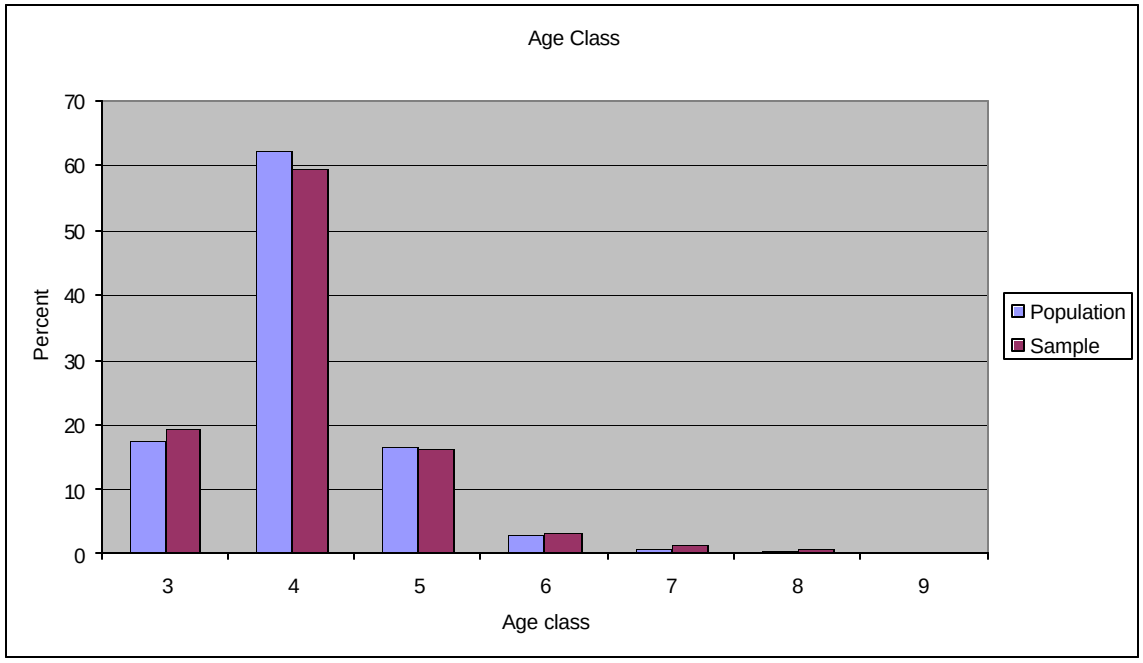
COMPARISON BETWEEN POPULATION AND SAMPLE

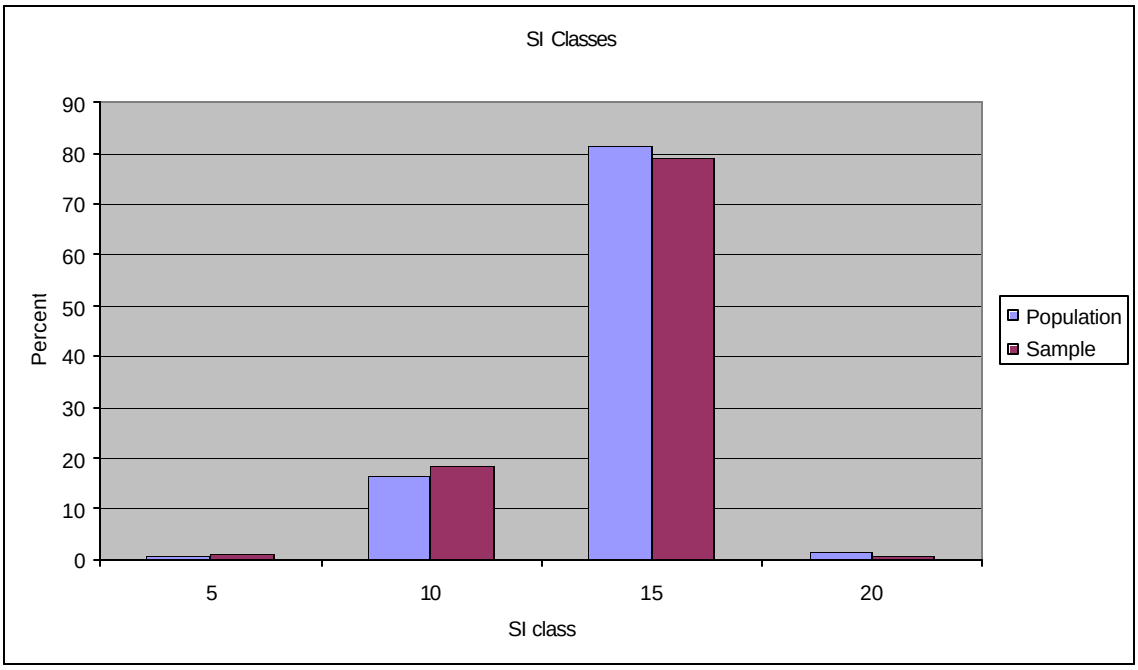
The following graphs depict the comparisons between population area percentages and sample sizes percentages by Landscape Unit, Inventory Type Group, Height Class, Age Class, and Site Class. The graphs suggest that the selected sample (Appendix A) is representative of the target population.






Ht Classes
Perecent
100
90
80
70
60
50
40
30
20
10
0
1
2
3
Ht class
Population
Sample


Age Class
Percent
70
60
50
40
30
20
10
0
3
4
5
6
7
8
9
Age class
Population
Sample


SI Classes
Percent
90
80
70
60
50
40
30
20
10
0
5
10
15
20
SI class
Population
Sample