

Okanagan Timber Supply Area

Vegetation Resources Inventory

**Strategic Inventory Plan
Revision for 2005 - 2007**

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EXECUTIVE SUMMARY

The Okanagan TSA 's Forest Inventory is from 25 to 35 years old. Land use, fires and now particularly pests are outdated the usefulness of this inventory.

This Vegetation Resources Inventory (VRI) Preliminary Strategic Inventory Plan (VSIP) (An update to the 2003 Okanagan VSIP), outlines the VRI activities and products that will address forest management and inventory issues in the Okanagan Timber Supply Area (TSA 22). Age of photos and emerging issues like the MPB may require additional VPIPS, for photo interpretation and potentially ground sampling to be developed after 2007. The lead stakeholders for this project include the Okanagan Innovative Forestry Society (OIFS), which includes, Tolko Industries Ltd., Weyerhaeuser Canada, Gorman Bros. Lumber Ltd., Federated Co-op Ltd., Louisiana-Pacific Ltd. Bell Pole Ltd., British Columbia Timber Sales, and the Ministry of Forests. Licensee priorities to complete the TSA with Predictive Ecosystem Mapping for the TSA and funding availability have been issues in the past; however a business plan to complete the VRI has recently been endorsed by the major Okanagan Licensees in October 2005.

The following VRI activities and products are planned for 2005 and 2007:

1. The intent is to conduct a Phase I photo-interpretation reinventory (Phase 1 VRI) over the entire Okanagan TSA, but for 2005 –07, focus on the northern wet belt and mapsheets throughout the TSA, with majority Douglas Fir combined with lodgepole pine as a minor component 20-49%. These mapsheets are primarily not dominated with Pine, so that issues such as the MPB can be addressed at a later date after this 2005 –07 VSIP expires. The Okanagan Licensees business needs have also identified forested stands exhibiting a minor pine component (21 – 50%) with Douglas Fir and Spruce/Balsam leading stands as a priority to manage within community watersheds, visuals and ungulate winter ranges after the MPB mortality is realized. Once this Phase I database is totally completed, it will support timber-emphasis inventories, habitat mapping, ecosystem mapping, riparian mapping, and other applications. During the Phase 1 VRI field calibration program emphases will be placed to improve species composition descriptions, stand heights, age estimates and the spatial data for all stands.
2. An initial VRI Phase 2 Sampling on the current 1960's –70's PSYP inventory has been completed. Once the entire TSA has been reinventoried to VRI Standards, the existing Phase 2 Ground Sampling and NVAF data will be reviewed to determine need for additional Phase 2, NVAF sampling requirements.

The 2002 Ground Sampling VPIP, results of existing P2 samples and consultation with MoF VRI staff will determine any additional needs and a new VPIP Ground sampling will be developed after total completion of the Photo Interpretation VRI.

3. A VRI monitoring program may also be considered to be implemented, focusing on a statistically robust sampling procedure that could identify the lodgepole pine fall out of secondary pine across the TSA. Field installations of monitoring plots should be considered for 2005 with remeasurement in 3 – 8 years hence.

These VRI activities and products will support timber supply objectives and other resource specific interpretations. They may be implemented in smaller units (e.g., Management Zones) across the TSA.

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1. INTRODUCTION

1.1 Background

The current Okanagan TSA's base Inventory is primarily data from portions of 11 different PSYU, Unit Survey Inventories from the 1960's to 1970's. An accurate forest inventory is an important tool for operational planning, timber supply analysis and meeting 3rd party certification objectives.

This Vegetation Resources Inventory (VRI) Strategic Inventory Plan (VSIP) outlines VRI activities and products needed to address forest management and inventory issues in the Okanagan Timber Supply Area (TSA 22). This VSIP is an amendment to the previously submitted VSIP (2003) for 2005 – 2007. In the past 2 years, 12 mapsheets have been completed to VRI Standards and the Okanagan IFPA is pursuing a need to complete the entire TSA, specifically for operational planning because of emerging issues such as the MPB epidemic. This VSIP provides details for photo interpretation and outlines the need to eventually review VRI timber emphasis ground sampling requirements in the TSA. After VSIP approval, the next steps are the preparation of project implementation plans (VPIP's) based on this VSIP, and the implementation of the VPIPs.

The Okanagan VRI Committee is comprised of willing participants operating within the Okanagan Timber Supply Area, including Tolko Industries Ltd., Weyerhaeuser Canada, Gorman Bros. Lumber Ltd., Federated Co-op Ltd., Louisiana-Pacific Ltd., Bell Pole Ltd., British Columbia Timber Sales, and Ministry of Forests.

1.2 VRI Overview

The VRI is a two phased vegetation (forest) inventory process approved by the Resources Inventory Committee (RIC) to assess the quantity and quality of BC's timber and vegetation resources. The VRI estimates overall population totals and averages, as well as individual polygon attributes, for timber and non-timber resources. Its design is simple, reasonably efficient, statistically defensible, and addresses issues raised by the Forest Resources Commission in its 1991 report, *The Future of Our Forests*, including:

1. Lack of statements of precision of the inventory.
2. Inadequate information on non-timber vegetation resources.
3. Lack of reliable estimates of growth rates and stand specific volumes.

4. Narrow focus on commercial timber volume and the timber harvesting land base.

The VRI consists of several components (Appendix II):

1. BC Land Cover Classification Scheme (BCLCS)
2. Photo Interpreted Estimates (Phase I)
3. Ground Sampling (Phase II) – timber emphasis, ecology, coarse woody debris
4. Net Volume Adjustment Factor (NVAF) sampling
5. Within Polygon Variation (WPV) sampling
6. Statistical Adjustment.

One or more of these components can address specific forest management or inventory issues. For more information, VRI manuals are available through the internet at <http://srmwww.gov.bc.ca/risc/pubs/teveg/index.htm>.

1.3 VRI Planning

The VRI planning process requires that a Strategic Inventory Plan (VSIP) and Project Implementation Plan (VPIP) are developed for defined units (e.g. TSA, TFL). A VSIP outlines VRI products to address forest management issues and provides strategic direction for implementing the inventory activities. A VPIP details the operational activities identified in the VSIP (e.g., ground sampling or photo interpretation projects) and identifies project areas, priorities, plot location, yearly inventory costs, and roles and responsibilities. Guidelines for preparing the VSIPs and VPIPs are available on the Internet at <http://srmwww.gov.bc.ca/tib/fia/vri.htm>.

The VRI planning process is an important component of the overall VRI process and related activities (Figure 1 and Appendix III). The intent of the VRI planning process is to ensure that baseline products meet a range of applications and they are efficiently implemented. These processes and activities include:

1. Forest management decision processes (land integration planning)
2. Identifying forest management issues
3. VRI Strategic planning (prepare a VSIP)
4. VRI operational planning (prepare VPIPs)
5. Implementation, including development and maintenance of procedures and standards;
 - a). Management inventories
 - b). Database management

c). Data interpretation

The steps for preparing a VSIP include:

1. Licensee stakeholders work with MoF staff to develop issue statements related to VRI.
2. The Okanagan IFPA stakeholders work with MoF to prepare a VRI " VSIP / VPIP. (VRI " Forest Management and Inventory Issues Discussion Paper" issues should be addressed in the VSIP and if required, further in the VPIP.) These explain the VRI process and identifies key issues known to date. Issues are usually taken from the Timber Supply Review Data Package, plus any other issues identified in Step 1.
3. The Okanagan Innovative Forestry Society (OIFS), including all agencies and stakeholders, meets to refine issues and discuss why these issues need to be considered fundable. The purpose of this meeting is to:
 - a). Introduce the VRI tools and process
 - b). Table new issues and issues recorded to date
 - c). Discuss issues that can be funded or not (under current funding mechanisms); this discussion provides general direction for developing the VSIP. This discussion also affects the extent of photo interpretation and the number and type of VRI plots.
 - d). Suggest the VRI tools to address currently fundable issues as well as those issues that may be funded in the future.
4. OIFS meeting minutes are prepared and circulated to all participants for review and feedback.
5. OIFS prepares a final VSIP, which incorporates items agreed to.
6. The VSIP must be reviewed by MoF and signed off by OIFS representative, MOF Designated Signoff and in the case where there is new photo acquisition, Base Mapping Geomatic Services (BMGS).
7. VPIP process begins

The steps for preparing a VPIP include:

1. Review and update VSIP recommendations
2. Secure funding
3. Identify project activities, geographic areas, and costs
4. Specify roles and responsibilities for project implementation
5. Prepare VPIP
6. Signed off by Licensee representative, MOF Forest District Manager and in the case where there is new photo acquisition, Base Mapping Geomatic Services (BMGS).

1.4 Funding

OIFS develops criteria for setting VRI activity priorities and products identified during the planning process. Inventory funding, or follow-up resource-specific management interpretations, is excluded from the planning process since funding mechanisms may vary. Currently, funding for VRI activities are FIA eligible. The IFPA will also seek alternate funding such as from Forest for Tomorrow and other emerging sources for this VSIP and future plans as issues such as the MPB emerge.

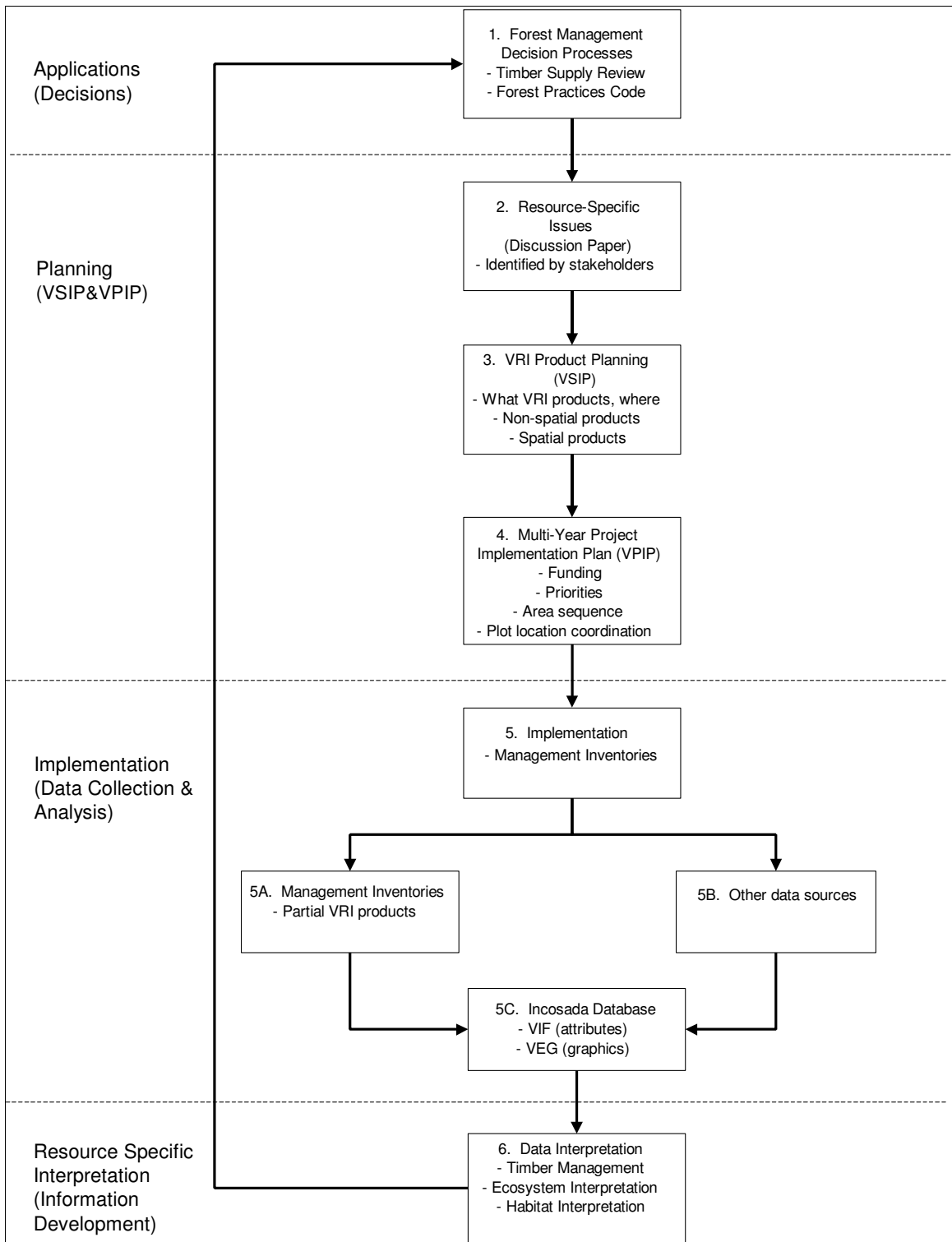


Figure 1. The VRI management inventory process.

2. INVENTORY ISSUES & BUSINESS CONSIDERATIONS

2.1 Landbase

The jurisdiction of the Okanagan TSA covers 1,945,037 ha of land (Table 1). The main tree species in the forested landbase are Lodgepole Pine (29%), Douglas fir (28%), Balsam (13%), and spruce (12%) (Table 2). In this report, we assume that the forested landbase corresponds to the Vegetated Treed (VT) landbase (BC Landcover Classification Scheme, or BCLCS). Appendix 3: List of Maps for OK TSA.

Table 1. Landbase by forest cover.¹

	Area (ha)	%
Forested	1,945,036	100
Mature	994,465	51.1
Immature	765,028	39.3
NSR	70,263	3.6
Non commercial	9,563	0.5
Non productive	105,717	5.4
<i>Grand Total</i>	1, 945,037	100

2.2 Forest Management Considerations

Significant forest management issues in the Okanagan TSA were highlighted in the last timber supply review determination (TSR 2 – Aug 1, 2001) and in the TSR 3 Data Package. Section 2.4 lists inventory issues. Other emerging data needs were considered to be relevant to the Okanagan TSA and could be addressed with a completed VRI

Table 2. Forested landbase by species

Leading Species	Area (ha)	%
Balsam	259,454	13%
Cedar	86,422	4%
Deciduous	67,741	3%
Douglas Fir	539,953	28%
Larch	49,811	3%
Hemlock	81,945	4%
Lodgepole Pine	564,290	29%
Spruce	237,089	12%
Yellow Pine	58,332	3%
Grand Total	1,945,037	100%

* cottonwood, aspen, birch

Table 3. List of parks and protected areas² in the Okanagan TSA.

Provincial/Regional Parks		
Anarchist	Greenbush Lake	South Okanagan Grasslands
Anstey-Hunakwa	Kingfisher Creek	Trepanier
Brent Mountain	Mount Griffin Park	Upper Seymour
Enderby Cliffs	Pennask	Vaseux
Adra Tunnel	Anarchist Larch	Browne Lake
Denison - Bonneau	Eagle River	Englishman River
Mara Meadows	Naramata Creek	Oliver Mountain
Pillar	Richter Grasslands	Shuswap River Islands
Shuttleworth Creek Larch	Similkameen Cottonwoods	Similkameen River
Skaha Bluffs	Skookumchuk Rapids	Spectrum Falls

¹ Data from IFPA Uplift Data Analysis Set (2004)

² The total area of the Ecological Reserves, Protected Areas, and Parks is 191,755 ha.

Turnbull Creek	Upper Perry River	Upper Shuswap ER Addition
Upper Violet Creek	Wap Creek	White Lake
Wrinkly Face	Yard Creek Provincial Park Addition	Graystokes
Pukeashun		
Protected Areas/Marine Parks		
Cathedral PA	Monashee	Shuswap Lake Marine Park - Swall Site
Cinnemousun Narrows	Myra-Bellevue	
Fintry	Snowy	
Kalamalka Lake	Shuswap Lake Marine Park - Bughouse Bay Site	

2.3 Current Forest Cover Inventory

The Okanagan TSA was inventoried from 1962-1979 , over portions of 11 different Public Sustained Yield Units (PSYU's). The inventory has been forest cover depletion updated to Feb. 2004, using the 2001/02 1:30,000 colour photos to account for harvesting disturbances, growth, and silviculture treatments. Since 2002, 12 mapsheets have been re-inventoried to VRI standards utilizing 2001 1:30,000 color aerial photography with softcopy technology.

The MoF initiated a forest inventory audit that was completed in 1996. The audit reviewed tree height, age and volume for forest stands greater than 60 years old. It also reviewed height, age and productivity for immature stands as well as an assessment of non forest types. Audit results showed that audit and inventory volumes were 299 m³/ha and 293 m³/ha respectively. While the audit indicated that volumes were still consistent with the original inventory, the 1996 PIA (Pre-Inventory Analysis) conducted by the MoF Inventory – Kamloops, indicated that there are problems with species composition, ages and height depending on where you are in the TSA and that a re-inventory was warranted because of the age of the inventory and its use for other than volume determination.

In preparation for a new VRI inventory in 2001, 1:30, 000 color photography was acquired in 2001 - 2002 for the Okanagan TSA and softcopy models were created. 1:30,000 photo in softcopy format at this time was being assessed for VRI.

Current VRI standards for acceptable photo scale have been revised. The preferred scale for VRI in the southern interior is 1:15,000 colour, although scales to 1:30,000 are still allowed, subject to approval by MoF. There is also a preferred age of no more than

5 years old for photography used in VRI work. These standards can be found in the VRI planning documentation for VSIP / VPIP.

2.4 Summary of Inventory Issues

The following inventory issues were identified by stakeholders: 3

- Age of the existing inventory. Needs to be brought to VRI Standards.
- Accuracy of forest-cover labels and spatial accuracy of stands. Species composition descriptions are inaccurate, especially in stands managed through the selection system. Check and update species composition labels for deciduous and deciduous-coniferous mixed stands.
- Pest infestations (particularly now with MPB) contribute to stand variability, makes inventory update for depletion difficult, and leads to poor inventory projections. Assessment of need to establish more P2 samples in MPB areas needs to be determined. Pine component monitoring is suggested so as to calibrate the depletion of minor Pine inventory as result of Mountain Pine Beetle activity in the future.
- MPB salvage and other and other related logging history that left many groups of small patches, that are not captured in inventory update.
- Polygon resolution is inadequate – individual polygon areas are large.
- The IDF stands are highly variable, making it difficult to project stand volume using existing models. Additional inventory attributes need to be collected to more accurately project the stand growth and to help select or define appropriate silviculture treatments for these stands. As well, smaller Phase 1 polygons with less variation are needed to help develop management guidelines.
- Overestimation of stand ages (i.e. FDi)
- Quantify non-recoverable (gross) losses from windthrow, insects and disease
- Check regenerated stand volume estimates from TIPSy models
- Silviculture history and free growing information requires significant improvement
- Operability line delineation
- Park inventories. [Okanagan Mountain and Cathedral Parks are not included.](#)
- Certification
- A Cedar/ hemlock Phase 2 VRI was completed in 2002. This should be reviewed before any more VRI plots are established in cedar hemlock stands.

3 Portions of Issues from: Okanagan Timber Supply Area Vegetation Resources Inventory Strategic Inventory Plan (2002 Update) Prepared by J.S. Thrower & Associates Ltd. April 30, 2002

2.5 VRI Activities and Products

The following VRI activities and products are needed to address the forest management issues identified for the Okanagan TSA. These recommendations are based on the issues identified Section 2.3, including the discussions at the stakeholders meeting.

1. Continue to use the Sept. 2001 and July 2002, 1:30,000 digital colour photography until it reaches its 5 year age. The September 2001 covers the middle (82L) and southern mapsheets (82E) of the TSA and the July 2002 cover the northern TSA mapsheets (82M).
2. Acquire the latest silviculture and other available depletion update data, any cruise data or other sources of data that might be of use. Historical document photos, and ground call, air call data must be reviewed for use.
3. Conduct a Phase I photo-interpretation (VRI) over the entire Okanagan TSA, but focusing in 2005 -06 on the northern wet belt areas of the TSA that are not dominated by PL leading stands, nor potential issues with MPB. The Phase I database will support timber-emphasis inventories, habitat mapping, ecosystem mapping, riparian mapping, and other applications over the TSA.
4. An initial Phase 2 Ground Sampling and NVAF has been completed for the existing Okanagan TSA forest inventory. Once the entire TSA, new Phase 1 VRI is done, the existing P2 Ground Sampling and NVAF will be subject to review, to assess the need for any additional Phase II timber emphasis ground sampling or potential need for additional NVAF in the vegetated-treed areas of the TSA, to provide statistically valid timber volumes and polygon-specific tree attributes.

A preliminary strategic inventory plan to address the identified products so far is outlined in section 3.

3. STRATEGIC INVENTORY PLAN

3.1 Overview

This section outlines a preliminary strategic inventory plan to develop specific VRI products discussed in Section 2.5. The VRI products include a new spatial vegetation inventory (Phase I) over the entire Okanagan TSA and a timber emphasis inventory primarily in the operable portion of the vegetated treed landbase. These products can

be obtained through completion of VRI photo interpretation, ground sampling and statistical adjustment.

3.2 Photo-Interpretation (Phase 1)

3.2.1 Objective

The objective is to improve TSA polygon information – **especially in areas where specific management issues occur** – using photo interpretation. Specifically, the existing inventory is 25+ years old; accuracy of forest cover attributes and spatial accuracy of stands need to be reviewed. In some areas polygon resolution is inadequate and species composition descriptions are also inaccurate, especially in stands managed through the selection system. The inventory needs to be updated to address pest infestations over the past 25+ years. There is overestimation of stand ages, particularly in the Fdi dry belt areas.

Target Area

The entire TSA will be reinventoried to VRI Standards, initially focusing on the northern wet belt and mapsheets with types not predominately Pine and that may eventually have major issues with MPB. All areas will be reinventoried to VRI standards, including woodlots, parks (Cathedral and Okanagan Mtn. Parks not included) protected areas and other areas. Some of these areas, have conducted there own VRI and any existing Park, Woodlot, etc. VRI, will not be redone without proper consultation, to ensure more detailed VRI's are not replaced. These existing VRIs will have to be incorporated into the new TSA VRI data base.

Due to limited funding, initial Phase 1 inventory work will focus on the northern wetbelt where lodgepole pine is generally a minor species. The strategy lies in completing areas with minor pine components while the MPB epidemic has a dramatic impact on the central and southern part of the TSA. Once the northern wetbelt areas are completed, new photography (subject to available funding and spread of the MPB) will need to be acquired to proceed into the central and southern portions of the TSA to complete the Phase 1 VRI. Target Attributes

Attributes

3.2.3 All VRI – Phase 1 photo interpreted attributes listed on the VRI photo interpretation attribute form will be collected either through photo interpretation

or field visitation. These attributes will be interpreted to current VRI photo interpretation standards using certified VRI Photo Interpreters.

3.2.4 Methods

The Phase 1 inventory will be completed using softcopy technology and certified VRI photo interpreters. All models, scanned images, and surface files have already been made for the entire TSA and are currently being utilized by the contractor completing the PEM.

Air and ground field calibration will be established by the photo interpreters to gain local knowledge and improve VRI attribute estimation.

The 1:30 000 color photo will be used for identification of all VRI attributes, including species composition which is a concern in the current forest inventory throughout the TSA (this was verified ten years ago by the MoF through a Pre-Inventory Analysis). Color photography may also improve detection of individual trees or small groups of trees severely affected by disease or insect.

The most available, current silvicultural records will be used to address gaps between the year of the photos and present time.

3.3 Timber Emphasis Inventory – Vegetated Treed Areas

There is a completed VRI Phase 2 and NVAF Sampling (Okanagan TSA VRI Phase II Ground Sampling Pilot Project Implementation Plan – 2002) of the existing Okanagan TSA Forest Inventory. Once the new Phase 1 VRI Inventory is totally completed, the new Phase 1 will be reassessed using existing Phase 2 samples and in consultation with MoF VRI Staff to determine any need for additional Phase 2 samples or NVAF.

Some of the process for Ground sampling is outlined below for information only.

3.3.1 Ground Sampling Objectives (Phase II)

The main objective of the ground sampling timber emphasis inventory is to:

Install an adequate number of Phase II VRI sample clusters to statistically adjust the photo interpreted timber inventory attributes in the Vegetated Treed (VT) areas of the TSA, to achieve a sampling error between 10 and 15% (95% probability) for overall net timber volume in the VT area, and reasonably accurate individual polygon adjusted estimates.

Net timber volume is gross volume less stumps, tops, decay, waste, and breakage. Decay and waste will be estimated using VRI call grading/net factoring and NVAF sampling. Breakage will be estimated using existing loss factors.

3.3.2 Target Population

The target population will be the vegetated treed (VT) portion of the TSA located on crown land that is also considered operable by the operability linework. The operable area within the TSA will be prioritized for ground sampling as it provides cost effective VRI ground sampling and focuses sampling activities in the portion of the landbase that is particularly important to the stakeholders.

3.3.3 Sample Size

Samples would be distributed among leading-species strata proportional to their area and potentially in concert with issue identified by stakeholders.

3.3.4 Sampling Approach

VRI Timber Emphasis Plots (TEP) should be used to gather data following the current VRI Ground Sampling Manual. These TEPs could provide a sampling framework for additional sampling, such as monitoring (where a subset of the TEPs would be re-measured over time).

3.3.5 Sample Selection

Sample polygons would be selected using the MoF probability of selection proportional to size with replacement (PPSWR). The selection process would follow the procedures outlined in the document, "Sample Selection Procedures for Ground Sampling v3.3", which was produced by the Ministry of Sustainable Resource Management, Terrestrial Information Branch, in December 2002.

3.3.6 Net Volume Adjustment Factor Sampling

As per the MoF standards, the net volume adjustment factor (NVAF) sampling is mandatory for the inventory. 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; it will be used to statistically adjust the estimate of net merchantable volume of VRI ground samples.

The objective of the NVAF portion of the inventory is to complete destructive tree sampling and obtain local information for hidden decay, waste, and stem taper in order to statistically adjust the cruiser calls for net volume.

In the ground sampling phase of the NVAF process, ground sampling crews will provide detailed enhanced cruising (net factoring and call grading) of all the trees (live, dead, standing or fallen) within the selected auxiliaries at the same time as they are conducting regular timber emphasis sampling within the TSA. Once the enhanced data is collected then the NVAF enhanced tree data will be compiled in a tree matrix and a sample design for selected trees will be developed.

All NVAF planning and implementation will follow the Net Volume Adjustment Factor Sampling Standards and Procedures, MSRM, Version v4.0, March 2004

3.4 Costs

Estimated sample sizes and preliminary costs for the TSA VRI activities are listed in 5. There are no Ground Sampling activities planned for the life of this VSIP.

3.5 Monitoring

MoF is responsible for monitoring this VRI planning process and ensuring that the final VSIP is approved.

Table 4. Estimated sample sizes and costs for VRI in the Okanagan TSA.

VRI activity	Sample size	Unit Cost (\$)	Total Cost (\$)
PHOTO INTERPRETATION			
a) Phase I		12,000 to 14,000 per map	2,520,000
Q&A and Project Management			250,000
<i>Total Photo interpretation</i>			<i>2,770,000</i>
OTHER COSTS			
Monitoring Plots for MPB	Mortality		100,000
Quality assurance (10% of ground sampling cost) ³			
Project management (20% of ground sampling cost) ⁴			
Statistical analysis			
<i>Total Other</i>			<i>N/A</i>
Grand Total			3,770,000

³ This quality assurance is for ground sampling only (not photo interpretation). It is done by a certified VRI Phase 2 check-cruiser, and it involves checking 10% of the field crew work using the MoF quality assurance procedures and standards.

⁴ These project management costs are for ground sampling; they will vary by project and how projects are managed (e.g. projects may be managed in-house).

APPENDIX I – STAKEHOLDERS –

Table 5. List of stakeholders in the Okanagan TSA.

Agencies	Participant
MoF Southern Interior Forest Region	Jim Grace
MoF Okanagan Shuswap Forest District	
Licensees	Participant
Okanagan IFPA	Glen Dick
BC Timber Sales	
Bell Pole Company	Gord Sluggett
Gorman Brois. Lumber Ltd.	Kerry Rouck
Federated Co-op Ltd	Jeff Lipsett
Louisiana-Pacific	Fernando Cocciollo
Riverside Forest Products Limited	Peter love
Tolko Industries Ltd.	Rob Kennett
Weyerhaeuser Company Ltd.	Sean Curry

APPENDIX II – GLOSSARY OF TERMS

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 using the probability proportional to size with replacement (PPSWR) method. 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. The inventory unit could be a specific geographic area (e.g. TFL or TSA) where a specific set of attributes is needed. The size of the inventory unit depends upon the 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,

including reporting on the Criteria and Indicators and the Kyoto protocols. The inventory unit for the NFI is the entire country, although it is implemented province-by-province. BC's provincial CMI system will provide the data needed for the NFI as well as provincial reporting.

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). The NVAF (and VRI net factoring) replaces the existing loss factors for inventory applications. It does not, however, replace the loss factors for revenue applications.

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.

Resource-Specific Interpretations

Resource-Specific Interpretations (RSI) use the Resource Inventory Committee (RIC) standard VRI baseline data products (provincial CMI 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 and habitats). These interpretations include ecosystem interpretations and habitat interpretations.

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 or adjustment is the process of adjusting the values of the photo-interpretation variables using ground sampling observations. Ground observations are compared to photo-estimated values to develop adjustment factors by species groups. These factors are then applied to the polygons in the photo interpretation database to produce the final adjusted database.

Sub-unit

Sub-unit describes the inventory unit within an Inventory Unit. For example, if the inventory unit is defined as the Vegetated Treed area in a TSA, then 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 Vegetated Treed area in the TSA.

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. The current target precision for timber volume is $\pm 10\%$ (90% or 95% probability); stakeholders define the probability (uncertainty) level.

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 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.

APPENDIX III – LIST OF MAPS FOR OK TSA

The Okanagan TSA is compressed of 192 maps or 136.6 MSE's (map sheet equivalents)

82E001	82E073	82L013	82L049	82L086	82M036
82E002	82E074	82L014	82L050	82L087	82M037
82E003	82E075	82L015	82L051	82L088	82M038
82E004	82E076	82L016	82L052	82L089	82M045
82E011	82E077	82L017	82L053	82L092	82M046
82E012	82E081	82L018	82L054	82L093	82M047
82E013	82E082	82L019	82L055	82L094	82M048
82E014	82E083	82L021	82L056	82L095	82M056
82E021	82E084	82L022	82L057	82L096	82M057
82E022	82E085	82L023	82L058	82L097	82M065
82E023	82E086	82L024	82L059	82L098	82M066
82E024	82E087	82L025	82L060	82L099	92H008
82E025	82E088	82L026	82L062	82M003	92H009
82E031	82E091	82L027	82L063	82M004	92H010
82E032	82E092	82L028	82L064	82M005	92H018
82E033	82E093	82L029	82L065	82M006	92H019
82E034	82E094	82L031	82L066	82M007	92H020
82E041	82E095	82L032	82L067	82M008	92H029
82E042	82E096	82L033	82L068	82M009	92H029
82E043	83E097	82L034	82L069	82M013	92H030
82E044	82E098	82L035	82L070	82M014	92H040
82E051	82E099	82L036	82L072	82M015	92H050
82E052	82L001	82L037	82L073	82M016	92H060
82E053	82L002	82L038	82L074	82M017	92H070
82E054	82L003	82L039	82L075	82M018	92H079
82E055	82L004	82L041	82L076	82M023	92H080
82E061	82L005	82L042	82L077	82M024	92H089
82E062	82L006	82L043	82L078	82M025	92H090
82E063	82L007	82L044	82L079	82M026	92H100
82E064	82L008	82L045	82L082	82M027	92I010
82E065	82L009	82L046	82L083	82M028	92I040
82E071	82L011	82L047	82L084	82M034	92I050
82E072	82L012	82L048	82L085	82M035	

Maps in bold text indicate potential wet belt, etc priority areas

1.0 PLAN SIGN OFF

I have read and concur with the 2005-06 Revision to Okanagan TSA VSI (Strategic Inventory Plan), dated March ,2005. 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 the plan and / or more detailed plans are required to be reviewed and approved by all signatories.

All signatories acknowledge that the licensee reserves the right to obtain newer imagery and technology for any inventory work undertaken and that this imagery and technology and actual works undertaken will be to MoF approved standards and/or procedures in place at the time of project commencement. Also that any new VRI Standards or processes, that may evolve at a result of the MPB Inventory Strategy or other VRI Standard changes, will be incorporated.



MoF Designate



Executive Director
Okanagan Innovative Forestry Society

