Soo
Timber Supply Area

Vegetation Resources Inventory

Photo Interpretation
Project Implementation Plan

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1. INTRODUCTION

1.1 Background Information

The Ministry of Forests and Range (MoFR) has developed a business plan to ensure the successful implementation of the Vegetation Resources Inventory (VRI) ground sampling and photo interpretation projects. The process includes the preparation of VRI Strategic Inventory plans (VSIPs) and Project Implementation Plans (VPIPs).

A VSIP provides a general strategic direction for implementing the provincial VRI. The VSIP for the Soo Timber Supply Area (TSA) was prepared between August 2005 and March 2006 and should be referred to for details on background information to Vegetation Resources Inventory VRI activities and also for products needed to address the TSA's forest management issues identified by the licensee.

A VPIP is a working document that details the specific operational activities associated with the implementation and documentation of a VRI project. It identifies the target areas for new photo interpretation, fieldwork, aerial photography, format of base files and project scheduling.

1.2 VRI Process

The VRI is an improved vegetation inventory process for assessing the quantity and quality of BC's timber and other vegetation resources. The VRI addresses the inventory design-related issues raised by the Forest Resources Commission in its 1991 report The Future of Our Forests. The VRI was designed by inventory specialists from government, industry, and academia, and has been approved by the BC Resources Inventory Committee (RIC) with the objective of developing a common set of standards and procedures for Provincial resources inventories.

The VRI process consists of several components:

1. The BC Land Cover Classification Scheme (BCLCS)

2. Photo-Interpreted Estimates (VRI Phase I)

3. Spatial products including line work (polygon boundaries) and a VRI file database

4. Ground Sampling (VRI Phase II)

    - Timber emphasis
    - Ecology
    - Coarse woody debris

5. Net Volume Adjustment Factor (NVAF) sampling

6. Within Polygon Variation (WPV) sampling

7. Statistical Adjustment

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 intent of the VRI planning process is to ensure the inventory baseline products meet a range of applications that are efficiently implemented. After the strategic inventory plan has been prepared, it can be used to prepare coordinated VRI Project Implementation Plans (VPIPs), which are working documents that detail the specific operational activities associated with implementing and documenting the inventory activities identified in the VSIP.

The VSIP and VPIPs provide the framework for coordinating the implementation of the provincial VRI over the TSA, and management inventories over priority areas. The VSIP and VPIPs seek to ensure that VRI products address important issues in priority areas, and support resource-specific management interpretations that address forest management issues. This planning process defines the baseline inventory product needs, ensures the right baseline products are selected to meet a range of applications, and achieves efficiencies in the delivery of the desired inventory products. Coordinated inventory planning also maximizes the value of the inventory data produced over issue areas by ensuring the VRI products are useful for addressing more than one resource issue.

1.4 State of Current Inventory

The Soo TSA was inventoried in 1992 to previous inventory standards. The inventory file has been updated for disturbance to 1997.

In 2003, the licensees initiated a project to update the inventory to VRI standards. The first step was to capture new photography. To date, approximately 70% of the TSA has been flown with 1:15,000 color aerial photos. Appendix I summarizes the current completion status to the summer of 2005 of the Soo TSA aerial photography program.

The MoFR are completing an "ad hoc" update for TSR 3 using Landsat imagery, forest cover and FDPs. They use the imagery to develop the depletion polygons. They then create an age class distribution and apply it to these polygons. The regular updates still need to be completed.

The re-inventory is proposed as a replacement of the existing inventory using the new aerial photographs and utilizing all useable historical data sources where applicable. All applicable historical data sources will be transferred to the new aerial photographs.

Prior to the last AAC determination an inventory audit was initiated an on the forest inventory. For mature forest stands the audit reviewed tree height, age and volume. Audit results for this component of the inventory suggest that the inventory volumes, which reflected those used in the analysis, are statistically acceptable for the land base as a whole.[1] While these audited attributes from the current forest cover are important, there are recognized weaknesses with this information (see section 2.1) and it is vital the inventory is upgraded to help deal with issues facing the forest stakeholders today.

In 2003, the licensees initiated a project to update the inventory to VRI standards. The first step was to capture new photography. 2006 marks the third year of attempts to

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[1] AAC Rationale for Soo TSA, Ministry of Forests (October 1, 2000)

capture 1:15,000 scale color aerial photographs.

1.5 Document Objectives

The objective of this VPIP is to outline and describe the VRI Phase I activities scheduled for completion in the Soo TSA. It provides some basic land base information and some background information from the previous Annual Allowable Cut (AAC) Rationale document (October 2000). This document describes the individual phases of the inventory plan including polygon delineation, field sampling, final attributing and digital mapping. The VPIP also describes the quality control and assurance requirements that will ensure all work is done to provincial VRI mapping standards.

The VPIP provides a project implementation plan that describes scheduling, air photo type and scale, project personnel, estimated costs and quality assurance.

In addition to the information provided in this VPIP, other higher level plans and related planning documents have been prepared and are indicated as links under the appropriate headings. Please refer to the documents for the additional information.

1.6 Landbase

The Soo TSA lies within the Coast Forest Region. The TSA covers approximately 826,000 hectares and is part of the Squamish Forest District, one of eight districts in the Coast Forest Region.

The TSA includes many parks, such as Porteau Cove, Shannon Falls, Murrin, Brandywine, Nairn Falls, Birkenhead Lake, Joffre Lake, Stawamus Chief, Alice Lake, Pinecone-Burke, Indian Arm and portions of Garibaldi and Golden Ears Provincial Parks. New provincial parks and protected areas created as a result of the Lower Mainland Protected Areas Strategy include the Upper Lillooet River, Callaghan Lake, Sockeye Creek (now part of Birkenhead Park), Tantalus and the Brackendale Eagle Reserve.

Of the 826 160 hectares in the TSA, 43 856 hectares are not managed directly by the MoFR, including the parks, ecological reserves, private land and various special use permit areas. An additional 483 392 hectares or approximately 59 percent are non-productive including rock, swamp, alpine areas and water bodies. Productive forest land managed by the MoFR is 298 912 hectares or approximately 36 percent of the total area. Further reductions applied to the productive forest land base result in 123 392 hectares or approximately 41 percent of the productive forest land considered to be available for timber harvesting.

The Soo TSA has a variety of terrain, ranging from the rugged coastal mountains to the valley bottoms of the Pemberton valley and the Squamish river estuary. This ecologically diverse TSA contains five biogeoclimatic zones, reflecting the significant range in climate and elevation. These zones are Coastal Western Hemlock (CWH), Mountain Hemlock (MH), Englemann Spruce Subalpine Fir (ESSF), Interior Douglas-fir (IDF), and Alpine Tundra (AT).[2]

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[2] AAC Rationale for Soo TSA, Ministry of Forests (October 1, 2000)

About 36% of the TSA land base is considered productive forest land managed by the B.C. Forest Service (approximately 299 000 hectares). A summary of the TSA land base is provided in Table 1

Table 1. Landbase By Forest Cover[3]

Area description	Hectares	Percentage of Total TSA Area
Total TSA Area	826 160 ha	100 %
Non-Forest	483 392	58.5 %
Not managed by the MoFR	43 856	5.3 %
Total Crown Forested Landbase	298 912 ha	36.2 %

2. PHOTO INTERPRETATION PLAN

2.1 Project Objectives

The objective of this VRI inventory is to improve the polygon delineation and attributing in the TSA. The entire TSA was done to previous forest cover inventory standards (refer to section 1.4) and that delineation does not meet current VRI standards. Similarly, final polygon descriptions were done to old forest cover inventory standards and many VRI attributes are missing.

The main areas of concern are:
• The existing inventory is outdated and needs to be brought to VRI standards
• The THLB is underestimated according to the last TSR
• There is a lack of deciduous information in the TSA
• Site indices have been underestimated in areas of old growth
• A better inventory is required to better define the operablility line
• Silviculture and free growing information needs significant improvement

The new VRI Phase 1 will either address these concerns or serve as a 'stepping stone' for other data improvement projects. Additional detailed information can be found in section 3.4 of the Soo TSA VSIP (August 2005; Revised March 2006)

The product is a spatial database consisting of unadjusted photo estimates supported by previous and current fieldwork. Ground sampling to check and adjust the photo-interpreted attributes is discussed as a separate process (see section 4.3 in the Soo TSA

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[3] Soo TSA, Rationale for Allowable Annual Cut, Ministry of Forests October 2000

VSIP)

For details on the forest management issues and inventory product needs identified, please refer to:

- Soo TSA Strategic Inventory Plan (VSIP), August 2005; Revised March 2006.
- Soo Timber Supply Area Rationale for (AAC) Determination, October 2000.

2.2 Target Area

As identified in the VSIP, the target area for populating the Phase I database with attributes is the entire Soo Timber Supply Area landbase, including woodlots, parks, and proposed protected areas. Small, isolated private lots may be also included but large regions of private land will be excluded. There will be no re-delineation of parks or proposed park areas.

2.3 Polygon Delineation

Provincially Certified Photo Interpreters will complete VRI Phase I polygon delineation (which will be based on the BC Land Cover Classification Scheme) according to the most current MoFR VRI standards.

For silviculture openings, external boundaries will be delineated as per new photos for vegetation.   Internal boundaries will be maintained for all non free-to-grow stands. Silviculture opening numbers will be maintained. Silviculture information provided by the licensees (most likely accessing the RESULTS databases) will be used.

Licensees (most likely accessing the RESULTS databases) will provide a list of free growing polygons and these areas will re-delineated with the free growing information utilized as reference material for polygon descriptions.

All new roads and landings will be digitized and kept on a separate layer and provided to BMGS for updating the TRIM base.

All delineation will be quality control checked and audited to ensure adherence to project objectives and MoFR Standards.

2.4 Calibration Data Sources

Calibration data sources are field data reference points established across the land base such as ground calls, air calls, ground observations, ground samples and cruise plots. Field data measurements or estimates at these points are used to assist in the delineation and interpretation of forest vegetation and terrain types.   Previous or historical data sources will also be reviewed and those air and ground calls/observations that are still valid will be transferred to the new photos and utilized in new stand delineation and attributing.

2.5   Field Calibration
It is the intention for classifiers to complete the delineation, fieldwork and final attributing of the mapsheets assigned to them. In the TSA, calibration fieldwork will be completed in the form of ground calls, ground observations and air calls in priority areas such as:

- stands having complex species composition
- second growth types
- height class 2-3 stands
- deciduous-coniferous mixes
- deciduous stands with possible coniferous in-growth
- stands not previously sampled
- polygons larger than 20 ha in size
- multi-layered or uneven aged stands
- a cross-section of stand stages of development
- all significant terrain types
- some vegetated treed and non-treed wetland types

Ground and air calls will be established according to VRI fieldwork procedures and standards and delivered in both hardcopy and a digital format.

For more information on VRI air call and ground call procedures refer to:
- Ground Call (Ground Calibration) Data Collection Procedures and Standards (version 3.0, March 2004).
- Air Call (Air Calibration) Data Collection Procedures and Standards (version 2.0, March 2003).

During fiscal year 2005, a Phase 1 VRI was completed on the Indian River Landscape Unit. Approximately 65 VRI single-point calibration points and 60 VRI ground observations were established throughout the Indian River Landscape Unit. This typically exceeds the 'normal' number of new calibration points that would be established on a mapsheet. The increased intensity in field sampling was due to the objectives of an end user who bore the additional costs to establish plots.

2.6 Attribute Estimation

All attribute estimation will be to MoFR VRI standards and it is expected that the same interpreters will complete all phases of work for a particular set of mapsheets. Initial delineation will be re-assessed during the final classification phase to ensure consistency and that VRI standards are met.

All VRI attribute files will be validated through VEGCAPS and delivered in .mdb format consistent with Ministry standards.

2.7 Digital Map Procedures

All VRI mapping will be done to provincial mapping standards and specifications. The graphics file will be checked for the integrity of the file structure to guarantee that no corrupt elements or missing pointers internally are present. A check on the parameters entered in each layer or theme will be done. This will confirm that the data meets the criteria defined in the Ministry standards and specifications. A log report will indicate the type of errors found on each level.

Completed VRI digital graphic files will be submitted in digital standard format and all digitizing must be done to TRIM digitizing standards.

In order to produce the Vegetation Information File (VIF), the overlay themes must have closed shapes and unique nodes before information is combined to produce a resultant file.

The Ministry of Forests is in the process of creating a revised format for the submission and storage of spatial and attribute data for the VRI program. The new format and database standards will be available by April 3, 2006. VRI photo interpretation projects initiated after March 31, 2006 are to be completed to the new standard.

All final products relevant to the work completed in a fiscal work will be delivered to the MoFR at the end of that year.

2.8   Deliverables

Deliverables will include the following;

- Digital map and attribute data
- All new document photos
- Data sources used
- Archival data and photos provided by MOFR
- 3rd party QA reports

All final products relevant to the work completed in a fiscal work will be delivered to MOFR at the end of that year.

3. PROJECT IMPLEMENTATION

3.1. Scheduling and Estimated Costs

All VRI mapping for the TSA will be completed the new 1:15 000 color aerial photography of the project area that is to be fully acquired (weather pending) in 2006. All new photography, will be done to BC government specifications.

Table 2 provides a summary of delivery schedule to complete the VRI in the TSA.

Table 2 – Delivery Schedule

Fiscal Year	Project Area (Landscape Units)	Photo Preparation	Polygon Delineation	Sample Design	Field Data Collection	Polygon Descriptions	Digital Map Production & Deliverables	Quality Control
2005	Indian River LU	Fall 2005	Fall 2005	Fall 2005	Fall 2005	Oct 2005-March 2006	Oct 2006-March 2006	On going
2006	TBD and VPIP will be revised to reflect specific LU's	Spring 2006	Spring 2006	April 2006	June-Sept 2006	Oct 2006-March 2007	Oct 2006-March 2007	On going
2007	TBD and VPIP will be revised to reflect specific LU's	Spring 2007	Spring 2007	April 2007	June – Aug 2007	Sept 2007-March 2008	Oct 2007 – March 2008	On going

VRI Task	Estimated Cost*
Phase I – 1:15,000 Color Photo acquisition	$120,000.00
Phase I – Polygon Delineation and Attribute Estimation*	0.85 to $1.25 per hectare = $0.7 million to $1.03 million
Phase I – Air and Ground Calibration*	$100 - $150/air call $250 - $300/ground call
Phase I – Air and Ground Calibration Helicopter Cost	Dependent upon the sample plan air calls and ground call access**
Estimated 2005 fiscal PHASE I COSTS for LU identified above and for those tasks identified	$1.40 per hectare

*assumes 826, 000 hectares

**Neither VRI nor the previous reinventory standards (manuals) specify how many calibration points are required in a mgt unit to support photo interpretation. Each case is unique and depends on:

- the amount and composition of productive forest
- amount of existing, usable calibration data
- distribution of existing calibration data
- knowledge and skill of the interpreter(s) and their familiarity with the area
- lots of other considerations, including available budget.

MOF set "benchmarks" for the number of air calls and ground observations with measurements (these replaced the earlier ground calls) that would be established. These were not a Standard, but more a "Best Practise" to ensure that the interpreters had adequate data to be confident in their attribute estimates. Note, also, that this "benchmark" specified that the air and ground calls were done by the individual interpreters in the areas they were assigned, to calibrate themselves

for later work with the photos.[4]

3.2 Certified Photo Interpreters

At least 50% of the photo interpreters must be VRI certified and all non-certified individuals must have successfully completed the Basic VRI Photo Interpretation Course. Non-certified interpreters must also work directly under the supervision of a certified interpreter for training and quality control. All supervising certified interpreters are responsible for the quality of work completed under their certification.

3.3 Quality Control and Quality Assurance

A certified photo interpreter having at least 5 years of coastal photo interpretation experience in BC will conduct proper quality control on 2-5% of each phase of the project. Documentation of all quality control checks will be maintained and made available to the Project Coordinator.

As part of the quality control program, the VRI contractor will hold a field data collection workshop in the project area at the commencement of the fieldwork program. The purpose of the workshop is to make sure that all individuals involved in the field data collection, monitoring and/or evaluation have a common understanding of the standards, specifications, and procedures that will be employed in the TSA. It will also ensure that all vegetation attributes are collected in a consistent and accurate manner.

Attending will be:
- Project Manager and Project Supervisors
- VRI interpreters
- Contracted resources

Invited to attend will include:
- Soo TSA Project Coordinator
- Quality Assurance Contractor
- Ministry VRI 'specialists'

At the beginning of the fieldwork, the project VRI Supervisor will accompany each interpreter in the field for a day and check their work as the plots are being established. Any errors or discrepancies will be corrected on site until the work meets the required standards of the supervisor.

The Project Supervisor will accompany the interpreters on their first flight plan to ensure that air call estimates are complete and correct. All subsequent air calls will be flown with two certified photo interpreters, in the helicopter, so that the second interpreter can

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[4] Email document from Derek Challenger, MoFR, June 23, 2005

check all estimates. The Project Supervisor will also ensure that the photo interpreters establish the air calls and a majority of the ground calls on their assigned mapsheets. .

An independent contractor will conduct an independent and comprehensive quality assurance program. This contractor will ensure the VRI contractor produces a consistent and reliable product. The third party Quality Assurance Contractor will have a minimum of 5 years' VRI delineation, fieldwork and final attributing experience in Coastal BC and will check all phases of the VRI s follows:

- Delineation – approximately 2% check of polygons for 80% of mapsheets
- Fieldwork – approximately 7.5% check of ground calls and air calls representative of the project area
- Final Attributing – approximately 2% check of polygons for 80% of mapsheets

The project coordinator will ensure the inventory contractor(s) conducting the inventory provides adequate and ongoing internal quality assurance (QA) of all deliverables. The results of all quality control and quality assurance will be recorded on approved QA/QC forms.

For more information, please refer to the following:

- Quality Assurance Procedures for Photo Interpretation (version 2.0, March 2004)

4.   REFERENCE MATERIAL

Each member of the inventory team will have the following reference material available for the duration of the project:

- Soo TSA VRI Strategic Inventory Plan (2006)
- Soo TSA VRI Project Implementation Plan (2006)
- VRI BC Land Cover Classification Scheme (2002)
- VRI Photo Interpretation Procedures (2002)
- VRI Quality Assurance Procedures for Photo Interpretation (2004)
- VRI Photo Interpretation Standards (1998)
- VRI Ground Call Data Collection Procedures and Standards (2004)
- Air Call Data Collection Procedures and Standards (2003)
- MSRM Vector Cleaning Specifications (1997)
- MOF Forest Inventory Manual
- MOF Biodiversity Guidebook
- MOF Color Stereogram, Handbook
- MOF Black and White Stereogram Handbook
- Several tree and plant field guide books

5. APPROVAL/SIGN-OFF OF VPIP

I have read and concur that the Soo TSA Project Implementation Plan (VPIP), meets current Vegetation Resources Inventory Standards and Ministry of Forests and Range business needs.

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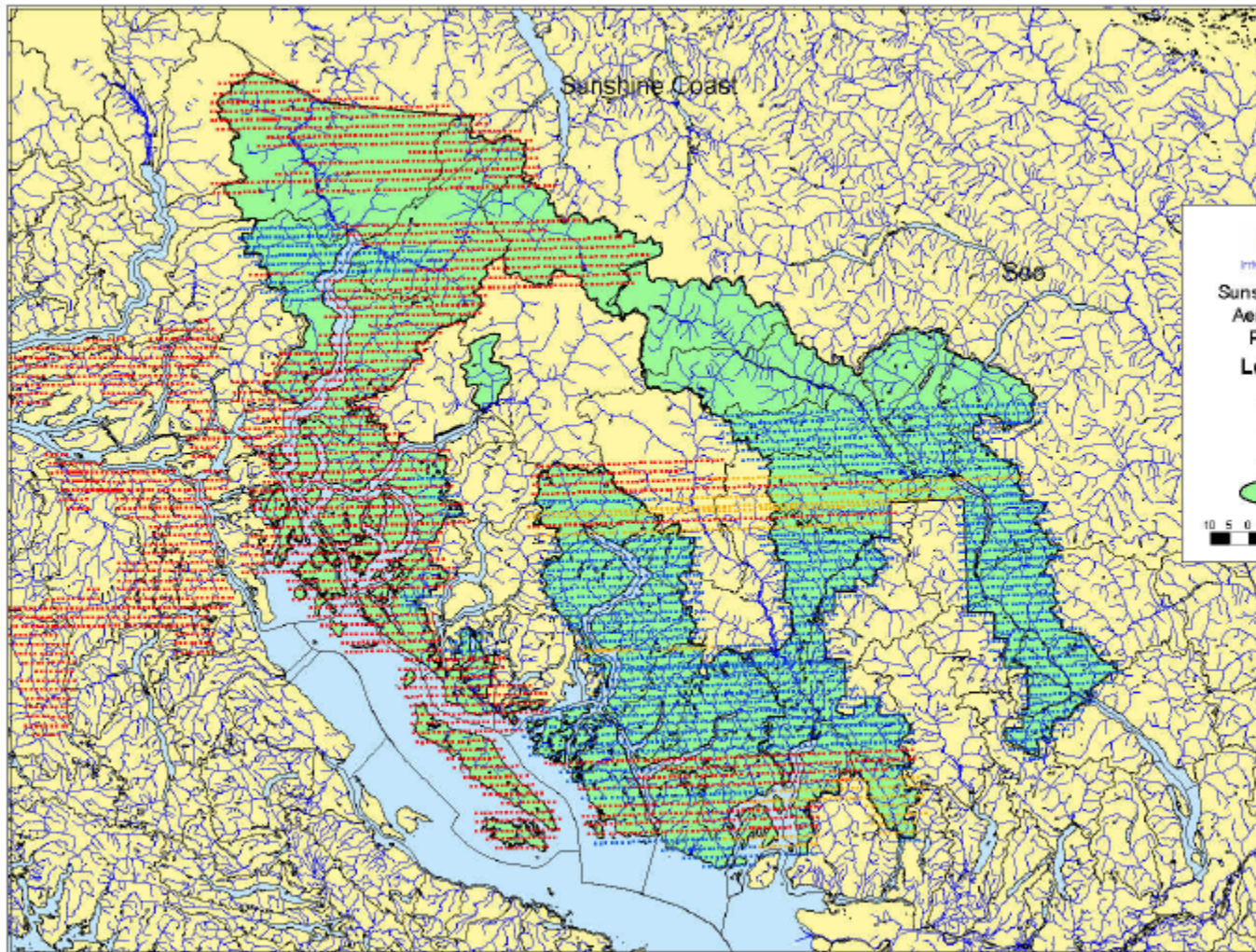Manager,   Date

Vegetation Resources Inventory Section

Forest Analysis and Inventory Branch

Ministry of Forests and Range

Appendix I – Flight Index

Sunshine Coast

Soo

INTERFOR
International Forest Products Limited

Sunshine Coast & Soo TSAs
Aerial Photo Project Area
Photos Flown to Date

Legend

· Photos 2005
· Photos 2004
· Photos 2003
Planned Photo Area

10 5 0   10   20   30   40 Kilometers

Created by
G. Sommers
Jan. 18, 2005