

Tree Farm License 46

Vegetation Resources Inventory

Photo Interpretation Project Implementation Plan

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**ON BEHALF OF:
TFL FOREST LTD**

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1. INTRODUCTION

1.1 TFL 46 Background Information

The BC Ministry of Forest issued a Rationale for Annual Allowable Cut Determination (AAC) for TFL 46 (BC MoF, September 1, 2003). In their report of the AAC, the Ministry “encourage(ed) the licensee to pursue completion of a VRI for the TFL, so that more up-to-date information can be used in the next determination for TFL 46”¹. Specific shortcomings of the current inventory have been identified by the Ministry as the age of the inventory, tree composition accuracy, and the lack of tree/stand heights. Site index in young stands is also believed to be underestimated.

A Vegetation Resources Inventory (VRI) is planned for Tree Farm License (TFL) 46 to provide both the Ministry and the licensee with updated inventory information for long-term planning and timber supply analysis.

The TFL has a high proportion of operable and productive land. It is primarily a Douglas fir, hemlock, cedar, and true fir forest. Table 1.1 provides a land base summary of TFL 46.

Table 1.1 TFL 46 area summary

Management Unit	Total Land Base (ha)	Timber Harvesting Land Base (ha)
TFL 46	83,545	63,777
Total Area	83,545	63,777

Table 1.2 provides a summary of the allowable annual cut (AAC) for TFL 46 by management unit as determined in 2003.

Table 1.2 TFL 46 allowable annual cut

Management Unit	AAC Determination (m ³ /year)	Effective AAC* (m ³ /year)
TFL 46	510,000	488,400
Total	510,000	488,400

- Reflecting a Part 13 Adjustment July 2004, and a further administrative adjustment July 2004.

¹ Rationale for Allowable Annual Cut (AAC) Determination, September 1, 2003

1.2 The VRI Process

1.2.1 VRI Overview

The VRI is a vegetation (forest) inventory process that has been 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*.

The VRI consists of several components:

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>.

1.2.2 VRI Planning

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

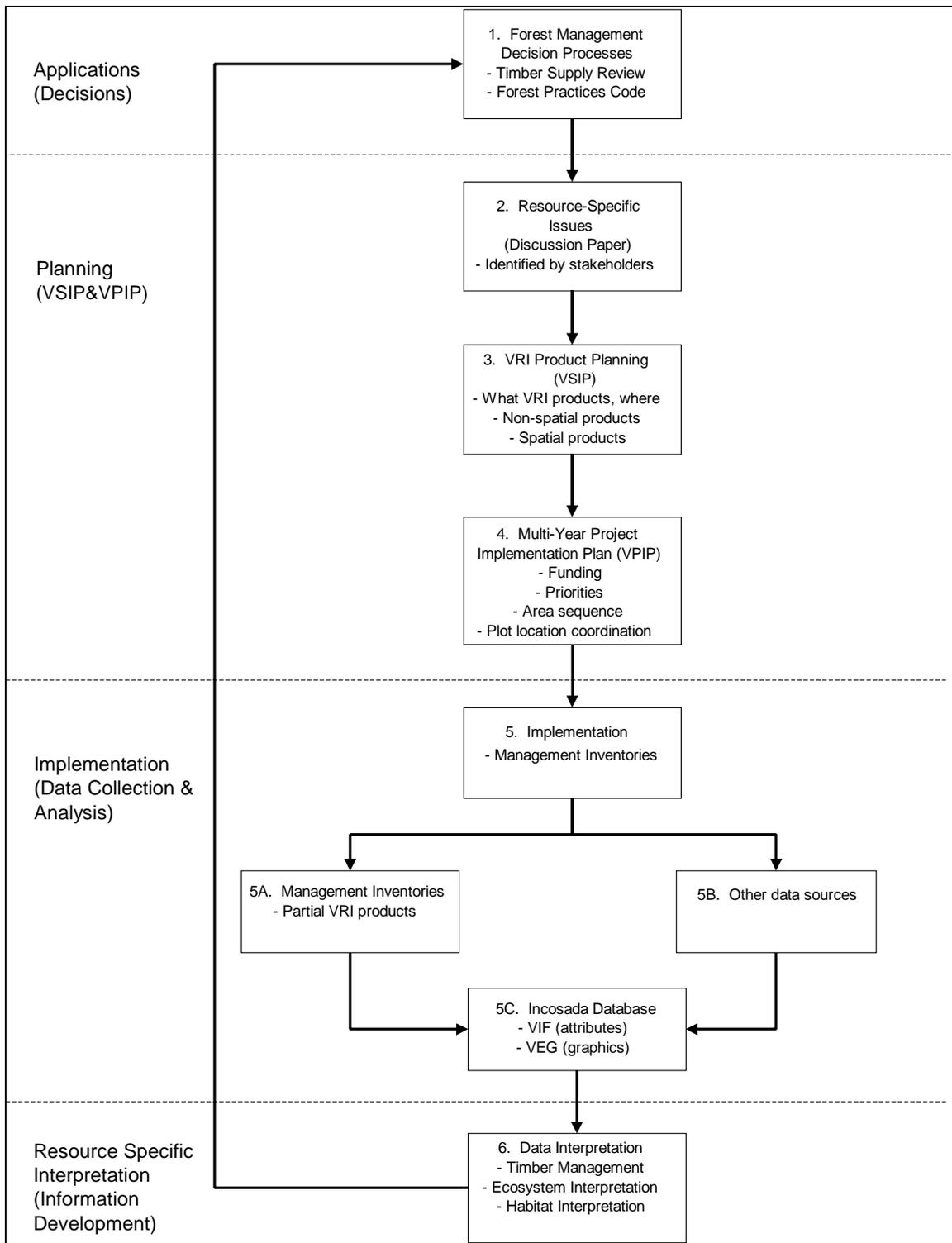


Figure 1. The VRI management inventory process.

1.3 State of the Current TFL 46 Inventory

The original forest inventory of old growth timber was prepared during the period 1967 to 1970. During the period 1972 to 1980, numerous intensive inventories were completed for the purpose of operational planning and these were combined with the original inventory to produce the maps and values for Management and Working Plan No. 1. Approximately 10,300 volume sample plots were established. For the TSR 2 analysis, the inventory was updated to account for harvesting and silvicultural activities to December 31, 1999.

The Ministry of Forests undertook an inventory audit of TFL 46 in 1997. The results suggested that volume prediction is acceptable for mature stands, but that assessment was of overall volume prediction and may disguise volume prediction at any sub-strata (such as by species or site grouping) level. The audit also suggested that site indices for stands between free growing and 60 years of age are underestimated using the inventory data.

1.4 Document Objectives

The objective of this document is to outline and describe the VRI Phase 1 activities to be completed within TFL 46. It provides some basic landbase information, some background information from the previous Annual Allowable Cut Rational document (September 2003), and it outlines the implementation plan for the field sampling.

1.5 Landbase

TFL 46 covers 98,973 ha of land (see Table 1.3) as of the last timber supply analysis. The landbase consists of seven individual blocks, which are located mainly on the Western Coast of Vancouver Island between Muir Creek in the south and Nitinat River and Cowichan Lake in the west and north. Smaller portions of the TFL are located on the southeast part of the Island.

Most areas of the TFL are located in watersheds with rivers running westward toward the west coast of Vancouver Island. Slopes vary from flat, alluvial river valleys to steep, rugged and rocky terrain. In contrast, areas of TFL 46 located in the Cowichan Valley drain eastward and have more gentle topographic features. The maximum elevation within the TFL is approximately 1,200 m, with many of the mountain ridges attaining elevations of 800 m.

Although the geology of Vancouver Island is complex and varied, pedologists believe that soils within the TFL developed following the last ice age of 10,000 years ago. Soils are composed of glacial tills at medium and upper elevations, while other tills occur in the valley bottoms. Glacial out-washes are found near the main rivers and moraine silts and clays occur at lower elevations on flat and concave slopes.

Most of TFL 46 is within the Coastal Western Hemlock (CWH) biogeoclimatic zone. The main tree species in the forested landbase (based on stand leading species) are Douglas-fir (44%), hemlock (35%), cedar (11%), and balsam fir (6%). In this report, we assume that the forested landbase corresponds to the Vegetated Treed (VT) landbase (BC Landcover Classification Scheme, or BCLCS).

Table 1.3. Landbase by forest cover.

	Total Area (ha)	%
Forested	95,057	96%
Mature	29,930	30%
Immature	65,127	66%
NSR	-	0%
Non commercial	-	0%
Non productive	3,916	4%
Grand Total	98,973	100%

2. PHOTO INTERPRETATION PLAN

2.1 Project Objectives

The objective is to improve the TFL polygon information using photo interpretation. The VRI product is a spatial database consisting of unadjusted photo-interpreted estimates. Ground sampling, used to correct or adjust the photo-interpreted estimates, is discussed as a separate process.

2.2 Target Area

All the lands, shown below in Figure 2, will be updated to VRI standards through new photo interpretation. Some portions of TFL 46 are the subject of takeback negotiations, but nonetheless will be included in the photo interpretation. A block not currently in the TFL, but committed as a future addition, will also be included in the interpretation.

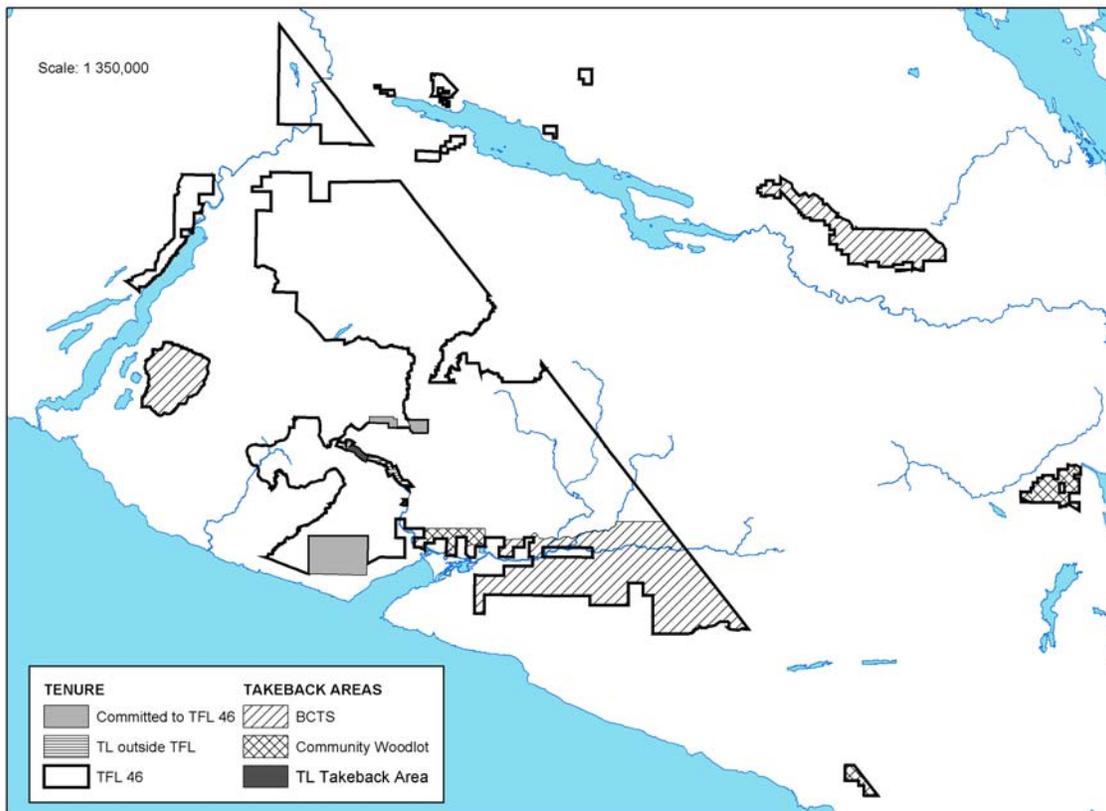


Figure 2. TFL 46

2.3 Calibration Data Sources

The number of calibration points, both ground calls and air calls, required to support VRI Photo Interpretation depends on the management unit in question. The current VRI Standards don't attempt to give precise estimates and neither did the earlier forest cover inventory manual, because any estimate comes from working through several considerations.² However, a generally accepted benchmark for calibration points is 12 ground calls and 20 air calls per map sheet.

For the TFL 46 VRI calibration, a minimum of or 55 1-pt ground calls (with two additional count plots when required) and 85 air calls will be completed. This works out to approximately 12 ground calls and 20 air calls per map sheet equivalent. In addition to the minimums, at least 110 ground observations without measurements and 50 air observations will be completed.

² Email from Ministry Rep. Derek Challenger (June 1, 2005)

For more information on this topic please refer to the following:

- VRI Air Calibration Data Collection Procedures and Standards (2003);
- VRI Ground Calibration Data Collection Procedures and Standards (2004);

Or, use the following links:

- http://srmwww.gov.bc.ca/risc/pubs/teveg/aircalibration2k3/air_call_procedures2k3.pdf
- http://srmwww.gov.bc.ca/tib/vri/vri/standards/photo_interp/vri_pi_gcall_2k4.pdf

2.4 Inventory Documentation and Archive

The original forest cover inventory for TFL 46 was collected between 1967 and 1970, with inventories of older immature stands updated in 1976 and 1977. Source photos from the 1967-1970 inventory work are unavailable.

The Ministry of Forests undertook an inventory audit of TFL 46 in 1997. The results suggested that volume prediction is acceptable for mature stands, but that assessment was of overall volume prediction and may disguise volume prediction at any sub-strata (such as by species or site grouping) level. The audit also suggested that site indices for stands between free growing and 60 years of age are underestimated using the inventory data. In the 2003 AAC rationale document, the B.C. Chief Forester encouraged the licensee to pursue completion of a VRI for the next timber supply analysis.

3. PROJECT IMPLEMENTATION

3.1 Scheduling

We propose to complete the Phase 1 of the VRI for TFL 46 this fiscal (pending funding). Activities for this fiscal year will include:

- Polygon delineation (using softcopy);
- Analysis of data sources (Gap Analysis);
- Supplementary Sample Plan design (to confirm sufficient calibration calls)
- Field Data Collection;
- Polygon Descriptions (using softcopy);
- Final Digital Mapping; and,
- Final Deliverables

Table 3.1 provides a summary of delivery schedule, by phase.

Table 3.1 - Summary of Estimated Delivery Schedule by Phase for TFL 46

Fiscal Year	Photos flown and Scanned	Viewer Set Preps.	Polygon Delineation	Sample Design	Field Data Collection	Polygon Descriptions	Final Digital Mapping and Deliverables	Quality Control
05/06	complete	complete	Aug.15	Aug. 30	Sept. 30	Dec.15	Mar.15	Continuous

3.2 Photo Scale

In preparation for the new inventory on TFL 46, 1:15 000 color photos were flown in 2003, scanned (20 microns) and viewer sets prepared for softcopy compatibility. The inventory will be completed using digital softcopy photogrammetric technology.

3.3 Project Coordination

Doug Reeve, RFT (Project Administrator)

Teal-Jones Forest Investment Account Coordinator

The project coordinator will at a minimum;

1. Select a suitable inventory consulting firm to undertake air photo interpretation (to be selected from the Ministry list of qualified VRI contractors)
2. Coordinate the project;
3. Monitor and communicate project progress;
4. Arrange for 3rd party Quality Control (QC), using suitably qualified individual or firm.

3.4 Quality Control

The contractor selected to undertake the VRI will be required to complete all work to established government standards. They will also be required to establish a comprehensive Quality Control (QC) program to ensure that a consistent and reliable product is produced. The QC program will be expected to cover, at a minimum, data source transfer, polygon delineation and description, ground and air calibration, and digital data validation. The VRI contractor will be required to provide Teal with documentation related to the QC program.

The following specifications and information will be utilized;

- VRI BC Land Cover Classification Scheme (2002);
- VRI Photo Interpretation Procedures (2002);
- VRI Quality Assurance Procedures for Photo Interpretation (1998);
- VRI Photo Interpretation Standards (1998);
- VRI Air Calibration Data Collection Procedures and Standards (2003);
- VRI Ground Calibration Data Collection Procedures and Standards (2004);
- MOF Vector Cleaning Specifications (1997).
- BC Ministry of Forests' Inventory Manual;
- BC Ministry of Forests' Biodiversity Guidebook;
- BC Ministry of Forests' Color Stereogram Handbook;
- BC Ministry of Forests' Black and White Stereogram Handbook;
- Forest District Silviculture Opening History records

The contractor selected to undertake the work will be required to use certified VRI photo interpreters. All photo interpretation will be completed or supervised by a Certified Photo Interpreter. If two or more interpreters are used, at least 50% of the interpreters will be certified; and all non-certified interpreters will work under the direct supervision of a VRI Certified Photo Interpreter for training and quality control.

All internal quality control will be completed by a Certified Photo Interpreter with at least 5 years of coastal photo interpretation experience.

3.4.1 Quality Assurance

A 3rd party company or individual will be retained to provide Quality Assurance (QA) services. This company or individual will be responsible for QA checks on all aspects of work undertaken by the VRI contractor. All QA efforts and findings will be documented. Selection of this company or individual will be done in consultation with Ministry of Forests and Range staff.

All third-party quality assurance will be completed by a individual who is VRI Certified, with at least 5 years of coastal photo interpretation experience.

3.4.2 Deliverables

Upon completion of the VRI Phase the following items will be delivered to Ministry of Forests and Range:

- Digital spatial and attribute data completed to current MoFR specifications and standards;
- All archival data and photos provided by the Ministry of Forests and Range;
- an edited and corrected vegetation cover attribute file in .mdb format validated through VegCAP;
- the final VegCAP reports from the Validate and Polygon Compare functions;
- a vector and polygon clean graphic file as per standards;
- a digital copy of all field calibration data; and
- copies of photo prints with calibration data.

3.5 Approval/Sign-off of VPIP

Suggested sign-off contacts are:

Agencies	Contact
Ministry of Forests and Range	Jon Vivian

Licensee Contacts:

Licensees	Contact
TFL Forest Ltd. (Teal-Jones)	John Pichugin

I have read and agree that the activities and products outlined in this proposal will meet the Ministry of Forests and Range business needs.

Manager

Development and Policy Forest Analysis Branch, Ministry of Forests
or other suitable MOF representative