

International Forest Products Ltd. Tree Farm Licence 23

Vegetation Resources Inventory Project Implementation Plan For Photo Interpretation

February 24, 2010
Nona Phillips Forestry Consulting

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Acknowledgements

This planning process for Tree Farm License (TFL) 23 was initiated by the local Stakeholders. Financial support was provided through a project funded by International Forest Products Ltd. (Interfor) as part of their Forest Investment Account (FIA) Land Based Investment Program (LBIP) activities. This Vegetation Resources Inventory (VRI) Project Implementation Plan (VPIP) was developed based on knowledge gained about the TFL Inventory through existing Inventory plans and projects and from Stakeholder input. It has been supported by both industry and government Stakeholders including the following:

Local licensees:

Frances Swan, Licensee Representative, Interfor, Nakusp
Geoff Bekker, Castlegar Woods Division Manager, Interfor
Planning Officers, British Columbia Timber Sales (BCTS), Kootenay (George Edney) and Okanagan-Columbia (Dave Gill) Business Areas

Ministry of Forests & Range staff:

Arrow Boundary Forest District, Tara DeCourcy, Stewardship Forester
Chris Mulvihill, Vegetation Resources Inventory, Southern Interior Forest Region (SIR), Nelson
Kevin Johnston, Stewardship Team Leader, SIR, Kamloops
Gary Johansen and Roman Bilek, Vegetation Resources Inventory, Forest Analysis and Inventory Branch (FAIB), Victoria

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Executive Summary

International Forest Products Ltd (Interfor) is the current holder of the license for the majority of Tree Farm License (TFL) 23. BC Timber Sales (BCTS) holds operating areas on 28% of the TFL. The Shelter Bay operating area in the Columbia Forest District is managed by the Okanagan-Columbia Business Area and the remaining operating area by the Kootenay Business Area. In November 2005, Pope & Talbot Ltd., the former holder of the licence, requested that the Minister of Forests remove BCTS from TFL 23 by excluding all of the BCTS operating areas currently within the TFL. Government intends to proceed with this removal and place the BCTS operating areas from TFL 23 and from two other interior TFL's into a new Management Unit named the Cascadia Timber Supply Area (TSA). As of the date of this report, the Cascadia TSA has not yet been formalized.¹

As recommended by Ministry of Forests and Range (MFR)², the complete TFL area (i.e. the area managed by the major licensee as well as the BCTS tract) will be included in the Vegetation Resource Inventory (VRI) Project proposed in this plan, for overall efficiencies.

This VRI Project Implementation Plan (VPIP) has been prepared based on information gleaned from previous planning projects completed for the VRI Inventory, Timber Supply Review (TSR) processes, and input by Stakeholders.

A requisite predecessor of the VPIP, the Strategic Inventory Plan (VSIP) for TFL 23 was prepared by A.Y. Omule of Rural Forestry International Ltd. and approved in January, 2007 by the MFR, Forest Analysis and Inventory Branch (FAIB).

The reasons for planning this Photo Interpretation Project include:

- The inventory in TFL23 dates from 1974 with a partial re-inventory in 1990. In the VSIP, a number of issues with the current classification were identified through a review of studies of the landbase.
- The experience of the stakeholders. They indicated that in various specific areas and/or types there were problems including incorrect species typing, age class underestimations, and site class overestimations.
- The 2007 'Order Respecting an AAC Determination for Tree Farm Licence No. 23' from the Deputy Chief Forester recommended that the Licensee continue to implement the VRI inventory initiatives identified in the VSIP for the next TSR. The net volume adjustment factor (NVAF) project has been completed. The Phase I project could now be undertaken by the local licensees prior to the next Timber Supply Review.
- Several tenures exist on the TFL. There are multiple land use issues such as caribou habitat which compete for the landbase. While the forest industry has undergone a market loss in the recent past, when the forest

¹ Personal Communication with Dave Gill, January 15, 2010. No time frame for this administrative work to be completed is currently available.

² Personal Communication with Chris Mulvihill, February 15, 2010.

industry and demand recover, it will be critical for these licensees and the province to have current information regarding the available timber on the landbase of TFL23.

This plan provides details for the TFL23 Phase I project including a discussion of the need for new photo acquisition. An interest has been expressed by the stakeholders to fly the TFL with digital coverage. This technology is discussed in the text of the plan and costs are compared for 'traditional' and digital photo products.

A Project Coordinator will be identified early in the project. This person will be responsible to maintain regular communication with Ministry of Forests and Range inventory staff, to identify and resolve developing issues and assist in delivery of a product that meets the provincial standards. All project deliverables will be made to the appropriate MFR staff, including interim deliverables such as QA and Interim Project Reports as well as final Project Completion Reports and mapsheet-related deliverables.

A team of Provincially Certified VRI Phase I photo interpreters will be contracted to undertake the project using Softcopy technology. The steps in their completion of the project include:

- Polygon delineation
- Assessment and integration of available historic calibration points and of other potential sources of information as identified in the RFP
- Field Calibration
- Polygon Attribute Estimation
- Digital Mapping

A Third-Party Quality Assurance (QA) contractor will follow up each phase of the project, ensuring that the quality of the project is assessed and maintained above the minimum project requirements. As of 2009, the MFR will be overseeing this project requirement.

Timelines outlined in this plan are funding dependent. This project could be initiated as early as 2010. Since there have been no funding commitments at the time of the writing of this plan, project years have been listed as 'Year 1, Year 2', etc to allow the plan to remain 'current' if there is a delay in start up. Project activities and costs have been included, based on historical project costs. Adequate detail has been provided for the Ministry VRI staff, local Stakeholders and eventually the Project Manager to use this plan in the decision making process and to carry out the project.

This plan was written following the current MFR VRI standards and procedures. All aspects of a resultant project will also follow the standards and procedures available from the MFR when the project is undertaken.

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1. Introduction

1.1 Background Information

The Vegetation Resources Inventory (VRI) in the province of British Columbia (BC) is a 'broad' inventory designed to support, among other things, the Timber Supply Review (TSR) process. A Timber Supply Review is currently being finalized for Tree Farm Licence (TFL) 23 so the next review will likely begin in about 2014. A new inventory initiative such as the Phase I project outlined in this plan could be available for use in that TSR.

A.Y. Omule of Rural Forestry International Ltd. completed a Strategic Inventory Plan (VSIP) in January, 2007 for this TFL in consultation with, then licence holder, Pope and Talbot and Ministry of Forest and Range (MFR). The VSIP summarized ongoing inventory projects on this landbase since the original inventory was completed, approximately 35 years ago. It concluded that the issues of an old inventory, attribute bias and developments in the inventory process with the 'new' Vegetation Resources Inventory recommend the undertaking of a Phase I photo interpretation project.

In the 2007 Order from the Chief Forester, the designated representative of the Chief, Craig Sutherland stated that: "I further request that the licensee implement as much as possible its vegetation resources inventory strategic plan for TFL23 before the next timber supply analysis." He went on to say that "uncertainty would be reduced for the next AAC determination by having the best information available."³

This Vegetation Resources Inventory Project Implementation Plan (VPIP) has been prepared as a follow up to the initial VRI Strategic planning process and the direction of the Chief Forester. Its development occurred with the guidance and input from the following Stakeholders:

International Forest Products (Interfor)

- Frances Swan, Lead for the Licensee
- Geoff Bekker, Castlegar Woods Division Manager

BC Timber Sales (BCTS)

- Dave Gill, Planning Officer Okanagan-Columbia Business Area
- George Edney, Planning Officer, Kootenay Business Area

Ministry of Forests and Range

- Gary Johansen and Roman Bilek - Forest Analysis & Inventory Branch (FAIB)

³ Chief Forester Order Respecting an AAC Determination for Tree Farm Licence No. 23, October 1, 2007, page 2.

- Chris Mulvihill, Inventory Forester and Kevin Johnston, Stewardship Team Leader -Southern Interior Forest Region (SIR)
- Tara DeCourcy, Stewardship Forester -Arrow Boundary Forest District

1.2 Vegetation Resources Inventory Planning Process Overview

The Vegetation Resources Inventory provides a ‘strategic’ level inventory for a management unit. It was designed to answer two questions: Where is, and how much, of a given vegetation resource is located in an inventory unit?⁴

The Vegetation Resources Inventory has two ‘phases’ that may be undertaken in combination or in certain situations, individually. In a Phase I project, polygons are delineated within a management unit. Vegetation attributes of these polygons are estimated by photo interpreters using a combination of photo work and field calibration. In Phase II of the inventory, a subset of the polygons is randomly selected for ground sampling and Net Volume Adjustment Factor (NVAF) destructive sampling. The purpose of these Phase II activities is to verify and if necessary, adjust Phase I numeric vegetation attributes. Figure 1, below, illustrates the process⁵.

The initial step in any effective inventory program is establishing goals and objectives in the planning process. VRI planning involves three parts:

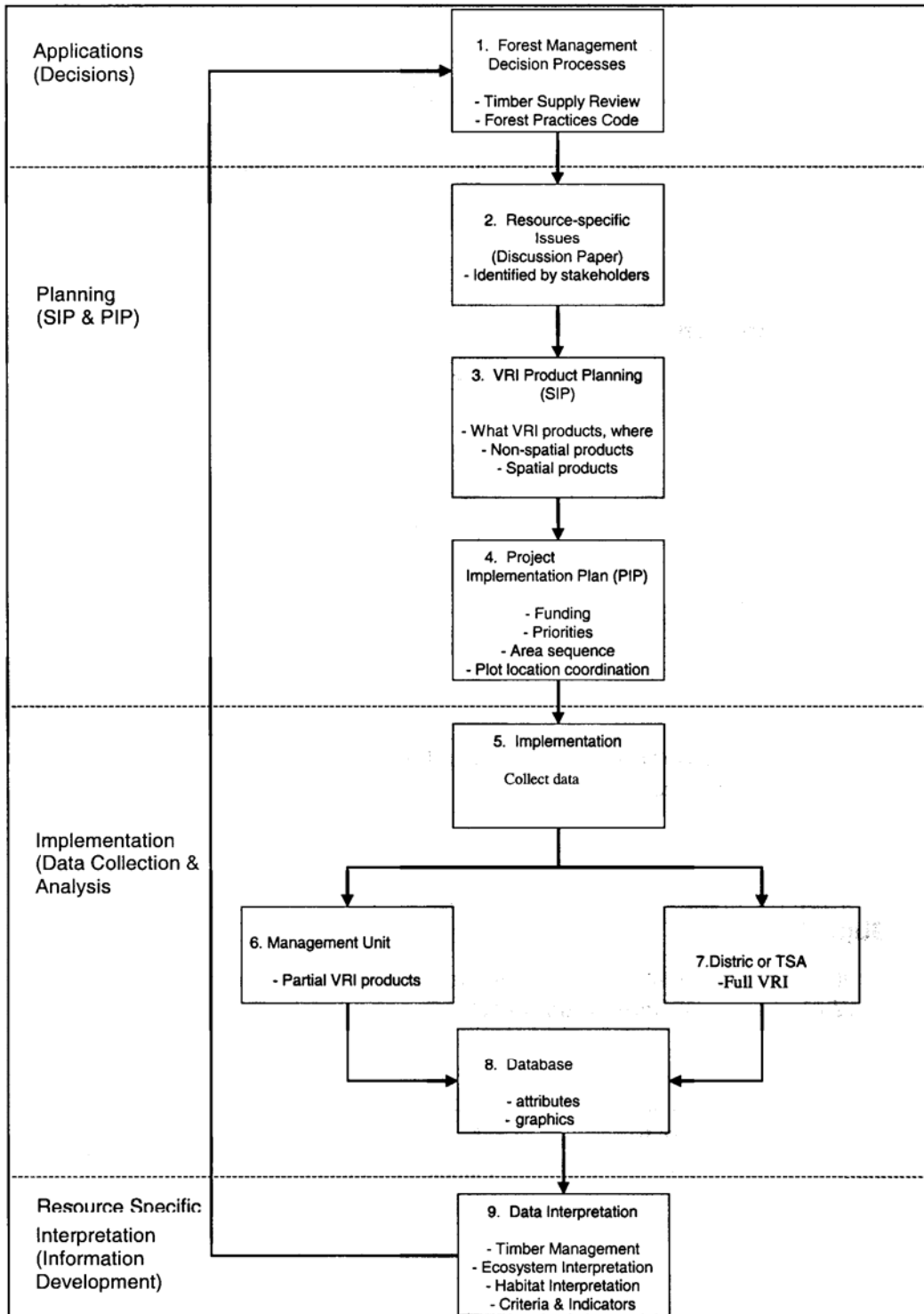
- Consultation with licensee and government stakeholders to identify issues that can be addressed by executing part or all of the Vegetation Resources Inventory, according to its Procedures and Standards.
- Developing a VRI Strategic Inventory Plan that provides background on the various VRI activities and draws on the consultation process to evaluate which ones would address local needs. The TFL 23 VRI VSIP is posted on the following website:
http://www.for.gov.bc.ca/hts/vri/reports&pub/tfl_vsips/tfl23_vrign_vsip.pdf
- **Development of a VRI Project Implementation Plan. The VPIP “is a working document that details the specific operational activities associated with the implementation and documentation of the inventory project.”⁶ For a photo interpretation project it provides details on the project area, data sources, aerial photographs (existing or new), format of base files, project scheduling, deliverables and costs.**

⁴ MFR Vegetation Resources Inventory website – Overview -
<http://www.for.gov.bc.ca/hts/vri/intro/index.html>

⁵ VRI –Preparing a Project Implementation Plan for Photo Interpretation. This flowchart was added to the plan at the request of the Stakeholders during the February 4, 2010 conference call.

⁶ From the Introduction in the VRI Standard “Preparing a Project Implementation Plan for Photo Interpretation”.

Figure 1 VRI Planning Process



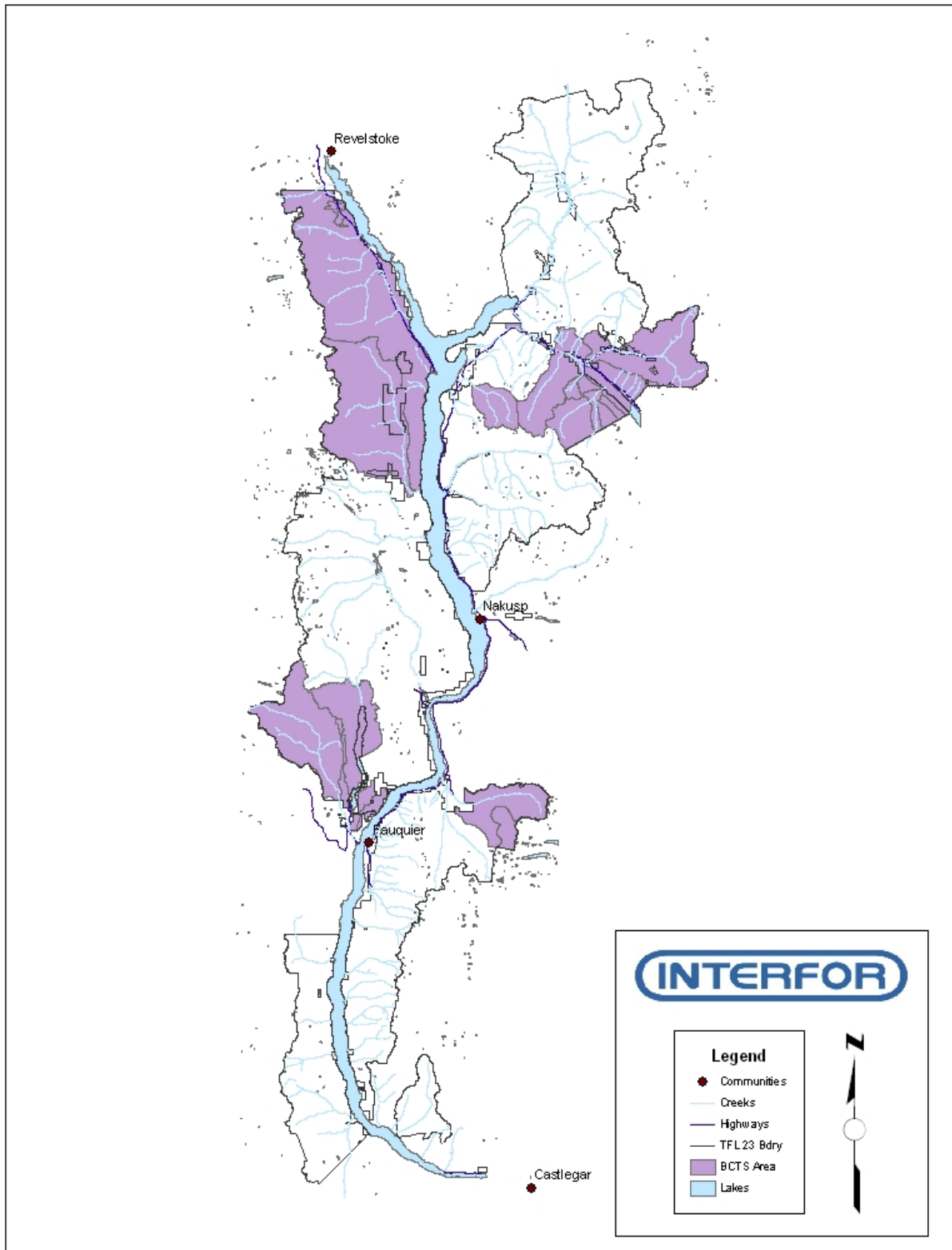
More information about the Vegetation Resources Inventory and the most current VRI Standards and Procedures, are available at the Ministry of Forests & Range, Forest Analysis & Inventory Branch website:

<http://www.for.gov.bc.ca/hts/vri/index.html>

1.3 Current Landbase

TFL 23 is a long and narrow management unit that runs north and south along both sides of Arrow Lake. The community of Revelstoke is at the north end of the TFL, Castlegar is at the south end and Nakusp is in the middle (see Figure 2 on next page).

Figure 2 - Overview map of TFL 23



TFL 23 is in the Arrow Boundary and Columbia Forest Districts, in the Southern Interior Forest Region. Interfor holds the majority of operating area but BCTS has a tract representing 28% of the TFL. The Shelter Bay operating area in the Columbia Forest District is managed by the Okanagan-Columbia Business Area and the remaining operating areas by the Kootenay Business Area. In November 2005, Pope & Talbot Ltd., the former holder of the licence, requested that the Minister of Forests remove BCTS from TFL 23 by excluding all of the BCTS operating areas currently within the TFL. Government intends to proceed with this removal and place the BCTS operating areas from TFL 23 and from two other interior TFL's into a new Management Unit named the Cascadia Timber Supply Area (TSA). As of the date of this report, the Cascadia TSA has not yet been formalized.⁷

Glacier National Park lies in the north, Valhalla Park to the east, and Monashee Park to the west.

The total area of the TFL is approximately 551,000 hectares.

Table 1 provides an Area Summary for the TFL by land classification.

Table 1: Area Summary for TFL 23⁸

Land Classification	Area (ha)	Percent of Category	Percent of Total Area
Total TFL Area	551,471		100
Non Productive-Total	125,930	100	23
Non Productive, non forest	121469	96.4	
Non-commercial brush	167	.1	
Roads	4294	3.5	
Total Productive Forest	425541	100	77
Private	6456	1.5	
Parkland	20	<.1	
BCTS Operating Area	157363	37.0	
Remaining	261702	61.5	

The terrain in the TFL is generally steep with the Monashee Mountains in the west and the Selkirk Mountains in the east.

The entire TFL is within an interior wet belt, a productive forest with three biogeoclimatic (BEC) zones: ICH, IDF, and ESSF. Over half of the landbase is in the ICHmw2. The dominant leading tree species, by area, are Douglas fir (35%),

⁷ Personal Communication with Dave Gill, Planning Forester, BCTS Okanagan-Columbia Business Area, January 15, 2010. No time frame for this administrative work to be completed is currently available.

⁸ Area Summary is derived from the "TFL23 Timber Supply Review 2008 Information Package. In this summary, it is noted that areas that would be included in more than one category are included in the first category.

hemlock (21%), pine (16%), and spruce (14%). Cedar and balsam make up the remaining area (14%)⁹.

1.4 State of the Current Inventory

1.4.1 Forest Cover Inventory History¹⁰

The inventory in TFL23 is one of the oldest in the province of BC. The date of the 'original' inventory was 1974, undertaken using photos taken over several years.

The reinventory of this unit is described in Sterling Wood Group Inc. TFL23 VRI Attribute Adjustment Report, May 2002, as follows: "A partial reinventory of TFL23 was completed in 1990. The 1990 project included restratification and classification of age class 2 to age class 6 stands, based on new aerial photography and field sampling, age classes 7 to 9 were updated based on the short form labels that had originated from the previous 1974 inventory and had been updated to 1988. Midpoints were used to assign ages and heights to these mature and age class 1 stands. The reinventory procedures are documented in the September 1990, Industrial Forestry Services Ltd. TFL 23 Reinventory Report."

In 1989, Timberline had a contract to identify the Environmentally Sensitive Areas (ESAs).

In 1999/2000 VRI samples were established across the TFL in all age classes (except stands < 10 years old). A portion of the VRI samples were re-visited in 2007/08 and enhanced for NVAF sampling. This destructive sampling followed in the 2008 field season. This NVAF sampling only occurred in the areas outside of the BCTS tract.

The last disturbance update was completed in January 2008.¹¹

1.4.2 Inventory Audit

The Provincial Inventory Audit program was developed to provide a statistical description of the accuracy of the forest inventory's volume estimates¹² by management unit. The field work for an audit on the TFL 23

⁹ The information in this section is from the Timber Supply Analysis Report for TFL23, January 2009, Timberline.

¹⁰ The information in this section (except for the disturbance date) was gleaned from the TFL 23 VSIP prepared by A.Y. Omule of Rural Forestry International Ltd., January 28, 2007, from the TFL23 VRI Attribute Adjustment Report by Sterling Wood Group Inc. and from personal communication with Chris Mulvihill on January 12, 2010.

¹¹ Timberline Natural Resource Group. TSR Information Package TFL 23, TSR 2008. Page 14

¹² Resource Inventory Branch, Inventory Audit Sampling Standards & Procedures 1998.

inventory was completed in 1994. The audit results, published in 1996 by the MFR were as follows:

- The difference in mature volumes was not statistically significant.
- When the population was post-stratified by operability, the volume in the operable forested area was again not statistically significant.
- The assessment of the non-forest strata indicated that this inventory met provincial standards.¹³

1.4.3 Further Analysis of the TFL 23 Inventory

The 1999 and 2000 VRI ground sampling project was followed up by an analysis by Sterling Wood Group. In the analysis process the consultant noted classification inconsistencies between the inventory and the VRI ground sampling data. Specifically, the report speculated that the large age and height ratios identified by the VRI adjustment methodology could have been caused by:

- Classification procedures in the original inventory
- Mid-pointing of height and age classes in the 1990 reinventory with repeated adjustments over time
- Updating inventory attributes for young stands from silvicultural surveys
- The possible presence of residual trees in stands for which there is no silvicultural record available.¹⁴

1.5 Document Objectives

The issues identified in the VSIP and by the expanded group of participating Stakeholders for the VPIP related to the TFL's inventory are the basis for this project planning exercise. This document will identify the operational planning steps for a VRI photo interpretation project in the TFL. It will detail the Phase I inventory project and specify the activities, schedule, specifications, responsibilities and costs to complete it.

It should be noted that the primary objective of any new VRI photo interpretation project is to create a new inventory to the Vegetation Resources Inventory Standard where the existing inventory is deemed to be inadequate. To support a successful project, it is important that photo interpreters participate in all activities

http://www.for.gov.bc.ca/hts/vri/audits/standards/audit_manuals/auditsp.pdf

¹³ TFL 23 inventory audit, 1996. <http://www.for.gov.bc.ca/hts/vri/audits/reports&pub/reports/tfl23-auditreport.pdf>

¹⁴ Page 23 of TFL23 Vegetation Resources Inventory Attribute Adjustment report by Sterling Wood Group Inc., May 2002

of the project (delineation, field work¹⁵, attribution, quality assurance (QA)) for the geographic area that they are assigned.

Section 1 of this document provides background on the VRI process and a description of the current inventory and landbase.

Section 2 states the information needs that precipitated the decision to plan a VRI project for this management unit. It also describes technical details regarding the phases of the project including polygon delineation, utilization of historic calibration points, field sampling, final attributing and digital mapping.

Section 3 provides considerations for the project's implementation.

¹⁵ The photo interpreters must be involved with field calibration activities to help them calibrate their photo interpretation for TFL 23.

2. Photo Interpretation Plan

2.1 Project Objectives

The primary objective of this project is to create an inventory of the current forest cover in TFL 23. This inventory will be consistent with current provincial VRI Phase I standards. Once initiated, the project could be completed in a relatively concentrated timeframe dependent on funding.

Through the completion of a VRI project in the TFL starting with new photo interpretation, the following issues identified in the VSIP should be addressed:

- About 28% of the TFL area has been transferred to BC Timber Sales and with a reduced operating area, Interfor could improve their planning efforts with a new inventory for the remaining area. (At the same time, the case could be made for BCTS to mutually benefit if their operations had a good inventory for their landbase.)
- The current inventory is not in VRI format so much valuable information is missing (new attributes and old attributes in a different format)
- The inventory is relatively old so does not reflect possible changes in stand structure.
- The VSIP indicated that only 22% of the species composition labels matched the ground checks.
- The 1999/2000 analysis conducted by Sterling Wood Group (and referenced in Section 1.4.3) found that there were 'issues' with ages and heights in most strata. Generally ages and heights were underestimated in young age classes and over-estimated in older age classes.

Additional issues identified in the development of this VPIP include the following concerns voiced by the Stakeholders:

- Unreliable species composition. Examples provided by the stakeholders included the mistyping of Cedar and Hemlock types and hemlock leading stands being typed as spruce. Species composition is critical for many strategic processes such as AAC determination, mill profile etc.
- Overestimation of height in some areas. One specific example provided was age class 8 and 9 stands in the Shelter Bay area had height consistently overestimated, particularly on slopes.

- Age class inaccuracies. For example, in the north end of the TFL (Incommapleaux and Trout Lake areas), in the wetter subzones age class 9 is often typed as age class 6. In particular, the age class of very old cedar and hemlock types is underestimated. This attribute is important for biodiversity analysis.
- Underestimated site index values. It follows that if age and height issues exist in the inventory, the result is incorrect site index values. The Stakeholders feel that the current inventory underestimates the TFL site index.
- Concern for getting the correct ages in regenerating stands. A stakeholder pointed out that in the Arrow TSA there were often incorrect ages associated with regenerating stands perhaps due to problems with integrating RESULTS information. RESULTS/Cengea¹⁶ integration is discussed in section 2.6.
- Poor classification of low value stands. Examples provided by the Stakeholders included stands in the Cayuse Creek area and intermediate utilization harvested/partially harvested stands in the Barnes Creek and Fostall area.
- Age class 2 and 3 stands (e.g. stands in the vicinity of the reservoir). These harvested stands are poorly typed. They are typically large polygons but there is a lot of diversity (some are two layered) that should be more finely delineated.

In addition, Stakeholders expressed a concern that the recent Galena Bay fire might not be interpreted correctly. Probably not all of this area will appear to be dead if photos are flown early in the next (2010) field season.

The photo interpretation contractor must decide how to best address these issues by developing a strategy that optimizes the use of existing information and the gathering of new data. This strategy would consider such things as:

1. Retrieving, reviewing, and using existing data where appropriate, and
2. Prioritizing the numbers, types and locations of air and ground calls.

2.2 Target Area

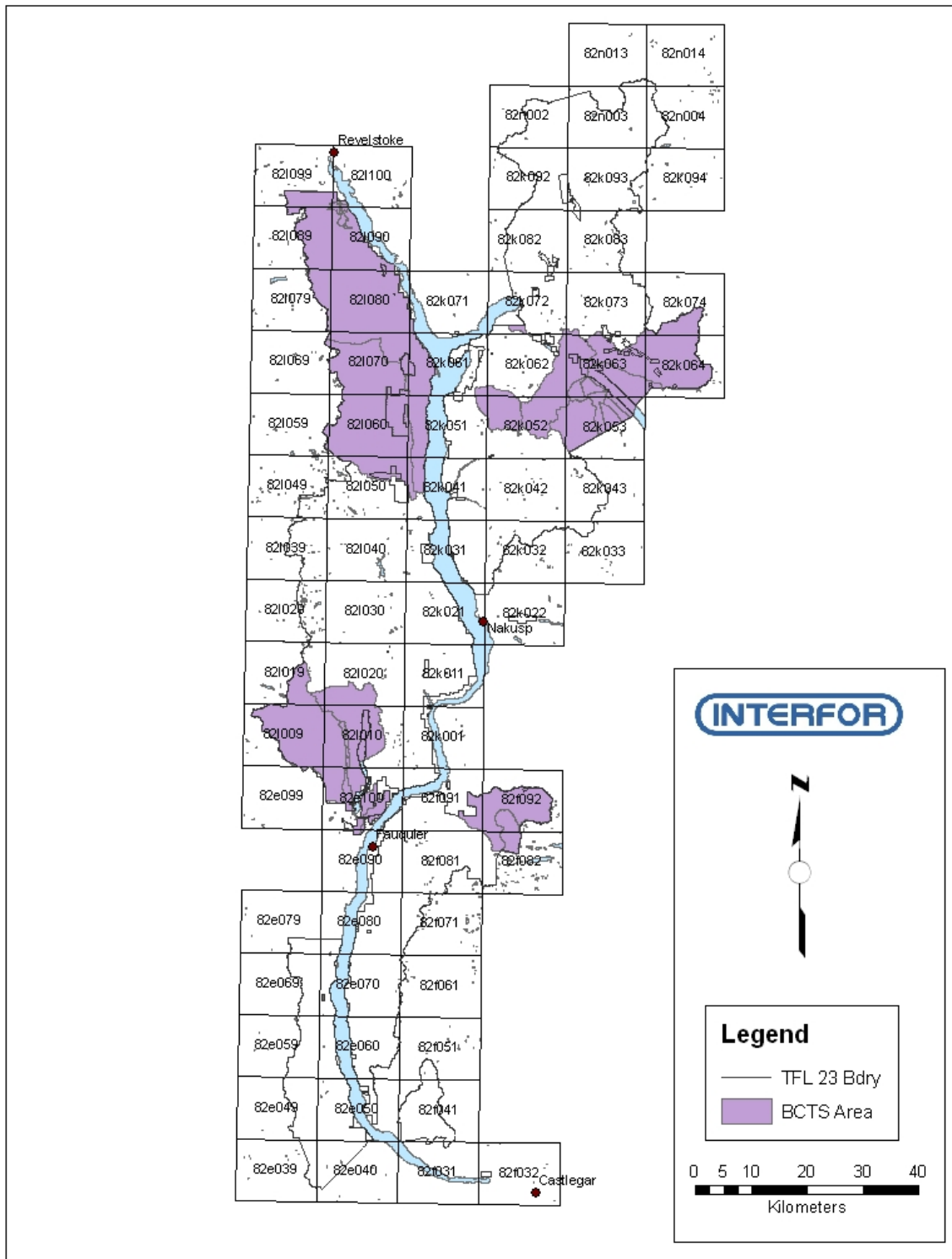
As noted in section 1.3, part (28%) of the TFL is in a BCTS tract. The MFR recommended that, for overall efficiencies, the complete TFL area (i.e. the area managed by the major licensee as well as the BCTS tract) should be included in

¹⁶ Cengea is the new name for what was formerly known as GENUS (Frances Swan email of Feb 4/10)

all proposed VRI projects so the BCTS tract will be included in this Phase I project. There are no proposed exclusions.

From a logistics standpoint, the photo acquisition phase of the project would need to be 'blocked' and the operational area would be 17 full and 57 partial mapsheets. The mapsheet list is provided in Appendix A of this VPIP, and illustrated below in Figure 3 (next page). Due to logistics for flying, the area of the photo acquisition project will be approximately 624,600 hectares.

Figure 3 TFL 23 - Photo Key Map



The gross area of TFL 23 as provided in Table 1, Section 1.3 of this VPIP, is 551,471 hectares.¹⁷ This area will be the focus of the photo interpretation project. This includes both the Interfor and BCTS operating areas.

Field work will be discussed in Section 2.7, New Field Calibration.

2.3 Inventory Documentation and Archive

2.3.1 Inventory Status

The history of the inventory is outlined in section 1.4.1 but can be summarized briefly as follows. The current inventory dates from a 1974 interpretation project with a re-inventory of age classes 3 to 6 in the late 1980's using 1987/88 photography. The reinventory was completed in 1990. Only updating has occurred since that time. None of the inventory is in VRI format.

Section 1.4.2 of this plan briefly discusses the Inventory Audit conducted by the MFR in 1994. This audit did not find any statistically significant differences in the data within its mandate.

The analysis of the inventory by Sterling Wood Group and referenced in Section 1.4.3 compared a large amount of VRI ground sampling data to the inventory. The report summarized a number of potential inventory problems that showed up as classification inconsistencies in their analysis.

Disturbances have been updated to 2008.

2.3.2 Digitizing History

Prior to 1978 strategic inventory maps were drafted by hand on Irish linen usually at a scale of 40 chains, the equivalent of 1" = 2640' (or 1:31680). In the digitizing era (late 70's, 1980), the Inventory Branch took the NTS 6' by 12' maps and cut and pasted them into the current BCGS format. Up to 6 portions of the old NTS were required to make one BCGS by hand (without computer technology). These maps had to have all polygons numbered and then the attributes had to be mid-pointed for species composition, age and height. (Generalized direct label entry). Crown closure and ESA's were added later.

These hard copy "cut and paste" maps were digitized during the mid to late 80's. NAD 83 shift and TRIM were added.¹⁸ The final product is what exists in TFL23 today.

¹⁷ TFL 23 Timber Supply Review 2008, Information Package

¹⁸ Personal Communication, Eric Fisher and Jim Grace, February 2, 2009.

The "FS810" method was used for entering forest cover details for projects in the PSYU Unit B Surveys. All of the attributes collected were mid-pointed range values, i.e. species composition, age and heights (Generalized direct label entry) onto the FS 810's; Crown closure was obtained from the document photos; and ESA were added from related surveys.

2.3.3 Aerial Photographs / Existing Photography Used for Inventory Projects

There have been two inventory projects in the TFL, the initial inventory of 1974 and the re-inventory completed by IFS in 1990. If the original copies of document photos from the 1974 photo interpretation exist, they would be located at the MFR Office in Nelson. A box of 1987/88 project photos with line work resides at the Interfor office.

2.3.4 Current Photo Coverage

The orthophotos currently available for the TFL are dated 2003. The photos that have been identified by Interfor to be available for the TFL are a full set of 1995 Black and White photos at a scale of 1:15,000 and a set of 2001 colour photos at a scale of 1:35,000.

A 5 year life span is normally considered by the MFR Forest Analysis and Inventory Branch to be the limit of an appropriate time frame for photography to be used in a new photo interpretation project. Not only are the available photos beyond this timeframe they are at a scale smaller than one recommended by the MFR, which would be 1:15,000 or 1:20,000. Accordingly, this plan for the TFL23 Phase I project has been prepared based on the conclusion that new photography will be required as the initial operational step for this project.

2.3.5 Photo Specifications and Quality

As noted above the existing photography is inadequate for the Phase I project. Photo acquisition for the TFL will be discussed further in Section 3.3 of this plan.

2.3.6 Base Maps – TRIM and adjacency issues

All maps are available in TRIM (NAD83) format. The dates that the TRIM was completed for the TFL mapsheet varies and this information can be found in Appendix B.

In other provincial planning exercises, the question has come up whether a TRIM update should be occurring at the same time as the VRI? Recognizing the financial and timeline constraints on a mapping project,

TRIM update is not being proposed as part of this project. If interpreters run into situations where the current TRIM affects the delineation, it is recommended that the issue be assessed and dealt with on a case by case basis¹⁹. There is a protocol where the interpreter can bring this change forward to GeoBC.

At the time of the writing of this plan, there are no adjacent VRI projects ongoing or planned. This is only mentioned because where there is concurrent, adjacent new VRI projects, contractors should edge tie mapsheets that are adjacent to other TSAs²⁰. Edge tying issues will have to be addressed and any requirements confirmed during the initial planning of the project.

2.4 Calibration Data Sources

Data sources are used as calibration points for improving the quality of photo interpretation. Existing data sources include ground calls, air calls, permanent and temporary samples and observations distributed across the TFL during previous inventory projects²¹.

Existing data sources do not include VRI data collected through the TFL Phase II ground sampling and NVAF projects or data from the audit project.

Once the project is underway, the Project Manager should request the historical field data from the Regional MFR Inventory Forester. This would include XO or air call and ground call books.

During this project it will be a requirement of certified VRI Interpreters on the Photo Interpretation Contractor's staff to assess the utility of the historical calibration points and any calibration points that are recognized to be still useful in the attribution stage. These will be transferred into a digital format provided by the MFR.

An initial step in the project might be to overlay the existing forest cover. Cut blocks or natural disturbances may provide a justification for removal of an existing data source. Where there is still forested cover, the assessment of the existing data sources will be based on:

¹⁹ Examples of the kind of issue to be considered include a river change that creates a new course, a change in a lake etc. The cost of handling these potential issues could be accommodated more cost efficiently through the VRI Phase I project.

²⁰ Where there is an adjacent old VRI project, the TFL boundary can be used as a polygon and edge tying is not required.

²¹ Chris Mulvihill, Personal Communication, February 4, 2010. After looking at the inventory file for the old data sources in the Region he estimated 3100 air calls, 600 ground call, 500 ground observations with measurements.

- Type of measurement (air call, ground call, permanent samples, temporary sample, etc.)
- Frequency
- Distribution
- Age / Year of Establishment
- Completeness
- Condition of available data
- Quality

The analysis should include a recommendation for the number and distribution of new air calls, ground calls and observations that are needed to support the photo interpretation on the project. Section 2.7 discusses this further.

2.4.1 Cruise Plot Data Sources

Cruise plot data from unlogged timber sales and cutting permits can be used as calibration points.

The Project Manager should be aware that incorporating cruise plots requires quite a bit of work. The licensees will be surveyed to determine the number of unlogged cutblocks and the potential number of current and valid cruise plots available to be summarized and transferred to the new photos. These will be checked for their availability, suitability, condition and compatibility for their potential use in calibration.

Finally, positional accuracy (UTMs) will also be a requirement to transfer the cruise plot locations to the new photos. It will be necessary to analyze which plots fall in each polygon and then summarize the data for only those plots. For this analysis, digital data will be preferred.

2.4.2 Other Resource Data Sources

The VRI Standard for preparing a VPIP suggests that the following information on each inventory is required to determine its usefulness in the VRI project:

1. Kind, scope and number of surveys available
2. Data reliability and compatibility
3. How the data can be incorporated.

The Project Manager should work with the MFR to assess the data available from Research and Growth & Yield (G&Y) plots.

The Regional Ecologist (Deb MacKillop) has BEC data that might be useful. This includes a mixture of old and new data including ages.

A list of inventories that have occurred in the TFL is maintained by Interfor and is provided below from Table 4 of their Management Plan 10. Appendix C is a metadata list of resource summaries (also from this management plan).

Table 2. Inventory List

Inventory Type	Description
Forest	Strategic (productive/non-productive), operational, growth and yield
Operability	Inoperable, aerial, conventional
Access	Roads and bridges
Silviculture	Silviculture activities
Terrain	Environmentally sensitive areas, terrain hazard mapping, slope
Ecological	Biogeoclimatic zone, subzone, variant, site series, natural disturbance types, predictive ecosystem mapping
Aquatic	Domestic and community watersheds, points of diversion, fish habitat, streams, lakes, wetlands
Range	Domestic agriculture
Cultural	Parks, protected areas, recreation, visuals, archaeological
Wildlife	Mountain caribou, grizzly bear, ungulate winter range, red and blue listed species
Biodiversity	Landscape units, biodiversity emphasis options, connectivity, old growth
Administration	Guide-outfitters, trappers, mineral claims, legal and administrative boundaries

At the time of the writing of this VPIP, during a brief review of the Interfor list, the following projects and surveys have been identified as having potential to be helpful to the photo interpreters.

- Preliminary avalanche chute mapping and field verification for two pilot areas.
- The Predictive Ecosystem Mapping (PEM) inventory completed for TFL23. It has high (minimum 65%) accuracy for predictions of site series and associated vegetation, soil moisture and soil nutrients. It will provide an ecological characterization of the VRI polygon.
- Habitat field sampling. This project involved site series and structural stage classification and habitat plot data collection for snags, coarse woody debris, shrubs and hardwoods.

2.5 Polygon Delineation

The polygon delineation will follow current Vegetation Resources Inventory Photo Interpretation Procedures. In the VRI Standards, the minimum polygon size is stated as 2 hectares for areas with distinct edges and 5 hectares for areas with indistinct edges. However, in instances where unique Vegetated or Non-Vegetated complexes or individual polygons are noted, such as swamps, slide areas, wildlife tree patches, etc. that provides the location of high value resources or significant features for field navigation by map users, polygon sizes down to 0.5 hectares may be appropriate. The issue to consider is excessive polygon counts, but these smaller polygons can be very important to capture. This should be discussed at the pre-work.

Quality Assurance of polygon delineation will be as specified in the “VRI Photo Interpretation Quality Assurance Procedures and Standards”.

2.6 Integrating RESULTS Information

Special consideration will be given to the integration of silvicultural openings data. There are two systems that will provide information. There is the provincial reporting system known as the Reporting Silviculture Updates and Land Status Tracking System (RESULTS) and Cengea Forest –Resources maintained by the company.

The MFR will provide a copy of the RESULTS shapefiles at the start of the photo interpretation contract and a new cut of RESULTS data should be requested from the VRI Update Section in Kamloops, for each year of a contract or project according to the document “VRI Contract Source Data” found at; http://www.for.gov.bc.ca/hts/vri/standards/source_data/vri_contract_source_data.pdf. Cengea is available from the company.

The contractor/stakeholders will have to choose which of the databases has the best information for each circumstance.

The integration process will follow the requirements outlined in the current edition of the VRI Standard “Photo Interpretation Procedures” that can be found at: <http://www.for.gov.bc.ca/hts/vri/standards/index.html#photo>

2.7 New Field Calibration

Phase I photo interpretation is supported by field data collection procedures referred to as calibration field work. The field work is a mixture of ground calls (one-point, three-point, ground observations with measurement) and air calls distributed over the entire project area and provides reference points with field

measurements. In addition, casual field and air observations, at no additional cost, have been a mainstay of all VRI projects. The goal is to improve the accuracy of forest polygon descriptions by improving the ability of the contractor to interpret the photos in the office. A data source analysis will need to be completed to determine the type and number of calibration data by mapsheet/project. The amount of fieldwork completed will be specified in the "request for proposal" (RFP) and is determined by the forest management and inventory issues identified and approved funding levels. The contract should be written to ensure that a variety of cover types are visited including non-vegetated and non-treed polygons (except for silviculture openings).

Ground calls are the most costly data collection but are particularly important for such details as age, and height. Air calls are excellent for determining species composition as they are able to see the entire polygon. Field calibration efforts should be distributed across the full range of cover types in sufficient numbers to assure accuracy, but emphasis should be placed on those that are more complex. For this project's field calibration plan, priority areas for air and ground calls should consider addressing issues identified in the Objective section of this plan. It should be outlined in the proposals from contractors responding to the RFP how they propose air and ground call will be used to address the issues.

Overall, priority for data collection should occur in polygons that do not otherwise have any source information or in polygons where the source information is questionable.

The general guideline to be considered is the establishment of at least 20 air calls and 10 ground calls per full map sheet²². (This will be left up to the Contractor as outlined in their RFP submission and reviewed by the Project Coordinator and MFR.)

There are three types of ground calls to consider:

- Three point ground calls (one full measure and 2 count plots) on complex species types and in uneven-aged stands.
- One point ground calls on single species stands (full measure plot). These will include two additional prism sweeps to ensure that the polygon is more fully covered.
- Ground Observations (XGO) with measurement.

Air calls are conducted from aircraft at pre-determined points. The collected data are estimates but must be supported by ground calibration on approximately 1 in 20 air calls.

Field calibration (air calls and ground calls) data collection is to be completed according to the "VRI Air Calibration (Air Call) and Ground Calibration (Ground

²² From Preparing a Project Implementation Plan for Photo Interpretation , MFR, April 2009 and personal communication with Roman Bilek.

Call) Data Collection Procedures”²³. Field calibration data collected is to be documented and recorded in a format acceptable to the Ministry and specified in the photo interpretation contractor’s contract. In keeping with the VRI Standard, a complete set of any new data sources will be provided to the MFR in an agreed digital format as part of the project delivery. This will included geographical locations (UTM coordinates) of these data sources as well as the complete set of field attribute data collected.

An additional method of gaining calibration information is large format (70 mm) photography and, more recently, large format digital imagery. These can collect a large amount of data in a short time frame and may be cheaper than ground visitation programs. It can provide details of understory brush conditions, heights, density, number of snags, species composition, etc. The MFR is currently developing specifications for the use of large scale digital photography as a tool for calibration.

Prior to the initiation of the field calibration program, a plan will be prepared in accordance with Appendix D: Field Calibration Plan Guidelines provided in the MFR Standard ‘Preparing a Project Implementation Plan for Photo Interpretation’. This plan will be submitted by the Photo Interpretation Contract Manager to the TFL23 Phase I Project Manager and to the Regional VRI specialist in Nelson. This plan should include a map of the unit documenting the general location and distribution of the calibration points.

It is beneficial to the project to have the same individuals completing the field data collection as are performing the attribute estimation. This is a MFR standard and the contract will reflect this requirement. The fact that this has occurred will be documented in the contractor’s report (Project Completion Report) at the end of the project.

2.8 Attribute Estimation

The trend in photo interpretation is softcopy technology. Softcopy refers to the project being done using digital air photos, on a computer screen. After the TFL is flown, the scanning of the photos, aerial triangulation and digital model building will need to occur before the delineation begins. (If using Digital photography, the scanning step is not required.)

Softcopy technology may facilitate the photogrammetric measurement of tree heights from the digital image (scanned conventional or digitally acquired images).

²³ Roman Bilek indicated that this will soon be replaced by a new standard called “VRI Field Calibration Procedures for Photo Interpretation”. The work will be conducted according to the current standard.

All polygon descriptions will be carried out to the standards of the most current VRI Photo Interpretation Procedures at the website:

<http://www.for.gov.bc.ca/hts/vri/standards/index.html>.

Polygon descriptions can be divided into 8 categories as follows:

General Attributes (e.g. polygon number, surface expression, site position meso)

Land Cover Component (identifies type of land cover under the BC Land Cover Classification Scheme)

Site Index Attributes (e.g. site index tree, site index)

Tree Attributes (e.g. species composition, age, height)

Shrub Attributes (shrub height, crown closure)

Herb Attributes (herb type, cover percent)

Bryoid Attributes (percent cover)

Non-Forest Attributes

2.9 Mapping

The Ministry of Forests & Range has developed a format and database standards for the submission and storage of spatial and attribute data for VRI Photo Interpretation. This project will be completed to the “VRI Phase I Digital Data Deliverables Format” Standards at the website

<http://www.for.gov.bc.ca/hts/vri/standards/index.html>.

3. Project Implementation

3.1 Project Pre-work meeting

The Ministry of Forests and Range has added this step to the project planning standard to ensure that this critical meeting occurs at the start up of a VRI Phase I project. This meeting should occur once all of the project participants are finalized, prior to actual 'start up'. Due to the importance of this step in the process, a face to face meeting rather than a conference call is recommended.

The purpose of the project pre-work meeting is to bring together the project 'team' who includes:

- The Project Coordinator. This person is usually a contractor. Ideally this person will have a technical understanding of the project, as well as some understanding of MFR Standards and Procedures and FIA funding responsibilities of the project on behalf of the recipient.
- The FIA recipient. This person is usually a representative of the licensees. Beyond providing the funding, this person has technical and contractual expectations from the project.
- The MFR Regional VRI representative. This person will be the first point of contact for technical issues on the project.
- The Contractor who is undertaking the project.
- The '3rd party' Quality Assurance personnel. This work is contracted out to a VRI Phase I certified contractor who is 'separate' from the Phase I Contractor.

This meeting will most likely be lead by the Project Coordinator, which is why it is important that they have a broad understanding of the process. If there are some gaps, the presence of all parties should help to avoid any key issues.

This meeting is the first step in establishing an effective and efficient communications network being developed for the project. A project pre-work checklist, developed by MFR will guide the meeting's agenda. It is recommended that it be signed off for the project's records. Key items that will be discussed are:

- the identification of the responsibility of each party involved in the project;
- the establishment of a communications network for day to day operations, for technical discussion, for contract discussion and for delivery;
- the expectations of the contractor based on the RFP, including any issues related to the project;
- minor changes to any contracts related to the completion of the Phase I activities;
- a clear statement on delivery, including content and project timelines; and
- data flow.

3.2 Scheduling

The following factors will affect scheduling of this project’s implementation:

1. Approval of this project plan.
2. Securing funding.
3. Once initial funding is secured, timing of the acquisition of new photography within the fiscal year. This will affect the activities that can be completed during the start up year.
4. Level of continuous funding to allow completion of all Phase I activities, over one or more fiscal years.
5. Availability of sufficient certified VRI photo interpreters for the duration of the project.

The Stakeholders are concerned about the future of FIA funding at this time, both ‘Inventory Focus Funding’ and licensee discretionary funding. If there had not been such a change in the forest industry and the overall financial climate over the past fiscal year, it would have been realistic to complete this Phase I project in time for the next TSR processes.

Since there is currently no financial commitment to expedite this project, scheduling in this plan will reference timelines in a general way i.e. “Year 1, Year 2”. This maintains this document’s value to guide work whenever the project proceeds.

Based on expected timelines, the delineation could be bid out and started in the same fiscal year in which the new photos are flown and produced. It normally takes two to three years to complete a new Phase I. Table 3 provides a project schedule.

Table 3: Project Schedule By Year

Year	Task
1	Photo acquisition; Aerial Triangulation (AT), DiAP model creation, Orthoimages Phase I start up – Delineation Phase Quality assurance of Delineation
2	Delineation and Quality assurance – This step of the Phase I would be delayed to Year 2 if time and/or funds are insufficient to allow this to occur in Year 1. Field data collection & VRI Attribution Quality assurance
3	Field data collection & VRI Attribution and Quality assurance – The project would only go into Year 3 if time and funding did not allow the TFL23 project to be completed in 2 years.

Steps in the start up scheduling include the following:

3.2.1 Preparation

- Select administration staff / (Contracted) Project Coordinator
- Define project area and tasks
- Conduct preliminary review to establish costs for each task
- Identify budget costs associated with each task

3.2.2 Work Plan

- Identify activities needed to meet project objectives
- Acquire funding / Develop work schedule based on assumed funding
- For the initial year of the project, TFL23 project will have to incorporate photo acquisition as a preliminary step. IF funds are sufficient in this year, the flying and the follow up steps including AT, DiAP and orthoimage model production can be achieved within Year 1 of the project.
- Conduct preliminary review i.e. data sources to develop RFP
- Develop RFP for photo interpretation. In Year 1 of each project, due to the requirements of acquiring photos, the photo interpretation contractor MAY be able to begin the polygon delineation. Details of delineation, field work requirements etc will be included in the RFP.

3.2.3 Viewing

- Identify contract evaluation team. The contract evaluation team must include a MFR VRI representative from the Southern Interior Forest Region.
- Advertise RFP.

3.2.4 The Contract

- Award work and develop Phase I contract
- Set time for Pre-Work Meeting outlined I Section 3.1 of this VPIP
- Contractor to produce a Work plan for the project that addresses the Contract Implementation Schedule. This will include the Field Calibration Sampling Plan at the start of the year that the field work is scheduled.
- Award QA to a third-party contractor and develop their associated contract
- All Contracts will include a Contract Implementation Schedule

3.3 Photo Specifications – Photo Scale and Coverage

All aerial photographs and digital stereo models used for the VRI photo interpretation project will be new and all relevant details will be approved by the

GeoBC section of the Integrated Land Management Bureau of the Ministry of Agriculture and Lands.

The decision regarding obtaining digital photography (appropriate GSD – Ground Sampling Distance) versus conventional photography (1:20,000 colour) for this project, has not been determined at this point. Digital photography requires more flight lines, many more images and can have increased photo acquisition costs. It does however, already come in a digital format (no scanning required) and has potential for higher resolution/quality imagery for the VRI.

The digital medium has a potential drawback in the format which is rectangular (compared to the square format of traditional photos). Since many field staff work with orthophotos which would be produced in the 'data acquisition phase', this may not result in any inconvenience operationally.

The local Stakeholders have expressed an interest in digital photography based on the following:

- 1) The improved resolution of this photography will aid in delineation and attribution in general.
- 2) This is a relatively small TFL so the cost differential for digital photography would not be great.

As well, the photo acquisition phase would proceed more quickly, without the cost of scanning (and scanning QA). Without the need to scan the film, the project could proceed to Aerial Triangulation and production of the DiAP models and orthoimages. (This may result in a time saving of up to two months.)

The preferred scale for image acquisition for conventional photo for VRI in the Southern Interior Forest Region is 1:20,000 colour. Digital Photography used in the 2008 Okanagan VRI was at a GSD (ground sampling distance) of 33cm.

If soft copy photogrammetric technology is used it will be at a recommended scale of 1:20,000 or suitable digital imagery and GSD.

The final decision on which medium to use will be discussed with the MFR VRI Regional staff, GeoBC and the local Stakeholders.

If conventional photos are the chosen medium, all photographs will be scanned at a 14 micron resolution and then converted to sjs format digital files for use with, a softcopy system. All scanning, aerial triangulation and control transfer will be conducted to current GeoBC standards.

3.4 Project Coordinator

A Project Coordinator completely independent of the Photo Interpretation Contractor will be assigned by the local Licensees to lead this process. Since the timeframe for funding is uncertain at this point in time, the Licensees will defer this decision in this planning document but prior to project start up, they will work with the MFR Inventory staff to support their selection of an appropriate candidate. The Project Coordinator is responsible for ensuring that all phases of the project are delivered.

Specific responsibilities of the Project Coordinator will include:

- Supporting the lead licensee to manage the budget and provide Forest Investment Account administration support;
- coordinating the project including setting up and running critical meetings such as the pre-work;
- monitoring and communicating project progress;
- preparing and bidding all tender documents and contracts related to the contractors who will undertake the photo interpretation;
- ensuring that all contractors undertaking the project are qualified and certified in the appropriate ratios; overseeing photo interpretation activities;
- ensuring that quality assurance is completed for all stages of the project and is delivered and resolved as is appropriate;
- assisting in coordinating available technical expertise when it is required and;
- ensuring that the most current VRI Phase I Standards and Procedures are followed.

3.5 Photo Interpretation Contractor and Personnel

The proponent who is awarded the photo interpretation contract(s) for the TFL23 VRI Phase I project must be able to comply with the high level of experience and supervision required by the VRI program. All VRI photo interpretation work conducted in British Columbia must be completed by or directly supervised by a VRI Certified Photo Interpreter²⁴. At least 50% of the photo interpreters working on a VRI project must be certified. All uncertified photo interpreters are to be directly supervised by a Certified Photo Interpreter working on the project.

²⁴ The Ministry of Forests & Range, Forest Analysis & Inventory Branch maintains a list of Certified Photo Interpreters on their website at:

http://www.for.gov.bc.ca/hts/vri/contractinfo/rpt_pi_list.pdf

3.6 Quality Assurance

A critical aspect of the project is retaining a qualified independent (of the Photo Interpretation Contractor) contractor to oversee the project's Quality Assurance. The QA contractor should be in place before the project starts, and will attend the pre-work meeting.

The QA contractor will conduct the QA for both the field data collection and the office (polygon delineation, polygon attribute estimation) efforts. He/she must make every effort to sample a proportion of the work for each crew or photo interpreter. In addition to providing a QA role, the intent is that he/she will also provide project technical support. He/she will monitor surveyors to ensure that the procedures and standards for VRI calibration work are being followed as detailed in the contract.

The QA program will be conducted on each phase of the project according to the VRI Photo Interpretation Standards and Quality Assurance procedures. The QA contractor will develop a schedule for his/her work that is designed to 'shadow' the photo interpretation contractor's delivery. Timely follow up by this contractor and good communication with all project team members will be conditions of this contract.

The 3rd party contractor will be responsible to provide a record of activities to both the Project Coordinator and the Ministry of Forests & Range Inventory Forester in the Region at regular intervals during the project. He/she will be involved with the Project Coordinator, MFR Inventory Forester and the Photo Interpretation Contractor if any quality issues occur during the phases of project delivery.

3.7 Deliverables

The following is a list of products that will be delivered to the MFR for the TFL23 project. At each level – project coordination, photo interpretation and quality control contractors – all project deliverables will be signed off by a Registered Professional Forester.

- Complete VRI data files in the format specified in "VRI Phase I Digital Data Deliverables Format" Standards;
- Hardcopy tally sheets or digital equivalent for each ground and air calibration point;
- Digital field summary for all calibration points per MFR VRI requirements. (This is for the VRI "Calibration Tile");
- Photo Interpretation contractor Project Completion Report²⁵. It should be noted that if funding issues result in the VRI being completed over a

²⁵ The minimum requirement for this report is provided in a template included in the MFR standards.

number of years potentially by various contractors, more than one Project Completion Report will be required. This will be verified at any pre-work meetings, for each year or contract, throughout the life of this project. It should be noted that the “Project Completion Report” is the responsibility of the proponent. The prework should identify responsibility for this deliverable, which may be written by the Project Coordinator or the VRI Photo Interpretation Contractor, with input from the MFR VRI Regional Staff and the Third Party QA Contractor;

- Quality Assurance Contractor documentation for each phase of the VRI project; and
- An annual progress report and a final project report will be required from the Project Coordinator due to the multi-year requirement of a Phase I project. The final report is the “Project Completion Report”, so another final report is not required. The format for annual progress report for multi-year contracts will need to be developed in consultation with the Project Coordinator, the MFR Inventory forester and the Recipient.

Due to the multi-year aspect of this undertaking, each ‘team member’s’ contract will specify interim deliverables that will be provided at the end of each fiscal year.

3.8 Reference Materials

The current version of all VRI Standards and Procedures for Photo Interpretation must be followed when completing this project. They can be found at the MFR website:

<http://www.for.gov.bc.ca/hts/vri/standards/index.html#photo>

Additional references that will be used by the Photo Interpretation Contractor include the following:

1. MoFR Vector Cleaning Specifications²⁶
2. BC MoFR Colour Stereogram Handbook
3. BC MoFR Black and White Stereogram Handbook

²⁶ These specifications apply to contractors who are working in Microstation. For deliverables in ARC pgdp format, there is reference to vector cleaning specs in “Digital Data Standards for VRI Map File Production (version 1.0, Dec 2008).

3.9 Costs

Table 4: Total Project Costs for VRI Phase I Activities

VRI Activity	Unit	Number of Units	Cost per Unit	Total Cost
VPIP Preparation - 2009/10	Plan	1	\$10,000.00	\$10,000.00
Photo Acquisition				
Administration for Photo Acquisition - Traditional	Hectares	625,000	\$0.021	\$13,125.00
Traditional Photo acquisition ²⁷	Hectares	625,000	\$0.30	\$187,500.00
Total Traditional Photo	Hectares	625,000		\$194,375.00
OR				
Administration for Photo Acquisition - Digital	Hectares	625,000	\$0.021	\$13,125.00
Digital Photo Acquisition ²⁸	Hectares	625,000	\$0.35	\$218,750.00
Total digital Photo	Hectares	625,000		\$231,875.00
Phase I				
Administration	Hectares	551,500	\$0.0906	\$50,000.00
Delineation	Hectares	551,500	\$0.15	\$82,725.00
QA-delineation	Hectares	551,500	\$0.03	\$16,545.00
Field data collection and VRI Attribution	Hectares	551,500	\$1.00	\$551,500.00
Helicopter	Hectares	551,500	\$0.05	\$27,575.00
QA-data collection & attribution	Hectares	551,500	\$0.04	\$22,060.00
TOTAL Phase I				\$750,405.00
Total Traditional Photos and Phase I (not including VPIP)				\$951,030.00
Total Digital Photos and Phase I (not including VPIP)				\$982,280.00

²⁷ Traditional Photo Acquisition costs include Flying to Acquire photos, Scanning and QA, Aerial Triangulation, DiAP model production and Orthoimage production and QA.

²⁸ Digital Photo Acquisition costs include Flying to Acquire photos, Aerial Triangulation, DiAP model production and Orthoimage production and QA.

Table 5: Project Costs By Year

VRI Activity	Unit	Number of Units	Unit Cost	Total Cost
Preliminary Year – 2009/10				
VPIP Preparation	Plan	1	\$10,000.00	\$10,000.00
Year 1 Traditional Photo Acquisition				
Administration	Hectares	625,000	\$0.021	\$13,125.00
Photo acquisition	Hectares	625,000	\$0.30	\$187,500.00
Total Year 1 Traditional Photo Acquisition				\$200,625.00
OR				
Year 1 Digital Photo Acquisition				
Administration	Hectares	625,000	\$0.021	\$13,125.00
Photo acquisition			\$0.35	\$218,750
Total Year 1 Digital Photo Acquisition				\$231,875.00
Year 1 –Phase I				
Administration	Hectares	551,500	\$0.0453	\$25,000.00
Delineation	Hectares	551,500	\$0.15	\$82,725.00
QA-delineation	Hectares	551,500	\$0.03	\$16,545.00
Total Year 1 Phase I		551,500		\$124,270.00
Year 2				
Administration	Hectares	551,500	\$0.0453	\$25,000.00
Field data collection & VRI Attribution	Hectares	551,500	\$1.00	\$551,500.00
Helicopter	Hectares	551,500	\$0.05	\$27,575.00
QA-data collection & attribution	Hectares	551,500	\$0.04	\$22,060.00
Total Year 2 Phase I		551,500		\$626,135.00
TOTAL Phase 1-Years 1&2 –Traditional Photos (not including VPIP)				
				\$951,030.00
Total Phase I –Years 1 & 2 Digital Photos (not including VPIP)				
				\$982,280.00

4.0 Approval/Sign-off of VPIP

TFL23 Vegetation Resources Inventory Project Implementation Plan Approval

The TFL23 Vegetation Resources Inventory Project Implementation Plan (VIP) for Photo Interpretation was prepared in consultation with Ministry of Forests & Range (MFR) staff. I have read and concur that this plan, dated February 24, 2010 meets current VRI standards, business needs and considerations. 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. .



Geoff Bekker, R.P.F. (Lead proponent)
Castlegar Woods Division Manager
International Forest Products Ltd.

Feb 25/10

Date



Jon Vivian, R.P.F.
Manager
Vegetation Resource Inventory
Forest Analysis and Inventory Branch
Ministry of Forests and Range

10.03.09

Date

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8. Sterling Wood Group Inc. TFL23 Vegetation Resources Inventory Attribute Adjustment Report, May 2002.
9. Timberline Natural Resources Group. Timber Supply Analysis Report, TFL 23 Timber Supply Review 2008. January, 2009.
10. Timberline Natural Resources Group. Timber Supply Analysis Report Information Package, TFL 23 Timber Supply Review 2008. January, 2009.

Other Sources of Information:

Personal Communication with Stakeholders including MFR staff, regarding issues related to the preparing of this VPIP. Phase I photo acquisition – historical and digital information was provided by Jim Grace during the Cariboos planning projects. Costs were provided by MFR staff and reflect costs of recent photo acquisition projects.

Appendix A – Project Mapsheet List

Mapsheet	% of mapsheet in TFL (squared off)	Area	Mapsheet	% of mapsheet in TFL (squared off)	Area
82E039	0.15	2250	82L069	0.03	450
82E040	0.35	5250	82L070	0.9	13500
82E049	0.45	6750	82L079	0.2	3000
82E050	0.75	11250	82L080	1	15000
82E059	0.4	6000	82L089	0.4	6000
82E060	1	15000	82L090	0.6	9000
82E069	0.4	6000	82L099	0.25	3750
82E070	1	15000	82L100	0.06	900
82E079	0.12	1800	82K001	0.5	7500
82E080	0.6	9000	82K011	0.9	13500
82E090	0.5	7500	82K021	1	15000
82E099	0.05	750	82K022	0.02	300
82E100	0.8	12000	82K031	1	15000
82F031	0.02	300	82K032	0.5	7500
82F032	0.01	150	82K033	0.12	1800
82F041	0.7	10500	82K041	1	15000
82F051	0.09	1350	82K042	1	15000
82F061	0.04	600	82K043	0.5	7500
82F071	0.2	3000	82K051	1	15000
82F081	0.82	12300	82K052	1	15000
82F082	0.3	4500	82K053	0.5	7500
82F091	0.84	12600	82K061	1	15000
82F092	0.6	9000	82K062	1	15000
82L009	0.75	11250	82K063	1	15000
82L010	1	15000	82K064	0.8	12000
82L019	0.4	6000	82K071	0.05	750
82L020	1	15000	82K072	0.75	11250
82L029	0.4	6000	82K073	1	15000
82L030	1	15000	82K074	0.3	4500
82L039	0.4	6000	82K082	0.8	12000
82L040	1	15000	82K083	0.75	11250
82L049	0.2	3000	82K092	0.8	12000
82L050	0.8	12000	82K093	0.95	14250
82L059	0.05	750	82K094	0.02	300
82L060	0.9	13500	82N002	0.6	9000
			82N003	0.95	14250
			82N004	0.25	3750
			82N013	0.03	450
			82N014	0.02	300
			Total Area Estimate (ha)		624,600

Total number of mapsheets =74

Number of whole mapsheets =17

Number of partial mapsheets =57

Appendix B - Mapsheet List - TRIM Status

Mapsheet		Year of Project Update ²⁹	Mapsheet		Year of Project update
82E039	TRIM II	2001	82L069	TRIM I	
82E040	TRIM II	2001	82L070	TRIM I	
82E049	TRIM II	2005	82L079	TRIM I	
82E050	TRIM II	2001	82L080	TRIM I	
82E059	TRIM I		82L089	TRIM I	
82E060	TRIM II	2001	82L090	TRIM I	
82E069	TRIM II	2005	82L099	TRIM I	
82E070	TRIM I		82L100	TRIM I	
82E079	TRIM II	2007	82K001	TRIM II	
82E080	TRIM II	2007	82K011	TRIM II	
82E090	TRIM II	2007	82K021	TRIM II	
82E099	TRIM II	2001	82K022	TRIM II	
82E100	TRIM II	2001	82K031	TRIM II	
82F031	TRIM II	2001	82K032	TRIM II	
82F032	TRIM II	2001	82K033	TRIM II	
82F041	TRIM II	2001	82K041	TRIM I	
82F051	TRIM II	2001	82K042	TRIM II	
82F061	TRIM II	2001	82K043	TRIM II	
82F071	TRIM II	2007	82K051	TRIM II	2005
82F081	TRIM II	2007	82K052	TRIM II	2005
82F082	TRIM II	2007	82K053	TRIM II	2005
82F091	TRIM II	2007	82K061	TRIM II	2005
82F092	TRIM II	2001	82K062	TRIM II	
82L009	TRIM II	2000	82K063	TRIM I	
82L010	TRIM II		82K064	TRIM II	
82L019	TRIM II	2000	82K071	TRIM II	
82L020	TRIM II	2001	82K072	TRIM II	
82L029	TRIM II	2000	82K073	TRIM I	
82L030	TRIM II	2005	82K074	TRIM I	
82L039	TRIM II	2000	82K082	TRIM II	
82L040	TRIM II	2005	82K083	TRIM I	
82L049	TRIM II	2000	82K092	TRIM I	
82L050	TRIM I		82K093	TRIM I	
82L059	TRIM II	2000	82K094	TRIM I	
82L060	TRIM II		82N002	TRIM II	2005
			82N003	TRIM II	2005
			82N004	TRIM I	
			82N013	TRIM I	
			82N014	TRIM II	2006

²⁹ Where the year of update is left blank it means that the date is unknown.

Appendix C: Other Inventories (From TFL 23 Management Plan 10)

TFL 23 Resource Inventory Summary

Inventory type	Description	Map extent	Standards/ specifications	Data source	Data Format	Map scale	Status	Date	Authority	Future updates
Biodiversity	Connectivity	Nelson Region	KBLUP	Nelson Region	Arc/Info		complete	3/1/02	MSRM	as required
Biodiversity	OGIMAs -draft	Arrow District	KBLUP	P&T/MSRM	Arc/Info		draft	3/1/02	MSRM	as required
Biodiversity	OGIMAs -draft	Columbia District	MAC	P&T/MSRM	Arc/Info		draft	7/1/02	MSRM	as required
Biogeoclimatic classification	BEC zones/ subzones/ variants/ NDT	Arrow District	KBLUP	MOF	Arc/Info	1:50,000	complete	3/1/02	MSRM	as required
Biogeoclimatic classification	BEC zones/ subzones/ variants/ NDT	Nelson Region	MSRM	Nelson Region	Arc/Info	1:50,000	complete	8/31/00	MSRM	as required
Biogeoclimatic classification	Predictive ecosystem mapping (PEM) – BEC site series	TFL	RIC	JMJ Holdings	Arc/Info		complete	5/10/01	MSRM	as required
Cultural heritage	Archaeological overview assessment	TFL	RIC	P&T	USTN	1:20,000	updated	2/5/01	MOF	as required
Environmentally sensitive areas	Ep only	TFL	RIC	P&T	Arc/Info	1:20,000	complete	6/1/96	MOF	as required
Fisheries	Reconnaissance fish and fish habitat inventory	TFL	RIC	P&T/MSRM	USTN		complete	3/31/02	MOF	as required
Fisheries	Fish stream breaks	TFL	FPC	Novak/Seaton	Arc/Info		complete	1/15/01	MOF	as required
Forest cover	Inventory	TFL	MSRM	P&T		1:20,000	complete	09/1990	MSRM	as required
Forest cover	Depletion, regeneration	TFL	MSRM	P&T	Arc/Info	1:20,000	complete	1/1/02	MSRM	annual
Forest cover	VRI site index, volume	TFL	MSRM	P&T			complete	5/31/02	MSRM	as required
Forest management	Resource management zones	Nelson Region	KBLUP	MOF/MW/LAP	Arc/Info	1:50,000	complete	3/31/02	MOF	as required
Forest Health	Aerial Overview Survey	TFL	FPC	P&T	USTN		complete	7/1/02	MOF	bi-annual
Landscape Units	Landscape units and emphasis	Arrow District	KBLUP	MSRM	Arc/Info		complete	3/1/02	MSRM	as required
Landscape Units	Landscape units and emphasis	Columbia District	MAC	MSRM	USTN		complete	8/31/00	MSRM	as required
Operability	1998 operability with revisions in Halfway LU, Hutchinson Cr., Turner Cr.	TFL	P&T	P&T	Arc/Info	1:20,000	complete	3/1/02	MOF	as required

Inventory type	Description	Map extent	Standards/ specifications	Data source	Data Format	Map scale	Status	Date	Authority	Future updates
Other resource users	Guide/ outfitters	TFL	WLAP	Nelson Region	Arc/ Info	1:250,000	updated	6/1/96	MWLAP	as required
Other resource users	Trappers	TFL	WLAP	Timberline	Arc/ Info	1:20,000	updated	6/1/96	MWLAP	as required
Parks	Parks and protected areas	Nelson Region	WLAP	Nelson Region	Arc/ Info		updated	3/1/02	MWLAP	as required
Range	Range units and tenure holders	Arrow District	MOF	MOF	Arc/ Info		updated	3/1/02	MOF	as required
Recreation	Recreation features update	Arrow District	RIC	Arrow District	Arc/ Info		updated	3/1/02	MSRM	as required
Recreation	Recreation inventory	TFL	RIC	Timberline	Arc/ Info	1:50,000	complete	10/16/98	MSRM	as required
Riparian	Classification	TFL	FPC	P&T			updated	1/4/02	MOF	as required
Riparian	Lakes	Arrow District	FPC	Arrow District	Arc/ Info		complete	3/1/02	MOF	as required
Riparian	Wetlands	TFL	FPC	P&T	Arc/ Info		complete	1/20/01	MOF	as required
Roads	Roads and road structures	TFL	MOF	P&T			ongoing	4/20/01	MOF	as required
Terrain	Terrain hazard TSIL D	TFL		Terratech	Arc/ Info	1:20,000	complete	7/24/01	MOF	as required
Visual Landscape	Visual landscape areas	TFL	KBLUP	P&T			complete	7/1/02	MOF	as required
Watersheds	Community and domestic boundaries	Nelson Region	KBLUP	Nelson Region	Arc/ Info	1:20,000	complete	3/1/02	MWLAP	as required