# Kootenay Lake Timber Supply Area

## Vegetation Resources Inventory

### Photo Interpretation Project Implementation Plan

**PREPARED BY:**

**TIMBERLINE NATURAL RESOURCE GROUP LTD.**

**PREPARED FOR:**

**TEMBEC INDUSTRIES INC. on behalf of the**

**KOOTENAY LAKE TSA STAKEHOLDERS**

**JUNE 2007**

# EXECUTIVE SUMMARY

This Vegetation Resources Inventory (VRI) Project Implementation Plan (VPIP) was prepared for the Kootenay Lake Timber Supply Area (TSA) licensees and covers all Phase I VRI activities that will be completed in the Kootenay Lake TSA. This document will be submitted to the Ministry of Forests and Range (MoFR) for approval prior to implementation of the program activities. This VPIP is consistent with the Kootenay Lake TSA VRI Strategic Implementation Plan (VSIP) that was previously approved by the MoFR.

The program proposed for the Kootenay Lake includes the creation of three stand-alone inventories using a common set of base VRI polygons. The three independent inventories are a VRI, a stand-alone Predictive Ecosystem Mapping (PEM) / Terrestrial Ecosystem Mapping (TEM) inventory and Sensitive Ecosystem Inventory (SEI), with each inventory being completed to Government standards.[1] Polygon line work will be created for the VRI initiative through which a subset of polygons will form the PEM / TEM that can be rolled up to the VRI polygons or left in raster format. A separate inventory using a subset of VRI based polygons will be used to describe SEI attributes.

A Provincially Certified VRI Phase I Photo-Interpreter and experienced eco-mapper will work together throughout the delineation process, using Softcopy technology. Each will ensure that the delineation component of the program will be completed to VRI and PEM / TEM and SEI standards. Each ground calibration point will be visited by a team of VRI and ecology mappers working on the delineation phase of this initiative. The integrated activities will provide better information on:

- Net merchantable volume;
- Levels of mountain pine beetle attack, including presence and distribution of dead trees;
- Height and age, and consequently, site index;
- Ecological data that will help make decisions on landscape-level biodiversity; and
- Key indicators in sustainable forest management planning.

The VRI target area is the entire Kootenay Lake TSA with the exception of large tracts of private land and woodlots and Parks[2] with a recent inventory (1,158,314 ha). The PEM / TEM / SEI initiatives will be completed on the Crown Productive Land Base, less Parks (506,224 ha). This project will be implemented in the 2007/08 and 2008/09 fiscal years and is expected to cost approximately $1,833,089 (excluding helicopter).

[1] The PEM / TEM and SEI initiative will be implemented to MoFR standards, but will include a series of variances. These variances include no collection of structural stage and core terrain attributes, ecosystems within the Alpine Tundra biogeoclimatic zone will be excluded, FS882 forms will be completed for ground inspections and GIF forms will be completed for visual inspections.

[2] The decision on those Parks to be included in this initiative will depend upon available funding. The intent is to complete polygon delineation and attribute estimation on all Parks currently lacking VRI. Ground calibration will not be included in Parks.

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# 1.0 INTRODUCTION

This Vegetation Resources Inventory (VRI) Project Implementation Plan (VPIP) was prepared for Tembec Industries Inc. and the Kootenay Lake TSA licensees and covers all Phase I VRI activities that will be conducted in the Kootenay Lake Timber Supply Area (TSA). This document was prepared and submitted in accordance with current Ministry of Forests and Range (MoFR) Phase I VPIP standards and guidelines and will be approved by the MoFR prior to implementation.

## 1.1 BACKGROUND INFORMATION

The MoFR has developed a business plan to ensure the successful implementation of the VRI ground sampling and photo interpretation projects. The process includes the preparation of VRI Strategic Inventory Plans (VSIP) and VPIP.

The VSIP provides a general strategic direction for implementing the provincial VRI. The VSIP for the Kootenay Lake TSA was prepared in December 2006 and should be referred to for details on background information to VRI activities and also for products needed to address the TSA's forest management issues identified by the stakeholders.

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, availability of existing aerial photographs or acquisition plan for new aerial photographs, data collection requirements, format of base files, project scheduling and deliverables.[3]

As identified in the Kootenay Lake TSA VSIP, the proposed Phase I program is unique in that it outlines both the Predictive Ecosystem Mapping (PEM) / Terrestrial Ecosystem Mapping (TEM) / Sensitive Ecosystem Inventory (SEI) and VRI activities[4] and products needed to address the forest management and inventory issues on the TSA. This proposed program uses Softcopy technology for both the VRI and PEM / TEM / SEI products. The integrated, but independent activities should provide better information on:[5]

- Net merchantable volume;
- Levels of MPB attack, including presence and distribution of dead trees;
- Height and age, and consequently, site index;
- Ecological data that will help make decisions on landscape-level biodiversity; and
- Key indicators in sustainable forest management planning.

The end product will be an independent VRI coverage with stand-alone PEM, TEM and SEI inventory coverages. Each of the ecosystem mapping coverages (i.e., PEM) can be rolled up to VRI polygons or "nested" into subdivided VRI polygons. SEI, TEM, and PEM would complement the data in the VRI with ecosystem predictions and locations of sensitive ecosystems but would not

[3] Preparing a VRI Project Implementation Plan for Photo Interpretation, MoFR (Ver. 2.0, April 2006)

[4] The PEM / TEM / SEI and VRI hybrid approach was presented in a 2006 report entitled *PEM Requirement Analysis for Kootenay Lake Timber Supply Area*, developed by Timberline Natural Resources Group Ltd. This report identified seven options for the Kootenay Lake TSA licensees to consider.

[5] Tembec Inductries Inc. 2006. Kootenay Lake Timber Supply Area VRI Strategic Implementation Plan. December 11, 2006. 20p.

complicate its data base structure. The advantage will be common polygon outer boundaries and no slivers polygons.

## 1.2 THE VRI PROCESS

The VRI is a vegetation (forest) inventory process that has been approved by the former 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:

- BC Land Cover Classification Scheme (BCLCS)
- Photo Interpreted Estimates (Phase I)
- Ground Sampling (Phase II) – timber emphasis, ecology, coarse woody debris
- Net Volume Adjustment Factor (NVAF) sampling
- Statistical Adjustment.

One or more of these components can address specific forest management or inventory issues. For more information, VRI manuals are available at http://www.for.gov.bc.ca/hts/vri/standards/index.html

## 1.3 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.

## 1.4 STATE OF CURRENT INVENTORY

The Kootenay Lake TSA inventory is one of BC's oldest forest inventories. The TSA consists of the Lardeau and Creston Public Sustained Yield Units (PSYU), which were inventoried in 1969 and 1973 respectively. Forest cover inventory attributes were estimated to the standards of the day and were converted to a digital format in the early 1980s. At that time, the Lardeau PSYU attributes were re-photo interpreted using the 1968 inventory photographs while the Creston PSYU attributes were derived from the mid-points of the existing class based forest cover information.

The resulting Forest Inventory Planning (FIP) files were converted to the VRI format in 2000. The disturbance update is current to September 2003.

An inventory audit was completed for the TSA in 1994. The average inventory volume was similar to the average audit volume, indicating no inventory volume bias, the average height and age were also considered accurate.

The Chief Forester noted his support for a new inventory for the Kootenay Lake TSA in his 2002 Allowable Annual Cut (AAC) Rationale for Kootenay Lake TSA. He stated, "I support completion of this important project (compete re-inventory) prior to the next AAC determination"[6]

[6] BC Ministry of Forests. 2002. Rationale for Allowable Annual Cut Determination for the Kootenay Lake Timber Supply Area. January 1, 2002. 63p.

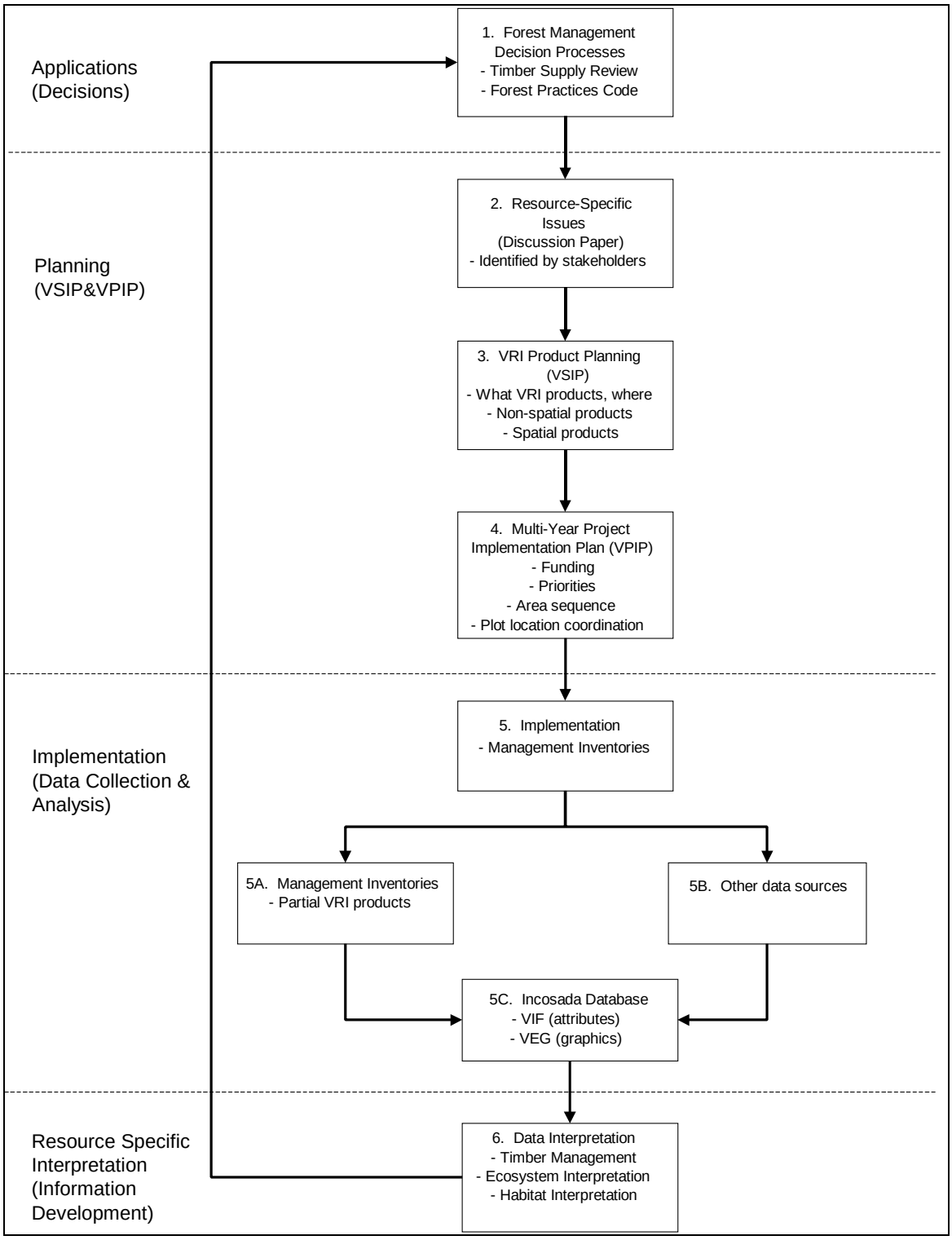


Figure 1. The VRI management inventory process.[7]

[7] Preparing a VRI Project Implementation Plan for Photo Interpretation, MoFR (Ver. 2.0, April 2006)

## 1.5 DOCUMENT OBJECTIVES

The objective of this document is to outline the VRI Phase I activities and where applicable, the concurrent TEM / PEM / SEI activities proposed for the Kootenay Lake TSA. This VPIP is a working document that:

- Details the specific operational activities associated with the implementation and documentation of a VRI project;
- Identifies the target areas for new photo interpretation;
- Documents availability of existing aerial photographs or acquisition plan for new aerial photographs, data sources, fieldwork, format of base files, project scheduling, and deliverables;[7] and
- Describes the linkage between VRI activities and ecosystem inventory that will include predictions of site series through PEM, mapping of certain materials and site series through TEM and mapping of sensitive ecosystems through SEI.

The final products of this process would be three stand alone inventories, VRI, PEM and SEI each to the appropriate standards.

The VPIP document provides basic land base information and some background information from the previous AAC Rationale document.[6] It also describes the individual phases of the inventory plan including polygon delineation, field sampling, final attributing and digital mapping. Finally, the VPIP describes the quality control and quality assurance requirements that will ensure all work is done to provincial VRI mapping standards.

## 1.6 LAND BASE

The Kootenay Lake TSA is in the Southern Interior Forest Region – Kootenay Lake Forest District and is administered from the Nelson office. The District (Figure 2) covers approximately 1.24 million hectares (Table 1), including approximately 215,986 ha in Provincial Parks and Protected Areas. The timber harvesting landbase (THLB) in Timber Supply Review (TSR) 2 was 257,850 ha (21% of the TSA).[8]

Approximately 49% of the total TSA area is considered Crown Forested Land Base (CFLB); the remaining 51% is considered non-productive (i.e., rock, ice, alpine, etc), or is not managed by the MoFR (i.e., is private, First Nations, woodlots, etc). Within the CFLB, only about 43% (or 21% of the total TSA), is in the THLB.

About 50% of the TSA land base is considered productive forest land managed by the B.C. Forest Service (approximately 613 000 hectares). A summary of the TSA land base is provided in Table 1.[8]

The TSA is located in the interior wet-belt and includes some of the most productive sites in the BC interior. There are four biogeoclimatic zones in the TSA, including the Interior Cedar-Hemlock (ICH), Engelmann Spruce-Subalpine Fir (ESSF), Alpine Tundra (AT), and Montane Spruce (MS).

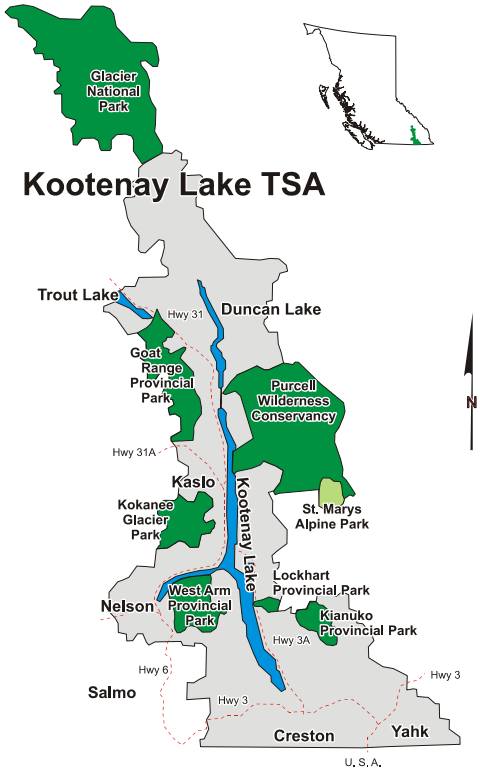


**Figure 2. Overview of Kootenay Lake TSA.**

Table 1. Kootenay Lake TSA land base by forest cover.

| Area description | Hectares | % of TSA Area |
|---|---|---|
| Total TSA Area | 1, 239, 633 ha | 100 % |
| Total Productive Forest Land | 613, 299 | 49.5 % |
| Reductions to Crown managed productive forest | 355, 449 | 28.7 % |
| Total Timber Harvesting Landbase | 257, 850 | 20.8 % |

[8] BC Ministry of Forests. 2001. Kootenay Lake Timber Supply Area Analysis Report. Unpublished Report, March 2001. p 11.

# 2.0 PHOTO INTERPRETATION PLAN

## 2.1 PROJECT OBJECTIVES

The objective of the VRI Phase I project is to use photo-interpretation to improve the vegetation resource information in the Kootenay Lake TSA. The specific objectives of this proposed inventory program include:

- Address the issues outlined in the Forest Management Considerations section of the Kootenay Lake VSIP;
- Improve the Kootenay Lake TSA vegetation polygon delineation and vegetation polygon descriptions;[9]
- Improve all core PEM / TEM and SEI data base attributes as required for an integrated PEM / TEM and SEI and VRI;[10] and
- Integrate the PEM / TEM and SEI and VRI inventories to increase cost effectiveness of the Kootenay Lake TSA inventory investments.

The VRI product will be a stand-alone spatial database consisting of unadjusted photo-interpreted estimates. There will also be independent PEM, TEM and SEI inventory coverages. Each of the ecosystem mapping coverages (i.e., PEM) can be rolled up to VRI polygons or "nested" into subdivided VRI polygons. SEI, TEM, and PEM will complement the data in the VRI with ecosystem predictions and locations of sensitive ecosystems but will not complicate its data base structure. The advantage will be common outer polygon boundaries and no sliver polygons.

## 2.2 INTEGRATION OF VRI WITH PEM / TEM AND SEI

Ecosystem mapping has been identified as a priority for the TSA. Therefore, this project will integrate the standards and procedures of PEM / TEM and SEI and the VRI Phase I Photo Interpretation programs to efficiently address the need for the vegetation and ecosystem mapping information. Inventory integration will occur at four levels:

1. The design of mapping, field sampling and standards for data collection;
2. At the project implementation stage where the different types of inventory information will be collected at the same time and place;
3. In reducing the complexity of supporting information systems by utilizing a common set of VRI polygon boundaries as the starting point for three stand alone inventories; and
4. Combining the VRI and PEM / TEM and SEI polygon delineation into one initiative that includes a certified Phase I photo-interpreter and ecologist each working to the appropriate standards for their respective portions of each inventory.

[9] The existing TSA forest cover inventory does not meet current VRI standards.

[10] Site modifier and structural stage attributes can be modeled at a later date, however, the final attributes must be provided in the data captured by polygon for each component.

The benefits of successfully integrating PEM / TEM and SEI and VRI include better information for planning, monitoring and resource allocation, as well as improved data compatibility, efficiency, and data currency.[11]

### *2.2.1 Relationship to TEM / VRI Inventory*

A TEM / VRI project like those being completed in other parts of the Province is not being proposed in the Kootenay Lake TSA. Instead, the intent is to integrate the TEM, PEM and SEI with the VRI process such that three stand-alone inventories exist with "nested" polygons. The benefit of this approach is that the inventories build on one another, yet are independent of one another. Modern forest management has to not only pay attention to stand characteristics, but also linkages to ecosystems for interpretations for on aspects such as site index, biodiversity, riparian, ecosystem-based management.

## 2.3 STANDARDS GUIDING INTEGRATION OF THE VRI PEM / TEM AND SEI

The VRI will be an independent product from the other inventories and will be completed to MoFR VRI standards.[12] The PEM / TEM and SEI will be conducted to MoFR standards.[13] The proposed approach has been used in the PEM / TEM and SEI currently ongoing in the Cranbrook TSA. Ministry of Environment (MOE) and Forest Investment Account (FIA) personnel have been involved in the previous discussions addressing the project-specific variances. The following variances from the provincial standard procedures will be addressed:

1. **Structural stage attributes will not be mapped** as a component of the PEM / TEM and SEI, instead structural stage will be derived from the GIS analysis of the completed VRI.[14]
2. **Standard (core) terrain attributes will not be included** in the PEM / TEM and SEI data base. A form of targeted terrain mapping will be undertaken as a non-standard input layer for the PEM/VRI
3. **Ecosystems within the alpine tundra (AT) biogeoclimatic zone will be excluded** from the project area. The resulting PEM / TEM and SEI study area boundary will consist of the ESSF parkland - alpine transition. However, the resulting alpine 'island' polygons will be numbered and given a generic PEM / TEM and SEI map label to define the relative proportions of the dominant alpine units including rock, ice, permanent snow, moraine and krummholz. The designation of the alpine will be consistent with the results of the spatial coverage from a current project underway being conducted by the MoFR (Dennis Lloyd of the Southern Interior Forest Region).

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[11] Standard and Procedures for Integration of Terrestrial Ecosystem Mapping (TEM) and Vegetation Resources Inventory (VRI) in British Columbia, February 12, 2002 (Ver.1.0)

[12] In response to MoFR comments, these include adhering to MoFR standards guiding polygon delineation and attribute estimation.

[13] The standards guiding implementation of the PEM / TEM / SEI component of the inventory can be found at *http://ilmbwww.gov.bc.ca/risc/*. These include (1) Standard and Procedures for Integration of Terrestrial Ecosystem Mapping (TEM) and Vegetation Resources Inventory (VRI) in British Columbia, February 12, 2002 (Ver.1.0)., (2) Ecosystem Mapping Technical Standard and Database Manual Errata 2.0 (Clarifies sections in PEM Digital Data Capture Standards (2000 RISC*)* and TEM Digital Data Capture Standards (2000 RISC) (Replaces the PEM Errata 1.0, 2004 and TEM Errata 1.0, 2004), (3) PEM Inventory Standards (1999 RISC) and TEM Inventory Standards (1998 RISC) Sensitive Ecosystem Mapping Standards (2006 RISC)

[14] Note that structure stage attributes are produced during the attribute estimation phase of the VRI Phase I.

4. **FS882 and Ground Inspection Forms (GIF) will be used in the Ecological data collection phase**. GIF's will include detailed species lists and full site page descriptions. Field plots will be completed in an approximate ratio of 70% GIF's to 30% FS882.

## 2.4 TARGET AREA

The project target area is the entire Kootenay Lake TSA with the exception of large tracts of private land (Tree Farm License 40 ~ 56,000 ha), West Arm Park (~25,319 ha), and woodlots with a recent inventory. The list of woodlots to be excluded will be reviewed with the MoFR before the project begins. A list of the BCGS mapsheets covering the Kootenay Lake TSA is in Appendix I. The target area for the PEM / TEM and SEI program is the Crown Productive land base with the exception of Parks.

## 2.5 INVENTORY DOCUMENTATION AND ARCHIVE

Photo-interpretation will be completed using Softcopy technology using colour 1:20,000 and 1:30,000[15] aerial photographs flown in 2004, 2005, and 2006. The 2006 photos were recently acquired and preparation for photo-interpretation (scanning, triangulation, digital modeling, etc.) is underway for the 2004, 2005, and 2006 photos.

## 2.6 POLYGON DELINEATION

### *2.6.1 VRI Polygon Delineation*

The proposed approach will create one set of delineated VRI polygons. These polygons will be created by a Provincially Certified VRI Phase I Photo-Interpreter (with input from an experienced eco-mapper) using Softcopy technology. Each will ensure that the VRI polygon delineation component of the program will be completed to VRI standards and completed in sufficient detail to service the PEM / TEM and SEI inventory needs. The photo-interpreter will use vegetation characteristics (including the B.C. Land Cover Classification Scheme) and ecological features to guide polygon delineation. The primary ecological attributes that will be incorporated into the VRI delineation process are:

- Ecosection, biogeoclimatic units, wetlands, grasslands, avalanche paths, talus slopes, and rock outcroppings,
- B.C. Land Cover Classification Scheme criteria;
- Vegetation attributes; and,
- Mensurational attributes

The MoFR Update Section will be contacted to ensure compliance with existing protocols related to silviculture openings. As a general guideline:

- Retain existing opening numbers and provide VRI attributes for the largest polygon of the silviculture opening (based on VRI source files). If opening numbers are not in the VRI source files, obtain the opening numbers from the RESULTS spatial file. The MoFR VRI Update Section will provide access to the RESULTS data as required.

[15] Approximately 20 mapsheets are covered by 1:30,000 scale photographs, with the remaining areas covered by 1:20,000 scale photographs.

- Add new openings that are not in the VRI source files. Obtain the opening number from RESULTS and provide full VRI attributes. Additional internal polygon delineation and attribute estimation is not required.
- Internal stratification of openings is required where an opening has been declared to be Free-to-Grow in RESULTS. Each polygon requires complete attributes plus the designation "FTG" in the VegCap polygon record project field.
- Any polygon from the VRI source files that has "FTG" in the project field must be re-interpreted to VRI standards and the "FTG" designation retained.

All delineation will be quality control checked and audited to ensure adherence to project objectives and MoFR standards. The polygon delineation and attribute estimation from West Arm Park will be tied to the delineation and estimation being completed for this project.[16]

### *2.6.2 VRI Polygon Size*

Average polygon size is estimated to be between 10 and 20 ha. These estimates are unaffected by PEM / SEI activities, which may, under their own standards, subdivide VRI polygons to better depict ecological inventory requirements.

### *2.6.3 PEM / TEM and SEI Polygon Delineation*

The VRI polygon features identified in the first bullet in 2.6.1 provides the "TEM" part of the PEM / TEM and SEI inventories. These are the hard line polygons for features such as avalanche paths, rock, talus, wetlands which can be delineated by VRI staff and described and delineated to VRI standards, but will also be described in more detail in the ecosystem mapping component to its standards. Other features to be used in the SEI but delineated to VRI standards, are based on stand composition and age (i.e., old Douglas fir stands, old Aspen stands, old cottonwood stands).

### *2.6.4 Relationships Between VRI Activities and Ecosystem Inventory (PEM / TEM and SEI)*

There are several steps in this process that are done separately, but concurrently by staff completing the VRI component and those completing the ecosystem components of the program.

The VRI delineates "hard-line" ecosystems formerly completed as part of the bioterrain inventory in TEM or part of the exceptional materials mapping in PEM. These "hard-lines" include identification of avalanche paths, talus slopes, rock outcrops, wetlands, open range, and grasslands. The VRI also delineates "hard-line" forest stand characteristics important to the SEI, including old aspen, old cottonwood, old Douglas-fir, wetlands, and open range and grasslands.

The PEM, TEM, and SEI programs also complete steps independently of the VRI. The PEM processes require delineation of "soft-line" features for use in ecosystem mapping models formerly identified as part of the bioterrain inventory or as part of the exceptional materials mapping. These include shallow materials, coarse materials, fine materials, and seepage.

PEM, in raster format, uses the TRIM Digital Elevation Model (DEM) and develops the following input layers; landscape shape, soil moisture, landscape position, slope, aspect and solar radiation.

The end product is a series of stand-alone VRI polygons that contain traditional inventory attributes. These same polygons, can be used to represent, in separate coverages, ecosystem attributes derived through the PEM, TEM, and SEI process.[17]

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[16] The Park boundary can used as a polygon line. Consideration should be given to the attributes and delineation inside West Arm Park.

[17] This proposed approach addresses the shortcomings of previous combined bioterrain and VRI programs where up to 2,000-3,000 polygons per mapsheet were delineated.

## 2.7 CALIBRATION PROGRAM

### *2.7.1 Calibration Program Design*

One of the objectives of the integrated VRI with the PEM / TEM and SEI approach is to produce a sample design that results in a cost-effective field data collection program. The sample design should reflect the type, frequency, distribution, and availability of existing forest and ecosystem data to ensure complete coverage, while recognizing overlap that can minimize the cost of field programs. A cost-effective field calibration program should be focused on filling remaining forest information gaps. Previous or historical data sources will also be reviewed and those air and ground calls/observations that are still valid will be transferred to a level that is unique from the new ones and utilized in new stand delineation and attributing.

Photo-interpreters will meet with the Kootenay Lake stakeholders before the project begins to get access to supporting data sets, incorporate local knowledge, and help familiarize photo-interpreters with issues specific to the Kootenay Lake TSA. Interpreters should discuss age classes in drainages with the licencees and acquire the latest old growth mapping from the District and ILMB. Changes to age classes 3-5 should be carefully examined. As part of this meeting, photo-interpreters should meet with MOE staff to review parameters associated with crown closure estimates in UWR areas to ensure that the information collected meets UWR information needs.[18] Photo-interpreters will also discuss the mapping of avalanche tracks so that target landscape units will have suitable mapping to support grizzly bear habitat information needs.

By ensuring that the field team includes a PEM / TEM and SEI and VRI specialist, this will increase the number of VRI Phase I calibration points and greatly improves the calibration data for VRI polygon descriptions.

### *2.7.2 VRI Field Calibration Sampling Plan*

Following a VRI Gap Analysis (or data source analysis) to identify stand types to be targeted, the VRI field calibration program will ensure that the targeted stand types are visited with the PEM / TEM and SEI sampling plan. A VRI Field Calibration Sampling plan with maps of potential distribution of the calibration points will be submitted to MoFR. This will document the types of stands, based on forest management issues and available data sources that are to be visited during the field program. The likely allocation of one- and three-plot calibration points, air calibration points, ground observations and air observations is presented in Table 2. Three-point ground calls (instead of 1-point ground calls) will be required in many areas of the TSA to account for variability in the polygon. VRI ground calibration will not be completed in Parks.

Table 2. Likely distribution of ground and air calibration points and observations.

| Type of VRI Calibration Point | Number Required per Mapsheet Equivalent (MSE) |
|---|---|
| One-plot Ground Calibration Points | 10 |
| Air Calibration Point | 20 |
| Ground Observation (without measurements) | 10 |
| Air Observations | 20 |

[18] Finer delineation based on changes in crown closure and smaller polygon sizes may be required in Ungulate Winter Range areas.

### *2.7.3 PEM / TEM and SEI Sampling Plan*

A PEM / TEM and SEI sampling plan will be prepared for MoFR staff to review prior to the start of the field program. The plan will contain proposed calibration locations and will be consistent with the commitments made in this VPIP. The following items will be addressed in the PEM / TEM and SEI sampling plan:

- Study area: size and topography;
- Previous ecological sampling (number, type and location);
- Existing information (i.e. BGC units, PEM, TEM, or SEI mapping etc);
- Additional data requirements for samples (i.e. wildlife data);
- A range of representative treed and non-treed types;
- Types not previously field surveyed;
- Survey intensity level;
- Expected sampling ratio of field plots;
- Procedures for describing 'new' site units;
- Summary of access options and constraints;
- Knowledge level and experience of the field crews and mappers; and
- Development of a tally key to keep track of the units that have been sampled and the units that still need to be sampled.

### *2.7.4 VRI and PEM / TEM and SEI Ground Calibration Procedures*

The VRI and PEM / TEM and SEI programs have different standards for minimum allowable calibration sources. According to the MoFR, the suggested minimum intensity is 10 ground calls, 10 air calls and 10 observations per full BCGS mapsheet equivalent.[19] The alternative approach is for the VRI calibration program to follow the standard sampling intensity in accordance with a PEM / TEM and SEI Level R field program. The result is more visitation to polygons than would likely be the case under a traditional VRI ground calibration program.

Field calibration (air calls and ground calls) data collection is to be completed as per the Vegetation Resources Inventory Air Calibration (Air Call) Data Collection Procedures and the Vegetation Resources Inventory Ground Calibration (Ground Call) Data Collection Procedures. Field calibration data collection is to be documented and recorded in a format acceptable to the MoFR.

Document photos and supporting information are needed for the historical calibration points. The MoFR will supply a digital file with locations, and air and ground call books, as well as the document photos.

VRI field calibration should occur in polygons lacking source information or where the source information is questionable and should include a variety of cover types including non-vegetated and non-treed. Note that VRI ground calibration will not occur in Parks.

The PEM / TEM and SEI goal is to achieve at least one plot in as many of the mapped PEM / TEM and SEI units as possible, although the MoFR requires a targeted sampling intensity of approximately 1 field plot per 1,500 ha. Field sampling will be in accordance with PEM / TEM and

[19] In a June 1, 2005 email from MoFR Regional Representative, '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 do not attempt to give precise estimates and neither did the earlier forest cover inventory manual, because any estimate comes from working through several considerations'.

SEI Level R intensity, as defined in the PEM / TEM and SEI manual (RIC 1998).[20] Sampling will be completed such that the spectrum of slope positions (crest, upper, middle, lower, toe and flats) are subjectively sampled in the field within each BGC unit and at least one hundred randomly located line intercept transects are completed for testing and development of the PEM model.

Typically, improved accessibility and road access in the mid to lower slope areas result in over-sampling of these areas, whereas rocky and steep upper slopes and crests have fewer observations because they are more difficult to visit. A sampling approach using linear transects is the preferred approach whereby the transect line crosses as many PEM / TEM and SEI units as possible. This provides a better idea of PEM / TEM and SEI proportions within a polygon and a better idea of the true elevation boundary between adjacent biogeoclimatic units.

The data collection procedures will follow the sampling procedures outlined in *Land Management Handbook 25: Field Manual for Describing Terrestrial Ecosystems (1998).*[21] Two types of ground-based samples will be completed in the field; Ground Inspections and Visual Inspections.

The BEC system within the Kootenay Lake TSA will be revised over the next three years, so sampling will not include identification of site series.[22] However, field data collection will include an extensive list of both vascular plants and bryophytes which will include important indicator species and the structural layer they occur in. The field samples will be established at a ratio of 70% Ground Inspections to 30% Visual Inspections. Each of the plot types is briefly described below:

1. **Detailed Ground Inspections** are plots from which data are recorded to confirm the ecosystem unit, polygon designation, or the polygon boundaries and will be completed using the MoF standard FS882 forms.[23] At each ground inspection plot, the form will generally be completed in its entirety and the spatial plot location and polygon number will be recorded with UTM coordinates or pinpricked onto the air photos. The plot size is typically 400m$^2$ (though the plot boundaries may not always be marked in the field). The data collected (site, soil and vegetation) at ground inspections is sufficient to confirm the ecosystem unit and all dominant and indicator vegetation species will be recorded by structural layer. The plots will be established in homogeneous locations, where possible. The sampling crews will target a minimum of three ground inspections within the unit to describe the dominant site and vegetation features where polygons are not previously described, proposed new, ecosystems are encountered in the field. This has been deemed acceptable by MOE staff in previous discussions.
2. **Detailed Visual Inspections** will consist of slightly less detailed plots and represent the dominant type of field inspection. They are completed on Ground Inspection Forms (GIF's). These plots are ground-truthing inspections for mapping and model development purposes and include the following objectives: record a comprehensive list of vegetation and indicator plants and their covers, assess soil textures, depths or drainage, and assess surficial materials and critical site information including elevation, aspect, slope, landscape

[20] Resources Inventory Committee (RIC) 1998. Standard for Terrestrial Ecosystem Mapping in British Columbia. Prepared by the Ecosystems Working Group, Terrestrial Ecosystems Task Force. Victoria, BC.

[21] BC Ministry of Forests and Ministry of Environment 1998. Field Manual for Describing Terrestrial Ecosystems. Land Management Handbook 25. Victoria, BC.

[22] The final decision on how site series should be derived in this initiative will include consultation with the Regional Ecologist. The final decision will be documented in the PEM /TEM / SEI sample plan.

[23] The final decision on whether the data collected will be completed on a GIF or FS882 will be determined in consultation with the Regional Ecologist.

position and landscape shape. The information collected at visual inspection locations will be recorded onto GIF's and their location recorded using GPS. The priority will always be to establish visual inspections on the ground (reliable data) although some visual checks may need to be conducted from helicopters and across viewscapes (lower reliability of data).

The spatial coordinates (UTM) for all field plots will be recorded on the field cards and/or pin-pricked on the air photos. The plot locations will subsequently be digitized as a separate spatial coverage, identified by plot type. A digital listing of field work data in a suitable format will be supplied to MoFR for all VRI field work with GPS location coordinates.

## 2.8 POLYGON DESCRIPTIONS (ATTRIBUTE ESTIMATION)

### *2.8.1 VRI Descriptions*

All VRI polygon descriptions will be completed to MoFR VRI standards. Photo interpreters who complete the field calibration phase will complete the polygon description phases. Initial polygon delineation will be re-assessed during the final polygon description phase to ensure consistency and that VRI standards are achieved.

The photos will assist in identification of mortality from forest insects, deciduous stands, and improve the description of Non Forested Polygons. There are five general categories of data that are produced during the attribute estimation of polygons:

1. **Ecology:** includes surface expression, modifying process, slope position, alpine designations, and soil nutrient regime;
2. **Land Classification – Land cover component:** includes treed (broadleaf, coniferous, mixed) terrain identification if trees are absent including snow, water, rock, and soil moisture regime;
3. **Site Index:** includes species, source, and site index;
4. **Tree Attributes:** includes crown closure, tree layer, vertical complexity, species and age of leading and second species, basal area, density, and snag frequency; and
5. **Non-treed attributes:** includes shrub height and crown closure, herb type and percent cover, and Bryoid percent cover.

All VRI attribute files will be validated and delivered in a format consistent with MoFR standards.

### *2.8.2 PEM / TEM Descriptions*

All core PEM polygon attributes will be completed as part of the PEM inventory. Final attributes will be provided in the data captured by polygon for each component and will adhere to digital data base standards for PEM (which are the same as the digital data base standards for TEM). TEM polygons embedded in the PEM model will consist of hard line polygons from the VRI coverage for features like wetlands, grasslands, avalanche paths, wetlands, talus slopes and rock outcropping. These features will be combined with modelled site series predictions for non hard-line areas.

The PEM model may utilize "soft-line" ecological features such as shallow materials, glaciofluvial materials, lacustrine materials mapped by the ecologist as non-standard data input layers for the PEM model. The final PEM product can be rolled up to the final VRI polygons and that can subdivided to form simple single site series based polygons or complex polygons that support up to three site series that are coincident with the base VRI shapes. The PEM model can also stay in raster format if the client sees that as a useful final product. The final format of the PEM is very flexible, and should address the desires and needs of the client.

### *2.8.3 SEI Descriptions*

A combination of VRI polygons and PEM polygons will be used to create an SEI inventory that will meet MoFR standards. Many of the hard line polygon features delineated in VRI that will be used in the PEM will also be used in the SEI. In addition, several combinations of stand age and species data will also form the basis for SEI polygons. The final SEI inventory will consist of polygons that will either be coincident to the VRI polygons that were used, subdivisions of the VRI polygons, or combined VRI polygons that do not support ecosystems of interest to that inventory.

## 2.9 MAPPING DELIVERABLES

The following is a summary of deliverables that will be required by each of the VRI and PEM / TEM and SEI.

### *2.9.1 VRI Mapping Digital Deliverables*

All VRI mapping will be done to MoFR mapping standards. The graphics file will be checked for integrity of file structure to ensure they are free of corrupt elements and missing pointers. Parameters entered in each layer or theme will be checked to confirm that the data meets MoFR standards. A log report will indicate the type of errors found on each level. The deliverables for this project include:

1. Completed VRI digital graphic files in digital standard format and digitized to TRIM digitizing standards.
2. 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 MoFR is revising the format for submission and storage of spatial and attribute data for the VRI program. All final products relevant to the work completed in a fiscal work will be delivered to the MoFR at the end of that year.

### *2.9.2 PEM / TEM and SEI Mapping Digital Deliverables*

The PEM / TEM and SEI deliverables include:

A single file in CD or zipped and uploaded to ftp://ftp.env.gov.bc.ca/pub/incoming/. Deliverables will be consistent with MoFR TEM digital data standards;[24]

1. Two ARC/INFO single digit precision export files[25] containing the PEM/TEM and SEI polygon information and the other with the sample points (plot locations).
    - e.g.: <TEM_coverage_name >.e00) – tECP_Project.e00
2. A set of final PEM / TEM and SEI map plot files generated from Arc/Info with polygon labels in HP Raster Transfer Language for each mapsheet within the project area.

[24] Ecosystem Mapping Technical Standard and Database Manual Errata 2.0 (Clarifies sections in PEM Digital Data Capture Standards (2000 RISC) and TEM Digital Data Capture Standards (2000 RISC) (Replaces the PEM Errata 1.0, 2004 and TEM Errata 1.0, 2004) to accompany PEM Inventory Standards (1999 RISC) and TEM Inventory Standards (1998 RISC) Sensitive Ecosystem Mapping Standards (2006 RISC).

[25] Export files must be created with the 'NONE' compression option (produces readable ASCII). The completed project spatial data file will include the entire project boundary, terrain and PEM / TEM / SEI features and spatial attributes.

# 3.0 PROJECT IMPLEMENTATION PLAN

## 3.1 SCHEDULING

This project is scheduled for implementation in the 2007/08 and 2008/09 fiscal years. The timing and completion of this project is dependant upon the Kootenay Lake TSA stakeholders available FIA funding. Activities will include:

- PEM / TEM and SEI and VRI Polygon Delineation (using Softcopy);
- Analysis of existing data sources;
- Sample Plan design;
- Field Data Collection;
- Polygon Descriptions (using Softcopy);
- Final Digital Mapping; and
- Final Deliverables.

Table 3. Kootenay Lake TSA summary of estimated delivery schedule by phase.

| Fiscal Year | Photos flown | Viewer Set Preps. | Polygon Delineation | Sample Design | Field Data Collection | Polygon Descriptions | Final Digital Mapping and Deliverables | Quality Control |
|---|---|---|---|---|---|---|---|---|
| **06/08** | Fall 2006 | Spring 2007 | Spring / Summer 2007 (PEM) Spring 2008 | Spring 2008 | | | | |
| **08/09** | | | | | Summer – Fall 2008 | Fall – Winter 2008/2009 | Spring 2009 | Ongoing |

## 3.2 PROJECT COORDINATOR

The project coordinator will:

- Coordinate the project;
- Monitor and communicate project progress; and
- Liaise with the project manager to ensure all expectations are met.

## 3.3 PERSONNEL

All VRI photo interpretation work will be completed or directly supervised by a VRI Certified Photo Interpreter. At least half of the photo interpreters working on the project will be certified for VRI Photo Interpretation and those photo interpreters not certified will be directly supervised by a Certified Photo Interpreter working on this project. All PEM / TEM and SEI photo interpretation work will be completed under the supervision of a certified TEM mapper and senior PEM practitioner.

## 3.4 QUALITY ASSURANCE

The Kootenay Lake licensees will hold a pre-project meeting with the photo interpretation contractor, quality assurance contractor, and MoFR representative to discuss the project goals,

objectives, methods, timing of activities and deliverables, and roles and responsibilities. An independent third-party auditor will provide quality assurance services concurrently throughout the program for polygon delineation, polygon attribute estimation and field data collection. QA results will be forwarded to the MoFR Regional representative during or after completion of each phase of the project. The program will be completed to VRI Phase I standards and will be audited to the VRI quality assurance standards and procedures for photo interpretation as outlined at:

http://ilmbwww.gov.bc.ca/risc/pubs/teveg/vri_qa_photointerp_2k6/qa_photointerp_2k6.pdf

PEM / TEM and SEI quality assurance will follow MOE procedures outlined in the Draft Quality Assurance Guidelines for Digital Data Capture (February 2003)
http://www.for.gov.bc.ca/hre/temalt/public.htm

Where possible, quality assurance of the VRI and PEM / TEM and SEI programs will be done concurrently.

## 3.5 DELIVERABLES

### *3.5.1 VRI Deliverables*

The following products will be delivered to MoFR upon completion of the VRI portion of the project:

- Complete and validated Microsoft Access™ format digital attribute descriptions linked to the vegetation inventory base maps;
- VegCap validation reports;
- Complete VRI data files in Microstation format;
- MoFR validation reports for each mapsheet;
- Hardcopy tally sheets or digital equivalent for each ground and air calibration point;
- Digital field summary for all calibration points;
- All DiAP Softcopy system files including digital SIS (or SJS) image files, MOD model files and SDT surface files on removable IDE hard drives;
- Quality assurance documentation for each phase of the VRI project; and
- A final project report.

All project deliverables will be signed off by a qualified Registered Professional Forester. Note that interim deliverables will be delivered at the end of each fiscal year that reflect the activities of the fiscal year. The proposed approach will be to complete the delineation, calibration, and attribute estimation in phases (as opposed to completing all phases for individual mapsheets). Year-end deliverables will be consistent with this approach.

### *3.5.2 PEM / TEM and SEI Deliverables*

The following products will be delivered to MOE, Environmental Stewardship Division, Ecosystems Branch upon completion of the PEM / TEM and SEI[26] portions of the project:

[26] Final ecosystem mapping cannot be completed until a final BEC revision is available (unless the existing BEC6 and Braumandl and Curran's 1992 site series classification are used).

- Draft plots of the PEM / TEM and SEI polygons with the ground / visual inspection field locations;
- Spatial coverage of the polygon inspection locations (ground inspection and visual inspections), referenced with the plot identifiers used in the field (ARC/INFO format);
- Spatial coverage of PEM / TEM and SEI polygons (ARC/INFO format);
- Non-spatial project metadata (.csv);
- Non-spatial digital PEM / TEM and SEI polygon database (.csv) linked to the GIS spatial data;
- Original (hardcopy) field plot data forms and digital databases including ground inspection data (VENUS 5.0) and visual inspection data (Microsoft Excel™ or Microsoft Access database);
- Final report (.pdf) describing the study area, project objectives, all Ecosections, Biogeoclimatic Units and PEM / TEM and SEI units, and documentation of the methods and results. Descriptive information for each of the mapped ecosystems units should also be included;
- Final map legend documentation (.pdf);
- Expanded legend (.pdf), including a detailed description of the site series mapped and a summary of the dominant vegetation species, but excluding a list of the dominant and associate vegetation species by structural stage for each unit; and
- All project materials purchased for project, including original typed air photos, original plot sheets, maps, equipment, and loaned materials.

All project deliverables will be signed off by a qualified Registered Professional Biologist.

## 3.6 REFERENCE MATERIAL

The following material is readily available for the project:

- Standard and Procedures for Integration of Terrestrial Ecosystem Mapping (TEM) and Vegetation Resources Inventory (VRI) in British Columbia (Current Version)
- VRI BC Land Cover Classification Scheme (Current Version);
- VRI Photo Interpretation Procedures (Current Version);
- VRI Quality Assurance Procedures for Photo Interpretation (Current Version);
- VRI Photo Interpretation Standards (Current Version);
- VRI Air Calibration Data Collection Procedures and Standards (Current Version);
- VRI Ground Calibration Data Collection Procedures and Standards (Current Version);
- MoFR Vector Cleaning Specifications (Current Version);
- BC MoFR Inventory Manual;
- BC MoFR Biodiversity Guidebook;
- BC MoFR Color Stereogram Handbook;
- BC MoFR Black and White Stereogram Handbook;
- Several tree and plant identification field guides; and
- Forest District Silviculture Opening History records.

## 3.7 COST

VRI will be completed on the total TSA land base, less Parks with a recently completed inventory and private land (or 1,158,314 ha). The PEM / TEM and SEI will be completed on the productive forest land base, less Parks (or 506,224 ha). The combined VRI and PEM / TEM and SEI program is expected to cost approximately $1,833,089 (excluding helicopter).

Table 4. Estimated costs for the Kootenay Lake VRI / PEM / TEM and SEI program.

| VRI Activity | Units (ha) | VRI Unit Cost ($/ha) | PEM / TEM / SEI Cost ($/ha) | Total Cost ($) |
|---|---|---|---|---|
| VRI land base | 1,158,314 | $1.20/ha | | $1,389,977 |
| PEM / TEM / SEI land base + Accuracy Assessment ($110,000) | 506,224 | | $0.50/ha | $363,112 |
| Photo AT, Digital Modeling, Orthophoto production | | | | $80,000 |
| ***Total*** | | | | ***$1,833,089*** |

# 4.0 APPROVAL/SIGN-OFF OF VPIP

I have read and concur that the Kootenay Lake TSA VRI Strategic Inventory Plan dated June 2007 meets current VRI standards. 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.

_____ _____

Tembec Industries Inc. (lead proponent) *Date*

_____ _____

*Jon Vivian, RPF* *Date*

*Manager Vegetation Resources Inventory*

*Forest Analysis and Inventory Branch*

*Ministry of Forests and Range*

# 5.0 APPENDIX I KOOTENAY LAKE MAPSHEET NUMBERS

| Mapsheet Number | 2006 Flying | 2004-2005 Flying (info. from Chris M.) | Arrow-2005 DiapViewer (info.from ILMB) | Kootenay L-2005 Diap Viewer (info.from ILMB) | Missing Sheets (info.from ILMB) | Comment |
|---|---|---|---|---|---|---|
| 082F005 | | 82F005 | | | 100% BB04 Coverage, No AT | Requires AT & Model Set-up |
| 082F006 | | 82F006 | 82F006 | | | |
| 082F007 | | 82F007 | 82F007 | | | |
| 082F008 | | 82F008 | 82F008 | | | |
| 082F009 | | 82F009 | | 82F009 | | |
| 082F010 | | 82F010 | | 82F010 | | |
| 082F015 | | 82F015 | 82F015 | | | |
| 082F016 | | 82F016 | 82F016 | | | |
| 082F017 | | 82F017 | 82F017 | | | |
| 082F018 | | 82F018 | | 82F018 | | |
| 082F019 | | 82F019 | | 82F019 | | |
| 082F020 | | 82F020 | | 82F020 | | |
| 082F025 | | 82F025 | | | 100% BB04 Coverage, No AT | Requires AT & Model Set-up |
| 082F026 | | 82F026 | 82F026 | | | |
| 082F027 | | 82F027 | | 82F027 | | |
| 082F028 | | 82F028 | | 82F028 | | |
| 082F029 | | 82F029 | | 82F029 | | |
| 082F030 | | 82F030 | | 82F030 | | |
| 082F033 | 82F033 | 82F033 | 82F033 | | | Requires AT & Model Set-up |
| 082F034 | | 82F034 | 82F034 | | | |
| 082F035 | | 82F035 | 82F035 | | | |
| 082F036 | 82F036 | | | | | Requires AT & Model Set-up |
| 082F037 | 82F037 | | | | | Requires AT & Model Set-up |
| 082F038 | 82F038 | | | | | Requires AT & Model Set-up |
| 082F039 | 82F039 | | | | | Requires AT & Model Set-up |
| 082F040 | | 082F040 | 100% BB04 Coverage, AT | | | |
| 082F043 | | 82F043 | 82F043 | | | |
| 082F044 | | 82F044 | 82F044 | | | |
| 082F045 | | 82F045 | 82F045 | | | |
| 082F046 | 82F046 | | | | | Requires AT & Model Set-up |

| | | | | | | |
|---|---|---|---|---|---|---|
| 082F047 | 82F047 | | | | | Requires AT & Model Set-up |
| 082F048 | 82F048 | | | | | Requires AT & Model Set-up |
| 082F049 | 82F049 | | | | | Requires AT & Model Set-up |
| 082F050 | | 82F050 | 100% BB04 Coverage, AT | | | |
| 082F053 | 82F053 | | | | | Requires AT & Model Set-up |
| 082F054 | 82F054 | | | | | Requires AT & Model Set-up |
| 082F055 | 82F055 | | | | | Requires AT & Model Set-up |
| 082F056 | 82F056 | | | | | Requires AT & Model Set-up |
| 082F057 | 82F057 | | | | | Requires AT & Model Set-up |
| 082F058 | 82F058 | | | | | Requires AT & Model Set-up |
| 082F059 | 82F059 | | | | | Requires AT & Model Set-up |
| 082F063 | 82F063 | 82F063 | 65% BB04 Coverage, AT | | | Requires AT & Model Set-up |
| 082F064 | 82F064 | | | | | Requires AT & Model Set-up |
| 082F065 | 82F065 | | | | | Requires AT & Model Set-up |
| 082F066 | 82F066 | | | | | Requires AT & Model Set-up |
| 082F067 | 82F067 | | | | | Requires AT & Model Set-up |
| 082F068 | | | | | | <100ha in K.L. |
| 082F074 | | 82F074 | 82F074 | | | |
| 082F075 | 82F075 | | | | | Requires AT & Model Set-up |
| 082F076 | 82F076 | | | | | Requires AT & Model Set-up |
| 082F077 | 82F077 | | | | | Requires AT & Model Set-up |
| 082F078 | 82F078 | 82F078 | 50% BB04 Coverage, AT | | | Requires AT & Model Set-up |
| 082F084 | | 82F084 | 82F084 | | | |
| 082F085 | 82F085 | | | | | Requires AT & Model Set-up |
| 082F086 | 82F086 | | | | | Requires AT & Model Set-up |
| 082F087 | 82F087 | | | | | Requires AT & Model Set-up |
| 82F088 | | 82F088 | 100% BB04 Coverage, AT | | | |
| 082F095 | 82F095 | | | | | Requires AT & Model Set-up |

| | | | | | | |
|---|---|---|---|---|---|---|
| 082F096 | 82F096 | | | | | Requires AT & Model Set-up |
| 082F097 | 82F097 | | | | | Requires AT & Model Set-up |
| 082F098 | | 82F098 | 100% BB04 Coverage, AT | 82F098 | | |
| 082G001 | | 82G001 | | 82G001 | | |
| 082G002 | | 82G002 | | 82G002 | | |
| 082G011 | | 82G011 | 100% BB04 Coverage, AT | 82G011 | | |
| 082G021 | | 82G021 | 100% BB04 Coverage, AT | | | |
| 082K004 | 82K004 | | 25% BB04 Coverage, AT | | | Requires AT & Model Set-up |
| 082K005 | 82K005 | | | | | Requires AT & Model Set-up |
| 082K006 | 82K006 | | | | | Requires AT & Model Set-up |
| 082K007 | | 82K007 | 82K007 | | | |
| 082K008 | | | | | | Purcell Conservancy |
| 082K014 | | 82K014 | 100% BB04 Coverage, AT | | | |
| 082K015 | 82K015 | | | | | Requires AT & Model Set-up |
| 082K016 | 82K016 | | | | | Requires AT & Model Set-up |
| 082K017 | 82K017 | | | | | Requires AT & Model Set-up |
| 082K018 | 82K018 | | | | | Requires AT & Model Set-up |
| 082K024 | | 82K024 | 82K024 | | | |
| 082K025 | | 82K025 | 82K025 | | | |
| 082K026 | | 82K026 | 82K026 | | | |
| 082K027 | | 82K027 | 82K027 | | | |
| 082K028 | | 82K028 | | | No Coverage | ? Requires AT & Model Set-up |
| 082K034 | | 82K034 | 82K034 | | | |
| 082K035 | | 82K035 | 82K035 | | | |
| 082K036 | | 82K036 | 82K036 | | | |
| 082K037 | | 82K037 | 82K037 | | | |
| 082K038 | 82K038 | | | | | Requires AT & Model Set-up |
| 082K043 | | 82K043 | 10% BB04 Coverage, AT | | | |
| 082K044 | 82K044 | | | | | Requires AT & Model Set-up |
| 082K045 | 82K045 | | | | | Requires AT & Model Set-up |
| 082K046 | 82K046 | | | | | Requires AT & Model Set-up |
| 082K047 | 82K047 | | | | | Requires AT & Model Set-up |

| | | | | | | |
|---|---|---|---|---|---|---|
| 082K053 | | 82K053 | | | 95% BB04 Coverage, AT | |
| 082K054 | | 82K054 | 82K054 | | | |
| 082K055 | | 82K055 | 82K055 | | | |
| 082K056 | | 82K056 | 82K056 | | | |
| 082K057 | 82K057 | | | | | Requires AT & Model Set-up |
| 082K064 | 82K064 | | | | | Requires AT & Model Set-up |
| 082K065 | | 82K065 | 82K065 | | | |
| 082K066 | | 82K066 | 82K066 | | | |
| 082K067 | 82K067 | 82K067 | | 82K067 | | Requires AT & Model Set-up |
| 082K068 | | 82K068 | | 82K068 | | |
| 082K073 | 82K073 | | | | | Requires AT & Model Set-up |
| 082K074 | 82K074 | | | | | Requires AT & Model Set-up |
| 082K075 | 82K075 | | | | | Requires AT & Model Set-up |
| 082K076 | 82K076 | | | | | Requires AT & Model Set-up |
| 082K077 | | | | | | v. small area in K. Lake |
| 082K083 | 82K083 | | | | | Requires AT & Model Set-up |
| 082K084 | | 82K084 | 82K084 | | | |
| 082K085 | 82K085 | 82K085 | | 82K085 | | Requires AT & Model Set-up |
| 082K086 | | | | | | |
| 082K093 | 82K093 | | | | | Requires AT & Model Set-up |
| 082K094 | 82K094 | | | | | Requires AT & Model Set-up |
| 082K095 | 82K095 | | | | | Requires AT & Model Set-up |
| 082N004 | 82N004 | 82N004 | 60% BB04 Coverage, AT | | | Requires AT & Model Set-up |
| 082N005 | 82N005 | 82N005 | | 82N005 | | Requires AT & Model Set-up |
| **TOTAL** | **57** | **60** | **42** | **17** | | |