

Dawson Creek Timber Supply Area

Vegetation Resources Inventory

Strategic Inventory Plan

Prepared for:

**Ministry of Forests and Range
Louisiana Pacific Canada Ltd.**

Prepared by:

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February 2006

EXECUTIVE SUMMARY

This Vegetation Resources Inventory (VRI) Strategic Inventory Plan (VSIP) was prepared for the Ministry of Forests and Range (MoFR) and Louisiana Pacific Canada Ltd. It outlines the VRI activities and products needed to address the forest management and inventory issues in the Dawson Creek Timber Supply Area (TSA) identified in the Ministry's 2003 *Dawson Creek TSA Rationale for Annual Allowable Cut (AAC) Determination* and additional issues identified by Ministry staff.

This plan provides background information including an overview of the VRI process, VRI overriding principles and an overview of the planning process. It also summarizes current business considerations and the inventory plan for Phase I and Phase II VRI activities

This document was prepared and submitted in accordance with current MoFR standards and guidelines. It has been reviewed and approved by MoFR representatives to ensure that all appropriate standards are being followed and to ensure that all of the planned activities will meet MoFR business needs.

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1.0 INTRODUCTION

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1.1 Overview of the VRI Process

The British Columbia VRI system has been approved by the Resource Information Standards Committee (RISC) to assess the quantity and quality of BC's timber and vegetation resources. The system uses both photo interpretation and detailed ground sampling to arrive at an accurate assessment of timber volume and other vegetation resources within a predefined unit.

The VRI is carried out in two phases. Phase I Photo Interpretation involves estimating vegetation polygon characteristics from existing information, aerial photography, or other sources. No sampling is done in Phase I.

Phase II Ground Sampling phase provides the information necessary to determine how much of a given characteristic is within the inventory area. Ground samples alone cannot be collected in sufficient numbers to provide the specific locations of the land cover characteristics being inventoried. Net Volume Adjustment Factor (NVAF) sampling collects data on a number of selected trees to account for errors in the estimates of net tree volume. The NVAF is calculated from the ratio of actual to estimates of sample tree volumes and is applied as a correction to VRI ground sample volumes. This data, used in conjunction with the original ground sampling data, provides an unbiased estimate of the net volume in the project area.

The ground measurements are used to estimate the proper total for the population. The relationship between the polygon estimates and ground samples is used to adjust the photo-interpreted polygon estimate. The total for the population is then distributed into the adjusted description for each polygon.

More detailed information, including VRI standards and procedures, is available at <http://www.for.gov.bc.ca/hts/vri/index.html>.

1.2 VRI Overriding Principles

VRI procedures are being implemented throughout the province. Implementation is guided by the following principles:

- Integrate provincial inventory activities including provincial VRI, management inventories, and the National Forest Inventory;
- Implement inventory projects to satisfy business needs as defined in the VSIP and VRI Project Implementation Plan (VPIP) documents. The VSIP and VPIP planning documents identify priorities and provide scope and direction in guiding VRI activities. All Forest Investment Account funded VRI activities will be conducted to Provincial RISC standards;

- Develop spatial VRI products using a structured methodology (e.g., implement photo interpretation activities by groups such as map sheets or watersheds and estimate all attributes listed in the photo interpretation manual);
- VRI Phase 1 photo interpretation must be followed with statistical adjustment of attributes with the objective of quantifying timber values with statistical confidence. The attribute adjustment will include adjustment for decay losses through NVAF.
- Implement inventory projects following approved VRI implementation standards as defined in the *Vegetation Resources Inventory Implementation Strategy to Integrate Management, Provincial, and National Inventories* report, BC Resources Inventory Branch, 1998.

VRI standards will be used when implementing inventories to address issues identified by the Forest Resources Commission's 1991 report *The Future of Our Forests*. These issues include inadequate provincial forest inventories, a lack of precision statements for these inventories, inadequate non-timber information, and a narrow focus on commercial timber volume and the operable land base.

1.3 Overview of the VRI Planning process

The VRI planning process requires that a Strategic Inventory Plan and a Project Implementation Plan be developed for a defined forest management unit (e.g. Timber Supply Area). A VSIP outlines the VRI products required to address forest management issues and provides strategic direction for implementing the inventory activities. A VPIP details the operational activities identified in the VSIP (e.g., ground sampling or photo interpretation projects) and identifies project areas, priorities, roles and responsibilities. Guidelines for preparing a VSIP and a VPIP are available at <http://www.for.gov.bc.ca/hts/vri/standards/index.html>.

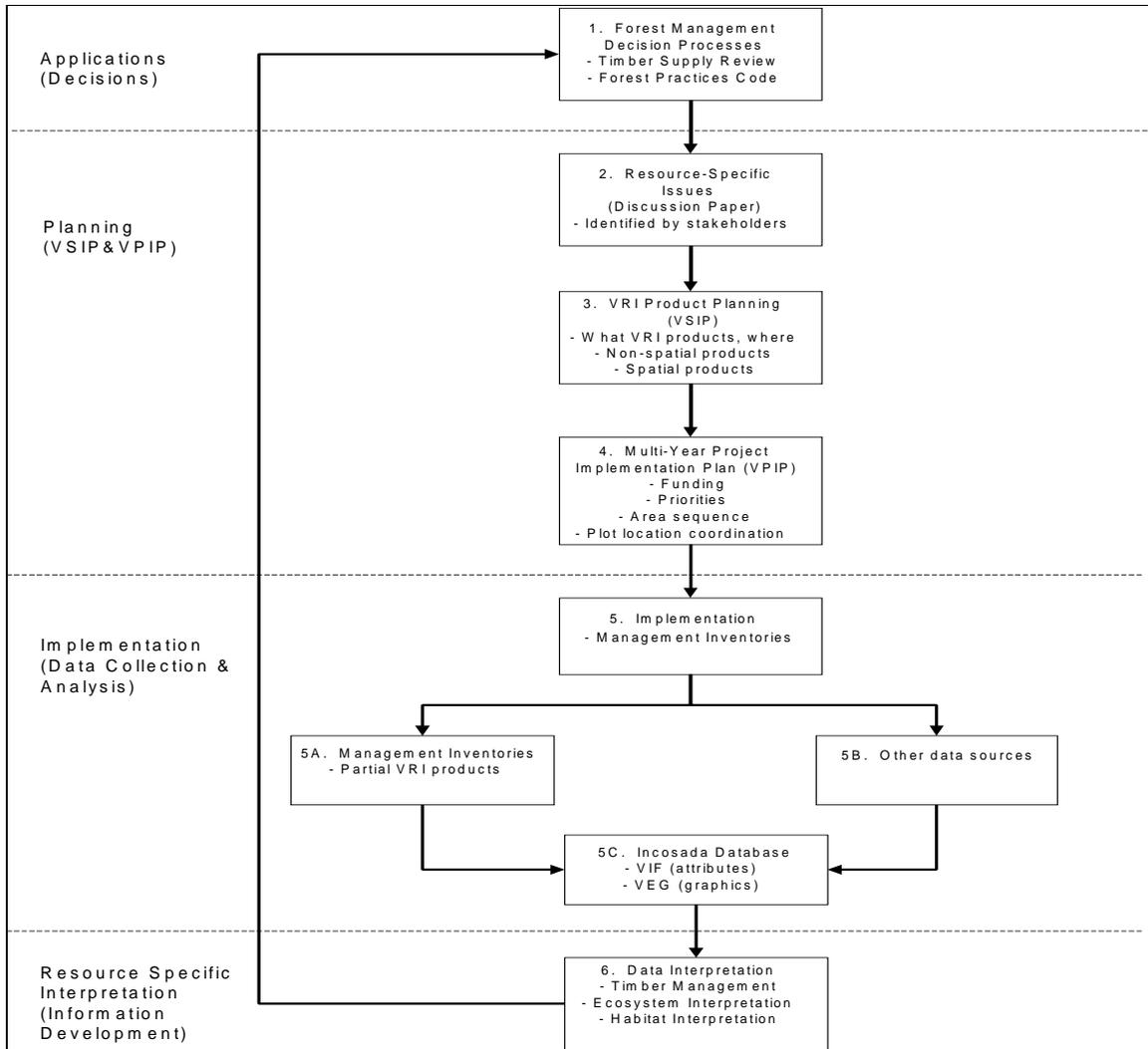


Figure 1.1 Overview of the VRI process

2.0 BUSINESS CONSIDERATIONS

2.1 Land base

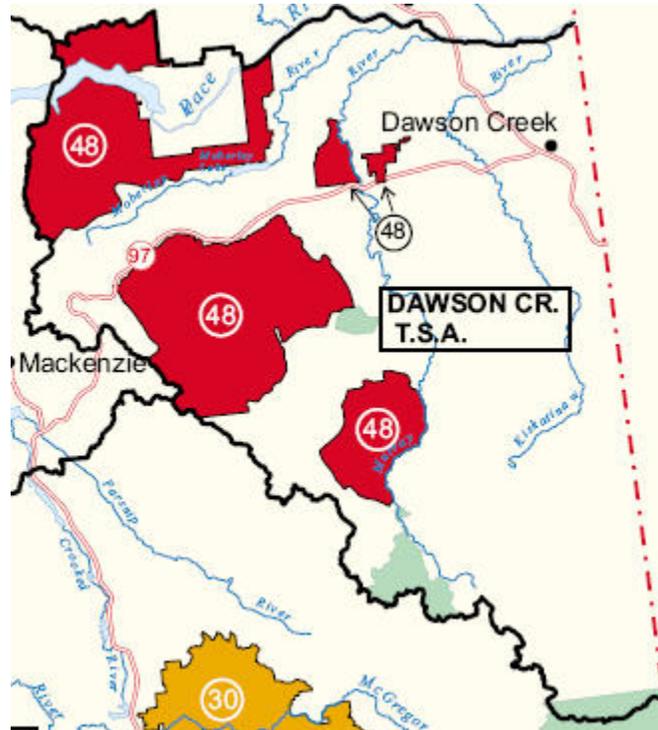


Figure 2.1 Dawson Creek TSA - Overview map

“The Dawson Creek TSA covers about 2.3 million hectares in northeastern British Columbia and is one of thirteen TSAs within the new Northern Interior Forest Region. The TSA is bounded by the Peace River to the north and the Alberta border to the east. To the west are the Hart Ranges and to the far south lie the Front Ranges, both of which are characterized by the mountainous terrain and steep valleys of the Rocky Mountains.

In 2001, the population of the Dawson Creek TSA was estimated at 26 500 people. The city of Dawson Creek is the largest community in the TSA, where about 40 percent of the population of the TSA lives. Other communities include Tumbler Ridge, Chetwynd, Hudson’s Hope and Pouce Coupe. Two First Nations communities in the TSA are the West Moberly and Sauleau. In addition, there is a Métis community at Kelly Lake.

About 60 percent of the Dawson Creek TSA (about 1.4 million hectares) is considered productive forestland managed by the Crown. Currently about 52 percent of this area is considered available for timber harvesting under current forest management practices. The current timber harvesting land base is estimated at 730 220 hectares, of which 429 440 hectares (59 percent) are stands of predominately coniferous species and 260 342 hectares (41 percent) are stands of predominately deciduous species.

The TSA lies primarily within two ecoregions: the Boreal Plains in the east, and the Central Canadian Rocky Mountains in the west. Climate is characterized by cold prolonged winters and warm short summers. Of the 14 biogeoclimatic zones in the province, four are represented in the TSA: Boreal White and Black Spruce (BWBS); Engelmann Spruce-Subalpine Fir (ESSF); Sub-Boreal Spruce (SBS); and, Alpine Tundra (AT). White spruce, lodgepole pine, trembling aspen, balsam poplar, black spruce and sub-alpine fir are the main tree species occurring in the TSA and frequently grow together as mixed-wood stands.”¹

Table 2.1 Dawson Creek TSA - Area summary by species²

Leading Species	Area (ha)	Percent
White spruce	248,230	34
Lodgepole pine	182,220	25
Subalpine fir	42,640	6
Aspen	215,232	29
Balsam poplar	41,778	6
Total TSA area	730,220	100

¹**B.C. Ministry of Forests.** 2003. *Dawson Creek TSA Rationale for Annual Allowable Cut (AAC) Determination.*

² **B.C. Ministry of Forests.** 2002. *Dawson Creek TSA Analysis Report.*

Table 2.2 Dawson Creek TSA - Area summary ³

Classification	Area (ha)	Percentage of TSA Area	Percentage of Productive Forest Area
Total area on file	2,989,835		
Area within TFL 48	644,724		
Total TSA area	2,345,111	100.0	
Non-forest land	664,153	28.3	
Woodlots	14,695	0.6	
Not managed by the BCFS	157,121	6.7	
Parks and eco-reserves	110,387	4.7	
Total area of Crown forest	1,398,755	59.6	100.0
Reductions to Crown forest			
Non-commercial brush	61,937	2.6	4.4
Riparian areas	65,318	2.8	4.6
Utility corridors	7,518	0.3	0.5
Transportation features	3,742	0.2	0.3
Physically inaccessible areas	34	0.0	0.0
Problem forest types	166,735	7.1	11.9
Economically inoperable	26,279	1.1	1.9
High value recreation	21,905	0.9	1.6
Non-merchantable stands	163,607	7.0	11.7
Low productivity — immature stands	89,789	3.8	6.4
Sensitive wildlife habitat	24,750	1.1	1.8
Wildlife tree patches	22,288	1.0	1.6
Non-commercial deciduous	14,633	0.6	1.0
Total current reductions	668,535	28.5	47.8
Current timber harvesting land base (incl NSR)	730,220	31.1	52.2
Coniferous stands (including small pine)	469,878		
Deciduous stands	260,342		
Future reductions — roads	34,005	1.5	2.4
Future timber harvesting land base	696,215	29.7	49.8

³ B.C. Ministry of Forests. 2002. Dawson Creek TSA Analysis Report.

2.2 Inventory History

2.2.1 Forest Inventory/Phase I VRI Photo Interpretation

The Dawson Creek TSA contains four Public Sustained Yield Units (PSYU's). The most recent forest cover inventories of the Dawson Creek SSA were conducted in 1969, 1971 and 1988. The most recent forest cover inventories of the Moberly PSYU were conducted in 1970 and 1983 (using 1970 photography). The most recent forest cover inventories of the Wapiti PSYU were conducted in 1969 and 1991 and the most recent forest cover inventories of the Peace River PSYU were conducted in 1972 and 1981. All four PSYU's had Environmentally Sensitive Area surveys conducted in 1978.

In September 2002, Louisiana Pacific Canada Ltd. issued a Request for Proposals for a Phase I Vegetation Resources Inventory for portions of the Dawson Creek TSA. The work began in the winter of 2003 and was completed in October 2005. As a result, portions of 62 British Columbia Geographic System (BCGS) map sheets within the Dawson Creek TSA have been inventoried to current VRI standards and specifications (approximately 37% of the total area of the TSA). All lands within the project area (including parks, reserves, private lands, Indian reserves and woodlots) were inventoried.

Table 2.3 Dawson Creek TSA – Current Inventory Status

Type of inventory	Number of BCGS maps	Area (ha)
VRI (2003 to date)	62	863,172
Forest Inventory (1981-1991)	160	1,490,780
Total TSA	222	2,353,953

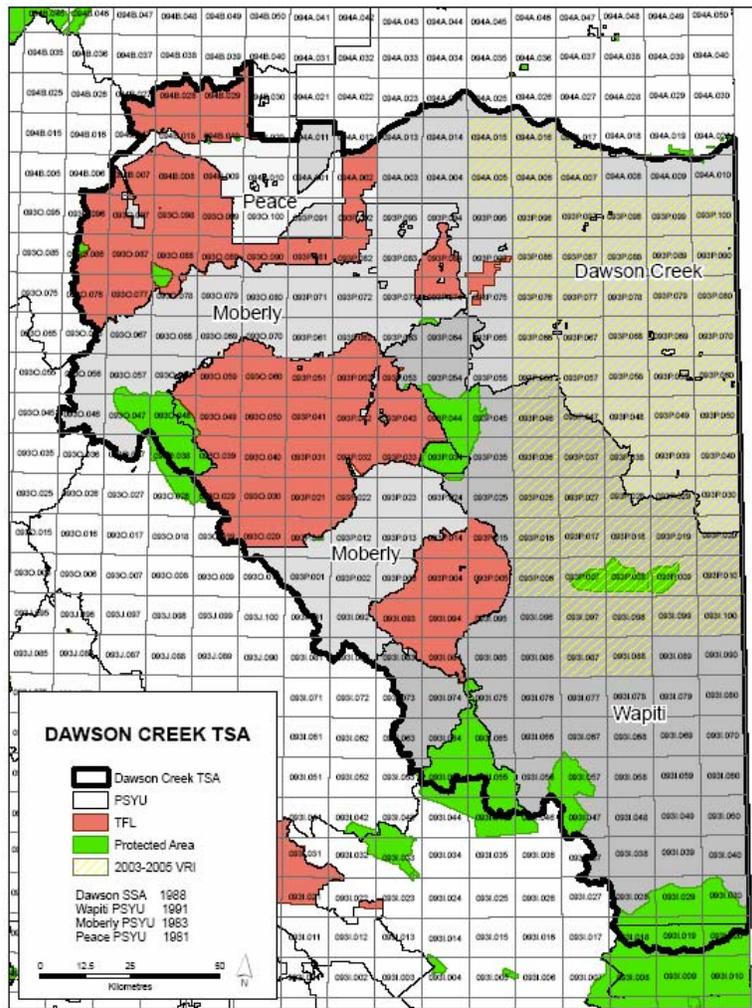


Figure 2.2 Dawson Creek TSA - Current inventory status

2.2.2 Phase II VRI Ground Sampling

The Ministry of Forests initiated a Phase II VRI Sampling project for the Dawson Creek TSA in 1997. Ground sample measurements were collected during 1998-2001 and final analysis of the VRI results was completed in March 2002.

No Phase I VRI data was available so the existing forest cover inventory information was used.⁴This project spanned four years of ground sampling and resulted in the establishment of 208 ground sample plots. The first two years of sampling proportionally targeted all forest types across the land base. In the third and fourth years samples were targeted in stands leading in

⁴BC Ministry of Forests. 2000. *Dawson Creek TSA Documentation of Vegetation Resources Inventory Interim Analysis.*

aspen/poplar and balsam respectively. NVAF sampling was also completed in the latter half of this project.⁵

Statistically based height, age and volume adjustment factors for deciduous, spruce, pine, and subalpine fir-leading stands were developed and incorporated into the timber supply analysis.

Net volume adjustment factors (NVAFs), based on destructive sampling for decay, were also derived. The NVAFs were not employed in the base case of the timber supply analysis due to related uncertainties when the analysis was initiated. Adjustment factors for volume were based on existing loss factors.⁶

Table 2.4 Dawson Creek TSA - VRI Phase II adjustment ratios⁷

Stratum	Sub-category	Compiler utilization (cm)	Inventory range (years)	Age adjustment ratio	Height adjustment ratio	Loss factor volume adjustment ratio	NVAF volume adjustment ratio
Bl		17.5	All ages	0.94	0.981	1.11	1.32
At,Ac		12.5	<=80	1.236	1.151	1.417	1.487
At,Ac		12.5	>80	0.855	0.951	1.345	1.479
Sw		17.5	All ages	0.804	1.024	1.002	1.103
Pl (no stkcl 4)	Pine	12.5	Age_prj=80	0.934	1.155	0.617	0.617
Pl (no stkcl 4)	Pine	12.5	60<age_prj<=120	0.991	0.948	1.34	1.426
Pl (no stkcl 4)	Pine	12.5	Age_prj>120	0.887	0.927	1.019	1.11
Pl (no stkcl 4)	Small pine	9.0	60<age_prj<=120	0.991	0.948	1.472	1.567
Pl (no stkcl 4)	Small pine	9.0	Age_prj>120	0.887	0.827	1.198	1.3
Pl (s/c4)		12.5	All ages	0.899	0.957	1.956	2.032
L		17.5	All ages	0.899	0.957	1.956	2.032
SB		17.5	All ages	0.899	0.957	1.956	2.032

Detailed reports documenting the Phase II VRI Ground Sampling project are available from the BC Ministry of Forests and Range.

⁵ B.C. Ministry of Forests. 2002. Dawson Creek TSA Documentation of Vegetation Resources Inventory Addendum 2.

⁶ B.C. Ministry of Forests. 2002. Dawson Creek TSA Analysis Report.

⁷ B.C. Ministry of Forests. 2002. Dawson Creek TSA Analysis Report.

2.3 Forest Management and Inventory Issues

The Chief Forester identified a number of significant inventory related forest management issues in his 2003 *Dawson Creek TSA Rationale for Annual Allowable Cut (AAC) Determination*. He noted significant reductions in the productive forestland base due to problem forest types, non-merchantable stands, low productivity stands, mixedwood types and small diameter pine stands.

The criteria for identifying and quantifying these types are based largely on forest/vegetation inventory descriptions.

2.3.1 Problem forest types

“Problem forest types are stands that are physically operable and exceed minimum productivity criteria yet are not currently utilized or have marginal merchantability. In the analysis, those polygons with a leading species of larch, black spruce, lodgepole pine (stocking class 4), alder, maple or birch were excluded from the timber harvesting land base to account for leading species groups that are typically not harvested in the TSA. In total, 166 735 hectares were deducted from the timber harvesting land base to account for problem forest types”.

2.3.2 Non-merchantable stands

“Non-merchantable stands were defined as mature stands that do not meet the minimum volume criteria. In the base case these criteria excluded mature stands not meeting a minimum of 120 cubic metres (conventional ground-based systems) or a minimum of 200 cubic metres (cable and aerial systems). In addition, mature small pine stands less than 17.5 metres were considered non-merchantable. In the timber supply analysis, 163 607 hectares were deducted to account for non-merchantable mature stands”.

2.3.3 Low productivity stands

“In the timber supply analysis, low productivity stands were considered to be immature stands that are not projected to achieve a volume greater than or equal to 120 cubic metres per hectare at maturity. VDYP Batch version 6.6d was used to project the volume per hectare of all immature stand polygons. Where the projected volume did not achieve the minimum volume per hectare at maturity, the polygon was excluded from the timber harvesting land base. In total, 89 789 hectares of productive forest were excluded from the timber harvesting land base to account for low productivity stands”.

2.3.4 Mixedwood types

“Mixedwood stands comprise a large proportion of the productive forest within the Dawson Creek TSA. In the analysis, coniferous mixedwood stands are defined as stands comprised of at least 20 percent deciduous species; deciduous mixedwood stands are comprised of at least 20 percent coniferous species. In the timber supply analysis, approximately 13 percent (92 246 hectares) of the timber harvesting land base consists of mixedwood stands. In the analysis, 48 689 hectares are assumed to contribute to the deciduous harvest forecast and 43 556 hectares contribute to the coniferous harvest forecast”.

2.3.5 Small pine profile

“In the base case, small pine stands were defined as leading lodgepole pine stands, of any site class, with a height between 17.5 metres and 19.4 metres, not in stocking class 4, and that yield at least 120 cubic metres at maturity. Within the Dawson Creek TSA, these stand types are estimated to cover 40 437 hectares of the timber harvesting land base. In the 1996 AAC

determination I noted that there was uncertainty regarding the contribution of small pine stands to timber supply. I included a 100 000 cubic metre per year partition for small pine stands and requested that staff monitor harvesting performance. To date, I note that there has been no harvesting under this partition and only limited harvesting of this profile in the past five years.

Although district staff have better defined the small pine profile since my previous determination, they are still uncertain about this profile due to inventory labeling deficiencies, variability in the stand attributes (age, height, volume and stocking) and the lack of harvesting performance.”

2.3.6 Transportation corridors

“In the analysis, a percentage of the productive forested area was excluded to account for the permanent loss of productive land due to roads, trails, and landings, as well as oil and gas well sites, seismic lines, pipelines and power lines. After previous deductions, 11 260 hectares (approximately 0.8 percent of the productive forest) were excluded from the timber harvesting land base to account for existing transportation and utility corridors.

To account for future transportation and utility development, 5 percent of the current timber harvesting land base covered by stands older than age 12 was deducted. In total, a further 34 005 hectares (2.4 percent of the total productive forest) were excluded from the current timber harvesting land base”.

Significant oil and gas exploration activity continue in the Dawson TSA. Ministry of Forests and Range staff has identified Base Mapping updates as a current inventory issue⁸. In particular, there is a need for mapping the location and extent of new roads, well sites, pipelines, and seismic lines as well as the need for determining recent permanent losses to the timber harvesting land base.

2.4 Inventory Issues

2.4.1 Re-inventory

The Chief Forester also addressed the need for a re-inventory of the Dawson Creek TSA. “In 1995 an inventory audit of the Dawson Creek TSA was completed by BCFS Resources Inventory Branch. The audit indicated that, among other things, the volumes of the mature component of the inventory were likely underestimated by 19 percent on average. It was also recognized that some of the original inventories were out of date. In the rationale for my 1996 determination, I acknowledged the deficiencies in the inventory and recommended that a re-inventory of this unit be conducted as soon as possible. In response, BCFS staff initiated a phase II Vegetation Resources Inventory (VRI) of the TSA in 1997. No VRI phase I was undertaken because given available resources, a higher priority was placed on improving volume estimates”.

The Ministry of Forests recommended action was to “continue to update forest inventories of the TSA, including the photo interpretation component (phase I) of the Vegetation Resources Inventory (VRI) project”⁹.

2.4.2 Mountain pine beetle

“British Columbia is currently experiencing the largest recorded mountain pine beetle outbreak in North America. Infestations are now appearing in the Peace River Region”¹⁰. Lodgepole pine is

⁸ Nakatsu, Dick. 2005. Ministry of Forests and Range. Forester. Personal Communication.

⁹ B.C. Ministry of Forests. 2003. *Summary of Prince George Region Timber Supply Review Issues*

the leading species on approximately 25% of the timber harvesting land base in The Dawson TSA. Implementation of planned Provincial objectives and mitigating actions against the epidemic will require a current and accurate inventory. There is clearly a need to “update and improve the timber inventory and information about non-timber resources to facilitate more accurate assessments and forest management decisions in the epidemic area”¹¹.

¹⁰ **B.C. Government.** 2005. *British Columbia’s Mountain Pine Beetle Action Plan 2005-2010*

¹¹ **B.C. Government.** 2005. *British Columbia’s Mountain Pine Beetle Action Plan 2005-2010*

3.0 INVENTORY PLAN

3.1 Phase I VRI Photo Interpretation

3.1.1 Objectives

Approximately 37% of the Dawson TSA has been inventoried to current VRI Phase I standards and specifications. The objective is to complete the inventory of the remaining land base in the TSA to the same standards and specifications as the areas inventoried in the period 2003 to 2005. This remaining land base will include all Crown land, parks, reserves, private lands and woodlots but will exclude TFL 48.

The Phase 1 VRI project will address the issues identified by the Chief Forester and other stakeholders (including the identification and quantification of problem forest types, non-merchantable stands, low productivity stands, mixedwood types and small diameter pine stands). The VRI information will be more current and more accurate than existing forest cover information and will facilitate more accurate assessments and forest management decisions

3.1.2 Scheduling

It is not feasible to complete the project in time for the data to be incorporated in the Chief Forester's next scheduled AAC determination in April 2007.

The project will be completed over a period of 10 years pending the availability of suitable recent photography and funding.

3.1.3 Target Area

Approximately 1,500,000 hectares of land in the Dawson Creek TSA remain to be inventoried to VRI standards.

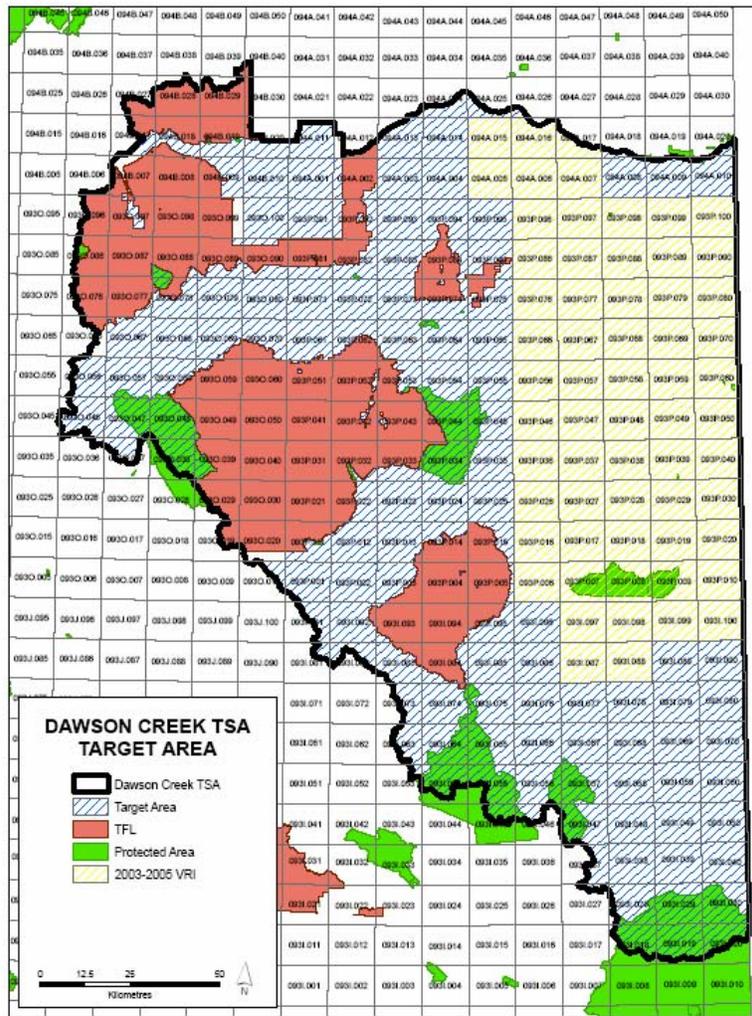


Figure 3.1 Dawson Creek TSA - Phase I VRI target area

3.1.4 Aerial Photography

This project will utilize the DiAP digital softcopy photogrammetric system and the most recent available medium-scale aerial photography that meets current MoFR and Base Mapping and Geomatic Services standards and specifications.

There is no recent suitable medium scale photography flown prior to 2005. The Phase I VRI project will use 1:30,000 scale colour photos flown as part of the Provincial Forest Health program in 2005. Future photography flown under the Health program will be utilized as much as possible.

All photographs will be scanned at a 10 to 15 micron resolution and then converted to SIS format digital files for use with the DiAP system. All scanning, aerial triangulation and control transfer will be conducted to current Base Mapping and Geomatic Services standards.

If future photography from the Provincial Forest Health program is unavailable, consideration will be given to procuring photography from outside agencies. Any photography acquired from outside agencies must be approved by Base Mapping and Geomatic Services and meet their standards and specifications before being utilized on the Dawson Creek TSA Phase I VRI project.

3.1.5 Standards

All work performed will conform to current Phase I VRI standards and specifications (which are available at <http://www.for.gov.bc.ca/hts/vri/index.html>).

3.1.6 Integrated Inventories

Individual licensees may undertake integrated inventories to address other information requirements (e.g. terrain or ecology information) in addition to the minimum requirements set forth in the VRI standards.

However, such additional work is optional for each licensee and will not be considered an obligation for the TSA Phase 1 VRI program.

3.2 Phase II VRI Ground Sampling

Phase II VRI Ground sample measurements (including NVAF samples) were collected during 1998-2001 field seasons and final analysis of the VRI results was completed in March 2002.

3.2.1 Objectives

- Evaluate the utility of the existing ground sample measurements and determine whether additional samples are required;
- If required, develop a new sample plan and collect additional Phase II data;
- Derive or confirm statistically-based height, age and volume adjustment factors for deciduous, spruce, pine, and subalpine fir-leading stands based on the collected Phase II data;
- Derive or confirm net volume adjustment factors (NVAFs) for decay, based on previously collected destructive sampling data;
- Complete adjustments to Phase I VRI descriptive attributes;
- Incorporate the adjusted data into the next timber supply analysis.

3.2.2 Scheduling

The remaining Phase II activities will be completed upon the completion of the Phase I program.

3.2.3 Standards

All work performed will conform to current Phase II VRI standards and specifications (which are available at <http://www.for.gov.bc.ca/hts/vri/index.html>).

3.3 Estimated Costs

Table 3.1 Total Phase I and II VRI Project Costs – 2006-2016¹²

Phase	Activity	Cost per hectare	Total Cost
I	Photo Products and Softcopy Costs	\$ 0.20	\$ 298,156.00
I	Polygon Delineation and Descriptions	\$ 1.00	\$ 1,490,780.00
I	Field Data Collection	\$ 0.20	\$ 298,156.00
I	Helicopter	\$ 0.15	\$ 223,617.00
I	Third-party Professional Quality Assurance	\$ 0.05	\$ 74,539.00
I	Phase I Total	\$ 1.60	\$ 2,385,248.00
II	Analysis and Attribute Adjustment	\$ 0.02	\$ 29,815.60
II	Phase II Total	\$ 0.02	\$ 29,815.60
I and II	Grand Total	\$ 1.62	\$ 2,415,063.60

¹² Based on historic Dawson Creek TSA Phase 1 VRI costs and on estimates contained in the most recent approved Prince George TSA and Vanderhoof TSA Vegetation Resources Inventory Strategic Inventory Plans

4.0 APPROVAL/SIGN-OFF OF VSIP

I have read and concur that the 2006 Dawson Creek TSA Vegetation Resources Inventory Strategic Inventory Plan, prepared by Frank Scheithauer R.P.F. of Timberline Forest Inventory Consultants Ltd. and dated February 2006, meets current Vegetation Resources Inventory Standards.

_____ Date: _____

Manager,
Ministry of Forests and Range,
Northern Interior Forest Region

I have read and concur that the 2006 Dawson Creek TSA Vegetation Resources Inventory Strategic Inventory Plan, prepared by Frank Scheithauer R.P.F. of Timberline Forest Inventory Consultants Ltd. and dated February 2006, addresses Ministry of Forests and Range, Forest Analysis and Inventory Branch concerns.

_____ Date: _____

Director,
Ministry of Forests and Range,
Forest Analysis and Inventory Branch