

Quesnel Timber Supply Area

Vegetation Resources Inventory

Photo Interpretation Project Implementation Plan

**PREPARED FOR:
QUESNEL TSA STAKEHOLDERS COMMITTEE**

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1.0 INTRODUCTION

1.1 Background Information

This document is an update of previous VPIP's for the Quesnel TSA completed in 2005 and 2006. An update is required to reflect a significant change in planning and scheduling for the VRI Phase 1 process as agreed at the April 23rd 2008 Quesnel TSA Mitigation Committee meeting held with key stakeholders. The update is also being made to incorporate the revised MFR VPIP standards released in May 2008 under VPIP Ver. 2.2. The current VRI Strategic Inventory Plan (VSIP) dates from June 2005.

In order to complement TSR planning requirements, the focus of the Quesnel VRI Phase 1 program will be revised to implement activities mainly in the eastern portion of the TSA which is primarily composed on non-pine stands. Approximately 32% of the TSA is comprised of non-pine stands based on the leading species. Focusing inventory projects on the non-pine component is essential as these stands will contribute significantly to near/mid-term timber supply. As well, due to the pervasive impact of the MPB on the pine component (51% by leading species) of the TSA, a large VRI Phase 1 investment at this time using current standards would have limited utility in the attacked stands. With a declining asset (dead trees) the value of the available inventory information would have minimal longevity. The required extent of attack and severity information in these stands will be secured from the Forests For Tomorrow "footprint" mapping process. A reevaluation of the timeliness and validity of conducting a Phase 1 inventory in the leading pine stands will occur in 2010.

Secondary structure or understory data is required for TSR in order to obtain an estimate of how much land will be excluded from harvest due to proposed secondary structure regulations. Understory point data will also be useful to determine species compositions, ages and heights for use as photo interpretation calibration data. Therefore, an understory sampling scheme will be incorporated in appropriate stands and the resultant data will be used to assist calibration.

1.1.1 Stakeholders and Support

This document has been prepared with input and support from the Quesnel TSA Stakeholders Committee, the Quesnel TSA Mitigation Committee and the Forest Analysis and Inventory Branch and VRI staff from the Southern Interior Forest Region. Membership on the committees includes representatives from:

- MFR regional and HQ inventory staff
- MFR District, regional and HQ FFT representatives
- BC Timber Sales
- MOE
- Canadian Forest Products Ltd.
- C & C Wood Products Ltd.
- Ainsworth
- Tolko Industries Ltd.
- West Fraser Mills Ltd.

1.1.2 Inventory and Key Business Drivers

The recent Mountain Pine Beetle infestation has introduced extremely significant challenges to implementing the above goals. Achieving these goals require access to topical terrestrial land base data including a robust statistically based Vegetation Resources Inventory. Particularly in

stands contributing to near/mid-term timber supply. In preparation for TSR 4 and TSR 5, the MFR has stated that sound and specific information regarding the non-pine component of the Quesnel TSA is essential to assess the contribution of the non-pine component of the vegetated land base to near/mid-term timber supply. Currently the determinations for TSR 4 and TSR 5 are scheduled for October 2009 and October 2014 respectively.

The focus of this plan is to provide a Phase 1 VRI inventory to support the mid-term TSR review expected to be required by 2011. The phase 1 VRI is to be conducted on that portion of the Quesnel land base where it has been determined that this inventory tool is the most appropriate. Further, the Quesnel Mitigation Committee agreed during its April 23, 2008 meeting that other sampling techniques funded through Forests for Tomorrow (FFT) would be employed in the portion of the Quesnel land base that is predominated by MPB killed pine stands. These latter activities consist of a new ground sampling protocol focused on providing understory information needed to meet mid-term TSR analysis, the reserves regulation and FFT silviculture requirements. Ground sampling information will be augmented by low level high resolution digital camera system (DCS) sampling wherever appropriate.

The key business drivers for implementing a new VRI include:

- The Timber Supply Review process uses forest resource inventory data as a quantitative basis for strategic yield analysis and sustained yield determinations.
- Support accurate and timely mid-term timber supply and environmental values mitigation strategies as being developed by the *Quesnel TSA Timber Supply & Environmental Values Mitigation Committee*.
- Support harvest scheduling and allocation planning for mid-term fibre supply
- Support accurate assessment of reserve, retention and recruitment areas
- Support the increasing demand for more detailed information for resource planning including monitoring functions due to questions surrounding sustainability of resources (that requires sound information to prove that sustainability is being achieved)
- Cariboo-Chilcotin Land Use Plan (C-CLUP)
- Sustainable Forest Management systems such as:
 - Canadian Standards Association (CSA)
 - Sustainable Forestry Initiative Program (SFI)
- Environmental management systems such as ISO 14001.
- Ecosystem management concepts.

1.1.3 Role and Status of Photo Interpretation

A non-VRI inventory update to the existing forest cover inventory was completed between 1994 and 1997. Information from the 10 map sheets completed in 2007/08 under the Quesnel TSA Pilot Project indicate that a new VRI Phase 1 will provide improved species differentiation and height attribution from the use of soft copy images using the 2005 and 2006 scanned colour photos. One of the findings of the pilot project (as well as from the polygon delineation contracts let in 2006) is that while the bulk of the aerial photographs indicated good colour, the scanning process degraded the colour in select areas of the TSA. Through image enhancement in softcopy (specifically gamma) the more grey toned images could be pushed variably to enhance the colour with minimal affect on image resolution. Ortho photos that had been pushed to reveal improved colour rendering were provided by FAIB staff to assist with attacked pine differentiation. Pushing the image gamma as required provided more or less the same end result. The scale and image quality of the 2005 and 2005 preset images was of high enough quality that even with

pushed imagery; softcopy height measurements taken near calibration plot locations indicated a strong correlation. Tree heights were quite discernable for non pine species, as well as green and red attack pine. Grey attack pine, with their skeleton like structure, were more difficult to measure with the same accuracy.

Although the current VRI focus is on non-pine stands the MPB has to varying degrees attacked the pine component within these non-pine stands. Quantification of the attacked component is necessary. The VRI standards for polygon delineation are much finer than with the previous forest inventory. Techniques for completing VRI inventories are also improved with the utilization of softcopy photogrammetry. This technique provides higher resolution optics for stereo-viewing compared to the methodology of stereo-viewing photographs in earlier inventories. With these two improvements over the previous inventory, the VRI will address the issues of broad typing and species composition. Average polygon size will be targeted at approximately 10 hectares.

1.2 Vegetation Resources Inventory Planning Process

The Vegetation Resources Inventory (VRI) is the Ministry of Forests and Range (MFR) standard for assessing the quantity and quality of BC's vegetation resources. The VRI process is a multi phased approach that includes field calibration, photo interpretation and various levels of sampling for collecting and reporting vegetation resource information. The VRI is essentially a toolbox of procedures, which include:

- *Photo Interpretation*: the delineation of polygons from aerial photography or digital imagery and the estimation of a pre-determined set of resource attributes.
- *Ground Sampling*: the establishment of plot clusters in selected polygons to measure timber, ecological, and/or range attributes.
- *Net Volume Adjustment Factor (NVAF) Sampling*: Stem analysis sampling of individual trees for net volume adjustment.
- *Within Polygon Variation (WPV) Sampling*: Intensive sampling of selected polygons to determine the error between the estimated attribute values and the "true" attribute values.
- *Statistical Adjustment*: the adjustment of the photo-interpreted estimates for all polygons in an inventory unit or management unit using the values measured during ground sampling.

The VRI can be deployed over a management unit measuring selected resources in specific portions of the land base. The VRI produces spatial and non-spatial databases that can be used in multiple resource management applications including timber, ecosystem, and wildlife habitat management.

The planned inventory in the Quesnel Timber Supply Area (TSA) will be a VRI. Ultimately, there will be three phases to this VRI; photo-interpretation, ground sampling, and net volume adjustment factor (NVAF) sampling. The VRI will provide an updated and improved foundation inventory for the TSA to support future forest management planning and the Timber Supply Review process.

1.3 State of the Current Inventory

The Quesnel TSA was inventoried between 1963 and 1988, with an extensive non-VRI (forest cover base) inventory classification update completed for all polygons between 1994 and 1997. The update process included an extensive field visitation for air and ground calls and was based on colour aerial photographs. However, a few partial map sheets in the TSA are still identified as

having a reference year from the 1978-1987 inventory. The Bowron Park inventory is dated as pre 1960 and is incomplete with portions missing..

The inventory audit results for the Quesnel TSA (provided for historical reference) indicated the following (from the Quesnel TSA Inventory Audit Report):

The correlation coefficient of 0.518 for the audit and inventory estimates indicates a moderate relationship among the individual samples. There is a 30m³/ha difference between the mean inventory estimate for mature volume (235m³/ha) and the audit estimate. A paired sample t-test determined that, for the mature component of the total forested area of the TSA, this difference is statistically significant 19 times out of 20. The 95% confidence interval for the mean paired difference is -57 to -3 m³/ha.

Since there is a statistically significant difference between the two estimates, the ground attribute volume was calculated using the VDYP model. The estimated mean ground attribute volume is 211 m³/ha. The difference between the mean ground attribute volume (211 m³/ha) and the mean audit volume (205 m³/ha) is 6 m³/ha. The difference between the mean inventory volume (235 m³/ha) and the mean ground attribute volume is 24 m³/ha. This suggests that the majority of the bias in the volume estimates for the Quesnel TSA is associated with some of the inventory attributes.

The objective of the inventory audit in the Quesnel TSA was to assess the overall accuracy of the current Ministry of Forests inventory. The mature, immature, and non-forest components were tested.

Audit results for the mature component of the inventory suggest that the inventory volume is overestimated. Subsequent analysis of post-stratified data also shows a similar volume over estimation in the operable forested area.

Audit results for the immature component of the inventory suggest an acceptable level of accuracy for site index assignment in young stands.

The full inventory audit of the Quesnel TSA re-inventory can be reviewed at the following site:

<http://www.for.gov.bc.ca/hts/vri/audits/reports&pub/>

Post audit analysis work identified the Narcosli (east and west) Supply Block as the main source of the problem. A breakdown of samples by BEC zone showed that the Sub-Boreal Pine-Spruce (SBPS) zone stands out with an inventory overestimate of approx. 25 percent. Where the SBPS and the Narcosli overlap the overestimate approached 28 percent¹.

1.4 Document Objectives

The Vegetation Resources Inventory Project Implementation Plan (VPIP) is a working document that details the specific operational activities associated with implementation and documentation of the inventory project. It identifies the project geographic areas, priorities, target areas for new photo interpretation, data sources, availability of aerial photographs, format of base files, project scheduling, plot location coordination, approximate or projected inventory costs, and roles and responsibilities for implementation.

1.5 Land Base

¹ from Quesnel Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination

The Quesnel TSA is situated in central British Columbia in the Southern Interior Forest Region (see Figure 1). The Quesnel TSA is geographically diverse, bounded by the Columbia Mountains to the east and extending west almost to Tweedsmuir Provincial Park.

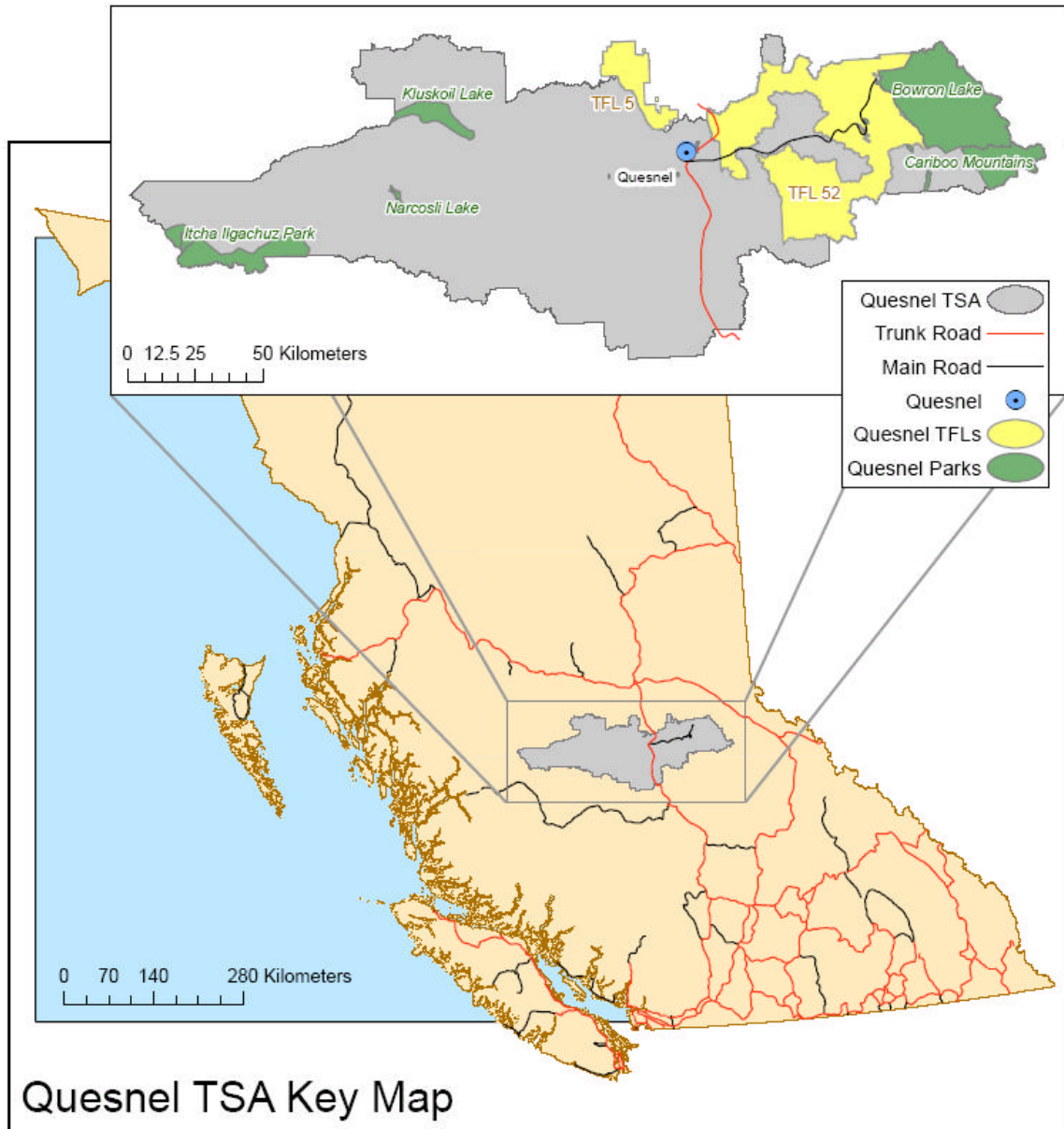


Figure 1 Quesnel TSA Key Map

The Quesnel Forest District covers approximately 2,077,236 hectares, with the Quesnel TSA occupying 1,779,951 hectares. Table 1 provides a further breakdown approximation of the land base, which is based on a blended 1999 TSR dataset that has been updated in places with newer information. It is acknowledged that there are suspected errors for some of the values listed under productive land base reductions. However, the information presented in Table 1 is not key to the project implementation plan and is only provided for general information.

The main tree species in the forested land base are broken down by area as follows: lodgepole pine (74.3%), hybrid white spruce (13.8%), Douglas-fir (4.9%), trembling aspen (3.8%), sub-alpine fir (2.0%), with cedar, hemlock, birch, cottonwood, and larch (1.2%) forming minor components (see Table 1).

In this plan, the assumption is made that the forested land base corresponds to the Vegetated Treed (VT) land base according to the BC Land Cover Classification Scheme (BCLCS).

Table 1 Quesnel Forest District Area Summary

Quesnel Forest District Area Summary	Area (ha)	Percent of TSA (%)
Total Quesnel Forest District	2,077,236	-
TFL 52, Block B	34,390	-
TFL 52, Block A	262,895	-
Total Quesnel TSA	1,779,951	100
Non Forest	180,989	10.2
Non-Crown	106,072	6.0
Woodlots/Schedule N	57,442	3.2
Bowron Provincial Park	113,968	6.4
Caribou Mountain Park	29,377	1.7
Other Parks	59,154	3.3
Productive Landbase	1,232,949	69.3
Non-commercial	417	0.0
Caribou Non-harvest Zone	74,728	4.2
Class A Lake Buffers	4,534	0.3
Non-merchantable Species	64,094	3.6
Environmentally Sensitive Areas (ESA)	8,919	0.5
Low Productivity	16,667	0.9
Riparian Reserves	26,602	1.5
Riparian Management Zones (RMZ)	15,787	0.9
Residual Non-merchantable	2,406	0.1
Current Roads, Trails, and Landings	37,493	2.1
Wildlife Tree Patch (WTP)	20,818	1.2
Additional Low Productivity Deciduous	14,908	0.8
Old Growth Management Area (OGMA)	111,170	6.2
Total Productive Land Base Reductions	398,543	22.4
Timber Harvesting Land Base (THLB)	834,406	46.9

Table 2 Quesnel TSA Tree Species Distribution by Area and Volume in the Productive Forest Land Base (approximation)*

Species	Area	Area	Volume	Volume
----------------	-------------	-------------	---------------	---------------

	(ha)	(%)	(m3)	(%)
Lodgepole pine	1,118,208	74.3	154,475,002.6	66.1
Spruce (Sx)	207,689	13.8	49,059,034.6	21.0
Douglas-fir	73,745	4.9	12,302,635.7	5.3
Trembling aspen	57,190	3.8	6,396,321.2	2.7
Sub-alpine fir	30,100	2.0	7,978,292.3	3.4
Other (Cw, Hw, Ep, Act & L)	18,060	1.2	3,385,882.9	1.5

*area includes parks in the Quesnel TSA where inventory data exists

Table 3 Quesnel TSA BEC Zone, Sub-zone, and Variant Distribution by Area and Percent (approximation, non-forest excluded)

BEC Zone, Sub-zone, Variant	Area (ha)	Percent (%)
AT	9,846.6	0.62%
AT All	9,846.6	0.62%
ESSFmv1	783.9	0.05%
ESSFwk1	65,200.0	4.07%
ESSFwc3	32,400.0	2.02%
ESSFvx1	17,127.9	1.07%
ESSF All	115,511.8	7.22%
ICHwk4	21,600.0	1.35%
ICH All	21,600.0	1.35%
IDFdk3	7,118.8	0.44%
IDFxm	2,186.8	0.14%
IDF All	9,305.6	0.58%
MSxv	339,119.6	21.19%
MS All	339,119.6	21.19%
SBPSdc	263,518.1	16.47%
SBPSmc	47,715.8	2.98%
SBPSmk	173,413.4	10.84%
SBPSxc	80,448.4	5.03%
SBSP All	565,095.7	35.32%
SBSdk	536.0	0.03%
SBSdw1	110,306.2	6.89%
SBSdw2	167,209.1	10.45%
SBSmc1	9,200.0	0.57%
SBSmc2	82,237.7	5.14%
SBSmc3	14,885.5	0.93%
SBSmh	78,363.3	4.90%
SBSmw	58,800.0	3.67%
SBSwk1	18,000.0	1.12%
SBS All	539,537.8	33.72%
Quesnel TSA Total	1,600,017.1	100.00%

2.0 PHOTO INTERPRETATION PROJECT PLAN

2.1 Project Objectives

The objective of the photo interpretation project is to improve and enhance TSA polygon attribute information through the VRI Phase 1 process in order to produce a more suitable foundation inventory for the TSA to support future forest management planning and TSR. In addition, the Quesnel TSA stakeholders identified the following issues and/or attributes need addressing:

1. All forest stands, including deciduous and deciduous-coniferous mixed stands, require improved polygon level species composition and height estimation accuracy.
2. Inventory needs to be brought up to VRI standards for land and vegetation cover reporting.
3. Silviculture history and free growing information requires significant improvement.
4. Better quantify non-recoverable (gross) losses from fire, insects, disease, and wind-throw.
5. Assess wildlife habitat supply in the aftermath of the mountain pine beetle epidemic.
6. Obtain and maintain a statistically defensible vegetation inventory to satisfy certification requirements.
7. Maintain inventory data in a consistent and accessible format (i.e. one seamless coverage updated to the current VRI standards available for use by all of the Quesnel TSA stakeholders).
8. Provide information to assist in an assessment of biophysical factors that may have an influence on the dynamics of the mountain pine beetle infestation.
9. Provide stratification of mixed stand polygons for subsequent growth and yield projection of polygon attributes for mixed stands where 10 to 40% of the species composition consisting of PI is expected to die (i.e. For determining the time estimates for PI mixed stands, non-PI volume, to reach merchantability and to aid in the development of harvesting strategies for these stands.
10. Categorize the abundance and health of young PI stands including understory.
11. Identify the extent of dead PI stands
12. Provide an improved inventory of non-pine stands including the dead pine component.
13. Inclusion of all provincial parks and protected areas for new aerial photo coverage and a VRI (where the area of the park within the TSA is less than 20,000 hectares) as these areas contribute to seral stage balances, old growth management and habitat and rare ecosystem representation. Currently there is no useful inventory information available for parks in the Quesnel TSA other than the PEM completed in early 2008.
14. Accommodating other resource values such as wildlife habitat identified through the additional vegetation and non-vegetation cover attributes that the VRI provides (not a timber inventory as currently exists).
15. Improved timber species identification.
16. Improved stand structure identification, especially conifer understories.

The product will be a spatial database consisting of unadjusted photo-interpreted estimates. Ground sampling and NVAF sampling, used to adjust photo-interpreted estimates, will be completed at a later date under another project implementation plan.

2.2 Target Area

The target area for the proposed photo interpretation project will focus on leading non-pine stands primarily in the eastern portion of the TSA (identified as priority 1 in Figure 2). A few map

sheets in the western area of the TSA contain substantial components of non-pine and are identified as priority 2 in Figure 2. A total of 73 map sheets are selected encompassing approximately 572,000 hectares. Priority 1 area is approximately 427,000 hectares over 57 map sheets. Priority 2 area is approximately 145,000 hectares over 16 map sheets. Whole map sheets will be mapped to the TSA and TFL boundaries. Map sheets bordering Bowron Lake and Cariboo Mountain Provincial Parks will be mapped to the park boundaries. Table 4 provides information for each map sheet.

Selection criteria for Priority 1 map sheets:

- predominantly non-pine (>50% by map sheet)
- contiguous units where possible
- builds on polygon delineation work previously completed in 2006 and 10 maps completed in 2007

Selection criteria for Priority 2 map sheets:

- exclude Priority 1
- predominantly non-pine (>30% by map sheet)
- contiguous units where possible
- builds on polygon delineation work previously completed in 2006 and 10 maps completed in 2007

					93F.048	93F.049	93F.050	93G.041	93G.042	93G.043	93G.044	93G.045	93G.046	93G.047	93G.048	93G.049	93G.050	93H.041	93H.042	93H.043	93H.044	93H.045	93H.046	93H.047			
					93F.038	93F.039	93F.040	93G.031	93G.032	93G.033	93G.034	93G.035	93G.036	93G.037	93G.038	93G.039	93G.040	93H.031	93H.032	93H.033	93H.034	93H.035	93H.036	93H.037			
			93F.026	93F.027	93F.028	93F.029	93F.030	93G.021	93G.022	93G.023	93G.024	93G.025	93G.026	93G.027	93G.028	93G.029	93G.030	93H.021	93H.022	93H.023	93H.024	93H.025	93H.026	93H.027	93H.028		
93F.013	93F.014	93F.015	93F.016	93F.017	93F.018	93F.019	93F.020	93G.011	93G.012	93G.013	93G.014	93G.015	93G.016	93G.017	93G.018	93G.019	93G.020	93H.011	93H.012	93H.013	93H.014	93H.015	93H.016	93H.017	93H.018		
93F.003	93F.004	93F.005	93F.006	93F.007	93F.008	93F.009	93F.010	93G.001	93G.002	93G.003	93G.004	93G.005	93G.006	93G.007	93G.008	93G.009	93G.010	93H.001	93H.002	93H.003	93H.004	93H.005	93H.006	93H.007	93H.008		
93C.093	93C.094	93C.095	93C.096	93C.097	93C.098	93C.099	93C.100	93B.091	93B.092	93B.093	93B.094	93B.095	93B.096	93B.097	93B.098	93B.099	93B.100	93A.091	93A.092	93A.093	93A.094	93A.095	93A.096	93A.097	93A.098		
93C.083	93C.084	93C.085	93C.086	93C.087	93C.088	93C.089	93C.090	93B.081	93B.082	93B.083	93B.084	93B.085	93B.086	93B.087	93B.088	93B.089	93B.090	93A.081	93A.082	93A.083	93A.084	93A.085	93A.086	93A.087	93A.088		
93C.073	93C.074	93C.075	93C.076	93C.077	93C.078	93C.079	93C.080	93B.071	93B.072	93B.073	93B.074	93B.075	93B.076	93B.077	93B.078	93B.079	93B.080	93A.071	93A.072	93A.073	93A.074	93A.075	93A.076	93A.077	93A.078		
93C.063	93C.064	93C.065	93C.066	93C.067	93C.068	93C.069	93C.070	93B.061	93B.062	93B.063	93B.064	93B.065	93B.066	93B.067	93B.068	93B.069	93B.070	93A.061	93A.062	93A.063	LEGEND						
								93B.051	93B.052	93B.053	93B.054	93B.055	93B.056	93B.057	93B.058	93B.059	93B.060	93A.051	93A.052	93A.053	Priority 1	VRI Phase 1, Priority 1					
								93B.041	93B.042	93B.043	93B.044	93B.045	93B.046	93B.047	93B.048	93B.049	93B.050				Priority 2	VRI Phase 1, Priority 2					
												93B.035	93B.036	93B.037	93B.038	93B.039	93B.040								VRI Phase 1 Completed 2007		

Figure 2 Quesnel TSA VRI Phase 1, Priority Map Sheets

Table 4 Quesnel TSA VRI Phase 1, List of Priority Map Sheets

Quesnel TSA, Priority Map Sheets											
Map Sheet	Map Priority	Total Stratified		Not Stratified*		Gross Area (ha)	Large Parks within Map Sheet	TFL Area (ha)	Total TSA VRI excluding TFL, Bowron & Cariboo Mtn. Parks (ha)	Ph. 1 polygon delineation completed 2006?	Ph. 1 polygon delineation completed 2006 (ha)
		Area (ha)	% of Map Sheet	Area (ha)	% of Map Sheet						
093A061	1	4,809	81%	1,154	19%	5,963		0	5,963	Y	5,963
093A071	1	4,646	31%	10,383	69%	15,028		8,265	6,763	Y	6,763
093B069	1	8,066	100%	3,898	33%	11,964		0	11,964		0
093B070	1	768	94%	48	6%	816		0	816		0
093B079	1	10,779	72%	4,228	28%	15,007		0	15,007	Y	15,007
093B080	1	9,644	70%	4,122	30%	13,767		0	13,767	Y	13,767
093B088	1	8,493	57%	6,501	43%	14,994		0	14,994	Y	14,994
093B089	1	11,969	80%	3,025	20%	14,994		0	14,994	Y	14,994
093B097	1	11,013	74%	3,947	26%	14,960		0	14,960	Y	14,960
093B098	1	7,953	53%	7,007	47%	14,960		0	14,960	Y	14,960
093B099	1	10,100	68%	4,860	32%	14,960		2,625	12,335	Y	12,335
093B100	1	9,774	65%	5,186	35%	14,960		4,360	10,600	Y	10,600
093G007	1	11,078	74%	3,848	26%	14,926		0	14,926	Y	14,926
093G008	1	8,354	56%	6,572	44%	14,926		0	14,926	Y	14,926
093G009	1	5,070	34%	9,856	66%	14,926		7,577	7,349	Y	7,349
093G010	1	8,340	56%	6,586	44%	14,926		4,640	10,286	Y	10,286
093G017	1	6,963	48%	7,425	52%	14,388		5,780	8,608	Y	8,608
093G018	1	5,341	54%	4,517	46%	9,858		1,571	8,287	Y	8,287
093G019	1	865	7%	11,660	93%	12,525		10,639	1,886	Y	1,886
093G020	1	1,235	8%	13,656	92%	14,891		13,532	1,359	Y	1,359
093H001	1	9,058	61%	5,868	39%	14,926		4,417	10,509	Y	10,509
093H002	1	9,197	62%	5,729	38%	14,926		4,943	9,983	Y	9,983
093H003	1	1,368	9%	13,558	91%	14,926		13,086	1,840	Y	1,840
093H011	1	13,450	90%	1,442	10%	14,891		215	14,676	Y	14,676
093H012	1	3,149	21%	11,742	79%	14,891		11,483	3,408	Y	3,408
093A062	1	1,138	80%	278	20%	1,417		0	1,417		0
093A072	1	1,375	100%	9,235	87%	10,610		8,784	1,826		0
093A081	1	90	1%	14,904	99%	14,994		14,333	661		0
093A083	1	272	5%	4,780	95%	5,052		4,639	413		0
093A084	1	3,365	90%	392	10%	3,758		0	3,758		0
093A085	1	2,610	79%	696	21%	3,306		0	3,306		0
093A086	1	4,153	83%	832	17%	4,986	Cariboo Mtn	0	4,000		0
093A092	1	4,444	30%	10,516	70%	14,960		10,239	4,721		0
093A093	1	4,713	32%	10,247	68%	14,960		9,871	5,089		0
093A094	1	13,091	88%	1,869	12%	14,960		1,065	13,895		0
093A095	1	13,628	91%	1,332	9%	14,960		0	14,960		0
093A096	1	9,010	60%	5,950	40%	14,960	Cariboo Mtn	0	5,000		0
093B048	1	10,755	77%	3,222	23%	13,977		0	13,977		0
093B049	1	3,734	74%	1,335	26%	5,069		0	5,069		0
093B059	1	8,201	63%	4,830	37%	13,032		8	13,024	Y	13,024
093B068	1	10,205	68%	4,857	32%	15,063		0	15,063		0
093B078	1	9,036	60%	5,992	40%	15,028		0	15,028		0
093G025	1	7,801	58%	5,766	42%	13,567		0	13,567		0
093G026	1	10,167	71%	4,231	29%	14,399		1,237	13,162		0
093G027	1	1,239	18%	5,625	82%	6,864		5,474	1,390		0
093G030	1	611	7%	8,096	93%	8,707		8,070	637		0
093G036	1	268	3%	10,321	97%	10,588		0	10,588		0
093G040	1	2,404	54%	2,020	46%	4,424		1,528	2,896		0
093G050	1	607	65%	322	35%	928		0	928		0
093H004	1	3,527	24%	11,399	76%	14,926		10,200	4,726		0
093H005	1	9,747	65%	5,179	35%	14,926	Bowron Lk	379	2,500		0
093H006	1	5,657	38%	9,268	62%	14,926	Bowron Lk	0	300		0
093H021	1	4,035	27%	10,727	73%	14,762		10,440	4,322		0
093H022	1	427	100%	13,581	97%	14,008		13,557	451		0
093H023	1	865	6%	13,992	94%	14,857	Bowron Lk	13,045	1,000		0
093H031	1	2,093	28%	5,265	72%	7,358		3,807	3,551		0
093H041	1	269	100%	560	68%	828		0	828		0
093B036	2	909	63%	543	37%	1,452		0	1,452		0
093B037	2	2,423	64%	1,364	36%	3,788		0	3,788	Y	3,788
093B038	2	1,882	73%	683	27%	2,565		0	2,565		0
093B046	2	11,194	81%	2,676	19%	13,870		0	13,870		0
093B067	2	12,647	100%	2,416	16%	15,063		0	15,063	Y	15,063
093B077	2	13,124	100%	1,905	13%	15,028		0	15,028	Y	15,028
093B087	2	11,685	100%	3,309	22%	14,994		0	14,994	Y	14,994
093C095	2	10,909	100%	4,051	27%	14,960		0	14,960	Y	14,960
093C096	2	12,827	100%	2,133	14%	14,960		0	14,960	Y	14,960
093C097	2	12,445	100%	2,515	17%	14,960		0	14,960	Y	14,960
093F005	2	343	100%	139	29%	482		0	482		0
093F006	2	1,782	100%	197	10%	1,978		0	1,978	Y	1,978
093F007	2	11,383	100%	1,505	12%	12,888		0	12,888	Y	12,888
093F008	2	13,400	100%	1,525	10%	14,926		0	14,926	Y	14,926
093F017	2	127	100%	92	42%	219		0	219	Y	219
093F018	2	1,717	100%	590	26%	2,307		0	2,307	Y	2,307
Total		449,821	55%	370,079	45%	819,899		209,809	571,660		371,479
%											

*Non-stratified areas include non-forested, water, NSR, TFL, Park)

Tree Farm Licence 52 in the Quesnel Forest District has previously been re-inventoried. In the case of private lands and the TFL, it is expected that any subsequent VRI Phase 2 works will be the responsibility of the land holder or licensee. The Quesnel TSA VRI will tie to these VRI's, and to other completed and adjacent VRI's, using a "best fit" to match at the polygon delineation and classification level. The VRI in adjacent land bases will not be modified to reflect the more recent 2005/2006 aerial photo coverage. All lands will be classified to a V inventory standard; that is, a complete VRI label will be given to each and every polygon. Note that all portions of project maps within this TSA will be completed to VRI standards. No holes, gaps or blank spaces shall exist in the data for the contiguous portion of the TSA and any map sheet (portion within the TSA only) completed as part of the VRI photo interpretation project. See Appendix B for a complete list of map sheets for the Quesnel TSA. Map sheet specific areas for the major parks are not provided. Parks with areas less than approximately 20,000 hectares within the TSA will be included in the VRI process. Larger park units, such as Bowron Lake Provincial Park (149,207 ha.) and Cariboo Mountain Provincial Park (113,469 ha. of which 29,377 ha. is in the TSA), will not be VRI mapped. Woodlots and other small parcels of private land will also be included in the inventory unless the Woodlot has conducted a recent inventory to VRI standards. The status of local Woodlot inventories will be reviewed during the project initiation phase.

2.3 Inventory Documentation and Archive

In preparation for a new inventory, 1:20,000 scale colour aerial photographs were acquired during 2005 and 2006. During the 2006/07 fiscal year VRI Phase 1 polygon delineation (without attribution) was completed on 93 map sheets. With many map sheets being covered by upwards of 90% attacked pine, the forest cover delineation was used extensively as a reference for line placement to address soil moisture/nutrient and productivity breaks as well as to assist with the qualification and quantification of dead stands. As part of a representative pilot project, VRI Phase 1 mapping was completed on 10 map sheets during the 2007/08 fiscal year. The map sheets are identified in Appendices C.

2.4 Calibration Data Sources

Data sources are used as calibration points for improving the quality of photo interpretation. Existing (historic) data sources include air calls, ground calls, and observations distributed across the TSA from previous re-inventories. The data sources from the most recent re-inventory update (1994 – 1998) were completed to FS810 attribute entry Forest Cover standards. These data sources indicate species composition derived from volume instead of basal area, and no second leading species data.

However, due to the severity and extent of mountain pine beetle (and other insect/diseases) the impact on these stands must be classified for primary and secondary structural attributes. Primary structure refers to trees killed by the mountain pine beetle or other attack. Secondary structure refers to the understory (seedlings and saplings), sub-canopy and canopy trees that will likely survive mountain pine beetle or other attack. Therefore, field visitation should not be excluded from polygons with previous data sources, but merely limited. Data source locations will be recovered from the existing fc1 files, and all available document data source books will be reviewed for actual measured attributes. In this way the VRI will enhance knowledge around shelf life characterization and understory ingress.

The Cariboo PEM inventory (completed in 2007) for the Quesnel TSA contains soil moisture regime and soil nutrient regime data, which will be of utility to the VRI photo-interpretation process as it will be of greater accuracy than what can be photo estimated by VRI interpreters. This information will be made available by the licensee group.

The plan for sampling the understory includes use of a new sampling protocol developed to acquire on-the-ground information in accordance with TSR, Forests For Tomorrow and inventory needs. This sampling will be conducted in concert with digital camera sampling (DCS) to acquire high resolution imagery of the overstory (for better snag counts and volume estimates of the dead overstory) and to obtain some estimate of understory wherever possible (limited by crown closure and needle fall). This FFT funded work will be outlined in the amended VSIP. Data should be available this fall for both TSR and FFT and is expected to be suitable for VRI phase 1 calibration purposes as well.

The Quesnel TSA Mitigation Committee intends to compile a data base of existing spatially referenced ground plot data suitable for VRI calibration and other future correlation work. This will include cruise plot data from un-logged timber sales. However, the Committee will check on the availability, suitability, condition, and compatibility of cruise plot data for use in calibration, as well as the positional accuracy needed for transferring the cruise plot locations to the base files. Only cruise plot information from blocks cruised and not yet logged as of the photo date are useful as calibration data. Existing PSP, planned FFT understory samples and other suitable plot data will also be loaded into the data base.

2.5 Initial Polygon Delineation

Initial delineation will be carried out or supervised by certified VRI photo interpreters, using softcopy (digital) technology. All work related to the VRI Phase I will be completed (at a minimum) with a ratio of one certified VRI photo interpreter to one non certified interpreter. This work will be to VRI Photo Interpretation Standards based on the B.C. Land Cover Classification Scheme.

Vegetation resources inventory photo-interpretation in the Quesnel TSA (specifically large areas of beetle killed pine) will involve specialized polygon delineation to address soil moisture and bioterrain, based on using the new PEM line work to better reflect moisture and productivity breaks that are less evident through a canopy of dead trees. The VRI standards will still be adhered to and will supersede other standards. In addition, delineation procedures will consider estimates of tree mortality within delineated polygons. This additional delineation criterion will provide for better spatial data with which to model grizzly bear and caribou habitat, it will facilitate the follow-up Site Index work, which is on-going as a separate project, and it will assist in salvage, mitigation and abandonment planning of MPB-killed stands.

2.6 Integrating RESULTS Information

Special consideration will be given to the process of integrating RESULTS (Reporting Silviculture Updates and Land Status Tracking System) openings into the photo interpreted inventory. The process will conform to the standards identified in Section 2, Integrating RESULTS Information in the Guidelines for Preparing a Project Implementation Plan for Photo Interpretation document (Ver. 2.2) available on-line at

http://www.for.gov.bc.ca/hts/vri/standards/photo_interp/VRI_Photo_Interp_PIP_May_2008.pdf

The MFR (Vegetation Inventory Update Section) will provide a copy of the RESULTS shapes at the start of the photo interpretation contract.

2.7 New Field Calibration

Field calibration will be carried out by the same certified VRI staff doing all phases of the photo interpretation work. Field visitation is an opportunity for the photo interpreter to become familiar with the area on the ground and to collect calibration attributes to assist in final attribute estimation.

The Quesnel TSA Stakeholders Committee recommends the following polygon calibration visitation intensity and distribution with apportionment estimates: 10-15 ground plots and 25-30 air calls per full map sheet equivalent (excluding TFL and large parks). The variation in calibration intensity will reflect access, strata variability / uniformity by species, age class, and other factors affecting interpretation.

Assumptions:

- Proportion of calibration points will be 65% air calls / 35% ground calls.
- Ground calibration points will be a mix of single point and three point configuration with application dependant on stand complexity
- Fieldwork will be performed by the same personnel doing the delineation and final attribute portions of the work over the same areas they are responsible for.
- Air calls will be minimized in Parks and protected areas

Requirements:

- Ground calls will not be established in parks and protected areas. Contractors will be required to check with the Ministry of Environment as to any restrictions on helicopter use over or landing in a park or protected area.
- No ground calls are to be established in the private land portions of the project area. Some air calls may be conducted to confirm species composition, etc. Helicopter use must be conducted with sensitivity to any wildlife or domestic stock that may be present.

A Field Calibration Sample Plan will be provided to the MFR (both FAIB and the Southern Interior Forest Region VRI staff) for approval.

All field data point locations and attributes, collected per VRI standards will be submitted to the MFR in a digital Excel data sheet format. The MFR will provide a copy of the required format to the Quesnel TSA stakeholders group.

2.8 Attribute Estimation: Final Classification

The attribute estimation phase requires all polygons initially delineated for this project will be reviewed and assigned a unique set of attributes based on VRI (Photo Interpretation Procedures) Standards for this phase of the project. Individual polygons will be given unique numbers. Descriptions of polygon attributes are to be entered into the Vegetation Cover Attribute Program (VegCAP) or equivalent digital data entry program, edited and cross-referenced with vegetation cover polygons through unique numbers. Attribute estimation will be performed by the same personnel who did the delineation / fieldwork portions of the project.

2.9 Mapping and Digital Products

Mapping and digital products will adhere to the following MFR standards:

1. Photo Interpretation Procedures version 2.4 – March 2002.

2. Vegetation Resources Inventory Photo Interpretation Standards and Quality Assurance Procedures (Ver. 3.1, May 2008)
3. Air Calibration (Air Call) Data Collection Procedures and Standards version 2.1 – June 2008).
4. Ground Calibration (Ground Call) Data Collection Procedures and Standards version 3.1 – June 2008).
5. BC Land Classification Scheme.
6. VRI contractors will consult with appropriate VRI Update and /or FAIB staff to ensure all digital mapping products and data are submitted in a format and manner required.

The standards and procedures documents listed above are constantly being updated. Those versions currently in effect at the time when the project RFP is tendered will be those that the project methodology will reflect. In the event that the project runs more than 1 year for a contract, the latest standards for any particular year will apply to that years work unless the standard changes cause a loss in data integrity.

3.0 PHOTO INTERPRETATION PROJECT IMPLEMENTATION

3.1 Schedule

The mapping of identified priority 1 and 2 map sheets is targeted for completion by December 2009. The intent is to complete priority 1 area by March 2009 depending on available budget, contractor capacity and field season. Priority 2, and any priority 1 areas not mapped in 2008/09 fiscal year, will be completed by December 2009. The tentative schedule for this component of the VRI is presented in Table 5.

Table 5 Quesnel TSA VRI Phase 1 Project Schedule

Item	End Date
VPIP (Photo Interpretation) Update Ver.4	June 2008
Request for Proposals for VRI Phase 1 issued for priority map sheets	July 2008
Request for Proposals for VRI Phase 1 Quality Assurance issued for priority map sheets	July 2008
Phase 1 Contract Award(s)	July 2008
Field Calibration Sample Plan	August 2008
Activity and Delivery Schedule	August 2008
VRI Phase I Photo Interpretation (2008/09 fiscal year)	March 2009
VRI Phase I Project Completion Report (2008/09 fiscal year)	March 2009
VRI Phase I Photo Interpretation (2009/10 fiscal year)	December 2009
VRI Phase I Project Completion Report (2009/10 fiscal year)	December 2009

3.2 Photo Scale

The Quesnel TSA was flown in 2005 and 2006 with colour 1:20,000 scale aerial photographs. Within fiscal years 2005/06 and 2006/07 the aerial photographs were scanned, controlled and converted into softcopy viewer sets. These viewer sets were used to complete the 10 map sheet VRI pilot project completed in 2007, in addition to the delineation of another 93 full and partial map sheets.

3.3 Project Coordinator

The project coordinator will be an employee of the contractor company that was the winning proponent, and will be subordinate to the Quesnel TSA Stakeholder group contract administrator for the purposes of this project. The project coordinator's responsibilities will include, but will not be limited to:

1. coordinating the project;
2. monitoring and communicating project progress;
3. ensuring all contractors are qualified and certified;
4. overseeing photo-interpretation activities;
5. ensuring quality assurance is completed in a timely manner; and
6. assisting in coordinating technical expertise where required.
7. ensuring all deliverables are provided to the MFR
8. submitting all air call / ground call data points to the MFR in a suitable digital format including the UTM location and reference point
9. preparation of a Project Completion Report

3.4 Personnel

It is the intent of the Quesnel TSA Stakeholders to obtain a quality inventory. To this end, quality imagery and consistency in the photo interpretation process are important. Only certified VRI photo interpreters, or photo interpreters under the direct supervision of a certified VRI interpreter will be used to delineate, complete fieldwork and estimate the attributes of vegetation types. At least 50% of the photo interpreters working on all aspects of the VRI will be required to be VRI Certified. The certified VRI photo interpreters list is currently found on the Internet at:

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

All certified VRI photo interpreters involved in this undertaking will be required to complete VRI field calibration (air calls and VRI ground calls) within the project area for the purposes of calibration for the photo attribute estimation phase. It is expected that all photo interpreters will be involved in all phases of the work including, delineation, data source transfer, fieldwork, attribution, and final digital mapping, for the areas within the project area in order to provide consistency in delivering a quality product.

3.5 Quality Control and Quality Assurance

Internal quality control of delineation, field work, attribute estimation, and digital map production will be undertaken by the contractor in accordance with the appropriate and current standards. All documentation of these processes will be provided to Southern Interior Forest Region VRI Staff as well as FAIB. External third-party quality assurance will be undertaken by a consultant/company that is not involved in the undertaking, and who is chosen by the Quesnel TSA Stakeholder group through an open bidding process. Files will be submitted for third-party quality assurance in batches of at least five or as agreed to by the contractor and quality assurance contractor. Files submitted for quality assurance must have undergone vector cleaning. These will be delivered through e-mail, ftp, hard drives or as agreed to by the contractor and quality assurance contractor. All project work must be completed to provincial VRI standards and pass the quality assurance performed by an independent third party. Quality assurance will be completed for the delineation, data source transfer, ground and air calls calibration data collection and attribution activities. Quality assurance will be completed in accordance to the latest MFR standards. The selected quality assurance photo interpreter must be certified and possess at least 5 years of photo interpretation experience in BC and 3 years of softcopy experience. Quality assurance will be completed on 2 - 5% of each phase of the project as follows:

- Delineation – approximately 5% of the polygons
- Fieldwork – approximately 5% of the field samples
- Final Attribute Estimation - approximately 2% of the polygons

Quality assurance will be completed in a timely manner. Third party QA contractors will strive to complete initial QA submissions for each phase and all classifiers as near to the start of each phase as possible, to ensure work is proceeding correctly. Undue delay to complete any QA work must be reported to the Project Co-ordinator and SIR and FAIB VRI staff. Provision will be made to ensure funding is available to the 3rd party QA contractor in the event any work is failed and will require additional QA submissions for review.

Documentation of all quality assurance checks will be maintained in acceptable MFR format and provided to the Project Coordinator and MFR VRI staff in the Southern Interior Forest Region and FAIB. As part of the quality assurance program, the VRI contractor(s) will hold a field data collection pre-work meeting in the project area at the commencement of the fieldwork program. The purpose of the pre-work meeting is to ensure that all individuals involved in the field data collection, monitoring and/or evaluation have a common understanding of the standards, specifications, and procedures that will be employed. It will also ensure that all attributes are collected in a consistent and accurate manner. Participants for the pre-work meeting will include:

- Project Manager and Project Supervisors
- VRI interpreters
- Project Coordinator or representative
- Quality Assurance Contractor
- MFR VRI specialists

All air calls will be flown with two certified photo interpreters in the helicopter as a means for quality assurance. To ensure accuracy of air and ground calibration locations, GPS coordinates will be required for all fieldwork calibration points. The project coordinator will ensure the inventory contractor(s) conducting the inventory provides adequate and ongoing internal quality control of all deliverables.

The results of all quality assurance will be recorded on approved quality assurance forms, as a record for both the individuals performing the work and for the Quesnel TSA Stakeholders Group. Copies of all quality assurance reports, etc will be provided to the MFR Regional VRI representative for review.

3.6 Deliverables

Completed digital data files will be submitted to the MFR in a digital format suitable to current MFR standards. Data and reports to be provided to the MFR include:

- Air and Ground Call calibration plot location and attribute data in hardcopy and digital format.
- Any digital products produced for the softcopy process.
- Copies of all QC/QA reports.
- Project Completion Report as outlined in Appendix F (Project Completion Report) of the VRI Guidelines for Preparing a Project Implementation Plan for Photo Interpretation. May, 2008 Version 2.2
- Any relevant project documentation.

3.7 Reference Materials and Standards

The following reference materials are available for this project:

- Quesnel TSA VRI Strategic Inventory Plan
- Quesnel TSA VRI Phase 1 Project Implementation Plan
- VRI BC Land Cover Classification Scheme
- VRI Photo Interpretation Procedures
- VRI Quality Assurance Procedures and Standards
- VRI Ground Calibration Data Collection Procedures and Standards
- VRI Air Call Data Collection Procedures and Standards
- ILMB Vector Cleaning Specifications
- MFR Color Stereogram, Handbook
- MFR Black and White Stereogram Handbook
- Local tree and plant field guide books

The current version of these reference materials and standards will be utilized. The latest standards for any particular year of work will apply to that years work.

3.8 Estimated Costs

Estimated costs are summarized in Table 6 and are based on completing the priority 1 and 2 map sheets identified in Section 2.2 over a two year time frame. Table 7 outlines the anticipated costs for mapping functions by priority areas with a reduction for previously completed delineation. Final costs will be determined by open tendering and are subject to FIA funding. The cost of understory and Digital Camera System surveys are not included as they will be implemented and funded by the FFT program.

Table 6 Costs

VRI Project Component	Unit Cost (estimated)	Total (est.)
VRI Phase 1	\$1.40 / ha.	\$800,000
Less previously completed delineation	\$.20 / ha.	\$74,000
VRI Phase 1 (net)		\$726,000
VRI Phase 1 QA Audit (Third Party)	~\$0.05 / ha.	\$28,600
Total:		\$754,600

Table 7 Phase 1 Cost Work Sheet

Priority 1 & 2			Est. Rate (\$)		Est. Budget (\$)
# of Map Sheets:		73			
Total ha.:		571,660	1.40		\$800,324
Total stratified ha.:		449,821			
# of Maps Previously Delineated:		36			
Previously Delineated ha.:		371,479	0.20		\$74,296
					\$726,028
Priority 1					
# of Map Sheets:		57			
Total ha.:		427,219	1.40		\$598,107
Total stratified ha.:		331,023			
# of Maps Previously Delineated:		24			
Previously Delineated ha.:		245,408	0.20		\$49,082
					\$549,025
Priority 2					
# of Map Sheets:		16			
Total ha.:		144,440	1.40		\$202,217
Total stratified ha.:		102,390			
# of Maps Previously Delineated:		12			
Previously Delineated ha.:		126,071	0.20		\$25,214
					\$177,002

4.0 APPROVAL AND SIGN-OFF OF THE PHOTO INTERPRETATION VPIIP

I have read and agree that the procedures outlined in this plan meet current MFR standards.

P. Winkler

per C & C Wood Products Ltd. on behalf of the
Quesnel TSA Stakeholders Committee

_____ per Forest Analysis and Inventory Branch - MFR

5.0 APPENDIX A: GLOSSARY OF TERMS

Ground Sampling	Ground sampling is the field measurement of timber, ecology, range and/or coarse woody debris values at one or more locations within each sample polygon. The sample polygons are selected proportional to their area from a sorted list. To accommodate the wide variety of resources, various types and sizes of sampling units (e.g., fixed and variable plots, transects) are used to make the measurements.
Inventory Unit	An inventory unit is the target population from which the samples are chosen. For management inventories, the inventory unit is usually a TSA or TFL.
Land Cover Classification	The BC Land Cover Classification Scheme (BCLCCS) was designed specifically to meet the requirements of the VRI, in addition to providing general information useful for “global vegetation accounting” and “integrated resource management.” The BCLCCS is hierarchical and reflects the current state of the land cover (such as the presence or absence of vegetation, type and density of vegetation) and such fixed characteristics as landscape position (wetland, upland, alpine.)
Photo Interpretation	Photo interpretation involves the subjective delineation of polygons and the photo estimation of attributes for all polygons in an inventory unit. For hardcopy projects, medium scale aerial photographs (1:20,000) are most often used in the photo interpretation process. The scale of aerial photographs for softcopy projects can vary depending on the geographic location in the province.
Vegetation Resources Inventory (VRI)	<p>The VRI is the MoFR standard for assessing the quantity and quality of BC’s vegetation resources. The VRI process is designed to include a flexible set of sampling procedures for collecting vegetation resource information. The VRI is essentially a toolbox of procedures, which include:</p> <p><i>Photo Interpretation:</i> the delineation of polygons from aerial photography and the estimation of resource attributes.</p> <p><i>Ground Sampling:</i> the establishment of plot clusters in selected polygons to measure timber, ecological, and/or range attributes.</p> <p><i>NVAF Sampling:</i> stem analysis sampling of individual trees for net volume adjustment.</p> <p><i>Statistical Adjustment:</i> the adjustment of the photo interpreted estimates for all polygons in an inventory unit or management unit using the values measured during ground sampling.</p> <p>The VRI can be deployed over a management unit measuring selected resources in specific portions of the land base. The VRI sampling process produces spatial and non-spatial databases that can be used in multiple resource management applications, including timber, ecosystem and wildlife habitat management.</p>

6.0 APPENDIX B: QUESNEL TSA MAP SHEET AREA SUMMARY

Map Sheet	THLB Area	Gross Area (excluding parks)	Park Area	TFL Area
093A061	4,354.61	5,663.50		
093A062	675.73	1,248.50		
093A071	4,401.53	5,781.25	10.25	8,264.75
093A072	1,362.07	1,584.25		8,784.10
093A073				162.18
093A081		435.00		14,332.83
093A082				14,302.88
093A083	34.03	81.25		4,639.20
093A084	1,794.37	2,716.25	118.00	
093A085	427.59	2,069.00	143.25	
093A086	1,812.00	3,766.00	682.75	
093A087		29.50	29.50	
093A091				14,950.12
093A092	3,279.93	4,626.00		10,238.99
093A093	1,733.61	4,602.25		9,870.69
093A094	9,316.44	13,209.00	2.00	1,064.56
093A095	5,936.16	12,811.75	42.50	
093A096	3,909.22	5,132.25	43.75	
093A097			*	
093A098		5.50	5.50	
093B036	1,024.24	1,230.75		
093B037	2,404.54	3,192.25		
093B038	1,716.04	2,254.75		
093B046	10,253.33	12,238.50	46.00	
093B047	10,460.95	13,739.50		
093B048	8,278.06	11,872.75		
093B049	2,876.19	4,170.00	42.00	
093B051	222.58	247.00		
093B052	1,140.75	1,289.75		
093B053	103.86	209.75		
093B054	7,458.19	9,214.75		
093B055	12,194.57	13,902.75		
093B056	11,900.81	14,027.50		
093B057	11,350.95	14,301.25	40.25	
093B058	3,254.74	12,293.75	7.00	
093B059	5,500.28	9,525.00	8.25	
093B061	5,854.29	6,549.00		
093B062	10,845.55	12,974.75		
093B063	9,001.26	11,491.50		
093B064	11,358.21	13,703.25		
093B065	11,847.26	13,760.75		
093B066	11,832.59	13,639.50	232.00	
093B067	11,701.60	14,242.75	8.50	

Map Sheet	THLB Area	Gross Area (excluding parks)	Park Area	TFL Area
093B068	2,567.56	11,124.75	253.25	
093B069	8,009.08	11,416.25		
093B070	593.76	758.25		
093B071	9,778.69	11,367.75		
093B072	11,289.26	13,715.25		
093B073	10,995.36	14,470.50	18.50	
093B074	11,313.55	12,874.75		
093B075	12,205.38	14,292.00		
093B076	12,506.29	14,297.25		
093B077	11,897.66	14,661.75		
093B078	1,578.70	9,709.25	411.75	
093B079	9,537.95	14,121.25	67.75	
093B080	8,639.19	12,628.00	129.75	
093B081	12,357.25	14,312.75		
093B082	12,152.09	14,542.25		
093B083	9,903.10	13,455.00		
093B084	12,537.51	14,542.50		
093B085	11,179.21	13,908.50	11.00	
093B086	10,751.88	13,305.25	11.50	
093B087	11,246.91	14,473.50		
093B088	2,795.99	9,742.75	157.25	
093B089	7,984.21	12,513.00	51.25	
093B090	10,929.25	14,051.00		94.42
093B091	11,801.01	13,894.75		
093B092	11,196.37	14,059.25	85.25	
093B093	8,774.49	11,705.25	120.75	
093B094	12,673.40	14,271.50		
093B095	10,742.13	13,395.25	54.00	
093B096	8,386.83	13,414.00	87.00	
093B097	7,646.00	13,927.50		
093B098	1,021.37	8,449.00	564.25	
093B099	7,512.97	10,206.00	33.75	2,624.89
093B100	5,773.50	9,816.50		4,360.14
093C070	904.86	1,045.25		
093C074			*	
093C075	2,680.84	3,338.50		
093C076	368.67	2,830.25	1.00	
093C077		233.50		
093C078	6.05	6,900.25		
093C079	3,110.42	9,101.50		
093C080	9,905.01	11,689.25		
093C083	1,094.99	2,112.75		
093C084	489.29	10,248.00	2,765.75	
093C085	10,754.26	13,635.75	178.25	
093C086	9,337.56	12,828.50	31.50	

Map Sheet	THLB Area	Gross Area (excluding parks)	Park Area	TFL Area
093C087	4,263.78	10,789.75		
093C088	1,806.19	13,607.00		
093C089	5,502.34	13,940.50		
093C090	12,282.65	14,446.75		
093C093	6,616.29	8,420.75	257.25	
093C094	5,108.07	11,269.50	281.00	
093C095	8,487.02	10,848.00	294.25	
093C096	10,489.63	12,858.50	144.50	
093C097	9,813.62	12,312.75		
093C098	12,735.47	13,979.25		
093C099	12,690.53	14,184.75		
093C100	9,841.77	12,716.75		
093F003	221.68	246.00		
093F004	357.08	413.25		
093F005	206.59	346.00		
093F006	1,160.87	1,782.50	77.00	
093F007	8,545.11	11,289.50	428.25	
093F008	9,977.40	13,409.75	184.50	
093F009	10,004.77	12,069.50		
093F010	10,735.73	12,646.00		
093F017	57.90	126.25		
093F018	491.51	1,713.50		
093F019	4,474.60	6,838.00	29.75	
093F020	10,188.32	11,962.25	135.25	
093F029	1,316.71	1,526.75		
093F030	6,338.61	9,577.25	1,934.50	
093F039	6,850.44	7,846.00	14.25	
093F040	10,250.43	13,697.25	45.50	
093F049	1,604.09	1,982.00	6.25	
093F050	3,682.98	4,141.00		
093G001	11,552.06	14,074.25		
093G002	11,040.53	13,861.75	2.00	
093G003	11,051.60	13,582.00		
093G004	12,598.56	14,251.25		
093G005	12,298.37	14,392.25	29.75	
093G006	11,626.52	13,965.50		
093G007	5,838.60	12,014.00	24.25	
093G008	715.11	9,312.50	307.75	
093G009	1,750.61	6,304.25	12.00	7,577.44
093G010	7,552.41	9,605.00	5.25	4,640.20
093G011	9,922.92	14,241.75	2,487.00	
093G012	7,405.62	13,962.50	3,195.25	
093G013	11,230.37	14,089.50		
093G014	13,082.46	14,726.50		
093G015	11,378.67	13,681.00		

Map Sheet	THLB Area	Gross Area (excluding parks)	Park Area	TFL Area
093G016	11,184.94	14,127.00	123.25	
093G017	4,741.13	7,685.00	24.00	5,779.61
093G018	1,032.03	5,936.50		1,571.20
093G019	109.08	1,110.25	32.50	10,639.38
093G020	1,203.01	1,344.00		13,531.63
093G021	4,481.94	13,355.00	5,851.50	
093G022	8,573.84	13,134.25	154.25	
093G023	7,752.90	10,700.75	38.00	
093G024	10,746.81	12,397.50		
093G025	6,366.72	11,133.50	47.50	
093G026	9,417.92	12,585.00		1,236.52
093G027	1,005.86	1,320.50	39.25	5,474.13
093G028				54.81
093G029				399.46
093G030	552.63	613.25		8,070.14
093G031	9,486.10	13,561.75	121.75	
093G032	9,371.26	12,154.25	109.75	
093G033	5,992.09	6,920.50	54.75	
093G036	227.21	271.75		10,214.23
093G037				7,319.97
093G040	2,189.73	2,785.25		1,527.83
093G041	7,859.48	8,966.00		
093G042	3,363.62	3,834.00		
093G043	539.56	632.00		
093G046				2,149.39
093G047				755.54
093G050	757.45	873.00		
093H001	8,339.84	9,674.00		4,417.21
093H002	6,126.42	9,619.50		4,943.01
093H003		995.50		13,086.36
093H004	1,959.19	3,334.75	10.50	10,200.58
093H005	1,241.50	1,800.50	1.00	379.02
093H006	1.58	9.00		
093H007		38.50	38.50	
093H008			*	
093H011	11,992.57	14,027.75	16.25	214.78
093H012	2,943.95	3,344.50		11,483.34
093H013		193.50	54.00	14,171.41
093H014		13.25		6,779.46
093H015			14,418.50	
093H016			*	
093H017			*	
093H021	3,770.54	4,217.00		10,439.51
093H022	379.38	421.00		13,556.87
093H023		402.00	11.50	13,045.43
093H024		6.75		2,051.79

Map Sheet	THLB Area	Gross Area (excluding parks)	Park Area	TFL Area
093H025			14,418.50	
093H026			*	
093H031	2,867.90	3,490.75		3,806.97
093H033				3,987.31
093H034				4,461.50
093H035			*	
093H036			*	
093H041	628.32	823.25		
Total	834,406	1,577,452	202,499	297,285

*Partial map sheet, area occupied by park unknown

7.0 APPENDIX C: DOCUMENTATION & ARCHIVE

7.1 Inventory Status

VRI Phase 1 was completed in 2007 on the following 10 map sheets:

93B047
 93B055
 93B056
 93B057
 93B058
 93B090
 93C094
 93C098
 93G014
 93G016

7.2 Digitizing History

VRI Phase 1 polygon delineation was completed in 2006 on the following map sheets:

93A061	93B069	93B091	93C079	93F007	93G008	93H003
93A071	93B070	93B092	93C080	93F008	93G009	93H011
93B036	93B071	93B093	93C086	93F009	93G010	93H012
93B037	93B079	93B094	93C087	93F010	93G011	
93B038	93B080	93B095	93C088	93F017	93G012	
93B046	93B081	93B096	93C089	93F018	93G013	
93B047	93B082	93B097	93C090	93F019	93G014	
93B048	93B083	93B098	93C094	93F020	93G015	
93B049	93B084	93B099	93C095	93G001	93G016	
93B055	93B085	93B100	93C096	93G002	93G017	
93B056	93B086	93C066	93C097	93G003	93G018	
93B057	93B087	93C070	93C098	93G004	93G019	
93B058	93B088	93C076	93C099	93G005	93G020	
93B059	93B089	93C077	93C100	93G006	93H001	
93B061	93B090	93C078	93F006	93G007	93H002	

A Quality Assurance review was performed on 61% of the map sheets. All QA reviewed map sheets as submitted to MFR FAIB met provincial delineation standards.

7.3 Photo Coverage

New colour 1:20,000 scale aerial photography was flown in 2005 and 2006 for the entire TSA. Within fiscal years 2005/06 and 2006/07 the aerial photographs were scanned, controlled and converted into softcopy viewer sets. Figure 3 provides an overview of the photo coverage by year. The VRI phase 1 contractor(s) is to also refer to the colour enhanced orthophotography in concert with the 3d model imagery while conducting this work in order to accurately identify and delineate any MPB killed stands.

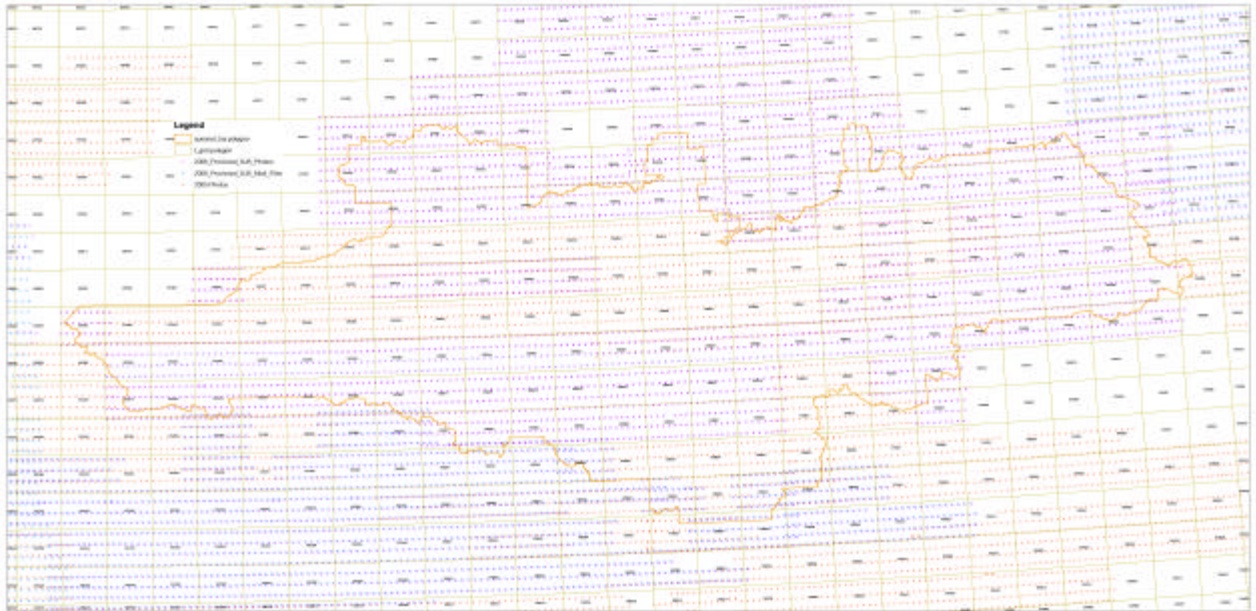


Figure 3 Quesnel TSA Photo Coverage

7.4 PEM

Predictive Ecosystem Mapping was completed in early 2008 for the Quesnel TSA. A PEM inventory includes four output components:

1. Site series polygon layer
2. Site series attribute data base which contains for each polygon:
 - a. BEC variant
 - b. Decile for slope series
 - c. Modifiers for slope and aspect
3. Structural stage polygon layer
4. Structural stage data base

The Quesnel stakeholders committee will ensure digital availability of PEM to appropriate VRI contractors. This data is available in the Quesnel GIS dataset that has been provided to the Quesnel District office and local stakeholders.