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**Updating the  
Okanagan TSA VRI Phase II Samples for  
Mountain Pine Beetle Impacts  
Project Implementation Plan**

Prepared for

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*On Behalf of*

*Forest Licensees in the  
Okanagan Timber Supply Area*

Project: OKI-301

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# 1. INTRODUCTION

## 1.1 BACKGROUND

The Okanagan Innovative Forestry Society (OIFS) installed 110 VRI Phase II ground samples in the Okanagan Timber Supply Area (TSA) in 2003. Those samples were installed under a Project Implementation Plan<sup>1</sup> (VPIP) developed to provincial Vegetation Resources Inventory (VRI) standards. The OIFS used the results from the statistical adjustment in a timber supply analysis and subsequent application<sup>2</sup> to the MOF for an uplift to the allowable annual cut (AAC).

The MOF Regional Executive Director for the Southern Interior approved the AAC application with a series of conditions.<sup>3</sup> One of those conditions was that the IFPA holders undertake a study to investigate the impact of the mountain pine beetle (MPB) infestation on the inventory adjustment. The OIFS has since decided to amend the TSA VPIP and install additional Phase II ground samples up to 160 across the TSA<sup>4</sup>.

## 1.2 GOALS & OBJECTIVES

The goal of this project is to address the Regional Executive Director's request to investigate the impact of the MPB infestation on the Phase II inventory estimate. The specific objectives of this MPB VPIP are to:

1. Describe the area of interest (where MPB is impacting the inventory).
2. Define the sample population (where new VRI plots may be installed).
3. Identify the existing VRI Phase II plots in the sample population.
4. List the attributes of interest to measure from existing and new VRI plots.
5. Develop a sample design to meet the goals of updating the current inventory and providing a platform to monitor changes into the future.
6. Provide sample packages and maps to support field sampling.

## 1.3 TERMS OF REFERENCE

This VPIP was developed by J.S. Thrower and Associates Ltd. (JST) for the OIFS. The OIFS contact is Glen Dick, RPF. The JST project team is René de Jong, BScF, RPF (project manager), Jim Thrower, PhD, RFP (technical support), and Darryl Klassen, BNRSc, DoT (GIS) (GIS support). This VPIP will be approved by MSRM prior to sampling.

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<sup>1</sup> J.S. Thrower & Associates Ltd. 2002. Okanagan TSA VRI Phase 2 Ground Sampling Pilot – Project Implementation Plan. Contract report prepared for the OIFS. JST Project OKI-002. May 16, 2002. 17 pp.

<sup>2</sup> Okanagan Innovative Forestry Society. 2003. Application for an Allowable Annual Cut Increase for the Okanagan IFPAs: Forestry Plan Amendment. January 31, 2003.

<sup>3</sup> Zacharatos, T.P. 2006. Okanagan TSA Innovative Forestry Practices Agreements Rationale for increase in allowable annual cut (AAC) determination. BC Ministry of Forests and Range, Southern Interior Forest Region. Kamloops, BC. Jan. 1, 2006.

<sup>4</sup> J.S. Thrower & Associates Ltd. 2006. Amendment to Okanagan TSA VRI Phase II Ground Sampling Pilot – Project Implementation Plan. Contract report prepared for the OIFS. JST Project OKI-400. May 17, 2006.

## 2. SAMPLE POPULATION

We defined the sample population as inventory polygons in the vegetated treed (VT) Crown forest of the TSA with a PI component > 25% and ages > 40 years. The data used to define this area included the VRI, updates for harvest depletions, BEC ecosystem classification, ownership, and parks and protected area coverage's (Table 1). The resulting sample population area is 344,443 ha (14% of the TSA) (Figure 1, Table 2).

The bulk of the sample population is equally distributed across age classes 4 – 8 (with the exception of age class 5 that contains about one-half the area as the other classes) ( Figure 2). The majority of the sample population area is in the MS (42%) followed by similar proportions in the ESSF, ICH, and IDF. Over 41% of the area is in stands with > 95% PI followed by similar area proportions across other PI percent classes ( Figure 3).

In defining the sample population, we included the younger age class 3 (41 – 60 years) stands even though they comprise a minor portion of the TSA (3% of the VT area). We excluded stands with < 25% PI as these stands account for 32% of the VT area, yet only 7% of the PI standing volume (Figure 4).

Table 1. List of GIS coverage's and information sources used to define the sample population.

Coverage Description	Source	Date Received
VRI for entire TSA	Dave Waddell, MOFR	February 27, 2006
Provincial BEC (BGC variant)	BC Land & Resource Data Warehouse	February 7, 2006
Ownership	BC Land & Resource Data Warehouse	March 2, 2006
Parks / Protected Areas	BC Land & Resource Data Warehouse	January 4, 2006
Operability	Steve Kachanoski, MOFR	August 11, 2003
Licensee harvested blocks to 2004	Timberline, Kelowna	March 13, 2006

Table 2. Area net-down sequence and area proportions.

Netdown Category	Area (ha)	Proportion of Area in Previous Category	Proportion of Total Area
Okanagan TSA (excluding TFLs)	2,453,451	100%	100%
Crown forest portion (ownership 62, 69, 70)	1,797,343	73%	73%
Crown forest outside parks / protected areas	1,683,609	94%	69%
Vegetated-Treed Portion	1,302,270	77%	53%
VT with recent harvest depletions / NSR removed	1,272,113	76%	52%
Stands > 40 years	1,105,238	85%	45%
Stands with > 5% PI component	513,796	40%	21%
Stands with > 25% PI component	344,443	31%	14%

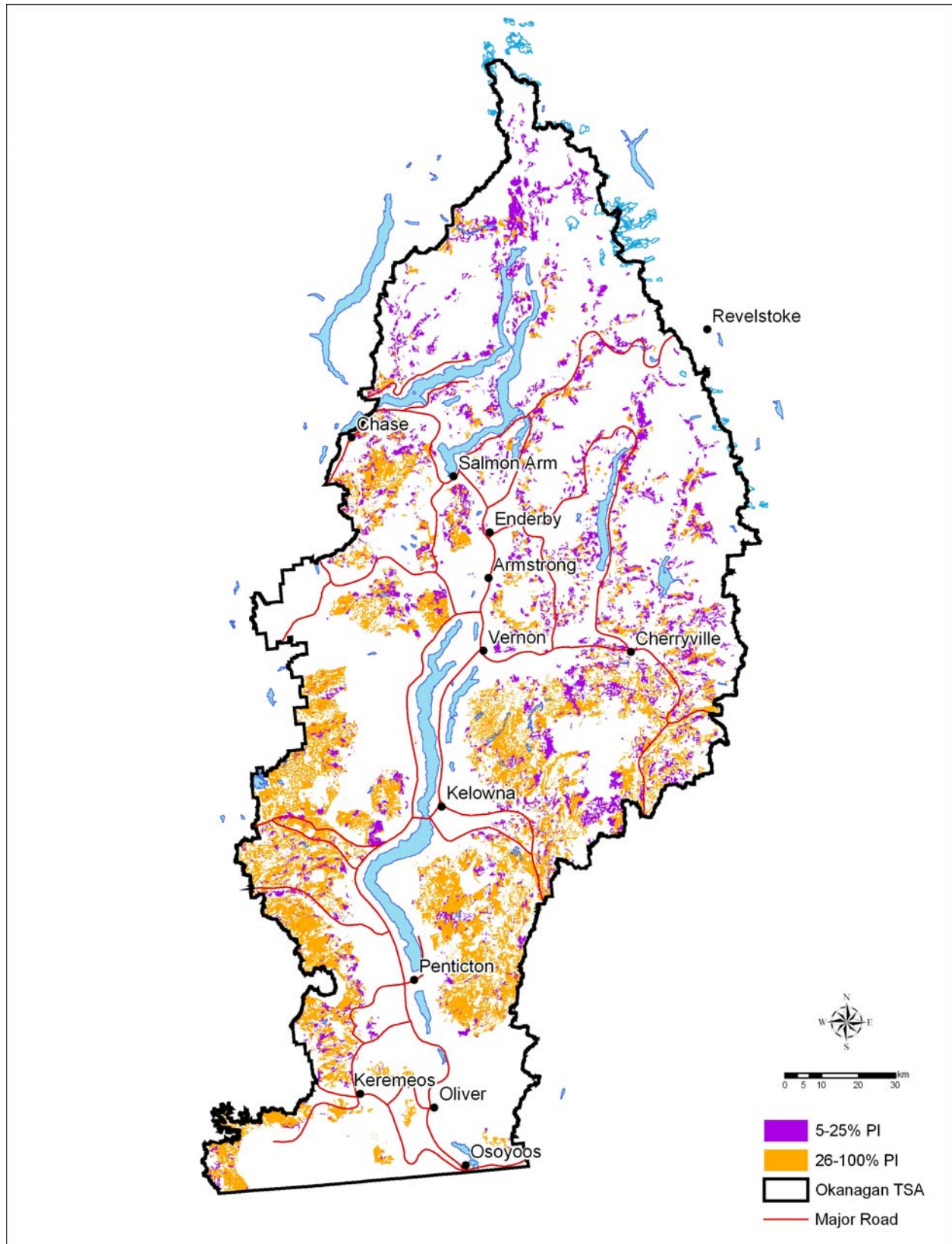


Figure 1. Distribution of pure and mixed PI stands in the Okanagan TSA, differentiated by stands between 26-100% PI (orange = sample population) and 5-25% PI (purple).

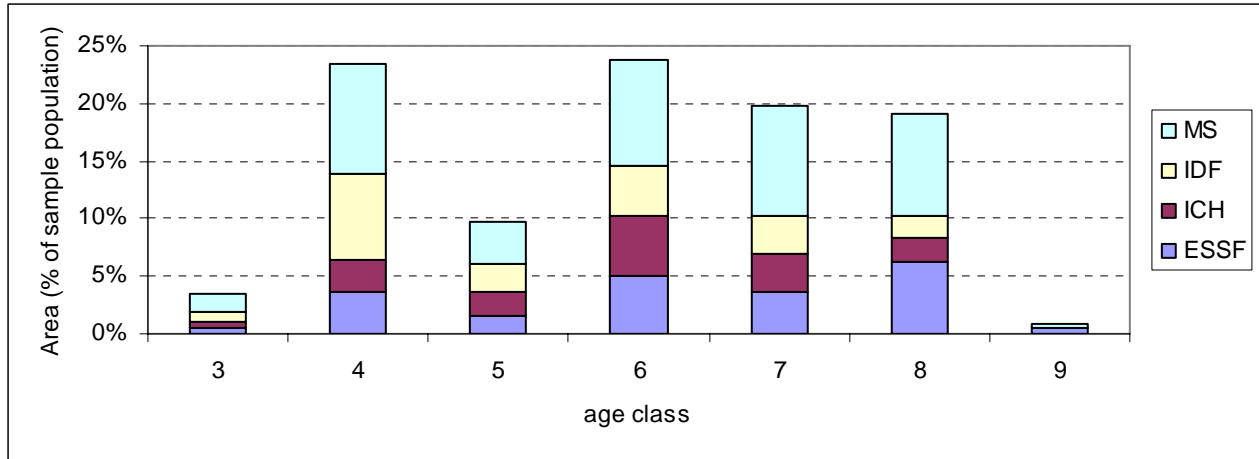


Figure 2. Proportion of sample population by inventory age class and BEC zone.

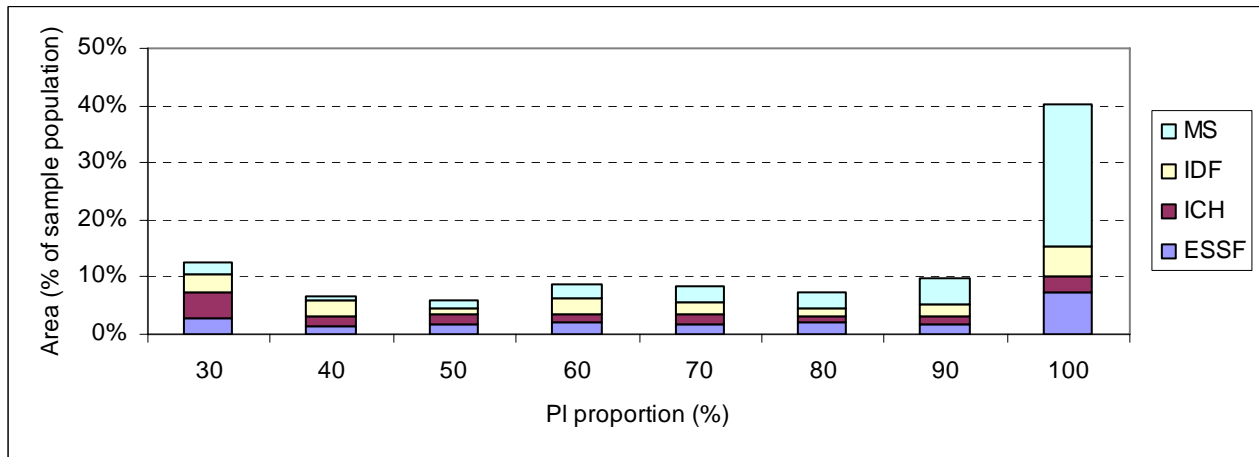


Figure 3. Proportion of sample population by PI percentage and BEC zone.

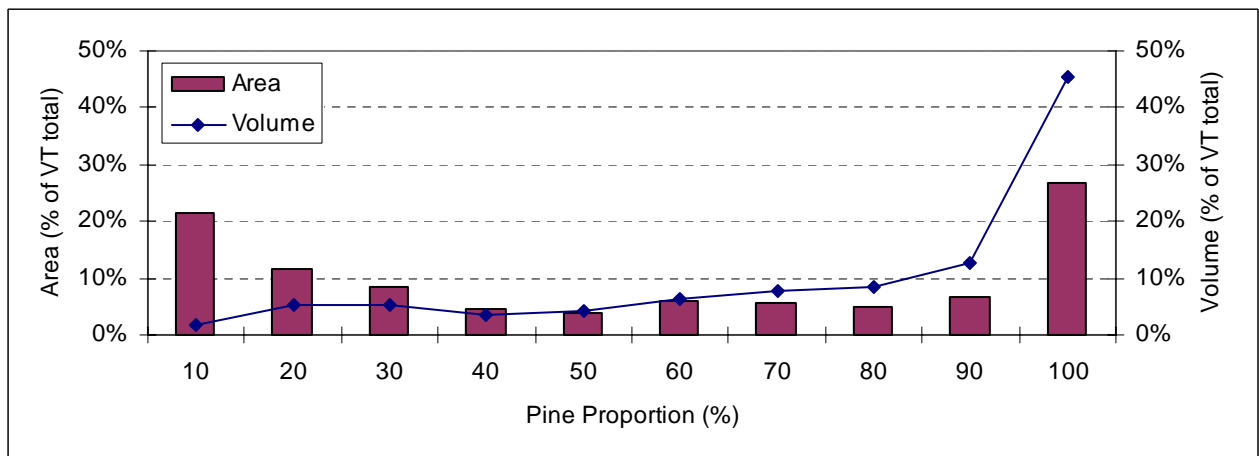


Figure 4. Proportion of VT area and volume by proportion of PI area.



### 3. SAMPLE DESIGN

#### 3.1 OBJECTIVES

The objectives of the sample design are to:

1. Add new VRI Phase II ground samples in the areas where MPB is impacting the inventory.
2. Provide a platform to monitor future MPB impacts in that area.

The intent is that the data from updating and supplementing the samples in these PI stands will allow the OIFS to address the Regional Executive Director's request to examine the impact of the MPB in the TSA. This will require statistical analysis of the data. Monitoring the future impact of the MPB infestation must be done by re-measuring some or all of these ground sample plots.

#### 3.2 STRATIFICATION

We did not pre-stratify the sample population in order to maintain flexibility in analysis and future changes and uses of the data. This also simplifies integration of these plots with a new VRI Phase I planned for the TSA and the subsequent statistical analysis. Samples located with equal probability throughout the sample population, can have the data post-stratified in any way. For example, the OIFS members may likely address salvage in stands with >75% PI using clear-cutting, and with partial-cutting in areas with 26 - 75% PI. Thus these two groups are logical strata on which to summarize the data.

#### 3.3 SAMPLE SIZE

This project expands on the existing TSA-wide Phase II program. Of the 110 existing plots 36 are already in the sample population, and of the 50 new plots 14 will be included. Therefore, to provide a total of about 61 plots in the sample population, 11 new Phase II plots will need to be selected. Note that one (1) of the existing Phase II plots specifically represents the younger age classes 41 – 60 years of age.

#### 3.4 SELECTION OF SAMPLE POINTS

We randomly selected 11 sample points from the sample population using the VRI standard PPSWR method from the 100 m VRI grid (Appendix 1). We stratified the sample population by BEC zone during sample selection to ensure equal distribution across these units. Each point has equal probability of selection and thus equal statistical weight. The TSA-wide Phase II sample points also occurring in the sample population are included in Appendix 1.

An second batch of sample points has also been selected in case one or more of the first 11 sample points cannot be sampled (e.g., due to safety concerns or recent harvest (Appendix 2)).

Table 3. Sample size for the distribution of existing and new VRI Phase II plots in the sample population.

Strata	Area (ha)	Proportion of sample population	Proportion of VT area (5% - 100% PI)	Existing TSA-wide plots established in 2003	New TSA-wide plots	New VRI plots established in sample population	Total # VRI plots
PI 25-75%	146,541	43%	29%	24	48%	4	28
PI 75-100%	197,902	57%	39%	26	52%	7	33
<b>Total sample pop</b>	<b>344,443</b>	<b>100%</b>	<b>67%</b>	<b>50</b>	<b>100%</b>	<b>11</b>	<b>61</b>

## 3.5 PLOT TYPE

### 3.5.1 New Plots

New plots in the sample population will be established as standard VRI timber emphasis plots (TEP) with the addition of NVAF enhancement, and successional interpretations. Ecological data may be also collected subject to the availability of an eco-certified field crew. We will also install all four auxiliary plots. This was done in the TSA-VPIP and is needed to integrate these plots into a new Phase I.

Each sample point under this design is a cluster of five points (Figure 5). Appendix 3 lists the VRI cards to collect this information and recommended modifications. The modifications include:

- Installing all four auxiliary plots in the sample cluster.
- Enhancing the data collected in auxiliary plots to include dead trees.<sup>5</sup>
- Apply the MPB mortality classes to classification of dead PI.
- Stem map all trees.<sup>6</sup>
- Complete set of information for the VRI ecology standard and successional interpretations may be collected.<sup>7</sup>

### 3.5.2 Existing Plots

Existing plots in the sample population will be re-visited with complete re-measurement<sup>8</sup> to ensure the data from all plots in the sample population are from the same year and thus reflect the same level of

<sup>5</sup> This variance includes all dead trees to be measured for DBH. Plus, each dead tree of a new species encountered is also fully enhanced to include heights, damage agents, plus NVAF enhancement for loss factors. This is the same approach as if a new live species were encountered in an auxiliary plot (ie., dead trees are dealt the same way as if a new species were encountered). Standard phase II protocol is to measure just the live trees in the auxiliary plots.

<sup>6</sup> this will enable 'critical height' sampling methods to be used for subsequent monitoring.

<sup>7</sup> Subject to the availability of an eco-certified field crew.

<sup>8</sup> May 17, 2006 email from Matt Makar (Inventory Forester MOFR), on rationale why MOFR requires full data collection on the Phase II re-measurements: 1) a partial measure would not meet VRI standards and is therefore not an eligible FIA funded VRI activity; 2) FIA funds strategic inventory activities rather than operational activities; 3) Handheld software, and the validation it provides will not work with partial information; 4) The MOFR cannot validate

growth and MPB impact. To be consistent with data collected for the new VRI plots, the re-measurement may also include full ecological classification.<sup>7</sup>

Plot re-measurement will follow 2003 establishment methods, with the following additional specific criteria:

- Copies of the 2003 field cards will be used as reference during field measurements
- Only the Integrated plot center (IPC) and auxiliary plots from the standard 5-point cluster will be re-measured<sup>9</sup>.
- Call grade, net factoring, damage agents, and loss indicators will be re-assessed from the IPC only.
- The same prism will be used as at establishment.
- The existing tree tag numbers will be used.
- New trees that have grown past the DBH tagging limit will be tagged and measured.
- Any missed tree from the previous measurement will be tagged and measured.
- Enhancing the data collected in auxiliary plots to include dead trees
- Stem map all trees

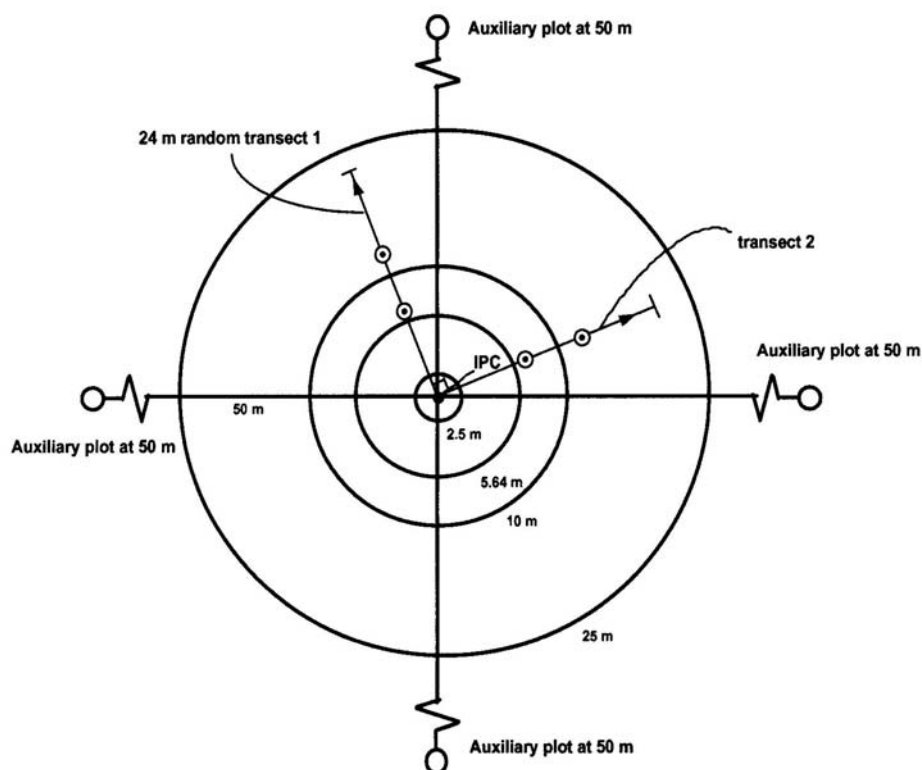


Figure 5. Schematic of the VRI plot cluster. Diagram taken from the VRI manual.

or load partial information into the corporate database; 5) There may be some value in collecting the full set of data in terms of 'monitoring' non-pine.

<sup>9</sup> The 2002 VRI Phase II plots included sampling all auxiliary plots, and tallying dead standing trees in the auxiliary plots. The number of auxiliary plots was increased to a 9-point cluster from the standard 5 for stands in the IDF. For this sample plan, only the auxiliary plots from the standard 5-point cluster will be re-measured.

## 4. IMPLEMENTATION

### 4.1 ESTABLISHING NEW VRI PLOTS

A total of 25 new VRI Phase II plots will be established for this project, of which 14 originate from the 2006 TSA-wide Phase II expansion, and 11 are specific to the sample population. New plots will be established following sampling methods outlined in section 3.5.1.

### 4.2 INCORPORATING EXISTING VRI PLOTS

A total of 36 existing VRI Phase II plots in the sample population will be revisited following methods outlined in section 3.5.2.

### 4.3 COMPILATION

The data will be compiled using a combination of the provincial VRI compiler and programs specially designed for these data. The special compilations are needed to address the non-standard data in this design (e.g., MPB mortality classes).

Analysis using compilers other than the provincial VRI compiler will not be used for the purposes of adjusting the inventory. Other compilers could be used to address operational issues internal to the IFPA.<sup>10</sup>

### 4.4 FUTURE RE-MEASUREMENT

Future re-measurement of these plots to monitor MPB impacts over time can be done as frequently as required. If updates for mortality is the only interest, the plots can be revisited and only trees which have died recorded. The statistical analyses can then be redone. This is a reasonable approach if less than five years has elapsed since the plots were installed. If growth is required in the update, critical height methods can be used. The critical height sampling approach to re-measuring prism plots is not yet approved by the MOFR, however, a pilot test of the methods is currently being undertaken by West Fraser in Quesnel using the VRI plots installed in the Vanderhoof Forest District.

Any procedures that are used for future Monitoring sampling will be reviewed for approval by MOFR using the standards that are in place at the time of re-measurement, if Forest Investment Account funding (or it's equivalent at the time) is to be used.<sup>11</sup>

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<sup>10</sup> June 7, 2006 email from Matt Makar (Inventory Forester MOFR), providing direction on the use of MOFR compilers for projects funded by FIA

<sup>11</sup> June 7, 2006 email from Matt Makar (Inventory Forester MOFR), providing clarification of expected monitoring standards at some future date

#### 4.5 SCHEDULE

The new VRI Phase II sampling will be implemented in 2006 as follows:

1. The OIFS will prepare and submit a VPIP for approval by the MOFR Southern Interior Region.
2. The OIFS will establish 25 new Phase II plots (11 from the sample population, and 14 from the new TSA-wide Phase II plots).
3. The OIFS will hire certified crews to install the TEPs and a certified 3<sup>rd</sup> party auditor to check their work.
4. The OIFS will mentor all crews on the first day of field sampling. The MOFR is invited to participate in mentoring and auditing QA.
5. The contractor crews will supply digital files of the TEP data to the OIFS for compilation and QA at the end of each shift.
6. The OIFS will audit approximately 10% of the TEPs.
7. The OIFS will complete the statistical analysis by December 31, 2006.

## Okanagan TSA Vegetation Resource Inventory

### 5. PHASE II GROUND SAMPLING PLAN

It is the intention of the proponent to implement the Okanagan Timber Supply Area Vegetation Resources Inventory Phase II Sampling (VPIP) as described. As a key stakeholder in the inventory, the Ministry of Forests and Range (MOFR) VRI staff have been consulted throughout the development of this plan.



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Glen Dick RPF  
Executive Director  
Okanagan Innovative Forestry Society  
c/o Tolko Industries Ltd.  
4280 Highway 6, Lumby V0E 2G7

June 14, 2006

I have reviewed the Okanagan Timber Supply Area Vegetation Resources Inventory Ground Phase II Sampling Plan. I will be advising Pricewaterhouse Coopers that the work proposed to this plan meets Vegetation Resources Inventory Standard and MOFR business needs.

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Jon Vivian  
Manager,  
Vegetation Resource Inventory Section  
Forest analysis and Inventory Branch  
Ministry of Forests and Range

June 14, 2006

## APPENDIX 1 – SAMPLE POPULATION SAMPLE POINTS

The following sample list is a combination of; 1) Project 022P new plots to be established in the MPB sample population (yellow), 2) Project 0222 new plots to be established under the TSA-wide Phase II expansion also occurring in the MPB sample population (green), and 3) Project 0222R existing plots to be re-measured under the TSA-wide Phase II program also occurring in the MPB sample population (blue). Note that sample points (existing and new) from the TSA-wide Phase II program that have a sampling conflict (i.e., in a designated protected area, or in a harvested opening) have been identified (red text) and excluded from sampling.

Project	Measurement Status	Sample No.	Mapsheet No.	Polygon No.	UTM Zone	UTM Northing	UTM Easting	BGC Unit	Leading Species	Secondary Species	PI Percent	Age (yrs)	Height (m)	Crown Closure (%)	Conflict	Protected Area	New Depletion
MPB-022P	New	1	082M003	556	11	5654289	327261	ICHmw3	FD	PL	40	92	32.7	50			
MPB-022P	New	2	082E064	76	11	5506835	339179	MSdm1	FD	PL	30	118	31.4	60			
MPB-022P	New	3	082M016	327	11	5666338	364075	ICHwk1	PL	SE	50	82	27.1	70			
MPB-022P	New	4	092I050	105	10	5590030	707244	MSdm2	PL		100	119	22.6	52			
MPB-022P	New	5	082E033	163	11	5472700	323494	MSdm1	PL		100	80	21.5	60			
MPB-022P	New	6	082E092	202	11	5535982	310859	MSdm2	PL		100	90	16.7	80			
MPB-022P	New	7	082E061	402	11	5503927	288093	IDFdk1	PL	FD	90	90	22.5	50			
MPB-022P	New	8	082L014	176	11	5558618	342017	MSdm1	PL		100	132	25.5	50			
MPB-022P	New	9	082E074	265	11	5514224	341222	MSdm1	PL		100	69	15.4	60			
MPB-022P	New	10	082E054	339	11	5488981	330783	ESSFdc1	PL	SE	80	190	25.1	50			
MPB-022P	New	11	082L082	691	11	5633576	314955	IDFmw2	PL	DEC	50	75	22.7	80			
TSA-0222	New	111	082E086	359		5518376	360065	ESSFdc1	P		100	190	28.1	60			
TSA-0222	New	112	082E064	33		5507126	334486	ESSFdc1	P	S	60	228	24.7	30			
TSA-0222	New	117	082E081	385		5525646	293849	IDFdk2	F	P	30	71	14.4	30			
TSA-0222	New	119	092I010	195		5548875	284496	MSxk1	P	S	90	144	26.3	60			
TSA-0222	New	126	082E071	601		5509661	288110	MSdm2	P		100	100	21.7	70			
TSA-0222	New	128	082L007	95		5549727	382671	ESSFdc1	P		100	78	15.6	60			
TSA-0222	New	129	082L033	440		5580538	328784	IDFdk2	A	P	30	101	16.5	70			
TSA-0222	New	130	082E073	412		5512190	318320	MSdm1	P		100	91	14.4	40	Y		Y
TSA-0222	New	137	082L062	1500		5619528	313677	IDFdk2	P	F	70	121	28.7	50			
TSA-0222	New	139	092H080	199		5519609	272251	MSdm2	P		100	102	23.2	60			
TSA-0222	New	148	082E073	373		5509881	322255	MSdm1	P		100	80	15.2	80			
TSA-0222	New	149	082E031	103		5475890	290198	ESSFxc1	P	S	90	115	16.7	60			
TSA-0222	New	150	082E074	118		5516308	331120	MSdm1	P	S	70	80	13.2	50			
TSA-0222	New	151	092H080	343		5519253	283078	ESSFdc2	P	S	80	132	25.1	60			
TSA-0222	New	155	082E073	2657		5516129	326165	ICHmk1	P	L	80	110	22.9	60	Y		Y
TSA-0222	New	157	082E085	1078		5520791	346583	MSdm1	P		100	119	25.7	70			
TSA-022R	Re-meas	5	082L006	603		5540458	360553	ESSFxc2	S	P	30	111	32.5	60			
TSA-022R	Re-meas	7	082E041	123		5481999	284024	ESSFxc1	P	S	90	122	24.3	70	Y		Y
TSA-022R	Re-meas	9	082L001	170		5549505	297062	ESSFdc2	S	P	30	195	32.6	60			

Project	Measurement Status	Sample No.	Mapsheet No.	Polygon No.	UTM Zone	UTM Northing	UTM Easting	BGC Unit	Leading Species	Secondary Species	PI Percent	Age (yrs)	Height (m)	Crown Closure (%)	Conflict	Protected Area	New Depletion
TSA	Re-meas	13	092H009	270		5434901	696136	ESSFxc1	P		100	86	13.9	50			
TSA-022R	Re-meas	20	082E021	56		5463005	287873	ESSFxcw	S	P	30	216	24.1	50			
TSA-022R	Re-meas	21	082E054	727		5489337	332739	ESSFdc1	P		100	150	21.9	60			
TSA-022R	Re-meas	27	082E095	38		5539339	346773	ESSFdc1	P		100	105	20.0	80			
TSA-022R	Re-meas	29	082L063	252		5615569	322647	ESSFdc3	P	S	60	112	22.7	70			
TSA-022R	Re-meas	31	082E031	323		5470249	284659	ESSFxc1	P		100	126	21.0	70			
TSA-022R	Re-meas	47	082L016	127		5559184	369275	ICHmk1	P	F	60	54	16	10			
TSA-022R	Re-meas	48	082L037	600		5574162	375813	ICHmk1	P	A	60	83	17.3	60			
TSA-022R	Re-meas	55	082L038	473		5574081	399367	ICHmw2	P		100	63	10.7	70			
TSA-022R	Re-meas	56	082E097	538		5529154	376631	ICHmk1	P	F	50	118	23.5	60			
TSA-022R	Re-meas	58	082E085	1147		5519732	343027	ICHmk1	S	P	30	109	25.5	55	Y		Y
TSA-022R	Re-meas	60	082L046	48		5593928	370070	ICHmw2	P	E	60	113	24.4	40			
TSA-022R	Re-meas	63	082L007	375		5543084	384242	ICHmk1	P		100	118	24.8	70			
TSA-022R	Re-meas	64	082L097	286		5645591	378968	ICHmw3	A	P	40	94	22.6	60			
TSA-022R	Re-meas	71	082L042	322		5588507	306424	IDFdk1	P	F	60	169	24.4	50			
TSA-022R	Re-meas	72	092H020	78		5449895	270536	IDFdk1b	P		100	156	20.1	60			
TSA-022R	Re-meas	74	082E022	181		5460941	299481	IDFdk1	F	P	30	166	23.5	40			
TSA-022R	Re-meas	78	082E092	328		5532783	313072	IDFdk2	P	A	90	80	13.2	70			
TSA-022R	Re-meas	80	082L014	210		5558046	336205	IDFhx1	P	F	60	72	11.9	70			
TSA-022R	Re-meas	81	092H080	1766		5510413	278140	IDFdk2	P	A	90	67	15.3	70			
TSA-022R	Re-meas	87	082E044	99		5484450	338761	IDFdm1	P	L	70	78	20.1	50			
TSA-022R	Re-meas	90	092H080	317		5519701	281121	MSdm2	P	B	70	117	23.2	80			
TSA-022R	Re-meas	91	082E081	187		5522868	284741	MSdm2	P	S	60	190	28.1	60	Y		Y
TSA-022R	Re-meas	92	082E044	17		5484835	329353	MSdm1	S	P	40	207	28.2	40			
TSA-022R	Re-meas	93	082L001	4		5543224	285394	MSxk1	P		100	135	23.6	60			
TSA-022R	Re-meas	94	082E085	4		5528934	342683	MSdm1	P	L	70	119	27.7	70			
TSA-022R	Re-meas	95	092I010	2002		5544848	284491	MSxk1	P		100	124	25.0	80			
TSA-022R	Re-meas	96	082L004	296		5544050	340975	MSdm1	P	S	60	90	12.4	70			
TSA-022R	Re-meas	98	082E011	622		5443416	282897	MSxk1	P	S	90	66	12.9	50	Y		Y
TSA-022R	Re-meas	100	082L033	339		5585105	325333	MSdm2	P	F	60	70	15.9	80			
TSA-022R	Re-meas	102	082E095	195		5536754	347701	MSdm1	P	B	80	105	16.9	50			
TSA-022R	Re-meas	103	082L004	156		5548231	337377	MSdm1	P		100	130	17.2	70			
TSA-022R	Re-meas	104	082E051	79		5496475	284135	MSdm2	P		100	130	17.2	80			
TSA-022R	Re-meas	105	082L005	64		5550803	353611	MSdm1	P		100	113	21.3	70			
TSA-022R	Re-meas	106	082E091	463		5541620	290126	MSdm2	P		100	135	20.6	70			
TSA-022R	Re-meas	108	082E064	699		5504062	338023	MSdm1	B	P	40	68	4.1	15			
TSA-022R	Re-meas	110	082E092	202		5536924	310575	MSdm2	P		100	90	16.7	80			



## APPENDIX 2 – ADDITIONAL BATCH SAMPLE POINTS

In anticipation that one or more of the 11 new Phase II sample points may not be sampled (e.g., unsafe field conditions, recent harvest), a second batch of points (sample numbers 12-20) has been selected.

Project	Measurement Status	Sample No.	Mapsheet No.	Polygon No.	UTM Zone	UTM Northing	UTM Easting	BGC Unit	Leading Species	Secondary Species	PI Percent	Age (yrs)	Height (m)	Crown Closure (%)	Conflict	Protected Area	New Depletion
MPB-022P	New	12	082E031	424	11	5467488	286626	ESSFxcw	SE	PL	30	136	26.2	60			
MPB-022P	New	13	082E064	752	11	5498264	340912	MSdm1	FD	PL	30	137	25.6	30			
MPB-022P	New	14	082E043	290	11	5479246	325025	IDFdm1	PL		100	80	16.9	60			
MPB-022P	New	15	082L054	498	11	5601272	337660	ICHmw2	PL	FD	70	70	18.4	40			
MPB-022P	New	16	082E095	246	11	5533969	353790	ESSFxc2	PL		100	131	24.4	70			
MPB-022P	New	17	082E051	739	11	5489089	290853	ESSFxc1	PL	BL	80	150	22.8	20			
MPB-022P	New	18	082E011	93	11	5452387	285935	MSxk1	PL		100	81	14.5	40			
MPB-022P	New	19	082E054	188	11	5494915	336363	MSdm1	PL	LT	70	118	23.5	60			
MPB-022P	New	20	082L043	135	11	5592228	320797	IDFmw1	PL	FD	70	150	20.3	70			

### APPENDIX 3 – VRI CARDS & MODIFICATIONS

Card	Name	Include	Information Collected	Modifications / Notes
1 – CH	Header	Yes	General sample information and access notes	None
2 – CP	Compass	Yes	Navigation and reference point information	None
3 – CL	Cluster Layout	Yes	Plot and cluster diagrams	None
4 – RS	Range Sampling - Shrub Transect 1	No	Shrub layer structure data and forage plot clippings along first random azimuth	NA
5 – RT	Range Sampling - Shrub Transect 2	No	Shrub layer structure data and forage plot clippings along second random azimuth	NA
6 – EW	CWD Transect 1	Yes	CWD data along first random azimuth	NA
7 – EC	CWD Transect 2	Yes	CWD data along transect at 90° to the first	NA
8 – TD	Tree Details	Yes	Tree attributes including call grade/net factoring	None
9 – TL	Tree Loss Indicators	Yes	Damage agents and loss indicators for trees	None
10 – TS	Small Tree, Stump, and Site Tree Data	Yes	Regeneration and stump data, and site tree data	None
11 – TA	Auxiliary Plot	Yes	Tree attributes, damage agents, loss indicators, and site tree data for aux plots	Install all four plots; map polygon boundaries (Card 3); enhance dead trees; stem map all trees.
12 – EP	Ecological Description 1	Yes	Site and soil classification for pin location	Yes
13 – ED	Ecological Description 2	Yes	Site and soil classification if pin location is not in dominant site	Yes
14 – ET	Tree and Shrub Layers	Yes	Species and percent cover for tree and shrub layers	NA
15 – EH	Herb and Moss Layers	Yes	Species and percent cover for herb and moss layers	NA
16 – EO	Succession Interpretations	Yes	Succession and old-growth attributes.	NA