
Tsi Del Del Enterprises



Growth and Yields Needs Assessment

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1. Acknowledgements

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2. Introduction

This Report is in response to the Yun Ka Whu'ten Holdings (YKW) and Tsi Del Del Enterprises Limited (TDD) RFP to provide for a Growth and Yield needs or opportunity assessment for both companies individually and mutually beneficial projects.

The requirement of growth and yield type products and skills can be seen as increasing in the Province of British Columbia. The BC government through the Forest Investment Account (FIA) and other Government agencies has sanctioned a number of programs, which possess grounding in the science of Growth and Yield. The Forest Investment Account recognizes the need to provide the Land-Base Investment Program funding in the areas of Resource Inventories, Monitoring, Forest Dynamics (Biodiversity/Habitat), and Data Management.

Considering the increasing landbase constraints placed on the Forest Industry, products and services such as Growth and Yield have become increasingly important to contribute toward a more accurate estimate of (sustained yield) annual allowable cut (AAC) levels within the context of sustainable yield forest management. Repeatedly, Timber Supply Analysis has shown to be very sensitive to accurate estimates of forest growth and yield. Additionally, growth and yield activities can aid in Sustainable Forest Management Planning.

As stated in the RFP, the specific business goals of YKW and TDD with regards to growth and yield opportunities and synergies between the two companies are the focus for this project. In order to accomplish this task RJ Vassov & Associates led number of workshops designed to assess the current status of YKW and TDD Forest Management capabilities with respect to Growth and Yield and provide a framework towards operational planning of growth and yield activities. Robert Vassov and Katherine Wolters provided the services for this contract.

The goals for this project are;

- Assist Yun Ka Whu'ten Holdings and Tsi Del Del Enterprises with business needs in the current and desired operating environments which also considers higher level plans and future tenure change;
- Localize this process by conducting independent workshops for both companies;
- Assist Yun Ka Whu'ten Holdings and Tsi Del Del Enterprises in finding shared opportunities for Growth and Yield; and
- Present a report on the range of Growth and Yield options for TDD's unique situation.

3. Methods

Before any Growth and Yield plans can be initiated an organized approach is required to provide a growth and yield needs assessment, objectives determination, evaluation and planning and documentation. YWK and TDD have provided the framework through provision in this RFP for workshops, evaluation, and operational planning.

A Pre – Meeting evaluation phase was planned before the workshops were conducted. (The essence of the pre – meeting evaluations were however, conducted at various times previous to and during the workshops).

The Pre – meeting evaluation was organized into what we think is best termed as the Situation Assessment and User Requirements Needs (Appendix I). A situation assessment helps defined the scope for the workshop and growth and yield needs for both the YKW and TDD companies. Understanding the needs and targets is the first step towards developing a growth and yield program,

A user requirements review helped us understand the skill level and state of readiness to embark on Growth and Yield operational plans. In addition, other concerns and needs not directly related to growth and yield surfaced. These items were assessed and became part of the workshop agenda.

A number of analyses were conducted on the inventory profile for the Tatla Timber Supply Block. Some of the attributes analyzed were distribution of species, site index, age-class, BGC Zone, reference year etc. These analyses were contrasted with available SIBEC and other information to gauge the accuracy of Site Index estimation across the landbase. This information was summarized for the workshop and the relevant information is contained within this document.

Two independent workshops and one combined workshop for YKW and TDD were conducted from February 10 to February13/03. As a result the consultant was able to explore each of the company's unique situations and look for common areas in growth and yield.

Additionally, Government growth and yield personnel from the Ministry of Forests from the Cariboo Region and Research Branch were consulted for the expertise in permanent sample plots, vegetation inventory information and growth and yield modelling.

4. Situation Assessment

4.1 Project Area

The Tatla Block is located in the middle of the Chilcotin Forest District (figure 1) bound to the west by the Anahim Block, to the south and east by the Chilcotin and Kloakut Blocks and to the north by the Chezacut Block. Within the William's Lake Timber Supply Area (TSA) of the Cariboo Forest Region the Tatla block is approximately 480,955 hectares in size (table 1).

Table 1
Tatla Block BGC Subzones

BGC ZONE	BGC SUBZONE	Block %	Area (ha)
SBPS	xc	60%	286,857
MS	xv	18%	86,570
	xc	1%	2,427
	dc	1%	2,660
IDF	dw	2%	8,563
	dk	9%	41,011
ESSF	xv	5%	24,593
AT		6%	28,275
Grand Total		100%	480,955

The Tatla block lies in the rain shadow of the Coast Mountains. Generally its climate can be characterized by having cool summers and cold winters. Precipitation is generally low but averages do differ by Biogeoclimatic (BGC) Zone. Five BEC zones (table 1) can be found with the boundaries of the Tatla Block, namely; the Sub Boreal Pine – Spruce (SBPS), Montane Spruce (MS), Interior Douglas-fir, Engelmann Spruce-Subalpine Fir (ESSF), and the Alpine Tundra (AT). Of these, the SBPS and the MS make up 60% and 20 % respectively and are the most economically viable timber production areas although the MSxv is reported as one the least productive biogeoclimatic units for tree growth (Steen and Coupe, 1997).

In both zones, Lodgepole Pine is the predominant species. The MS is a transition zone from lower elevation SBPS to the Engelmann Spruce – Subalpine Fir (ESSF) Zone. Generally temperatures are colder, growing seasons shorter and precipitation is greater than the SBPS. Within the MS BEC zone there are two subzones namely, xv (very dry very cold) and dc (dry cold). The xc subzone is predominant and is characterized by very slow growing even-aged lodgepole pine with many stands reaching as old as 230 years (Forest Cover Fip Files).

The SBPS generally occurs above the IDF and below the MS. The SBPS is characterized by cold dry winters and cool dry summers. Again like the MS, tree growth is slow although somewhat slightly faster on average than lodgepole pine of the MS. Both subzones are distinctly unique to forest products of the the West Chilcotin Plateau. Short growing seasons and cold temperatures result in trees with very narrow growth rings. These provide for very dense and strong lumber products that are dimensionally stable.



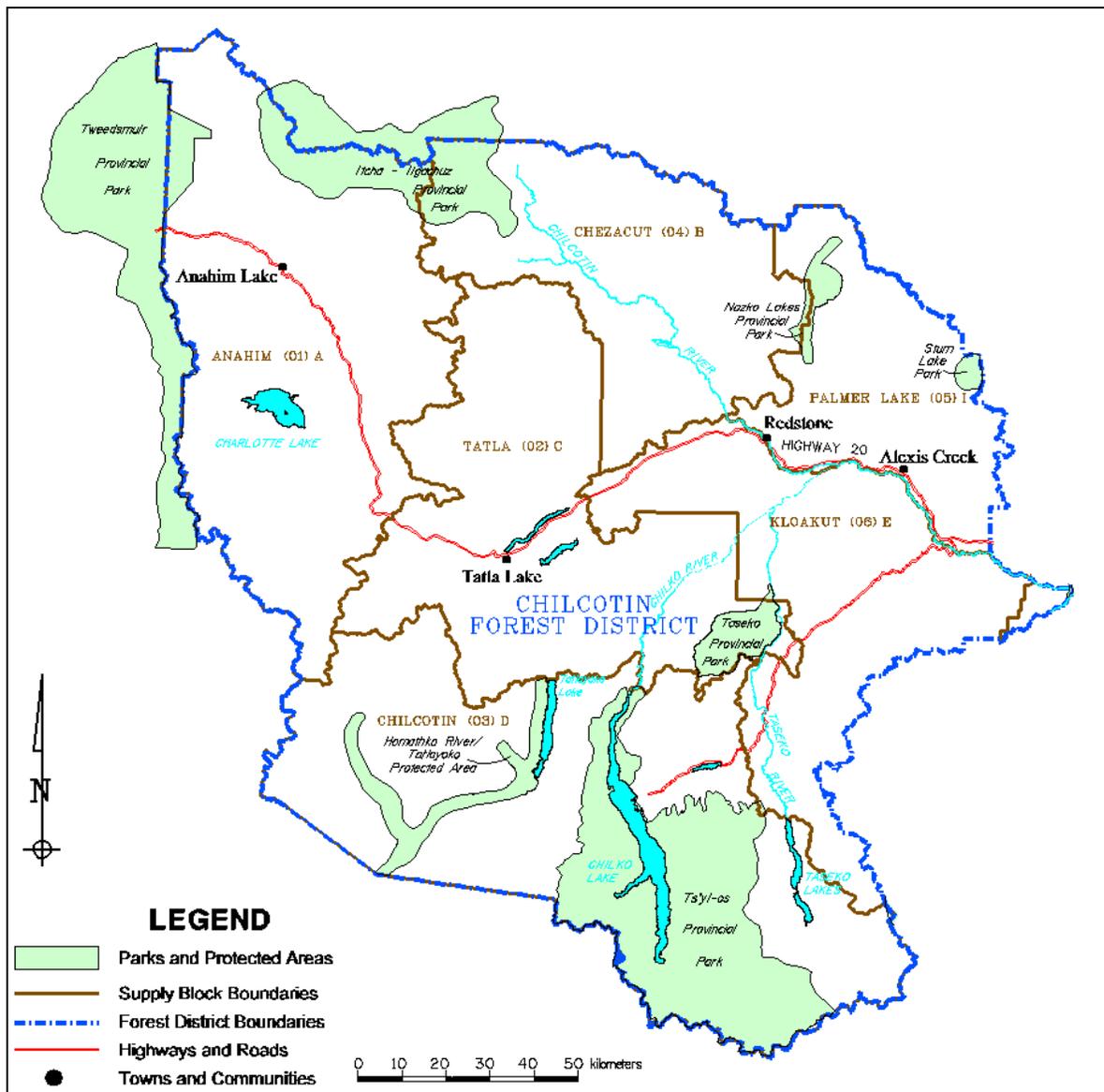


Figure 1
Chilcotin Forest District

4.2 Situation Assessment Review

This following is a summary of information learned though a situation and user needs assessment conducted for TDD. (Please refer to appendix I for an outline of the questions).

Tsi Del Del Enterprises is a joint venture between Riverside Forest Products and various first nations of the West Chilcotin Plateau. TDD holds the forest license and is responsible for all silviculture, road deactivation and fire readiness plans, operations and the business as a whole. There is a strong desire to remain independent from other licensees on the landbase. TDD holds a long term (up to 10 year) non replaceable volume license contributing to approximately 65,000 cubic metres.

The long term goals of Tsi Del Del are to provide for a sustainable business that will support long term local employment and to manage the resources of the Tatla Block in a sustainable manner. Tsi Del Del would like to see the Tatla block evolve into a Defined Forest Management Area to assert more control and better forest Management in the long run. TDD would also like to fully utilize their operational capability which is roughly estimated to handle 120,000 cubic metres. Additionally, Tsi Del Del would like to embark on projects that will offer some type of due diligence in understanding the land capability in terms of productivity across the landbase. Additionally, projects that would aid toward future certification would be desirable.

The short term goals of TDD are to continue to operate with current levels of volume (approx. 80,000 cubic metres). TDD also supplies consulting services in the areas of block layout and riparian assessment.

Given TDD's current limited form of tenure and Forest Management planning is increasingly frustrated with the lack of precise data and information to conduct proper planning. Forest managers would like to ameliorate this situation through a better understanding of the forest growth and yield and other connected or integrated landbase projects. It's envisioned that projects identified during this analysis will provide for increased understanding and education of the landbase and local employment. This is congruent with TDD's long term business goal of providing local jobs, community stability and increased involvement and control of the landbase.

Mainstream Forest products currently produced are stud lumber and wood chips. There are future plans to branch into value added products (from waste ends) when market demand increases. Other wood products taken from the landbase include select logs for local log home manufacturers, range fence post development and maintenance, and a local satellite mill for dimensional lumber.

Other products and resources from the landbase include back country tourism (in the southern part of the block), commercial Kokanee fishery on the Chilco River, wild mushroom collecting and traditional uses such as trapping, pitch collecting, and hunting. There are also a number of ranches in the area which use open fields for grazing.

In the most recent timber supply analyses (January 2003) of the Williams Lake TSA a new AAC of 3,768,400 cubic metres was determined. Of this total, the three Western Supply Blocks (Anahim, Tatla, Chilcotin) are expected to contribute 450,000 cubic metres of which 100,000 cubic metres must be taken from low volume stands. This represents an increase of 100,000 cubic metres from the previous determination (Table 2).



Table 2
Williams Lake TSA AAC History

Year	AAC Total	Western Supply Blocks
1981	2,500,000	0
1985	3,750,000	
1989	4,092,510	600,000
1992	3,975,000	
1996	3,807,000	350,000
2003	3,768,400	450,000

It appears that much of the increase in AAC (2003) in the three Western Supply Blocks can be attributed to an increase in the timber harvesting landbase (43%) over the previous determination. The increase in timber harvesting landbase is largely due to a re-definition of the merchantability criteria over the previous AAC determination analysis. The merchantability criteria that appears to have the largest effect on the Western Supply blocks is the reclassification of problem forest types site class (L) was replaced with those stands with site index less than 7 metres.

Additionally, the new AAC determination recognizes there is an overall underestimate of site index across the William's Lake TSA. To the extent that values are underestimated in the Anahim is unknown but an analysis of existing stie index data is compared to SIBEC values in the provincial database and is included in the analysis section of the report.

There is a strong desire by TDD to provide for a more defensible long run sustained yield based on more accurate growth and yield data and a better and more accurate vegetation inventory. The long run sustained yield average helps to project the potential productivity of the forest beyond one rotation. The rotation is usually based on the number of years required to establish and grow and even aged timber stand to a specified maturity. The reliability of yield curves used in the most recent Timber Supply Analysis is of concern for TDD. To the consultants' knowledge, there has been no independent or empirical evaluation of yield curves for timber types in the Tatla Timber Supply Block.

Given the regions' (West Chilcotin – Tatla Block) young forest industry and relatively poor productive forest zones little effort has been given by Provincial Growth and Yield Programs too represent the range and conditions across the Chilcotin Plateau with permanent sample plots. Ministry of Forests personnel report that only four permanent sample plots (PSP) have been established in the whole of the West Chilcotin. In addition, provincial growth intercept models have been published for interior lodgepole pine but discussions with MoF personnel indicated that little or no data from the Chilcotin Plateau were used to calibrate these models.

Data from other areas of research on the plateau exists but possess limited applicability to the assess growth and yield models. Of notable value, are a series of fertilization and escapement trials in naturally regenerated pine. TDD has indicated that a managed stand fertilization trial would be beneficial.

Over the past four years a number of VRI Timber Emphasis Plots were established in the Williams Lake TSA for the purposes of supporting Timber Supply Analysis AAC determination. Additional plots have been established during the last field season (2002). A second analysis is currently underway and expected completion is expected by the end of this fiscal year (March 2003). The object of this analysis is to conduct an inventory attribute adjustment to stand age, height and volume.

5. Forest Cover and Site Index Analysis

A copy of the Forest Inventory Planning File (FIP) was obtained from TDD and imported into MS Access. The tables imported include a resultant table which partitioned the landbase by BEC subzone and subzone variant, tree layer information, history file, and polygon attributes.

The data were partitioned for the Tatla block and the FIP file Attribute "TYPE DENSITY REFERENCE" on Immature (always stocking class 0), Mature (stocking classes 1,2,3,4), and Immature/Residual (stocking class R) values 1,2 and 3.

Figure 2 represents the Tatla block treed landbase by BEC zone. The SBPS occupies 64% while the MS makes up 21%. Forest operations on the Anahim Block are mainly conducted on these two BEC zones.

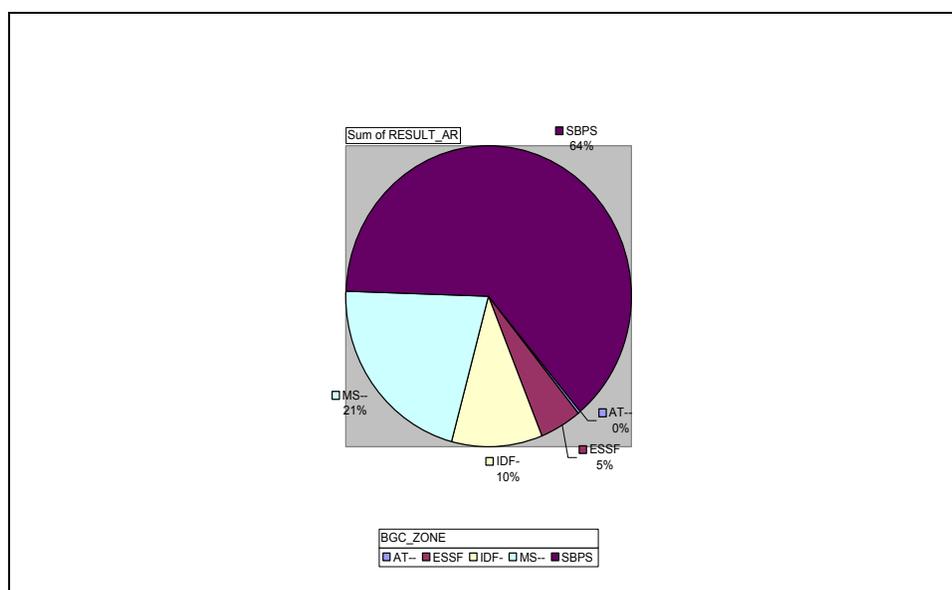


Figure 2
Tatla Block BGC Zone Percentage

Figure 3 breaks down each of the BEC zones of the Tatla Block by Species. Lodgepole pine is by far the most prevalent tree species found on both BEC zones.

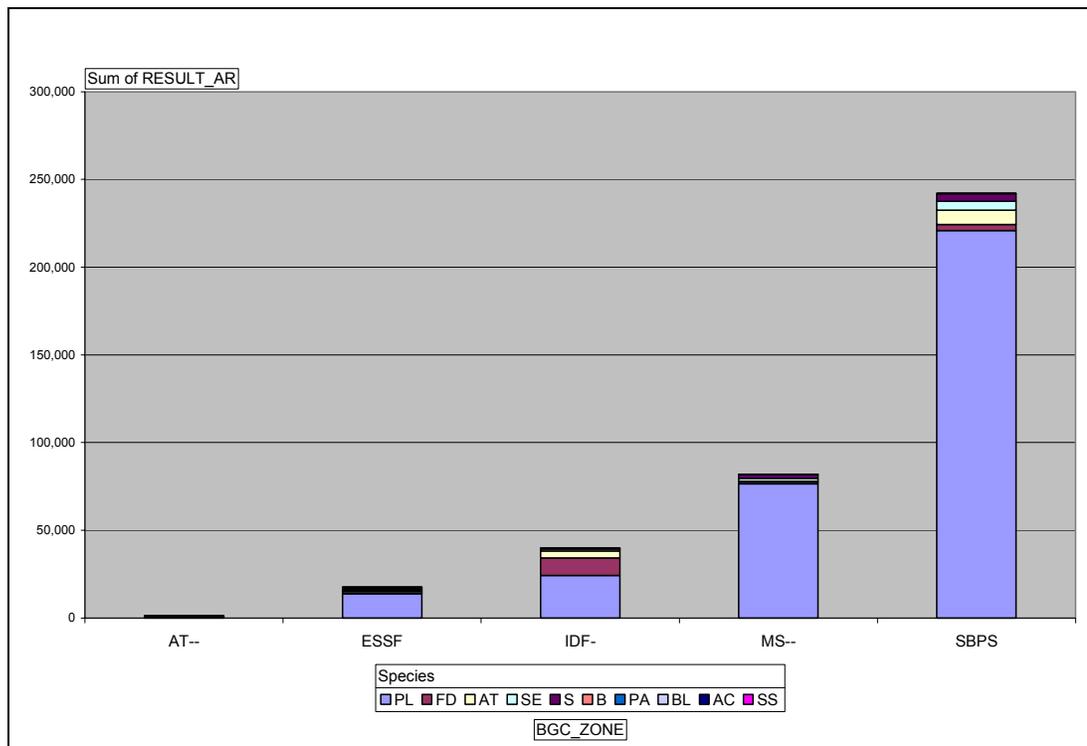


Figure 3
Tatla Block Area Breakdown by Species and BGC Zone

Table 2 reports average site index values by age class and species for all species present on the Tatla Block. Both area weighted average and straight averages are shown. The area weighted average site index value for pine is 8.8. As mentioned earlier Lodgepole pine is the most prevalent species on the landbase and exhibits one of the lowest average site index values in the Province.

The accuracy of site index estimates within the forest cover is unknown without ground based measurements for verification but information from previous inventory audits conducted on the Williams Lake TSA suggest there is an underestimate of site index across the TSA.

Table 3
Tatla Block Average Site Index by Species and Age Class

Species	Age Class																			
	1		2		3		4		5		6		7		8		9		Average	
PL	12.0	9.6	9.4	9.0	8.4	8.5	8.6	8.6	8.8	8.5	8.8	8.5	9.0	8.7	8.1	7.7	7.4	6.7	8.8	8.5
FD	5.9	10.2	3.2	7.8	8.1	8.8	9.3	9.2	11.8	11.1	12.4	11.8	13.9	12.7	12.8	10.9	12.3	10.3	12.3	10.8
AT	12.6	10.2	10.7	10.9	10.9	11.3	10.2	10.6	10.8	10.3	11.3	11.2	12.7	12.8	14.1	14.3			10.7	10.9
SE	24.1	9.3	16.3	14.5	14.1	13.2	10.6	10.7	12.6	11.5	10.5	10.0	8.9	8.9	6.9	7.4	5.8	6.1	8.4	8.5
S	3.5	11.6	11.6	11.8	11.6	12.7	10.0	10.6	12.6	11.4	11.1	9.7	10.4	9.4	9.1	7.1	6.6	4.6	9.3	8.2
B			10.7	11.5			5.1	5.5	6.0	6.5	5.1	5.8	7.1	8.2	6.4	6.6	6.1	6.2	6.3	6.8
PA	7.3	11.0	6.8	6.5	6.3	6.2	7.1	7.1	4.4	3.8	6.9	6.7	9.5	8.5	4.0	3.8	3.2	2.9	4.6	4.4
BL	30.5	11.0	14.7	13.0							9.1	9.1	11.3	11.3	4.3	4.8			7.5	7.4
AC			10.0	7.9			15.1	15.2	13.6	11.7	11.4	9.2	9.9	7.4	12.8	9.3			12.9	11.3
SS	36.5	9.3																	36.5	9.3
Average	11.7	9.8	9.5	9.3	8.6	8.8	8.7	8.8	8.9	8.7	8.9	8.6	9.2	8.9	8.8	8.1	9.8	8.8	9.0	8.7

Note- A represents an area weighted average SI and B represents a straight average

Figure 4, combination bar and line chart depicts both the average site index values and area by age class for Lodgepole Pine on the Tatla Block. Average site index values are not consistent across all age classes. There is a tendency for site index estimates to increase in the younger age classes and decrease in the older age classes. This trend is reported in many aerial photo based inventories across Canada. The trend however illustrates the inconsistency of site productivity estimates using an aerial based inventory.

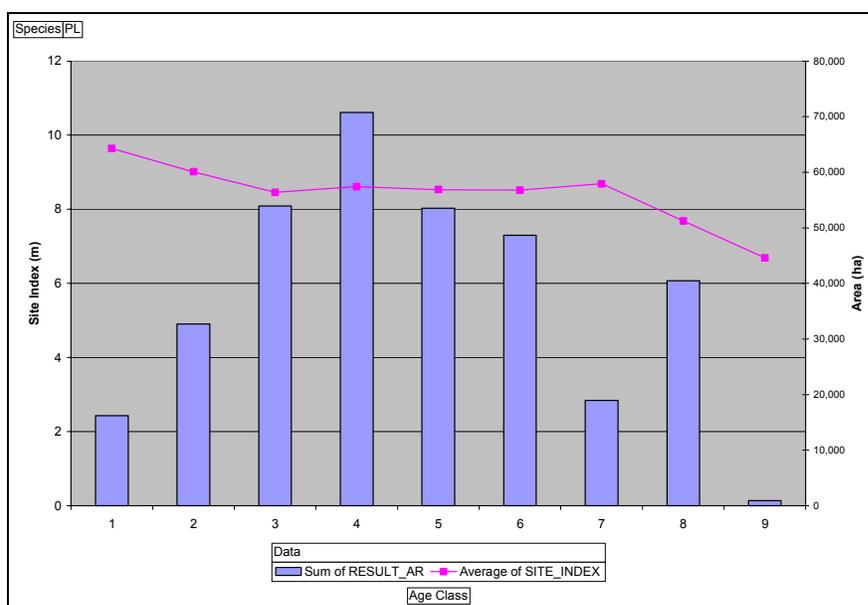


Figure 4
Tatla Block Pine SI and Area by Age Class

A percent area breakdown of the landbase by site index classes is depicted in figure 5. Individual polygons were assigned into single site index classes and charted. This purpose of this analysis was to quantify the spread and distribution of site index around the merchantability class limit used in the Williams Lake Timber Supply Analysis. It would appear from figure 5 that there is a normal distribution around the mean although the area difference noted between site index classes is largest between site index classes 6 and 7.

Figure 6 illustrated the comparison of average site index for the Anahim and Tatla Blocks with SIBEC averages obtained from the provincial database pine leading types on the MSdc, MSxc, MSxv, SBPSmc, and SPBSxc. In each case except for the SBPmc the provincial SIBEC values are distinctly higher. It should be noted figure 6 represents straight averages only as weighted area averages are not possible with an ecosystem link to the inventory.

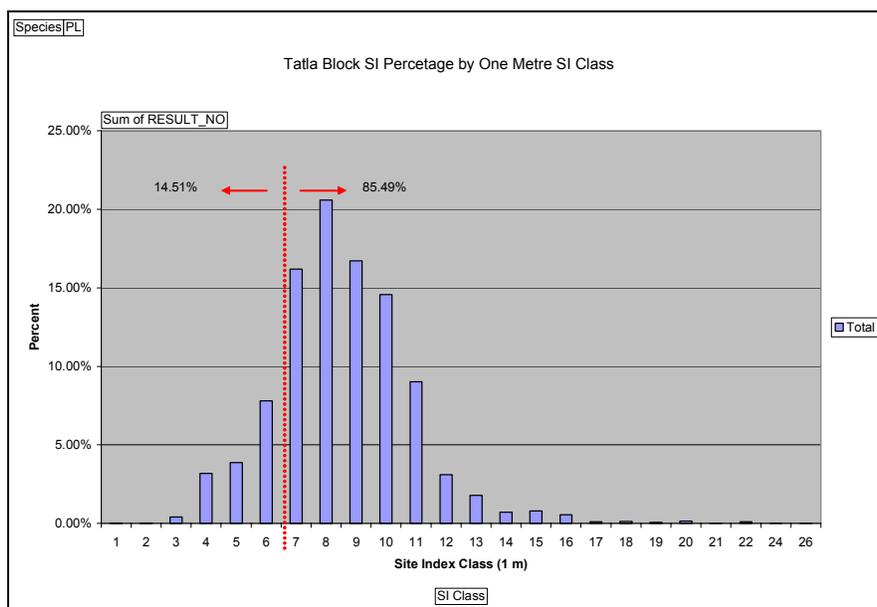


Figure 5
Tatla Block SI Percentage by One Metre SI Class

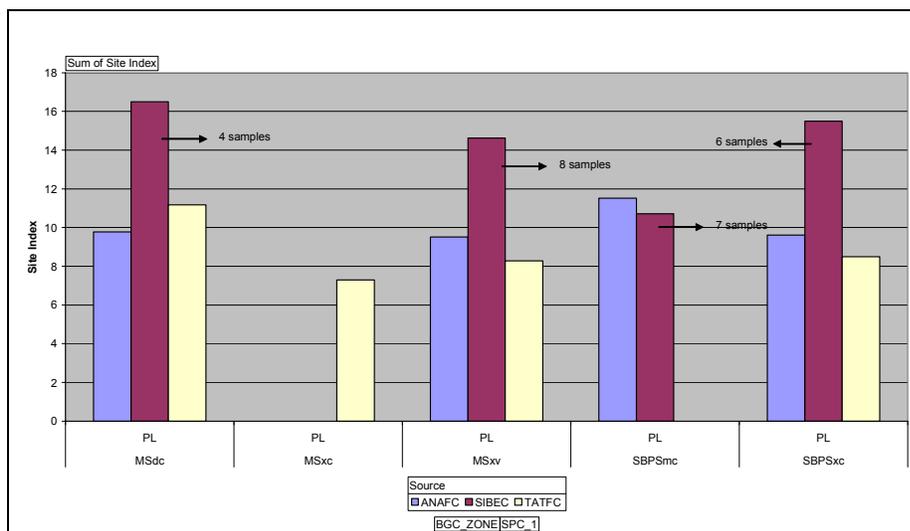


Figure 6
Comparison of Anahim and Tatla Block Pine SI with SIBEC Values

5.1 Forest Cover Reliability

Although an accuracy assessment of the Williams Lake Inventory is beyond the scope of this project it should be noted that an accurate assessment of Long Run Sustained Yield of an area depends not only on accurate growth and yield information, but also on the state of the inventory and the attributes intended for application in Timber Supply Analysis. This section provides only a cursory look at the current inventory in the Tatla Block.

A simple query was conducted on the FIP File Reference Year (calendar year for which the time dependent attributes in the layer are most reliable). The reference year is often used to evaluate the currentness of the inventory. Figure 7 provides an area based bar chart indicating the last full inventory was conducted in 1966 with major inventory updates completed in 1987, 1988, 1989 and 1991.

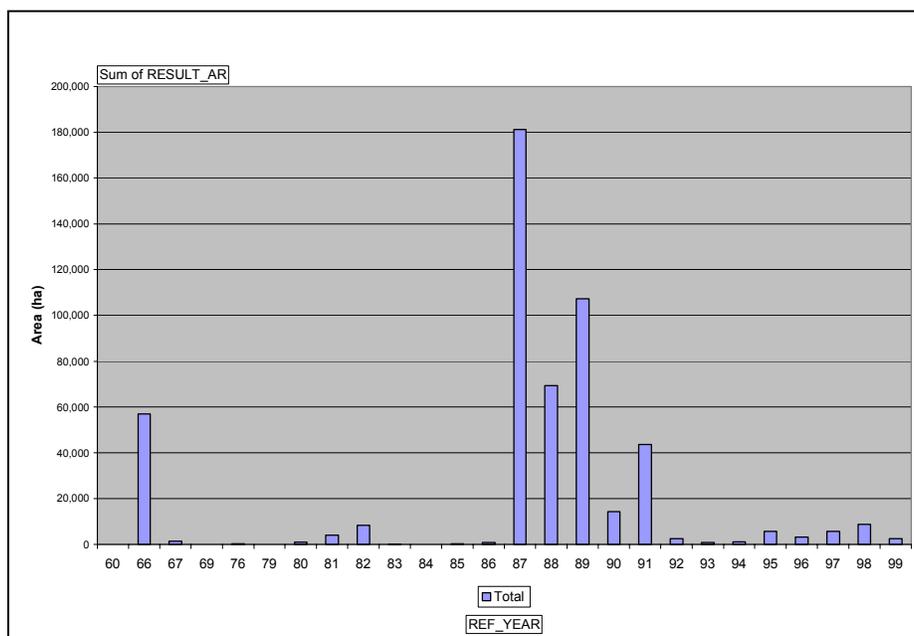


Figure 7
Tatla Block Area by Reference Year

A Williams Lake TSA Inventory Audit was recently conducted and results can be found on the web (<http://srmwww.gov.bc.ca/tib/audits/williams/williamstsa.htm#discussion>). This audit was primarily intended and specifically designed to test the overall accuracy of estimates of the total standing volume for the Williams Lake TSA as a whole. Essentially the results of the audit indicate that the volume attribute in the inventory was overestimated for the Williams Lake TSA as a whole. No analyses were conducted on any individual partitions.

This document states that:

*The amount of data collected, however, is not sufficient to make **statistically reliable conclusions about specific areas or tree species**. For example, any overall differences highlighted by the audit could result from problems with one tree species, from part of the land*



base (such as high elevation rather than lower elevation areas), from one age group of forest stands, or from a combination of these and other factors. As a consequence, general audit results cannot appropriately be used to adjust information about the forests currently available for timber harvesting since this area constitutes only a portion of the total forested area in the TSA.

*The audits provide information that may be useful to the Chief Forester when determining the allowable annual cut—offering a general assessment of the uncertainty associated with mature timber volumes, immature site index, and the non-forest classification. **However, the audit results cannot justifiably be used to make specific adjustments to growth and yield and other information used in timber supply analyses and allowable annual cut determinations.***

The extent to which inventory updates in from 1987 to 1991 included changes to forest cover linework and attributes is unknown. The inventory is now between 12 and 16 years old. New standards (VRI) exist which could provide TDD with better and more precise management options especially in the areas of ecological attributes (nutrients and moisture regime) and basic tree density information which could greatly assist TDD in quantifying the amount of repressed pine on the landbase.

6. Options

Little growth and yield information exists on the Chilcotin Plateau that represents forest types found in the Tatla Block. Permanent sample plots are fixed area plots designed with the intention of being measured periodically to capture the long term growth and can be used to facilitate yield estimation in the interim. PSP's can provide accurate information of individual stand and tree development that is not readily available in other sampling programs. Over time PSPs provide data points in the real growth series of stands and trees. Through a network of growth and yield plots growth, survival and ingrowth can be captured. Over time accurate estimates of the culmination of mean annual increment can be made and local models adjusted.

Provincial Site Index Models were not calibrated with data from the Chilcotin. Given the importance of site index as the main drivers in growth and yield modelling, and the propensity of the lowest productivity sites in the Chilcotin, validating existing site index models is also required. The shape of existing polymorphic site index curves at the lower end of the productivity classes may require adjustment in the Chilcotin.

Site productivity for a given stand polygon or sample plot(s) representative of a stand polygon has traditionally been expressed in terms of **site index**: the height that site trees would attain at some index age. The ultimate measure of site productivity for timber production would be based on an index of potential volume production over a normal rotation, but in practice this is cost prohibitive. In practice, site index for a given stand polygon is determined from the stand polygon or plot(s) vegetation attributes of site-tree height and age indexed against a standard site index model. Therefore, the availability and appropriate application of suitable site index models is an important consideration in quantification of site productivity.



In practice, the height of a subset of the trees in a stand is used to estimate site productivity – the site trees or site height in a stand polygon. Given the inadequacy of the current forest cover to estimate site height it is recommended that YDD adopt develop a site productivity strategy.

6.1 Growth and Yield Program Development

Considering need for better growth and yield estimates YDD should consider the adoption and development of a growth and yield program to that will:

- Provide a network of reliable permanent samples plots that reflect the local stand and site conditions for future long term growth and yield modelling
 - At a minimum a plot network should take into account the important BEC subzones, important forest types and age and productivity classes. It is recommended that a minimum of 5 plots be allocated within each cell of the resulting matrix.
 - Develop a carefully planned PSP strategy that addresses
 - Required growth trend data to verify existing model estimates
 - Supplemental data to be used for ecological assessments
 - Provide tree and stand level data suitable for calibrating growth and yield models
 - Data storage and retrieval and analysis procedures
 - PSP Value mapping and protection
 - Utilize existing provincial plot designs and data measurement standards
- Verify the suitability of existing Site Index and Growth Intercept Models for Pine types on the West Chilcotin Plateau
 - Little data from Chilcotin Plateau forest stands was used in the development of Site Index Models and Growth Intercept Models. A purposive project to evaluate these models is needed.
- Adopt and develop a Site Productivity Plan that includes evaluation of current SPAWG PEM mapping to provide a link to better site index information on the lanbase.
 - Explore Site Index Adjustment with the Cariboo Region SPAWG group.
- Look for shared development opportunities between local licensees and growth and yield organizations
 - Share Specific Project Costs with Licensees on similar lanbase
 - Join and Leverage Growth and Yield expertise from SIGGY



- Explore the opportunities for utilizing existing TSA Wide VRI Phase 1 timber emphasis plots – Samples may help define the better allocation of PSP's based on timber types and volume estimates.
- Expand Current Fertilization and Escapement Trials to include managed stands

6.2 Inventory

Although beyond the scope of analysis for this project the consultant has included a cursory examination of the current forest cover inventory of the Anahim Block. It is the opinion of the consultant that the current forest inventory requires a pre-inventory analysis and needs assessment to plan for an inventory that would address the many needs and concerns of integrated forest management planning in the Anahim Block.

A Pre-inventory Analysis should be conducted across the Anahim block utilizing VRI Phase 1 ground plots and provide a tabulated comparison of the forest cover data versus measured field data. In addition, more in-depth measurements on ecological attributes should be considered with respect to the current need for providing a reliability assessment on the existing Terrestrial Ecosystem Map coverage for the Anahim block.

Once a pre-inventory analysis has been conducted it is prudent to conduct an inventory needs assessment with the objective of synthesizing landbase objectives and inventory attributes of importance to address those objectives. Then a strategic inventory can be determined.

6.2.1 Yield Assessment

Over the past four years a number of VRI Timber Emphasis Plots were established in the Williams Lake TSA for the purposes of supporting Timber Supply Analysis AAC determination. Additional plots have been established during the last field season (2002). A second analysis is currently underway and expected completion is expected by the end of this fiscal year (March 2003). The object of this analysis is to conduct an inventory attribute adjustment to stand age, height and volume.

TDD should consider a partition of the set of VRI Timber Emphasis Plots that would be appropriate to augment a sampling program on the Tatla Block to acquire a more precise volume estimate of local timber types by:

- Query the set of available VRI Timber Emphasis Plots for the Tatla Block
- Develop a stratification of timber types important to TDD forest management activities
- Develop a sampling plan for augmenting the current data set with new data.
- Follow MSRM Attribute Adjustment Procedures for updating attributes of the Tatla Block.

7. Summary

Growth and yield and inventory needs on the Tatla block are many. For reasons discussed above the Chilcotin Plateau has not been well represented by PSP's and other growth and yield type data plots. Additionally, the inventory accuracy at a polygon level is questionable and requires assessment. Table 4 outlines the steps for each program listed and the approximate magnitude of the program in dollar value.

Table 4
Recommended Projects

Project	Project Magnitude	
Growth and Yield	Approximate Costs	
<i>Permanent Sample Plot Program</i>		\$ 210,000.00
Develop a PSP Strategy	\$ 20,000.00	
Develop a Sampling Plan	\$ 10,000.00	
Develop Data Storage and Retrieval System	\$ 50,000.00	
Develop PSP Field Program (100 plots)	\$ 130,000.00	
<i>Site Productivity</i>		
<i>Ecosystem Mapping</i>		\$ 340,000.00
Develop PEM Mapping with SPAWG (~.40/ha)	\$ 140,000.00	
<i>Site Index Adjustment Project</i>		
Develop a Site Index Adjustment Strategy	\$ 20,000.00	
Develop a Sampling Plan	\$ 10,000.00	
Develop Site Index Field Program (100 plots)	\$ 130,000.00	
Conduct Analysis	\$ 40,000.00	
<i>Site Index Model Validation Project</i>		\$ 167,500.00
Develop a Site Index Validation Strategy	\$ 20,000.00	
Develop a Sampling Plan	\$ 10,000.00	
Develop PSP Field Program (75 plots)	\$ 97,500.00	
Conduct Validation	\$ 40,000.00	
Inventory		
<i>Yield Assessment</i>		\$ 95,000.00
Assess current VRI Phase 1 Timber Emphasis Plots	\$ 5,000.00	
Develop Sampling Strategy	\$ 10,000.00	
Conduct Field Program (50 plots)	\$ 40,000.00	
Adjust Inventory Volume Estimates	\$ 40,000.00	
<i>Pre-Inventory Analysis</i>		\$ 95,000.00
Develop a Pre-inventory Analysis Strategy	\$ 20,000.00	
Develop Sampling Plan	\$ 10,000.00	
Develop Field Program (50 plots)	\$ 40,000.00	
Assess Accuracy and Precision of Current Inventory Attributes	\$ 25,000.00	
<i>Inventory Needs Assessment</i>		\$ 40,000.00
Develop an Inventory Strategy	\$ 40,000.00	
<i>Develop New or Update Inventory (costs pending previous steps)</i>		

8. Literature Reviewed

Anonymous. September 2001. Williams Lake Timber Supply Area Analysis Report. British Columbia Ministry of Forests

Anonymous. August 1999. Williams Lake Timber Supply Area Timber Supply Review; Data Package. British Columbia Ministry of Forests

Pederson, L.. January 2003. Williams Lake Timber Supply Area; Rationale for Annual Allowable Cut (AAC) Determination. British Columbia Ministry of Forests

Iverson K., March 2000. Reliability Assessment for the Punky Creek area of the Itchas-Ilgachuz TEM Project. Yun Ka Whu'ten Holdings.

Steen O.A., and R.A. Coupe. 1997. A Field Guide to Forest Site Identification and Interpretation for the Cariboo Forest Region Part 1; Land Management Handbook Number 39. Ministry of Forests, British Columbia

Williams Lake TSA Inventory Audit
(<http://srmwww.gov.bc.ca/tib/audits/williams/williamstsa.htm#glossary>)

Appendix I
Situation Assessment

Situation and User Needs Assessment

Tsi Del Del Enterprises
January 28/2003

Phase I: Situation and User Assessment

A situation assessment will help define the scope for the workshop and the needs for YKW and TDD companies. Understanding the needs for the YKW and TDD companies will target the appropriate materials for the workshop. A user requirements review will help us understand the skill level and state of readiness to embark on Growth and Yield operational plans. In addition, there may arise other concerns and needs not related to growth and yield. These items can be assessed during the pre-evaluation meeting and may become part of the workshop agenda. These phases are designed to define a baseline for the companies' current business profile and Forest Management Planning capability.

Please find below a number of questions designed to gather information about TDD's current situation and user needs on the Tatla Western Supply Block. The intent is to process the questions by the questions through a telephone interview (preferred) or by email with appropriate client personnel.

Following the interviews the information will be compiled and synthesized into part of the workshop presentation where client personnel can review the findings and/or any added information from local experts.

Situation Assessment

Business requirements

What are the Tsi Del Del Enterprises short and long term Business Goals?

What are your current forest tree products from the Landbase?

Are there plans for any new products from trees from the Anahim block?

What are other forest products or resources that are obtained from the landbase?

Landbase Objectives

What are the long term sustainable landbase objectives for the Tatla Western Supply Block?

Tenure

What is the current AAC granted under your Forest License Agreement?

What are the obligations to the landbase under the current TDD tenure agreement?

What are the current crown obligations under the current agreement?

Are there any outstanding land claims which might affect AAC determination on the Tatla Block?

What are the future plans with respect to tenure rights on the Tatla Block?

Forest Certification



Have any of the Licensees operating in the Western Supply Blocks made any plans towards Forest Certification (FSC or CSA)?

Timber Supply Analysis

Have there been any independent evaluations of Long Term Sustained Yield on the Anahim and Tatla Supply Blocks in consideration of the Landbase constraints from the LRMP?

Have there been any silviculture effects sensitivity analysis conducted on the Anahim or Tatla blocks?

Silviculture

What are the challenges facing silviculture on the Tatla Block?

Are there any fertilizer trials in the Tatla Block?

Has TDD utilized Stand Density Management Diagrams in any areas of their Silviculture work?

User Requirements

State of the Forest Inventory

When was the last inventory conducted on the Anahim and Tatla blocks?

Have there been accuracy assessments conducted on either the polygon line work or the interpreted attributes?

What is the update process used by TDD for updating the Forest Cover?

Ecosite Mapping

Has there been any ecosite mapping conducted in the Anahim or Tatla Blocks?

If “yes” to question xx, what type of mapping was conducted? (TEM or PEM)?

Were any accuracy assessments conducted on the knowledge bases?

Were any accuracy assessments conducted on the landbase?

Mountain Pine Beetle

What is the extent of Mountain Pine Beetle infestation in the Tatla Block?

What are the expected MPB infestation levels in the next year?

Have any MPB infestation surveys been conducted on the Tatla block?

GIS Capability

What is the available current Spatial Coverage’s available for the Tatla Block?

Growth and Yield

How many Permanent Sample Plots are in the Tatla Blocks?

How many SIBEC plots are in the Tatla Block?

Is the TDD aware of the Site Productivity efforts by various Licensees in the Caribou Region?

Other Researched G&Y Information:

PSP Data on the landbase and similar Subzones

TSP – Veg, G&Y

Site Index Models

Growth Intercept Models

Site Productivity Ratings

Other Growth and Yield Models in use (VDYP TIPS Y)

Regional Strategies

Industry Strategies

How does TDD intend on carrying out Growth and Yield Related projects in the future?

Monitoring

Are there any monitoring protocols in place?

Current or new landbase projects

Name/list current or new projects on the Tatla Blocks with might provide a growth and yield program with stand or landbase level information.

Shared Development Projects

Are there any shared development projects ongoing with any other agencies (Forest Cover Updates, other purposive surveys)?

Appendix II
Information Review

<u>Current PSPs</u>	
PSPs	4 PSP's on the Chilcotin Plateau
Outstanding Issues	Lack of data
<u>Current SI sources</u>	
natural stands (e.g., inventory Site Index)	Cariboo Region FIP inventory file
Outstanding Issues	Provincial Site Index Curves – no data form Chilcotin Plateau Growth Intercept Models – no data form Chilcotin Plateau
<u>Forest inventory</u>	
type, standard (e.g., photo-based)	Various updates – no local attribute reliability assessment Anahim Block updates (mainly 1987, 1991)
ground attributes (e.g., density)	No reliable estimates of density or site index
<u>Other relevant plot data</u>	
VRI Phase I Timber Emphasis Plots	VRI Phase One plots exist in the TSA that cover parts of the Tatla Block - This data is readily available to TDD – An investigation of this data should be completed to investigate its utility.
<u>Current direct SI tools</u>	
ht/age models (e.g., std LFS curves)	Std MoF
GI	Standard MoF, no plots from Chilcotin Plateau
<u>Current indirect SI tools</u>	
Type, Source (e.g., SIBEC, MoF)	SIBEC – limited reliability in Chilcotin Plateau
Inventory link (e.g., eco-mapping)	Only Partial eco mapping exists in the North West portion of the block.
new developments	The SPAWG Group – New PEM – Application area as yet unspecified – TDD could benefit from leveraging SPAWG PEM model

	development.
issues	No Site Index Adjustment process has been developed by SPAWG. TDD could benefit from SPAWG's work in the future.
<u>Current Eco-mapping</u>	
Source (TEM Mapping)	Non available
new developments planned	None at this time.
<u>Silviculture</u>	
General issues	Regeneration of low productive nutrient deficient sites – little information on early managed stand performance
fertilization	Series of three trials on fertilization of natural regen sites (Rob Brockley) Need study on fertilization of managed stands
density mgmt	No protocols in place
<u>Shared development potential</u>	
Projects	Fertilization Trials
formal organizations (e.g., co-ops)	Not SIGY member
GI Model Evaluation	TDD and YKW could benefit by sharing a project to check existing GI models for the Chilcotin Plateau
other relationships (e.g., other orgs/individuals)	CFS, MoF, UBC staff, Consultants