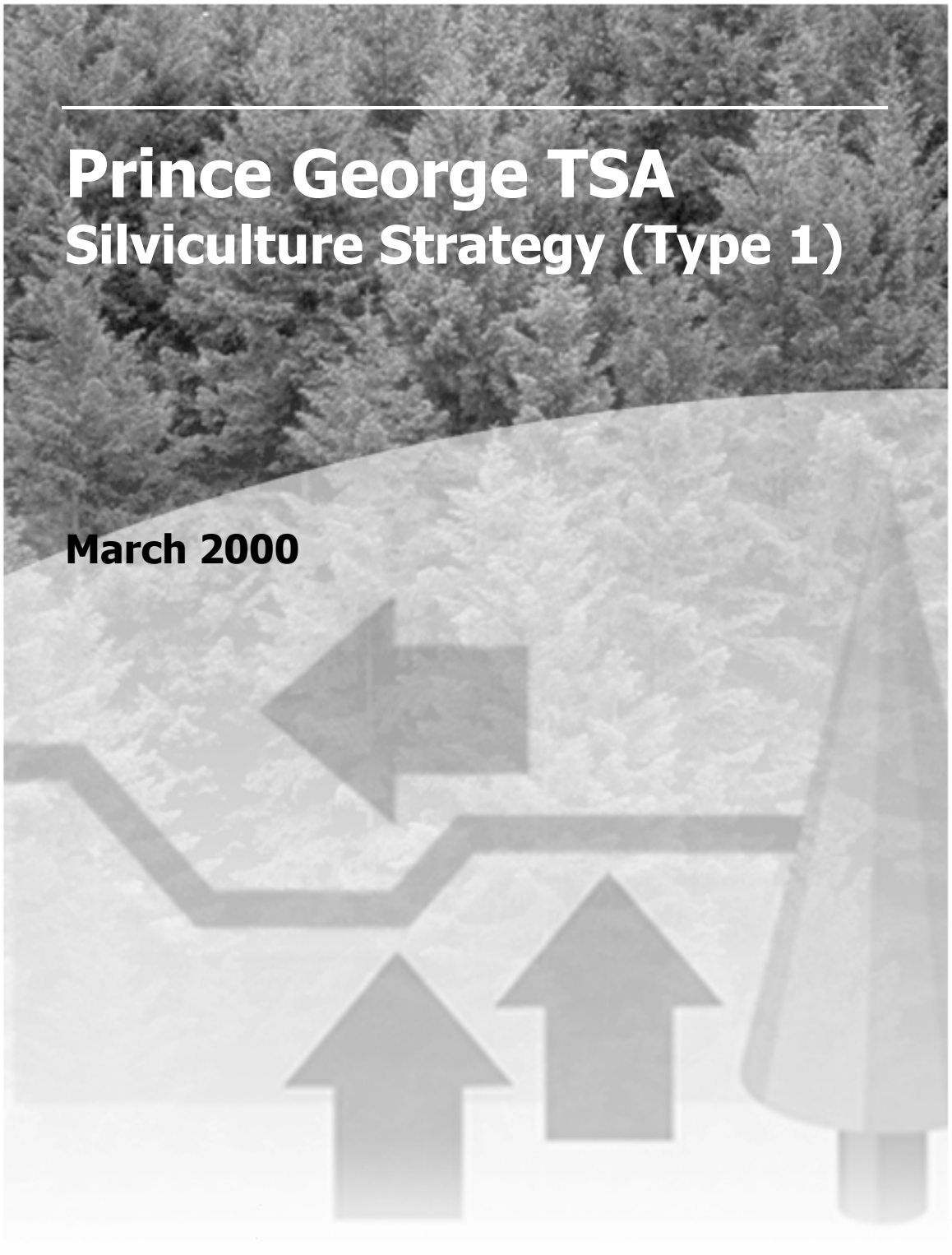
Prince George TSA
Silviculture Strategy (Type 1)

March 2000



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The consultants also wish to thank the participants in the workshop whose contributions are the basis of this strategy.

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Preface

The development of silviculture strategies for TSAs and TFLs is motivated by the desire to clarify the relationship between investments in silviculture and the critical forest-level issues specific to the management unit.

The Type 1 analysis is workshop-based. It draws on the expert knowledge of the participants to identify the critical issues, derive objectives with respect to those issues, specify regimes to meet those issues, and identify the regime activities that can be implemented in the next five years. After consideration of the benefits and costs of each of the activities on each of the forest-level objectives, the participants rank the silviculture activities by priority. The result is a prioritized list of silviculture activities that are explicitly linked to the critical issues of the management unit.

Type 2 analyses are model-based, but the analysis process is fundamentally identical to the Type 1 analysis. A forest-level model is used to evaluate the impacts of regimes on the forest-level objectives, to identify the silviculture activities constituting the "preferred management scenario", and to rank those activities.

The Type 2 (model-based) analysis will result in a silviculture strategy that is considerably more appropriate and robust than the Type 1 approach, but it is more expensive and demanding of scarce modeling expertise. Hence the Type 1 (workshop-based) approach has been designed to produce an interim silviculture strategy that will serve until a Type 2 analysis can be completed.

In the absence of a silviculture strategy for a management unit, the Ministry of Forests' provincial level strategy *Incremental Silviculture Strategy For British Columbia (Interim)* has provided interim guidance. A summary of this document is included as an appendix to this report.

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Strategy Summary

While many issues were proposed and discussed in the workshop, the participants focused on 5 issues: the projected shortfall in mid-term timber supply, backlog NSR and impeded stands, Western Gall Rust, repressed pine, and timber quality.

Elements of the Strategy

Issue 1: Potential Gaps in Mid-term Timber Supply

Currently there is no mid-term fiber supply shortfall forecast for the Prince George TSA. There are localized shortfalls, however, which are forcing large scale spatial shifts in industrial operations. Treatments to address this issue are intended to either move stands up in the harvest queue or to increase volumes in stands that are likely to be harvested in the mid-term period.

Thin and fertilize moderately repressed 40-70 year-old pine stands (currently in the THLB)

A thinning program of 200 ha/yr for the next 10 years was proposed. A study was also recommended by workshop participants to investigate the effects on fertilizing these stands (or applying multiple fertilizer treatments alone).

Survey and reclassify old Intermediate Utilization (IU) harvest units

Many areas harvested either to intermediate utilization standards (circa 1963-1970) and those harvested earlier under a variety of partial cutting regimes have uncertain stocking and rates of growth. These areas should be surveyed and if appropriate reclassified. Benefits of this strategy include increases to the THLB, increases in MAI through accelerated conversion to more productive stands, and increased harvest flexibility in the mid-term. There are approximately 25,000 ha of old harvesting units remaining in this category, approximately 16,000 of which can be dealt with through re-classification.

Fertilize thrifty juvenile stands on 10-year cycle

Fertilizing stands currently 20-40 years old on a repeat cycle of 10 years will make these stands available for harvest sooner. Target stands include spruce and pine stands on medium and good sites. The opportunity for implementing this treatment regime is estimated to be 300 ha/yr over the next 10 years.

Pre-commercial thin to set up mid-term commercial thin treatments

Commercial thinning in the mid-term may be a good way to increase harvesting flexibility by making more volume available for harvest. In many stands, a pre-commercial thin treatment now can create optimum conditions for commercial thinning later. The workshop estimated that 2400 ha could be treated annually over the next 10 years. The target stands for this strategy are pine stands on medium and good sites that are currently 15-20 years of age.

Fertilize thrifty pole-sized stands on 10-year cycle

Fertilizing stands currently 40-60 years old on a repeat cycle of 10 years will provide additional volume when these stands are harvested in the mid-term. The workshop estimated 300 ha could be treated annually over the next 10 years.

Issue 2: Addressing Backlog Stands

Backlog Surveys

A program of 66,000 ha per year will facilitate planning of the needed treatments.

Backlog Reforestation

A program to initiate a site prep/plant/brush sequence is required at a rate of 1800 ha/yr. This rate is faster than that currently assumed in TSR and may increase harvesting flexibility in the late mid-term and early long term.

Treat Backlog Impeded

A program of 9200 ha/yr of brushing and spacing (pre-commercial thinning) is required (5000 ha/ yr in Prince George District, 2000 ha/yr in Vanderhoof District and 2200 ha/yr in Ft. St. James District).These treatments will ensure that currently established stands are meeting the expectations already assumed in TSR.

Enhance Structure of Aspen Stands

Backlog stands that have regenerated to aspen and have been accepted as aspen stands at least for the current rotation can be enhanced for volume production either by under-planting with spruce or by planting spruce in canopy voids. A program of 150 ha/yr is thought to be possible.

Enhance Intermediate Utilization (IU) Sites

IU sites that are otherwise satisfactorily restocked, but still have stocking gaps, may be enhanced through fill planting. A program of 150 ha/yr is thought to be possible.

Issue 3: Forest Health

Strategies to protect forest health are intended to maintain conditions favorable for maximizing timber production.

Reduce Risk of Western Gall Rust Losses

Stands heavily infected with western gall rust can be treated to reduce impacts of branch infections that will eventually be engulfed in the bole of the tree. Pruning infected branches will reduce losses. A program of up to 150 ha/yr is thought possible, spread primarily within the Ft. St. James and Vanderhoof Districts.

Issue 4: Lodgepole Pine Repression

Density related repression of lodgepole pine reduces volume production by dramatically slowing stand development.

Increase THLB – Prince George District

Approximately 500 ha/yr of 30-40 year-old fire origin pine stands can be surveyed, with a decision to be made as to either leave it to grow or to initiate rehabilitation treatments. It was estimated that approximately 300 ha of each 500 surveyed would be left and scheduled for an early harvest as pulpwood.

Strategy: Increase THLB – Vanderhoof District

Approximately 1500 ha/yr of 30-40 year-old fire origin pine stands can be surveyed, with a decision to be made as to either leave it to grow, treat it, or to initiate rehabilitation treatments. Of this, it is estimated that 900 ha/yr will be reclassified and left to grow, 300 ha/yr will be thinned and fertilized, and 300 ha/yr will be rehabilitated. All areas will be returned to the THLB either through reclassification of site or improvement of site through treatment.

Issue 5: Timber Quality

Strategies to address timber quality were given minimal consideration by the workshop. It was recognized that density management treatments in other strategies listed above would have impacts on timber quality, particularly on piece size and fibre quality. Only one strategy targeted wood quality:

Strategy: Prune to produce clear lumber

Trees pruned to produce clear lumber have the potential then to yield higher stumpage values than non-pruned trees. Expected benefits from a conservative pruning program also include short term employment and future product diversification. A program of 170 ha/yr was suggested by the workshop.

Tactical Priorities

The tactical priorities set by the participants represent a balance between the participant's strategic objectives for the management unit and the silvicultural opportunities available on the TSA in the next 5 years.

The highest ranked activities are surveying and reclassifying backlog NSR, and brushing and spacing impeded backlog SR. Treating backlog is necessary to maintain the timber harvesting land base as represented in the TSR, and impacts long term timber supply.

The next priority identified by the participants was surveying and reclassifying old intermediate utilization sites. The fourth-ranked strategy was pre-commercial thinning 15-20 year old pine on good and medium sites, as preparation for subsequent commercial thinning.

Table S-1 lists activities identified by the participants and the rank (priority) assigned to each activity.

Table S-1. Silviculture treatments and areas selected by the workshop participants

Activities/Treatments		Opportunity (ha/year)	Workshop Rank
Mid-term gap in fibre supply			
	PCT and/or fertilizing (repressed Pl)	200	11
	Surveys	5000	
	Reclassification and harvesting	3200	3
	Pre-commercial thinning	2400	4
	Fertilizing thrifty juvenile stands	300	10
	Fertilizing thrifty pole-size stands	300	10
Backlog NSR			
	Surveying and reclassifying	66000	1
	Site preparation, planting, brushing	1800	2
Backlog Impeded Stands			
	Brushing, spacing (PDFD)	5000	1
	Brushing, spacing (VFD)	2000	1
	Brushing, spacing (FSJFD)	2200	1
	Site preparation, fill planting (aspen)	150	8
	Site preparation, fill planting (old Intermediate Utilization blocks)	150	8
Forest Health (Western Gall Rust)			
	Pruning infected branches	150	7
	Monitoring	TSA	6
Repressed Pine			
PGFD	Surveying	500	5
	Reclassifying	300	5
	Rehabilitating and planting	200	5
VFD	Surveying	1500	
	Reclassifying	900	5
	Thinning, fertilizing	300	5
	Rehabilitating and planting	300	5
Timber Quality			
	Pruning	170	12

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1. Introduction

The Silviculture Strategy (Type 1) workshop draws on the expert knowledge of the participants to identify the key issues that should guide silvicultural planning on the TSA, derive objectives with respect to those issues, specify regimes to meet those issues, and identify the regime activities that can be implemented in the next five years. The key idea is that this line of logic from issues to silvicultural activities can be retraced when evaluating funding levels, ensuring that activities are funded that address critical TSA issues.

The first step in developing this line of logic is to identify the key issues that should guide silvicultural planning on the TSA. Next, the participants' objectives with respect to these issues are clearly stated. Strategies for meeting these objectives are identified, together with the silvicultural target (stand types) to which these strategies are to be applied. A plan of action, most often a silvicultural regime, is then developed to implement each strategy. This sequence constitutes the "strategic analysis" part of the workshop and the resulting compilation of issues, objectives, strategies and regimes is the silviculture strategy.

After developing the strategy, the workshop identifies opportunities to implement the regimes in the next five years and develops a program of silvicultural activities that is consistent with the strategy and is feasible with respect to the operational realities of the TSA. The impacts of these silvicultural activities on selected objectives are estimated by the workshop participants, and in a final step, the activities are ranked as to their importance with respect to the TSA issues. Development of the 5-year plan of silvicultural activity and estimating impacts and evaluating ranks of the activities constitutes the tactical analysis part of the workshop.

This report documents the results of a workshop to develop a strategy and a 5-year plan for the Prince George TSA. Following this introduction, section 2 summarizes the results of the strategic analysis and section 3 presents the analysis of the 5-year plan. Issues that influence silviculture planning on the TSA were obtained from a questionnaire sent to the District, the most recent Resource Management Plan, and other documents identified by the District. These issues were compiled prior to the workshop and are described in Appendix 1.

Appendix 2 contains an examination of the timber supply situation on the TSA, also prepared prior to the workshop, as some aspect of timber supply is often a guiding issue for silviculture planning. The treatment of timber supply in this report is cursory relative to sections prepared for other Type 1 workshops conducted in 1999-2000 because the TSR timber supply analysis is out-of-date and lacks information specific to the three districts comprising the TSA. However, information was obtained in the workshop from Ministry staff who were participating in the current TSR and which enabled discussion of the silviculture benefits to the timber supply of the TSA.

2. Analysis of Issues and Strategies

This section identifies the critical issues that guide silviculture planning in the Prince George TSA and the strategies developed in the workshop for addressing them. The issues prepared prior to the workshop (Appendix 1) were reviewed by the participants and categorized as

- not an issue or not addressable with silviculture actions,
- addressable with silviculture activities, or
- requiring investigation prior to undertaking silviculture actions.

The participants analyzed issues that could be addressed with silvicultural actions, by identifying objectives with respect to each issue, strategies for meeting the objectives, the target stand types, and a list of activities to implement each strategy. These elements are tabulated in Table 2-1 for the issues analyzed by the workshop, and are examined in more detail in sections 2.1 –2.5 below. Some issues, which were deemed to be outside the scope of the workshop (i.e., ineligible for Forest Renewal BC funding), are discussed in section 2.6.

Issues that were identified as requiring investigation prior to silvicultural action are discussed in section 2.7.

2.1 Issue: Potential Gaps in Mid-term Timber Supply

Currently there is no mid-term fiber supply shortfall forecast for the Prince George TSA. There are localized shortfalls, however, which are forcing large scale spatial shifts in industrial operations. There are also some indications that mid-term conditions for the TSA as a whole will limit early capture of the potential long term benefits that are yet to be calculated based on OGSI adjustments and genetic gain. Treatments to address this issue are intended to either move stands up in the harvest queue or to increase volumes in stands that are likely to be harvested in the mid-term period. Both strategies will increase harvest flexibility in the mid-term by increasing the volume of timber that is available for harvest.

Strategy: Thin and fertilize moderately repressed 40-70 yr-old pine stands (currently in the THLB)

The full potential for this treatment is not yet known. Conservative estimates for thinning alone, which is currently being carried out on a limited basis in the Fort St. James District, are that stands will be available for harvest two decades earlier than with no treatment. A thinning program of 200 ha/yr for the next 10 years would provide 2000 ha for harvest in the mid-term that would not otherwise be available.

A study has been recommended by workshop participants to investigate the effects on fertilizing these stands (or applying multiple fertilizer treatments alone). If the stands show a standard fertilizer response, there is the potential for an extra 10-15 m^3/ha for each fertilizer application.

If in addition to the standard response there is an effect of helping the stand to overcome density related repression as has been observed in some younger stands, the benefits could be much greater. Potentially, MAI for the remainder of the rotation in these stands might be doubled.

Strategy: Survey and reclassify old Intermediate Utilization (IU) harvest units

Many areas harvested either to intermediate utilization standards (circa 1963-1970) and those harvested earlier under a variety of partial cutting regimes have uncertain stocking and rates of growth. Some are growing well, are not adequately recognized in the inventory, and will be available for harvest in the mid-term. Others which are growing poorly still have sufficient volume for harvest either now or in the mid-term; harvesting these stands provides greater flexibility in harvesting the rationed old growth. Some stands are now so poorly stocked (insufficient trees of an ecologically suitable species) that a total rehab treatment will both increase the productivity of the stand and produce a harvestable crop sooner – these stands should be scheduled for prompt treatment.

Benefits of this strategy include increases to the THLB (where stands are either misclassified as having a low site index or have insufficient stocking to produce minimally harvestable volume), increases in MAI through accelerated conversion to more productive stands, and increased harvest flexibility in the mid-term. There are approximately 25,000 ha of old harvesting units remaining in this category, approximately 16,000 of which can be dealt with through re-classification.

Strategy: Fertilize thrifty juvenile stands on 10-year cycle

Fertilizing stands currently 20-40 years old on a repeat cycle of 10 years will make these stands available for harvest sooner. Target stands include spruce and pine stands on medium and good sites. Assuming a conservative volume gain of 10 m^3/ha for each treatment, an average MAI of 4 m^3/ha/yr, and four fertilizer treatments, stands will be ready for harvest with the same volumes 10 years earlier than without treatment. A program which initiates this treatment regime on 300 ha/yr over the next 10 years would provide 3000 ha that is available for harvest one decade sooner than without treatment.

Strategy: Pre-commercial thin to set up mid-term commercial thin treatments

Commercial thinning in the mid-term may be a good way to increase harvesting flexibility by making more volume available for harvest. In many stands, a pre-commercial thin treatment now can create optimum conditions for commercial thinning later. A program of pre-commercially thinning 2400 ha/yr over the next 10 years would create a situation where 24,000 ha could be commercially thinned in the mid-term, with each hectare yielding approximately 100 m^3/ha of thinning volume. Target stands for this strategy are pine stands on medium and good sites that are currently 15-20 years of age.

Strategy: Fertilize thrifty pole-sized stands on 10-year cycle

Fertilizing stands currently 40-60 years old on a repeat cycle of 10 years will provide additional volume when these stands are harvested in the mid-term. This will provide increased flexibility in harvest scheduling of the rationed old growth. Assuming a conservative gain of 10 m^3/ha for each treatment and four treatments, each hectare treated will provide an extra 40 m^3. A program which initiates this treatment regime on 300 ha/yr over the next 10 years is expected to result in an extra 120,000 m^3 of available volume during the mid-term.

2.2 Addressing Backlog Stands

Treatment of backlog stands is viewed as a mandatory program, and assumptions for completion have already been included in TSR. For the most part there will be no timber supply gains per se; the benefits will be in maintaining the conditions that are already assumed. To a small degree, however, there may be some timber supply benefits in accelerating the backlog program over the

TSR assumptions; earlier treatment will result in earlier availability for harvest. There may also be small gains through improvement of stocking conditions beyond those assumed.

Strategy: Backlog Surveys

A program of 66,000 ha per year will facilitate planning of the needed treatments.

Strategy: Backlog Reforestation

A program to initiate a site prep/plant/brush sequence is required at a rate of 1800 ha/yr. This rate is faster than that currently assumed in TSR and may increase harvesting flexibility in the late mid-term and early long term.

Strategy: Backlog Impeded

A program of 9200 ha/yr of brushing and spacing (pre-commercial thinning) is required (5000 ha/ yr in Prince George District, 2000 ha/yr in Vanderhoof District and 2200 ha/yr in Ft. St. James District).These treatments will ensure that currently established stands are meeting the expectations already assumed in TSR.

Strategy: Enhancement of Aspen Stands

Backlog stands that have regenerated to aspen and have been accepted as aspen stands at least for the current rotation can be enhanced for volume production either by under-planting with spruce or by planting spruce in canopy voids. In both situations, the successive conifer rotation will be shortened by 10-30 years due to the use of an already-established crop. A program of 150 ha/yr is thought to be possible.

Strategy: Enhancement of IU Sites

IU sites that are otherwise satisfactorily restocked, but still have stocking gaps, may be enhanced through fill planting. This would potentially lead to improved volume growth - currently many of these sites have reduced volume projections due to poor stocking. A program of 150 ha/yr is thought to be possible.

2.3 Issue: Forest Health

Strategies to protect forest health are intended to maintain conditions favorable for maximizing timber production. Avoiding pest problems will help maintain productivity levels already assumed in TSR, thus no gains per se are expected.

Strategy: Reduce Risk of Western Gall Rust Losses

Stands heavily infected with western gall rust can be treated to reduce impacts of branch infections that will eventually be engulfed in the bole of the tree. Such infections reduce lumber yield and can cause tree mortality. Pruning infected branches will reduce losses. A program of treating 150 ha/yr is thought possible, primarily in Fort St. James and Vanderhoof Forest Districts.

Strategy: Forest Health Hazard Mapping

A project to enhance current efforts in mapping forest health hazards is needed to improve both silvicultural planning specifically and forest management planning generally. This is a risk management function needed to help both direct and protect forest investments.

2.4 Issue: Lodgepole Pine Repression

Density related repression of lodgepole pine reduces volume production by dramatically slowing stand development. Stands with light and moderate levels of repression are still included in the THLB, but projected volume production is well below site potential (a reduction in apparent SI50 from 20 to 15 will result in roughly a 50% loss in MAI). Stands with high levels of repression may be excluded from the THLB due to a low apparent site index, even though potential SI50 may be 18 or more.

Strategy: Increase THLB – Prince George District

Approximately 500 ha/yr of 30-40 year-old fire origin pine stands can be surveyed, with a decision to be made as to either leave it to grow or to initiate rehabilitation treatments. It was estimated that approximately 300 ha of each 500 surveyed would be left and scheduled for an early harvest as pulpwood. The benefits of this treatment would be an immediate increase in the THLB through rehab treatments (approx, 200 ha/yr for 10 years) with a further 3000 ha being returned to the THLB as pul,pwood stands are harvested over a time horizon of 10 to 50 years. Volume harvested as pulpwood from these stands (80-120 m^3/ha) would increase harvest flexibility in the rationed old growth.

Strategy: Increase THLB – Vanderhoof District

Approximately 1500 ha/yr of 30-40 year-old fire origin pine stands can be surveyed, with a decision to be made as to either leave it to grow, treat it, or to initiate rehabilitation treatments. Of this, it is estimated that 900 ha/yr will be reclassified and left to grow, 300 ha/yr will be thinned and fertilized, and 300 ha/yr will be rehabilitated. All areas will be returned to the THLB either through reclassification of site or improvement of site through treatment.

2.5 Issue: Timber Quality

Strategies to address timber quality were given minimal consideration by the workshop. It was recognized that density management treatments in other strategies listed above would have impacts on timber quality, particularly on piece size and fibre quality. A range of post-PCT densities was recognized as desirable to ensure at least a small component of future harvests in large logs. It was also recognized that low densities, particularly in lodgepole pine, can lead to low fibre quality by maintaining a high proportion of juvenile stemwood. These, however, are issues requiring no specific program of treatments. Only one program of treatment was targeted specifically at wood quality:

Strategy: Prune to produce clear lumber

Clear lumber is commonly valued 3-4 times greater than similar wood containing knots. Trees pruned to produce clear lumber have the potential then to yield higher stumpage values than non-pruned trees (although regimes to prune trees in interior BC stands are typically financially non-viable or highly risky). Expected benefits from a conservative pruning program include short term employment and future product diversification. A program of 170 ha/yr was suggested by the workshop.

2.6 Ineligible (for FRBC funding) Issues Raised in Workshop

Several issues were raised and discussed in the workshop that were determined to be outside the mandate of the workshop (FRBC-fundable projects):

Stocking Effects on Harvest Flexibility

A workshop participant raised the issue of stocking targets for both current and backlog reforestation, suggesting that higher stocking levels than are typically being currently applied will increase harvest volumes and decrease culmination ages. For example, test runs with TIPSY suggest that for a lodgepole pine stand with an SI50=20, increasing free growing targets from 1200 to 1800 trees/ha would result in an 0.4 m^3/ha/yr (8%) increase in CMAI, and decrease culmination age by 8 years. Benefits would include increased harvest flexibility and a higher LTHL.

Current Commercial Thinning

A demand for current commercial thinning opportunities was recognized, primarily for the purposes of employment. This was acknowledged as a niche treatment in 50-60 year-old pine stands, with minimal opportunities for application. Potential impacts on mid term harvest flexibility need to be explored.

Optimize timber production on current harvest units

An intensive regime of treatments was suggested to accelerate volume production on current harvest units, with the objective of increasing harvest flexibility in the mid term. A regime was suggested that included planting improved seed, fertilizing on a 5 year cycle throughout the rotation, commercial thinning at age 40 and harvesting at age 60. It was suggested that such a regime could both provide volume in the mid-term that would otherwise be unavailable, and increase MAI by 2 m^3/ha/yr.

Current Commercial Thinning with Fertilization

A program of commercial thinning over the next 5 years combined with fertilizer treatments in the thinned stands was suggested to improve harvest flexibility in the mid-term. Volumes removed from stands in the short term would improve options for rationing old growth, and volumes removed from the thinned stands could at least partially replaced with fertilizer treatments. Target stands for current CT treatments would be 60-80 year-old pine stands on medium and good sites with 800-1200 trees/ha. Final harvest would occur 20-40 years in the future.

Table 2-1. Silvicultural strategies to mitigate the critical TSA issues determined by the workshop

Issue Name	Issue Description	Objective	Strategy	Target	Activities	Area (ha/yr)
Mid-term gap in fibre supply	Localized shortfalls are forcing large scale spatial shifts in industrial operations	Make more volume available in mid-term by either moving stands up in harvest queue, or increasing volume yields	Thin and fertilize	moderately repressed 40-70 yr pine stands (currently in THLB)	Thinning	**200**
			Survey and reclassify	old Intermediate Utilization (IU) harvest units	Survey	25,000 ha
					Reclassify	16,000 ha
			Fertilize thrifty juvenile stands	20-40 yr old Sx, Pl in aPGFD, on medium and good sites	Fertilize on 10-yr cycle	300
			Pre-commercial thin to set up for commercial thinning	15-20 yr old Pl on medium and good sites	Pre-commercial thin	2400
		Increase volume yields	Fertilize thrifty pole-size stands	40-60 yr old Sx and Pl stands in PGFD on medium and good sites	Fertilize on 10-yr cycle	300
Backlog	Treatment of backlog is mandatory and already assumed in TSR--a "must do" for the District.	Eliminate all existing backlog NSR	Backlog surveys and reclassification	Areas labelled backlog NSR?	Survey and reclassify	66,000
			Backlog reforestation	Areas surveyed and classed backlog NSR	Site preparation, planting, brushing	1800
		Ensure all existing backlog impeded stands reach FG	Treat backlog impeded	Backlog impeded areas in PGFD	Brush, space	5000
				Backlog impeded areas in VFD	Brush, space	2000
				Backlog impeded areas in FSJFD	Brush, space	2200
				aspen stands	site prep, plant under canopy or in voids	150
				Old Intermediate Utlilization logging sites	site preparation, plant under canopy or in voids	150
Forest Health (Western Gall Rust)	Losses to Western Gall Rust	Reduce risk of Western Gall Rust	Reduce impacts of branch infections	pre-87 SR pine in FSJFD and VFD	Prune infected branches	150
			Map risk due to forest health hazards	Managed stands	Pest and disease monitoring	TSA
Repressed Pine	Density-related repression may reduce stand productivity so that stands are netted out of the THLB	Increase THLB by treating repressed Pli stands to make them operable	Prince George FD: Survey, and either reclassify or rehabilitate	30 - 40 yr old fire origin pine	Survey	500
					Reclassify, bring into THLB, early harvest	300
					Rehabilitate and plant	200
			Vanderhoof FD: Survey, and either reclassify or rehabilitate	30 - 40 yr old fire origin pine	Survey	1500
					Reclassify, leave to grow	900
					Thin, fertilize	300
					Rehabilitate and plant	300
Timber Quality	Clear lumber is about 3 or 4 times greater than similar wood containing knots	Diversify log products from TSA by producing small amounts of clear lumber		Pine	Pruning	170

2.7 Issues Requiring Investigation

Issues that were identified by the participants as requiring investigation prior to silvicultural action are listed in Table 2-2. The participants assigned a rank to each topic reflecting the consensus priority.

Table 2-2. Issues requiring investigation (the "to-do" list).

Topic	Rank
OAF study for plantations	**1**
Concern was expressed about the use of Provincial default OAF 1 values for TSR yield determinations using TIPSY for managed stands. A sampling strategy is required to obtain locally accurate OAF 1 estimates. This will serve a dual purpose: a) it will provide better estimates of local managed stand yields for use in TSR, potentially stratified by stand type, ecosystem unit or year of stand origin (i.e. pre 1983, 1983 to 1987, post 1987). b) it has the potential to affect reforestation practices (current and backlog sites) by highlighting areas of concern related to stocking and associated yield impacts.	
Growth and yield of managed stands for pure and mixed stands	**1**
A program is needed to establish permanent sample plots for growth and yield in managed stands. No such program currently exists. Data sets are required to monitor growth in pure and mixed species/complex stands at stocking levels similar to those currently being established in managed stands – such stands are rare in the existing data sets predominated by natural stands. This data is necessary for calibration/validation of models such as Prognosis^{BC} and MGM.	
Improved SI estimates for disturbed sites	**2**
Concern was expressed about the accuracy of SI data for disturbed sites. Better SI data is required on most openings so that accurate estimates of managed stand yields can be determined in the TSR process, and appropriate silviculture investment decisions can be facilitated. For units in which surveys are scheduled in the near future, this means ensuring that appropriate data is collected and the best available method of SI estimation is used. It was also suggested that the method of SI estimation be recorded and tracked to provide indications of reliability. For stands which are not scheduled for surveys in the near future (i.e. free growing stands), other methods will be required.	
Validation and improvement of growth intercepts	**2**
Concern was expressed regarding the accuracy of growth intercept measures of SI estimation, particularly for white spruce. ***An investigation is required into the need for further sampling to improve Growth Intercepts***.	
OGSI paired plots; local paired plots required	**2**
Concern was expressed about the localized (TSA) use of OGSI corrections derived from broad (provincial) scale averaging of data. ***An investigation into the need for localization of OGSI corrections is required.***	
Improved data tracking and inventory updates;	**3**
Concern was expressed regarding the lack of links between the silviculture reporting system (ISIS) and the inventory system. In particular, SI data from silviculture surveys is not always being transferred into the inventory system, and where transfer does occur there are often delays of several years. ***A methodology is required to ensure that inventory updates based on silviculture survey information are carried out promptly.***	
ISIS audit	**3**
Concern was expressed about the accuracy of information in the ISIS database, in particular related to areas (sum of strata not equal to total) and disparities between opening files and ISIS records. ***An audit of the ISIS database is required to assess potential impacts of planning errors that could result from erroneous information, and to recommend improvements to the data management system.***	
Repressed 40-70 year old fire origin pine, thinning and fertilization trial.	**4**
The practice of thinning 40-70 year old repressed pine stands has been viewed as risky from an investment stand point due to doubts about treatment response. There is some indication that fertilizer applications can dramatically improve treatment gains. ***A controlled trial is required to assess efficacy of thinning and fertilization treatments.*** Monitoring of disease (stem rust) effects in such trials was also suggested.	

Fertilization trials in white spruce stands.	**4**
There is widespread interest in fertilizing white spruce stands, but few response trials have been established. ***There is a need for white spruce fertilizer response data for all stand ages.*** Monitoring is also required to asses interaction of fertilizer application with pests of white spruce, in particular with the white pine weevil but also with small mammal damage.	
Monitor intensive fertilization/CT regimes.	**4**
An increase in commercial thinning is expected in the near future, providing opportunities for potential gains in mid-term timber supplies through fertilization. ***Controlled trials are required to asses fertilizer response in commercially thinned stands (all species)***.	
Studies to collect better SIBEC data	**5**
Accurate SI estimates are required for making informed decisions on silvicultural investments and for properly forecasting future timber supplies. In many stands, the only source of SI estimates is through correlation with site series. Currently, these relationships are weak or non-existent for many ecosystem units. ***More data collection is required to improve SI estimates for those sites that are currently poorly supported in the SIBEC database***.	
Inventory audit/ VRI - check heights	**5**
Concern was expressed, particularly from the Vanderhoof District, that height estimate errors in the inventory are leading to errors in estimating yields of existing stands projected using VDYP; an audit is required to asses the magnitude of this problem. The problem may also be adequately addressed during VRI sampling, although a VRI has not yet been scheduled.	
ESSF establishment and growth	**6**
Concern was expressed with regard to regeneration performance in high elevation stands. While some studies have been conducted, more work is required to assess growth rate expectations for these stands in the ESSF zone. Of particular concern is for projected times (years) to green-up height.	

Notes to Workshop Participants (from Craig Farnden):

On further reflection after the workshop, and including some preliminary discussions with recognized experts, I recommend the following modifications to the To-Do list:

1. Eliminate the item labeled "Validation and improvement of growth intercepts". Discussions with Gord Nigh (MoF Research Branch) indicate that there are only very limited refinements that can be made in the current equations, even with considerable sampling. Future improvements may be possible, but only by including additional parameters to the equation. Such a step is a provincial scale initiative, and no such proposals/methodologies have currently been put forward.

2. Reduce in rank (to 5) the item labeled "OGSI paired plots; local paired plots required". Discussions with Gord Nigh (MoF Research Branch) and Albert Nussbaum (MoF Timber Supply Branch) indicate that yes, more localized refinements to OGSI adjustments are possible, but there should be little immediate demand. OGSI adjustments affect only managed stand yield projections, and in most cases have no impact on short term harvest forecasts. Compared to currently available OGSI adjustments, the improved information provided by further sampling would primarily refine prediction of the LTHL, with minor adjustments possible in mid term forecasts. There is little if any opportunity to impact current practices or short term supply projections.

3. Reduce in rank (to 4) the item labeled "Improved data tracking and inventory updates…".While it is important to get accurate information from surveys into the inventory, delays in doing so have no impact on current practices. The largest impact of outdated information in the inventory is to predictions for the LTHL, with only minimal impacts if any on short term harvest level projections. Where the data exist, it is probable

they will make it into the inventory long before it has an impact on short term harvest levels.

4. Increase in rank (to 3) the three items related to fertilization. These items relate directly to on-the-ground practices which will occur in the short term and have impacts in the medium term. Delay in implementation will delay potential benefits.

5. Increase in rank (to 2) the item labeled "Studies to collect better SIBEC data". SI values are often important criteria in making current silviculture investment decisions, and in many cases for juvenile stands SIBEC at least has the potential to provide the best estimate of SI. Also, in many cases correlation with SIBEC will be the source of the SI estimate that is carried in the inventory through the next rotation, particularly in stands where free growing status is achieved before a growth intercept estimate of SI can be completed. It is very important, therefor, that we immediately improve our SIBEC estimates of SI.

3. Silviculture Impacts and Priorities

The silviculture activities required to implement the strategies identified in Table 2.1 are summarized below in Table 3.1, together with their impacts on selected TSA objectives. The workshop determined the opportunity area (i.e., the area available for treatment for the next 5 years), the impacts on timber supply quantity and quality, and habitat effects for each treatment. The employment effects and costs are based on district and licensee records. The rank (priority) of each treatment was determined through consideration of the impacts of each activity on each objective, and represents a consensus of the participants.

4. Silviculture Program

4.1 Tactical Priorities

The rankings of Table 3.1 represent a balance between the participant's strategic concerns and the silvicultural opportunities available on the TSA in the next 5 years.

The highest ranked activities are surveying and reclassifying backlog NSR, and brushing and spacing impeded backlog SR. Treating backlog is necessary to maintain the timber harvesting land base as represented in the TSR, and impacts long term timber supply.

The next priority identified by the participants was surveying and reclassifying old intermediate utilization sites. The fourth-ranked strategy was pre-commercial thinning 15-20 year old pine on good and medium sites, as preparation for subsequent commercial thinning.

4.2 Program Costs and Benefits

Table 4-1 contains the area treated by activity and year.

Table 4-2 contains the expenditure by activity and year, based on the unit costs recorded in the treatment table (Table 4.1).

Table 4-3 contains the silviculture employment benefits associated with the program..

Table 3-1a. Silviculture activities, strategies they implement, impacts on TSA objectives, and priorities determined by the workshop

Issues	Activities/Treatments	Opportunity Area (ha/yr)	Timber Supply Effects Short	Medium	Long	Quality	Habitat	Jobs Days/ha	Cost $/ha[1]	MOF Rank
			0-20	21-120	121+					
Mid-term gap in fibre supply										
	PCT and/or fertilizing (repressed Pl)	200		+	+	+	+	3.0	562	11
	Surveys	5000						0.05	32	
	Reclassification and harvesting	3200		++++			-			3
	Pre-commercial thinning (PCT)	2400						3.0	562	4
	Fertilizing thrifty juvenile stands	300		++	+	+	+/-	0.1	443	10
	Fertilizing thrifty pole-size stands	300						0.1	443	10
Backlog NSR										
	Surveying and reclassifying	66000		M	M			0.05	32	1
	Site preparation, planting, brushing	1800		M	M			4.5	2,027	2
Backlog Impeded Stands										
	Brushing, spacing (PGFD)	5000		M	M		+/-	5.0	1200	1
	Brushing, spacing (VFD)	2000		M	M		+/-	5.0	1000	1
	Brushing, spacing (FSJFD)	2200		M	M		+/-	5.0	1215	1
	Site preparation, fill planting (aspen)	150			+			2.5	1450	8
	Site preparation, fill planting (old Intermediate Utilization blocks)	150			+			2.5	1450	8
Forest Health (Western Gall Rust)										
	Pruning infected branches	150		M				4.0	1188	7
	Monitoring	TSA		M	M					6

Table 3-1b. Silviculture activities, strategies they implement, impacts on TSA objectives, and priorities determined by the workshop (cont'd)

Issues	Activities/Treatments	Opportunity Area (ha/yr)	Timber Supply Effects			Quality	Habitat	Jobs Days/ha	Cost $/ha1	MOF Rank
			Short	Medium	Long					
			0-20	21-120	121+					
Repressed Pine										
PGFD	Surveying	500						0.05	25	5
	Reclassifying	300		++	++		+			5
	Rehabilitating and planting	200		++	++		+	2.5	1400	5
VFD	Surveying	1500						0.05	20	
	Reclassifying	900		++	++		+			5
	Thinning, fertilizing	300		++	++	+	+	3.0	500	5
	Rehabilitating and planting	300		++	++		+	2.5	1250	5
Timber Quality										
	Pruning	170				++	-	4.0	1188	12

Tables 4.1. Area (ha) treated by activity and year

Year	Surveys* All	Site Prep	Planting	Brushing	Spacing / PCT	Fertilizing	Pruning	Total
1	73,000	2,600	300	11,000	12,100	900	320	100,220
2	73,000	2,600	300	11,000	12,100	900	320	100,220
3	73,000	2,600	300	11,000	12,100	900	320	100,220
4	73,000	2,600	300	11,000	12,100	900	320	100,220
5	73,000	2,600	300	11,000	12,100	900	320	100,220
Subtotal Yr 1-5	365,000	13,000	1,500	55,000	60,500	4,500	1,600	501,100
Yr 6 - 10	365,000	13,000	1,500	55,000	60,500	4,500	1,600	1,002,200
Total Yr 1-10	730,000	26,000	3,000	110,000	121,000	9,000	3,200	0

* Includes prescription and layout

Table 4-2. Expenditure ('000 $) by activity and year

Year	Surveys* All	Site Prep	Planting	Brushing	Spacing / PCT	Fertilizing	Pruning	Total
1	2,312	2,037	200	6,343	6,796	398	398	18,484
2	2,312	2,037	200	6,343	6,796	398	398	18,484
3	2,312	2,037	200	6,343	6,796	398	398	18,484
4	2,312	2,037	200	6,343	6,796	398	398	18,484
5	2,312	2,037	200	6,343	6,796	398	398	18,484
Subtotal Yr 1-5	11,558	10,183	1,000	31,717	33,981	1,991	1,991	92,421
Yr 6 -10	11,558	10,183	1,000	31,717	33,981	1,991	1,991	184,845
Total Yr 1-10	23,117	20,367	2,000	63,433	67,962	3,983	3,983	0

* Includes prescription and layout

Table 4.3. Short-term employment benefits (person-years), by year and activity

Year	Surveys* All	Site Prep	Planting	Brushing	Spacing / PCT	Fertilizing	Pruning	Total
1	3,650	1,300	600	22,000	36,300	90	1,280	65,220
2	3,650	1,300	600	22,000	36,300	90	1,280	65,220
3	3,650	1,300	600	22,000	36,300	90	1,280	65,220
4	3,650	1,300	600	22,000	36,300	90	1,280	65,220
5	3,650	1,300	600	22,000	36,300	90	1,280	65,220
Subtotal Yr 1-5	18,250	6,500	3,000	110,000	181,500	450	6,400	326,100
Yr 6 -10	18,250	6,500	3,000	110,000	181,500	450	6,400	652,200
Total Yr 1-10	36,500	13,000	6,000	220,000	363,000	900	12,800	0

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

Appendix 1
Issues Reviewed in the Prince George TSA Workshop

Issues that can be addressed through silviculture were obtained from Timber Supply Review documents and other documents identified by the District (District Enquiry) and from the workshop presentation. Unless otherwise indicated, the issues listed in the following sections are drawn from two sources: A Resource Management Plan for The Sustainable Harvest Strategic Objective in the Prince George Forest Region 2001-2005, or the District Questionnaires for the Prince George and Fort St. James Forest Districts.

A1.1 Timber Supply Issues

Prince George Forest District

Fall Down — A fall-down effect is predicted when over-mature stands are liquidated

Age Class Imbalance — Mid-range age classes (age 30-60) are deficient, while younger age classes are plentiful.

Immature Stands — Uncertainty with respect to TSR assumptions and productivity of immature stands and condition of backlog.

"Managing to minimums" — Need to manage more to targets and less to minimums.

Regeneration of sub-alpine — Uncertainty with respect to regeneration success in high elevation (sub-alpine) stands.

Fort St James Forest District

Timber quantity will only be affected by silviculture activities which stock or reclassify NSR land. The impact will be small because there are less than 3000 hectares of NSR in the district. The priority is high because it is a basic silviculture obligation.

Concerns were raised in the TSR rational about whether or not it is appropriate to represent growth for all backlog NSR areas according to the Table Interpolation Program for Stand Yields (TIPSY) managed stand yield curves. Rehabilitation of some backlog areas has been deferred to accommodate locally important wildlife habitat or to ensure green-up adjacency constraints are met. The delays in rehabilitation could affect the timing of restocking relative to assumptions employed in the analysis, as well as potentially affecting stand growth. It is therefore worthwhile to consider the modelled backlog performance in this analysis as a maximum level that is unlikely to be achieved given the circumstances

A1.2 Timber Quality Issues

(this section was S 3.2 of workshop report, "Timber Quality Strategies)

The effects of silviculture on the future quality of the timber resource were not analyzed in the timber supply review.

Prince George Forest District

(Source: Gord Dow, Prince George Forest District)

The premium product in the Prince George forest District is sawlog spruce with diameter greater than 40 cm and heights between 22 and 35 metres. Log quality and size decrease as younger stands are harvested from increasingly marginal stands.

Fort St James Forest District

(Source: Earl Wilson, Fort St. James Forest District)

Those local mills that are set up to utilize a standard log and species within narrow ranges will likely dictate the prime log qualification. However, this does not suggest that high quality, larger logs will not be utilized. There are smaller mills in the District that utilize large Douglas-fir, for instance. Some of these larger logs are shipped to mills outside the District for milling. There may also be a market for poles and rails that might be available from either pre or commercial thinning operations.

Log quality or size, in my mind, should not be established on the basis of local mill requirements and preferences. Rather, markets that will define this criteria remain to be developed. With increasing world population and a corresponding reduction in the net land base available for forestry, the emphasis may shift from fibre volume to wood quality. That shift might well re-define our objectives on log quality and size over the next 50 years.

A1.3 Habitat Issues

(Source: A Resource Management Plan for The Sustainable Harvest Strategic Objective in the Prince George Forest Region 2001-2005)

Prince George Forest District

Ungulate winter range and general browse supply is the primary concern on upland areas. Riparian cover and protection on streams and wetlands is also an issue. Magnitude and expanse of monocultures and homogenous areas is also of concern.

Backlog silviculture operations are carried out with considerations for the habitat concerns. Prescriptions are prepared and are approved for each treatment project, and habitat issues are addressed in concert with a District standard operating procedure which was prepared as a joint effort by Ministries of Forests and Environment.

Fort St James Forest District

The natural seral stages of succession can cause changes to the availability of natural habitats. The control of fire in our forests has slowed the 'renewal' process nature used to maintain a supply of habitat for certain species. By using prescribed fire, existing grassland habitats can be maintained. Other silviculture management techniques may be effective in maintaining habitat or making alternative habitats available. The resource management plan schedules planning, surveys, prescriptions, prescribed burning treatments and a study to manage at-risk species and habitats.

Five habitat supply issues are given a priority in the LRMP through discussions between the MOF and MELP. No activities are planned for year 2000/2001. Impacts of silvicultural practices on lichen habitats will be studied in 2001-2002. In 2002-2003, the development of a management plan to maintain at-risk species and habitats is scheduled. In 2003-2004, sites for wildlife enhancement using prescribed fire as a tool will be located. Treatment of sites where fire is prescribed for grassland enhancement is planned for 2004-2005. These activities will mitigate habitat supply problems or enhance habitat quality.

Vanderhoof Forest District

Presently there is only one proposed issue, a study of habitat use. The proposed study would evaluate if habitat use by large mammals (deer, moose and bear) of treated stands is stem density related. Large mammals are "high profile" wildlife species and it is important to monitor their responses to the trend of intensely managed stands.

A1.4 Employment Issues

(Source: A Resource Management Plan for The Sustainable Harvest Strategic Objective in the Prince George Forest Region 2001-2005)

Prince George Forest District

A large portion of the stand tending program is carried out through manual methods which are very labour intensive. A shift to a higher proportion of herbicide treatments may be in order - to ensure better efficacy of treatment, and to allow for higher timber supply gains with a fixed or reduced budget.

Fort St. James Forest District

Job outcomes are dependent on licensee activities. The district should maintain ample opportunities for local contractors through the competitive bid process. In addition, licensees have either First Nation partners or hire contractors who employ aboriginal people.

Much of the planned work is seasonal, but pre-commercial thinning can be done even after there is snow on the ground. This extends the traditional work window right through to spring if there is not an unusual excess of snow giving some stability to that group of workers

A1.5 Forest Health Issues

(Source: A Resource Management Plan for The Sustainable Harvest Strategic Objective in the Prince George Forest Region 2001-2005)

Fort St James Forest District

(Source: John DeGagne, District Acting Forest Health Planning Forester)

Forest health concerns with bark beetles and spruce budworm is a critical issue. Approximately 70% of the Fort St. James Forest District (2.7 million hectares) is comprised of mature and over-mature timber, highly susceptible to pest damage. The District has an active forest health program. The presence of four different bark beetles, pine, spruce, Douglas-fir, and balsam, as well as spruce budworm result in extensive damage and value losses within the District. A

conservative estimate of infested area for bark beetle alone is 55 000 hectares. This value will more than double for 1999 infestations due to mild winters and insufficient efforts for control. Based on 1997 figures, budworm infestation covered approximately 253 000 hectares, though historical evidence indicates a doubling in size every year so the figure for 1999 will be closer to 1 million hectares.

The Fort St. James District has not been complacent in its pest management activities. Vigorous control activities have been carried out to the extent made possible by funds provided. Further effort has been made to complete a District Bark Beetle Management Strategy to direct control activities and available resources into priority areas.

Effort is also being placed to manage spruce budworm. Research projects completed by Forestry Canada and sponsored by the Ministry of Forests are furthering our understanding of landscape dynamics of budworm infestations. The work being done will predict the probability of outbreak occurring in a stand, measure the long-term impacts of budworm defoliation on timber productivity, measure budworm densities, and provide a map showing extent of current infestation.

Vanderhoof Forest District

(Source: A Resource Management Plan for The Sustainable Harvest Strategic Objective in the Prince George Forest Region 2001-2005)

No significant areas denuded by fire or pests have been identified in the District at this time Mountain pine beetle is the most significant pest threat to District. A milling "on-site" study is also proposed, to evaluate it's feasibility/benefits as a forest health maintenance tool.

A1.6 First Nations Issues

Fort St James Forest District

(Source: Earl Wilson, Fort St James Forest District)

Silvicultural activities occurring on 40 to 70 year old fire origin pine stands employ First Nations people during the winter. It has been debated whether a moratorium should be placed on these activities, even with a social objective of First nations being negatively impacted.

A1.7 Visual Quality Issues

Fort St James forest District

(Source: Earl Wilson, Fort St James Forest District)

Green-up for this District varies from 3 to 5 meters depending on slope and topography. This means generally re-entries into a viewscape will vary from 15 to 35 years depending on species and site index. This may have implications for log recovery where age class 6 pine stands exist within a partial retention VQO which requires that only 15 % (operationally 5-7 %) can be removed at each entry. Pine stands in these latitudes tend to start falling apart at about age 150. Therefore, significant log volume may be lost to forest health problems before the viewscape can be completely harvested. This may be offset in the second rotation as openings will become available for harvest at 15 - 35 year intervals.

Appendix 2
Timber Supply Context of Silviculture in Prince George TSA

The objective of this section on resource dynamics analysis is to further define timber supply issues and identify constraining mechanisms that shape the timber supply forecast for the unit.

Timber supply is the rate at which timber is made available for harvesting, and it is "made available" through natural, administrative, and economic processes. The forest economy draws timber from the landbase in response to consumer demand, and this flow of timber is limited by the rate at which the forest can physically grow trees, and by a variety of administrative constraints. The combined effect of these administrative constraints is incorporated in the Annual Allowable Cut (AAC).

The base case of the timber supply review (TSR) forecasts future timber supply subject to current administrative constraints and assuming present market conditions. The purpose of this section is to identify the "pinch points" and constraining mechanisms that shape the timber supply forecast for the unit. Observations drawn from the TSR base case and selected sensitivity analyses are used to describe the timber supply dynamics of the management unit and to suggest how silviculture treatments might enhance timber supply.

Timber Supply and the AAC

The 1995 TSR shows an even-flow harvest level which can be maintained throughout the entire planning horizon (Figure A2-1). The base case harvest forecast level is 9 630 000 m³ per year. This level is 3% above the current AAC of 9 363 661 m³ per year resulting from the 1996 Rationale for AAC Determination. The base case harvest forecast is the maximum non-declining harvest level that can be achieved without resulting in future shortfalls.

Figure A2-1. Base harvest forecast, Prince George TSA.

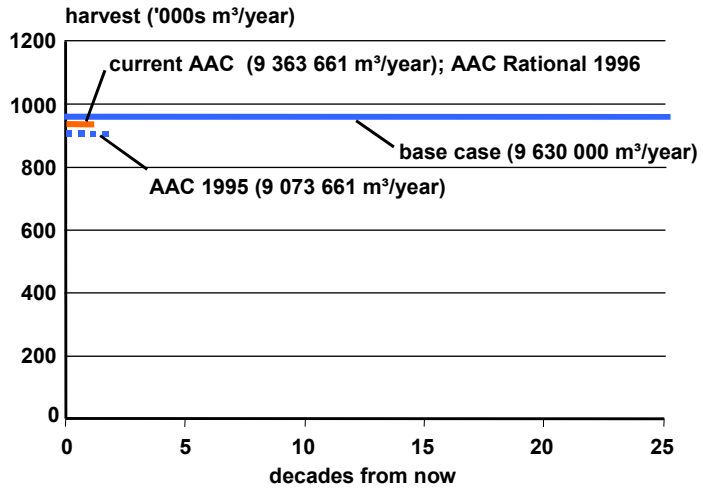

Figure A2-2. Changes in growing stock over time, Prince George TSA.

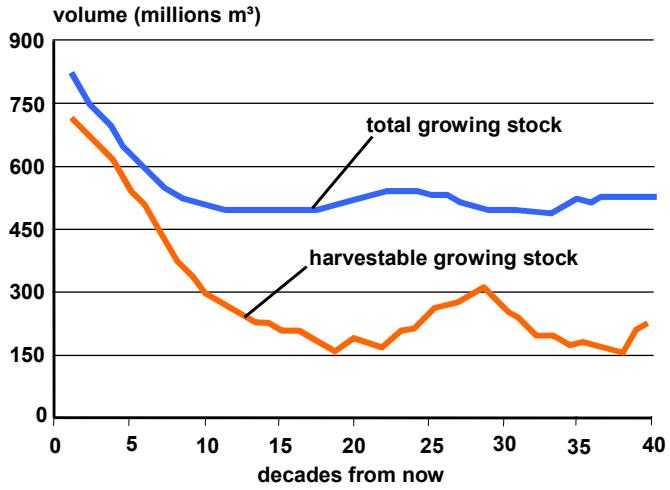

Figure A2-2 illustrates that the total growing stock for the base case harvest level can maintained at a constant level from year 100 to the end of the planning horizon. This demonstrates that the harvest level is near the productivity level of the timber harvesting land base.

Appendix 3
Executive Summary, *Incremental Silviculture Strategy for BC*

STRATEGY AT A GLANCE

Purpose	This strategy provides guidance to the application of available funds for incremental silviculture activities. It is not tied to a specified funding level.
Government's Goals	• Sustainable Use • Community Stability • A Strong Forest Sector
Key Principles	1. Because the distant future cannot be foretold, the best and only course of action in managing the timber resource is that which minimizes risk and maintains options. 2. British Columbia's forests are important locally, provincially, nationally and glo bally and should be managed in this context. 3. Each generation of British Columbians becomes the steward of the province's forest resources and has a moral obligation to preserve this heritage for future generations.
Working Targets	Within the context of the guiding principles: WT 1: Minimize the anticipated interim reduction in timber supply so that provincial annual harvests of at least 65 million m^3 can be achieved during this period. WT 2: Create a long term timber supply capable of supporting a steady long term provincial harvest level of at least 75 million m^3. WT 3: Over the long term, maintain the production of premium quality logs at or above 10% of total harvest.
Major Silvicultural Strategies	• Increase the use of alternative silvicultural systems and commercial thinning. • Achieve earlier green-up of harvested areas. • Increase regenerated stand volumes 20%. • Eliminate all pre-1982 good and medium site backlog NSR and all 1982 to 1987 backlog NSR. • Initiate a long rotation quality management program for stands where harvesting must be delayed. Other silvicultural and non-silvicultural strategies must also be implemented to achieve the working targets.
Strategy Implementation	Regional and management unit strategies must be developed, followed by programs and plans to implement them.

Appendix 4
Workshop Feedback - Prince George TSA

Please circle the number that best represents your view.

1 Length of session	5 too long	4	3 just right	2	1 too short
2 Level of detail of content	5 too much	4	3 just right (6)	2	1 not enough
3 Instructional method (style, interaction, clarity)	5 excellent	4 (2)	3 adequate (4)	2	1 poor
4 Relevance to your interests/needs	5 extremely (1)	4 (4)	3 average (1)	2	1 not at all
5 Extent to which your needs were met	5 entirely	4 (5)	3 average (1)	2	1 not at all
6 Usefulness of the handout graphics and texts	5 very (2)	4 (2)	3 adequate (2)	2	1 useless

What were the strengths of this workshop?

- Getting together and discussing the issues and developing the strategy to deal with them.
- Very current information.
- Confirmed silviculture investments to date.
- The actual descriptive process used through the PowerPoint to see the actual benefits.

What were the weaknesses of this workshop?

- Needed more “upper management” personnel in attendance to discuss the pros and cons of specific silviculture investments.

How could this workshop be improved?

- No comments.

Other comments? (use back if necessary)

- No comments.