TFL 45
Tree Farm License

Incremental Silviculture Strategy (Interim)

-- Version 1.0 --

Contents

British Columbia

Ministry of Forests

Funded By

Forest Renewal BC

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Strategic Issues

General Strategy

Interfor feels that it is very difficult to predict the future demand for various forest products. With this in mind stands are not being managed with specific product objectives but rather the whole forest is being managed for maximum fiber flow. It is realized that the forest always has and always will produce a variety species and sizes of trees. Some stands will be harvested earlier than culmination and others will be harvested at or much later than culmination age. Stands will be harvested at various ages for a wide variety of reasons: wildlife, biodiversity, recreation, esthetics logistics and market demands. It is these other forest values that will to some degree extend the rotation of some stands and will produce the very high value trees.

Working Targets

Quantity

The following comments are derived from Management Plan #3 (MP #3) and its corresponding timber supply analysis. The current AAC is 220,000 m^3 and will stay at this level for a decade. In subsequent decades the cut level will decrease by 10% per decade and will level out at 167,100m^3 in forty years from now. In the long term the cut will rise to 185,100 m^3 (after 120 years).

It should be stated that these comments regarding TFL 45's AAC scenario will very likely change with the completion of Management Plan #4. MP #4 will take into account new inventory information and additional landbase constraints that were not in place at the time of MP #3.

Quality

The grades of logs that will be produced from second growth stands will vary depending on the length of the rotation. The vast majority of the stands should be harvested close to culmination age but undoubtedly some will be harvested before this and some will be harvested significantly past it.

- Pre Culmination
  Stands harvested prior to culmination will have a higher proportion of the logs falling into the J grades (gang and chip and saw) and pulp grades.
- Culmination
  Stands harvested at culmination will have a slightly heavier weighting in better grades than the pre culmination harvesting. There will 10 to 20% of the volume in the H and I grades (standard sawlogs) and approximately 70 to 80% falling into J grades. The balance will fall into pulp.
- Post Culmination
  Post culmination stands will have a greater amount of the stems falling into the higher grades. Exactly what the grades will be is a function of how far past culmination the stands would be taken. It expected that while there would be some higher grade sawlogs, there would still be a significant level of J grade sawlogs and a very small component of pulp.

Product Objecties

Quality Class	Species	Characteristics
Premium log	Fd, Cw, Ss	60 - 90 cm DBH
Sawlog	Fd, Cw, Ss, Hw, Ba, Cy	35 - 60 cm DBH

Major Silvicultural Strategies

Currently Identified

The following points represent the potential silviculture strategies, which have been identified for TFL 45 in the existing management plan (MP #3).

1. Improve plantation yields through the use of genetically improved stock.
2. Optimize selection of species in managed stands.
3. Reduce minimum harvest ages for managed stands.
4. Reclaim existing alder types.
5. Explore commercial thinning opportunities.
6. Achieve yield gains through fertilization.
7. Implement selective harvesting in VQO zones.

Possible Additions

The following are additional strategies, which could be explored.

1. Reduce regeneration delay.
2. Accelerate early height growth to shorten greenup period.
3. Space/prune to increase the future supplies of premium logs.
4. Alter stand structures to enhance habitat characteristics.
5. Alter stand structures to create old forest characteristics as early as possible.

Introduction

About the Interim Strategy

The terms of a service agreement between Forest Renewal BC (FRBC) and the BC Ministry of Forests (MoF) require the MoF to develop, and FRBC to fund, what is essentially an incremental silviculture strategy. This document addresses this contractual requirement.

Incremental silviculture is part of a suite of strategies, which together may influence the future quality and quantity of habitat and timber supply. This strategy document broadly analyzes the full potential range of silviculture activities in order to create a context for an incremental silviculture strategy.

An incremental silviculture strategy should not be confused with the allowable annual cut (AAC) determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. The degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed. In the case of TFL 45, MP #4 will be prepared over the next nine months. Therefore, this interim strategy will be useful in providing background for the development of this plan.

Methodology

This strategy was prepared through the following process:

1. Prior to a district working session, Timberline Forest Inventory Consultants prepared a preliminary draft of this report, summarizing available information relevant to a strategy and identifying opportunities to improve the future quantity and quality of timber supply.
2. A district working session was held March 15,16, 2000 in Campbell River, attended by representatives of the MoF, MoELP and Interfor staff. Erik Wang of Timberline and Nigel Ross of Interfor lead the session. The objective of the session was to review potential opportunities identified in this draft document along with others that may arise. The outcome of the session included a silviculture regime table, complete with priorities.
3. The results of the working session were incorporated into this document along with attendant forecasts of future harvest quantity and quality and of job outcomes.
4. After ministry review, a completed strategy document will be submitted to the MoF.

Acknowledgments

The project is being coordinated through Mr. Larry Sigurdson of the Ministry of Forests, Vancouver Forest Region. Forest Renewal BC is providing funding. Participation of representatives of the following participation at the district working session is gratefully acknowledged.

Agency	Representative
MoF - Vancouver Region	Larry Sigurdson
MoF - Campbell River District	Paul Larsen
MoELP	Dave Donald
Interfor	Gerry Sommers, Nigel Ross, Wayne Wall, Richard Gage, Jamie Kantor

The format of this document, and the methodology to be employed in the upcoming working session, are based on previous work completed for the Strathcona TSA by L. P. Atherton & Associates, and Cortex Consultants Inc.

Basic Data

Land Area

Description	Area (ha)	Area %
Total Area of TSA	243 000	100
Total Productive Crown Forest	54 100	22
Current NTH Land Base	29 400	12
Long-term NTH Landbase	29 100	12

Source: MP #3 TS A report - rounded to nearest 100 ha.

AAC

AAC Type	Pre-MP #3	MP #3*	Change (%)
Licensee	199 920	209 920	
SBFEP	10 080	10 080	
Total	210 000	220 000	+4.8

*effective November 1 1996

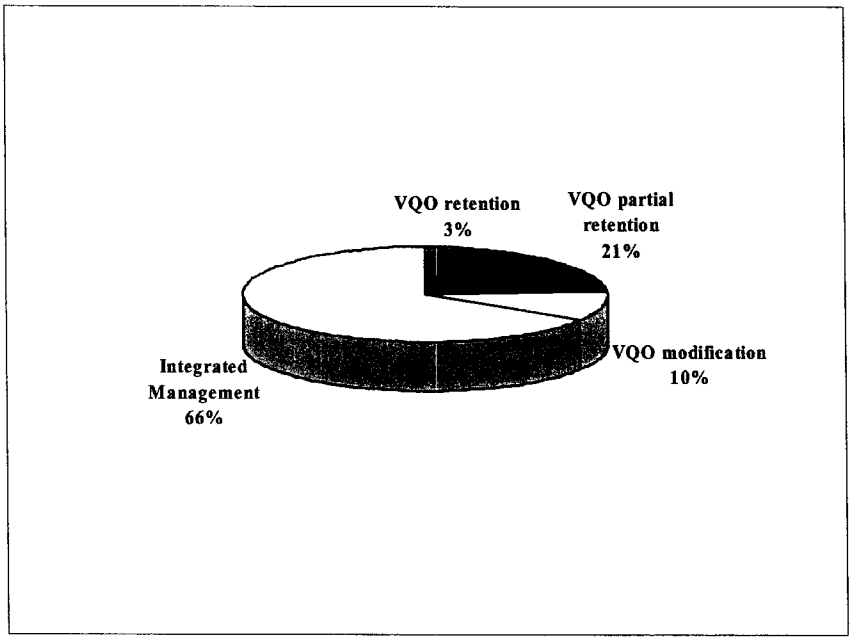

Figure 1. Distribution of net area by zone

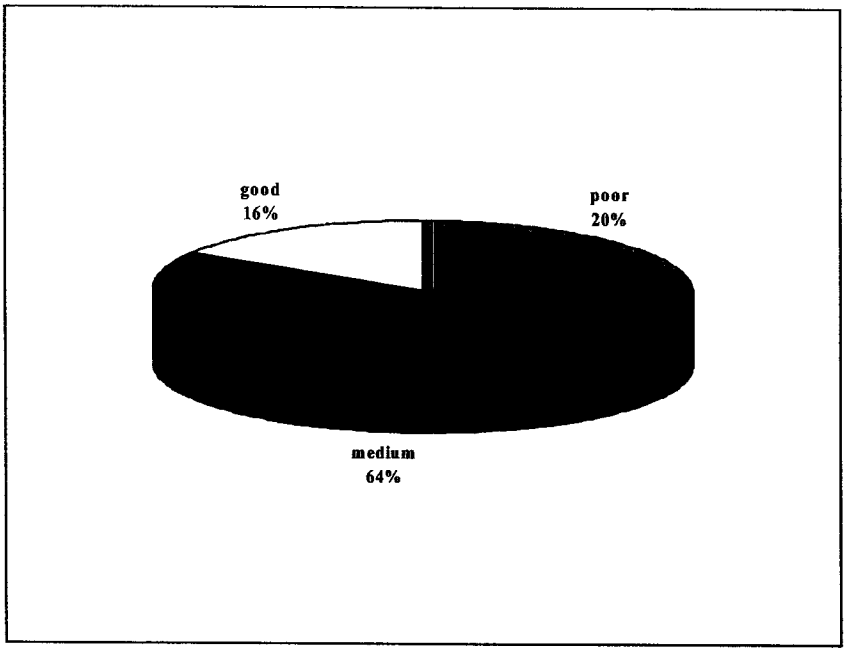

Figure 2. Distribution of net area by site class

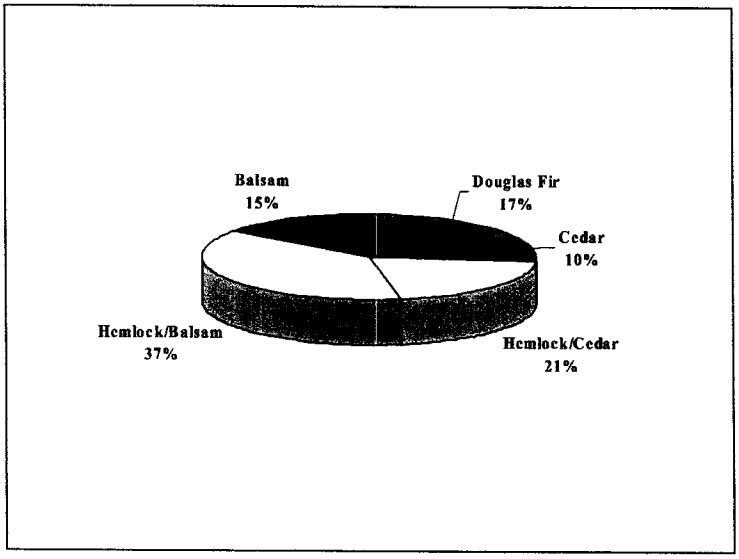

Figure 3. Distribution of net area by leading tree species

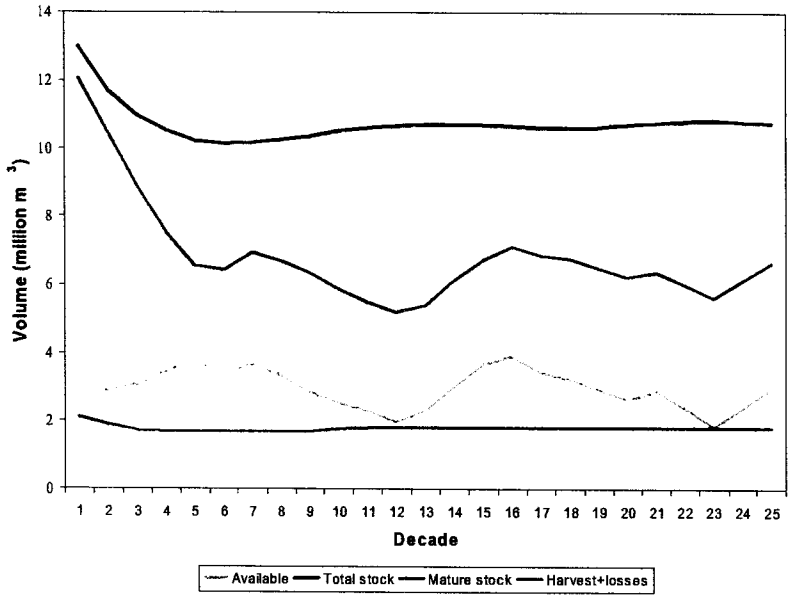

Figure 4. Base case harvest and growing stock profile

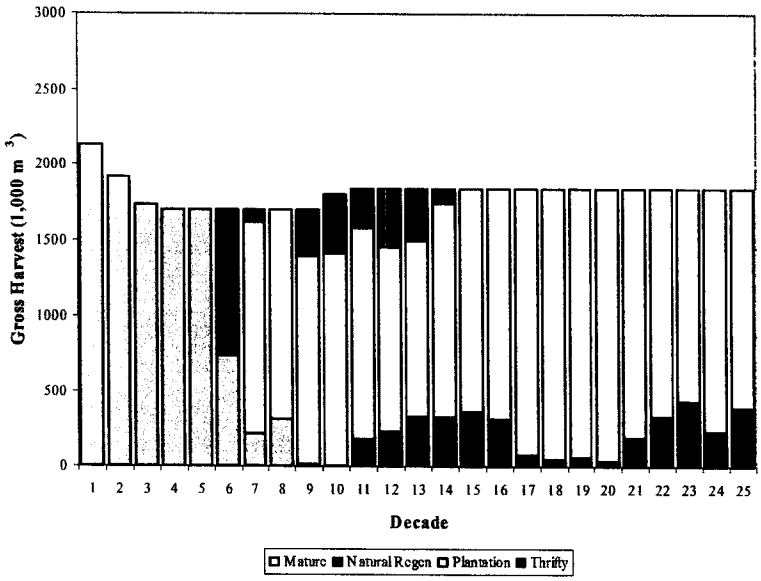

Figure 5. Gross harvest by maturity

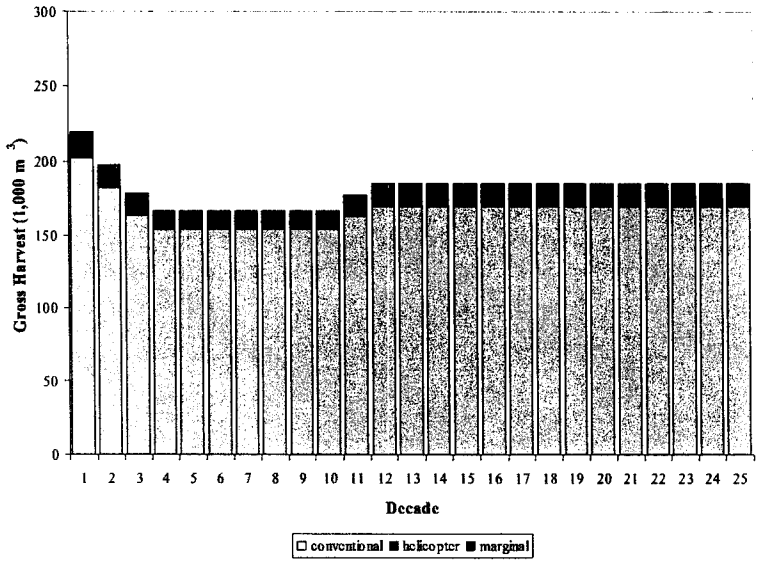

Figure 6. Gross harvest by operability class

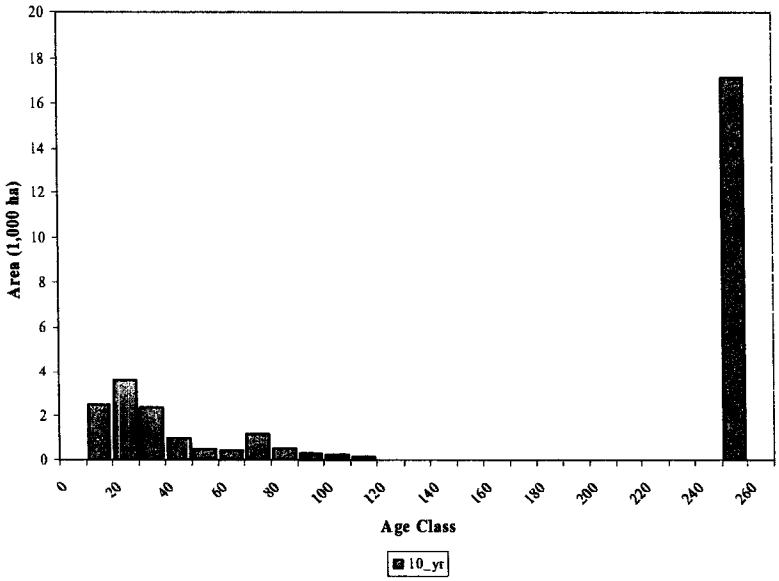

Figure 7. Initial age structure

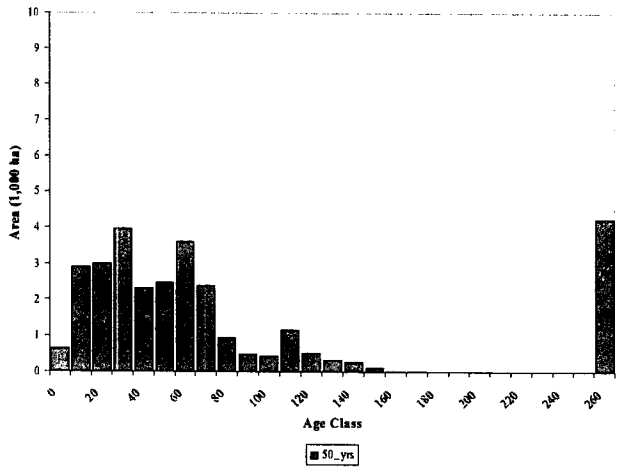

Figure 8. Age structure in 50 years

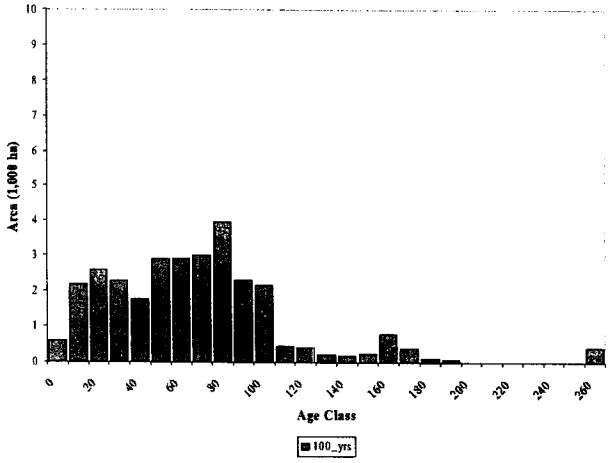

Figure 9. Age structure in 100 years

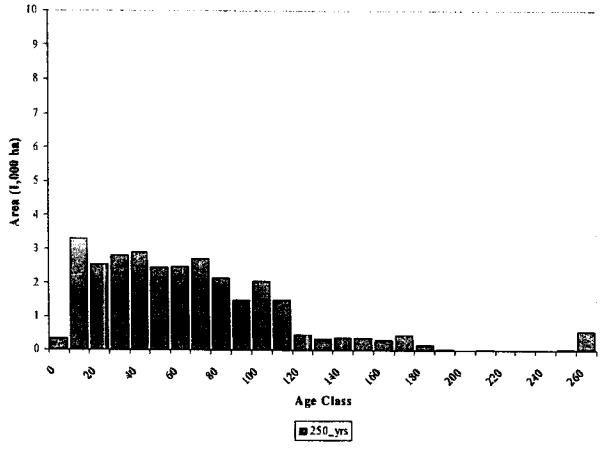

Figure 10. Age structure in 250 years

Issues

Individual Issue Analysis

The following information is primarily from documentation produced under the last timber supply analysis for MP #3. This includes the Information Package and Analysis Report, along with the Chief Forester's AAC Determination Report. Information, which is relevant to an incremental silviculture strategy, is recorded. Key statements are bolded.

Abbreviations: AAC - allowable annual cut; THLB - timber harvesting land base; IHL - initial harvest level; LTHL - long term harvest level; CF - chief forester; AVL - average volume line.

Species abbreviations: Fd - Douglas-fir; Fdc - coastal Douglas-fir; Hw - western hemlock; Cw - western redcedar; B or Ba - balsam fir.

Site class abbreviations: G - good; M - medium; P - poor.

♦ Harvest Forecast	**"Current AAC" is 220 000 m³**, after a 2 900 m³ deduction non-recoverable losses. Initial harvest level declines thereafter at a rate of 10%/ decade to a mid term level of 167 100 m³ reached in 40 years from now (**24% below current AAC**), and rising to a long term harvest level of 185 100 (**16% below current AAC**) 120 years from now. Harvest levels must decline to avoid serious timber supply shortfalls in the future.
♦ Age Class	57% of the THLB is mature (> age 250) forest, while 33% is less than age 60. The transition of harvest from the mature to second growth forest represents a challenge to avoid interruption in timber flow. The rate of harvest from the existing mature forest must be balanced with the rate at which regenerating stands become available for harvest.
♦ Productivity	**Existing productivity estimates are deemed to be significantly understated, due to the bias in estimation of old growth site indices.** Sensitivity: Increased site indices for regenerated types by 3-6 metres, depending upon species. Impact: ***Significant impact on short term supply*** **as decade 12 timber availability constraint is relaxed.**
♦ Forest Cover	*Non-VQ Zones*: 66% of THLB. Base case requirement of at most 25% of THLB permitted to be < 3 m tall (4 pass system). *Visual Quality Zones*: 34% of THLB. Base case requirement of at most 2% (retention VQO), 10% (partial retention VQO) and 25% (modification VQO) to be < 5 m tall. Sensitivity test: varied by zone Relaxation: ***Highly sensitive in the short-term***. Increasing the maximum disturbance percentages in both VQO and non-VQO zones permitted the IHL to be maintained for 4 decades. Overall, the harvest over the first rotation could be increased by 8%. Increase: ***Highly sensitive in the short-term***. Reducing the VQO maximum % forced a reduction of the IHL This caused a 10% reduction in harvest over the first rotation. *Green-up*: Green up ages 12 yrs for 3 m (non-VQO) and 16 yrs for 5 m (VQ). Sensitivity test : +/- 2 years Relaxation: The IHL could be maintained for an additional decade. Increase: Short-term timber supply relatively insensitive

♦ Backlog NSR	0 ha of backlog NSR. 479 ha of current NSR to be regenerated within 2 years.
♦ Quality	• 798 ha were deducted from the THLB for deciduous species. Low productivity and unmerchantable types were deducted through the operability classification. • 205 ha of non-commercial cover deducted from THLB.
♦ Older Forests	Base case does not include a requirement for old growth or biodiversity as there were no specific provisions applied operationally in the TFL at the time of analysis. Relaxation: N/A **Increase: CF recognizes that requirements for biodiversity can largely be met outside the THLB. However, he expressed concern about the distribution of representative area.**
♦ Minimum Harvest Ages	Base case uses MAI culmination ages as min. harvest ages (70 – 140 years). Sensitivity test: +/- 10 years Relaxation: IHL can be maintained for an additional decade. Increase: ***Highly sensitive***. Causes a 25% decrease in IHL.
♦ Silvicultural Systems	Most of the THLB is currently managed under a clearcut harvesting system
♦ Regeneration	Base case assumes regen delays of 3 years for plantations and 5 years for natural stands. Sensitivity test: +/- 2 years Relaxation: Moderately sensitive. Increase: Moderately sensitive. All stands are regenerated to the same leading species with the same site class. 80% of the future managed stands are assumed to be planted at 1,000 stems per hectare. The remaining 20% regenerated naturally at an initial density of 4,000 stems per hectare, spaced to 800 stems per hectare.
♦ Estimates of Timber Volumes	AVLs were used for existing stand volumes for all stands > age 140. VDYP used for existing stand volumes for all stands between ages 40-140. Sensitivity test +/- 10% Increase: Moderately sensitive. The IHL could be maintained for an additional period. Decrease: ***Highly sensitive***. IHL reduced by 24%. TIPSY used for existing stands less than age 41, and all future regenerated stands. OAF1 – 15%. OAF-2 of 5% was used for Douglas-fir, while 15% was used for remaining species. **The CF considered these yield estimates to be conservative, in light of the high OAF 2 values employed, and the site index issue discussed earlier**. Sensitivity test: see productivity issue
Wildlife Issues	The CF recognized concerns from the Ministry of the Environment with respect to allowances for Mountain Goat Habitat in the Knight Inlet portion of the TFL. This was not assessed in the MP #3 timber supply analysis. It therefore could represent an unquantified downward pressure on timber supply.
Riparian/fish Habitat	The CF identified a downward pressure of 2-3 percent for riparian management requirements not incorporated into the MP #3 analysis.

Summary of TFL-level Issues by Period

Overall, timber supply is constrained at two points over the 250 year time horizon of the analysis. The first constraint point occurs at decade 12, and limits timber harvest in the short and medium terms. The second constraint point occurs at decade 23, affecting long-term timber availability.

Short Term (1 - 20 years)

In the base case, the IHL can only be maintained for 1 decade. Any factors, which affect timber availability over the first 12 decades, can therefore be expected to impact on short-term harvest levels.

Mid Term (21 - 110 years)

In the timber supply analysis, any impacts on timber supply during the first 110 years were primarily absorbed by the short-term harvest. This was by design, to avoid excessive negative impacts on mid-term levels, and conversely to capitalize on short-term opportunities where they existed. As a result, mid-term levels demonstrated relatively low sensitivity to the changes discussed.

Long Term (111 + years)

The major impacts on long-term harvest levels were, not surprisingly, caused by changes in regenerated yield estimates. Increases (or decreases) in long-term timber harvest are proportional to changes in these yield estimates.

Future Issues

Older forest, biodiversity and Forest Practices Code requirements not incorporated into the MP #3 analysis are likely to have future impacts on timber supply.

Incremental Silviculture History

Treatment	MP #3 Status (1995)	Current Status (2000)
♦ Backlog NSR	Backlog NSR is virtually non-existent.	None
♦ Current NSR	479 ha	396 ha
♦ Commercial Thin	None	None
♦ Space	None	30 ha
♦ Prune	None	None
♦ Fertilize	None	None
♦ Space/ Prune	None	1,500 ha completed over past 10 years
♦ Space /Fertilize	None	None
♦ Other	None	None

Higher Level Goals and Objectives

This section documents higher level goals and objectives relevant to an incremental silviculture strategy for the TFL.

Provincial Goals

Fundamentally, government's goals can be characterized as:

- sustainable use;
- community stability; and
- a strong forest sector. (MoF, 1998a)

Provincial Objectives

Until provincial targets for timber quantity and quality are established, management unit strategies are to consider the following interim provincial strategic objectives (MoF, 1998a). Incremental silviculture strategies must also be in keeping with higher level plans under the Forest Practices Code.

Objective 1: Maintain current harvest levels as long as possible without creating disruptive shortfalls in future timber supply.

Objective 2: Create a long term timber supply capable of supporting a steady long term provincial harvest level similar to current levels.

Objective 3: Minimize the interim shortfall in provincial harvest anticipated before a steady long term timber supply is achieved.

Objective 4: Create a long term timber supply, which will enable the timber quality profile of future harvests to be the same or better than the current profile.

It is recognized that not every management unit has the same capability to contribute to these interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

Regional Objectives

The objectives of the regional incremental silviculture strategy are to:

- Ensure a long term sustainable harvest, which approximates the current harvest value and volume levels and that, produces a diversified mix of products necessary to create and maintain sustainable forest employment.
- Balance treatments that enhance growth and yield such as fertilizing, spacing and forest health activities with those that increase the value of the wood such as pruning.
- Utilize incremental silviculture treatments to contribute to sustainable management of non-timber values at the landscape level. (MoF, 1998b)

Opportunities to Increase Timber Supply

Opportunities Indicated Through MP #3 Sensitivity Analyses

TSA modelling in support of planning incremental silviculture has not yet been undertaken. In its absence, sensitivity analyses from the MP #3 analysis report are the best source of information as to the opportunities for incremental silviculture to increase future timber supply. The following are selected sensitivity analsysis charts from the MP #3 analysis report.

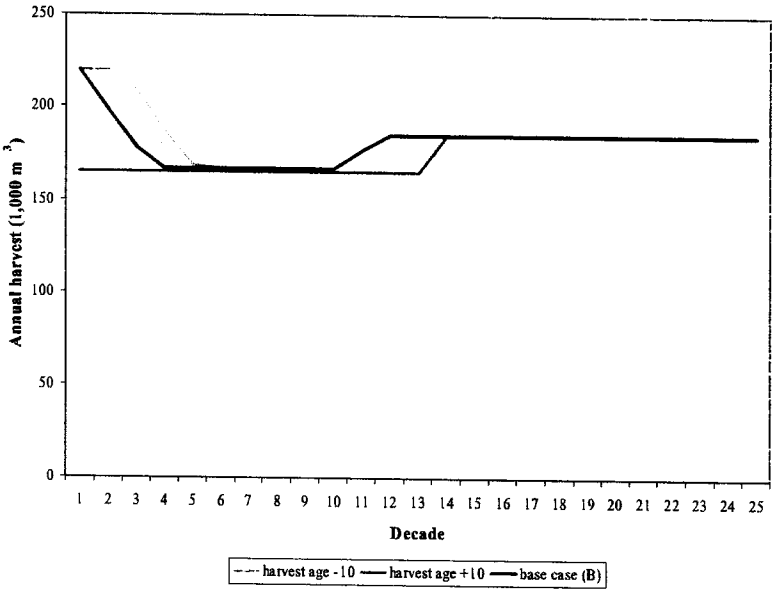

Figure 11. Impact of altering minimum havest age

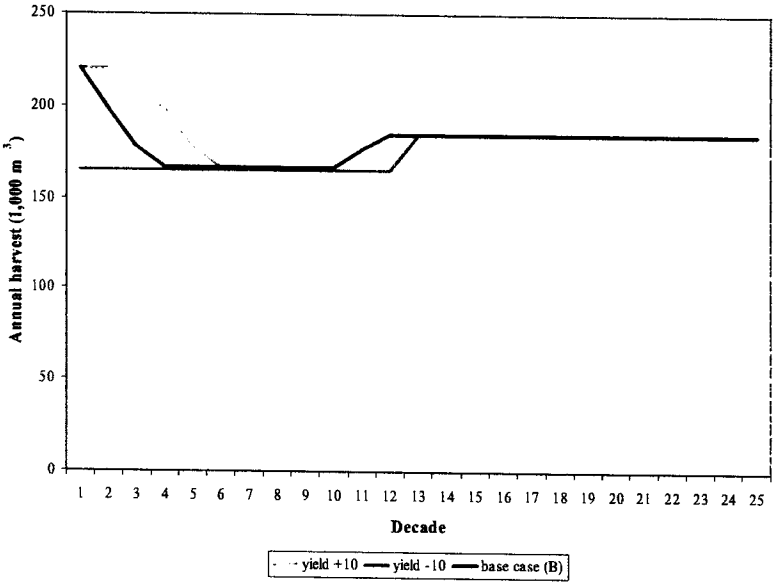

Figure 12. Impact of altering existing stand yields

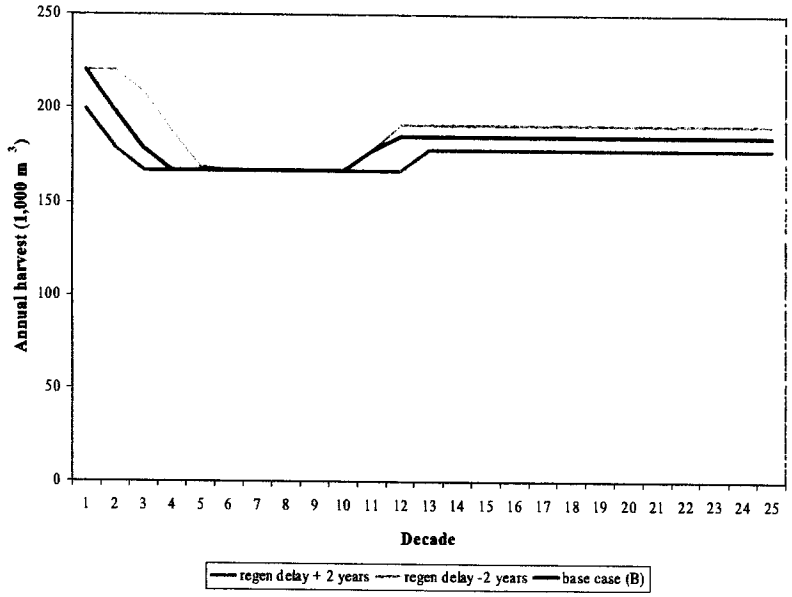

Figure 13. Impact of altering regeneration delay

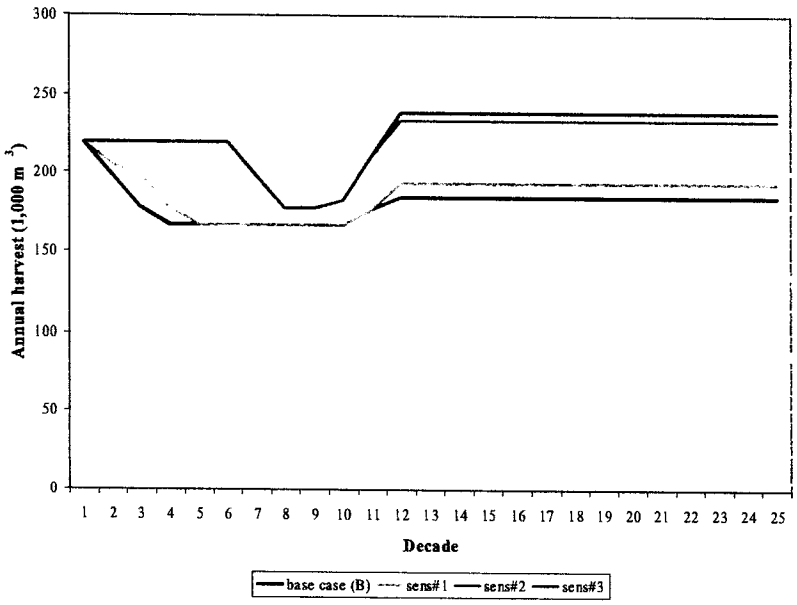

Figure 14. Impact of altering managed stand yields

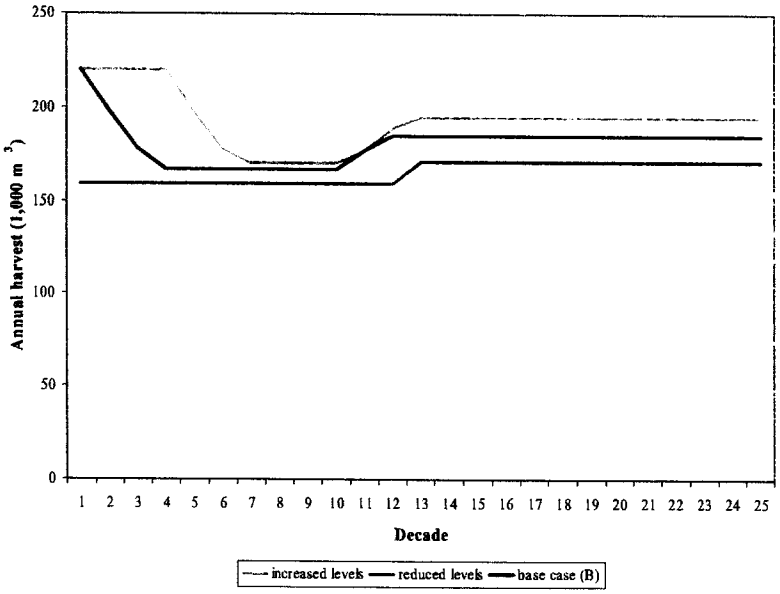

Figure 15. Impact of altering disturbance percentage

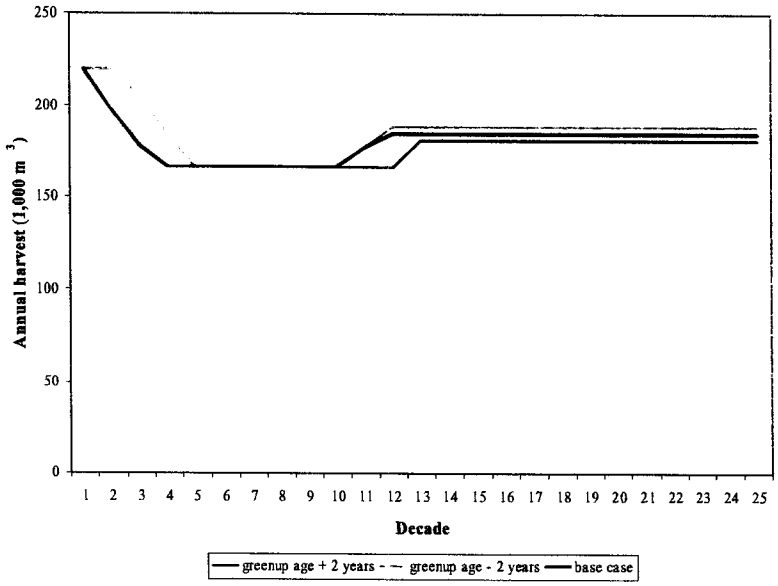

Figure 16. Impact of altering greenup age

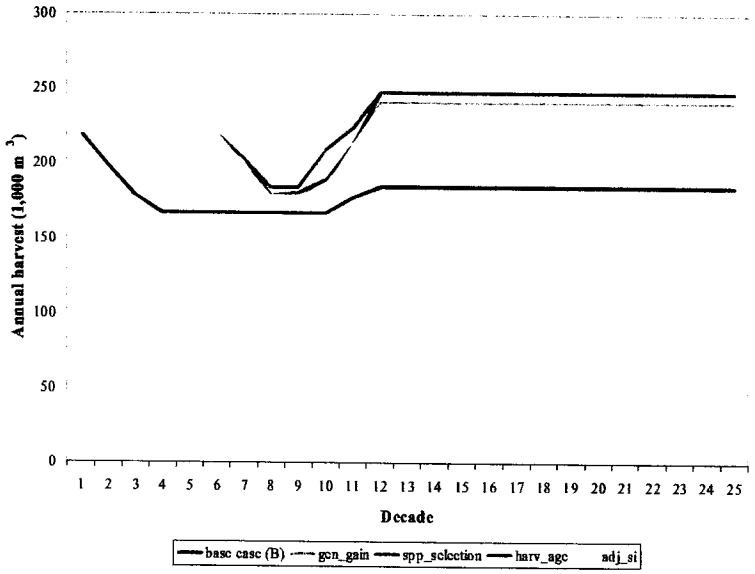

Figure 17. Impact of adjusted site index + genetic gain + altering species selection + altering harvest age for good site managed types

Identification of Silviculture Opportunities

Prior to the district working session, information in the previous sections was used to identify a number of silvicultural strategies as having potential to increase future timber supply at the TFL level. These were meant only to initiate discussion during the working session. Each of these was addressed in more detail in the workshop, along with other strategies developed during discussion.

While an attempt has been made to categorize opportunities according to response time fame, it should be noted that most of the strategies can have significant impact on short-term timber supply. This is due to the timing of the timber constraint (decade 12). Any effort, which improves timber availability within the first 120 years, will significantly impact on short-term supplies. This "Allowable Cut Effect" offers a significant investment opportunity, as economic returns from these activities will be almost immediate.

In addition, several treatment opportunities are not expected to have significant impacts on timber quantity, but are associated with changes in timber quality and/or wildlife habitat availability.

Immediate impact on quantity (required to sustain current timber flow forecast)

IM 1: Conifer release

IM 2: Pre-commercial thinning (PCT) for fibre production

Short Term (1 - 20 yrs) impact on quantity

ST 1: Fertilization at time of planting

ST 2: Late rotation fertilization

ST 3: Develop alternative harvesting systems in VQOs to reduce disturbance impact

ST 4: Alder conversion

Mid Term (21 - 110 yrs) impact on quantity

MT 1: Increase mid-term volume availability through commercial thinning programs

Long Term (111+ yrs) impact on quantity

LT 1: Improve long-term yields through genetic improvement program

Impact on timber quality

Q 1: Increase mid-long term quality through pruning

Impact on wildlife quantity/quality

H 1: Improve wildlife habitat characteristics through pre-commercial thinning

Available Information Regarding Potential Treatments and Treatable Area

This section summarizes available information directly relevant to the potential treatments for the TFL.

	Treatment	Comment	Location	Treatable Area
IM 1	Conifer Release	Remove alder in existing conifer stands, which are assumed to be FTG in current MP	North	50 ha/year 200 ha total
IM 2	PCT-fibre	Target Douglas-fir plantations on precut type Hw leading, medium site.	Mainly South	50 ha
ST 1	Fertilization @ planting	Accelerate early height growth and reduce greenup age	South and North	200 ha/year ongoing
ST 2	Fertilization-late rotation	Higher yield at harvest age	South and North	2,000 ha of backlog, + 200 ha/year ongoing
ST 3	Alternative silviculture systems in VQOs	Increases access to timber within VQOs	40% North 60% South	60 ha/year ongoing
ST 4	Alder conversion	Increases THLB	South and North	20 ha/year 200 ha total
MT 1	Commercial Thinning	Thin 1,000 stems/ha to 600-700 stems/ha. Very site specific	North	15 ha/year ongoing
LT 1	Genetic Improvement	Genetically improved seed increases yield, and reduces greenup and minimum harvest ages.	South and north	200 ha/year ongoing
Q 1	Pruning		North and South	30 ha per year
H 1	PCT-habitat		North and South	10 ha per year

Potential Timber Quantity Strategies by Response Time Frame

Explanatory notes with respect to the following tables.

Column Number	Note
1	The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.
2	Description of treatment
3	Information will be largely obtained from the March 15, 16 workshop, combined with information presented earlier in this document.
4	Anticipated results will be calculated using the timber supply responses indicated by MP #3 sensitivity analyses.
5	The harvest forecasts will use the current AAC as the starting level. Mid and long term harvest forecasts will employ the base case levels from MP #3 as the starting levels.

In the AAC rationale, the chief forester identified several downward influences on timber supply, dealing primarily with additional requirements for biodiversity, and other aspects of the Forest Practices Code. For the purposes of this strategy, however, a status quo is assumed with respect to these. Should any arise, the strategies would serve to mitigate their effects rather than increase timber supply.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m^3/yr)
♦ Immediate				
IM 1 IM 2	Conifer Release PCT-fibre	Both of these treatments must be applied, where necessary, to achieve the managed stand performance incorporated into the MP #3 base case timber supply analysis. These treatments are considered to be part of current practice on TFL 45.	If not implemented, slower greenup. Based on sensitivity analysis (Figure 16), a -2% impact on timber flow will result from a 2 year increase in greenup age.	-2%
♦ Short Term (1 - 20 yrs)				
ST 1	Fertilization @ planting	Not part of current practice on the TFL.	Reduced time to greenup. . Based on sensitivity analysis (Figure 16), a +2% impact on timber flow will result from a 2 year reduction in greenup age.	+2%
ST 2	Fertilization-late rotation	Not part of current practice on the TFL.	Higher volume and piece size. As this treatment is implemented late in rotation, it can be applied to stands currently nearing harvestable age, thereby enhancing short-term volume and piece size.	5-10% if applied to all sites. (use 7% as average)
ST 3	Alternative silviculture systems in VQOs	Currently being implemented through variable retention harvesting systems.	Increased access to timber within VQOs. Figure 15 shows the sensitivity associated with disturbance constraints. Overall, timber flow can be increased by approximately 8% if all disturbance constraints can be relaxed by 3-5%. A program of 60 ha (25% of annual harvest) could therefore have a 1% impact.	+1%
ST 4	Alder conversion	Not part of current practice on the TFL.	Potentially, 200 ha can be added to the THLB. This represents an increase of approximately 0.7%.	1%
♦ Mid Term (21-110 yrs)				

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m^3/yr)
MT 1	Commercial Thinning	Not part of current practice on the TFL.	Increased volumes from intermediate harvests. Application is very site specific and expected size of program is small. Therefore, timber supply impact is minor.	n/a
♦ Long Term (111+ yrs)				
LT 1	Genetic Improvement	80% of harvested areas are currently planted. 1st generation stock being used where possible.	Increases in long-term yields of 3-5% are anticipated from 1st generation stock. Assuming that all planning is done with improved stock, an average long-term gain of 3% (.8 * 4%) is expected.	+3%

Potential Harvest Forecast

Based on a completion of the above table, a graphical representation of the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables has been developed. It assumes the following additive impacts.

- 11% overall improvement of timber flow (across time horizon) (ST1+ST2+ST3+ST4)
- 3% long-term improvement (LT1)

These increases are applied to the base case as shown in Figure 18.

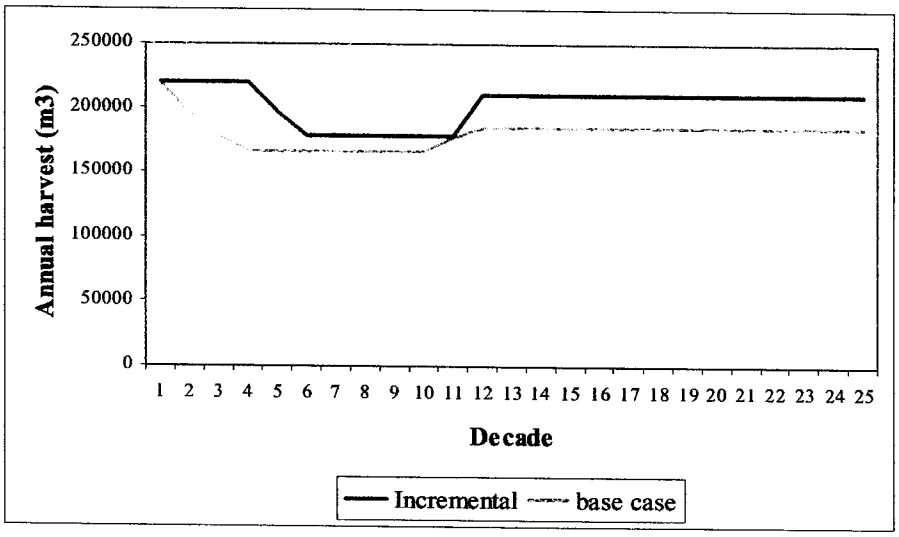

Figure 18. Potential harvest increase

The 11% overall impact was not distributed evenly across the entire time horizon. Rather, in the short-term, the gain was used to extend the existing AAC from 1 decade to 4, thereby increasing the stability of harvest. In the long-term, the harvest flow was increased by a total of 14% (11+3%).

This forecast is at best highly speculative, requiring confirmation through timber supply analysis. Modelling may indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

Opportunities to Improve Timber Quality

The effects of incremental silviculture on the future quality of the timber resource were not analyzed in the MP #3 Timber Supply Analysis. This issue was discussed during the working session.

Product Objectives

During the working session, the topic of product objectives was discussed frequently. It is apparent from discussions with Interfor that no specific product objectives exist, or at least are driving silviculture strategies for the TFL. Uncertainty surrounding future markets is cited as a key reason for this. Nevertheless, it is clear that many of the silviculture opportunities identified will impact on log quality. As part of the characterization of these opportunities, each treatment was assessed with respect to its probable impact on log quality. These assessments are summarized in the following table.

Code	Impact
+	positive
0	neutral
-	negative

Available Information Regarding Potential Treatments and Impact on Quality

Treatment		Impact on quality
IM 1	Conifer Release	0
IM 2	PCT-fibre	+
ST 1	Fertilization @ planting	0
ST 2	Fertilization-late rotation	+
ST 3	Alternative silviculture systems in VQOs	Unknown
ST 4	Alder conversion	0
MT 1	Commercial Thinning	+
LT 1	Genetic Improvement	+
Q1	Pruning	+

Potential Timber Quality Strategies by Response Time Frame

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result
♦ Immediate			
IM 2	PCT-fibre	See Quantity Table	Rotation ages could be decreased, average piece size will be larger at harvest. There will be a quality increase.
♦ Short Term (1–20 yrs)			
ST 2	Fertilization-late rotation	See Quantity Table	If done average piece size would be increased, increase in quality
♦ Mid Term (21–110 yrs)			
MT 1	Commercial Thinning	See Quantity Table	Would result in an increase and stand quality
♦ Long Term (111+ yrs)			
LT 1	Genetic Improvement	See Quantity Table	Should have some effect on stand quality, hard to quantify.
Q 1	Pruning	Being done on a limited basis. Approx 1,500 ha done in past 10 years.	Will definitely increase quality

Opportunities to Improve Habitat Quality/Quantity

The effects of incremental silviculture on the future quality/quantity of wildlife habitat were not analyzed explicitly in the MP #3 Timber Supply Analysis. The issue was discussed during the working session. As with timber quantity/quality, it is clear that many of the silviculture opportunities identified will impact on habitat availability. As part of the characterization of these opportunities, each treatment was assessed with respect to its probable impact on habitat. These assessments are summarized in the following table.

Code	Impact
+	positive
0	neutral
-	negative

Available Information Regarding Potential Treatments and Impact on Habitat

	Treatment	Impact on old growth	Impact on riparian zones	Impact on wildlife habitat
IM 1	Conifer Release	0	0	+
IM 2	PCT-fibre	+	+	+
ST 1	Fertilization @ planting	0	0	0
ST 2	Fertilization-late rotation	0	0	0
ST 3	Alternative silviculture systems in VQOs	+	+	+
ST 4	Alder conversion	0	+	+
MT 1	Commercial Thinning	+	+	+
LT 1	Genetic Improvement	0	0	0
Q1	Pruning	0	0	+
H1	PCT-habitat	0	+	+

Potential Habitat A Strategies by Response Time Frame

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result
♦ Immediate			
IM 1	Conifer Release		Small diameter snag creation
IM 2	PCT-fibre		Promotes understorey vegetation
♦ Short Term (1 - 20 yrs)			
ST 3	Alternative silviculture systems in VQOs		Provides diversity of habitat
ST 4	Alder conversion		Benefits some species, hinders others
♦ Mid Term (21-110 yrs)			
MT 1	Commercial Thinning		Speeds up the development of second growth stands to old growth characteristics, promotes understorey
♦ Long Term (111+ yrs)			
LT 1	Genetic Improvement	Presently being done as seed supply allows	No affect on habitat
H 1	PCT - Habitat	Presently not being done specifically for habitat	Accelerates development of old growth characteristics

Incremental Silviculture Strategy

This section synthesizes the preceding background information and analysis into an incremental silviculture strategy for the TFL.

General Strategy

As stated earlier, short and medium term timber flow on TFL 45 is constrained by timber availability at decade 12. Because of the timing of this constraint, considerable opportunity exists to enhance timber supply prior to this point. Generally, any strategy, which increases timber availability prior to decade 12, will have a positive impact on short and medium term timber flow. Tactics, which accelerate the development of managed stands, are particularly important in this regard. These tactics impact on timber availability in three positive fashions:

- reduced time to greenup;
- Reduced minimum harvest ages; and
- Increased yields at rotation.

Quality targets have not been explicitly established for TFL 45. Several of the silviculture tactics identified for improvement of quantity are also expected to have a positive impact on quality. In addition, pruning could be implemented specifically to improve the supply of premium log grades. However, the cost of such a program is substantial, and more explicit definition of quality objectives should be completed prior to undertaking a pruning program.

Working Targets

The preceding analysis indicates the following working target is attainable:

- Maintain the existing AAC (220,000 m^3) for a period of 40 years;
- Maintain a mid-term level of at least 179,000 m^3; and
- Achieve a long-term level of 212,000 m^3.

Log Product Objectives

As stated, log product quality objectives have not been explicitly developed for TFL 45, nor was it possible to develop focus on this issue during the workshop. The following are product objectives at the log level, which have been developed for another TSA on the coast (Strathcona). These should be used as a starting point for further discussions on this issue.

Quality Class	Species	Characteristics
Premium Log:	Douglas-fir, clear, pruned	45+ cm min DBH, pruned, min 5 m log.
	Douglas-fir, large timber	55+ cm min DBH, unpruned.
	Douglas-fir, clear, unpruned	long rotation.
	Hemlock, large timber	55+ cm min DBH, unpruned.
	Hemlock, clear, unpruned	long rotation.
	Cedar, large timber	55+ cm min DBH, unpruned.
	Cedar, clear, unpruned	2 rotations in stand.
Sawlog:	Minimum average stand DBH of 45 cm and min. stand vol. of 350 m^3/ha.	

Silviculture Strategies

Strategies to Maintain Existing Timber Supply Target

Strategies to Increase the *Quantity* of Future Timber Supply

IM 1, IM 2, ST 1 Achieve earlier greenup through:

a) conifer release (50 ha/year) in North;

b) pre-commercially thin (50 ha/year), primarily in South; and

c) fertilize 17 ha/year @ planting.

ST 2 Achieve higher volumes in existing stands through fertilizing 200 ha/year late in rotation.

ST 3 Increase access to timber in VQOs by harvesting 60 ha/year using variable retention.

ST 4 Increase area of THLB through alder conversion on approximately 20 ha/year.

MT 1 Achieve small increase in medium term supply through commercially thinning 15 ha/year.

LT 1 Increase volumes in managed stands by planting genetically improved stock.

Strategies to Increase the *Quality* of Future Timber Supply

Q 1 Increase premium log content of future stands through pruning 30 ha/year, mainly in South.

Strategies to Increase the *Quantity* or *Quality* of Future Habitat Supply

H 1 Accelerate development of old-growth characteristics through by spacing 10 ha/year.

Summary of Information and Research Needs

No specific information/research needs were identified during the course of the workshop. However, in general, the following uncertainties are recognized:

1. Genetic gain expectations for current and future genetically improved stock;
2. Expected response to early and late fertilization regimes;
3. Yield and stand structural responses to variable retention harvesting systems; and
4. Yield and stand structural responses to commercial thinning.

Silviculture Regimes and Investment Priorities

The following table indicates incremental silviculture regimes which are suitable for attaining the above working targets and strategies.

Regime Table: TFL 45, March, 2000.

Treatment		Location	Ha/yr	Timber supply			Quality	Habitat			Direct Jobs	Direct Cost	Priority
				Sh	Me	Lo		OG	Ri	W	Days/ha	$/ha	
	Surveys	North and South	400								0.1	75	1
IM 1	Conifer Release	North	50	0	0	0	0	0	+	+	2.0	1,500	1
IM 2	PCT-fibre	Mainly South	50	0	0	0	+	+	+	+	4.5	1,800	1
ST 1	Fertilization @ planting	South and North	200	+	+	+	0	0	0	0	0.5	130	3
ST 2	Fertilization-late rotation	South and North	200	+	+	+	+	0	0	0	0.1	320	2
ST 3	Alternative silviculture in VQOs	40% North 60% South	60	+	+	+	0	+	+	+	1.0	3,000	2
ST 4	Alder conversion	South and North	20	+	+	+	0	0	+	+	1.0	25,000	4
MT 1	Commercial Thinning	North and South	15	0	0	0	+	0	+	+	0.5	4,000	4
LT 1	Genetic Improvement	South and north	200	0	0	+	+	0	0	0	0.0	0.0	4
Q 1	Pruning	Primarily South	30	0	0	0	+	0	0	+	10.0	2,500	4
H 1	PCT-habitat	North and South	10	0	0	0	-	0	+	+	4.5	1,800	4

Incremental Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies.

Program Table - Hectares treated: TFL 45, March, 2000

Treatment		Location	Years 1-5					Totals		
			1	2	3	4	5	1-5	6-10	1-10
	Surveys	All	400	400	400	400	400	2000	2000	4000
IM 1	Conifer Release	N	50	50	50	50	50	300	0	300
IM 2	PCT-fibre	Mainly S	50	50	50	50	50	300	300	600
ST 1	Fertilization @ planting	S and N	200	200	200	200	200	1000	1000	2000
ST 2	Fertilization-late rotation	S and N	200	200	200	200	200	1000	1000	2000
ST 3	Alternative silv. in VQOs	S and N	60	60	60	60	60	300	300	600
ST 4	Alder conversion	S and N	20	20	20	20	20	100	100	200
MT 1	Commercial Thinning	S and N	15	15	15	15	15	75	75	150
LT 1	Genetic Improvement	S and N	200	200	200	200	200	1000	1000	2000
Q 1	Pruning	Primarily S	30	30	30	30	30	150	150	300
H 1	PCT-habitat	S and N	10	10	10	10	10	50	50	100
	Total		1235	1235	1235	1235	1235	6275	5975	12250

Program Table – $ 000s: TFL 45, March, 2000

Treatment		Location	Years 1-5					Totals		
			1	2	3	4	5	1-5	6-10	1-10
	Surveys	All	30	30	30	30	30	150	150	300
IM 1	Conifer Release	S	75	75	75	75	75	375	0	375
IM 2	PCT-fibre	Mainly S	90	90	90	90	90	450	450	900
ST 1	Fertilization @ planting	S and N	26	26	26	26	26	130	130	260
ST 2	Fertilization-late rotation	S and N	64	64	64	64	64	320	320	640
ST 3	Alternative silv. in VQOs	S and N	180	180	180	180	180	900	900	1800
ST 4	Alder conversion	S and N	500	500	500	500	500	2500	2500	5000
MT 1	Commercial Thinning	N	60	60	60	60	60	300	300	600
LT 1	Genetic Improvement	S and N	0	0	0	0	0	0	0	0
Q 1	Pruning	Primarily S	75	75	75	75	75	375	375	750
H 1	PCT-habitat		18	18	18	18	18	90	90	180
	Total		1118	1118	1118	1118	1118	5590	5215	10805

Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

Program Table – Short-term job outcomes: TFL 45, March, 2000

Treatment		Location	Years 1-5					Totals		
			1	2	3	4	5	1-5	6-10	1-10
	Surveys	All	0.20	0.2	0.2	0.2	0.2	1.0	1.0	2.0
IM 1	Conifer Release	S	0.6	0.6	0.6	0.6	0.6	3.0	3.0	6.0
IM 2	PCT-fibre	Mainly S	1.2	1.2	1.2	1.2	1.2	6.0	6.0	12.0
ST 1	Fertilization @ planting	S and N	0.55	0.55	0.55	0.55	0.55	2.75	2.75	5.50
ST 2	Fertilization-late rotation	S and N	0.1	0.1	0.1	0.1	0.1	0.5	0.5	1.0
ST 3	Alternative silv. in VQOs	S and N	0.3	0.3	0.3	0.3	0.3	1.5	1.5	3.0
ST 4	Alder conversion	S and N	0.1	0.1	0.1	0.1	0.1	0.5	0.5	1.0
MT 1	Commercial Thinning	N	0.05	0.05	0.05	0.05	0.05	0.25	0.25	0.5
LT 1	Genetic Improvement	S and N	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q 1	Pruning	Primarily S	1.7	1.7	1.7	1.7	1.7	8.5	8.5	17.0
H 1	PCT-habitat		0.25	0.25	0.25	0.25	0.25	1.25	1.25	2.50
	Total		5.05	5.05	5.05	5.05	5.05	25.25	25.25	50.5

Note: assumes 180 days of silviculture work = 1 job

Program Table - Long-term employment: TFL 45, March, 2000

Decade	Harvest Increment ('000m³)	Incremental Jobs			
		Per year by decade		Total by decade	
		TFL	Prov	TFL	Prov
1	0	0.0	0.0	0	0
2	22	11.7	28.8	117	288
3	41.8	22.2	54.8	222	548
4	52.9	28.0	69.3	280	693
5	30.9	16.4	40.5	164	405
6	11.9	6.3	15.6	63	156
7	11.9	6.3	15.6	63	156
8	11.9	6.3	15.6	63	156
9	11.9	6.3	15.6	63	156
10	11.9	6.3	15.6	63	156
11	1.9	1.0	2.5	10	25
12	26.5	14.0	34.7	140	347
13	26.5	14.0	34.7	140	347
14	26.5	14.0	34.7	140	347
15	26.5	14.0	34.7	140	347
16	26.5	14.0	34.7	140	347
17	26.5	14.0	34.7	140	347
18	26.5	14.0	34.7	140	347
19	26.5	14.0	34.7	140	347
20	26.5	14.0	34.7	140	347
21	26.5	14.0	34.7	140	347
22	26.5	14.0	34.7	140	347
23	26.5	14.0	34.7	140	347
24	26.5	14.0	34.7	140	347
25	26.5	14.0	34.7	140	347
Total				3068	7597

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