Strathcona Timber Supply Area

Incremental Silviculture Strategy (Interim)

-- Version 1.0 --

Contents

British Columbia

Ministry of Forests

Funded By

Forest Renewal BC

August 31, 1998

STRATEGY AT A GLANCE

General Strategy

The focus of the silviculture strategy in the Strathcona TSA is to aid the redistribution of harvest between supply blocks, increase the supply of sawlogs during the mid term period, diversify the age class structure, assist in managing for aesthetic and wildlife values, and increase the future supply of premium logs.

Working Targets

Quantity: Manage mid-term timber supplies to yield a harvest of approximately 1.10 million m3/yr and long term supplies to yield 1.25 million m3/yr.

Quality: Manage regenerated stands to yield at least 6% premium logs by volume, with the majority of the remainder being of sawlog quality.

Product Objectives

The following are product objectives at the log level for the Strathcona TSA.

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 m3/ha.	

Major Silvicultural Strategies

Quantity

(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness.)

1. In the Sayward and Kyuquot SB's, achieve a 3-5 year earlier green-up of regenerated stands through a variety of silvicultural practices.
2. In the Sayward, increase existing stand volumes 10% and diversify the age class structure by spacing 300 ha/yr, fertilizing1 500 ha/yr and commercial thinning 400 ha/yr.
3. In the Kyuquot and Loughborough SB's, move age class 1 & 2 stands ahead for earlier harvest and diversify the age class structure by spacing 1 100 ha/yr and fertilizing 200 ha/yr.
4. Increase regenerated stand volumes 20% (tree improvement is critical to success).

Quality

1. Prune 250 ha/yr to increase the future supply of premium logs by 2%.
2. Manage selected stands for large dimension timbers.
3. Manage for clear timber through long rotations of selected stands.

Habitat

1. In the Sayward, create old forest characteristics as early as possible.
2. Space 50 ha/yr to [what density?] for [what purpose?].

Incremental Silviculture Program

(ha)

Year	Surveys	Backlog Brushing	Space	Prune	Fertilize	Total
1	7,000	100	1,550	250	1,500	3,400
2	7,000	100	1,550	250	1,500	3,400
3	7,000	100	1,550	250	1,500	3,400
4	7,000	-	1,550	250	1,500	3,300
5	7,000	-	1,550	250	1,500	3,300
Subtot Yr 1 - 5	35,000	300	7,750	1,250	7,500	51,800
6 - 10	35,000	-	7,750	1,250	7,500	51,500
Total Yr 1 - 10	70,000	300	15,500	2,500	15,000	103,300

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 is in fulfillment of 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.

Methodology

This strategy was prepared through the following process:

1. Prior to the district working session, L. P. Atherton & Associates prepared a preliminary draft of this document, summarizing all 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 July 27 & 28, 1998 in Campbell River, attended by representatives of the MoF and forest licensees of the Strathcona TSA. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. Participants reviewed the potential opportunities identified in the draft document along with others that arose. The outcome of the session was a regime table, complete with priorities.
3. The consultants incorporated the results of the working session into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.
4. After ministry review, the consultants submitted a completed strategy document to the MoF in electronic format as version 1.0. (The ministry will assign higher version numbers (e.g., 1.1, 1.2, etc.) as the strategy evolves and changes are made.)

Acknowledgments

The participation of representatives of the following organizations at the district working session is gratefully acknowledged.

Ministry of Forests:

- Campbell River Forest District;
- Vancouver Forest Region.

Forest licensees of the Strathcona TSA:

- Interfor
- Canfor
- MacMillan Bloedel
- Western Forest Products

The project was managed by Mr. Larry Sigurdson of the Ministry of Forests, Vancouver Forest Region. Funding was provided by Forest Renewal BC.

Basic Data

Land Area

Description	Area (ha)	Area %
Total Area of TSA	659 100	100
Total Productive Crown Forest	377 000	57
Net Timber Harv. Land Base	236 300	36

Source: TS analysis report - rounded to nearest 100 ha.

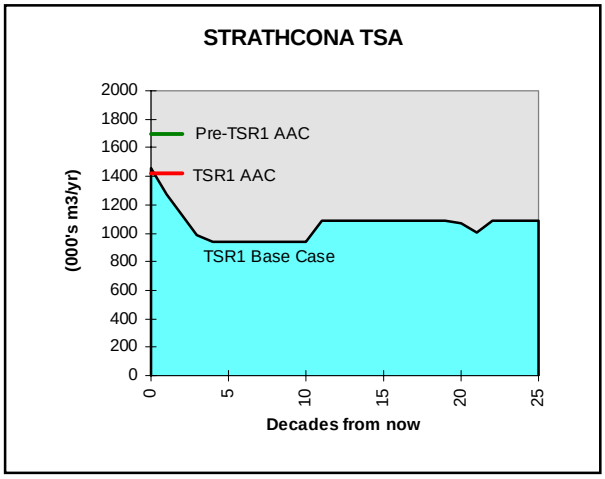
AAC

AAC Type	Pre-TSR	TSR1*	Change (%)
Conventional	1 677 745	1 404 000	-16.3
Deciduous	16 000	16 000	0.0
Insect/Disease	-	-	-
Marginal	-	-	-
Total	1 693 745	1 420 000	-16.2

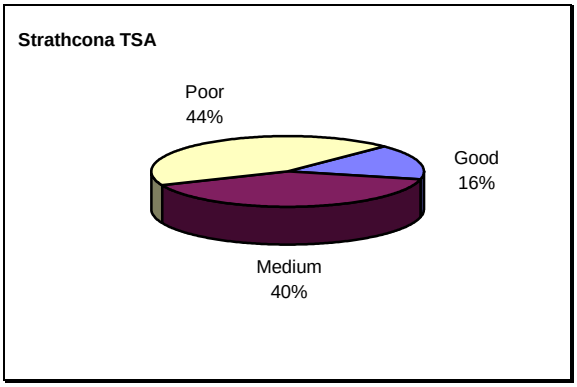
Woodlot AAC

*effective Jan 1/96

Harvest Forecast

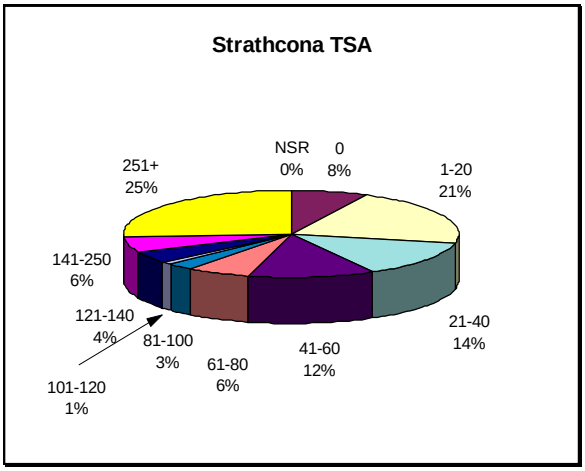


Site Class



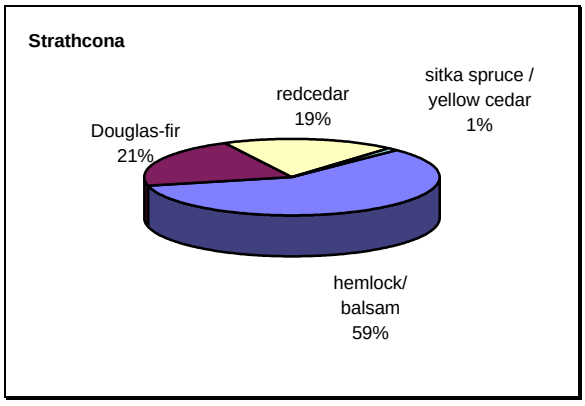
Data scaled from chart in TS analysis report.

Age Class



Data scaled from chart in TS analysis report.

Tree Species



Issues

Individual Issue Analysis

The following information is primarily from documentation produced under the first timber supply review, or TSR1. Sources are noted, with full references given on page 32. Only 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; TSR - timber supply review.

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" assumed to be 1 665 745 m3, after a 28 000 m3 deduction for inclusion of recent land base additions (total pre TSR AAC: 1 693 745 m3). **Initial harvest level is 1 456 621 m3, 13% below current AAC,** declining thereafter at a rate of 12%/ decade to a mid term level of 938 250 m3 reached essentially in 30 years from now (**44% below current AAC, 35% below initial harvest level)**, rising to a long term harvest level of 1 088 250 (**35% below current AAC, 25% below initial harvest level**) 110 years from now. (rationale, 10; analysis, 12) The original abundance of mature forests which historically allowed harvest levels well above the long-term harvest level no longer exists. Harvest levels must decline to avoid serious timber supply shortfalls in the future. (rationale, 27)
♦ Age Class	Approximately 61% of THLB in stands less than 81 years old, more than half of which is in the Sayward and Loughborough supply blocks. These 2 blocks now have a large proportion of relatively young stands due to the historic concentration of harvesting in them. 25% of the THLB is in stands aged 251+, largely in the Kyuquot supply block into which harvesting operations have more recently shifted. (analysis, 13; rationale, 17)
♦ Harvest Distribution	**The challenge is to more evenly distribute the harvest amongst the 3 supply blocks**. Harvesting must be reduced immediately in the Kyuquot SB from the recent level of 1 100 000 m3/yr to 800 000 m3/yr (discussion paper, 9). Approx. 45 000 m3/yr is CT'd in the Sayward SB (rationale, 18), but this appears to be near the limit (discussion paper, 10).
♦ Forest Cover	*Non-VQ Zones*: 63% of THLB. Base case requirement of at most 25% of THLB permitted to be < 3 m tall (4 pass system). Sensitivity test of ± 1 pass. (analysis, 24) Relaxation: (3 pass assumed - actual relaxation amount not stated in analysis report.) Insensitive. This requirement was not a limiting factor in the base case. Increase: (5 pass) **Highly sensitive in the short term**. Initial harvest level 25% below base case. Same as base case starting in 3rd decade but because reduced harvest in the short term causes a larger inventory to be maintained until later decades, reaches the steady LTHL 2 decades earlier than base case. *Visual Quality Zones*: 37% of THLB. Base case requirement of at most 5% (retention VQO), 10% (partial retention VQO) and 20% (modification VQO) to be < 5 m tall. Sensitivity test of ± 5%. (analysis, 25) Relaxation: (+5%) **Mid term shortfall eliminated** (19% above base case). Moderately

sensitive short and long term, with both about 3% higher than base case.

Increase: (-5%) **Highly sensitive** - decrease of 6% in short and mid term, **14% below long term base case**.

Green-up: Green up ages 12 - 14 yrs for 3 m (non-VQ) and 18 - 21 yrs for 5 m (VQ).

Sensitivity test of ± 5 years. (analysis, 23)

Relaxation: (- 5 yrs) Moderately sensitive short and mid term with approximate increases in timber supply of 4 to 6% respectively. Long term insensitive.

Increase: (+ 5 yrs) **Highly sensitive** - initial harvest level 33% below base case. Rises to base case in decade 12. LTHL 3% below base case.

♦ Backlog NSR

0 ha of backlog NSR.

♦ Quality

- 17 738 ha of non-merchantable forest types deducted from THLB (deciduous, low quality pine, age class 8+ stands which are < ht class 3, age class 8+ stands which are ht class 3 unless cedar or cypress leading or have a secondary component of at least 20% cypress). Partition of 16 000 m3 for deciduous species.
- 711 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 TSA at the time of analysis.

Relaxation: N/A

Increase: N/A. CF recognizes that additional requirements for biodiversity constitute a small downward pressure on the initial harvest level projected in the base case (rationale, 24).

♦ Min. Harvest Ages

Base case uses ages within 5% of culmination ages as min. harvest ages (50 - 110 years). Sensitivity analyses of ± 10 yrs. Short term insensitive to either increase or decrease. Slight sensitivity (± 2%) in mid and long term. (analysis, 22)

♦ Silvicultural Systems

Most of the THLB is currently managed under a clearcut harvesting system. Some harvesting is clearcut with reserves. **CF notes potential to increase harvests in visually sensitive areas through visual quality rehabilitation and by using alternative silvicultural systems and careful design of cutblocks** (rationale, 22). 45 000 m3/yr currently harvested through CT. [No mention of Vancouver region directive to have 10% of harvesting done via alternate systems.]

♦ Regeneration

Base case assumes regen delays of 2 (all Fdc, cottonwood) to 5 years (cedar, hem/bal, Sitka spruce). (analysis, 53) Considered an accurate reflection of current practice although some areas stocked before 5 years (rationale, 18).

All cedar and spruce stands are regenerated to hemlock of the same site class. All regeneration is modeled as a pure species. All Douglas-fir are assumed planted to 900 stems/ha. Half of hemlock are assumed to be planted at 900 stems/ha and half to regenerate naturally at 1800 stems/ha. (analysis, 53)

Minor losses to Sitka spruce weevil of 325 m3/yr. (rationale, 18)

♦ Estimates of Timber Volumes

VDYP used for existing stand volumes except Douglas-fir 60 years old or less and hemlock 30 years old or less. TIPSY used for regenerated stand volumes and existing managed Douglas-fir and hemlock stands. (analysis, 54)

Existing stand volumes: Sensitivity test for ± 10% in volume. Long term insensitive. (analysis, 26)

Increase: (+10%) When goal of reducing mid term shortfall below LTHL is given priority, short term insensitive and **mid-term drop below LTHL almost eliminated** (+10%, visual estimate from charts). When this goal not given priority, short term harvests may increase

and base case mid term drop below LTHL maintained.

Decrease: (-10%) **Highly sensitive**. Initial volumes reduced 7% below base case for 1st decade and approx 12% in 2nd decade. Mid term shortfall below LTHL increased by approx. 5% (visual estimate from chart).

Regenerated stand volumes: OAF1 - 15% OAF2 - 5%. (analysis, 54)

Sensitivity tests for ± 20% in volume. Short term insensitive to either. **Highly sensitive to both in long term**. (analysis, 27)

Increase: (+20%) **Mid term harvests raised about 7%** (visual estimate from chart). LTHL 21% higher than base case, rising from a lower mid term shortfall 110 years from now.

Decrease: (-20%) LTHL 22% lower than base case. Mid term harvest level lower than that of base case and from which the LTHL never recovers.

Summary of TSA-level Issues by Period

Short Term (1 - 20 years)

Past harvesting and fires have converted the two eastern supply blocks to younger forests, leaving older forests concentrated in the Kyuquot supply block on the western side of Vancouver Island. Given the general insensitivity to relaxation of forest cover constraints, it appears that there is simply not enough remaining mature forest to support recent harvest levels. The shortage and configuration of older stands makes the short term very sensitive to increases in forest cover constraints and to a decrease in existing stand volumes.

Mid Term (21 - 110 years)

The timber supply analysis does not discuss the cause of the mid term shortfall. Reducing the adjacency constraint by allowing 5% more to be below green up in the VQ zones eliminates the base case shortfall. The shortfall is also almost eliminated when existing stand volumes are increased 10%. Decreasing green-up ages 5 years results in a 6% increase to mid term harvests.

Long Term (111 + years)

The long term is highly sensitive to two factors. Decreasing by 5% the amount of areas in the VQ zones which may be below green-up (thereby increasing the constraint) drops LTHL 14% below the base case. This is because the 5% decrease eliminates all harvest in areas classified retention and doubles the constraint in partial retention areas.

As is the case in virtually all management units, the long term is sensitive to changes in regenerated stand volumes. A 1% increase or decrease in volume results in a corresponding approximate 1% increase or decrease to LTHL.

Future

Deferred harvesting (log-around) and future land base reductions through the Vancouver Island Land Use Plan have undetermined complications for future timber supply.

Older forest, biodiversity and Forest Practices Code requirements are likely to have significant future impacts on timber supply.

Incremental Silviculture History

Approximately 2 000 ha are harvested annually.

Treatment	TSR1 Status (1994)		Current Status (1998)
	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis	Source: CRFD[1]
♦ Backlog	Backlog NSR is virtually non-existent.		There is < 100 ha of backlog in the Kyuquot supply block that is scheduled for treatment this year.
♦ Conversion	900 ha of deciduous converted to conifer forest. Time frame not specified but presumably 10 yrs.		
♦ Commercial Thin		45 000 m3/yr current program (rationale, 18). Appears to be at its limit (paper, 10).	Same program level. Area of CT about 400 ha/yr.
♦ Space		1 000 ha/yr current program to improve stand quality and diameters (rationale, 19).	About 200 ha/yr.
♦ Prune			About 250 ha/yr, mostly 1st lift.
♦ Fertilize		1 000 ha/yr since about 1980. Increases yields approx 14 000 m3/yr. Volume gains not included in base case. (rationale, 19)	Still about 1 000 ha/yr.
♦ Space/ Prune		Combinations not indicated.	Only spaced stands are pruned.
♦ Space /Fertilize		"	Only spaced stands are fertilized.
♦ Other		None indicated.	

Higher Level Goals and Objectives

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

Provincial Goals

Fundamentally, government's goals can be characterized as:

- sustainable use;

[1] CRFD - Campbell River Forest District

- 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 TSR Sensitivity Analyses

TSA modelling in support of planning incremental silviculture has not yet been undertaken. In its absence, sensitivity analyses from the TSR1 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 TSR1 analysis report, to which opportunity information is added. Detailed analyses are required to confirm the indicated effects.

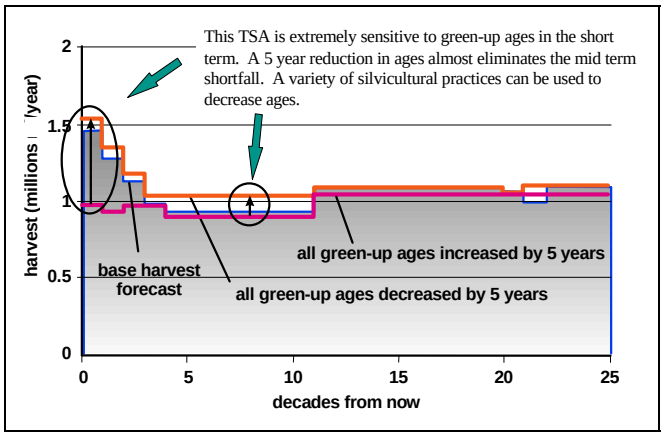


Figure 1. Changes in green-up ages, Strathcona TSA

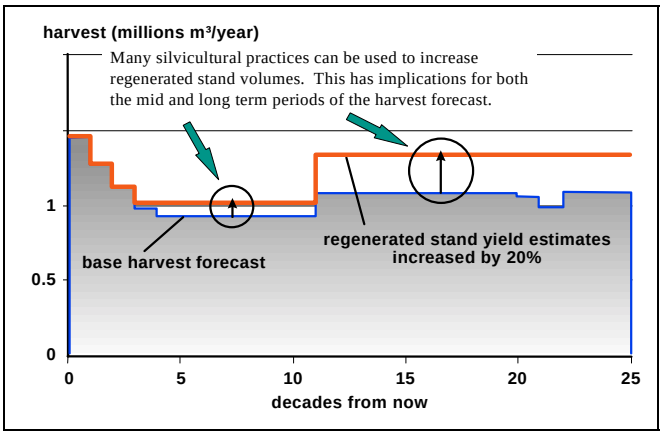


Figure 3. Changes in regenerated stand volumes, Strathcona TSA

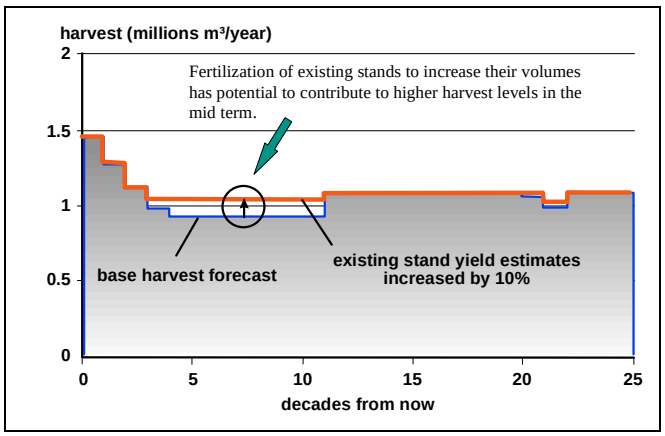


Figure 2. Changes in existing stand volumes, Strathcona TSA

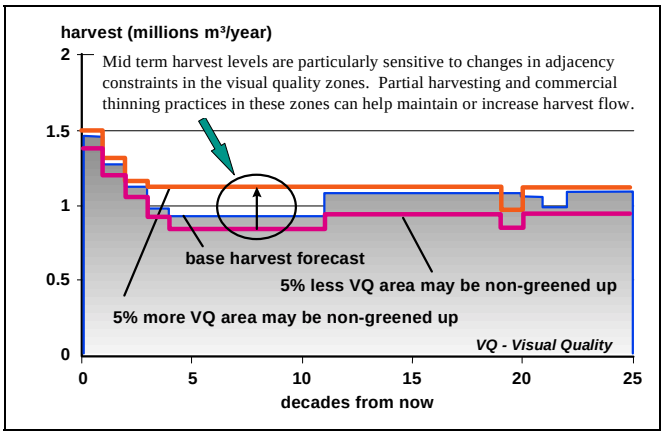


Figure 4. Changes in adjacency requirements in the visual quality zones, Strathcona TSA

Preliminary Identification of Silviculture Opportunities

Prior to the district working session, information in the previous sections was used to identify the following silvicultural strategies as having potential to increase future timber supply at the TSA level. Each of these was discussed in detail in the district working session (at the supply block level), the results of which are recorded in "Potential Strategies by Response Time Frame," page 11, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 26.

♦ Short Term (1 - 20 yrs)

ST 1: complete site index and existing stand volume estimation studies.

ST 2: achieve green-up 3 years earlier through a variety of actions.

ST 3: overcome adjacency limitations by implementing partial harvesting/CT regimes in VQO zones.

ST 4: fertilize P or M site Douglas-fir stands scheduled for harvest in the 2nd decade.

♦ Mid Term (21 - 110 yrs)

MT 1: continue partial harvesting/CT regimes as in ST 3.

MT 2: increase the volume of regenerated stands by 20% and achieve green-up 3 years earlier through a variety of actions.

MT 3: space post FG stands to set up for CT to bring forward harvest from long term into mid term (increasing regenerated stand volumes creates a mid term shortfall).

MT 4: conduct extensive fertilization trials in hemlock stands.

MT 5: address older forest/habitat/biodiversity constraints.

♦ Long Term (111+ yrs)

LT 1: increase regenerated stand volumes 20%.

Supply Block Issues Identified in the District Working Session

MoF district staff and forest licensees of the Strathcona TSA , in a working session held July 27 & 28, 1998 in Campbell River, stressed the importance of supply block (SB) differences within the Strathcona TSA. Redistributing the harvest between the three supply blocks, the Kyuquot, Sayward and Loughborough, is a major issue. The immediate silvicultural challenge is to assist in moving a significant portion of the cut out of the Kyuquot SB into the other two SB's over the next few years, with a return of a portion of this back to the Kyuquot in 20 or so years at a lower and more balanced level.

Perhaps the biggest factor affecting the harvest distribution is the age class distribution of each of the supply blocks (accessibility and treatability being the others). The Kyuquot has the bulk of the older forests as well as a substantial area in age class 1 & 2 as a result of more recent harvesting activities. The other two supply blocks have second growth forests, some of which are nearing maturity. The Sayward SB has much of its timber in a relatively narrow age class band, mostly due to the Sayward fire having burned a large area in the _____'s and which regenerated to a single age class. These age class distributions, although different, create green-up limitations in both the Kyuquot and Sayward supply blocks.

The general consensus is that the Loughborough supply block is not a major player in managing the harvest distribution issue. Much of the supply block consists of higher elevation fragments on the coastal mainland, which are difficult to access and therefore expensive to treat. In the planning discussions, the Loughborough was largely considered a neutral factor.

To aid in developing a silviculture strategy which was relevant to the supply block management issue, the following rough supply block statistics were developed by participants at the working session.

	Supply Block			
	Sayward	**Kyuquot**	**Loughborough**	**TSA**
THLB (net operable ha's)	65 000	126 000	45 000	236 000
Current cut (m3)	300 000	1 000 000	100 000	1 400 000
Forecast cut (m3)	440 000	800 000	160 000	1 400 000
Distribution of IRM zone				63%
Distribution of VQO zone	7%	20%	10%	37%
species distribution	Fd_6 Hw_3 $Other_1$	HB_6 Cw_2 $Other_2$	Hw_5 Fd_2 $Other_3$	

	Supply Block						TSA
	Sayward		Kyuquot		Loughborough		
(subscripts denote %)							
Site class distribution	35%G, 50%M, 15%P		25%G, 50%M, 25%P		25%G, 50%M, 25%P		
Potential area for fertilization treatment as % of total THLB	based on Fdc 60% of 65 000 ha = 39 000 ha		based on estimate of treatable Hw? Assume 50% H responds? ∴ 30% of 126 000 ha = 38 000 ha? [check]		based on Fdc 15% of 156 000 ha = 23 500 ha		
	%	Area	%*	Area	%	Area	
Age class 0-1-2	40	16 000	60	23 000	45	10 500	
Age class 3-4	40	16 000	2.5	1 000	25	5 900	
Age class 5-6	10	3 500	2.5	1 000	5	1 200	
Age class 7+	10	3 500	35	13 000	25	5 900	
Total	100	39 000	100	38 000	100	23 500	

*after ≅ 26 000 ha protected areas removed

Available Information Regarding Potential Treatments and Treatable Area

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

Treatment	Comment	Treatable Area
♦ Spacing		
♦ Fertilization	Fertilization program of 1 000 ha/yr, started in 1980. Volume gain estimated as 14 000 m3/yr. Not reflected in base case forecast. CF recognizes this as optimism for medium to long term. (rationale, 19) Hemlock in the Kyuquot has had a variable response to fertilization. Must do screening trials before treatments.	Fdc 21% of THLB. HB 59 % of THLB.
♦ Commercial Thinning	CT program since 1978 with a current harvest of 45 000 m3/yr. In Sayward SB, goals are to improve age class distribution, enhance wildlife habitat and protect aesthetic values. An analysis by Timberline suggests CT can increase short term supplies. However, CF concludes CT produces little increase in total stand yields over the rotation. (rationale, 18)	18% of THLB aged 41 to 80 years and may be candidates.
♦ Rehabilitation	900 ha of deciduous stands included in analysis as converted to mainly coniferous forest. Other areas may be converted through harvesting under the 16 000 m3 partitioned AAC.	
♦ Backlog NSR	None.	0

Potential 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	Due to the need to manage at the supply block level, strategy numbers doe not correspond with the numbers recorded earlier in "Preliminary Identification of Silviculture Opportunities," page 8.
3	Information is largely from a meeting of ministry personnel and forest licensees held July 27 & 28, 1998 in Campbell River (the "district working session") combined with information presented earlier in this document.
4	Anticipated results are typically calculated using the timber supply response indicated by TSR1 sensitivity analyses.
5	The harvest forecast for the short term uses the TSR1 AAC as the starting level in the first decade, and the TSR1 AAC less 12% for the 2nd decade (as per the base case). Mid and long term harvest forecasts take the base case levels from TSR1 as the starting levels. The harvest forecast column was not thoroughly reviewed during the district meeting. *Results are largely conjecture and are meant to illustrate the potential of the strategies.*

In the AAC rationale, the chief forester identified a number of potential downward influences on timber supply. For the purposes of this strategy, however, a status quo is assumed with respect to these. Should any arise, the following 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 m3/yr)
♦ Short Term (1 - 20 yrs)	*The primary challenges in the short term are: (1) to increase harvest levels in the Sayward SB to accommodate the transfer of cut from the Kyuquot SB and (2) overcome green-up and adjacency limitations in the Kyuquot SB to maintain harvest levels there as much as possible.*			
Sayward ♦ ST1	1. CT to overcome adjacency constraints.	1. 45 000 m3/yr is coming from CT. Probably at or near its upper limit.	1. Sensitivity test indicates a 3% gain in short term if 5% more area may be non-greened up. 45 000 m3/yr is coming from CT. Equals 45/1420 tot cut = 3% of total cut. ⇒ 3%	
Sayward ♦ ST2	2. Achieve green-up 3 years earlier in IRM zone and 5 years earlier in VQ zones by: (a) Plant large genetically improved stock; (b) reduce regeneration delay 1 yr by increasing proportion of area planted; (c) brush for growth enhancement; (d) space and fertilize suitable regenerated stands; and/or (e) plant 10% alder.*	2. Constraint in IRM zone is a max of 25% of THLB can be < 3 m tall. About 25% of Sayward is VQO (7% of entire THLB) where green-up ht is 5 m. TSR1 ages are 12 - 14 yrs for 3m and 18-21 yrs for 5 m. (a) All areas are planted. All Fdc, Hw and Cw stock is A class. Yield gains are 3-5% on 1st generation stock. [check - any 2nd gen in use?] Assume gains of 1 yr on 3m and 2 yr on 5m. (b) All areas are planted with 1 yr regen delay avg. TSR 1 regen delays were 2 yrs for Fdc & 5 yrs for Hw. Assume avg gain 2 yrs. (c) Brush competition is not normally a problem. [check] (d) Fertilizing at time of planting is an option, although is associated with a basic silviculture activity (planting). Assume gain 1 - 2 yrs. [check - how much tea bag fert at present?] (e) alder contributes to green-up as well as increases site productivity. Could gain 1 - 2 yrs. Not current practice.	2. Indications are the potential strategy is achievable. District working session participants estimate 3m ht is achieved in 10 yrs. Sayward has 20% of TSA VQO's (7/37). Sensitivity analysis indicates a 4% gain in short term with g-up ages decreased 5 yrs. (.2 X .04) ⇒ 1%	
Sayward ♦ ST 3	3. Increase existing stand volumes 10% by:	3. The benefits of past actions now accrue to the short term period of this planning horizon. (a) approx. 12 000 ha of age class 3 Fdc is now spaced;	3. Assume program will be continued with age class 1 & 2 stands ∴approx 30 000 ha potentially under management (age classes 1 -	

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
	(a) spacing to prepare for CT; (b) multiple fertilization of suitable Fdc stands; and (c) commercial thinning to capture mortality.	(b) above stands have been fertilized every 10 years since 1975, most 2X, some 3X - requires an **annual program of 1 300 ha/yr** [changed to match regime table - OK?]; and (c) 2 500 ha have been CT'd.	4), or 13% of THLB. Fertilization is anticipated to increase yields by 8%. CT can recover up to 10% mortality. Assume 6% recovery on ½ of areas = 3% gain, for a total gain of 11%. Overall TSA increase is .11 X .13 = 1%. Sensitivity test indicates a 10% increase in existing stand vol's gives a 10% incr. in harvest levels ∴⇒ 1% across entire TSA.	
Kyuquot ♦ ST 4	4. Achieve green-up 3 years earlier in IRM zone and 5 years earlier in VQ zones by: (a) Plant large genetically improved stock; (b) reduce regeneration delay 1 yr by increasing proportion of area planted; (c) brush for growth enhancement; (d) space and fertilize suitable regenerated stands; and/or (e) plant 10% alder.*	4. Almost 40% of Kyuquot is VQO (20% of entire THLB). TSR1 ages and current actual practice ages are as follows: Zone / Max % / <ht (m) / TSR age / current age IRM / 25 / 3 / 14 / 10 Ret'n / 5 / 5 / 20 / 12 P Ret'n / 11 / 5 / 20 / 12 Mod'n / 27 / 5 / 21 / 12 (a) Regeneration is a mix of natural/plant, however all areas receive some planting. All Fdc, Hw [check] and Cw stock is A class. [How much 2nd gen?] (b) All areas are planted with 1 yr regen delay avg. TSR 1 regen delays were 2 yrs for Fdc & 5 yrs for Hw. Assume avg gain 2 yrs. (c) Brush competition is not normally a problem [check]. (d) Fertilizing at time of planting is an option, although is associated with a basic silviculture activity (planting). Assume gain 1 - 2 yrs. [how much at present?] (e) alder contributes to green-up as well as increases site productivity. Could gain 1 - 2 yrs. Not current practice.	4. Indications are the strategy is being achieved. Participants estimate 3m ht is achieved in 10 yrs. Kyuquot has 54% of TSA VQO's (20/37). Sensitivity analysis indicates a 4% gain in short term with g-up ages decreased 5 yrs. (.54 X .04) ⇒ 2%	

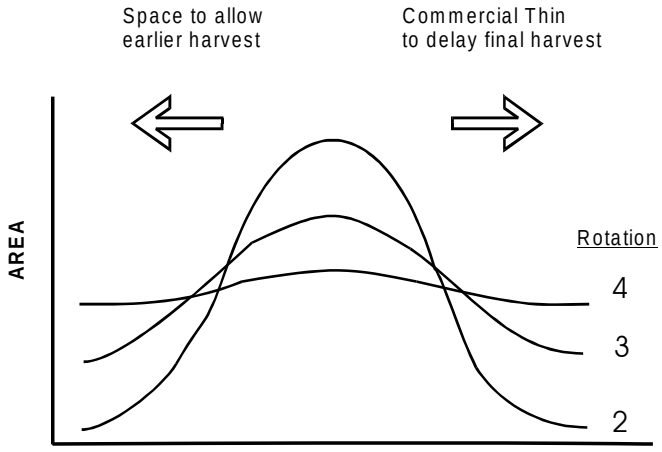
Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
TSA				
♦ ST 5	5. Complete site index and existing stand volume estimation studies.	5. Noted under "Summary of Information and Research Needs," page 28.	5. Not factored into this harvest forecast.	
TSA			Assume responses are 2nd decade only.	1.42 1st dec.
Short Term Summary			ST1 Sayward CT 3%	
			ST 2 Sayward green-up 1%	1.25 2nd dec.
			ST 3 Incr. Sayward vol's 1%	0.09 7% gain
			ST 4 Kyuquot green-up 2%	1.34
			Total 7%	Start point is TSR1 AAC. 2nd decade is 12% less as per base case forecast.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
♦ Mid Term (21 - 110 yrs)	*The primary challenge in the mid term is to advance the growth of some of the existing age class 1 & 2 stands in the Kyuquot and Loughborough SB's to allow the early return of harvest back into these blocks, as well as to break up the age class structure.*			
Kyuquot				
♦ MT 1	1. Move age class 1 & 2 stands ahead for earlier harvest through: (a) spacing; and (b) fertilizing.	1. There is about 60 000 ha of age class 1 & 2 in the Kyuquot. (a) About 15 000 ha could be spaced. Remainder is inaccessible or uneconomic to treat. **Potential program of 1 000 ha/yr.** Due to concerns about shallow rooting and blowdown, standard practice is to space to 850 - 1 000 stems/ha as late as possible (15 - 25 years). (b) Hw response to fertilization is variable. Need to focus operational research into Hw fertilization response. Noted under "Summary of Information and Research Needs," page 28. Also an accessibility problem. Until more is known about response, relatively small **annual program of 200 ha** is reasonable.	1. Requires modelling.	
Lough-borough				
♦ MT 2	2. Move age class 1 & 2 stands ahead for earlier harvest and break up age class structure through: (a) spacing; and (b) fertilizing.	2. Most stands are age class 2 in the Loughborough. Many of the original roads are gone. Generally poor rocky sites. High treatment cost - all camp work. (a) Not many available areas for spacing. Most treatable stands are done. Remainder are too old. Only enough for a **small program of 100 ha/yr.** (b) Hw response to fertilization is variable (see MT 1 above). Fragmentation of this SB makes grouping stands for treatment difficult. No program proposed until more is known about Hw fertilization response.	2. Requires modelling to determine the dependency of the TSA harvest schedule on the age class structure of this SB.	

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
TSA				
♦ MT 3	3. Continue partial harvesting/CT in VQO zones as in ST1 above.	3. The Sayward has substantial opportunity for CT. Limited opportunities exist in the other 2 SB's.	3. Sensitivity analysis indicates a 19% gain with a 5% relaxation in constraints. Assume 25% of this ⇒ 4%	
TSA				
♦ MT 4	4. Increase existing stand volumes 10% by: (a) continuing as per ST 3 the Sayward SB; and (b) over time, intensifying the management of Hw in the Kyuquot SB (as per ST 4); and (c) commercial thinning 400 ha/yr to capture mortality.	4. Continuing. (a) See ST3. (b) See ST4 (c) Current level of activity.	4. Sensitivity test indicates a 10% increase in existing stand vol's gives a 10% incr. in mid term harvest levels. (a) See ST3 ⇒ 2% across entire TSA. (b) See ST4 ⇒ 2% across entire TSA. (c) very small effect on a TSA-wide basis.	
TSA ♦ MT 5	5. (a) Increase regenerated stand volumes 20%; and (b) reduce green-up ages 3 years by: (i) planting all areas; (ii) reducing time to regeneration; (iii) using A class seed or better; (iv) using large planting stock;	5. (i) Approx. 80%+ of harvested areas are planted, with some fill planting on the remainder. Likely at its maximum. (ii) See ST 2 & ST 4 above. (iii) All Fdc and Cw seed is "A" class. Latest estimates of yield gains are (%):[2] Species / 1st gen / 2nd gen Doug-fir 3-5 15 Hemlock 3 20 Cedar 3 10 **A tree improvement program for Ba is needed**. Noted under "Summary of Information and Research Needs," page 28.	5. These are associated with basic silviculture activities. (a) Assume regenerated stand yields increased by: (iii) 10% tree improvement (requires at least 25% 2nd generation stock); (v) 5% void management (more in Sayward, less in Loughborough); (vi) 1% fertilization. Total = 16% Sensitivity tests indicate a 7% MT increase from increasing regenerated stand	

[2] Source: participants at Fraser TSA district meeting.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
	(v) managing stocking to reduce voids 5%; (vi) fertilizing regenerated stands (cedar?) where efficacy is proven.	(iv) Basic silviculture item. Larger stock could be used but not likely in current economic conditions. (v) Voids can be desirable for wildlife habitat. Current free growing requirements will result in < 15% in voids, especially in the Sayward, however amount is unknown. Noted under "Summary of Information and Research Needs," page 28. (vi) "Tea bag" seedlings? Not likely to fertilize prior to FG. Post FG see ST2, ST 3, MT2, MT3.	volumes 20% ∴(16/20 X .07) ⇒ 6%. (b) See ST 2 & ST4. A 5 yr green-up reduction is probable (assume Loughborough = other SB's). Sensitivity tests indicate a 6% increase from a 5 yr reduction in green-up. ⇒ 4%. Unknown if effects are additive or perhaps compounded. (Fig 25 of TSR analysis (p 31) indicates at least additive.) Increased site productivity may further compound these effects.	
TSA ***Mid Term Summary***			MT3 Partial Harvest / CT 4% MT 4a Incr. Sayward vol's 2% MT 4b Incr. Kyuquot vol's 2% MT 5a Incr. regen. vol's 6% MT 5b Decr. green-up ages 4% Total 18%	0.94 base 0.17 18% 1.11

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
♦ Long Term (111 + yrs)	*Over the long term, the challenge is to normalize the age class distributions of the Sayward and Kyuquot SB's and to increase regenerated stand volumes.*			
Sayward				
♦ LT 1	1. Break up the concentration of ages into a normal forest by: (a) spacing some stands to bring them to harvestable size earlier and move them forward in the harvest queue; (b) spacing some stands to set up for CT; and (c) CT some stands to delay final harvest by 1 age class.	1. The diagram below shows how over several harvest rotations, the strategy will redistribute the age classes into a more even distribution.  **AGE CLASS DISTRIBUTION** The district expects to soon assign to every stand a target harvest age within 5 year age groupings. (a) Current program is to **space 200 ha/yr for bringing harvest ages forward** (b) Current program is to **space 100 ha/yr for setting up for CT**. (c) Current program is to **CT 400 ha/yr** for the dual purpose of delaying final harvest ages as well as overcoming	1. Effect unknown - requires modelling. Ultimately beneficial in meeting adjacency/green-up requirements. Allows for the Sayward to be potentially managed as an independent management unit as some future time.	

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000 000s m3/yr)
		adjacency constraints.		
Sayward				
♦ LT 2 ♦ H 1	2. Create old forest characteristics as early as possible through a regime of spacing / fertilization / CT / fertilization.	2. The Sayward has few older forests. Anticipated as a future issue - TSR 1 did not include an older forest requirement in base case. Forest structure can be advanced similar to that of older forests through this strategy. Existing programs will accomplish this.	2. Effect unknown. No TSR 1 sensitivity test. Requires modelling.	
Kyuquot				
♦ LT 3	3. Break up age class structure by continuing MT1.	3. See MT 1	3. See MT 1. Requires modelling.	
Lough-borough				
♦ LT 4	4. Break up age class structure by continuing MT2.	3. See MT 2	3. See MT 2. Requires modelling.	
TSA				
♦ LT 5	5. Increase regenerated stand volumes 20% by continuing MT5.	5. See MT5.	5. See MT5. ⇒ 16%	
TSA				
Long Term Summary			LT 5 Incr. regen. vol's 16% Total 16%	1.09 base 0.17 16% 1.26 total

Potential Harvest Forecast

Figure 5 graphs the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables. This forecast is highly speculative and requires confirmation through computer-based modeling and analysis. It also includes silvicultural activities that are not within the traditional scope of incremental silviculture. Modeling may indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

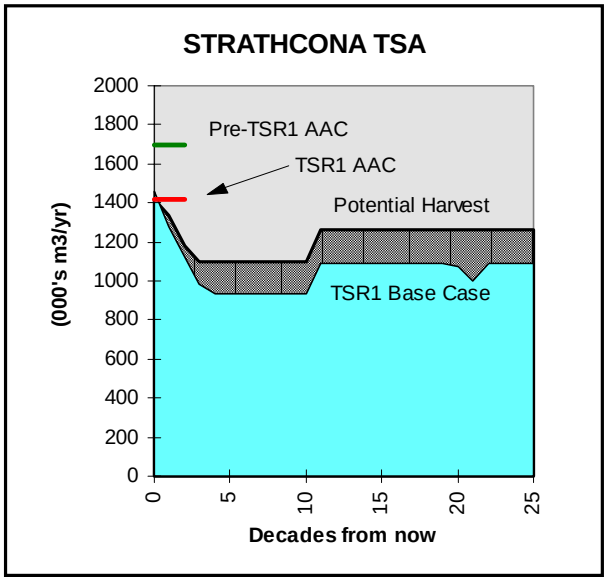


Figure 5. Potential harvest forecast, Strathcona TSA

Opportunities to Improve Timber Quality

The effects of incremental silviculture on the future quality of the timber resource were not analyzed in the timber supply review. Information in this section was gathered during the district working session.

Product Objectives

The following are product objectives at the log level for the Strathcona TSA.

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 m3/ha. [check. These are common specs elsewhere, but were not discussed at the district working session. Suspect in Sayward they could be lower. What is merch CT material?]	

Available Information Regarding Potential Treatments and Treatable Area

Treatment	Comment/ Potential Treatment Regimes	Treatable Area
♦ Incremental Silviculture		
♦ Spacing	There is debate in professional circles regarding the benefits of spacing. However, actual stand measurements of trials at Shawnigan Lake (in Douglas-fir stands), as opposed to modeled projections, are showing increases in mean diameters with little or no loss in total volume, 24 years after treatment.	
♦ Commercial Thinning		
♦ Pruning		
♦ Space/ Prune		
♦ Space/ Prune/Fert		
♦ Other		

Potential Strategies by Response Time Frame

The following strategies have potential to increase timber quality. These were identified in the district working session. The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Premium Log Forecast
♦ Short Term (1 - 20 yrs)	None	Short term harvests will come from existing very old stands which are not treatable to improve quality.	Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%.	15%?
♦ Mid Term (21 - 160 yrs)	Q1. Prune 200 ha/yr in the Sayward SB to yield a 5 m log. Q2. Prune 50 ha/yr in the Kyuquot SB to 5.5 m to yield a 5 m log [check] Q3. Manage for large dimension timber. Q4. Manage for clear timber through long rotations of selected stands.	1. Normal regime is to prune in 2 lifts to 5.5 m, Dfc good and medium site only. Because many stands are already 1st lift pruned, most treatments in the near future will be 2nd lift. Net effect is 200 ha/yr treated for 2 lift pruning. [check - are all stems pruned, or only 2/3rd's as often the case elsewhere?] 2. Normal regime is to prune in 2 lifts to 5.5 m, Dfc & Hw, good and medium site only. Because many stands are already 1st lift pruned, most treatments in the near future will be 2nd lift. Net effect is 50 ha/yr treated for 2 lift pruning. 3. Commercially thinned stands will yield large dimension timber where residual stems are left for a significant time before final harvest. [note: if these are pruned, will overlap with 1 & 2 above] 4. It is likely that at least 5% of stands must be held in an older forest condition. If this condition is renewable, would mean 5% of harvests would be from such stands on a periodic basis. Assume 5% every 20 years (1 age class), means 0.25%/yr. The issue of natural pruning achieved through managing stands to higher densities vs. manual pruning arose in the district working session. More analysis of the economics of these management choices is needed. Noted under "Summary of Information and Research Needs," page 28.	1 & 2. 250 ha is approx 13% of annual area harvested. Assume 5 m log is 20% of tree vol. (.13 X .20) ⇒ 3%. 3. See large dimension timber calculation below. 4. Negligible.	1,2 3% clear 3. 4% large Assume 1/3rd of clear are also large, net total = 6%

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Premium Log Forecast</th></tr>
<tr><td>♦</td><td></td><td>Large dimension timber calculation:
Avg. annual area harvested = 2 000 ha
Although program calls for 1 000 ha/yr spacing Hw in Kyuquot, much of this is a “backlog”. For this calc, a steady state level of 300 ha/yr in M/G sites assumed.
% > 60 cm is from TIPSY stock table, rounded to nearest 5%.
Bottom 5m log = 20% of tree vol.
% large = (Area/2000) X (% > 60 cm) X (20% of tree vol.)
<table>
<tr><th>Species</th><th>SI</th><th>Cul Age</th><th>Space frm/to:</th><th>Area</th><th>% > 60cm</th><th>% large</th></tr>
<tr><td>Fdc</td><td>35</td><td>80</td><td>1600/800</td><td>200</td><td>40</td><td>1</td></tr>
<tr><td></td><td>30</td><td>80</td><td>unspaced</td><td>200</td><td>10</td><td>0</td></tr>
<tr><td>Hw/othr</td><td>30</td><td>100</td><td>4000/900</td><td>300</td><td>35</td><td>1</td></tr>
<tr><td></td><td>27.5</td><td>100</td><td>unspaced</td><td>1300</td><td>15</td><td>2</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td>2000</td><td></td><td>4</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>♦ Long Term (161 + yrs)</td><td>As above.</td><td>As above.</td><td>As above.</td><td>4%</td></tr>
</table>

Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be substantially lower than today's levels (6% forecast vs. current estimate of 15%). A higher level of pruning program than currently planned would serve to improve future timber quality, however, there is a lack of treatable stands due to accessibility and cost.

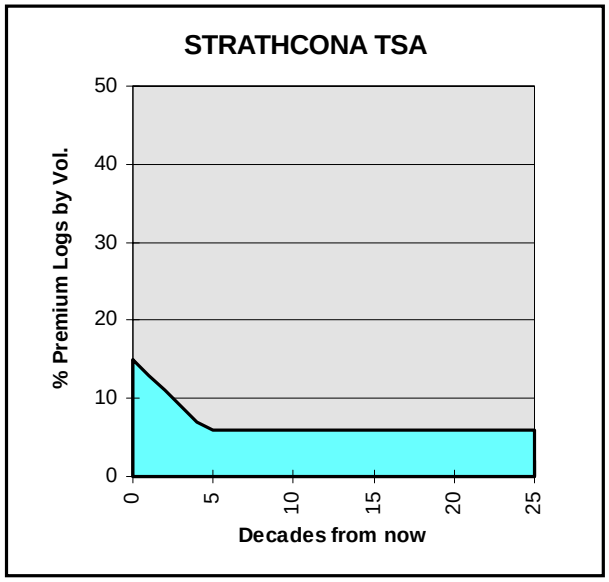


Figure 6. Potential Quality Forecast, Strathcona TSA

This quality forecast is for a combination of clear logs and large-dimension premium logs. Large logs are projected to be 4% of future harvests and clear logs 3%. However, approximately 1/3rd of clear logs will also be large logs, resulting in a net premium log forecast of 6% of future volumes.

Incremental Silviculture Strategy

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

General Strategy

The Strathcona TSA has limited ability to overcome forecast reductions in timber supply in the mid term. Central to increasing long term timber supply is the use of 2nd generation or better improved seedlings. Ensuring future timber quality is particularly important, given the indicated trend toward substantially lower premium log harvest levels in the future. Spacing and commercial thinning are essential practices towards the objective of breaking up the

concentration of area in younger age classes. Pruning is needed to ensure at least a minimal level of premium logs in the future.

Working Targets

The preceding analysis indicates the following working targets are attainable. Figure 7 illustrates these.

WT 1 (Quantity): Manage mid-term timber supplies to yield a harvest of approximately 1.10 million m3/yr and long term supplies to yield 1.25 million m3/yr.

WT 2 (Quality): Manage regenerated stands to yield at least 6% premium logs by volume, with the majority of the remainder being of sawlog quality.

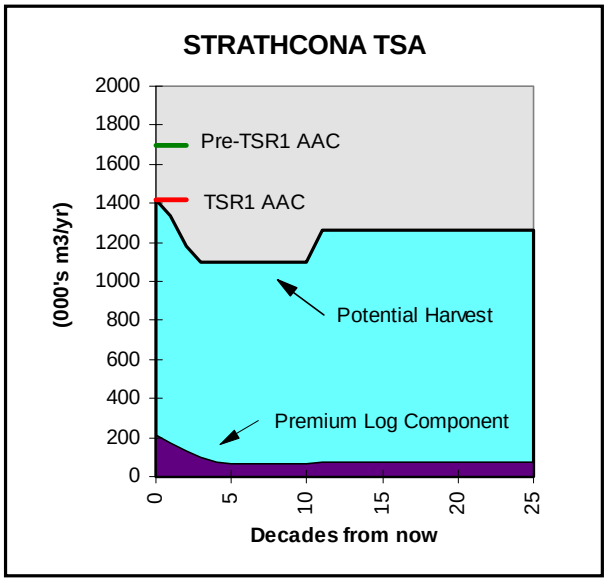


Figure 7. Combined Potential Quantity and Quality Harvest Forecasts, Strathcona TSA

Log Product Objectives

The following are product objectives at the log level for the Strathcona TSA.

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 m3/ha.

Silviculture Strategies

♦ Strategies to Increase the *Quantity* of Future Timber Supply

The following strategies have identified potential to increase the quantity of the timber supply of the Strathcona TSA. (Strategy numbers correspond with those recorded earlier.)

No.	Strategy
ST1	In the Sayward SB, commercial thin 400 ha/yr to overcome adjacency constraints.
ST2 & ST4	In the Sayward and Kyuquot SB's, achieve green-up 3 years earlier in IRM zone and 5 years earlier in VQ zones by: (a) Planting large genetically improved stock; (b) reducing regeneration delay 1 yr by increasing proportion of area planted; (d) space and fertilize (?) suitable regenerated stands; and/or (e) plant 10% alder.*
ST3	In the Sayward, increase existing stand volumes 10% by: (a) spacing to prepare for CT; (b) multiple fertilization of suitable Fdc stands (annual program 1 500 ha/yr); and (c) commercial thinning to capture mortality.
MT1 & MT2	In the Kyuquot and Loughborough SB's, move age class 1 & 2 stands ahead for earlier harvest and to break up age class structure through: (a) spacing 1100 ha/yr; and (b) fertilizing 200 ha/yr.
MT3	Continue partial harvesting/CT in VQO zones as in ST1 above.
MT4	Increase existing stand volumes 10% by: (a) continuing as per ST 3 the Sayward SB; and (b) over time, intensifying the management of Hw in the Kyuquot SB (as per ST 4); and (c) commercial thinning 400 ha/yr to capture mortality.
MT5	(a) Increase regenerated stand volumes 20%; and (b) reduce green-up ages 3 years by: (i) planting all areas; (ii) reducing time to regeneration; (iii) using A class seed or better;

No.	Strategy
	(iv) using large planting stock;
	(v) managing stocking to reduce voids 5%;
	(vi) fertilizing regenerated stands (cedar?) where efficacy is proven.
LT1, LT 3 & LT 4	In all 3 supply blocks, break up the concentration of ages into a normal forest by:
	(a) spacing and fertilizing some stands to bring them to harvestable size earlier and move them forward in the harvest queue;
	(b) spacing some stands to set up for CT (mostly Sayward); and
	(c) CT some stands to delay final harvest by 1 age class (mostly Sayward).
LT5	Increase regenerated stand volumes 16% by continuing MT5.

Tree improvement is critical to achievement of a number of the preceding strategies.

♦ Strategies to Increase the *Quality* of Future Timber Supply

The following strategies have identified potential to increase the quality of the timber supply of the Kingcome TSA.

No.	Strategy
Q1 & Q2	Prune 200 ha/yr in the Sayward SB and 50 ha/yr in the Kyuquot SB (achieves 250 ha/yr of 5.5 m 2 lift pruning) to increase premium log content of future harvests by 3% by volume.
Q3	Manage selected stands for large dimension timbers.
Q4	Manage for clear timber through long rotations of selection stands.

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

(Note: The following strategy was developed in the district working session during discussion of the regime table and is not previously discussed in this document.)

The following strategy has identified potential to increase the quality or quantity of the habitat supply of the Strathcona TSA.

No.	Strategy
H1	In the Sayward, create old forest characteristics as early as possible through a regime of spacing / fertilization / CT / fertilization. (This can be achieved in conjunction with other programs and does not require additional activity goals.)
H2	Space 50 ha/yr to [what density?] for [what purpose?].

Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified.

1. A tree improvement program for Balsam is needed. (MT5)
2. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT5)
3. Old growth site index and existing stand volume estimation studies require completion. (ST5)
4. Hemlock response to fertilization is variable. Were the causes for this determined there may be considerable potential for hemlock fertilization to improve the harvest forecast. (MT1, MT2)
5. More information and analysis is needed regarding natural versus manual pruning regimes, particularly in hemlock forests (Q1, Q2, Q4).

Silviculture Regimes and Investment Priorities

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

Regime Table, Strathcona TSA, July 1998

	Regimes	Strategy	Opportunity Area (Ha/Yr)	Timber Supply Effects Short	Medium	Long	Quality	Habitat OG	Riparian	Wildlife	Direct Silv. Jobs Days/ha	Direct Cost $/ha	Rank[1,2] S	K	L
1	**Backlog Brushing**		100	0	0	0	0	0	0	0	1	1000	na	**3**/2	**3**/1
	Spacing														
	CT Regimes (Sayward @ 10 - 12 yrs)														
2	Fd M-G sites >1600 to 900 (2 entry CT)	ST3, MT4, LT1	100	0	++	0	+	++	0	+	2.5	900	**2**/2	na	na
3	Fd M-G sites >1600 to 750 (1 entry CT)	ST3, MT4, LT1	100	0	++	0	+	++	0	+	2.5	900	**2**/2	na	na
	non-CT Regimes														
	HB,HF/HC M-G sites, 3-5000 to 750-1000														
4	Kyuquot	MT1	1000	0	++	0	+	0	0	+	4	1300		**2**/1	
5	Sayward	LT1	200	0	++	0	+	0	0	+		900	**3**/3		
6	Loughborough	MT2	100	0	++	0	+	0	0	+		1600			**3**/1
7	Habitat	H2	50	0	0	0	0	+	+	++	2.5	1600	**3**/3	**3**/3	
	Pruning														
8	Fd M-G spaced stands (Sayward) 2nd lift	Q1	200	0	0	0	++	0	0	+	10	1350	**4**/4	**4**/5	
9	FdHw M-G spaced (Kyuquot) 2nd lift	Q2	50	0	0	0	++	0	0	+	10	1350	**4**/4	**4**/5	
	Fertilization														
	Fd M-G /CT age 40-50														
	Fd M-G /spaced, no CT, age 40-50														
	Fd M-G /spaced, no CT, younger ages														
10	Sayward	ST3	1300	++	++	+	0	+	0	0	.1	275	**1**/1[3]		
11	Kyuquot	MT1	200	++	++	+	0	+	0	0	.1	275		**3**/3	

Notes
1 Rank S=Sayward, K=Kyuquot, L=Loughborough
2 General ranking: H = 1 & 2; M = 3; L = 4 & 5
3 n/m: **n** is TSA rank, m is supply block rank

[check - both pruning regimes show as 2nd lift]

Incremental Silviculture Program

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

Program Table - Hectares Treated, Strathcona TSA, July 1998

Year	Surveys	Backlog Brushing	Space	Prune	Fertilize	Total
1	7,000	100	1,550	250	1,500	3,400
2	7,000	100	1,550	250	1,500	3,400
3	7,000	100	1,550	250	1,500	3,400
4	7,000	-	1,550	250	1,500	3,300
5	7,000	-	1,550	250	1,500	3,300
Subtot Yr 1 - 5	35,000	300	7,750	1,250	7,500	51,800
6 - 10	35,000	-	7,750	1,250	7,500	51,500
Total Yr 1 - 10	70,000	300	15,500	2,500	15,000	103,300
Unit cost ($/ha)	50	1,000	1,226	1,350	275	

Program Table - $ 000s, Strathcona TSA, July 1998

Year	Surveys	Backlog Brushing	Space	Prune	Fertilize	Total
1	350	100	1,900	338	413	2,750
2	350	230	1,900	338	413	2,880
3	350	230	1,900	338	413	2,880
4	350	-	1,900	338	413	2,650
5	350	-	1,900	338	413	2,650
Subtot Yr 1 - 5	1,750	560	9,502	1,688	2,063	15,562
6 - 10	1,750	-	9,502	1,688	2,063	15,002
Total Yr 1 - 10	3,500	560	19,003	3,375	4,125	30,563

[check - is surveys 7 000/yr or 14 000?]

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 Job Outcomes, Strathcona TSA, July 1998

Short term *employment associated with undertaking the silviculture activity, in person years*

Year	Surveys	Backlog Brushing	Space	Prune	Fertilize	Total
1	3.9	0.6	30.1	13.9	0.8	45
2	3.9	0.6	30.1	13.9	0.8	45
3	3.9	0.6	30.1	13.9	0.8	45
4	3.9	-	30.1	13.9	0.8	45
5	3.9	-	30.1	13.9	0.8	45
Subtot Yr 1 - 5	19	2	151	69	4	226
6 - 10	19.4		151	69	4	226
Total Yr 1 - 10	39	2	301	139	8	452

Note: Assumes 180 days of silviculture work = 1 job (Source: Jobs and Timber Accord)

Long term *employment associated with improved quality and quantity of the timber resource*[1]

Decade	Harvest Increment ('000 m3)	Incremental Jobs per year by decade TSA[2]	Prov[3]	Total by decade TSA	Prov
1	-	-	-		
2	58	30.8	76.2	308	762
3	117	62.0	153.3	620	1,533
4	162	85.9	212.2	859	2,122
5	162	85.9	212.2	859	2,122
6	162	85.9	212.2	859	2,122
7	162	85.9	212.2	859	2,122
8	162	85.9	212.2	859	2,122
9	162	85.9	212.2	859	2,122
10	162	85.9	212.2	859	2,122
11	172	91.2	225.3	912	2,253
12	172	91.2	225.3	912	2,253
13	172	91.2	225.3	912	2,253
14	172	91.2	225.3	912	2,253
15	172	91.2	225.3	912	2,253
16	172	91.2	225.3	912	2,253
17	172	91.2	225.3	912	2,253
18	172	91.2	225.3	912	2,253
19	172	91.2	225.3	912	2,253
20	188	99.6	246.3	996	2,463
21	256	135.7	335.4	1,357	3,354
22	172	91.2	225.3	912	2,253
23	172	91.2	225.3	912	2,253
24	172	91.2	225.3	912	2,253
25	172	91.2	225.3	912	2,253
Total				21,143	52,259

Notes

1 Assumes continuation of on the incremental silviclture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of TSR1.

2 Assumes 0.53 TSA level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Queen Charlotte Islands SEA)

3 Assumes 1.31 Provincial level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Queen Charlotte Islands SEA)

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