

Sunshine Coast Timber Supply Area

Incremental Silviculture Strategy (Interim)

-- Version 1.0 --

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British Columbia
Ministry of Forests

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STRATEGY AT A GLANCE

General Strategy

The Sunshine Coast TSA has substantial opportunity to sustainably increase future timber supply. A general strategy of increasing existing and regenerated stand volumes as well as overcoming forest cover constraints in the visual quality zones will accomplish this. A stable timber supply also allows a focus in this TSA on strategies to generate high quality premium logs, particularly large clear timbers.

Working Targets

Quantity: Manage mid term timber supply to yield harvest levels near the current level of 1.14 million m³/yr, rising in a series of steps beginning in approximately 100 years from now to a long term harvest level of 1.23 million m³/yr.

Quality: Manage regenerated stands to yield at least 10% 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 Sunshine Coast TSA.

<u>Quality Class</u>	<u>Species</u>	<u>Characteristics</u>
Premium Log:	Douglas-fir, clear, pruned.....	45+ cm min DBH, pruned, min 5.2 m log.
	Hemlock, Douglas-fir, large timber	55+ cm min DBH, unpruned.
	Cedar pole	30+ cm min dia over 15 m, few knots.
Sawlog:	Minimum average stand DBH of 30 cm and min. stand vol. of 350 m ³ /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. Achieve green-up 5 years earlier by reducing regeneration delay 2 years; planting large, second generation, improved stock; and fertilizing at the time of planting.
2. Increase partial harvesting / commercial thinning regimes in VQO zones.
3. Repeat fertilize approximately 4 000 ha of existing stands scheduled for harvest 20 to 80 years from now (300 ha/yr in spaced stands & 100 ha/yr in commercially thinned stands) to raise their volumes.
4. Increase regenerated stand volumes 15% through a variety of silvicultural actions (tree improvement is critical to success).
5. Brush 400 ha to maintain backlog plantations.

Quality

1. 1st lift prune 400ha/yr to create knot-free timber in the lowest 3.0 m log.
2. 2nd lift prune 250 ha/yr to create knot-free timber in the lowest 5.1 m log.
3. Space 1200 ha/yr to obtain large dimension timber and prepare stands for fertilization and pruning.

**Incremental
Silviculture
Program
(ha)**

Year	Surveys*	Backlog Brushing	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Health
1	2,000	100	1,200	400	250	400	400
2	2,000	100	1,200	400	250	400	400
3	2,000	100	1,200	400	250	400	400
4	2,000	50	1,200	400	250	400	425
5	2,000	50	1,200	400	250	400	450
Subtot Yr 1 - 5	10,000	400	6,000	2,000	1,250	2,000	2,075
6 - 10	10,000	-	6,000	2,000	1,250	2,000	2,075
Total Yr 1 - 10	20,000	400	12,000	4,000	2,500	4,000	4,150

* Includes prescription and layout

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 20 & 21, 1998 in Powell River, attended by representatives of the MoF and forest licensees of the Sunshine Coast 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:

- Sunshine Coast Forest District;
- Vancouver Forest Region.

Forest licensees of the Sunshine Coast 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	1 121 100	100
Total Productive Crown Forest	447 500	40
Net Timber Harv. Land Base	219 000	20

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

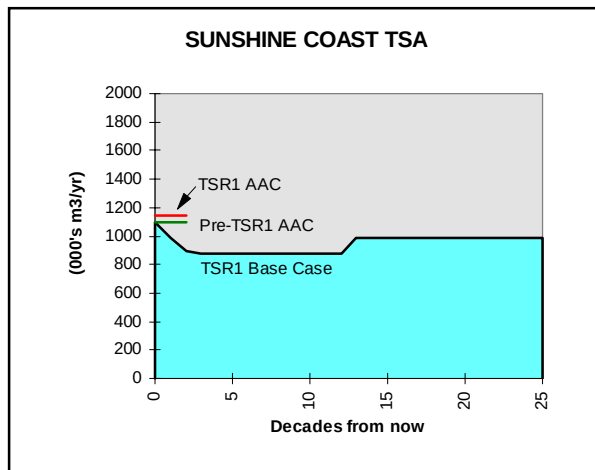
AAC

AAC Type	Pre-TSR	TSR1*	Change (%)
Conventional	1 100 000	1 045 000	-5.0
Deciduous	-	95 000	∞
Insect/Disease	-	-	-
Marginal	-	-	-
Total	1 100 000	1 140 000	+3.6

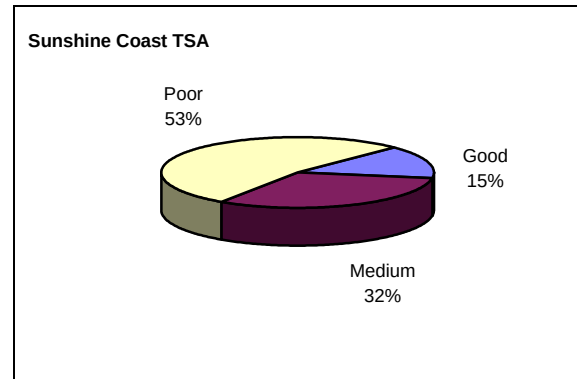
Woodlot AAC

*effective July 1/96

Harvest Forecast

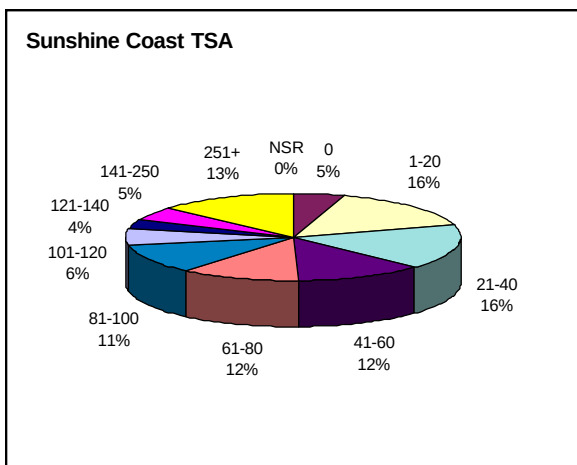


Site Class



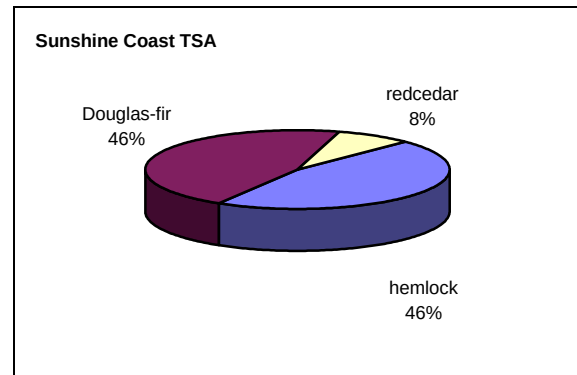
Data scaled from chart in TS analysis report.

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 28. 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; CT - commercial thinning.

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	The initial harvest level of 1 100 000 m ³ (the pre TSR AAC) can be maintained for only one decade, followed by a decline at a rate of 10%/decade over basically after 2 decades to a mid term level of 876 000 m ³ (20% below the IHL). The harvest level rises 130 years from now, at the start of decade 14, to a long term harvest level of 986 000 (10% below pre-TSR AAC). (analysis, 13)
◆ Age Class	Approximately 65% of THLB in stands aged 100 years or less in a relatively balanced distribution of age classes, largely due to the long history of harvesting in the TSA. In approximately 50 yrs, about ½ of the THLB is expected to be managed stands. (rationale, 18)
◆ Forest Cover	<p>IRM Zone: 40% of THLB. Base case requirement of at most 33% of THLB permitted to be < 3 m tall (3 pass system). Sensitivity test of ± 1 pass. Sensitivity test not reported in the timber supply analysis report but CF notes the base case is insensitive to either an increase or decrease. (rationale, 26)</p> <p>Visual Quality Zones: 55% 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, 30)</p> <p><u>Relaxation:</u> (+5%) Highly sensitive over all terms - allows harvests to remain almost constant at the current AAC.</p> <p><u>Increase:</u> (-5%) Highly sensitive - decrease of 10% in first 3 decades from base case, almost 30% below mid term, and 15% below long term.</p> <p>Green-up: 13 yrs in IRM zone, 16 yrs in retention and partial retention VQO zones, and 18 yrs for the modification zone. Sensitivity test of ± 5 years. (analysis, 31)</p> <p><u>Relaxation:</u> (- 5 yrs) Highly sensitive. 1st decade same as base case, but dramatic increases thereafter. Mid term trough below LTHL almost eliminated (16% above base case). LTHL only 8% below current AAC (6% above base case). However, CF finds it unlikely that green-up ages will be reduced 5 years (rationale, 26).</p> <p><u>Increase:</u> (+ 5 yrs) Highly sensitive - initial harvest level 10% below base case. Mid and long term about 6% below base case.</p>
◆ Backlog NSR	Less than 200 ha of backlog NSR. District staff conducting assessment of treatments for these areas. (rationale, 23) [These appear to be included in initial THLB.]
◆ Quality	<ul style="list-style-type: none"> 23 411 ha of alder forest types deducted from THLB (rationale, 15). Partition of 95 000 m³

for deciduous species.

- 17 809 ha (equiv to 8% of THLB) of low productivity forest types deducted from THLB (not reaching 300 m³/ha by age 150 and < specified site index criteria). CF consider almost ¼ of this should be in THLB. (rationale, 19 - 20)
- 77 ha of brush deducted from THLB. (analysis, 7)

◆ Older Forests

Base case does not include a requirement for old growth or biodiversity as there are no specific provisions applied operationally in the TSA. Chief forester acknowledges that additional requirements are likely to present some risk to future timber supplies (rationale, 30).

◆ Min. Harvest Ages

Base case uses ages within 5% of culmination ages as min. harvest ages and the stand has achieved a min harvest vol of 350 m³. Range from 60 - 160 yrs, avg. of 110 yrs. Sensitivity analyses of ± 20 yrs. Slight sensitivity to either in long term. (analysis, 23-24)

Decrease: (- 20 yrs) Short term insensitive. Mild sensitivity mid term, with harvest levels 5% above base case. LTHL 1% higher.

Increase: (+20 yrs) **Short term highly sensitive 21% below base case.** Insensitive mid term.

◆ Silvicultural Systems

Most of the THLB is currently managed under a clearcut harvesting system. Use of alternative systems increasing. CF notes potential to use CT to buffer the impact of increasing constraints by moving operations into areas that would otherwise be unavailable. (rationale, 23-24)

◆ Estimates of Timber Volumes

VDYP used for existing stands older than 20 years. TIPSYS used for all regenerated stands and existing stands aged 20 or less. (analysis, 55)

Existing stand volumes: CF finds no evidence to suggest existing stands are over-estimated (rationale, 18).

Sensitivity test for ± 10% in volume. Long term insensitive to either increase or decrease. (analysis, 26-27)

Increase: (+10%) Short term insensitive as **volume deferred to filling in mid term trough which is almost eliminated.**

Decrease: (-10%) **Highly sensitive.** Initial volume reduced 25% below base case for 1st decade and about 4% below in the mid term. Smaller vol/ha requires more area be forested which is restricted by visual quality forest cover requirements.

Regenerated stand volumes: TIPSYS OAF1 - 5%; OAF 2 - 15%, except 12% for Fdc (rationale, 20 - 21).

Sensitivity tests for ± 20% in volume. Short term insensitive to either. **Highly sensitive to both in long term.** (analysis, 27-28)

Increase: (+20%) Mid term about 6% above base case. LTHL 22% higher than base case, rising from mid term shortfall 110 years from now.

Decrease: (-20%) Harvest levels decrease steadily to LTHL 21% lower than base case.

◆ Site Productivity

Old growth site indexes may be underestimated (rationale, 19). Site index change simulated by changing regen stand volumes ± 10%, minimum harvest ages ± 10%, and green-up ages ± 3 years. In addition to the direct effect of regen stand volume changes, also interacts with forest cover requirements (analysis, 28-29).

Increase: Mid term about 10% above base case. LTHL 16% higher than base case, rising from mid term shortfall 110 years from now.

Decrease: Harvest levels decrease steadily to mid term shortfall 14% below base case rising about 130 years from now to an LTHL also 14% lower than base case.

Summary of Issues by Period

Short Term (1 - 20 years)

The relatively balanced age class structure results in the lowest percentage forecast harvest reduction of any TSA in the Vancouver Forest Region. However, this balanced age class situation also places a heavy reliance on those stands at the front of the harvest queue being available in the short term. Thus the short term is highly sensitive to increases in adjacency constraints in the VQ zones, increases in green-up ages, increases to the minimum harvest ages and decreases to existing stand volumes.

Mid Term (21 - 130 years)

A reason for the early mid term drop below LTHL is not provided in the analysis report but its likely due largely to the application of VDYP (with lower volumes) to the existing mature and immature stands. A 10% increase in existing stand volumes almost eliminates the shortfall. Relaxation of forest cover constraints in the VQ zone also eliminates the trough. Thus there is a potential opportunity for a fertilization and CT regime to eliminate the shortfall.

Long Term (131 + years)

Because of the extensive area within the visual quality zones, the long term is highly sensitive to changes in visual quality constraints and to changes in green-up ages.

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

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 (1995)		Current Status (1998) Source: SCFD ¹
	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis	
◆ Backlog	200 ha restocked in near future.		All backlog has been treated. Brushing required on 400 ha to maintain plantations.
◆ Conversion			
◆ Commercial Thin			30 ha/yr have been commercial thinned over the past two years. The 5 yr plan calls for 30 - 60 ha/yr.

¹ SCFD - Sunshine Coast Forest District

Treatment	TSR1 Status (1995)		Current Status (1998) Source: SCFD ¹
	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis	
◆ Space	TIPSY used on stands regenerated over the past 20 years. Assumes incremental spacing for stocking control on stands harvested prior to 1987 and basic spacing thereafter.		Recent levels have been between 600 to 1 000 ha/yr spaced.
◆ Prune			Current levels is between 300 - 500 ha/yr.
◆ Fertilize			Current practice is 1 000 ha every 5-6 years.
◆ Space/ Prune		Combinations not indicated.	Only spaced stands are pruned. About ¼ of low and mid elevation stands are being 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;
- 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 analysis charts from the TSR1 analysis report, to which opportunity information is added. Detailed analyses are required to confirm the indicated effects.

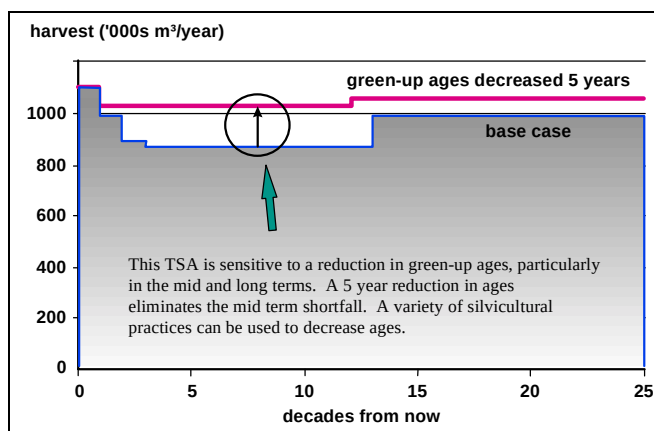


Figure 1. Changes in green-up ages, Sunshine Coast TSA

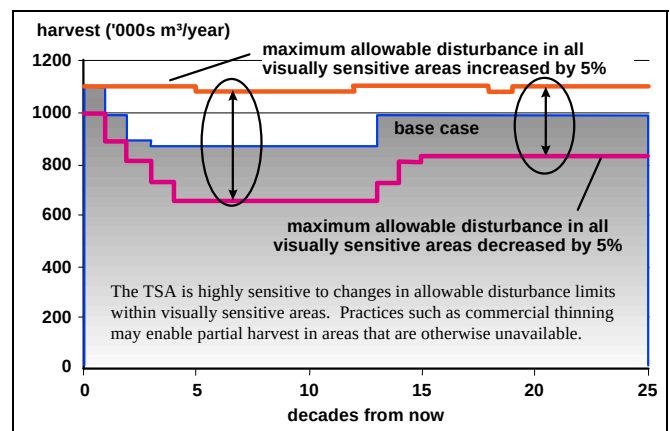


Figure 2. Changes in adjacency requirements in the visual quality zones, Sunshine Coast TSA

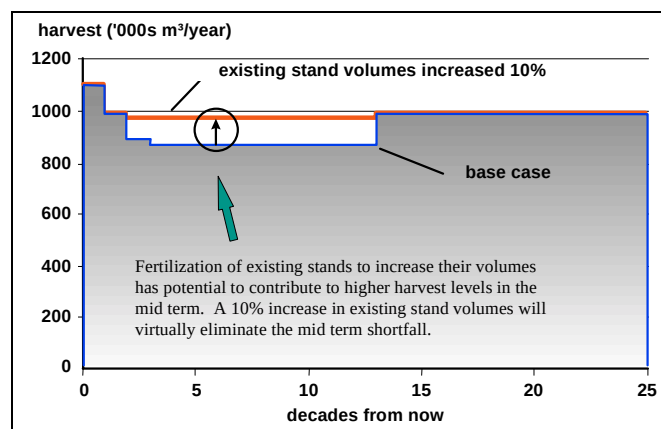


Figure 3. Changes in existing stand volumes, Sunshine Coast TSA

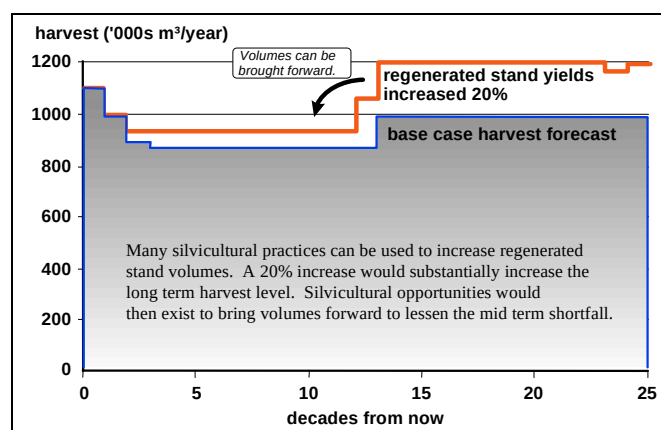


Figure 4. Changes in regenerated stand volumes, Sunshine Coast TSA

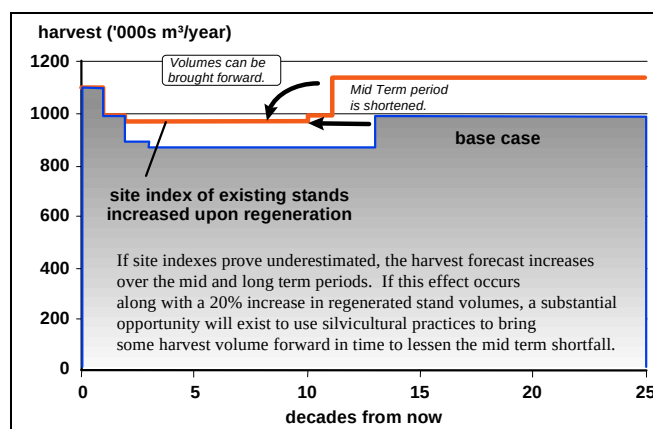


Figure 5. Changes in site index estimates, Sunshine Coast TSA

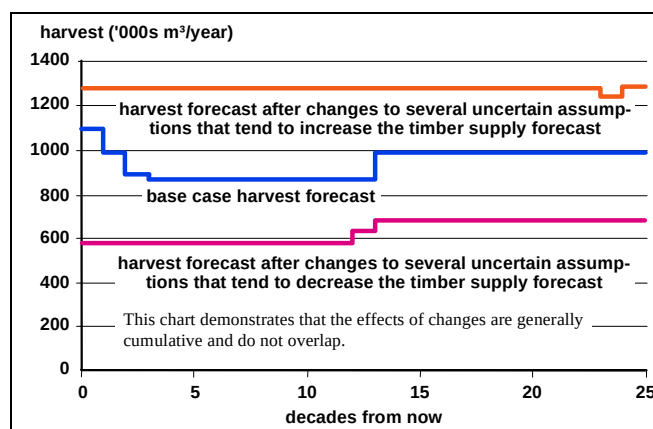


Figure 6. Cumulative effect of several changes, Sunshine Coast TSA

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, the results of which are recorded in "Potential Strategies by Response Time Frame," page 10, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 22.

♦ Short Term (1 - 20 yrs)

ST 1: achieve green-up 3-5 years earlier in VQ zones through a variety of actions.

ST 2: fertilize all suitable stands scheduled for harvest in the 2nd decade.

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

◆ **Mid Term (21 - 130 yrs)**

MT 1: complete the inventory audit and site index estimation studies..

MT 2: continue partial harvesting/CT regimes as in ST 3

MT 3: repeat fertilize all suitable existing stands scheduled for harvest 20 to 80 years from now to both raise existing stand volumes and lower minimum harvest ages.

MT 4: increase the volume of regenerated stands by 20%, achieve green-up 3-5 years earlier, and reduce minimum harvest ages 10 years through a variety of actions.

MT 5: reduce the shortfall below LTHL by using CT/fertilizing regimes commencing in about 80 years to bring forward volumes from the long term.

◆ **Long Term (131+ yrs)**

LT 1: continue MT 4.

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	On an individual stand basis, a yield increase of 5% is anticipated following 1 application after spacing and 1 prior to harvest. (SCFD)	Significant proportion of Fdc stands.
◆ Commercial Thinning	Little CT as of analysis date. Some planned. Concerns over root rot and accessibility. CF notes potential to use CT to buffer the impact of increasing constraints by moving operations into areas that would otherwise be unavailable.	Significant areas in suitable age classes. However, because of access and topography limitations, there are not many available stands.
◆ Partial Harvesting	There is a general district trend towards partial harvesting in the visual quality zones. This may include CT where appropriate.	
◆ Rehabilitation	No rehabilitation program reported in TS analysis.	No opportunity (SCFD).
◆ Alder Conversion	Significant areas of alder will be either converted to conifer or younger alder through the 95 000 m3 partitioned AAC for alder. The district is required to regenerate 35 ha/yr to alder (trials).	
◆ Backlog NSR	None.	
◆ Non-merch Forest Types	Most area deducted in timber supply analysis already accounted for in deciduous partition and increase in THLB associated with special site classifications for some low productivity sites.	

Potential Strategies by Response Time Frame

Explanatory notes with respect to the following tables.

<u>Column Number</u>	<u>Note</u>
1	The response time frame is the period in which the anticipated result is expected, <u>not</u> the period in which actions must necessarily commence.
2	Strategy numbers correspond with the numbers recorded earlier in “Preliminary Identification of Silviculture Opportunities,” page 8. Items followed by an asterisk (*) were added during the district working session.
3	Information is largely from a meeting of ministry personnel and forest licensees held 20 & 21, 1998 in Powell 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 10% for the 2 nd decade (as per the base case). Mid and long term harvest forecasts take the base case levels from TSR1 as the starting levels, adjusted for an increased land base associated with the new TSR1 partitioned AAC for alder (based on a 4000 ha incr. in THLB which TSR1 sensitivity tests indicate would increase harvest levels 2%. The harvest forecast column was not thoroughly reviewed during the district meeting. <i>Results are largely conjecture and are meant to illustrate the potential of the strategies.</i> The harvest forecast does not contain adjustments to reflect the changes in the THLB associated with the TSR 1 AAC determination.

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 (000s m3/yr)
♦ Short Term (1 - 20 yrs)	1. Achieve green-up 3 - 5 years earlier in VQ all zones by:	1. A new definition of green-up has recently been issued. This effectively lowers green-up ages. In the working session, it was found that this potential strategy needs to apply to all zones to attain the effects indicated by the sensitivity test.	1. Sensitivity analysis indicates that a 5 yr reduction in ages results in a 2% gain in the 2 nd decade. If ages are reduced 3 yrs through silvicultural actions, and the definition change accounts for a further 2yr reduction, this gain could be realized. ⇒ 2% (2% X 1.03 = .02)	1.14 1 st dec.
	(a) Planting large genetically improved stock;	(a) 70%-80% of areas are planted with genetically improved stock. All Fdc, and Cw (which is 10-20% of planting) is improved. No improved Hw. First gen seed has 3-5% yield gain (see MT4), but effect on earlier green-up is unknown. Assume 1 yr. Larger stock could be used but not likely in current economic conditions. Basic silviculture item. Depending on size of stock, could reduce green-up ages 1 yr.		1.03 2 nd dec. 0.02 grn-up 0.00 fert <u>0.02</u> prt harv 1.07 total
	(b) spacing and fertilizing suitable regenerated stands; and	(b) Spacing would have little effect on green up as trees are not in serious competition for much of this time. A minor amount of fertilizing is taking place at time of planting (not presently eligible for FRBC funding and not likely to be voluntarily undertaken unless necessary to achieve FG). This costs \$.08 for the tea bag & \$.05 to place. Post FG / pre 5 m green-up can be funded by FRBC but is not currently happening. Assume 2 yr reduction in ages for 5 m greenup as being possible if fertilized at time of planting.		
	(c) reducing regeneration delay.	(c) TSR 1 regen delays are 3 yrs for planted and 6 yrs for natural. Current practice is 1 yr planted and 3 natural -- a 2 yr gain. The above indicates that, on the whole, a 3 yr earlier green-up is attainable through silvicultural practices.		
♦	2. Fertilize all suitable stands scheduled for harvest in the 2nd decade.	2. The bulk of stands coming up for harvest are too old for fertilization. They would have to be CT'd first to open up the canopy to provide room for it to expand in response to fertilization. Constraints on water quality further limit the amount of fertilization that can be done.	2. N/A	

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000s m3/yr)
♦	3. Implement partial harvesting (CT?) regimes in VQO zones.	3. VQO zones are 55% of THLB. MacMillan Bloedel is partial harvesting in its TFL. Interfor is doing some in the TSA. Currently no more than 200 ha/yr, < 10% of harvest in TSA. Will likely increase when necessary to access timber. Root rot can limit CT options in Fdc stands. Further study of root rot management techniques and options are needed. Noted under "Summary of Information and Research Needs," page 23. Log products from thinning are very sensitive to market prices. On the whole, participants in the district working session felt partial harvesting and CT could increase over time.	3. TSR1 sensitivity test indicates a 5% increase in allowable disturbance limits results in a 10% increase in 2 nd decade harvests. Assume partial harvesting doubles to 20% of harvest (.2 X .10) ⇒ 2%	
♦ Mid Term (21 - 130 yrs)	1. Complete the inventory audit and site index estimation studies.	1. Studies are currently underway. The need for their completion is noted under "Summary of Information and Research Needs," page 23. If existing volumes and/or site indices prove underestimated, mid term harvest levels could be substantially higher than the base case. Cruise volumes have been 20% below actual scale volumes.	1. Results unknown. Not factored into this harvest forecast.	876 - base case 18 - Decid adj 44 - Part Harv 0 - Fert 0 - Min ages 44 - regen vols 140 - green-up 0 - min ages 1122 ≅ 1120
♦	2. Implement partial harvesting (CT?) regimes in VQO zones.	2. See ST 3. Requires modelling.	2. Sensitivity test indicates a 5% relaxation in VQO zone yields a 25% incr. in mid term harvests. Assume part harv doubles to 20% of area and this = 2/10 of a 5% relaxation (.2 X .25) ⇒ ≅ 5% increase.	

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000s m3/yr)												
♦	3. Repeat fertilize all suitable existing stands scheduled for harvest 20 to 80 years from now to: (a) raise existing stand volumes; and (b) lower min harvest ages.	3. (a) If 25% of stands aged 41-100 (35% of THLB) are suitable for fert, would equal 55 000 ha. On a 10 yr return cycle, this would be a program of $\approx$ 5 500 ha/yr. However, many existing stands are too old for spacing and would have to be commercially thinned before fertilization. Watershed issues also limit fertilizer application. After taking these factors into account, a program of 300 ha/yr in spaced stands and 100 ha/yr in CT'd stands is the maximum presently possible. This equates to 4 000 ha under a repeat fertilization regime, which = 2% of THLB. (Recent program has been roughly 1 000 ha every 5 or 6 years.) See also, MT4 (v). (b) Usually managers have the choice following fertilization to either maintain the planned harvest age and harvest higher volumes, or harvest the original volume at an earlier age, but not both. In this TSA, because there is greater sensitivity to volume than to minimum ages, the response is assumed to be desired in the volume form - see (a) above.	3. (a) Assume 2% of THLB) suitable for fert. and 10% volume gain $\Rightarrow$ 0.2% increase. (negligible) (b) N/A.													
♦	4. (a) Increase regenerated stand volumes 20% (b) achieve green-up 3 - 5 years earlier, and (c) reduce minimum harvest ages by 10 years by: (i) reducing time to regeneration; (ii)using A class seed or better; (iii)using large planting stock; (iv)managing stocking to reduce voids 5%;	4. (i), (iii) See ST1. (ii) 70%-80% of areas are planted. Of this, about 65% and 15% is genetically improved Fdc and Cw stock respectively. About 15% and 5% is planted with 'B' class Hw or other species respectively. Latest estimates of yield gains are (%): ² <table><tr><th>Species</th><th>1st gen</th><th>2nd gen</th></tr><tr><td>Doug-fir</td><td>3-5</td><td>15</td></tr><tr><td>Hemlock</td><td>3</td><td>20</td></tr><tr><td>Cedar</td><td>3</td><td>10</td></tr></table> Yield gains were not included in TSR 1. Assume a 10% avg yield gain from 2 nd gen seed. (iv) TIPSy standard OAF1 factor for voids is 15%. Objective is to reduce this to 10%. Current free growing requirements will result in < 15% in voids, however the actual amount is unknown. There is a need for completion of surveys for voids to get a measure of the actual area in voids (noted under "Summary of Information and Research Needs," page 23). Voids can be desirable for wildlife habitat, so intensive void management may not be practicable on all areas. Guesstimate that intensive void	Species	1 st gen	2 nd gen	Doug-fir	3-5	15	Hemlock	3	20	Cedar	3	10	4.	
Species	1 st gen	2 nd gen														
Doug-fir	3-5	15														
Hemlock	3	20														
Cedar	3	10														

² Source: participants at district meeting for Fraser TSA, held in Rosedale.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000s m3/yr)								
♦	(v)fertilizing regenerated stands where efficacy is proven; and	management could be achieved on ½ of areas. If practiced on ½ of areas and voids reduced by 5% = .5 X .05 ⇒ 3% (v) Hw response to fertilization is variable. Further information is required (noted under “Summary of Information and Research Needs,” page 23). Including Hw and approx 2/3rds of Fdc, possibly 40% of the THLB could be under a fertilization management regime. However, considerations such as watershed sensitivities, Fdc root rot, etc. probably reduce this by ¾, to 10% of THLB. This would place roughly 20 000 ha ultimately under fertilization management. On a 10 yr return cycle this would mean an annual program of 2 000 ha. As more stands come under management the fertilization program could be expanded gradually to this level. At the present, there is a lack of candidate stands for treatment (see MT3a). Assume a 10% gain (.1 X .1) ⇒ 1% overall.	(a) Sensitivity analysis indicates a 20 yr increase in regen stand vol’s will result in a 6% increase in mid term harvest levels. A 15% gain = (.75 X .06) ⇒ 5%;									
	(vi) root rot management in Doug-fir.	(vi)TIPSY OAF2 for Dfc of 12% used in TSR 1. Normal OAF2 is 5%. When combined with OAF1, there is a net 6% difference in total stand yield caused by a higher OAF2. See ST3 re the need for further study of root rot management. Managing root rot requires an annual program of 200 ha/yr aerial surveys, 100 ha/yr of ground surveys and 100 ha/yr of treatments . Treatment normally consists of removing bridge trees to contain infection centres, but other forms of treatment are also undertaken. Assume no gain for now. (a) From the above, it would appear a 15% gain in regenerated stand volumes is achievable. A mid term rise in harvest levels results because less mature timber has to be held throughout this time period. (b) See ST1. A 5 yr earlier green-up is possible given the potential for improved silvicultural practices and the recent change in standards for measuring green-up. (c) See MT3(b) No impact.	(b) Sensitivity analysis indicates a 5 yr reduction in green up ages results in a 16% increase in mid term harvest levels. ⇒ 16% increase. (c) N/A.									
	5. Reduce shortfall below LTHL by using CT/fertilizing regimes commencing in about 80 years to bring forward volumes from the long term.	5. This item was not reviewed in the district working session. CT will be a future action commencing in a significant way (for this purpose) about 80 years from now. Planning ahead for this has implications for current spacing and fertilization programs. Timberline study (see “References”) indicates substantial possibility.	5. Requires modelling. Assume 5% can be transferred over last 3 decades = 5% of 1 100 000 m3/yr ≅ 55 000 /yr. A 30% vol removal by CT would yield about	Increased site productivity may further compound these effects.	over last 5 decades of MT. <table><tr><th>decade</th><th>vol</th></tr><tr><td>11</td><td>1.17</td></tr><tr><td>12</td><td>1.17</td></tr><tr><td>13</td><td>1.17</td></tr></table>	decade	vol	11	1.17	12	1.17	13
decade	vol											
11	1.17											
12	1.17											
13	1.17											

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Harv Forecast (000s m3/yr)												
♦ Long Term (131+ yrs)	1. (a) Increase regenerated stand volumes 20% (b) achieve green-up 3 - 5 years earlier, and (c) reduce minimum harvest ages by 10 years by continuing activities under MT4.	1. See MT 4. Assume: (a) a 15% gain on regen stand volumes; (b) a 5 yr reduction in green-up ages; and (c) no change due to reduction in min harvest ages.	200 m3/ha. Requires about 55 000/200 or 275 ha/yr of CT.	etc.												
			1. (a) Sensitivity analysis indicates a 20 yr increase in regen stand vol's will result in a 22% increase in mid term harvest levels. A 15% gain = (.75 X .22) ⇒ 17%;	986 - base case 20 - Decid adj 168 - regen vols 59 - green-up 0 - min ages 1233 ≅ 1230												
			(b) Sensitivity analysis indicates a 5 yr reduction in green up ages results in a 6% increase in long term harvest levels. ⇒ 6% increase.	Over 1st 3 decades of LT 0.05 million m3 transferred to MT. (see MT5)												
			(c) N/A	<table><tr><td>decade</td><td>vol</td></tr><tr><td>14</td><td>1.18</td></tr><tr><td>15</td><td>1.18</td></tr><tr><td>16</td><td>1.18</td></tr><tr><td>17</td><td>1.23</td></tr><tr><td>18</td><td>1.23</td></tr></table>	decade	vol	14	1.18	15	1.18	16	1.18	17	1.23	18	1.23
			decade	vol												
14	1.18															
15	1.18															
16	1.18															
17	1.23															
18	1.23															
Increased site productivity may further compound these effects.	etc.															
♦	2. Brush 400 ha to maintain backlog plantations.	2. All backlog NSR has been treated. Brushing is needed on some plantations to ensure they attain free-growing. A program of 100 ha over the next 3 years followed by 50 ha/yr for 2 years is needed.	3. Already included in base case scenarios.	N/A												

Potential Harvest Forecast

Figure 7 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.

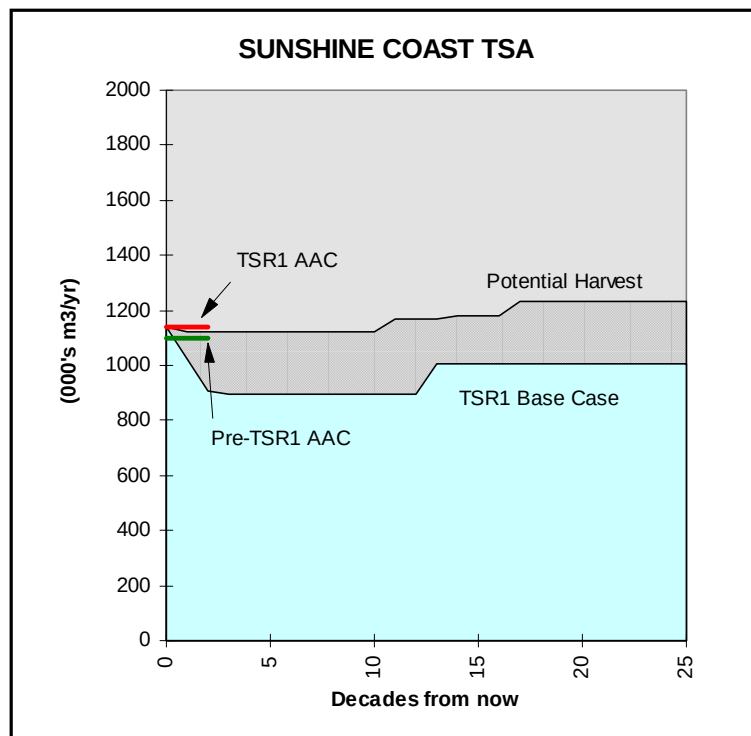


Figure 7. Potential harvest forecast, Sunshine Coast TSA

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 Sunshine Coast TSA.

Quality Class**Species****Characteristics**

Premium Log: Douglas-fir, clear, pruned..... 45+ cm min DBH, pruned, min 5.2 m log.
 Hemlock, Douglas-fir, large timber..... 55+ cm min DBH, unpruned.
 Cedar pole..... 30+ cm min dia over 15 m, few knots.

Sawlog: Minimum average stand DBH of 30 cm and min. stand vol. of 350 m³/ha.

Available Information Regarding Potential Treatments and Treatable Area

Treatment	Comment/ Potential Treatment Regimes	Treatable Area
♦ Incremental Silviculture		
♦ Spacing		
♦ 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 older 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 - 130 yrs)	Q1. First lift prune 400 ha/yr to 3.1 m.	1. Target stands are Dfc, low elevation, good and medium site. All stems are pruned. Any hemlock in a Fdc stand is also pruned, but hemlock stands are not normally pruned.	1. 400 ha is approx 20% of annual area harvested. Assume 3.1 m log is 9% of tree vol. (.20 X .09) ⇒ 2%.	2% clear log content.
	Q2. Second lift prune 250 ha/yr to 5.5 - 6 m.	2. Generally, all 1 st lift stands are given a 2 nd lift. At present, there are more candidate stands coming on line for first lift than there are already treated stands available for 2 nd lift. Hence, within the planning horizon of this strategy, more 1 st lift than 2 nd lift pruning is planned.	2. 250 ha is approx 13% of annual area harvested. Assume next 2.5 to 3 m of tree (2 nd lift distance) is 7% of tree vol. (.13 X .07) ⇒ 1%.	1% clear log content.

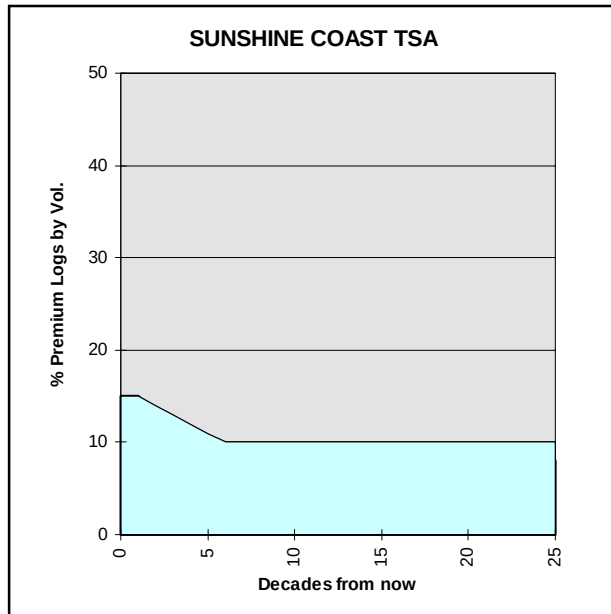
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Response Time Frame	Potential Strategy/Action	Discussion / Current Status							Anticipated Result	Premium Log Forecast	
	Q3. Space 1200 ha/yr to obtain large dimension timber and prepare stands for fertilization and pruning.	3.								3. 6% premium log content, 5% from spaced stands and 1% from unspaced stands.	6% premium logs, some of which will also be clear.
		Avg. annual area harvested = 2 000 ha									
		% ≥ 60 cm is from TIPSYS stock table, rounded to nearest 5%.									
		Bottom 5m log = 20% of tree vol.									
		% large = (Area/2000) X (%≥ 60 cm) X (20% of tree vol.)									
		Species	SI	Cul Age	Space frm/to:	Area	% ≥ 60cm	% large			
		Fdc	35	80	1200/700	700	45	3			
					unsaced	0		0			
		Hw	27.5	100	4000/700	400	40	2			
					unsaced	650	15	1			
C		pole (see below)		<u>250</u>		—					
Total				2000		6					
		Calculation for cedar pole premium log component of future harvests.							No estimate available. If 1/3 of Cw leading species (8% of THLB) is higher density Cw and 25% of stand is poles ⇒ 1% of future harvests will be poles.	1% pole log content.	
		TIPSYS indicates that for Cw with an initial density of 4 000 st/ha, SI 30, at age 100, 50% of stems will be ≥ 40 cm dbh. However, not all of these stems will be pole quality. Assume ½ of this or 25%.									
♦ Long Term (131 + yrs)	As above.	As above.								As above.	10%

Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels (10% forecast vs. current estimate of 15%).

Postponing harvest to ages that are past culmination age would increase the large dimension component of premium logs. However, this is unlikely, given the need to maintain sawlog volumes.



This quality forecast is for a combination of clear logs, large-dimension premium logs, and cedar poles. Large logs are projected to be 7% of future harvests and clear logs 3%. Some large logs will also be clear logs. Cedar poles are estimated to be 1% of future harvest volume.

Figure 8. Potential Quality Forecast, Sunshine Coast TSA

Incremental Silviculture Strategy

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

General Strategy

The Sunshine Coast TSA has substantial opportunity to sustainably increase future timber supply. A general strategy of increasing existing and regenerated stand volumes as well as overcoming forest cover constraints in the visual quality zones will accomplish this. Central to increasing future timber supply is the use of 2nd generation or better improved seedlings. A stable timber supply also affords this TSA the somewhat unique opportunity to focus on strategies to generate high quality premium logs in the future, particularly large dimension, clear timber. Ensuring future timber quality is particularly important, given the indicated trend toward lower premium log harvest levels across the BC coast. Spacing is needed to increase piece size,

reduce future harvesting costs, and prepare stands for pruning and fertilization. Pruning is needed to ensure premium clear logs exist in the future.

Working Targets

The preceding analysis indicates the following working targets are attainable. Figure 9 illustrates these.

WT 1 (Quantity): Manage mid term timber supply to yield harvest levels near the current level of 1.14 million m³/yr, rising in a series of steps beginning in approximately 100 years from now to a long term harvest level of 1.23 million m³/yr.

WT 2 (Quality): Manage regenerated stands to yield at least 10% premium logs by volume, with the majority of the remainder being of sawlog quality.

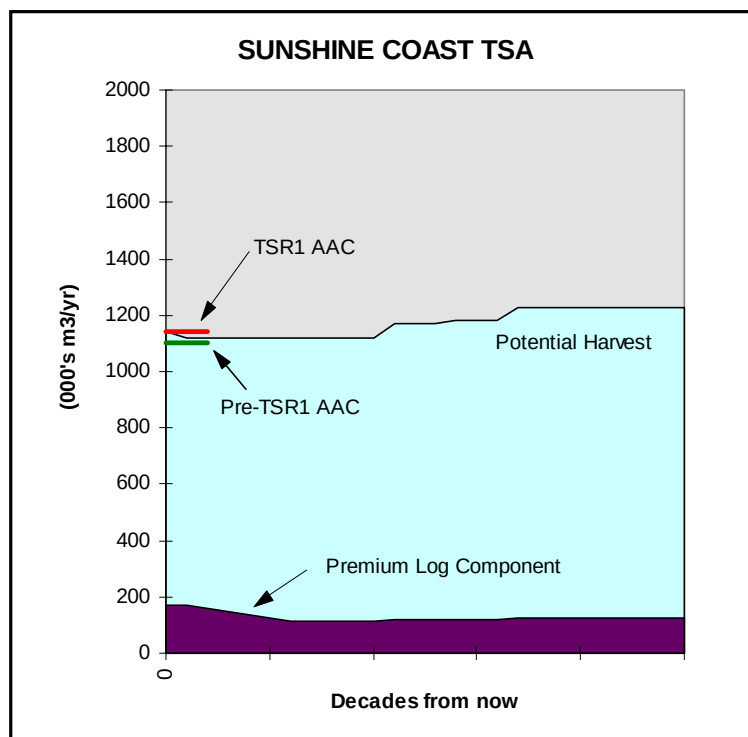


Figure 9. Combined Potential Quantity and Quality Harvest Forecasts, Sunshine Coast TSA

Log Product Objectives

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

<u>Quality Class</u>	<u>Species</u>	<u>Characteristics</u>
Premium Log:	Douglas-fir, clear, pruned.....	45+ cm min DBH, pruned, min 5.2 m log.
	Hemlock, Douglas-fir, large timber	55+ cm min DBH, unpruned.
	Cedar pole.....	30+ cm min dia over 15 m, few knots.
Sawlog:	Minimum average stand DBH of 30 cm and min. stand vol. of 350 m ³ /ha.	

Silviculture Strategies

The following strategies have identified potential to increase the quantity and quality of the timber supply of the Sunshine Coast TSA. Strategy numbers correspond with those recorded earlier.

◆ Strategies to Increase the Quantity of Future Timber Supply

(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.)

<u>No.</u>	<u>Strategy</u>
------------	-----------------

Short Term

- | | |
|------------|--|
| ST1 | Achieve green-up 5 years earlier by reducing regeneration delay 2 years; planting large, second generation, improved stock; and fertilizing at the time of planting. |
| ST3 | Increase partial harvesting / commercial thinning regimes in VQO zones. |

Mid Term

- | | |
|------------|--|
| MT2 | Continue ST 3. |
| MT3 | Repeat fertilize approximately 4 000 ha of existing stands scheduled for harvest 20 to 80 years from now (300 ha/yr in spaced stands & 100 ha/yr in commercially thinned stands) to raise their volumes. |
| MT4 | Increase regenerated stand volumes 15% and achieve green-up 5 years earlier by: <ul style="list-style-type: none"> (a) reduce regeneration delay by 2 years; (b) using 2nd generation 'A' class seed for Douglas-fir, western hemlock, and cedar (requires programs for production of seed for these species); (c) using large planting stock; (d) managing stocking on approximately ½ of regenerated areas to reduce voids by 5%; (e) fertilizing up to 20% of regenerated stands (requires determination of which hemlock |

stands are responsive); and

(f) managing root rot in Douglas-fir stands to reduce losses by 50%.

MT5 Reduce shortfall below LTHL by using CT/fertilizing regimes commencing in about 80 years to bring forward volumes from the long term.

Long Term

LT1 Continue MT 4.

LT2 Brush 400 ha to maintain backlog plantations.

◆ Strategies to Increase the Quality of Future Timber Supply

<u>No.</u>	<u>Strategy</u>
Q1	1 st lift prune 400ha/yr to create knot-free timber in the lowest 3.0 m log.
Q2	2 nd lift prune 250 ha/yr to create knot-free timber in the lowest 5.1 m log.
Q3	Space 1200 ha/yr to obtain large dimension timber and prepare stands for fertilization and pruning.

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

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

<u>No.</u>	<u>Strategy</u>
	No strategies proposed at this time.

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 (see tables in “Potential Strategies by Response Time Frame,” page 10.

1. Further study of root rot management techniques and options are needed. (ST3)
2. Old growth site index estimation studies and the inventory audit require completion. It is anticipated that site indexes and existing stand volumes may be underestimated. (MT1)

3. 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. (MT4)
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. (MT4)

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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, Sunshine Coast TSA, July 1998

Regimes	Strategy	Opportunity Area (Ha/Yr)	Timber Supply Effects			Quality	Direct Silv. Jobs Days/ha	Direct Cost \$/ha	Habitat	Rank
			Short	Medium	Long					
1 Backlog Brushing	LT2	100 (3 yrs) 50 (2 yrs)	0	A+	A+	0	2	1000		1,1,1
Spacing @15-20 yrs										
M-G FHC low elevation ---> 600-700 sph	Q3	600	0	+	-	++	5	1200		2,2,2
M-G FHC mid elevation ---> 600-700 sph	Q3	400	0	+	-	++	5	1200		2,2,2
M-G HCB mid-upper elevation ---> 600-700 sph	Q3	200	0	+	-	++	5	1200		2,2,2
Pruning										
FH low-mid elevation (previously spaced)										
all stems, 1st lift to 3.1 m	Q1	400	0	0	0	+++	6	1200		3,5,4
all stems, 2nd lift to 5.5-6.0 m	Q2	250	0	0	0	+++	8	2000		
Fertilization										
M-G FHC spaced	MT3	300	0	++	++	0	0.1	350		4,3,3
CT'ed stands	MT3	100	+							
Health - bridge tree removal and white pine operational trials	MT4, LT1	400	0	+	+		1	800		4,4,5

Notes

A-type timber supply effects are incorporated in the TSR base case

B-type timber supply effects are incremental to the TSR base case

Rank: 1st column - MOF; others - Licensees

Incremental Silviculture Program

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

Program Table - Ha, Sunshine Coast TSA, July 1998

Year	Surveys*	Backlog Brushing	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Health
1	2,000	100	1,200	400	250	400	400
2	2,000	100	1,200	400	250	400	400
3	2,000	100	1,200	400	250	400	400
4	2,000	50	1,200	400	250	400	425
5	2,000	50	1,200	400	250	400	450
Subtot Yr 1 - 5	10,000	400	6,000	2,000	1,250	2,000	2,075
6 - 10	10,000	-	6,000	2,000	1,250	2,000	2,075
Total Yr 1 - 10	20,000	400	12,000	4,000	2,500	4,000	4,150

* Includes prescription and layout

Unit cost (\$/ha)	50	1,000	1,200	1,200	2000	350	800
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Program Table - \$ 000s, Sunshine Coast TSA, July 1998

Year	Surveys	Backlog Brushing	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Health	Total
1	100	100	1,440	480	500	140	320	3,080
2	100	100	1,440	480	500	140	320	3,080
3	100	100	1,440	480	500	140	320	3,080
4	100	50	1,440	480	500	140	340	3,050
5	100	50	1,440	480	500	140	360	3,070
Subtot Yr 1 - 5	500	400	7,200	2,400	2,500	700	1,660	15,360
6 - 10	500	-	7,200	2,400	2,500	700	1,660	14,960
Total Yr 1 - 10	1,000	400	14,400	4,800	5,000	1,400	3,320	30,320

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, Sunshine Coast TSA, July 1998

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

Year	Surveys	Backlog Brushing	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Health	Total
1	1.1	1.1	33.3	13.3	11.1	0.2	2.2	62
2	1.1	1.1	33.3	13.3	11.1	0.2	2.2	62
3	1.1	1.1	33.3	13.3	11.1	0.2	2.2	62
4	1.1	0.6	33.3	13.3	11.1	0.2	2.4	62
5	1.1	0.6	33.3	13.3	11.1	0.2	2.5	62
Subtot Yr 1 - 5	6	4.4	166.7	66.7	55.6	1.1	11.5	312
6 - 10	6	-	166.7	66.7	55.6	1.1	11.5	307
Total Yr 1 - 10	11	4.4	333.3	133.3	111.1	2.2	23.1	619

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 resource¹

Decade	Harvest Increment ('000 m3)	Incremental Jobs			
		per year by decade		Total by decade	
		TSA ²	Prov ³	TSA ²	Prov ³
1	94	53.6	112.8	536	1,128
2	211	120	253.4	1,204	2,534
3	226	129	271.8	1,291	2,718
4	226	129	271.8	1,291	2,718
5	226	129	271.8	1,291	2,718
6	226	129	271.8	1,291	2,718
7	226	129	271.8	1,291	2,718
8	226	129	271.8	1,291	2,718
9	226	129	271.8	1,291	2,718
10	226	129	271.8	1,291	2,718
11	276	158	331.8	1,576	3,318
12	276	158	331.8	1,576	3,318
13	164	94	197.1	936	1,971
14	174	99	209.1	993	2,091
15	174	99	209.1	993	2,091
16	174	99	209.1	993	2,091
17	224	128	269.1	1,278	2,691
18	224	128	269.1	1,278	2,691
19	224	128	269.1	1,278	2,691
20	224	128	269.1	1,278	2,691
21	224	128	269.1	1,278	2,691
22	224	128	269.1	1,278	2,691
23	224	128	269.1	1,278	2,691
24	224	128	269.1	1,278	2,691
25	224	128	269.1	1,278	2,691
Total				30,641	64,507

Notes:

1. Assumes continuation of on the incremental silviculture 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 0.57 TSA level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Sunshine Coast SEA)

3. Assumes 1.2 Provincial level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Sunshine Coast SEA)

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- B.C. Ministry of Forests. 1991. *Regional Stand Tending Guidelines*. Vancouver Circular Letter VR91-558. Vancouver Forest Region, Nanaimo, British Columbia. 24p + Appendices.
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