

Soo Timber Supply Area

Incremental Silviculture Strategy (Interim)

-- Version 1.0 --

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**British Columbia
Ministry of Forests**

Funded By

Forest Renewal BC

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STRATEGY AT A GLANCE

Working Targets

The focus of the silviculture strategy in the Soo TSA is to increase the supply of sawlogs during the mid term period. This focus restricts the ability to improve timber quality.

Quantity: Manage mid-term timber supplies to yield a harvest of 440 000 m³/yr and long term supplies to yield 530 000 m³/yr.

Quality: Manage existing age class 1 & 2 and regenerated stands to yield 2% premium logs by volume, with the majority of the remainder being of sawlog quality.

Product Objectives

The following are definitions of premium logs and sawlogs in the Soo TSA.

Premium Log: Douglas-fir: 50+ cm min dbh, pruned 5 m 1st log.
Balsam: 40 - 45 cm min dbh, small tight knots, pruned 5m 1st log.
(Balsam is only 5-10% of total timber and is not significant.)

Sawlog: stands having 250 stems/ha 50+cm DBH and average diameter 40 cm.

Major Silvicultural Strategies

Quantity

1. (Non-silvicultural) Complete a number of identified studies.
2. Reduce minimum harvest ages of younger existing stands and newly regenerated stands by 10 years through a number of identified practices.
3. Increase the volume of 2 000 ha Fdc, age class 3 existing stands through fertilization.
4. Design stocking levels on some existing stands to facilitate a possible commercial thinning program in the period 40 - 70 years from now.
5. Create owl habitat in 10% of spaced areas.
6. Increase regenerated stand volumes 20% (tree improvement is critical to success).
7. Expand the timber harvesting land base by 1% by restocking 250 ha of backlog NSR and rehabilitating 1 000 ha of poor-site PI.

Quality

1. Prune 50 ha/yr to increase future timber quality.

Incremental Silviculture Program

Program Table - Ha, Soo TSA, August 1998

Year	Surveys*	Backlog Brushing	Backlog Planting	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Owl
1	4,000	150	50	1,200	50	100	1,450	50
2	4,000	150	50	1,200	50	100	1,450	50
3	4,000	150	50	1,200	50	100	1,450	50
4	4,000	150	50	1,200	50	100	1,450	50
5	4,000	150	50	1,200	50	100	1,450	50
Subtot Yr 1 - 5	20,000	750	250	6,000	250	500	7,250	250
6 - 10	15,000	125	0	6,000	250	250	7,250	250
Total Yr 1 - 10	35,000	875	250	12,000	500	750	14,500	500

* 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 with funding by FRBC, among other things, 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 August 12 & 13, 1998 in Squamish, attended by representatives of the MoF and forest licensees of the Soo 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:

- Squamish Forest District; and
- Vancouver Forest Region.

Forest licensees of the Soo TSA:

- Interfor
- Canfor
- VCH Forestry
- Squamish Mills
- Terminal 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

* Does not include approximately 7 000 ha (6%) of low productivity forest determined by the chief forester in the AAC rationale to be part of the THLB.

Land Area

Description	Area (ha)	Area %
Total Area of TSA	719 500	100
Total Productive Crown Forest	300 700	42
Net Timber Harv. Land Base	109 800	15

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

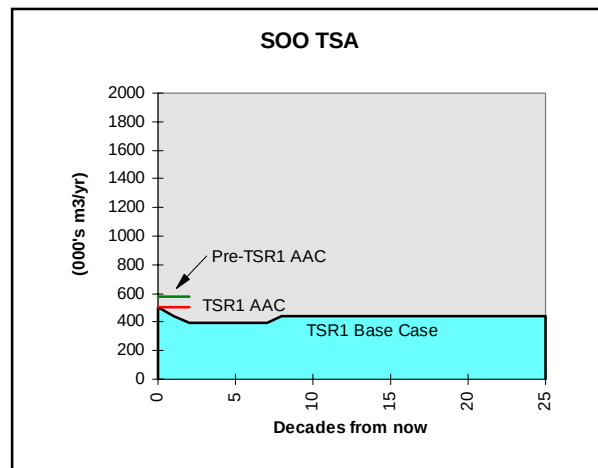
AAC

AAC Type	Pre-TSR	TSR1*	Change (%)
Conventional	575 843	503 500	-12.6
Deciduous	4 157	2 500	-39.9
Insect/Disease	-	-	-
Marginal	-	-	-
Total	580 000	506 000	-12.8

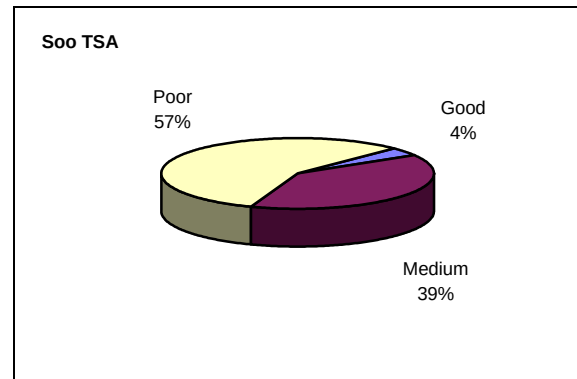
Woodlot AAC

*effective Jan 1/96

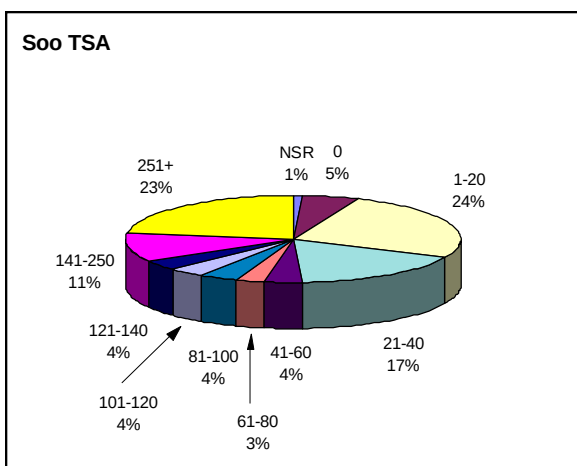
Harvest Forecast



Site Class

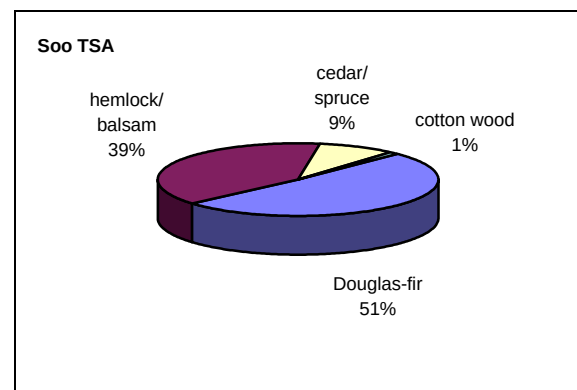


Age Class



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 27. Only information which is relevant to an incremental silviculture strategy is recorded. Key statements are bolded.

◆ Harvest Forecast	<p>Initial harvest level of 506 000 m3/yr, about 13% below pre-TSR AAC. This is followed by declines over the next 2 decades of 13% and 11% respectively, to a mid term level of 394 000 m3 (32% below the pre-TSR AAC and 22% below the initial harvest level) rising to a long term harvest level in decade 8 of 442 000 m3 (24% below pre-TSR AAC, 13% below initial harvest level). (analysis, 14)</p> <p>Most of the mature timber upon which harvesting will depend in the short term is located on poor growing sites. This means a relatively greater area will need to be harvested in the short term than if harvest were coming from better sites (rationale, 11).</p> <p>All of the harvesting in the first 7 decades occurs in existing unmanaged stands. By decade 8 (starting 70 years from now), most of the stands available for harvest are managed stands, for which increased yields apply. (analysis, 29)</p>
◆ Age Class	<p>As a result of past harvesting, approximately 47% of THLB is in stands aged 0 - 40 years. A shortage of stands aged 41 - 140 years (approx. 19% of THLB), leaves a considerable gap before the existing immature forests are available for harvest, resulting in mid term harvest levels below LTHL for a period of 50 years. As a result of this age class structure, short and mid term harvest levels are highly sensitive to changes in minimum harvest ages.</p>
◆ Forest Cover	<p><i>IRM Zone:</i> 77% of THLB. Base case requirement of at most 33% of THLB permitted to be < 3 m tall (3 pass system). (rationale, 20)</p> <p>Sensitivity test of + 1,2 passes. (analysis, 26)</p> <p><u>Relaxation:</u> Not illustrated in TS report. However, report indicates not sensitive.</p> <p><u>Increase:</u> (4, 5 pass) Insensitive to 4 pass requirement (25%). Very slight sensitivity to 5 pass requirement (20%) with a decline of only 1% during decades 3 - 7. This occurs because the harvest target of 12% from the Pemberton Supply Block high decay stands cannot be met at this level of constraint and other areas do not have enough timber to make up the shortfall.</p> <p><i>Visual Quality Zones:</i> 11% of THLB (rationale, 21). Base case requirement of at most 11% (retention), and 21% (partial retention) to be < 5 m tall. No separate sensitivity test in analysis report. Recent classification work indicates the amount of visually sensitive area will at least double. However, a doubling of the visually sensitive area showed no significant impact on the short term timber supply. (rationale, 21-22)</p> <p><i>Green-up:</i> Sensitivity test of ± 5 years. (analysis, 25)</p> <p><u>Relaxation:</u> (- 5 yrs) Insensitive over all terms. Forest cover requirements are not a limiting factor in the base case.</p> <p><u>Increase:</u> (+ 5 yrs) Insensitive over short and long term. Very slight sensitivity (2% reduction) in decades 3 to 7.</p>
◆ Backlog NSR	<p>1 051 ha of backlog NSR to be restocked within 5 years (rationale, 18). By 1997 this has been reduced to approx. 600 ha (1997 data package).</p>
◆ Quality	<ul style="list-style-type: none"> Of the 3 443 ha of deciduous stands removed from the THLB, 1 000 ha are projected to be converted to softwood stands over 50 years through a combination of natural stand succession and manual stand replacement projects. This has been included in the timber

	<p>supply analysis. (rationale, 19) This does not include cottonwood, of which there are approx. 1 450 operable ha. (rationale, 26) Although analysis indicates a potential sustainable cottonwood harvest of 3 500 m³/yr, chief forester (CF) sets a partition of 2 500 m³ to allow for other constraints (rationale, 34).</p> <ul style="list-style-type: none"> • 711 ha of non-commercial cover deducted from THLB. (analysis, 6) • 20 970 ha of low productivity sites deducted from THLB (all mature stands < 23 m ht. and all regenerated stands having an SI age 100 of 20 m or less). CF subsequently concludes this area overestimated by 7 000 ha (6% of THLB). (rationale, 16) • The 1994 Soo TSA management plan specifies 25% of the harvest must come from difficult or decadent stands. This has been implemented to the extent that special harvesting priorities are no longer needed. (data package, 15)
◆ 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. The deer winter range zone (approx 7% of THLB) has a requirement for at least 65%, and the mushroom zone (<1%) a requirement of at least 50%, to be age 80 or older. No independent sensitivity test shown, however analysis report states that the harvest forecast is minimally sensitive. (analysis, 27)
◆ Min. Harvest Ages	<p>Ages based on product objectives of 1993 Soo Forest Management Plan. Objective to grow the most valuable log grades possible, without reducing total volume by more than 5% from the maximum. Ages range from 95 - 105 years for existing stands and 70 - 130 for regenerated stands. (rationale, 13-14) Minimum ages in TSR2 analysis will be 90% of culmination age, which are the ages at which stands are marketable (data package, 15).</p> <p>Sensitivity analyses of ± 10 and ± 20 yrs. Short and mid terms highly sensitive. Long term insensitive ($\pm 1\%$). (analysis, 23-25)</p> <p><u>Decrease:</u> (- 10, 20 yrs) Short and mid term highly sensitive, increasing harvest in 1st decade by 7 & 13% respectively. Mid term trough below LTHL eliminated, as lower ages allow the large area of existing immature stands to reach harvestable age sooner. However, total growing stock is reduced 23% from base case if min ages are 20 years less.</p> <p><u>Increase:</u> (+10, 20 yrs) Short and mid term highly sensitive, decreasing harvest in 1st decade by 35 & 43% respectively. Harvest levels rise to LTHL at decades 9 and 10 respectively, when large areas reach minimum harvest age and this factor is no longer limiting.</p>
◆ Silvicultural Systems	Most of the THLB is currently managed under a clearcut harvesting system. Soo Forest Management Strategy requires licensees and SBFEP to use 10% alternate systems but largely not yet implemented. As of 1997, there is still little use of partial or selection harvest systems, although increased usage is anticipated, especially in the spotted owl management zone (data package, 15).
◆ Regeneration Delay	Majority of sites are regenerated within 2-3 yrs of harvest with 15% taking longer. This equates to an avg 3 yr regeneration delay. (rationale, 18) A 3 year regeneration delay will be used in TSR 2 (data package, 17).
◆ Site Productivity	<p>Licensee commissioned analysis suggests that site indexes attributed to existing overmature forests underestimate the productivity of those sites that are regenerating. Forest Service staff agree that site indexes may be underestimated. BCFS analysis shows this could mean a potential increase in the mid and long term harvest levels. (rationale, 12) CF concludes it is likely that site indexes may be underestimated, which may increase the land base further (rationale, 16).</p> <p>District estimates a 3 m productivity gain overall which will likely move a significant amount of poor site forest land to medium site, and all higher medium-site to good site.¹</p>

¹ Source: MoF Squamish Forest District. Hereafter noted in the text as (SFD).

♦ Estimates of Timber Volumes	<p>VDYP used for existing stands >20yrs. TIPSYP used for regenerated stands and existing stands 20 years and under, with OAF1 of 15% and OAF 2 of 5%. (rationale, 13) A 2% volume increase resulting from tree improvement is recognized in some regeneration assumptions, as well as increases from fertilization of some timber types (analysis, 47). <u>TSR2</u> will apply TIPSYP to all Douglas-fir stands 30 yrs old or less, all hemlock/balsam stands 20 yrs old or less and all other existing stands 10 yrs old or less, with standard OAF 1 of 15% and OAF2 of 5%. In addition TSR2 TIPSYP yields will recognize effects of tree improvement (at least a 3% volume increase) and repeat fertilization of some stands (data package, 17-18).</p> <p><i>Existing stand volumes:</i> The Soo TSA was re-inventoried in 1992, but there are some allegations that the inventory has underestimated volumes. CF accepts the existing inventory as suitable. (rationale, 11)</p> <p>Sensitivity test for $\pm 10\%$ in volume. Moderately sensitive to an increase and highly sensitive to a decrease in short and mid terms. Long term insensitive. (analysis, 28)</p> <p><u>Increase:</u> (+10%) Moderately sensitive. Increases volumes in 1st several decades by 5 -8% (visual estimate from charts). Mid term shortfall eliminated.</p> <p><u>Decrease:</u> (-10%) Highly sensitive. Initial volumes reduced 26% below base case in 1st decade, remaining more or less at this level until rising to LTHL beginning in 8th decade.</p> <p><i>Regenerated stand volumes:</i> Sensitivity tests for $\pm 20\%$ in volume. Short and mid term insensitive to either. Highly sensitive to both in long term. (analysis, 29)</p> <p><u>Increase:</u> (+20%) LTHL 21% higher than base case, starting to rise from mid term shortfall 80 years from now which is when most of the stands available for harvest are managed stands. [This effectively increases the magnitude of the mid-term dip below LTHL, creating a potential for commercial thinning or spacing to bring forward harvests?]</p> <p><u>Decrease:</u> (-20%) LTHL 22% lower than base case.</p>
♦ Land Use Planning	<p>Areas affected by spotted owl habitat and the PAS occupy approx. 30% of the THLB. Logging around these areas is presenting serious problems. (rationale, 25) CF recommends early consideration be given to the identification of appropriate parts of the Soo TSA as designated areas under Part 15 of the <i>Forest Act</i>, in order that a temporary AAC reduction may be effected (rationale, 34).</p> <p>Approximately 10 000 ha of THLB age class 9 forest land has gone into protected areas (subsequent to TSR1). Offsetting this is the increase in THLB operable area associated with helicopter logging. There is approximately 26 000 ha of heli-logging opportunity, however only 13 000 ha are considered operable in the near future and will be recognized in TSR2 (at a rate of 130 ha/yr). The remainder will be the subject of a sensitivity analysis. (SFD)</p>

Summary of Issues by Period

1. Future harvest levels are very much controlled by fact that almost one-half of area is 40 years old or less.
2. District desire to manage for higher value products overridden in the AAC rationale by the need to keep higher timber supply levels by reducing minimum harvest ages.
3. The TSA is virtually insensitive over all periods to all forest cover constraints.

Short Term (1 - 20 years)

The short term is highly sensitive to decreases in minimum harvest ages and is moderately sensitive to increases in existing stand volumes. (It is also highly sensitive to the opposite; strengthening the value of incremental silviculture in a preventative sense.) Thus the short term could respond to an intensive

fertilization program to boost volumes in suitable stands planned for harvest in the period 10 - 20 years from now and to a program of treatments oriented to reducing harvest ages over the next 70 - 80 years.

Mid Term (21 - 70 years)

A 10% reduction in minimum harvest ages eliminates the mid term shortfall of the base case forecast. Raising the volume of existing stands by 10% will also accomplish this. Presumably, the two actions, combined with other appropriate efforts, can eliminate the shortfall as shown by the base case. However, were regenerated stand volumes to be increased 20% the mid term would still have a shortfall below a now-higher LTHL.

Long Term (71+ years)

The long term only exhibits sensitivity to changes in regenerated stand volumes. For every 1% increase or decrease in volume there is a corresponding approximate 1% increase or decrease in the LTHL.

Future

The timber supply review could not take into account the following:

- Changes under the Forest Practices Code had yet to be seen in practice. Implementation of the code is likely to have a downward effect on timber supplies.
- Decisions with respect to spotted owl management and protected areas were still pending at the time of the analysis and AAC determination. These may result in reductions to the timber harvesting land base or place additional constraints on timber supply.

Incremental Silviculture History

Approximately 1 100 ha are harvested annually. This amount is increasing due to logging in poorer sites. (SFD)

Treatment	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis
◆ Backlog	Restock 1 051 ha in 5 years (rationale, 18). (By 1997 this had been reduced to approx. 600 ha (1997 data package)).	
◆ Conversion	1 000 ha of decid to conifers over 50 yrs through a combination of natural stand succession and manual stand replacement projects (rationale, 19). (No projects as of 1988 - best stands are in the riparian zone (SFD).)	
◆ Commercial Thin		Little performance to date. One small business block of 30 ha to be sold in 1998 (SFD).
◆ Space	TIPSY used on stands regenerated over the past 20 years. Assumes incremental spacing for stocking control on stands harvested prior to 1987. 600-900 ha/yr in district program. (rationale, 18) Average of 1 000 ha/yr from 1988 to 1997 (SFD).	
◆ Prune	200 ha/yr planned program. (rationale, 18) Recent	

Treatment	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis
	level approx. 60 ha/yr (SFD).	
◆ Fertilize	1 100 ha/yr planned program. (rationale, 18) Approx. 1 200 ha/yr from 1990 to 1997.	
◆ Space/ Prune		Combinations not indicated.
◆ Space /Fertilize		“
◆ Space/ Prune/Fert		“
◆ 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.

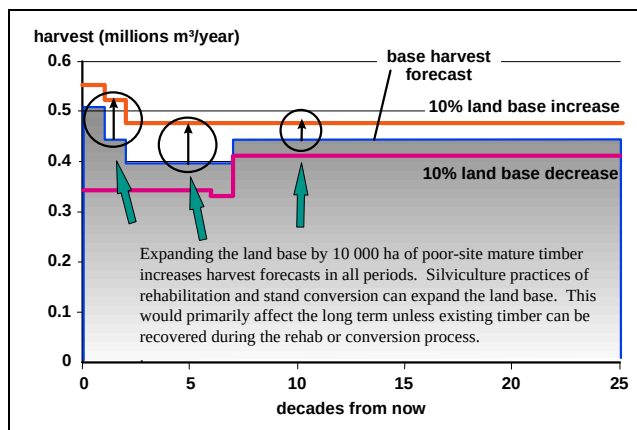


Figure 1. Changes in land base, Soo TSA

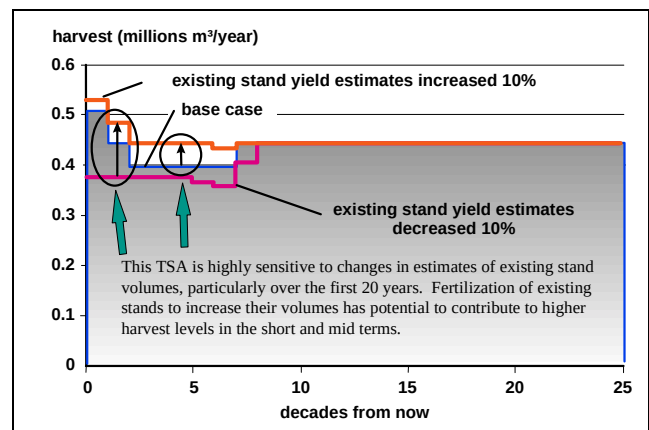


Figure 2. Changes in existing stand volumes, Soo TSA

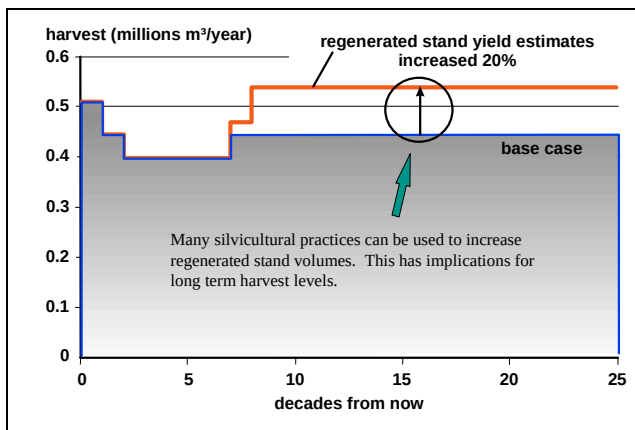


Figure 3. Changes in regenerated stand volumes, Soo TSA

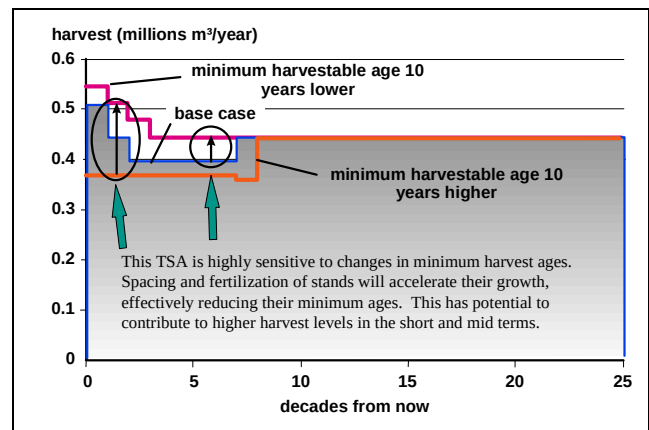


Figure 4. Changes in minimum harvest ages, Soo TSA

Preliminary Identification of Silviculture Opportunities

Information in the previous sections indicates the following silvicultural strategies may have potential to increase future timber supply. 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: reduce minimum harvest ages; and
- ST 2: expand the timber harvesting land base.

◆ Mid Term (21 - 70 yrs)

- MT 1: reduce minimum harvest ages;
- MT 2: increase the volume of some existing stands;
- 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: expand the timber harvesting land base; and
- MT 5: address older forest/habitat/biodiversity constraints.

◆ Long Term (71+ yrs)

- LT 1: increase regenerated stand volumes 20%;
- LT 2: expand the timber harvesting land base; and
- LT 3: address older forest/habitat/biodiversity constraints.

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/
♦ General	Soo TSA has an aggressive intensive silviculture program with the objectives of providing 47 000 m ³ /yr above that from basic silviculture, improving stand value, meeting product objectives and lowering the harvestable age where investment provides an annual return > 4%. (rationale, 18)	
♦ Spacing	Soo TSA plan specifies spacing 600 -900 ha/yr.	
♦ Fertilization	<p>Soo TSA plan specifies fertilizing 1 100 ha/yr.</p> <p>A more intensive fertilization program, combined with spacing and commercial thinning programs on suitable stands may:</p> <ul style="list-style-type: none"> • increase short and mid term harvests by effectively lowering minimum harvest ages; • increase long term harvests by increasing total volumes. 	Large area in Douglas-fir which responds to fertilization.
♦ Commercial Thinning	No CT to date. Some areas are planned in licensee 5 year development plans. (rationale, 19, 30) A very realistic option for increasing mid term harvest levels when combined with other intensive forestry practices. As second growth or managed stands start to mature, it is expected that 10% of the annual harvest will come from commercial thinnings. (data package, 15)	Large candidate areas becoming available several decades from now.
♦ Backlog NSR	1 051 ha of backlog NSR to be restocked within 5 years (Approx. 600 ha in 1997). No additional opportunity.	

Potential Strategies by Response Time Frame

This section documents the discussions and outcomes of the district working session.

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 indicated strategies would serve to mitigate their effects rather than increase timber supply.

The TSR2 analysis report is due out by the end of 1998. However, the requirement for development of an interim strategy by the end of September, 1998 precludes waiting for the newer information. In the district working session, the potential differences between TSR1 and TSR2 were explored as best as

possible given the limited knowledge of anticipated TSR2 results. The following assumptions were made:

1. The land area reductions due to protected areas will be largely offset by increases due to helicopter logging; therefore, the TSR1 base case shape should remain essentially the same in TSR2.
2. Increased productivity estimates will increase the upward response in harvest levels beyond that indicated in the sensitivity test where regenerated stand volumes are increased 20% (see Figure 3, page 9). This presents an opportunity to bring forward harvest volumes into the mid term.
3. The TSR2 base case will still show sensitivity to minimum harvest ages. This conclusion is based on (a) assuming that TSR2 min ages in the base case will be reduced approximately 10 years, but because TSR1 demonstrated sensitivity to a 20 year reduction in ages there will still be a residual minimum age sensitivity in TSR2; and (b) assuming the decreases and increases in the land base will largely offset each other, resulting in a TSR2 age class profile similar to the TSR1 profile.

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, <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 9. Items followed by an * were added during the district working session.
3	Information in this column is largely from the district working session, combined with information presented earlier in this document. Potential treatment regimes are highlighted in bold print.
4	Anticipated results are 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. 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. <i>Results are largely conjecture and are meant to illustrate the potential of the strategies.</i>

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)
♦ Short Term (1 - 20 yrs)	1. Reduce minimum harvest ages.	1. Determined in the district working session that activities to reduce minimum harvest ages would mostly have a mid term impact. See MT 1.	1. Assume benefits of reductions in min ages would accrue to the mid term, ∴ short term harvest forecast unchanged from TSR1 base case.	0.51 1 st dec.
	2. Expand the timber harvesting land base.	2. Determined in the district working session that expanding the land base through incremental silviculture projects would mostly have a long term impact. See LT 2.	2. See LT 2.	0.46 2 nd dec.
	3. Increase stocking of existing low density stands.*	3. Some areas have been declared satisfactorily restocked but have low average stocking levels. Within these stands there may be some large voids which are masked by the use of averages. Determined in the district working session that more information about these stands is required . This is noted under “Summary of Information and Research Needs,” page 17. Would likely have a mid to long term impact, rather than short term.	3. None. More info required.	
	4. Conversion of the following off-site or lower productivity stands to Douglas-fir:*	4. The early harvest of stands that are not best suited to the site would increase timber supply in the short term, potentially at the expense of the mid term when they would otherwise be planned for harvest. The main benefit would be over the long term.	4. None. Modelling required.	
	(a) alder (1 000 ha);	(a) Approx. 1 000 ha of alder was included in the TSR1 land base (see Issues - Quality). This area was expected to convert to Fdc through natural succession and stand replacement projects. The district working session determined these stands are best left alone in the hopes a future market for alder will exist. Also, many of these stands are likely to be in the riparian zone. The potential benefits could be explored through modelling .		
	(b) hemlock (1 000 ha);	(b) About 1 000 ha of sub-optimal Hw could be converted to good-site Fdc. Impacts of conversion need modelling . Has potential to extend the length of the mid term shortfall.		
	(c) balsam (1 000 ha)	(c) About 1 000 ha of balsam pulp logs, age class 4, are on too dry a site for the species and could be converted to Fdc. Impacts need modelling .		

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)
♦ Mid Term (21 - 70 yrs)	<p>1. Reduce minimum harvest ages of:</p> <p>(a) younger existing stands (aged 1 - 40 yrs) 10 years by:</p> <p>(i) spacing remaining suitable stands;</p> <p>(ii) fertilizing suitable stands; and</p> <p>(iii) commercial thinning stands to obtain volume otherwise not available.</p> <p>(b) newly regenerated stands by 10 years by undertaking the actions to increase regenerated stand volumes 20% (see LT 1) + spacing to bring harvest ages forward.</p>	<p>1. Objective is to reduce min ages by another 10 years below TSR 2 ages, which are estimated to be 10 yrs below TSR1 ages</p> <p>(a) The following treatments will move forward the technical rotation ages of existing stands aged 1 - 40 yrs forward.</p> <p>(i) Recent spacing program of 1 000 ha/yr which includes catch-up, and all of which is post free-growing. Of the 10 000 ha of Fdc under a fertilization regime (see below), 3 000 will require spacing. Over a 10 yr period this is a program of 300 ha/yr. Once caught up, program will drop to a steady state level of approx. 6-700 ha/yr. Spacing will bring stands to technical rotation (i.e., min harvest age) earlier, as demonstrated by Carter report. Currently, spaced Fdc stands are fertilized (see next section for effect on min harvest ages). An additional 500 ha/yr of HB stands could be treated over the next 10 year period (total treatable area = 5 000 ha or 5% of THLB). There is another 250 + 150 ha/yr of potential spacing of low density Fdc and HB stands.</p> <p>1994 Soo TSA strategy indicates spacing reduces rotation of Hw, SI 25, by 15 yrs (from 105 to 90 yrs) and Ba, SI 20, by 35 yrs (from 140 to 105 yrs).</p> <p>(ii) Recent fert prog of 1 200 ha/yr. Target ½ of age class 1 and all age class 2 Fdc on site index 25 - 35, which is about 10 000 ha. An 8 yr repeat fertilization cycle equates to an annual program of 1 250 ha/yr. A study done by Reid Carter as background to the 1994 Soo TSA Management Plan indicates repeat fertilization of Fdc SI 30 reduces rotation age from 82 to 75 years, a 7 yr reduction. Some, if not all of this effect may be captured in the TSR2 base case. The TSR2 data package includes the above fert regimes.</p> <p>43% of THLB is age class 1 & 2. Above-noted program could possibly be doubled if expanded to include H & B stands. Hw response to fert is variable. Studies are required to confirm fertilization potential (noted under "Summary of Information and Research Needs," page 17).</p> <p>(iii) See MT 3 below.</p> <p>(b) Increasing regenerated stand volumes will move technical rotation ages forward. Focus is on those to be regenerated over the next 40 to 60 years for this objective. Enables the option of harvesting earlier at a smaller size or retaining longer for higher volume.</p>	<p>1. Sensitivity analysis indicates a 10 yr reduction in min ages will raise mid term harvests 11% to a level equal to the base case LTHL. Because this exercise does not attribute any benefit to the short term (see above) effect in mid term could be greater than this (assume by ½, or 16%).</p> <p>(a) The indicated programs of combined spacing and fertilization of Fdc (10 000 ha) and spacing of Hw (5 000 ha) will reduce min harvest ages on approx. 15% of the THLB. If this results in an avg 15 yr reduction in ages, may equate to filling the gap by 20%. Expanding the program to fertilization of H/B has the potential to significantly increase the benefits but cannot be quantified at this time.</p> <p>(b) Assume that by continuing above spacing & fertilization programs, in conjunction with management of regenerated stands as discussed under the LT, min ages of regenerated stands can also be reduced 10 to 35 yrs. This could equate to reduced ages for another 30% of the THLB for a total of 50% when combined with the above. ∴ .5 X 16% ⇒ 8%</p>	<p>0.39 base. 0.03 min ages 0.01 exist std 0.01 bring fwd THLB biodiv</p> <hr/> <p>0.44 total</p> <p>Effects may be additive, duplicative or compounding. Assume additive. Increased site productivity may further compound these effects.</p>

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)
♦ Mid Term (cont'd)	<p>2. Increase the volume of some existing stands through fertilization.</p> <p>3. Space some post FG stands to set up for CT to bring forward harvest from long term into mid term.</p> <p>4. Expand the timber harvesting land base.</p> <p>5. Address older forest / habitat / biodiversity constraints?</p>	<p>2. Younger existing stands aged 1 - 40 years are targeted for reduced min. harvest ages. See MT1 above.</p> <p>Only about 15% of THLB is aged 41 - 120. Hw response to fert is variable. Studies are required to confirm fertilization potential (noted under "Summary of Information and Research Needs," page 17). Currently no areas in this age range are being fertilized. Area of Fdc, age class 3, P-M site, is about 2 000 ha. A 10 yr repeat fertilization cycle equates to an annual program of 200 ha/yr. Two applications are likely necessary. While the objective is to increase the volume of these stands, a fertilization program creates options. Fertilized stands could be either harvested earlier (i.e., at reduced min. ages, but with smaller stand volumes) or at culmination (at later ages but higher volumes) as needed.</p> <p>3. Few ha currently available for CT. CT in the short term is not recommended. This would bring forward volumes from the mid term, thereby worsening the mid term shortfall (unless this in turn is replaced by bringing forward volumes from the long term).</p> <p>In the early mid-term period (21-40 yrs from now), CT is less effective at producing the volumes needed and more costly than the alternative of lowering minimum harvest ages and clearcutting. Therefore CT is not the preferred option in this time period.</p> <p>An extensive CT program may be appropriate in the later mid term period (41 - 70 yrs from now) to bring forward volumes from the long term. (Dependent upon achieving LT1 below.) CT in this time period would capture some losses to mortality as well as overcome potential future green-up/adjacency limitations. Spacing regimes should allow for a proportion of stands to have higher stocking levels to facilitate CT in this period. This need may be satisfied if lower density stands do not get spaced (i.e., Fdc and H/B stands < 2 000 and < 3 000 stems/ha respectively).</p> <p>4. Determined in the district working session that expanding the land base through incremental silviculture projects would mostly have a long term impact. See LT 2.</p> <p>5. Creating spotted owl habitat increases future flexibility. Owls prefer 2-layered stands of Douglas-fir. Top layer consists of 40-60 large trees/ha; lower layer of smaller trees, fully stocked. Historically, this habitat developed through fire history. About 25% of the TSA is 50% owl habitat, mostly in the transition zone. This is basically an ecosystem management problem, requiring habitat supply modelling. Published estimates state owl strategy will result in only a 10% loss of harvest, but on the ground estimates indicate more like a 30% loss.</p> <p>A strategy would be to manage some spacing regimes to allow the creation of owl habitat. If 10% of annual area spaced were managed this way would equate to about 100 ha/yr. Future management would consist of partial harvest or CT to create two-layered stand condition. At this point is a matter for consideration in SMP's.</p>	<p>2. TSR1 indicates a 10% increase in all existing stand volumes would eliminate the mid term shortfall. Assume benefit of any additional volume incurred in short term is realized in the mid term. Assume a 30m3 volume increase/ha X 2000 ha = 60 000 m3 over mid term period (50 yrs) or $\Rightarrow$ 1 200 m3/yr.</p> <p>3. Planning to allow for CT maintains options. Difficult to quantify direct volume benefits w/o analysis. Assume enables the equivalent of 1 000 m3/yr higher harvest level through out entire mid term period by bringing forward approx 2 000 m3/yr during the last 3 decades of the mid term from the long term.</p> <p>4. Impact of increasing THLB on the mid term difficult to quantify. Sensitivity analysis indicates a 10% increase results in a 21% increase in MT harvest levels. Because impact is considered mostly long term and because opportunities need further definition, assume no MT impact.</p> <p>5. Requires habitat supply modelling.</p>	See above.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)																							
♦ Long Term (71 + yrs)	1. Increase regenerated stand volumes 20% by:	Approx. 85%+ of harvested areas are currently planted. Natural regeneration is practiced only on some H sites.		0.44 base																							
	(a) reducing time to regeneration;	1.(a) Reducing regen delay is a basic silv matter. TSR 1 & 2 regen delays are 3 yrs. Current practice is to plant soon after harvest. Very high plantation success rate. Discussion in the district working session indicates 3 yr delay is appropriate given that the delay is measured from the time harvesting is commenced.	1.(a) None. Current delays are shortest possible.	0.08 rgn vol																							
	(b) using 2 nd gen A class or elite seed;	1.(b) All Fdc seed is 1 st generation “A” class. About 1/6 th of TSA is coastal maritime (the remainder being coastal subarctic, or transition zone), which is where Hw would be planted (everywhere else Hw is managed for natural). No genetically improved 2nd generation Fdc stock is available for the subarctic zone (noted under “Summary of Information and Research Needs,” page 17). Latest estimates of yield gains are (%): ²	1.(b) Moving to 2 nd generation seed would increase Fdc production by 10%. Potential gain is 10% improvement X 50% of THLB (see below) ⇒ 5% overall.	0.01 land base																							
		<table><tr><td>Species</td><td>1st gen</td><td>2nd gen</td></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><tr><td>Spruce</td><td>3</td><td>N/A</td></tr></table>	Species	1 st gen	2 nd gen	Doug-fir	3-5	15	Hemlock	3	20	Cedar	3	10	Spruce	3	N/A		0.53 old growth total								
	Species	1 st gen	2 nd gen																								
	Doug-fir	3-5	15																								
	Hemlock	3	20																								
	Cedar	3	10																								
	Spruce	3	N/A																								
		TSR1 applied a 2% increase to 100% of Fdc, good site, 75% Fdc, med site, and 25% of C/S, good site (analysis, 47). TSR2 plans are to apply at least a 3% increase to essentially the same Fdc, but nothing to C/S.																									
	1.(c) If areas now managed for natural regen Hw (40% of total area) were planted w genetically improved stock (20% gain), gain could be 40% X 20% ⇒ 8% overall.	1.(c) Estimate a 15% increase in Fdc area X (15% 2 nd gen gain + 5% more productive site use) ⇒ 3%																									
(c) planting 2 nd gen. improved hemlock on areas currently managed for natural regeneration;	However, much of the current HB is Dfc site which was naturally regenerated to HB. After harvesting, the % area is expected to change as follows:		0.02 transfer to mid term over first 3 decades.																								
	<table><tr><td>Species</td><td>current profile</td><td>future profile</td></tr><tr><td>Doug-fir</td><td>51</td><td>65</td></tr><tr><td>Hemlock/B</td><td>39</td><td>20</td></tr><tr><td>Cedar/S</td><td>9</td><td>15</td></tr></table>	Species	current profile	future profile	Doug-fir	51	65	Hemlock/B	39	20	Cedar/S	9	15		<table><tr><td>decade</td><td>vol</td></tr><tr><td>8</td><td>.51</td></tr><tr><td>9</td><td>.51</td></tr><tr><td>10</td><td>.51</td></tr><tr><td>11</td><td>.53</td></tr><tr><td>12</td><td>.53</td></tr></table>	decade	vol	8	.51	9	.51	10	.51	11	.53	12	.53
Species	current profile	future profile																									
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decade	vol																										
8	.51																										
9	.51																										
10	.51																										
11	.53																										
12	.53																										
	On the one hand, this reduces the opportunity to plant with genetically improved H, on the other, conversion is to genetically improved Fdc or S on sites that are more productive for these species.		etc.																								

² Source: participants at Chilliwack district meeting.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)
♦ Long Term (cont'd)	(d) using large planting stock;	1.(d) Planting larger stock is a basic silv matter - not likely to change w/o funding assistance. District working session concluded this is not a good option.	1.(d) None.	See above.
	(e) brushing for growth enhancement;	1.(e) 70-80% of regenerated areas are brushed to ensure free growing. May be some benefit to brushing earlier - unlikely to change w/in current funding structure. Opportunities and potential gains are unquantified. In the district discussion of this topic, it was brought up that the amount of site prep has dropped dramatically due to reductions in broadcast burning. Because TIPSy plots are based on prepared sites, they may now over-estimate yields. Somewhat offsetting this is the shorter regen delay w/o site prep. This concern is noted under "Summary of Information and Research Needs," page 17.	1.(e) Unquantified.	
	(f) managing stocking to reduce voids 5%;	1.(f) Voids can be desirable for wildlife habitat. Current free growing requirements will result in < 15% in voids, however amount is unknown as must also account for area not in the net area to be reforested (other than allowable roads & landings) and for voids that open up later on. Given the difficult operating terrain of this area, 15% voids may be reasonable. Actual voids could be surveyed (noted under "Summary of Information and Research Needs," page 17).	1.(f) None.	
	(g) fertilizing suitable regenerated stands.	1.(g) Currently only seedlings on rehab plantations are "tea bagged". See MT1 re fertilizing regenerated stands to reduce min ages. Licensees not likely to fertilize prior to FG unless necessary to achieve FG. Post FG could be done with FRBC funding. Ultimately, about 75% of the THLB could prove to respond to fertilization.	1.(g) Assume a THLB of 100 000 ha, a 30 m3/ha avg response to fert., and a 90 yr avg rotation, (.75 X 100 000 X30 / 90) ⇒ 25 000 m3/yr or 6%.	
			Total: 14% from increasing regen stand volumes. When this is combined with a potential site productivity increase of approx. 10%, an objective of achieving a 20% increase in regenerated stand volumes appears achievable.	
	2. Expand the timber harvesting land base through: (a) rehabilitating backlog NSR; (b) NP Brush Area;* and (c) rehab of Pl stands.*	2. The district working session determined that site rehabilitation would mostly have a long term impact. (a) 600 ha of backlog NSR remaining, about 250 ha of which is accessible and treatable. Approx 900 ha of backlog brushing required to maintain earlier plantations. (b) More information on NPBr rehab opportunities is required. For now, best strategy would be to revisit NP sites and assess opportunities for treatment (noted under "Summary of Information and Research Needs," page 17). (c) All Pl stands were excluded from the THLB in TSR1 (analysis, 40). TSR2 will include pine stands of better site productivity (data package, 5). Opportunity exists to rehab poor-site Pl stands that are not expected to become merchantable and reforest to Fdc, SI 25. These stands exist in the Squamish-Whistler corridor, Lillooet River valley and Birkenhead areas. Potential program of 100 ha/yr. Total treatable area unknown - estimate 1 000 +ha.	2. (a) Already in base case forecast. (b) More information required. (c) Sensitivity analysis indicates a 7% increase in LTHL with a 10% increase in land base. Assume 1% increase in THLB = .01 X .07 ⇒ 1%.	
	3. Address older forest / habitat / biodiversity constraints?	3. See discussion under MT 5 above.	3. See MT 5.	

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. Modeling may also indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

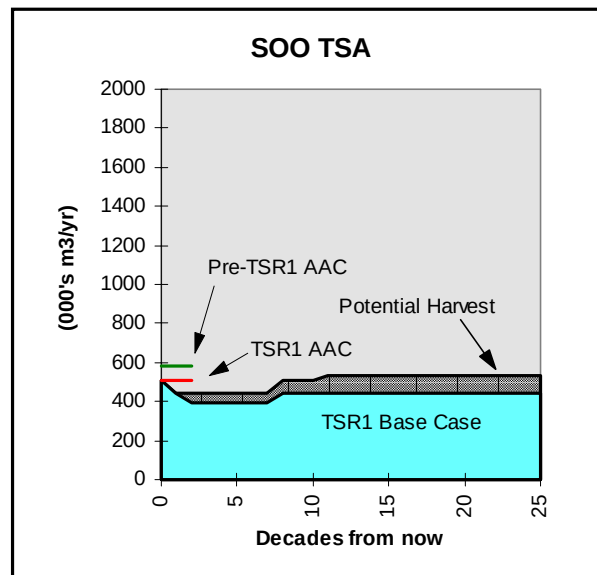


Figure 5. Potential Harvest Forecast, Soo TSA

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.

1. 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.
2. The amount of site prep has dropped dramatically due to reductions in broadcast burning. Because TIPSy plots are based on prepared sites, they may now over-estimate yields. Somewhat offsetting this is the shorter regen delay w/o site prep. An assessment of these effects is required to confirm TIPSy yields reflect current practice.
3. Old growth site index and existing stand volume estimation studies require completion. It is anticipated that site indexes are underestimated and existing stand volumes are accurate.

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. A program of screening trials to determine the extent of treatment opportunities is required.
5. A tree-breeding program is needed to create 2nd generation improved seed for engelmann spruce and Douglas-fir for the subarctic zone.
6. More information is required regarding the treatability of sites classified as non-productive (NP). Funding is needed to revisit NP sites and assess opportunities for treatment. A first step would be to determine available information within ministry information systems.
7. More information is required regarding the treatability of voids within sites having low average stocking levels but which are classified as satisfactorily restocked. Funding is needed to conduct a "level one" assessment to determine opportunities for treatment. A first step would be to determine available information within ministry information systems.
8. Modelling is needed regarding the opportunities for and benefits of conversion of approximately 3 000 ha of off-site alder, hemlock and balsam stands

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 product objectives at the log level for the Soo TSA were defined by the participants at the district working session.

Premium Log:	Douglas-fir:	50+ cm min dbh, pruned 5 m 1 st log.
	Balsam:	40 - 45 cm min dbh, small tight knots, pruned 5m 1 st log. (Balsam is only 5-10% of total timber and is not significant.)
Sawlog:	250 stems/ha 50+cm DBH and average diameter 40 cm.	

Available Information Regarding Potential Treatments and Treatable Area

Treatment	Comment/ Potential Treatment Regimes	Treatable Area
♦ Incremental Silviculture	Soo TSA has an aggressive intensive silviculture program with the objectives of providing 47 000 m ³ /yr above that from basic silviculture, improving stand value, meeting product objectives and lowering the harvestable age where investment provides an annual return > 4%.	
♦ Spacing	Spacing is not used in this TSA for quality purposes. Due to the sensitivity to minimum harvest ages, spacing is targeted to reducing ages and increasing volumes.	N/A
♦ Commercial Thinning	No CT at time of analysis, however 30 ha planned (SFD). Commercial thinning can increase the value of residual stems. See pruning.	Little treatable area at present.
♦ Pruning - Manual	Soo TSA plan specifies pruning 200 ha/yr. Recent pruning level is around 150 ha/yr 1 st lift and 100 ha/yr 2 nd lift. Usually the largest 2/3 rd s of trees in a stand are pruned, the other 1/3 possibly to be removed through commercial thinning. Only spaced stands are pruned. Some pruning would be conducive to the development of spotted owl habitat, perhaps to the extent that may then not be able to harvest the pruned trees.	
♦ Pruning - Natural	(Discussion re density management and natural pruning of balsam stands.)	

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.	15%?
♦ Mid Term (21 - 70 yrs)	1. Prune 150 ha/yr 1st lift. 2. Prune 100 ha/yr 2nd lift.	1. First and 2 nd lift pruning are not done at the same time, except in remote areas where pruning is often being done later than optimal. Assume of the 150 ha, 100 ha is in advance of 2 nd lift prune (see next strategy), with 50 ha receiving only a 1 lift pruning. Some concern was expressed in the district working session about the ability to capture the value when only a single lift pruning. Assume value will be obtained through lumber grading but may not be captured as veneer. Scanning technology may be such in the future that maximum value can be obtained. 2. 100 ha/yr is current level. District anticipates this will fall to 50 ha/yr?	1. Assuming value can be captured, premium log component generated will be approx. ½ of two lift pruning (see calc below). 2. Assuming a “steady state” level in comparison to annual area harvested (1 100 ha/yr), 100 ha pruned annually is 100/1 100 or 9% of the total area. If 2/3 rd of trees in a stand are pruned, = 6%. Assuming 25% of tree volume is in 1 st 5 m log, = .25 X 6 ⇒ 1.5%	1. 00.75% 2. 01.50% Total: 2.25%
♦ Long Term (71 + yrs)	As above.	As above.	As above.	2.25%

Timber Quality Forecast

The foregoing analysis indicates a relatively low premium log content forecast for the mid and long term (2¼% forecast vs. a potential target of 15%). This is a result of the trade-off between quantity of timber supply and quality. A higher level of pruning program than planned would serve to improve future timber quality.

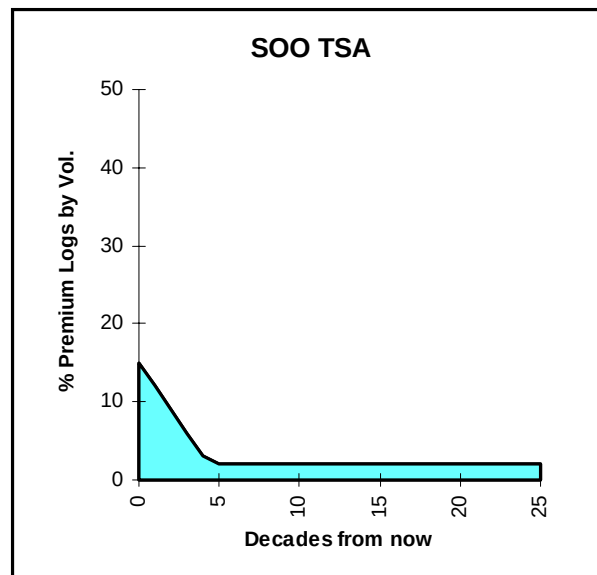


Figure 6. Potential Quality Forecast, Soo TSA

Incremental Silviculture Strategy

General Strategy

The existing age class structure of the Soo TSA makes it particularly sensitive to changes in minimum harvest ages. This, combined with a forecast immediate reduction in timber supply, make increasing timber quantity a priority over improving timber quality. The general strategy, therefore, is to undertake those silvicultural treatments that will advance the technical rotations of existing younger stands and future regenerated stands. A small pruning program on treatable high-site stands will ensure a minimal future supply of premium quality logs.

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 440 000 m³/yr and long term supplies to yield 530 000 m³/yr.

WT 2 (Quality): Manage existing age class 1 & 2 and regenerated stands to yield 2% premium logs by volume, with the majority of the remainder being of sawlog quality.

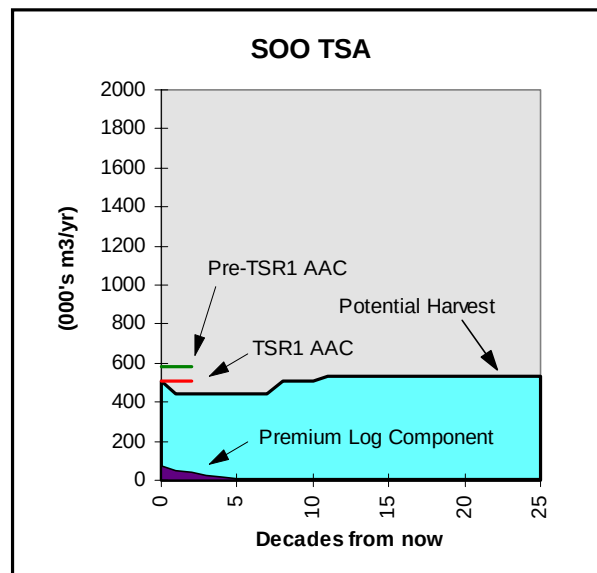


Figure 7. Combined Potential Quantity and Quality Harvest Forecasts, Soo TSA

Log Product Objectives

The following are definitions of premium logs and sawlogs in the Soo TSA.

Premium Log: Douglas-fir: 50+ cm min dbh, pruned 5 m 1st log.
 Balsam: 40 - 45 cm min dbh, small tight knots, pruned 5m 1st log.
 (Balsam is only 5-10% of total timber and is not significant.)

Sawlog: 250 stems/ha 50+cm DBH and average diameter 40 cm.

Silviculture Strategies

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

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

<u>No.</u>	<u>Strategy</u>
MT1	Reduce minimum harvest ages of: (a) younger existing stands (aged 1 - 40 yrs) 10 years by: (i) spacing 3 000 ha and 5 000 ha of remaining high density unspaced Fdc and HB stands respectively, aged FG to 30 yrs (low density stands may be spaced if funds

become available but are not a priority and, if left unspaced, may offer future commercial thinning opportunities);

(ii) fertilizing 10 000 ha of age class 1 & 2 Fdc stands on an 8 year return cycle;

(b) newly regenerated stands by 10 years by undertaking the actions to increase regenerated stand volumes 20% (see LT 1) + spacing to bring harvest ages forward.

MT2 Increase the volume of 2 000 ha Fdc, age class 3 existing stands through fertilization on a 10 year return cycle.

MT3 Design stocking levels on some existing stands to facilitate a possible commercial thinning program in the period 40 - 70 years from now.

MT5 Create owl habitat in 10% of spaced areas.

LT1 Increase regenerated stand volumes 20% by:

(b) using 2nd generation 'A' class seed for Douglas-fir, western hemlock, and engelmann spruce (requires programs for production of seed for these species for the coastal subarctic zone);

(c) following harvest of some H stands, plant 2nd generation Fdc and S where these species are more suited to the site;

(g) fertilize up to 75% of regenerated stands (requires determination of which H and B stands are responsive).

(Note: these actions are expected to achieve the 20% target when combined with an anticipated 10% increase in site productivity.)

LT2 Expand the timber harvesting land base by:

(a) restocking approximately 250 ha of backlog NSR in the next 5 years and brushing approx 900 ha over the next 10 years. (already incorporated in TSR1 base case)

(b) rehabilitating approximately 1 000 ha of poor-site Pl over 10 years.

◆ Strategies to Increase the Quality of Future Timber Supply

No.

Strategy

Q1 1st lift prune 50ha/yr to create knot-free timber in the lowest 3.5 m log.

Q2 2nd lift prune 50 ha/yr to create knot-free timber in the lowest 5 m log. (100 ha/yr required over next 5 years to catch up with the backlog of stands already 1 lift pruned.)

Silviculture Treatments and Investment Priorities

The following table indicates incremental silviculture treatments determined during the district working session to be suitable to attaining the above working targets and strategies. Several treatments may be applied to the same stand in a regime of treatments (however, these regimes are not specifically identified in the table).

Regime Table, Soo TSA, August 1998

			Timber Supply Effects				Direct Silv. Jobs	Direct Cost	Habi-tat	
Regimes	Strategy	Opportunity Area (Ha/Yr)	Short	Medium	Long	Quality	Days/ha	\$/ha		Rank
Rehabilitation										
1 Conversion of PI to Fd (outside current THL)	LT2	100/10yrs	0	+	++	0	10	2000	+	5
2 Plant NSR	LT2	50/ 5yr	0	+	++	0	3	650	+	2
3 Backlog brushing	LT2, MT4	150/5yr 25/yr(6-10)	0	+	++	0	5	500	+	2
Spacing^{1,2}										
High density										
4 HB >3000 --> 700 sph	MT1	500	0	+	0	+	4	950	+	3
5 Fd > 2000 --> 600 sph	MT1	300	0	+	0	+	4	950	+	3
Low density										
6 HB < 3000 --> 700 sph	MT1	150	0	+	0	+	4	950	+	7
7 Fd < 2000 --> 600 sph	MT1	250	0	+	0	+	4	950	+	7
Pruning										
Fd si 33+										
8 1st lift --> 3.5 m	Q1	50	0	0	0	++	5	1250	+	6
9 2nd lift --> 5m	Q2	100 /5yr 50/yr(6-10)	0	0	0	++	6	1600	+	6
Fertilization										
10 Fd si 25-35, age 10-40	MT1	1250	0	+	0	0	0.1	250	0	1
11 Fd si 25-35, age 40-70	MT2	200	0	+	0	0	0.1	250	0	1
12 Owl Habitat Enhancement stocking reduction (post CT) girdling for snag trees void creation underplanting to create a multilayered canopy	Owl	50	0	+	+	0	2	1000	+	4

Notes

1 Some stands may be spaced to a lower density to provide deer winter range.

2 Some stands may be spaced to a higher density to provide commercial thinning opportunities.

Incremental Silviculture Program

The following annualized program will achieve the above goals and strategies.

Program Table - Ha, Soo TSA, August 1998

Year	Surveys*	Backlog Brushing	Backlog Planting	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Owl
1	4,000	150	50	1,200	50	100	1,450	50
2	4,000	150	50	1,200	50	100	1,450	50
3	4,000	150	50	1,200	50	100	1,450	50
4	4,000	150	50	1,200	50	100	1,450	50
5	4,000	150	50	1,200	50	100	1,450	50
Subtot Yr 1 - 5	20,000	750	250	6,000	250	500	7,250	250
6 - 10	15,000	125	0	6,000	250	250	7,250	250
Total Yr 1 - 10	35,000	875	250	12,000	500	750	14,500	500

* Includes prescription and layout

Unit Cost (\$/ha)	90	500	650	950	1,250	1,600	250	1000
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Program Table - \$ 000s, Soo TSA, August 1998

Year	Surveys*	Backlog Brushing	Backlog Planting	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Owl	Total
1	360	75	33	1,140	63	160	363	50	2,243
2	360	75	33	1,140	63	160	363	50	2,243
3	360	75	33	1,140	63	160	363	50	2,243
4	360	75	33	1,140	63	160	363	50	2,243
5	360	75	33	1,140	63	160	363	50	2,243
Subtot Yr 1 - 5	1,800	375	163	5,700	313	800	1,813	250	11,213
6 - 10	1,350	63	-	5,700	313	400	1,813	250	9,888
Total Yr 1 - 10	3,150	438	163	11,400	625	1,200	3,625	500	21,100

Job Outcomes

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

Program Job Outcomes, Soo TSA, August 1998

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

Year	Surveys*	Backlog Brushing	Backlog Planting	Space	Prune 1st lift	Prune 2nd lift	Fertilize	Owl	Total
1		4.2	0.8	26.7	1.4	3.3	0.8	0.6	38
2		4.2	0.8	26.7	1.4	3.3	0.8	0.6	38
3		4.2	0.8	26.7	1.4	3.3	0.8	0.6	38
4		4.2	0.8	26.7	1.4	3.3	0.8	0.6	38
5		4.2	0.8	26.7	1.4	3.3	0.8	0.6	38
Subtot Yr 1 - 5	0	20.8	4.2	133.3	6.9	16.7	4.0	2.8	189
6 - 10		3.5	0.0	133.3	6.9	8.3	4.0	2.8	159
Total Yr 1 - 10	0	24.3	4.2	266.7	13.9	25.0	8.1	5.6	348

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

Long term employment associated with improved quantity of the timber resource¹

Decade	Harvest Increment ('000 m3)	Incremental Jobs			
		per year by decade		Total by decade	
		TSA ²	Region ³	TSA ²	Region ³
1	0	-	-	-	-
2	46	29	55	290	547
3	46	29	55	290	547
4	46	29	55	290	547
5	46	29	55	290	547
6	46	29	55	290	547
7	46	29	55	290	547
8	68	43	81	428	809
9	68	43	81	428	809
10	68	43	81	428	809
11	88	55	105	554	1,047
12	88	55	105	554	1,047
13	88	55	105	554	1,047
14	88	55	105	554	1,047
15	88	55	105	554	1,047
16	88	55	105	554	1,047
17	88	55	105	554	1,047
18	88	55	105	554	1,047
19	88	55	105	554	1,047
20	88	55	105	554	1,047
21	88	55	105	554	1,047
22	88	55	105	554	1,047
23	88	55	105	554	1,047
24	88	55	105	554	1,047
25	88	55	105	554	1,047
Total				11,340	21,420

1 - Assumes continuation of the incremental silviculture program beyond the first 10 years, in accordance with the strategy.

The total harvest increment is associated with all 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 0.63 TSA level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Soo SEA)

3 - Assumes 1.19 Regional level harvesting and processing jobs (PYs) per 1000 cubic metre, inclusive of TSA jobs (Source: Soo SEA)

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