

Kingcome Timber Supply Area

Incremental Silviculture Strategy (Interim)

-- Version 1.0 --

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British Columbia
Ministry of Forests

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Forest Renewal BC

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STRATEGY AT A GLANCE

Working Targets

The Kingcome TSA has limited ability to overcome forecast reductions in both timber quantity and quality.

Quantity: Maintain short term harvests at near-current levels (TSR 1 AAC of approx. 1.4 million m³/yr) for as long as possible. Manage mid-term timber supplies to yield a harvest of approximately 1.0 million m³/yr and long term supplies to yield 1.3 million m³/yr.

Quality: Manage regenerated stands to yield at least 4% 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 Kingcome TSA.

Premium Log: Hemlock60+ cm DBH, clear, min 5 m log, not less than 3-4 rings/cm on M/P sites and 2-3 rings/cm on G sites.

Cedar pole....45+ cm min DBH, min 20 m log, low taper, min 20 cm top.

Balsam60+ cm DBH, clear, min 5 m log.

Sawlog: Minimum average stand DBH of 45 cm and min. stand vol. of 350 m³/ha.

Major Silvicultural Strategies

Quantity

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

1. Increase regenerated stand yields 20%, and achieve green-up 3 years earlier by:
 - reducing time to regeneration by 2 years by planting all areas;
 - using (2nd gen) A class seed or better (requires tree improvement for Balsam);
 - using large planting stock, and/or individual tree fertilizing at planting, and/or seedling protection;
 - brushing for growth enhancement; and
 - fertilizing 500 ha/yr of cedar-salal sites to achieve early crown closure.
2. Implement partial harvesting regimes in VQ zones.
3. Expand the timber harvesting land base by:
 - rehabilitating the remaining 400 ha of backlog NSR and brushing (conifer release) 3000 ha of backlog plantations;
 - draining low-site wet lands (10 ha trial); and
 - assessing opportunities for rehabilitating non-commercial alder stands back into conifer production.

Quality

1. One-lift prune (3.5 m) 150 ha/yr, two-lift prune (5.0 m) 150 ha over the next 2 years.
2. Manage selected stands to higher densities to yield pole-sized trees.
3. Space 200 ha/yr to increase avg. piece sizes and prepare stands for pruning and commercial thinning.

*Incremental
Silviculture
Program
(ha)*

Year	Surveys	Backlog Prep/Plant	Backlog Brushing	Space	Prune - 1	Prune - 2	Fertilize	Drain	Total
1	2,000	100	400	200	150	75	500		3,425
2	2,000	100	400	200	150	75	500	10	3,435
3	2,000	100	400	200	150	-	500		3,350
4	2,000	100	400	200	150	-	500		3,350
5	2,000	-	400	200	150	-	500		3,250
Subtot Yr 1 - 5	10,000	400	2,000	1,000	750	150	2,500	10	16,810
6 - 10	10,000	-	1,000	1,000	750	-	2,500	-	15,250
Total Yr 1 - 10	20,000	400	3,000	2,000	1,500	150	5,000	10	32,060

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 range of potential 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 29 & 30, 1998 in Port McNeill, attended by representatives of the MoF and forest licensees of the Kingcome 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:

- Port McNeill Forest District
- Vancouver Forest Region.

Forest licensees of the Kingcome TSA:

- TimberWest
- MacMillan Bloedel
- Western Forest Products
- Interfor
- Canfor

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

After publication of the Analysis Report, the BCFS corrected a data error, increasing the timber harvesting land base by 1%. Information below is noted as corrected or uncorrected, as available.

Land Area

Description	Area (ha)	Area %
Total Area of TSA	1 126 100	100
Total Productive Crown Forest	519 700	46
Net Timber Harv. Land Base	177 900	16

Corrected THLB - rounded to nearest 100 ha.

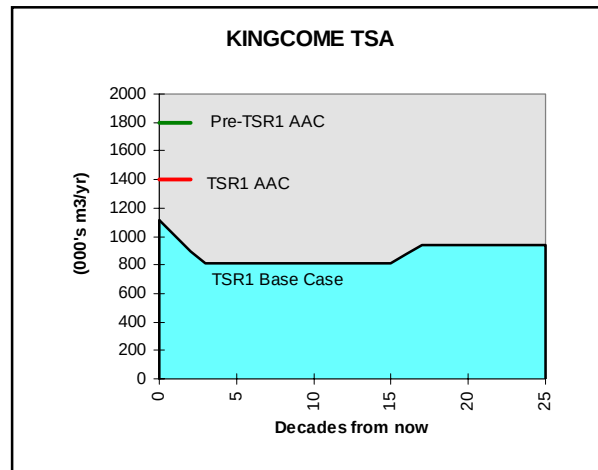
AAC

AAC Type	Pre-TSR	TSR1*	Change (%)
Conventional	1 798 270	1 244 000	-30.8
Deciduous	-	25 000	∞
Insect/Disease	-	-	∞
Marginal	-	130 000	∞
Total	1 798 270	1 399 000	-22.2

Woodlot AAC	Not included in conventional AAC	10 278
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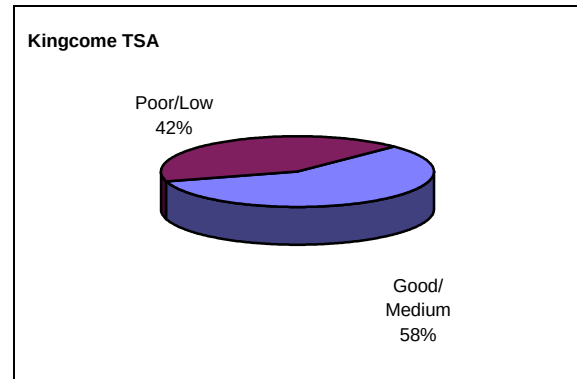
*effective Nov 1/96

Harvest Forecast



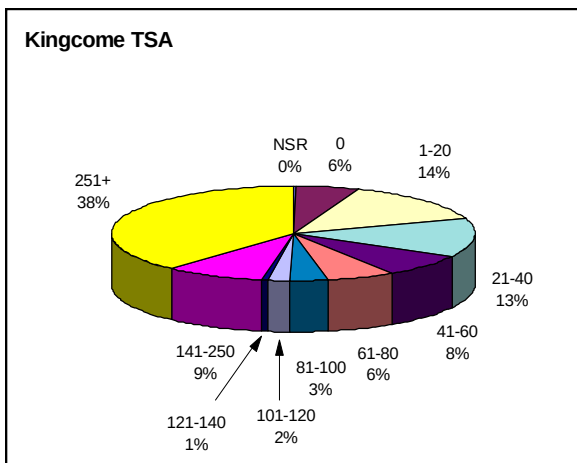
Corrected THLB

Site Class



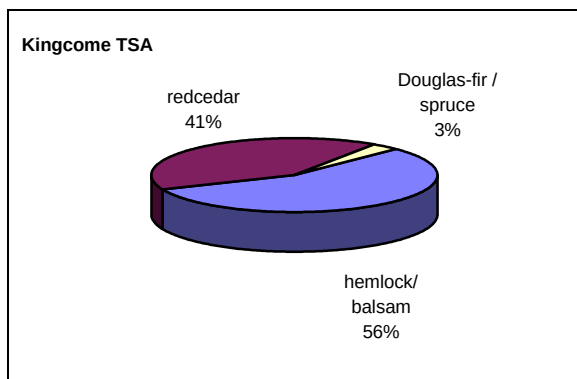
Uncorrected THLB

Age Class



Uncorrected THLB. Data scaled from chart in TS analysis report.

Tree Species



Uncorrected THLB.

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

Due to the discovery of a data error (the THLB was increased 1% following correction), a different base case was used in the AAC rationale from that in the TSR report. Some of the information below may therefore not precisely correspond with the corrected base case.

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; VQO - visual quality objective.

♦ Fall Down	Base case is for the conventional coniferous component of the TSA (rationale, 44). "Current AAC" assumed to be 1 658 770 m ³ , after a 139 500 m ³ deduction for allocated woodlots, deciduous stands, and stands with low productivity (total pre TSR AAC: 1 798 270 m ³). Corrected base case initial harvest level is 1 117 600 m³, 33% below current AAC , declining thereafter at a rate of 10%/ decade to a mid term level of 811 600 m ³ after 3 decades (51% below current AAC, 27% below initial harvest level), rising to a long term harvest level in decade 16 of 963 600 (42% below current AAC, 14% below initial harvest level). (rationale, 11)
♦ Age Class	Approximately 38% of THLB in stands aged 251+ , having implications for green-up and adjacency constraints. Only 6% of THLB in stands aged 81-140 , resulting in mid term harvest levels below LTHL for an extended period. (TSR report)
♦ Forest Cover	<p><i>IRM Zone:</i> 59% of THLB. Base case requirement of at most 25% of THLB permitted to be < 3 m tall (4 pass system). Sensitivity test of ± 1 pass.</p> <p><u>Relaxation:</u> (3 pass) Moderate sensitivity, increase of 8% in first 4 decades, otherwise not sensitive in mid or long term. Other factors restrict the response.</p> <p><u>Increase:</u> (5 pass) Highly sensitive in the short term. Initial harvest level 28% below base case. Slightly below mid term base case. No effect long term.</p> <p><i>Visual Quality Zones:</i> 41% of THLB. Base case requirement of at most 4% (high sensitive areas), 14% (medium) and 24% (low) to be < 5 m tall.</p> <p>Sensitivity test of ± 5%. (analysis, 42-43)</p> <p><u>Relaxation:</u> (+5%) Moderately sensitive - increase of 8% in first 3 decades, almost eliminates mid term shortfall. Long term insensitive.</p> <p><u>Increase:</u> (-5%) Highly sensitive - decrease of 10% in first 3 decades, 17% over mid long term, and 7% below long term.</p> <p>[Indications are that some VQO's will be re-classified prior to TSR2, and that while VQO's will be less restrictive than in TSR1 they will still be significant.¹]</p> <p><i>Green-up:</i> Base case uses avg of 14 yrs for 3 m green-up in IRM zone and 19 yrs for 5 m green-up in VQ zones.</p>

¹ Source: MoF Port McNeill Forest District. Hereafter noted in the text as (PMFD).

	<p>Sensitivity test of ± 5 years.</p> <p><u>Decrease:</u> (- 5 yrs) Two alternatives indicate either higher short term volumes (+22% over 1st several decades) or higher mid term volumes (+9.5% over base case - almost eliminates mid term shortfall), but not both, can result from lowering green up ages 5 years. Long term insensitive.</p> <p><u>Increase:</u> (+ 5 yrs) Highly sensitive - initial harvest level 41% below base case. Rises to base case in decade 13. LTHL 1.5% below base case.</p> <p>Change to green up ages is more sensitive than changes to adjacency due to the large existing area already below green up age. Lowering green up ages makes more adjacent area available to a greater extent than relaxing adjacency constraints.</p> <p>Site indexes are potentially underestimated by 4 m, which would result in a 3 yr reduction in green-up ages. A sensitivity test of - 3 years indicates the initial harvest level could be 18% higher than corrected base case if time to green-up is reduced 3 years. (rationale, 29) CF does not explicitly accept that site productivity has been underestimated and green-up periods over-estimated, but accepts the likelihood that this offsets other uncertain factors which may reduce short term timber supply (rationale, 46).</p>
◆ Backlog NSR	443 ha of backlog NSR. Assumed to be restocked within 3 - 5 years. CF considers this a minor over-estimation as will become either deciduous or will be understocked.
◆ Quality	<ul style="list-style-type: none"> • 11 451 ha of non-merchantable forest types deducted from THLB (approx 10 000 ha deciduous and 1 450 low quality pine). Partition of 25 000 m³ for deciduous species. • 816 ha of brush deducted from THLB. • 25 478 ha of low productivity sites deducted from THLB. Partition of 130 000 m³ of AAC for low productivity sites.
◆ Older Forests	<p>Base case does not include a requirement for old growth or biodiversity as there are no specific provisions applied operationally in the TSA.</p> <p><u>Relaxation:</u> N/A</p> <p><u>Increase:</u> Sensitivity analysis indicates the impacts of biodiversity and riparian requirements could result in a 5.7% decrease in initial harvest levels from the corrected base case. [Sensitivity analysis on the uncorrected base case for the addition of a requirement for at least 10% of stands being older than 140 years indicates that all terms are sensitive. Long term is 5% below base as it forces the harvesting of stands at ages past the point of maximum growth rates.]</p>
◆ Min. Harvest Ages	<p>Base case uses ages within 5% of culmination ages as min. harvest ages. Sensitivity analyses on uncorrected base case of ± 10 and ± 20 yrs. Slight sensitivity ($\pm 2\%$) to 10 yr change only in decades 4 to 16.</p> <p><u>Decrease:</u> (- 20 yrs) Short and long term insensitive. Mild sensitivity mid term, with harvest levels slightly higher than uncorrected base case (+2%).</p> <p><u>Increase:</u> (+20 yrs) Short and long term insensitive. Mild sensitivity mid term, with harvest levels 5% lower than uncorrected base case.</p> <p>Effects are considerably greater when a 20 yr reduction in minimum harvest ages is combined with a 30% increase in regenerated stand volumes, as would be the result were site indexes increased by 4 m (see "Site Productivity").</p>
◆ Silvicultural Systems	Most of the THLB is currently managed under a clearcut harvesting system. Some harvesting is clearcut with reserves. CF notes potential to increase harvests in visually sensitive areas using alternative silvicultural systems.
◆ Regeneration Delay	Approximately 40% of harvested areas are regenerated naturally (rationale, 23). Regeneration delays in the TSR analysis were 3 years for Douglas-fir and spruce and 5-6 years for cedar,

hemlock and balsam (analysis, 78). Those areas having a 6 yr delay were subsequently found to be regenerated in 5 years. A sensitivity analysis indicated **initial harvest level could be increased 1.2%** due to this change [likely due to a 1 yr reduction in green-up age], which CF took into consideration in AAC determination (rationale, 23).

Deer browse and Sitka spruce leader weevil are the most significant impediments to regeneration. However, losses are not of sufficient magnitude to cause CF to make an AAC adjustment. (rationale, 24)

Potential to reduce all delays to 3 years if all areas are planted (rationale, 23).

Sensitivity test of ± 3 yrs. (analysis, 39-40; uncorrected base case) All periods are sensitive.

Decrease: (- 3 yrs) **Very sensitive in the short term**, with harvest levels 12% above the base case for the 1st 3 decades. Moderate sensitivity mid term, with harvest levels 5% higher than base case. LTHL 2% higher.

Increase: (+3 yrs) Harvest levels 8% below base case for the 1st 3 decades. Mid and long terms 5% and 3% lower than base case, respectively.

◆ Site Productivity

Information from adjacent areas indicates site indexes may be underestimated by 4m. If site indexes are underestimated 4 m, estimates of min harvestable ages decrease by 20 yrs and regenerated stand volumes increase 30%. (rationale, 21) Sensitivity analysis indicates **this combination could increase mid and long term harvests by 11% and 29% respectively** (analysis, 38).

A site productivity increase of 4 m would also decrease green-up periods by 3 yrs, resulting in an 18% increase above the base case initial harvest level. (rationale, 21)

◆ Estimates of Timber Volumes

[All of the following is with respect to the uncorrected base case.]

VDYP - existing stands (analysis, 80). TIPSYP - regenerated stands (analysis, 82).

Existing stand volumes: An inventory audit found inventory existing stand volumes to be overestimated by 11% for the TSA as a whole (rationale, 45). While the CF considers this not to be fully quantified, based on the sensitivity test below, **this indicates short and long term harvest level reductions below the base case of approximately 120 000 and 50 000 m³/yr respectively.**

Sensitivity test for $\pm 10\%$ in volume. Highly sensitive to both in short and mid terms. Long term insensitive.

Increase: (+10%) **Highly sensitive.** Increases volumes in 1st several decades by 10% and over mid term by 8% (due to some harvesting of regenerated stands).

Decrease: (-10%) **Highly sensitive.** Initial volumes reduced 10% below base case for 1st 3 decades and 6% below for decades 4 - 16.

Regenerated stand volumes: OAF 1 - 15%, OAF 2 - 5% (analysis, 78).

Sensitivity tests for ± 10 and $\pm 25\%$ in volume. Short term insensitive to either. Highly sensitive to both in long term.

Increase: (+10 or +25%) LTHL 10 or 25% higher than base case, starting to rise from mid term shortfall 150 years from now. 10% change insensitive in mid term but **25% change gives a 7% increase in this period.** [Both scenarios exacerbate the mid-term dip below LTHL in base case- potential for commercial thinning?]

Decrease: (-10 or -25%) LTHL 10 or 25% lower than base case. 10% change insensitive in mid term but 25% change gives a 13% decrease below base case starting at decade 8.

Summary of Issues by Period

Short Term (1 - 20 yrs)

Short term harvest levels are highly sensitive to changes in green-up ages, and consequently to regeneration delay. Lowering green up ages makes more adjacent area available to a greater extent than relaxing adjacency constraints. This is because of the large existing area currently below green-up age.

An inventory audit found mature stand volumes to be overestimated by approximately 11%. Based on TSR sensitivity analysis results this can be expected to result in short term harvest levels in the order of 120 000 m³/yr less than the base case. However, the CF considers this to be offset by the possibility that green-up ages are overestimated (because site indexes are underestimated), which is an approximately equal upward influence on short term harvest levels.

Mid Term (21 - 160 yrs)

Only 6% of stands are aged 81 - 140 years, contributing to mid term harvest levels being below the LTHL for an extended period.

Relaxing adjacency requirements in the visual quality zones almost eliminates the base case mid term harvest shortfall, indicating the potential for partial harvesting or commercial thinning in these zones. Similarly, achieving green-up earlier through silviculture practices (effectively lowering green-up ages) can also eliminate the mid term shortfall.

As a result of inventory audit findings, mid term harvest levels are likely in the order of 50 000 m³ (6%) below the base case (see "Short Term"). Potentially offsetting this decrease is the finding that, if site indexes are underestimated 4 m, estimates of min harvestable ages decrease by 20 yrs and regenerated stand volumes increase 30%. Sensitivity analysis indicates these could result in an 11% increase in mid term harvest levels.

Long Term (161+ yrs)

Long term harvest levels are sensitive to the imposition of an older forest constraint (currently there isn't one) as it forces the harvest of stands beyond culmination age. A requirement for 10% of stands to be older than 140 years at all times results in a 5% reduction to the long term harvest level.

The long term is otherwise only sensitive to changes in regenerated stand volumes. A 1% increase or decrease in regenerated volumes results in a corresponding 1% increase or decrease to the LTHL. An increase in LTHL increases the difference between the mid term and long term harvest levels, thereby increasing the opportunity for silvicultural practices to bring forward volumes from the long term into the mid term.

Future

Future factors to be considered in determining an incremental silviculture program include:

- further reductions in land base resulting from implementation of the Vancouver Island Land Use Plan;
- the implementation of biodiversity and old growth plans.

Incremental Silviculture History

Approximately 2 000 ha are harvested annually.

Treatment	TSR1 Status (1994)		Current Status (1998) Source: PMFD
	Incorporated in Timber Supply Analysis	Not Incorporated in Timber Supply Analysis	
◆ Backlog	443 ha to be reforested in 5 years (rationale, 25).		About 400 ha require site preparation and planting. Expected to be completed in 3 years.
◆ Backlog Brushing /Conifer Release	400 ha/yr, on Vancouver Island and the mainland portions of the TSA.		
◆ Conversion	600 ha of alder overstory to be treated, releasing HC understory.		
◆ Commercial Thin		None.	None.
◆ Space		Approx. 5 000 ha spaced since 1980 (rationale, 26).	1998 level approx. 200 ha/yr.
◆ Prune		None indicated at time of TSR1.	1998 level approx. 100 ha/yr. Typical treatment is 1 lift prune to 2/3 rd 's of the trees in a spaced stand.
◆ Fertilize			None to date, but available stands could support a program of 500 ha/yr. Target is age class 1 & 2 cedar, poor to low site class.

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

The Kingcome TSA occurs primarily on the mainland from Knight Inlet in the south to Cape Caution in the northwest and inland to Tweedsmuir Park. Smaller portions of the TSA are located at the northern tip of Vancouver Island and adjacent to Brooks Bay on the west coast of Vancouver Island. Steep terrain and lack of access limit the ability to offset projected timber supply reductions.

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.

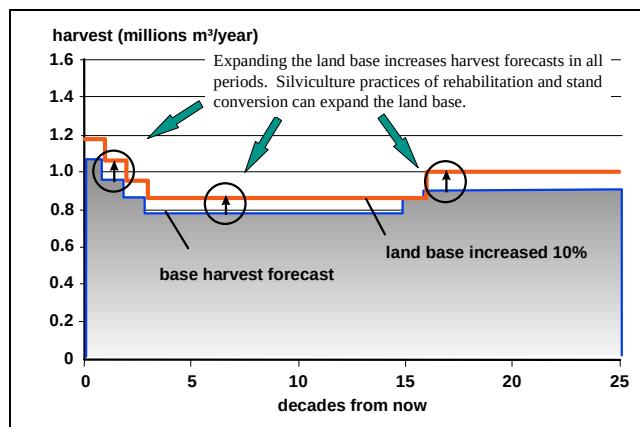


Figure 1. Changes in land base, Kingcome TSA

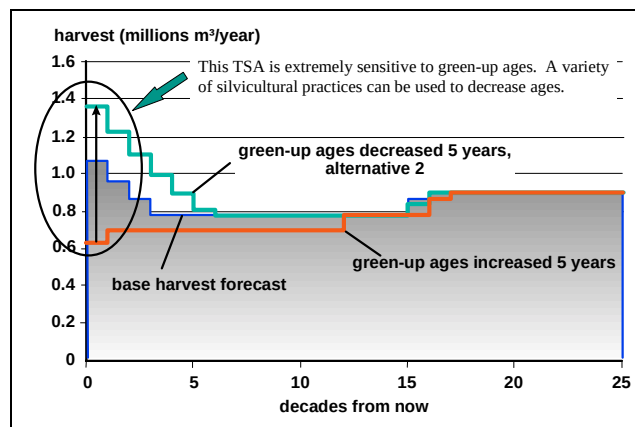


Figure 4. Changes in green-up ages, Kingcome TSA

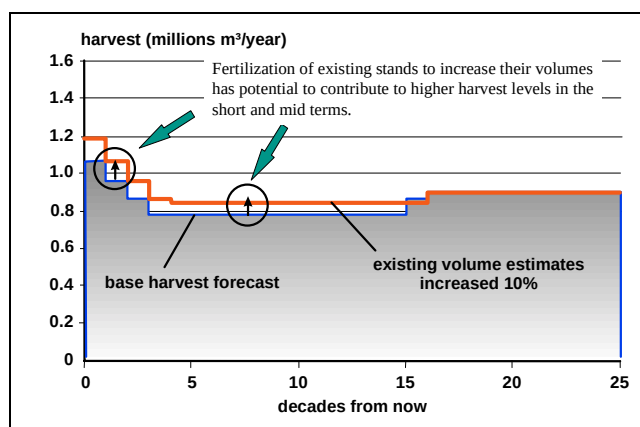


Figure 2. Changes in existing stand volumes, Kingcome TSA

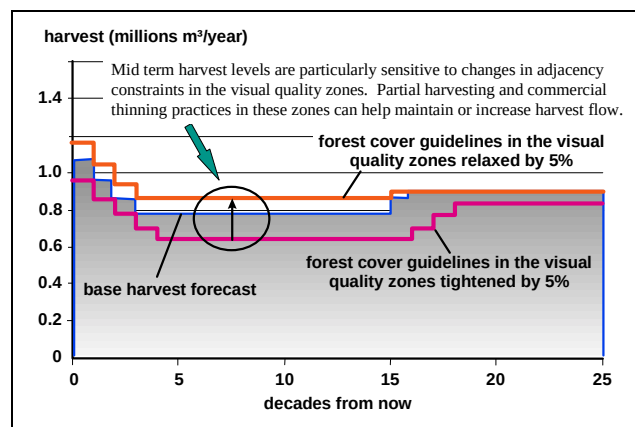


Figure 5. Changes in adjacency requirements, Kingcome TSA

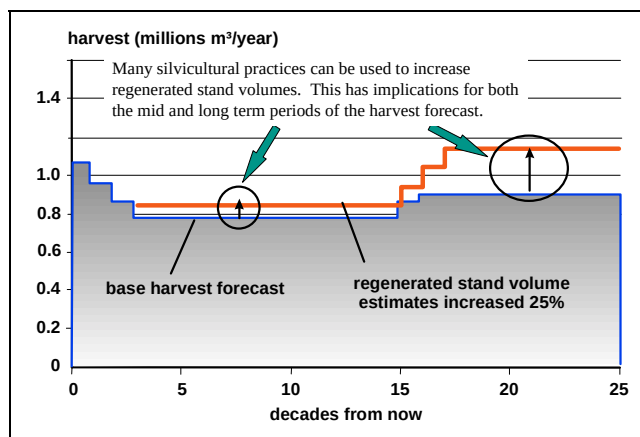


Figure 3. Changes in regenerated stand volumes, Kingcome TSA

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 the potential strategies was discussed in detail in the district working session, the results of which are recorded in "Potential Strategies by Response Time Frame," page 11, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 20.

◆ Short Term (1 - 20 yrs)

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

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

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

◆ Mid Term (21 - 160 yrs)

MT 1: reduce regeneration delay 2 yrs by planting all areas.

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

MT 3: increase the volume of regenerated stands by 20% through a variety of actions.

MT 4: move volume forward from the long term to the mid term.

MT 5: conduct extensive fertilization trials in hemlock stands to be able to increase the volume of existing hemlock stands.

◆ Long Term (161+ yrs)

LT 1: increase the volume of regenerated stands by 20% as in MT 3 above.

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
◆ Alternative Silvicultural Systems	Use of alternative systems in visually sensitive areas could increase availability of timber for harvesting. A recently issued forest licence located in lower Knight Inlet requires alternative harvesting and silvicultural systems. MacMillan Bloedel is planning a transition to alternative systems over the next 5 years.	41 % of TSA is visually sensitive.
◆ Spacing	Spacing has been applied in some younger existing stands.	
◆ Fertilization	Very little fertilization in the TSA. Variable response in H. Few Fdc stands. Cedar stands give response but many stands are remote and therefore costly to treat. A greater knowledge of growth and yield responses of hemlock to fertilization is needed (PMFD). Cw/Hw salal sites achieve crown closure (CC) at approximately 7 m, which shades out competing salal. Prior to CC, salal reduces site potential through nutrient competition. Stands show significant response to a regime of fertilization at time of planting, plus 1 or 2 more applications to achieve early CC.	Little treatable area amongst older stands. Significant early tree ht. growth found in SCHIRP trials in cedar - salal associations.

Treatment	Comment	Treatable Area
	90%+ of Cw sites are planted.	
♦ Commercial Thinning	None to date. CF expects district staff to analyze potential for CT and, if feasible, to implement a CT strategy. (rationale, 27) Approx. 17% of forests in the THLB are 30 to 80 years old and may be candidates for commercial thinning. 10 400 ha of H stands 40 -60 years old. Steep terrain and lack of access limits availability. (rationale, 26-27)	About 10 000 ha of suitably aged stands are located on the mainland. Of these, 3 000 ha are considered accessible (PMFD).
♦ Backlog NSR	All backlog scheduled to be restocked in next 4 years. No additional opportunity.	0

Potential Strategies by Response Time Frame

Explanatory notes with respect to the following tables.

Column
Number

Note

- 1 The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.
- 2 Strategy numbers correspond with the numbers recorded earlier in “Preliminary Identification of Silviculture Opportunities,” page 10. 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 July 29 & 30, 1998, (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 2nd decade (as per the base case). Mid and long term harvest forecasts take the corrected base case levels from TSR1 as the starting levels, adjusted upwards by 10% to recognize the partitioned AAC for low productivity sites and associated timber harvesting land base increase (see rationale, 17). The harvest forecast column was not thoroughly reviewed during the district meeting. *Results are largely conjecture and are meant to illustrate the potential of the strategies.*

In the AAC rationale, the chief forester identified a number of potential downward influences on timber supply. For the purposes of this strategy, however, a status quo is assumed with respect to these. Should any arise, the following strategies would serve to mitigate their effects rather than increase timber supply.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)												
♦ Short Term (1 - 20 yrs)	1. Complete site index & existing stand volume estimation studies.	1. The need for completion of these studies is noted under “Summary of Information and Research Needs,” page 21.	1. N/A - results of the two studies may be largely offsetting.	1.40 1 st dec.												
	2. Achieve green-up 3 years earlier in VQ zones by:	2. Green-up is a policy issue and requirements are subject to change. The best opportunities to achieve earlier green-up are pre-free growing. TSR1 ages to reach specified tree heights. <table><tr><td>Species</td><td>FG</td><td>3M</td><td>5M</td></tr><tr><td>Cw</td><td>7-8</td><td>14</td><td>20</td></tr><tr><td>H/B</td><td>5-8</td><td>5-8</td><td>10-12</td></tr></table> Overall, approx. 60%+ of harvested areas are currently planted (Cw, Hw, Ba, minor Fdc). Natural regeneration is common on N to NE aspect Hw/Ba sites.	Species	FG	3M	5M	Cw	7-8	14	20	H/B	5-8	5-8	10-12	2. TSR1 indicates a 3 yr earlier green-up yields an approximately 18% increase in harvest levels in the 1 st decade. Assume 3 yr earlier green-up achieved on ½ of areas (0.5 X 18% ⇒ 9%) (or 1.26 X .09 = .11).	1.26 2 nd dec. 0.11 grn-up <u>0.03</u> prt harv 1.40 total
	Species	FG	3M	5M												
	Cw	7-8	14	20												
	H/B	5-8	5-8	10-12												
	(a) planting large genetically improved stock;	2.(a) Planting larger stock is a basic silv matter - not likely to change w/o funding assistance. Genetically improved stock will reach green-up sooner than stock from “wild” seed, although gain in years is not known. See MT3 re yield gains. All Cw and Hw seed is “A” class. No Ba available.														
	(b) increasing proportion of area planted & plant all areas sooner (to reduce regeneration delay 1-2 yrs);	2.(b) Reducing regen delay is a basic silv matter. TSR1 regen delay for Fdc & S is 3 yrs. Current practice is to plant in 2 yrs. Very high plantation success rate. (relatively little of these species in this TSA). TSR1 regen delay for Cw is 5 yrs. Current practice is to plant in 1-2 yrs. Very high plantation success rate. TSR1 regen delay for Hw natural is 5 yrs. Current practice is 3 yrs. If planted (not likely to change w/o funding assistance), would likely be 1-2 yrs.														
	(c) brush for growth enhancement; and/or	2.(c) Brushing is currently for survival - unlikely to change within current funding structure.														
	(d) fertilize suitable regenerated stands to increase their growth.	2.(d) Fertilizing Cw is an option. See discussions under MT 3 & MT 5 below.														
	3. Implement partial harvesting/CT regimes in VQO zones to increase timber supply from areas limited by adjacency constraints.	3. Some partial harvesting is planned. Will likely increase when there is no alternative to harvesting in areas limited by forest cover constraints. About 3 000 ha currently available on the mainland for CT, but no plans. During discussion of this topic in the district working session, regenerated stand yields for the TSA were questioned. There was a strong feeling TIPSY yields for Hw in particular were underestimated. Noted under “Summary of Information and Research Needs,” page 21.	3. TSR1 indicates an 8% increase in ST harvests from relaxing requirement of area allowed to be not greened up by 5%. Assume achieved on ¼ of areas. (0.25 X 8% ⇒ 2%)													
4. Increase the volume of some existing stand volumes through fertilization.* ²	4. Hw response is variable. Studies required to confirm fertilization potential.	4. N/A. Studies required.														
5. Expand the timber harvesting land base through:*	5.(a) Remaining 400 ha is mostly on the mainland portion of the TSA and will be															

² * - indicates potential strategies that were added during the district working session.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)												
	(a) rehabilitating backlog NSR; (b) draining low site wet lands in the Nawhitti Plateau and Standby area; and (c) rehabilitating non-commercial alder stands.	stocked in next 4 yrs. About 3 000 ha of backlog brushing required to release conifers on previously harvested areas. Impacts already included in TSR1 base case. 5.(b) About 40 000 ha classified as Cw 921 P/L. About 8 000 ha may be treatable at \$3 000/ha. Requires 1 m ditches 30 m apart. Would require environmental and public review. Consider experimental for now, with a 10 ha trial. 5.(c) Considerable area in alder which is operable but not commercial. Would need to co-ordinate with alder licensee to determine treatable areas. Requires further study - program not likely to start in next 5 yrs & then would take 15 yrs to complete.	5. (a) Already in base case forecast. (b) 8 000 ha of drainage =4.5% of THLB. Expect to change site quality from low to poor, ∴ possible 3% gain. Due to experimental nature and need for public review, this is not included in potential ST harv forecast. (c) Assume 2 000 ha may be rehabilitated to G site conifer = 2/178 THLB.= 1%. However, not likely completed within ST.													
♦ Mid Term (21 - 160 yrs)	1. Plant all areas to reduce regeneration delay by 2 years. 2. Overcome adjacency constraints in VQO zones by: (a) partial harvesting; and (b) setting up stands for CT through spacing. 3. Increase regenerated stand volumes 20%: (a) reducing time to regeneration; (b) using A class seed or better; (c) using large planting stock;	1. See discussion under ST 2 above. This is a basic silv. activity. 2. (a) See discussion under ST 3 above. (b) Some areas are currently being spaced to set up for CT. However, although 33% of THLB is in stands ≤ 40 years old, few of these meet the criteria of better site, high visibility and economically accessible. Only 2-3% of stands in this age group are considered suitable for CT and would support a program of approx. 200 ha/yr. 3. (a) & (c) - see discussions under ST 2 above. 3. (b) Approx. 60%+ of harvested areas are planted. Fdc, Cw & Hw seed is “A” class. Latest estimates of yield gains are (%): ³ <table><tr><th>Species</th><th>1st gen</th><th>2nd gen</th></tr><tr><td>Doug-fir (Fdc)</td><td>3-5</td><td>15</td></tr><tr><td>Hemlock (Hw)</td><td>3</td><td>20</td></tr><tr><td>Cedar (Cw)</td><td>3</td><td>10</td></tr></table> If areas now managed for natural regen Hw (40% of total area) were planted w	Species	1 st gen	2 nd gen	Doug-fir (Fdc)	3-5	15	Hemlock (Hw)	3	20	Cedar (Cw)	3	10	1. Potentially overlaps with gains from reducing time to green-up, but treated as an indication of mid term potential. Sensitivity analysis indicates a 5% gain with a 3 yr reduction, ∴ (2/3 X 5% ⇒ 3%. 2.(a) Sensitivity analysis indicates a 11.5% gain with a 5% relaxation in constraints. Assume achieved on ¼ of areas. (0.25 X 11.5% ⇒ 3%) 2.(b) Slight positive impact - not estimable. 3. Sensitivity tests indicates a 25% increase in regenerated stand yields will increase MT harvests 7%. At least a 20% gain can be anticipated through implementation of the indicated actions ∴ 20/25 X 7% ⇒ 6%.	0.81 base 0.08 THLB adj 0.89 Adj base + 0.03 rgn dlay 0.03 prt harv 0.05 rgn vol 0.02 fert Cw 0.01 inc THLB 1.03 total See p 11 re THLB adjustment.
Species	1 st gen	2 nd gen														
Doug-fir (Fdc)	3-5	15														
Hemlock (Hw)	3	20														
Cedar (Cw)	3	10														

³ Source: participants at Fraser TSA working session.

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Potential Harvest Forecast (000 000s m3/yr)
	<p>(d) managing stocking to reduce voids 5%;</p> <p>(e) individual tree fertilizing at time of planting.</p> <p>4. Space all post FG stands to set up for CT to bring forward harvest from long term into mid term.</p> <p>5. Fertilize existing (a) hemlock and (b) cedar stands to raise their volumes.</p> <p>6. Expand the timber harvesting land base as per ST 5 above*</p>	<p>genetically improved stock (20% gain), gain could be $40\% \times 20\% \Rightarrow 8\%$ overall;</p> <p>3. (d) 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 21.</p> <p>3. (e) It is now common practice throughout the TSA to fertilize individual trees at time of planting on cedar / salal sites. Post FG is done with FRBC funding, however no funding in 1997. These treatments are done aerial / broadcast for efficiency and effectiveness. See discussions under MT 5 below.</p> <p>4. Currently not much opportunity. Bringing forward harvest from the LT is too far into the future to contemplate or assess now. Noted for future assessment in approx. 50 yrs.</p> <p>5. No fertilization currently taking place.</p> <p>(a) Identify characteristics of hemlock stands that show a fertilization response so treatable area can be expanded. The need for extensive fertilization trials in hemlock stands is noted as a requirement for further research under "Summary of Information and Research Needs," page 21.</p> <p>5. (b) Cw shows an estimated 30% response from fertilizing to force early CC. Once Cw has achieved CC, no further fertilization is required. Two methods of estimating potential were explored. (Method 1) Existing stands between post-FG and age 20 = 8% of THLB. Cw = 40% of THLB. $\therefore$ Cw between FG & 20 = $40\% \times 8\% = 3.2\%$ of THLB, or approx. 5 000 ha. $30\% \text{ gain} \times 3.2\% \text{ THLB} = 1\% \text{ gain overall}$. Would require a fert. program of approx. 500 ha/yr for 5 yrs. (Mthd 2) Estimate up to 15 000 ha of existing Cw stands between post-FG and age 20. $15\,000 \text{ ha} \times 2 \text{ m}^3/\text{ha}/\text{yr} \text{ gain} = 30\,000 \text{ m}^3/\text{yr}$ or 4% gain overall.</p> <p>6. See discussions under ST 5 above.</p>	<p>4. N/A</p> <p>5. (a) N/A</p> <p>5. (b) potential gains of between 1% and 4% demonstrated. Conservative estimate $\Rightarrow 2\%$</p> <p>6. See ST 5 above. Assume 1% increase in THLB. Sensitivity analysis indicates this results in a 1% increase in MT harvest levels $\Rightarrow 1\%$.</p> <p>Effects may add or compound. Increased site productivity may further compound these effects. Age reduction factors may overlap, with the combined total being less than when separately analyzed.</p>	
♦ Long Term (161 + yrs)	<p>1. Increase regenerated stand volumes 20% as per MT 3 above.</p> <p>2. Expand the timber harvesting land base as per ST 5 above*</p>	<p>1. See discussion under MT 3 above.</p> <p>2. See discussion under ST 5 above.</p>	<p>1. See MT 3 above. $\Rightarrow 20\%$</p> <p>2. See discussion under ST 5 above. Assume 1% increase in THLB. Sensitivity analysis indicates this results in a 1% increase in MT harvest levels $\Rightarrow 1\%$.</p> <p>Effects may add or compound. See note above.</p>	<p>0.96 base 0.10 THLB adj 1.06 Adj base</p> <p>0.21 rgn vol 0.01 inc THLB 1.28 total</p>

Potential Harvest Forecast

Figure 6 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.

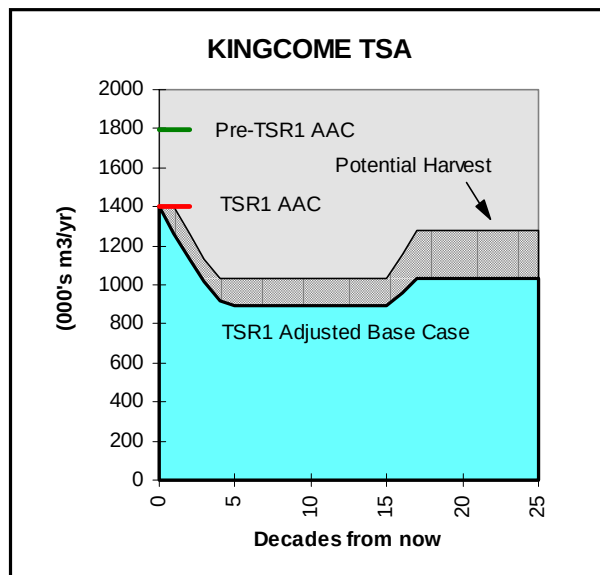


Figure 6. Potential harvest forecast, Kingcome TSA

TSR 1 base case adjusted as follows:

- initial harvest level set at TSR 1 AAC;
- next 4 decades decreased at 10%/decade, same rate as TSR 1 base case;
- mid-term trough & long term increased 10% in recognition of a 11% increase in THLB associated with adding low sites (not previously included in the base case). Because low site, a 10% factor was used rather than 11%.

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 Kingcome TSA.

<u>Quality Class</u>	<u>Species</u>	<u>Characteristics</u>
Premium Log:	Hemlock	60+ cm DBH, clear, min 5 m log, not less than 3-4 rings/cm on M/P sites and 2-3 rings/cm on G sites.
	Cedar pole	45+ cm min DBH, min 20 m log, low taper, min 20 cm top.
	Balsam.....	60+ cm DBH, clear, min 5 m log.
Sawlog:	Minimum average stand DBH of 45 cm and min. stand vol. of 350 m ³ /ha.	

Available Information Regarding Potential Treatments and Treatable Area

Treatment	Comment/ Potential Treatment Regimes	Treatable Area
♦ Spacing		
♦ Commercial Thinning		
♦ Pruning	Stands are spaced to 850 stems/ha and 2/3 rd s of these are pruned (PMFD). Stands on G-M sites will reach 45 cm dbh in 85 yrs and are 45 m tall.	
♦ Space/ Prune		
♦ Space/ Prune/Fert		

Potential Strategies by Response Time Frame

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

Response Time Frame	Potential Strategy/Action	Discussion / Current Status	Anticipated Result	Premium Log Forecast
♦ Short Term (1 - 20 yrs)	None	Short term harvests will come from existing very old stands which are not treatable to improve quality.	Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%.	15%?
♦ Mid Term (21 - 160 yrs)	1. Prune 150 ha/yr to 3.5 m to yield a 5 m log and prune 150 ha to 5.0 m over the next 2 years.	1. Because of cost, a single pruning lift is normal practice. Spacing is a pre-requisite to pruning.	1. 150 ha is approx 8% of annual area harvested. However, only 2/3rds of stems are pruned. Assume 3.5 m log is 10% of tree vol. $(.08 \times \frac{2}{3} \times .10) \Rightarrow 1\%$.	1. 1% clear 2. 3% poles Total: 4%
	2. Manage selected stands to higher densities to yield pole-sized trees.	2. TIPSy indicates that for Cw with an initial density of 4 000 st/ha, SI 30, at age 100, 28% of stems will be > 50 cm dbh.	2. No estimate available. If 1/3 of Cw leading species (14% of THLB) is higher density Cw and 25% of stand is poles $\Rightarrow$ 3% of future harvests will be poles.	
	3. Space 200 ha/yr to prepare stands for pruning and CT regimes.	3. Target stands are hemlock/balsam > 5 000 st/ha. The TSA has high harvesting and transportation costs. Spacing concentrates volume on fewer, larger logs, thus reducing future costs. Also brings harvest ages forward, enabling CT.	3. Sawlog oriented but pre-requisite to pruning. No premium log effect on its own.	
♦ Long Term (161 + yrs)	As above.	As above.	As above.	4%

Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be substantially lower than today's levels (4% forecast vs. current estimate of 15%). A higher level of pruning program than currently planned would serve to improve future timber quality, however, there is a lack of treatable stands due to accessibility and cost.

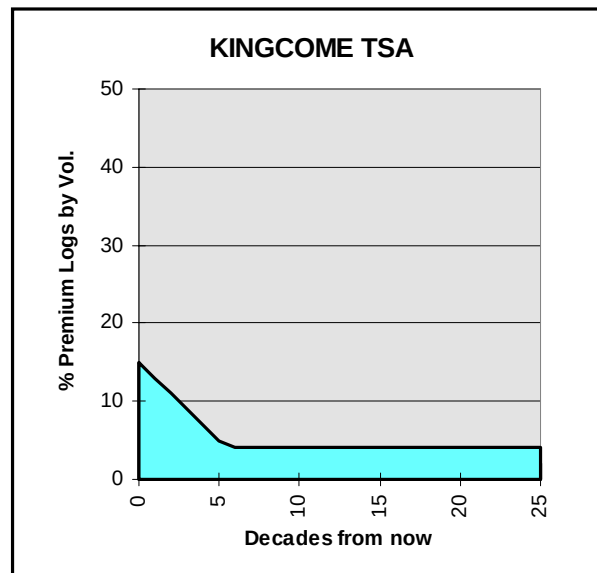


Figure 7. Potential Quality Forecast, Kingcome TSA

Incremental Silviculture Strategy

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

General Strategy

The Kingcome TSA has limited ability to overcome forecast reductions in timber supply in the mid term. Central to increasing future timber supply is the use of 2nd generation or better improved seedlings. Ensuring future timber quality is particularly important, given the indicated trend toward substantially lower premium log harvest levels in the future. Spacing is needed to increase piece size, reduce future harvesting costs, and prepare stands for pruning. Pruning is needed to ensure at least a minimal level of premium logs in the future.

Working Targets

The preceding analysis indicates the following working targets are attainable. Figure 8 illustrates these.

- WT 1 (Quantity):** Maintain short term harvests at near current levels (TSR 1 AAC of approx. 1.4 million m³/yr) for as long as possible. Manage mid-term timber supplies to yield a harvest of approximately 1.0 million m³/yr and long term supplies to yield 1.3 million m³/yr.
- WT 2 (Quality):** Manage regenerated stands to yield at least 4% premium logs by volume, with the majority of the remainder being of sawlog quality.

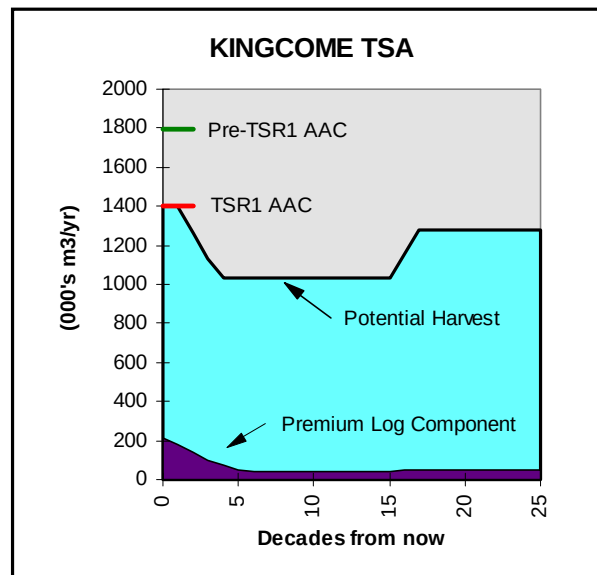


Figure 8. Combined Potential Quantity and Quality Harvest Forecasts, Kingcome TSA

Log Product Objectives

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

<u>Quality Class</u>	<u>Species</u>	<u>Characteristics</u>
Premium Log:	Hemlock	60+ cm DBH, clear, min 5 m log, not less than 3-4 rings/cm on M/P sites and 2-3 rings/cm on G sites.
	Cedar pole	45+ cm min DBH, min 20 m log, low taper, min 20 cm top.
	Balsam.....	60+ cm DBH, clear, min 5 m log.
Sawlog:	Minimum average stand DBH of 45 cm and min. stand vol. of 350 m ³ /ha.	

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

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

<u>No.</u>	<u>Strategy</u>
ST2	<p>Achieve green-up 3 years earlier in VQ zones by:</p> <ul style="list-style-type: none"> (a) planting large genetically improved stock; (b) reducing regeneration delay by increasing the proportion of area planted and planting all areas sooner; (c) brushing for growth enhancement; and (d) fertilizing regenerated stands to increase their growth. <p>(Note: The majority of these are pre free growing silviculture activities. Where licensees can meet their free-growing obligations without undertaking such activities they are not likely to voluntarily undertake them due to the extra cost. In such cases, funding assistance would likely be necessary.)</p>
ST3	Implement partial harvesting / commercial thinning regimes in VQ zones.
MT1	<p>Plant all areas to reduce regeneration delay by 2 years.</p> <p>(Note: This action is with respect to pre free-growing stands and is not within the traditional scope of incremental silviculture.)</p>
MT2	<p>Overcome adjacency constraints in VQO zones by partial harvesting and setting up stands for future commercial thinning through spacing.</p> <p>(Note: There are limited opportunities for commercial thinning in this TSA.)</p>
MT3	<p>Increase regenerated stand volumes 20% by:</p> <ul style="list-style-type: none"> (a) reducing time to regeneration; (b) using (2nd generation) A class seed or better; (c) using large planting stock; and (d) individual tree fertilization at time of planting and MT 5. <p>(Note: some of these are pre free growing silviculture activities. Licensees have adopted most of these options, but they will not generally use higher cost larger stock if free growing obligations can be achieved without it. (In such cases, funding assistance would likely be necessary.)</p>
MT5	Fertilizing 500 ha/yr of cedar-salal sites for early crown closure.
MT6	<p>Expand the timber harvesting land base by:</p> <ul style="list-style-type: none"> (a) rehabilitating the remaining 400 ha of backlog NSR and brushing (conifer release) 3000 ha of backlog plantations;

- (b) draining low site wet lands in the Nawhitti Plateau (10 ha trial); and
- (c) assessing opportunities for rehabilitating non-commercial alder stands.

LT1 Increase regenerated stand volumes 20% by continuing MT3 above.

LT2 Expand the timber harvesting land base by continuing MT 6 above.

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

◆ Strategies to Increase the Quality of Future Timber Supply

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

<u>No.</u>	<u>Strategy</u>
Q1	One-lift prune (3.5 m) 150 ha/yr, two-lift prune (5.0 m) 150 ha over the next 2 years.
Q2	Manage selected stands to higher densities to yield pole-sized trees.
Q3	Space 200 ha/yr to increase avg. piece sizes and prepare stands for pruning and commercial thinning.

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

(Note: The following strategy was developed in the district working session during discussion of timber quantity strategy MT7.)

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

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

1. TIPSYS yields for hemlock stands may be underestimated and require confirmation. (ST3)
2. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT3)
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 overestimated and that these effects may prove offsetting to some extent. (ST1)

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. (ST2, ST4, MT5)
5. Trials are required to determine costs, efficacy and social acceptability of draining low-site forest land to increase productivity. (ST5, MT6, LT2)
6. The amount of area in alder stands which are not likely to be commercially harvested and therefore have potential for rehabilitation requires determination. (ST5, MT6, LT2)
7. Research is needed to determine the causes and extent of poor occlusion of branch stubs in pruned cedar which can result in hollow tunnels extending in the tree trunk for some distance past the end of the stub. (Q1)

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, Kingcome TSA, August 1998

Regimes		Strategy	Opportunity Area (Ha/Yr)	Timber Supply Effects			Quality	Habitat	Direct Silv. Jobs Days/ha	Direct Cost \$/ha	Rank
				Short	Medium	Long					
Backlog											
1	site prep & planting	ST5, MT6,LT2	100	+	+	+	0	0	2	3000	1
2	conifer release / brushing	ST5, MT6,LT2	400	+	+	+	0	0	3	800	1
Spacing											
3	HemBal M-G <10m >5000 to 850 (set up for CT)	MT2, Q3	200	0	+	0	+	+/-	5	1500-1800	4
Pruning (2/3 of spaced stands)											
4	3.5 m 1st lift	Q1	150	0	0	0	+	+	8	1800	5
5	5m prune	Q1	150 tot over 2 yrs	0	0	0	+	+	12	2200	5
Fertilization											
6	Cw age 10-40 M,P	ST2, ST4 MT3, MT5, LT1	500	+	+	+	+	+	.1	600	2
Expand THLB											
7	Drainage	ST5, MT6, LT2	10, study only*	+	+	+	0	-	1	3000	3
8	Alder rehabilitation	ST5, MT6, LT2									

* Experimental, 1 yr project only

Incremental Silviculture Program

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

Program Table - Hectares Treated, Kingcome TSA, August 1998

Year	Surveys	Backlog Prep/Plant	Backlog Brushing	Space	Prune - 1	Prune - 2	Fertilize	Drain	Total
1	2,000	100	400	200	150	75	500		3,425
2	2,000	100	400	200	150	75	500	10	3,435
3	2,000	100	400	200	150	-	500		3,350
4	2,000	100	400	200	150	-	500		3,350
5	2,000	-	400	200	150	-	500		3,250
Subtot Yr 1 - 5	10,000	400	2,000	1,000	750	150	2,500	10	16,810
6 - 10	10,000	-	1,000	1,000	750	-	2,500	-	15,250
Total Yr 1 - 10	20,000	400	3,000	2,000	1,500	150	5,000	10	32,060
Unit cost (\$/ha)	150	3,000	800	1,750	1,800	2,200	600	3,000	

Program Table - \$ 000s, Kingcome TSA, August 1998

		Backlog	Backlog						
Year	Surveys	Prep/Plant	Brushing	Space		Prune	Fertilize	Drain	Total
1	300	300	320	350	270	165	300	-	2,005
2	300	300	320	350	270	165	300	30	2,035
3	300	300	320	350	270	-	300	-	1,840
4	300	300	320	350	270	-	300	-	1,840
5	300	-	320	350	270	-	300	-	1,540
Subtot Yr 1 - 5	1,500	1,200	1,600	1,750	1,350	330	1,500	30	9,260
	1,500	-	800	1,750	1,350	-	1,500	-	6,900
Total Yr 1 - 10	3,000	1,200	2,400	3,500	2,700	330	3,000	30	16,160

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, Kingcome TSA, August 1998

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

Year	Surveys	Backlog	Backlog	Space	Prune	Fertilize	Drain	Total
		Prep/Plant	Brushing					
1	-	1.1	6.7	5.6	17.8	0.3	-	31
2	-	1.1	6.7	5.6	17.8	0.3	0.1	31
3	-	1.1	6.7	5.6	17.8	0.3	-	31
4	-	1.1	6.7	5.6	17.8	0.3	-	31
5	-	-	6.7	5.6	17.8	0.3	-	30
Subtot Yr 1 - 5	-	4	33	28	89	1	0	156
6 - 10	-	-	33	28	55.6	1	0	118
Total Yr 1 - 10	-	4	67	56	144	3	0	274

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	Prov
1	140	27	199	266	1,987
2	126	24	179	239	1,788
3	113	22	161	215	1,609
4	112	21	159	213	1,592
5	137	26	195	260	1,945
6	137	26	194	260	1,943
7	137	26	194	260	1,943
8	137	26	194	260	1,943
9	137	26	194	260	1,943
10	137	26	194	260	1,943
11	137	26	194	260	1,943
12	137	26	194	260	1,943
13	137	26	194	260	1,943
14	137	26	194	260	1,943
15	137	26	194	260	1,943
16	193	37	273	366	2,734
17	249	47	354	474	3,540
18	249	47	354	474	3,540
19	249	47	354	474	3,540
20	249	47	354	474	3,540
21	249	47	354	474	3,540
22	249	47	354	474	3,540
23	249	47	354	474	3,540
24	249	47	354	474	3,540
25	249	47	354	474	3,540
Total				8,422	62,941

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 0.19 TSA level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Kingcome SEA)

3 Assumes 1.42 Provincial level harvesting and processing jobs (PYs) per 1000 cubic metre (Source: Kingcome SEA)

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