
Kamloops TSA Silviculture Strategy (Type 1)

September 2001



funded by
FOREST
RENEWAL BC



Acknowledgements

This strategy was developed through a workshop conducted in Barriere on September 24, 2001. The workshop and this report were prepared and presented by Doug Williams and Mike Buell of Cortex Consultants Inc. and Craig Farnden RPF. Forest Renewal BC provided funding through a contract between Kamloops Forest Region and Cortex Consultants Inc.

The consultants wish to express their gratitude to Bruce Pamplin of Kamloops Forest Region who administered this project and for coordinating the six workshops undertaken in the Region. Ron Vanderzwan (Clearwater Forest District) and Brent Olson (Kamloops Forest District) provided liaison and support for the TSA. The consultants are grateful to the Kamloops Forest District for providing the presentation facility and other support.

The consultants also wish to thank the participants in the workshop, listed below, whose contributions are the basis of this strategy.

	Name	Organization
1	Wes Bieber	Weyerhaeuser
2	Darius Bucher	G. S. F. P. Ltd.
3	Carman Smith	G. S. F. P. Ltd
4	Mary Lester	J.S. Thrower
5	Jeff Mycock	Charm Sawmills
6	Norm Fennel	Tolko Industries
7	Abbey Bates	MoF – Clearwater Forest District
8	Heather MacLennan	MoF – Clearwater Forest District
9	Ron Vanderzwan	MoF – Clearwater Forest District
10	Kelly Low	Weyerhaeuser
11	Brent Olson	MoF – Kamloops Forest District



Preface

The development of silviculture strategies for TSAs and TFLs is motivated by the desire to clarify the relationship between investments in silviculture and the critical forest-level issues specific to the management unit.

The Type 1 analysis is workshop-based. It draws on the expert knowledge of the participants to identify the critical issues, derive objectives with respect to those issues, specify regimes to meet those issues, and identify the regime activities that can be implemented in the next five years. After consideration of the benefits and costs of each of the activities on each of the forest-level objectives, the participants rank the silviculture activities by priority. The result is a prioritized list of silviculture activities that are explicitly linked to the critical issues of the management unit.

Type 2 analyses are model-based, but the analysis process is fundamentally identical to the Type 1 analysis. A forest-level model is used to evaluate the impacts of regimes on the forest-level objectives, to identify the silviculture activities constituting the “preferred management scenario”, and to rank those activities.

The Type 2 (model-based) analysis will result in a silviculture strategy that is considerably more appropriate and robust than the Type 1 approach, but it is more expensive and demanding of scarce modeling expertise. Hence the Type 1 (workshop-based) approach has been designed to produce an interim silviculture strategy that will serve until a Type 2 analysis can be completed.

In the absence of a silviculture strategy for a management unit, the Ministry of Forests’ provincial level strategy *Incremental Silviculture Strategy For British Columbia (Interim)* has provided interim guidance. A summary of this document is included as Appendix 3 to this report.



Strategy Summary

While many issues were proposed and discussed in the workshop, the participants developed five general strategies to address them.

Elements of the Strategy

1. Assess the current condition of backlog stands through a set of multi-scale surveys (including air calls, walkthroughs, and full plot studies), and develop and the indicated prescriptions for site preparation, planting, and brushing.
2. Increase the timber harvesting landbase (THLB) through harvesting of problem forest types and low volume types within age class 8 and 9 Cw/Hw stands.
3. Increase stand volumes through late rotation fertilization of Fdi stands which do not exhibit excessive crowding, and thinning of suppressed Fdi sites in the IDF xh subzone. Subalpine-fir dominated IU stands should be thinned to release spruce or the entire stand replaced.
4. Maintain or improve forest health and reduce losses in second growth stands, by pruning of white pine to prevent white pine blister rust (*Cronartium ribicloa*), and reducing spruce plantation susceptibility to spruce leader weevil (*Pissodes strobi*) through increased planting of Pl and/or Cw in high risk zones.
5. Improve timber quality through second pruning lifts on previously pruned stands.

Tactical Plan

After developing the strategy, Type 1 silviculture strategy workshops usually proceed to identify opportunities to implement the regimes in the next five years and to develop a program of silvicultural activities that is consistent with the strategy and is feasible with respect to the operational realities of the TSA. This was not accomplished in this workshop—the participants saw few current opportunities for investment consistent with this strategy.

Hence tactical priorities— which represent the balance between the participant's strategic objectives for the management unit and the silvicultural opportunities available on the TSA in the next 5 years — were not assigned by the workshop participants.



Table of Contents

Acknowledgements	i
Preface	ii
Strategy Summary	iii
Elements of the Strategy	iii
Tactical Plan	iii
Table of Contents	iv
1 Introduction	1
2 Guiding Issues	1
2.1 Management Issues	2
2.2 Knowledge Issues	2
3 Strategies and Implementation	3
3.1 Timber Quantity Strategies	3
3.2 Timber Quality Strategies	4
3.3 Forest Health Strategies	4
4 Silviculture Impacts and Priorities	4
Appendix 1 Issues Reviewed in the Kamloops TSA Workshop	6
A1.1 TSA Issues Impacted by Silviculture	6
A1.1.1 Timber Supply Issues	6
A1.1.2 Forest Health Issues	7
A1.1.3 Habitat Issues	7
A1.1.4 Employment Issues (none supplied)	7
A1.1.5 First Nations Issues (Source: Kamloops LRMP)	7
A1.1.6 Visual Quality Issues	7
Appendix 2 The Timber Supply Context of Silviculture in the Kamloops TSA	8
A2.4.1 Timber Supply and the AAC	8
A2.4.2 Rationing of mature timber	9
A2.4.3 Uncertainty in Existing Stand Volume Estimates	12
A2.4.4 Uncertainty in Regenerated Stand Volume Estimates	13
A2.4.5 Minimum Harvestable Ages	13
A2.4.6 Application of OGSi adjustment factors	14
A2.4.7 Green-up and Cutblock adjacency	15
A2.4.8 Uncertainty in management zone objectives for visual quality	16
Appendix 3 Executive Summary of The Incremental Silviculture Strategy For British Columbia (Interim)	18
Appendix 4 Comments Subsequent to the Workshop	19



1 Introduction

The Silviculture Strategy (Type 1) workshop draws on the expert knowledge of the participants to identify the key issues that should guide silvicultural planning on the TSA, derive objectives with respect to those issues, specify regimes to meet those issues, and identify the regime activities that can be implemented in the next five years. The key idea is that this line of logic from issues to silvicultural activities can be retraced when evaluating funding levels, ensuring that activities are funded that address critical TSA issues.

The first step in developing this line of logic is to identify the key issues that should guide silvicultural planning on the TSA. Next, the participants' objectives with respect to these issues are clearly stated. Strategies for meeting these objectives are identified, together with the silvicultural target (stand types) to which these strategies are to be applied. A plan of action, most often a silvicultural regime, is then developed to implement each strategy. This sequence constitutes the "strategic analysis" part of the workshop and the resulting compilation of issues, objectives, strategies and regimes is the silviculture strategy.

After developing the strategy, Type 1 silviculture strategy workshop usually proceed to identify opportunities to implement the regimes in the next five years and develop a program of silvicultural activities that is consistent with the strategy and is feasible with respect to the operational realities of the TSA. This was not accomplished in this workshop—the participants saw few current opportunities for investment consistent with this strategy.

Hence, tactical priorities—which represent the balance between the participant's strategic objectives for the management unit and the silvicultural opportunities available on the TSA in the next 5 years—were not assigned by the workshop participants.

However, the intended impacts of these silvicultural regimes on selected objectives were estimated by the workshop participants.

This report documents the results of the workshop to develop a silviculture strategy for the Kamloops TSA. Following this introduction, section 2 presents the guiding issues identified by the participants, section 3 describes the strategies and the regimes that implement them, and section 4 presents the regime impacts with respect to selected issues and objectives.

Issues that influence silviculture planning on the TSA were obtained from discussions with the District staff, the TSR AAC Rationale, the most recent Resource Management Plan, and other documents identified by the District. These issues were compiled prior to the workshop and are described in Appendix 1. Appendix 2 contains a detailed examination of the timber supply situation on the TSA, also prepared prior to the workshop, as some aspect of timber supply is often a guiding issue for silviculture planning.

2 Guiding Issues

This section identifies the critical issues that guide silviculture planning in the Kamloops TSA. They are categorized as "management issues" that guide silviculture planning, and "knowledge issues" that require investigation prior to planning silvicultural action.



2.1 Management Issues

The issues prepared prior to the workshop (Appendix 1) were reviewed by the presenters and discussed with the participants. Four issues were identified as guiding silviculture planning:

- long-term timber supply is 15% below the current AAC
- short-term timber supply is scheduled to drop 11% at the end of the second decade
- forest health issues (weevil damage in spruce plantations and Pw-blister rust) are limiting productivity
- log-quality is forecast to decline

2.2 Knowledge Issues

2.2.1 Inventory information.

A number of concerns were raised in the workshop about various components of the forest inventory and their impact on resource planning. Inadequate inventory information leads to uncertainty in the planning process, possibly leading to inappropriate resource use or investment decisions. In particular:

- Concern was expressed about uncertainty regarding stocking levels on old fires. TSR assumptions regarding restocking rates are suspect and little information exists regarding actual status. **Surveys at varying intensities are required to confirm stocking levels.**
- In the 2001 TSR report, application of Old Growth Site Index (OGSI) adjustments for stands in excess of 140 years age resulted in a potential increase in the LTHL of 11%. The data for this exercise came from provincial level studies. Future yield and silviculture planning exercises would benefit from development of relationships (corrections) based on local conditions. **Studies are required to establish locally applicable OGSI adjustments.**
- There is considerable uncertainty over appropriate decay, waste and breakage (DWB) factors for several forest types, in particular older stands in the ICH and ESSF biogeoclimatic zones. In particular, breakage rates on steeper ground are believed to be much higher than on gentler ground that was harvested in previous years. Current DWB factors likely reflect operations on that gentler ground. Current operational (realized) volumes for some types have been as much as 50% below those predicted. **Studies are required to establish appropriate DWB factors under a range of operation and site conditions.**

2.2.2 Investigate root rot impacts on yield

There is considerable uncertainty about the impacts of root rots on second growth yields. Part of the uncertainty arises from inconsistent detection of root rots, and part from a lack of information on impacts of harvesting and reforestation practices on root rot spread. Some studies are underway, but more **studies are required to quantify the impacts of root rots on second growth stands.**

2.2.3 Investigate treatment of repressed IDF xh stands

Concern was expressed that young stands or young patches within complex stands that are established at very high densities are growing slower than the site potential would suggest.



Thinning and possibly fertilizing these areas may increase growth rates considerably, but no reliable studies exist to support such supposition - **trials are needed**.

2.2.4 Re-examine/ confirm OAF's by analysis unit

Concern was expressed that provincial default values for Operational Adjustment Factors (OAF's) used to adjust TIPSYS yield projections in timber supply analysis may be inappropriate for the Kamloops TSA. There is a need to **implement a sampling strategy to localize estimates of OAF 1 (area based reductions) and, if possible, OAF2 (losses which increase over time)**. This item may be of relatively low priority as the impacts of any adjustments will not show up in the timber supply projection for several decades.

3 Strategies and Implementation

The participants analyzed issues that could be addressed with silvicultural actions by identifying objectives with respect to each issue, strategies for meeting the objectives, the target stand types, and a list of activities to implement each strategy. Some of these detailed specifications of regimes are compiled in Appendix 4. The set of strategies and activities are categorized in the following sections as timber quantity, timber quality and habitat strategies.

3.1 Timber Quantity Strategies

Potential silvicultural strategies for maintaining or increasing future timber supply were reviewed and evaluated in the workshop. The strategies that were determined by the workshop to have positive impacts on the timber supply and opportunity for implementation in the next 10 years are listed below. The strategies are grouped according to the timing of their anticipated effects– the short, mid– and long-term periods (0-20, 21-100, and >100 years for the Kamloops TSA).¹

3.1.1 Short-Term Strategies (Years 1-20)

Presently there are no limitations on short-term conventional harvest levels. There may however, be opportunities to increase the short, mid and long term harvest levels if certain actions are followed.

Two major strategies emerged from the workshop regarding short-term timber supply.

1. S1. Increase stand volumes in existing 50 to 80 year old stands of Fdi that do not exhibit excessive crowding. Research by Rob Brockley at the Kalamalka Reaseach Station is investigating the possibility of late fertilization.
2. S2. Restock backlog NSR utilizing site preparation and planting. Some portion of the backlog NSR currently categorized as NSR has been acceptably stocked, and a survey is required to confirm the status. This strategy has short-term benefits because mature stands that are unavailable due to adjacency constraints may be released for harvesting.

¹ See Appendix 2 for a more complete explanation of the response framework for the Kamloops TSA.



3.1.2 Mid-Term Strategy

There were no opportunities listed to increase mid-term timber supply, but short-term strategies will allow increases in mid-term harvest levels through relaxation of the harvest queue.

3.1.3 Long-Term Strategies

Using present information the following strategies were recommended within the workshop to increase the long-term timber supply:

3. L1. Increase the timber harvesting land base by treatment of backlog NSR and impeded NSR (site preparation, planting, and brushing).
4. L2. Reclassify selected age class 8 and 9 cedar and hemlock stands as operable. If the stands are dead or have low recovery potential the stands can be slashed, burned and reforested.
- L3. Increasing stand volumes by juvenile spacing single Fdi stands in the IDF xh subzone to prevent suppression and to release these stands to perform closer to their site potential.

3.2 Timber Quality Strategies

The following strategies were identified to enhance timber quality within the TSA.

5. Q1. Manage Fdi, Pli good site, low density pruned stands. Pruning is limited to second lifts on stands that have already been pruned previously

3.3 Forest Health Strategies

The strategies below were identified to increase forest health and increase managed stand yields.

6. He1. To decrease white pine blister rust infections in high value white pine regeneration, pruning of lower branch infections can be utilized to prevent spread of infections into the bole of the tree. Plant rust-resistant Pw.
- He2. In areas which are susceptible to spruce leader weevil increased planting of non-susceptible species is recommended. Pl is an attractive alternative for many areas, while Cw is recommended for wet-belt ICH sites.

4 Silviculture Impacts and Priorities

The silviculture activities required to implement the strategies identified in Section 2.1 are summarized below in Table 4.1, together with their targets and impacts on selected TSA objectives. The workshop determined the impacts on timber supply quantity and quality, and habitat effects for each treatment. The rank (priority) of each treatment was determined through consideration of the impacts of each activity on each objective, and represents a consensus of the participants.

Table 4-1. Kamloop TSA issues, strategies, targets, regimes and impacts

Issue Name	Strategy	Target	Regime Description	Intended Benefit	Side Effects
LT timber supply will decrease by 15%	Increase productivity by fertilization	WB Fd m site, 50-80 yr stands, thrifty and good live crown; managed stands	fert 10 years prior to harvest	LT +	Q+
	Increase productivity by treating suppressed stands	IDF xh sites, Fd SI 8-12	spacing	LT +++	H+, He+, B+/-, P+
	Increase productivity by planting A/Select seed	all	plant	LT+++	ST+, MT+
	Maintain the THLB by treating suppressed stands	IDF xh sites, Fd SI < 8	spacing	LT +++	H+, He+, B+/-, P+
	Increase the THLB by stand conversion	Age 8,9 CwHw (PFT) -- looper kill	slash, burn plant	LT +++++	B+
		Age 8,9 CwHw (PFT) -- other	harvest, burn plant	LT +++++	B+
	Increase the THLB by treating IU Balsam	IU Balsam	1 site prep, plant 2 reclassify	LT +++	Ha-, Hy+/-
	Maintain the THLB by treating backlog	Backlog NSR	survey, reclass site prep, plant	LT +++++	Ha-/-
	Backlog Impeded	brushing	LT ++	Ha-/-	
Maintain the THLB by incremental planting	marginally stocked stands	site prep, fill planting brush and plant, brush	LT ++		
ST Timber supply will decrease by 11%	Increase yield through fertilization	WB Fd m site, 50-80 yr stands, thrifty and good live crown; existing natural	fert 10 years prior to harvest	ST +	Q+
	Make available for harvest mature timber by ensuring greenup of NSR	Backlog NSR	survey & reclass site prep, plant brush fill plant	ST +	Hy+
Weevil damage in spruce plantations is reducing productivity	Plant non-susceptible species to protect/replace spruce	Pure spruce plantations in weevil zones	plant PI, Cw	He ++	B+
Loss of Pw to blister rust	Prune Pw to reduce/prevent infestation	Pw	prune	LT+, Q+	
	Plant rust-resistant Pw	Pw	plant	LT+	
Log quality is declining	Prune to maintain/improve log quality	Fd, PI g site, low density	prune 2 lifts	Q+	B+, He, Ha



Appendix 1

Issues Reviewed in the Kamloops TSA Workshop

The objective of this section is to identify aspects of the timber harvesting land base and its management that govern the supply of timber from the TSA. This information provides the basis for identifying the constraining mechanisms that shape the timber supply forecast for the unit and for specifying possible silvicultural remedies. Unless otherwise indicated, the data in this appendix is drawn from the Kamloops TSA Timber Supply Analysis (2001) .

A1.1 TSA Issues Impacted by Silviculture

Issues that can be addressed through silviculture were obtained from the District (District Enquiry), the most recent Resource Management Plan, and other documents identified by the District. These issues will be reviewed and expanded during the workshop.

A1.1.1 Timber Supply Issues

The timber supply is declining. The most important factor is the transfer from existing natural unmanaged stands to regenerating managed stands. The harvest level must be lowered until the transition from natural to managed stands is complete (about 90 years). The regenerating stands will be harvested at a younger age and smaller size than the old growth stands, and there will be less timber volume available to harvest. This is the reason why the long-term harvest level (LTHL) cannot rise from the lowered level which was needed to allow the transition from natural to managed stands. Forest cover requirements for other resources such as wildlife habitat and visual quality also limit timber harvesting.

Existing stand volumes - Sensitivity analyses performed for the 2001 timber supply review indicated that the short-term timber supply is sensitive to changes in volumes of existing stands. Even moderate changes in assumptions resulted in initial harvests more than 10% lower than the base.

Cutblock adjacency and green-up - Approval of harvesting activities is based on a stands ability to reach a desired condition before adjacent stands can be harvested. If a stands ability to reach the desired condition is increased adjacent stands will become available for harvest earlier and at an increasing rate

Other uncertainties - Uncertainties about minimum harvestable ages, green-up requirements, size of the THLB, forest cover requirements, and visual quality objectives have moderate impacts on mid-term (21-80 years from now) harvest levels, while uncertainty about regenerated yields estimates of old-growth site productivity, availability of improved seed, and contribution of forest outside of the THLB to forest cover requirements has a moderate impact on long term (80 years and beyond) harvest level.

Timber Quality - Pruning activities have been recently utilized in the TSA. High priority pruning opportunities are declining, but there are a number of second entries remaining on those stands where a 3 m lift was not attained



A1.1.2 Forest Health Issues

Timber losses to fire, wind and pest is significant within the Kamloops TSA. The unsalvaged portion is 62 600 m³ per year.

A1.1.3 Habitat Issues

The TSA overlaps the range of mountain caribou. The caribou require canopy cover provided by mature forest. The TSA provides a migration corridor for the caribou that inhabit Wells Gray Park.

A1.1.4 Employment Issues (none supplied)

A1.1.5 First Nations Issues (Source: Kamloops LRMP)

Traditional territories of the The Secwepemc Nation, the Nlaka'pamux Nation, the St'at'imc Nation, the Okanagan Nation and the South Carrier Nation overlap the Kamloops TSA. First Nations people have expressed concerns over the lack of equitable employment. They have also expressed concerns about the impact of logging on water and fishery resources, traditional use areas, heritage resources and spiritual ceremonial sites in their traditional territories.

A1.1.6 Visual Quality Issues

Managing visual quality is an important issue in the district. Harvesting and silviculture operations must conform with the visual quality objectives. Approximately 39% of the THLB is managed for visual quality.



Appendix 2

The Timber Supply Context of Silviculture in the Kamloops TSA

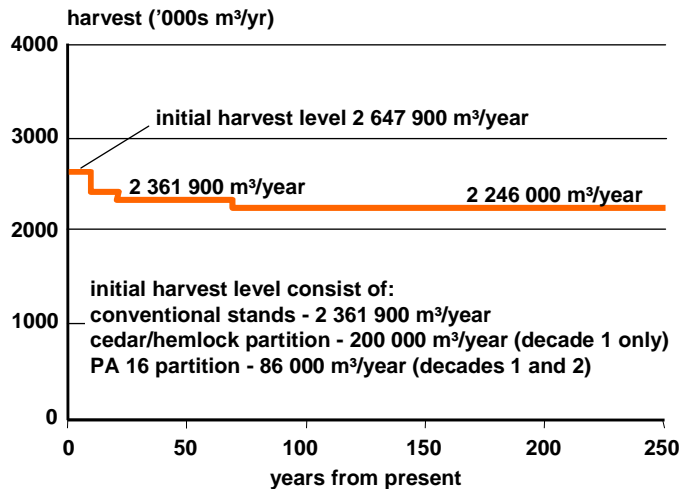
The objective of this section is to further define timber supply issues and identify the constraining mechanisms that shape the timber supply forecast for the unit.

Timber supply is the rate at which timber is made available for harvesting, and it is “made available” through natural, administrative, and economic processes. The forest economy draws timber from the land base in response to consumer demand, and this flow of timber is limited by the rate at which the forest can physically grow trees, and by a variety of administrative constraints. The combined effect of these three processes is considered in the determination of the Annual Allowable Cut (AAC). Silviculture can modify directly or adjust the effect of each of the three underlying processes.

The base case of the timber supply review (TSR) forecasts future timber supply subject to current management practices, administrative constraints and market conditions. The purpose of this section is to identify the “pinch points” and constraining mechanisms that shape the timber supply forecast for the unit. Observations drawn from the TSR base case and selected sensitivity analyses are used to describe the timber supply dynamics of the management unit and to suggest how silviculture treatments might enhance timber supply.

A2.4.1 Timber Supply and the AAC

The 2001 TSR, upon which the future AAC determination will be based, forecasts a harvest level of 2 647 900 m³ maintained for the first decade (Figure A2-1). The level is broken up into the following percentages: 89% conventional, 8% partition for old/hemlock, and 2% from the Pulpwood Agreement (PA) 16 partition. In the second decade the harvest level declines by 8% because the old cedar/hemlock licence agreement expires. The harvest level declines by a further 2% in decade 3 due to the expiry of PA 16. The conventional harvest level can be maintained until decade 7. At this time the harvest level falls 5%, to the LTHL of 2 246 000.

**Figure A2-1 Base case harvest forecast, Kamloops TSA, 2001.**

A2.4.2 Rationing of mature timber

This current harvest level can be maintained due to the age class structure of the timber harvesting land base (Figure A2-2). There is an abundance of mature timber, which allows the conventional harvest level to be maintained for 7 decades. The harvest flow then steps down to the LTHL as seen with the base case harvest forecast. The reason for this decline is the depletion of mature harvestable stands before regenerating stands have reached the minimum harvestable age.

The lack of harvestable timber in decades 5-7 has been “filled in” by rationing the current available mature – timber which is currently age 200+ years. Timber rationing is the main objective of constraints on the rate of change of harvest levels.

So this mechanism shaping timber supply – constraints on the rate of change of the harvest level – also provides a means of capturing silvicultural benefits in the short term. Note that the efficacy of this effect is determined by the shape of the timber supply curve and hence is specific to a management unit.

Over the first 100 years there is a drawing down of the mature stock. Figure A2-3 forecasts a steady decline in total and harvestable growing stock for the first 100 years. After this time, both measures of stock reach a steady long-term level.

Also shown in Figure A2-2 is the area which is forested and outside of the THLB. When the age class structure is forecasted 100 years into the future the majority of stands above 150 years old are classified as forested and outside of the THLB. These areas contribute to the old growth requirements. The age class structure 250 years into the future (not shown) remains the same, with a majority of the stands greater than 150 years old contributing most of the area necessary to meet old growth requirements



Figure A2-2 Age class distribution-timber harvesting land base, Kamloops TSA 2001.

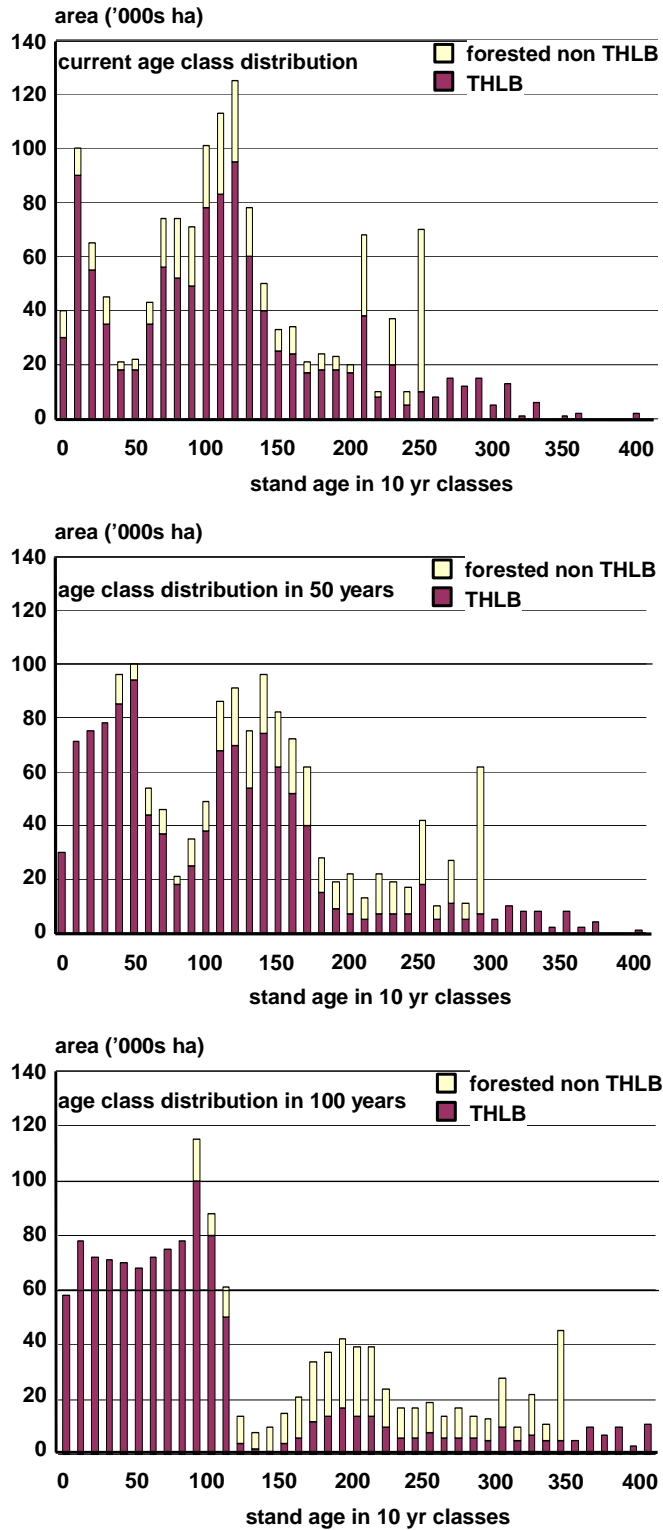
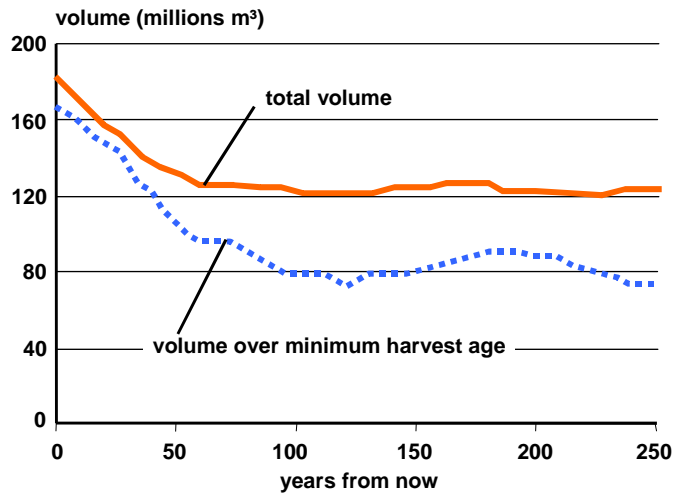


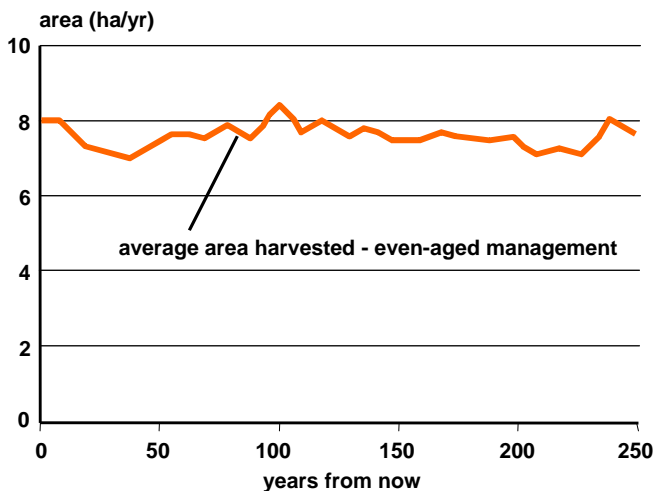


Figure A2-3 Total, merchantable and available growing stock, Kamloops TSA, 2001.



The area harvested over time decreases for the first 5 decades while older higher volume stands are being harvested (Figure A2-4). The level rises while the oldest stands are eliminated from the timber harvesting land base. As the younger stands reach merchantable limits, the volume attained from the stands is lower, therefore more area must be harvested.

Figure A2-4 Average area harvested over time, Kamloops TSA, 2001.



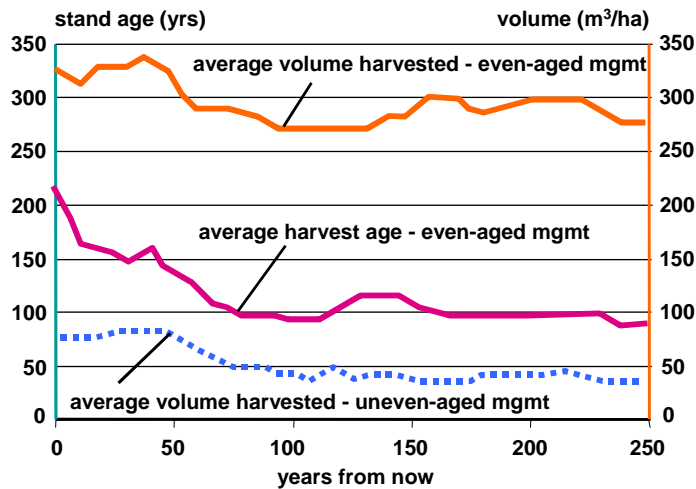
The average volume per hectare of timber harvested over time will decline until harvesting occurs on managed stands with good to medium site productivity (Figure A2-5). A cyclic pattern will develop as the good to medium sites are depleted and replenished at a constant rate.

The average age of harvested stands (Figure A2-5) declines quickly over the first 130 decades of the planning period. This decline can be attributed to older stands ranging in ages 120-300+ years



being harvested for the first 70 years. Once these stands are harvested, the average age declines as the heavy concentration of regenerating stands with lower minimum harvestable ages become merchantable.

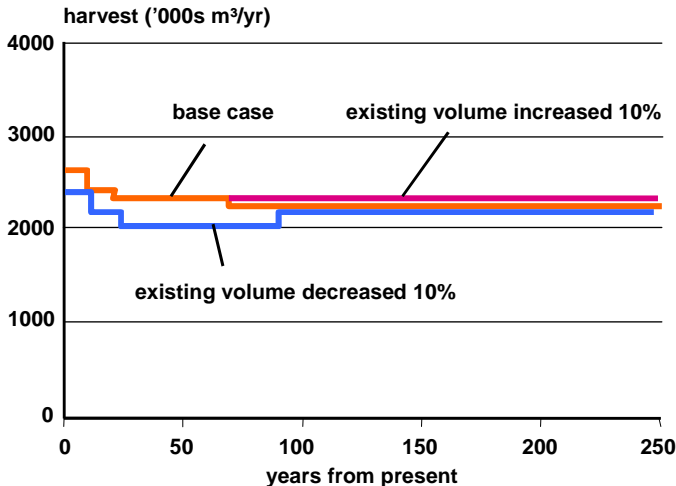
Figure A2-5 Average age and volume per hectare of harvested stands over time, Kamloops TSA, 2001.



A2.4.3 Uncertainty in Existing Stand Volume Estimates

For the next 80 years the Kamloops TSA is heavily dependent upon mature timber. Figure A2-6 demonstrates the sensitivity to estimates for existing stands. Increasing the estimates for existing stands by 10% cause the conventional harvest level to be maintained for the entire planning horizon, which is a 10% increase compared to the base case. Decreasing the existing stand volumes by 10% causes the initial harvest level to be 10% lower than the base case. The harvest then decreases by an additional 10%. The harvest level then rises to the base case LTHL once managed stands reach merchantable limits.

Figure A2-6 Sensitivity to volume estimates for existing stands, Kamloops TSA, 2001.



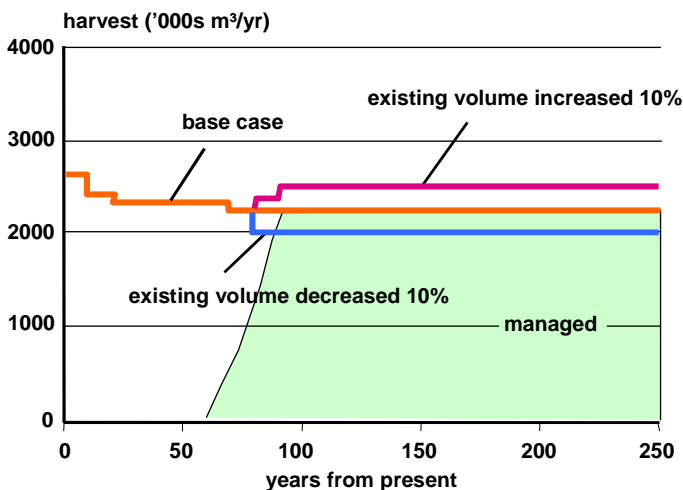


A2.4.4 Uncertainty in Regenerated Stand Volume Estimates

Figure A2-7 demonstrates the sensitivity to volume estimates for regenerated stands. When regenerated volumes are increased the long-term harvest level can be increased to 10% above the base case forecast. Decreasing regenerated volumes causes the long-term harvest level to fall 10% below the base case forecast.

Also plotted on Figure A2-7 is the transition (estimated) from natural to managed stands. This transition at 100 years marks the end of the mid-term of the timber supply forecast and the beginning of the long term. The short term is arbitrarily defined as the first two decades.

Figure A2-7. Sensitivity to volume estimates for regenerated stands, Kamloops TSA, 1996.

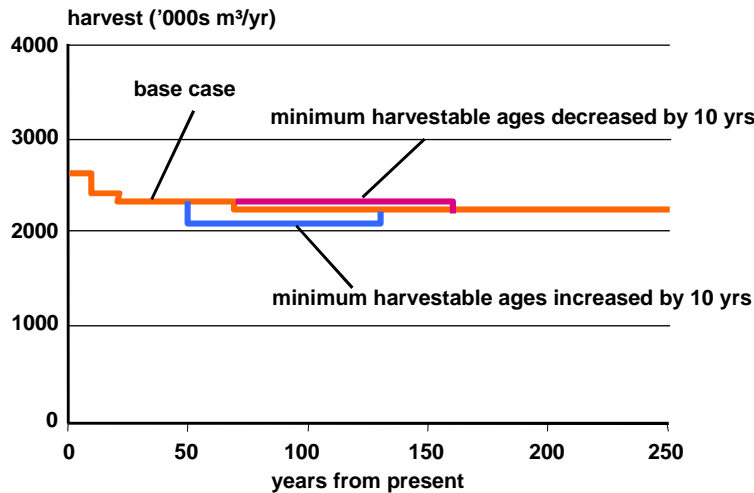


A2.4.5 Minimum Harvestable Ages

Increasing the minimum harvestable age by 10 years will affect existing and regenerated stands (Figure A2-8). Increasing the minimum harvestable age causes the base case forecast to be maintained until decade 5. The harvest level then falls by 9%, and rises to the base case LTHL in decade 14. Decreasing the minimum harvestable ages by 10 years allows the conventional harvest level to be maintained until decade 17, before falling to the base case LTHL.



Figure A2-8 Sensitivity to minimum harvestable ages, Kamloops TSA, 2001.



A2.4.6 Application of OGSi adjustment factors

Within the Kamloops TSA, 29% of the THLB is comprised of stands greater than 140 years. The current site productivity of these sites may be significantly underestimated. Site indices of the older stands were adjusted using one of the two accepted study results: paired plot and veteran tree. Table A2-1 shows the results of applying OGSi adjustment on stands in the Kamloops TSA.

Table A2-1. Analysis unit site index based on current data and OGSi adjustments, Kamloops TSA, 2001.

Analysis unit	THLB (hectares)	Inventory site index	Adjusted site index
Dry fir, small patch	13 205	15.54	16.53
Wet fir, good/medium	24 673	17.18	18.79
Wet fir, poor	9 884	13.56	16.48
Balsam, good/medium	5 886	14.16	16.69
Balsam, poor	28 992	10.67	14.68
Spruce, good/medium	24 369	16.9	20.52
Spruce, poor	65 725	11.03	18.92
Pine, good/medium	13 827	16.37	20.02
Pine, poor	10 004	12.6	18.54
Dry fir, small patch, PA 16	879	11.51	12.6
Wet fir, PA 16	3 086	12.64	12.8
Balsam, PA 16	2 603	11.29	11.58
Spruce, PA 16	829	11.82	12.38
Pine, PA 16	32 570	12.13	12.68



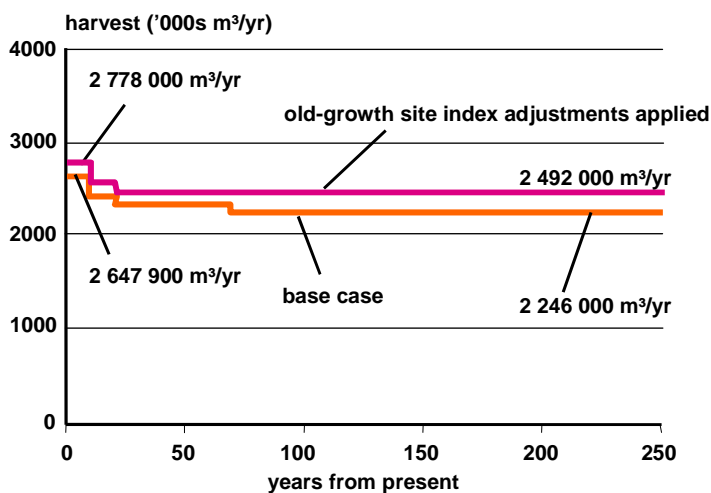
Cedar, good/medium	3 676	18.38	20.44
Cedar, poor	26 698	14.51	19.82
Hemlock, good/medium	1 121	17.21	19.96
Hemlock, poor	21 741	12.95	18.18

Derived from the Kamloops TSA Timber Supply Analysis 2001, p. 48

The application of OGSi adjustments has changed the average site index for the Kamloops TSA from 15.5 to 16.6, and for stands greater than 140 years old the site index has increased from 13.3 to 17.3, a 30% increase.

The effect of applying the OGSi adjustment to the timber supply analysis has caused significant increases in the harvest level (Figure A2-9). The short-term harvest has increased by 5.5%. The harvest from conventional areas can be maintained at 2 492 000 (an 11% increase from the base case) from period 3 to the end of the planning horizon.

Figure A2-9 Harvest forecast with OGSi adjustment applied, Kamloops TSA, 2001



A2.4.7 Green-up and Cutblock adjacency

The current green-up height in the Kamloops TSA is 3 metres (16 years) in standard management areas. Unexpectedly increasing green-up ages to 21 years allows the conventional AAC to be maintained an extra decade (Figure A2-10). The reason for this increase is that regenerated stands with lower minimum harvestable ages become available sooner due to adjustments made in the harvest queue. When green-up ages are decreased, stands reach height requirements earlier, therefore allowing unharvested adjacent areas to become eligible for harvest. The AAC attained from conventional stands can be maintained an additional 2 decades through a stands ability to reach height requirements earlier.

In the base case forecast the forest cover requirement used to model cutblock adjacency is based on the assumption that a maximum of 33% of the area can be less than 3 metres tall at any given time – a 3-pass harvesting system. Decreasing the percent of area which can be below green-up height to 20% allows the conventional AAC to be maintained an extra decade (Figure A2-11). Once again the re-ordering of stands in the harvest queue has allowed managed stands to be



accessible earlier in the harvest forecast. Decreasing the percent area by an additional 5% to 20% causes the conventional AAC to be maintained until decade 4 (base case is maintained until decade 7), but the LTHL has risen 1% compared to the base case harvest forecast. The reason for this increase is stands are being harvested closer to their maximum potential, as well as the shortening of rotation lengths.

Figure A2-10 Harvest forecast with variable green-up ages in standard management areas, Kamloops TSA, 2001

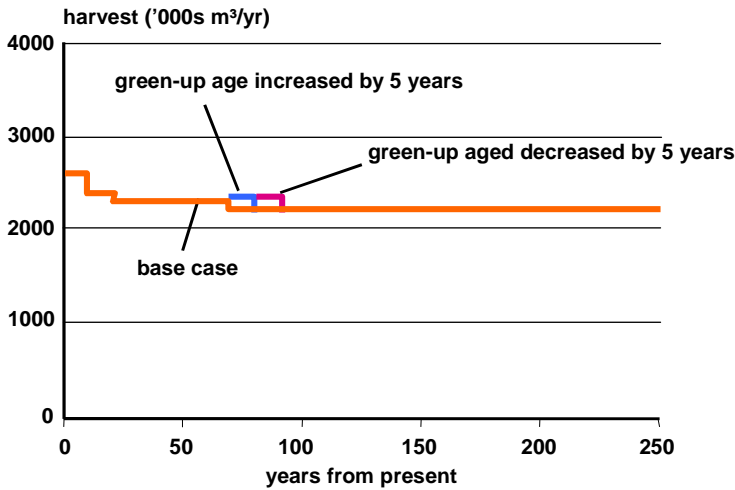
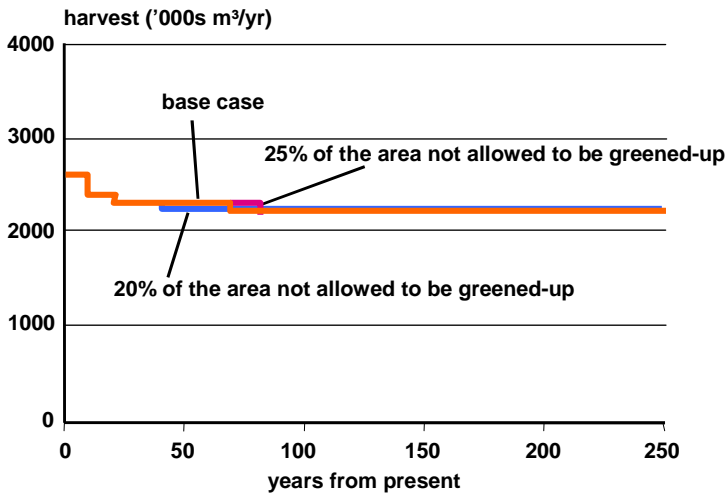


Figure A2-11 Harvest forecast with a less stringent cutblock adjacency requirement, Kamloops TSA, 2001.



A2.4.8 Uncertainty in management zone objectives for visual quality

In the Kamloops TSA the area occupied by visually sensitive areas is 39%. The amount of area which can be below the green-up height can be greatly affected by silvicultural practices which

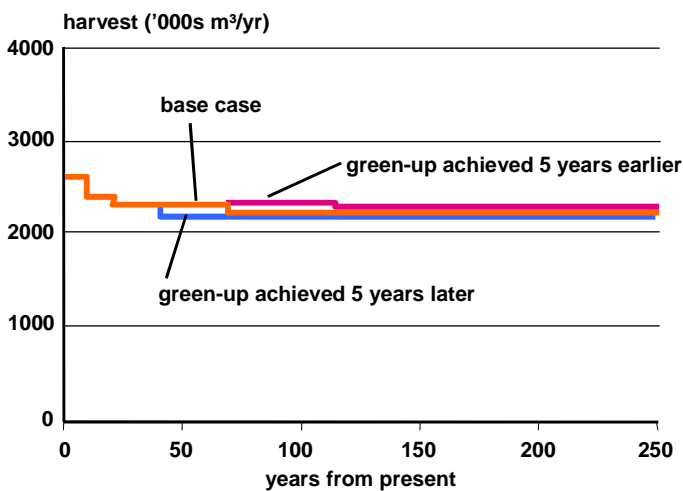


allow a stand to reach green-up height requirements earlier therefore lessening the affect visually sensitive areas have on timber supply.

Achieving green-up in visually sensitive area 5 years earlier allows the conventional AAC to be maintained to the 12th decade, as well as a 1.3% increase in the LTHL (Figure A2-12). When green-up in visually sensitive areas is achieved later the base case forecast can only be maintained for 4 decades.

The utilization of silvicultural practices which decrease the time to reach green-up requirements in visually sensitive area has an increased impact on timber supply compared to reducing the time to green-up in standard management areas (Figure A2-10).

Figure A2-12 Harvest forecast with variable green-up ages in visually sensitive areas, Kamloops TSA, 2001



Timber Supply Dynamics - Summary

The base case harvest forecast decreases over the first 2 decades due to the expiry of the cedar/hemlock partition and pulpwood agreement 16. The harvest level from conventional stands can only be maintained until decade 7 when the forecast decreases because of the age class structure, which is heavily weighted to mature timber.

As the mature stands are depleted, harvest and growing stock levels decline until managed stands allow for a stabilization of levels. Once the managed stands are established certain levels will enter a cyclic pattern as higher productive sites enter and exit the operability window.

This timber supply forecast is robust with respect to management modeling parameters such as green-up age and adjacency. Changes to regenerated stand yields and site productivity estimates results in significant increases or decreases in mid-term and long-term timber supply.



Appendix 3

Executive Summary of The Incremental Silviculture Strategy For British Columbia (Interim)

STRATEGY AT A GLANCE

Purpose	This strategy provides guidance to the application of available funds for incremental silviculture activities. It is not tied to a specified funding level.
Government's Goals	<ul style="list-style-type: none">• Sustainable Use• Community Stability• A Strong Forest Sector
Key Principles	<ol style="list-style-type: none">1. Because the distant future cannot be foretold, the best and only course of action in managing the timber resource is that which minimizes risk and maintains options.2. British Columbia's forests are important locally, provincially, nationally and globally and should be managed in this context.3. Each generation of British Columbians becomes the steward of the province's forest resources and has a moral obligation to preserve this heritage for future generations.
Working Targets	Within the context of the guiding principles: WT 1: Minimize the anticipated interim reduction in timber supply so that provincial annual harvests of at least 65 million m ³ can be achieved during this period. WT 2: Create a long term timber supply capable of supporting a steady long term provincial harvest level of at least 75 million m ³ . WT 3: Over the long term, maintain the production of premium quality logs at or above 10% of total harvest.
Major Silvicultural Strategies	<ul style="list-style-type: none">• Increase the use of alternative silvicultural systems and commercial thinning.• Achieve earlier green-up of harvested areas.• Increase regenerated stand volumes 20%.• Eliminate all pre-1982 good and medium site backlog NSR and all 1982 to 1987 backlog NSR.• Initiate a long rotation quality management program for stands where harvesting must be delayed. <p>Other silvicultural and non-silvicultural strategies must also be implemented to achieve the working targets.</p>
Strategy Implementation	Regional and management unit strategies must be developed, followed by programs and plans to implement them.



Appendix 4

Comments Subsequent to the Workshop

The following comments were offered by reviewers of the draft strategy, produced subsequent to the September 24, 2001, strategy workshop.

1. The issue of a proper site index for managed stands is critical.
2. With regard to minimum harvest age, has anyone done an analysis to determine what these stands will be looking like in 90 - 100 years? I would suggest the need for head rig wood (peelers aside) will be substantially lower in the future.
3. I would also hope that the report would present a strong argument against spacing in stands that are not at risk of suppression. As you have indicated, we are not increasing future volumes by spacing but we certainly are lowering wood quality. As a result, we are having to fund expensive pruning activities to salvage log value.
4. With regard to green-up, is there a scientific or biological reason for 3m? Our discussions with wildlife experts do not suggest there is a difference between 3 or 2m. For interest sake, SFI certification (U.S based) requires a green up height of 5 feet (1.7m) There is already a minimum seral stage limit in the timber supply analysis to account for watershed health.