
Bulkley TSA

Silviculture Strategy (Type 1)

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Bulkley TSA Silviculture Strategy (Type 1)

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Name	Organization
Melissa Steidle	Mountain View Silviculture
Gary Quanstrom	West Fraser Mills
Brad Leroux	Silvicon Services
Jay Baker	Silvicon Services
Bob Mitchell	MoF Bulkley Forest District
Jane Lloyd-Smith	MoF Bulkley Forest District
Bob Shiach	MoF Bulkley Forest District
Bruce Hartley	MoF Bulkley Forest District
Ron Donnelly	MoF Bulkley Forest District
Dave Duncan	MoF Bulkley Forest District
Janet Beltz	MoF Bulkley Forest District
Glen Buhr	MoF Bulkley Forest District
Lou Tromp	MoF Prince Rupert Forest Region



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 was designed to produce an interim silviculture strategy that can serve until a Type 2 analysis can be completed.

Strategic planning for silviculture has been going on in Bulkley TSA for some time. The Bulkley Silviculture Strategy (prepared by the Bulkley Silviculture Committee in 1999) already provides a great deal of strategic information for planning silviculture activities in the TSA. One of the most useful components of this Type 1 analysis report may be the identification of issues to be addressed and the list of items needing further investigation (the “To Do List”). Together, the Bulkley Silviculture Strategy and this Type 1 analysis provide a very good basis for undertaking a Type 2 analysis, whenever the District is ready to do that.



Strategy Summary

Issues Addressed by the Strategy

While many issues were proposed and discussed in the workshop, the participants developed a silviculture strategy that addressed three key issues: addressing backlog, mitigating the projected reduction in harvest levels (AAC falldown), and increasing the size of the timber harvesting land base (THLB). Many other issues were also discussed, e.g., management of old wildfire-burned areas, managing for higher quality log grades on some portion of the land base, and wildlife habitat. Workshop participants ranked the elimination of backlog NSR as the highest priority item.

Elements of the Strategy

1. Eliminate approximately 1000 ha of backlog NSR by 2003. Identify treatable areas in the first year. Reclassify and apply treatments within two years.
2. Increase the growth of existing stands through commercial thinning 2200 ha of young stands, and fertilizing 2000 ha of spaced lodgepole pine. Whether fertilization can be implemented will depend at least in part on public acceptance, and its implementation will be contingent on ground rules developed through public consultation. It is unlikely that the first fertilization treatments would occur sooner than 3 years from now.

Retain balsam advanced regeneration when harvesting balsam stands.

Expand the timber harvesting land base by:

- harvesting (when market conditions allow) 24 000 ha of low site balsam/hemlock and about 15 000 ha of pine in stocking classes 2, 3 and 4,
- rehabilitating roads and landings, and
- reclassifying low sites using OASIS.

Increase regenerated stand yields for poor (1000 ha total), medium (1500 ha/year) and good sites (500 ha/year) through regimes of: planting improved and large stock, site preparation and microsite selection, fertilization at sowing and planting, brushing, spacing, fertilization after free-growing, and recognition of mixed species stands. [After the workshop some doubt was expressed about the effectiveness of this regime for increasing stand yields. Careful thought and analysis is needed before treatments are implemented.]

3. Continue to treat high densities in past wildfires by thinning and fertilizing 3000-4000 ha of balsam, hemlock, spruce and lodgepole pine in old burns and treating other areas to be determined.
4. Expand the timber harvesting land base by using silvicultural systems that avoid adjacency constraints (partial cutting) and fine tuning landscape-unit zoning in sensitive zones.
5. Manage for a variety of timber products so that 50% of the area harvested in the Bulkley TSA produces defined sawlog products (listed on page 7 of the Bulkley Silviculture Strategy) by juvenile spacing.

As well, produce clear sawlogs with a minimum 35-cm diameter from 10% of the THLB by juvenile spacing to target densities, pruning, and fertilizing.



Manage a further 25% of the THLB for increased net volume yields by controlling density to targets, followed by commercial thinning.

6. Address biodiversity requirements by meeting the objectives of landscape unit plans and forest practices guidebooks in the implementation of the silviculture strategy.
7. Initiate habitat supply projections for grizzly bear, moose and caribou, to defined areas or the entire TSA depending on the species, to quantify habitat supply.
8. Assess the condition of riparian areas logged before the Forest Practices Code in the Chapman and Harold-Price Landscape Units, develop guidelines for appropriate stocking, and treat areas as required. These guidelines could eventually be adopted for application in other parts of the TSA.
9. Achieve VQOs by reducing the green-up age through planting at higher densities with improved, large-size stock and fertilizing at planting, increasing the component of lodgepole pine, retaining poles and saplings at harvest, and using deciduous species.
10. Maintain an even flow of labour-intensive silviculture activities (juvenile spacing, brushing, planting, pruning) to create stable employment in the Bulkley TSA. Involve the First Nations Economic Committee in determining ways to create employment opportunities for First Nations.
11. Address First Nations' concerns about forest practices through consultation by government and licensees and building constructive relationships with First Nations.
12. Address conflicts between range and timber management by enforcing tenure conditions, obstacle planting with large stock, proper cattle management and seeding of landings and in-block roads to increase available range away from plantations.
13. Continue to harvest old, slow-growing balsam/hemlock stands currently in the partitioned cut to replace them with managed, thriftier stands.
14. Address the five main forest health concerns – balsam bark beetle, mountain pine beetle, spruce beetle, tomentosus root rot and stem rust – through the Bulkley TSA forest health strategy.



Tactical Priorities

The tactical priorities set by the participants represent a balance between the participant's strategic objectives for the management unit and the silvicultural opportunities available on the TSA in the next 5 years. Treatment of backlog NSR was ranked highest by the workshop participants. Additional high-ranking activities were density management in regenerating stands, and fertilization. Table S-1 lists activities identified by the participants and the rank (priority) assigned to each activity.

Table S-1. Silviculture activities and areas selected by the workshop participants

Activity Type	Activities	Opportunity Area (ha/yr)	Rank
NSR rehabilitation	Identify NSR (complete in first year)	1000	1
	reclassify NSR (complete by 2003)	250	1
	treat NSR (complete by 2003)	250	1
Site Preparation	part of regimes to increase regenerated yields*	500	3
	part of regimes to increase regenerated yields*	1500	4
	part of regimes to increase regenerated yields*	1000	5
Thinning	commercial thinning	200	2
	thin old burns	350	2
Fertilization	fertilize thinned areas in burns	350	2
	part of regimes to increase regenerated yields*	500	3
	part of regimes to increase regenerated yields*	1500	4
	part of regimes to increase regenerated yields*	1000	5
	fertilize spaced and pruned stands	200	6
Brushing	part of regimes to increase regenerated yields*	500	3
	part of regimes to increase regenerated yields*	1500	4
	part of regimes to increase regenerated yields*	1000	5
Spacing	part of regimes to increase regenerated yields*	500	3
	part of regimes to increase regenerated yields*	1500	4
	part of regimes to increase regenerated yields*	1000	5
	Juvenile space [to 900-3000] sph at 4-m height**	1000	6
	space [to btwn 900 sph and MSS] (regime for clear sawlogs)**	200	6
	space [to keep density at 3000 to 5000 sph at 4-m height**]	500	6

* This regime included using improved stock, large stock; site prep and careful selection of microsite; fertilization at sowing and planting; brushing; spacing; post-FG fertilization. However, after the workshop some doubt was expressed about the effectiveness of this regime for increasing stand yields. This regime should be carefully evaluated before implementation.



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1. Issues and Strategies

This section identifies the critical issues that guide silviculture planning on the TSA and strategies developed in the workshop for addressing those issues. These strategies were assessed by the workshop participants as to their appropriateness and efficacy. Table 1 presents the issues, objectives, strategies, regimes and activities developed in the workshop. Some of these strategies were selected by the participants as feasible and desirable for the TSA—this set of strategies (listed below) constitutes the silviculture strategy for the Bulkley TSA. Related issues requiring further investigation (the “To Do List”) are included with the relevant issue and summarized in Table 7.

Special mention should be made of density, and fertilization. After the workshop some concern was expressed that the density specified for a number of regimes will not achieve the desired product goals. These regimes should be carefully considered and evaluated before these regimes are implemented.

During the workshop concern was expressed about public acceptance of fertilization. A public consultation process should be completed and “ground rules” for fertilization should be developed before implementing any fertilization treatments (see the To Do items and Table 7).

1.1 Backlog NSR

Eliminate backlog NSR (approximately 1000 ha) by 2003 to help offset future timber supply shortfalls.

Strategies:

Identify backlog, reclassify and treat as required. Backlog identification should be conducted within one year, with reclassification and treatments over the following two years, to eliminate backlog NSR by 2003.

To Do:

Continue updating NSR records.

1.2 Timber Supply Falldown

The timber supply forecast predicts reductions of up to 14.5% per decade in harvest levels beginning after the first decade and extending for up to eight decades. Workshop participants identified the need to maintain the current harvest level or increase mid-term harvest levels, and increase the long-term harvest level.

Strategies:

1. Increase growth of existing stands shortly before harvest by:
 - commercial thinning 2200 ha of young stands; and
 - fertilizing 2000 ha of spaced lodgepole pine¹.

¹ After the workshop uncertainty was expressed about identifying this 2000 ha of spaced lodgepole pine.



2. Retain balsam advanced regeneration² when harvesting balsam stands.
3. Expand the timber harvesting land base (THLB) by:
 - harvesting (when market conditions allow) 24 000 ha of low site balsam/hemlock and about 15 000 ha [of pine?] in stocking classes 2, 3 and 4 to bring these sites currently growing marginal stands back into production.
 - rehabilitating roads and landings [At the workshop it was estimated that about 3000 ha of roads and landings may exist; later this estimate was questioned with respect both to the amount of area in roads and landings, and the proportion of that total that is treatable.]
 - reclassifying low productivity sites using OASIS.
4. Increase regenerated stand yield for poor (1000 ha total), medium (1500 ha/year) and good sites (500 ha/year) through regimes of: planting improved and large stock, site preparation and microsite selection, fertilization at sowing and planting, brushing, spacing, fertilization after free-growing, and recognition of mixed species stands.³

To Do:

1. Investigate fertilization response of spruce and balsam.
2. Devise appropriate fertilization regimes for conifer species by site index class.
3. No fertilization is being done currently in the Bulkley TSA, and concerns were expressed at the workshop about the public in the TSA not accepting fertilization. Before fertilization treatments are implemented there should be public consultation and development of ground rules. Three years has been allowed in this strategy before fertilization treatments are first scheduled (see Section 3.3, Program Costs and Benefits).
4. Confirm existence and location of 2000 ha of “spaced lodgepole pine”.
5. Undertake research into regimes aimed at increasing yields from regenerated (managed) stands on poor, medium, and good sites (strategy # 4).
6. Confirm the area of roads and landings that could be reforested.
7. Pursue studies to refine Operational Adjustment Factor values for modelling regenerated yields, as they might affect regimes (especially density) for product objectives.
8. Break down non-merchantable area identified in the timber supply analysis report to show area in low site and in stocking classes 2, 3 and 4.
9. Determine the economic feasibility of harvesting lodgepole pine stocking classes 2, 3 and 4.

² The workshop group proposed leaving 400 sph of advanced balsam regeneration, but the District later requested that the actual density be omitted because the appropriate number of stems per hectare is quite variable and time is needed to investigate further.

³ After the workshop skepticism was expressed about the effectiveness of this regime for increasing stand yields. Research is needed.



1.3 Old Wildfires

Old wildfires often regenerate naturally at excessively high densities that are not expected to yield a merchantable piece size at rotation.

Strategies:

Conduct density management to reduce the time to achieve minimum target diameters. Thinning and fertilization are recommended for 3000-4000 ha of balsam, hemlock, spruce and pine in old burns (see page 13 of Bulkley Silviculture Strategy) and other areas yet to be determined.

To Do:

1. Continue with wildfire area management plans, prescriptions and treatments.
2. Devise appropriate fertilization regimes for conifer species by site index class.
3. Investigate the amount of immature overstocked stands that would respond to density management treatment regimes.

1.4 Timber Harvesting Land Base

Expand the timber harvesting land base by making constrained areas available for harvesting.

Strategies:

1. Use silvicultural systems that avoid adjacency constraints by using partial cutting in any zone with restrictive cover constraints in TSR (e.g., landscape corridor zones or areas with VQOs of retention or partial retention).
2. In landscape unit-level assessment and planning, fine tune landscape unit zoning by the silviculture potential to grow timber on existing plantations in sensitive zones.

To Do:

1. Review current studies to determine the acceptable understory density for retention after overstorey removal.

1.5 Timber Products

Manage for a variety of timber products so that 50% of the area harvested in the Bulkley TSA produces the sawlog products listed on page 7 of the Bulkley Silviculture Strategy and page 2 of the workshop booklet. As well, 10% of the timber harvesting land base should produce clear sawlogs with minimum 35-cm diameter and a further 25% of the THLB is to be managed for increased net volume yields.

Strategies:

1. To produce the listed sawlog products for lodgepole pine in the Bulkley Silviculture Strategy, juvenile space [to 900-3000] sph when stands have a height of 4 m.



2. To produce clear pine sawlogs with a minimum 35-cm diameter, juvenile space to target densities between 900 sph and the minimum stocking standard when stands have a height of 6 m, prune, and fertilize (delay until year 4 of program because of concerns about public acceptance of fertilization).
3. To increase net volume yield, ensure that effective densities are between [3000 and 5000 sph] at 4 m height, and commercial thin later.

To Do:

1. Devise appropriate fertilization regimes for conifer species by site index class.
2. Pursue studies to refine Operational Adjustment Factor values for modelling regenerated yields, as they might affect regimes (especially density) for product objectives.
3. Investigate optimum stand height for juvenile spacing and pruning in the Bulkley TSA relative to knot size.
4. Investigate appropriate density parameters for increasing stand yields.

1.6 Biodiversity

Biodiversity requirements are critical in the implementation of a silviculture strategy.

Strategies:

Follow objectives of landscape unit plans and forest practices guidebooks while maintaining or increasing timber supply.

1.7 Grizzly Bear, Moose and Caribou Habitat Supply

A lack of information exists on habitat supply for grizzly bear, moose and caribou in the Bulkley TSA. Habitat supply must be quantified for these three species.

Strategies:

1. Initiate habitat supply projections for grizzly bear (see "Guidelines for habitat supply analysis") in the Babine and Nilkitkwa landscape units.
2. Initiate habitat supply projections for moose (see "Guidelines for habitat supply analysis") for the entire Bulkley TSA.
3. Initiate habitat supply projections for caribou (see "Guidelines for habitat supply analysis") in the Telkwa Landscape Unit and summarize existing information on caribou habitat supply in the Bulkley TSA.

1.8 Riparian Management Zones

Riparian areas harvested before the inception of the Forest Practices Code in 1995 have unknown condition in relation to coniferous stocking for providing large organic debris.



Strategies:

Assess the condition of riparian areas logged prior to implementation of the Forest Practices Code in the Chapman and Harold-Price Landscape Units, most notably at Harold-Price Creek and Fulton River. Guidelines for appropriate stocking in these riparian areas need development by the MOF and MELP. Treat areas as required. These guidelines could eventually be considered for adoption in other areas of the TSA.

1.9 Visual Quality

Achieve VQOs of landscape unit plans while maintaining or increasing timber supply by reducing the green-up age.

Strategies:

1. Map visually sensitive areas and plant with improved, large-size stock with fertilization at planting.
2. On landscape units constrained by past harvesting, plant at higher densities with improved, large-size stock and fertilize at planting. Increase the lodgepole pine component for faster height growth, retain poles and saplings during harvesting, and use deciduous species.

To Do:

Seek clarification from the MOF district manager on “commercially acceptable” species for green-up.

1.10 Employment

Maintain an even flow of labour-intensive silviculture activities to create stable employment in the Bulkley TSA.

Strategies:

Conduct juvenile spacing, brushing, planting and pruning activities.

1.11 First Nations and Employment

Maintain an even flow of labour-intensive silviculture activities to create stable employment for First Nations in the Bulkley TSA.

Strategies:

1. Involve the First Nations Economic Committee in determining ways to create employment opportunities for First Nations.
2. Conduct juvenile spacing, brushing, planting and pruning activities.



1.12 First Nations and Forest Practices

First Nations in the Bulkley TSA have some concerns about forest practices, and constructive relationships are needed to ensure that First Nations concerns are heard and acted on.

Strategies:

Government and licensees consult with First Nations on silviculture practices.

1.13 Range Management

Conflicts between timber management and range management need attention through the building of constructive relationships with range/forest tenure holders and agencies to achieve management objectives and minimize negative impacts. Range and forest tenures should be complementary and supportive.

Strategies:

1. Reforestation on range tenures should include obstacle planting (planting near stumps and logs to protect seedlings from trampling) with large stock, with all tenure conditions enforced.
2. Cattle management on range tenures requires optimum location of salt licks and watering areas to minimize seedling trampling, and frequent rotation of grazing areas.
3. Graze cattle on seeded landings and in-block roads to increase the grazing area beyond young plantations.

1.14 Old Balsam/Hemlock Stands

Old, slow-growing balsam/hemlock stands are currently included in the partitioned cut and will be replaced with thriftier and more productive stands after harvest.

Strategies:

Continue to harvest the partitioned cut so that these stands can produce yields from managed stand regimes.

1.15 Forest Health

The five most significant forest health agents in the Bulkley TSA are: balsam bark beetle, mountain pine beetle, spruce beetle, tomentosus root rot and stem rust. Non-recoverable losses from bark beetle mortality must be reduced. The losses for tomentosus root rot must be quantified, and stem rust areas must be located to mitigate losses. These problems will be addressed through the Bulkley TSA forest health strategy.

To Do:

Confirm estimates of non-recoverable losses from balsam bark beetle, mountain pine beetle, and spruce beetle.



2. Silviculture Impacts and Priorities

The following worksheet, defining the elements of the interim strategy, was produced in the workshop in the Bulkley Forest District offices.

Table 1a. Showing the workshop issues, objectives, strategies, activities, targets, and impacts for Bulkley TSA

#	Issues	Objectives	Strategies	Target	Activities	Opportunity Area	Short	Mid	Long	Qual	Habitat Effects	Jobs Days/ha	Cost \$/ha	Rank
1	Backlog NSR	Eliminate backlog NSR (approximately 1000 ha) by 2003.	Identify backlog, reclassify, treat.	Backlog areas	Identify	1000 total			+		0			1
					Reclassify	500 total			+		0			1
					Treat	500 total			+		+/-			1
2	Falldown begins after decade 1	Maintain current harvest level or increase mid-term harvest levels.	Increase growth of existing stands shortly before harvest.	High elevation 60-yr old balsam (Se minor), SI 15+	Thin, fertilize	5000		++		+	+			2
				Young stands	CT	2200	+	+	-	+	+/-			2
				Spaced stands—pine	Fertilize	2000		+		+/-	+/-			2
			Retain understory	Balsam (subalpine fir)	When harvesting, leave 400 sph balsam sapling advanced regen	800		+		+/-	+			2
			Expand THLB	24,000 ha low site in district (B/Hw)	Harvest when market conditions allow.	24000 ha	+	+	+		-			2
				About 15,000 ha in stocking classes 2, 3, and 4	Harvest when market conditions allow.	15000 ha	+	+	+		+/-			2
				Roads and landings	Assess area of treatable roads and landings.	Telkwa, Blunt, McDonnell, McKendrick Pass								
					Reforest roads and landings.	3000 ha			+		+			2
				Hectares classed as "low" site	Use OASIS to reclassify "low" site hectares with respect to defining THLB.		+	+	+		-			
		Increase LTHL	Increase regenerated stand yields.	Poor site (SI=<16 m)	Improved stock	1000			+					5
					Large planting stock									
					Site prep and microsite selection									
					Fertilize at sowing and planting									
					Brushing									
					Spacing (density control)									
					Post-FG fertilization									
					Mixed species: conifer only, conif-decid									
				Medium site (SI = 16-19 m)	Improved stock	1500 ha/yr			+					4
					Large planting stock									
					Site prep and microsite selection									
					Fertilize at sowing and planting									
					Brushing									
					Spacing (density control)									
					Post-FG fertilization									
					Mixed species: conifer only, conif-decid									
				Areas with SI > 20	Improved stock	500 ha/yr			+					3
					Large planting stock									
					Site prep and microsite selection									
					Fertilize at sowing and planting									
					Brushing									
					Spacing (density control)									
					Post-FG fertilization									



Table 1b. Showing the workshop issues, objectives, strategies, activities, targets, and impacts, Bulkley TSA (continued)

3	Wildfire areas, overstocked	Reduce time needed to achieve minimum diameter targets.	Density management	3000-4000 ha of balsam, hemlock, spruce, pine in old fires (p.13 of Bulkley Silv Strategy).	Thin, fertilize	3000 - 4000 ha total		++		+	+						2
				Other areas not yet known (see Issue #3 on to-do list).	Thin, fertilize												
4	Expand timber harvesting land base	Make constrained areas available for harvesting.	Use silvicultural systems that avoid adjacency constraints.	Any zone with restrictive cover constraints in TSR (e.g., landscape corridors zone, VQOs of PR, R)	Partial-cutting silvicultural system	2500 ha?		+	+		0	+/-					
			Fine-tune landscape unit zonation for silviculture potential to grow timber.	Existing plantations in sensitive zones (e.g., trading core ecosystem zones for areas in IRM zone)	Landscape unit level assessment and planning			+	+								
5	Manage for a variety of timber products	50% of the area harvested to produce products in Table 1-1.	Keep effective density between 900 and 3000 sph at 4-m height.	Pine with SI<19 m; pine w SI >=19 m; other conifers SI <20 m; other conifers w SI>=20m	Space			+									6
		10% of area harvested to produce clear sawlog, 35-cm minimum diameter.	Keep effective density between 900 sph and MSS (at 6-m height).	Pine	Space, prune (1 lift) at 6 m (top 250 stems), fertilize.			-	-	++							6
		25% of area harvested is to be managed for increased net volume yields.	Keep effective density btwn 3000 and 5000 sph (at 4-m height).	25% of area harvested annually	Space, CT			+		—							6
6	Biodiversity	Follow objectives of landscape unit plans and forest practices guidebooks while maintaining or increasing timber supply.															
7	Lack of information about habitat supply for grizzly bear, moose, caribou	Quantify habitat supply for grizzly bear in the TSA.	Initiate habitat supply projections (see "Guidelines for habitat supply analysis") for grizzly bear.	Babine and Nlakitwa Landscape Units					?		?						
		Quantify habitat supply for moose in the TSA.	Initiate habitat supply projections (see "Guidelines for habitat supply analysis") for moose.	Entire TSA					?		?						
		Quantify habitat supply for caribou in the TSA.	Initiate habitat supply projections (see "Guidelines for habitat supply analysis") for caribou.	Telkwa Landscape Unit	Summarize existing information on caribou habitat supply in the TSA.				?		?						
					Habitat supply projection activities?												
8	Condition of management zone of riparian areas that were harvested pre-Code	Ensure appropriate amount of coniferous stocking to provide future large organic debris (LOD).	In areas logged to creekside pre-Code, assess condition of riparian area, treat as needed.	Chapman and Harold-Price landscape units: Harold Price Creek, Fulton River	Assess condition of riparian areas logged pre-Code.												
					Develop guidelines (MoF, MELP) for appropriate stocking levels in these riparian areas.												
					Treat areas as needed.							+					



Table 1c. Showing the workshop issues, objectives, strategies, activities, targets, and impacts, Bulkley TSA (continued)

9	Visual quality	Achieve VQOs of Landscape Unit Plans while maintaining or increasing timber supply.	Reduce green-up age	Mapped visually sensitive areas	Improved stock, larger planting stock and fertilization at planting.	Harvested stands with VQOs.		+	+		-					10
				Landscape units constrained by past logging	Improved stock, larger planting stock and fertilization at planting.			+	+		-					10
					Increase planting density	Harvested stands with VQOs					-					10
					Increase % pine (faster height growth)	Harvested stands with VQOs		+	+							10
					Retain poles and saplings during harvesting.	Harvested stands with VQOs		+	+		++					10
					Use deciduous species.	Harvested stands with VQOs					+					10
10	Employment	Maintain or increase stable employment from silviculture activities.	Maintain even flow of labour-intensive silviculture activity.	TSA	Space, brush, plant, prune.						+					
11	First Nations concerns about employment	Maintain or increase stable employment from silviculture activities for First Nations.	Maintain even flow of labour-intensive silviculture activity.	TSA	Take direction from First Nations economic committee.											
				TSA	Space, brush, plant, prune.											
12	First Nations concerns about forest practices	Develop constructive relationships with First Nations about their concerns re: forest practices.	Gov't and licensees to consult with First Nations on silviculture practices (overall responsibility to remain with gov't).													
13	Range management	Build constructive relationships with range/forest tenure holders and agencies to achieve objectives.	Recognize impacts, reduce conflicts, minimize impacts.	Range tenures	Obstacle planting				small +	+						11
					Plant large stock				small +	+						11
					Enforce tenure conditions.				small +	+						11
			Cattle management	Range tenures	Location of salt licks, watering areas, rotating grazing areas frequently.				small +	+						11
			Increase grazing area outside young plantations.	Landings and in-block roads	Seed landings				small +	+	+					11
14	Old and slow-growing BI/Hw stands	Target very old BI/Hw stands for harvesting (current partitioned cut).	Harvest and replace slow-growing BI/Hw stands with thrifty stands.	Old BI/Hw stands	Continue to harvest partitioned cut.		++									
15	Forest health: All five forest health issues to be addressed in District Forest Health Strategy															
	Balsam bark beetle	Minimize NRL's of 34,000 m3/yr.														1
	Mountain pine beetle	Minimize NRL's of 3,000 m3/yr														2
	Spruce beetle	Minimize unsalvageable losses														2
	Tomentosus root rot	Identify location and area affected, quantify losses (est. at 19,000 m3/yr).							+	+						11
	Stem rust	Identify location and area affected, mitigate losses.														11



Table 2. Summary of silvicultural activities defined for Bulkley TSA

Activity Type	Activities	Target	Opportunity Area (ha/yr)	Rank
NSR rehabilitation	Identify NSR (complete in first year)	backlog NSR	1000	1
	reclassify NSR (complete by 2003)	backlog NSR	250	1
	treat NSR (complete by 2003)	backlog NSR	250	1
Site Preparation	part of regimes to increase regenerated yields*	good sites (SI >19 m)	500	3
	part of regimes to increase regenerated yields*	medium sites (SI=16-19 m)	1500	4
	part of regimes to increase regenerated yields*	poor sites (SI <16 m)	1000	5
Thinning	commercial thinning	young stands	200	2
	thin old burns	balsam, hemlock, spruce, pine in old burns	350	2
Fertilization	fertilize thinned areas in burns	balsam, hemlock, spruce, pine in old burns	350	2
	part of regimes to increase regenerated yields*	good sites (SI >19 m)	500	3
	part of regimes to increase regenerated yields*	medium sites (SI=16-19 m)	1500	4
	part of regimes to increase regenerated yields*	poor sites (SI <16 m)	1000	5
	fertilize spaced and pruned stands	spaced and pruned clear sawlog stands	200 (10% area harvested)	6
Brushing	part of regimes to increase regenerated yields*	good sites (SI >19 m)	500	3
	part of regimes to increase regenerated yields*	medium sites (SI=16-19 m)	1500	4
	part of regimes to increase regenerated yields*	poor sites (SI <16 m)	1000	5
Spacing	part of regimes to increase regenerated yields*	good sites (SI >19 m)	500	3
	part of regimes to increase regenerated yields*	medium sites (SI=16-19 m)	1500	4
	part of regimes to increase regenerated yields*	poor sites (SI <16 m)	1000	5
	Juvenile space [to 900-3000] sph at 4-m height**	(see Bulkley Silviculture Strategy, Table 1)	1000 (50% area harvested)	6
	space [to btwn 900 sph and MSS] (regime for clear sawlogs)**	pine	200 (10% area harvested)	6
	space [to keep density at 3000 to 5000 sph at 4-m height]**	25% area harvested annually	500 (25% area harvested)	6

* The regimes to increase yields from regenerated stands includes: improved planting stock, large stock; site prep and careful selection of microsite; fertilization at sowing and planting; brushing; spacing; post-FG fertilization. After the workshop skepticism was expressed about the effectiveness of this regime for increasing stand yields

** After the workshop concern was expressed about appropriate densities for these regimes. They should be carefully reconsidered before implementation.



3. Silviculture Program

3.1 Tactical Priorities

Tactical priorities for Bulkley TSA were defined in the workshop by having participants ranking strategies and activities for implementation in the next five years. Priorities were assigned through discussion and consensus among the participants, and produced a clear sense of the most important activities from the participants' perspectives.

In Bulkley TSA, workshop participants felt that the most important objective is to eliminate backlog NSR. Activities related to this objective—surveys, brushing, spacing—were ranked highest. See Issue 1.

Addressing projected reductions in harvest level in the short and mid-term was ranked as second most important by workshop participants. Related activities include thinning, fertilization, retaining balsam advanced regeneration, expanding the timber harvesting land base by bringing about 39 000 ha of marginal stands into production, rehabilitating roads and landings, and reclassifying some low sites. See Issue 2.

Activities that would increase yields from regenerating stands were ranked third, fourth and fifth in the workshop. The activities specified were elements of multiple treatment regimes such as planting large, genetically improved stock, site preparation with careful microsite selection, fertilization at sowing and planting, brushing, spacing, and post-FG fertilization. See Issue 2.

3.2 Summary of the Elements of the Strategy

This section summarizes the strategies devised to address the issues described in Section 1.

1. Eliminate approximately 1000 ha of backlog NSR by 2003. Identify treatable areas in the first year. Reclassify and apply treatments within two years.
2. Increase the growth of existing stands through commercial thinning 2200 ha of young stands, and fertilizing 2000 ha of spaced lodgepole pine. Whether fertilization can be implemented will depend at least in part on public acceptance, and its implementation will be contingent on ground rules developed through public consultation. It is unlikely that the first fertilization treatments would occur sooner than 3 years from now.

Retain balsam advanced regeneration when harvesting balsam stands.

Expand the timber harvesting land base by:

- harvesting (when market conditions allow) 24 000 ha of low site balsam/hemlock and about 15 000 ha of pine in stocking classes 2, 3 and 4,
- rehabilitating roads and landings, and
- reclassifying low sites using OASIS.

Increase regenerated stand yields for poor (1000 ha total), medium (1500 ha/year) and good sites (500 ha/year) through regimes of: planting improved and large stock, site preparation and microsite selection, fertilization at sowing and planting, brushing, spacing, fertilization after free-growing, and recognition of mixed species stands. [After the



workshop some doubt was expressed about the effectiveness of this regime for increasing stand yields. Careful thought and analysis is needed before treatments are implemented.]

3. Continue to treat high densities in past wildfires by thinning and fertilizing 3000-4000 ha of balsam, hemlock, spruce and lodgepole pine in old burns and treating other areas to be determined.
4. Expand the timber harvesting land base by using silvicultural systems that avoid adjacency constraints (partial cutting) and fine tuning landscape-unit zoning in sensitive zones.
5. Manage for a variety of timber products so that 50% of the area harvested in the Bulkley TSA produces defined sawlog products (listed on page 7 of the Bulkley Silviculture Strategy) by juvenile spacing.

As well, produce clear sawlogs with a minimum 35-cm diameter from 10% of the THLB by juvenile spacing to target densities, pruning, and fertilizing.

Manage a further 25% of the THLB for increased net volume yields by controlling density to targets, followed by commercial thinning.

6. Address biodiversity requirements by meeting the objectives of landscape unit plans and forest practices guidebooks in the implementation of the silviculture strategy.
7. Initiate habitat supply projections for grizzly bear, moose and caribou, to defined areas or the entire TSA depending on the species, to quantify habitat supply.
8. Assess the condition of riparian areas logged before the Forest Practices Code in the Chapman and Harold-Price Landscape Units, develop guidelines for appropriate stocking, and treat areas as required. These guidelines could eventually be adopted for application in other parts of the TSA.
9. Achieve VQOs by reducing the green-up age through planting at higher densities with improved, large-size stock and fertilizing at planting, increasing the component of lodgepole pine, retaining poles and saplings at harvest, and using deciduous species.
10. Maintain an even flow of labour-intensive silviculture activities (juvenile spacing, brushing, planting, pruning) to create stable employment in the Bulkley TSA. Involve the First Nations Economic Committee in determining ways to create employment opportunities for First Nations.
11. Address First Nations' concerns about forest practices through consultation by government and licensees and building constructive relationships with First Nations.
12. Address conflicts between range and timber management by enforcing tenure conditions, obstacle planting with large stock, proper cattle management and seeding of landings and in-block roads to increase available range away from plantations.
13. Continue to harvest old, slow-growing balsam/hemlock stands currently in the partitioned cut to replace them with managed, thriftier stands.
14. Address the five main forest health concerns – balsam bark beetle, mountain pine beetle, spruce beetle, tomentosus root rot and stem rust – through the Bulkley TSA forest health strategy.



3.3 Program Costs and Benefits

The costs and benefits of the program developed in the workshop are summarized in Tables 3-6, below.

Table 3 shows the assumed unit costs and employment associated with each activity. Employment multipliers were estimated by the consultant and should be verified by the District.

Tables 4a and 4b show the area treated by activity and program year.

Tables 5a and 5b show expenditures in thousands of dollars by activity and program year.

Tables 6a and 6b show the person-days of employment generated by undertaking the activities listed in the preceding tables.

Table 3. Unit cost (\$/ha) and employment (person-days/ha) assumptions*

	NSR Rehabilitation			Thinning		Fertilization			Site Prep	Fert	Brush	Space
	Identify NSR	Reclassify NSR	Treat NSR	CT	- old burns	Pine	- thinned areas in burns	- spaced and pruned stands				
\$/ha average	20	20	1800	0	600	340	340	340	400	340	400	500
PDs/ha	0.05	0.05	3	3	3	0.1	0.1	0.05	1.85	0.05	1.0	6

* these cost and employment multipliers were estimated by the consultant and should be reviewed by District and licensee staff

Table 4a. Area (ha) treated by activity and year

Year	NSR Rehabilitation			Thinning		Fertilization			Spacing			Total
	Identify NSR	Reclassify NSR	Treat NSR	CT	- old burns	Pine	- thinned areas in burns	- spaced and pruned stands	Juvenile space to 900-300 sph	to btwn 900 and MSS	to 3000 - 5000 sph	
1	1,000	250	250	2,200	3,500	2,000	350	200	1,000	200	500	11,450
2	0	250	250	2,200	3,500	2,000	350	200	1,000	200	500	10,450
3	0	0	0	2,200	3,500	2,000	350	200	1,000	200	500	9,950
4	0	0	0	2,200	3,500	2,000	350	200	1,000	200	500	9,950
5	0	0	0	2,200	3,500	2,000	350	200	1,000	200	500	9,950
Subtotal Yr 1-5	1,000	500	500	11,000	17,500	10,000	1,750	1,000	5,000	1,000	2,500	51,750
6 - 10	0	0	0	11,000	17,500	10,000	1,750	1,000	5,000	1,000	2,500	49,750
Total Yr 1-10	1,000	500	500	22,000	35,000	20,000	3,500	2,000	10,000	2,000	5,000	101,500

Table 4b. Area (ha) treated by activity and year

Year	Good Site (SI > 19 m)				Medium Site (>=16 m SI <=19 m)				Poor Site (SI < 16 m)				Total
	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	
1	500	500	500	500	1,500	1,500	1,500	1,500	1,000	1,000	1,000	1,000	12,000
2	500	500	500	500	1,500	1,500	1,500	1,500	1,000	1,000	1,000	1,000	12,000
3	500	500	500	500	1,500	1,500	1,500	1,500	1,000	1,000	1,000	1,000	12,000
4	500	500	500	500	1,500	1,500	1,500	1,500	1,000	1,000	1,000	1,000	12,000
5	500	500	500	500	1,500	1,500	1,500	1,500	1,000	1,000	1,000	1,000	12,000
Subtotal Yr 1-5	2,500	2,500	2,500	2,500	7,500	7,500	7,500	7,500	5,000	5,000	5,000	5,000	60,000
6 - 10	2,500	2,500	2,500	2,500	7,500	7,500	7,500	7,500	5,000	5,000	5,000	5,000	60,000
Total Yr 1-10	5,000	5,000	5,000	5,000	15,000	15,000	15,000	15,000	10,000	10,000	10,000	10,000	120,000

Table 5a. Expenditures (\$ X 1000) by activity and year

Year	NSR Rehabilitation			Thinning		Fertilization			Spacing			Total
	Identify NSR	Reclassify NSR	Treat NSR	CT	- old burns	Pine	- thinned areas in burns	- spaced and pruned stands	Juvenile space to 900-300 sph	to btwn 900 and MSS	to 3000 - 5000 sph	
1	20	5	450	0	2,100	680	119	68	500	100	250	4,292
2	0	5	450	0	2,100	680	119	68	500	100	250	4,272
3	0	0	0	0	2,100	680	119	68	500	100	250	3,817
4	0	0	0	0	2,100	680	119	68	500	100	250	3,817
5	0	0	0	0	2,100	680	119	68	500	100	250	3,817
Subtotal Yr 1-5	20	10	900	0	10,500	3,400	595	340	2,500	500	1,250	20,015
6 - 10	0	0	0	0	10,500	3,400	595	340	2,500	500	1,250	19,085
Total Yr 1-10	20	10	900	0	21,000	6,800	1,190	680	5,000	1,000	2,500	39,100

* % of area harvested annually

Table 5b. Expenditures (\$ X 1000) by activity and year

	Good Site (SI > 19 m)				Medium Site (>=16 m SI <=19 m)				Poor Site (SI < 16 m)				
Year	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	Total
1	200	170	200	250	600	510	600	750	400	340	400	500	4,920
2	200	170	200	250	600	510	600	750	400	340	400	500	4,920
3	200	170	200	250	600	510	600	750	400	340	400	500	4,920
4	200	170	200	250	600	510	600	750	400	340	400	500	4,920
5	200	170	200	250	600	510	600	750	400	340	400	500	4,920
Subtotal Yr 1-5	1,000	850	1,000	1,250	3,000	2,550	3,000	3,750	2,000	1,700	2,000	2,500	24,600
6 - 10	1,000	850	1,000	1,250	3,000	2,550	3,000	3,750	2,000	1,700	2,000	2,500	24,600
Total Yr 1-10	2,000	1,700	2,000	2,500	6,000	5,100	6,000	7,500	4,000	3,400	4,000	5,000	49,200

Table 6a. Short term employment benefits (person-years**), by activity and year

Year	NSR Rehabilitation			Thinning		Fertilization			Spacing			Total
	Identify NSR	Reclassify NSR	Treat NSR	CT	Thin old burns	- thinned areas in burns	- spaced and pruned stands		Juvenile space to 900-300 sph	to btwn 900 and MSS	to 3000 - 5000 sph	
1	0.25	0.06	3.75	33.00	52.50	1.00	0.18	0.05	30	6	15	142
2	-	0.06	3.75	33.00	52.50	1.00	0.18	0.05	30	6	15	142
3	-	-	-	33.00	52.50	1.00	0.18	0.05	30	6	15	138
4	-	-	-	33.00	52.50	1.00	0.18	0.05	30	6	15	138
5	-	-	-	33.00	52.50	1.00	0.18	0.05	30	6	15	138
Subtotal Yr 1-5	0.25	0.13	7.50	165.00	262.50	5.00	0.88	0.25	150	30	75	697
6 - 10	-	-	-	165.00	262.50	5.00	0.88	0.25	150	30	75	689
Total Yr 1-10	0.25	0.13	7.50	330.00	525.00	10.00	1.75	0.50	300	60	150	1,385

** one person-year is equivalent to 200 person-days

Table 6b. Short term employment benefits (person-years**), by activity and year

	Good Site (SI > 19 m)				Medium Site (>=16 m SI <=19 m)				Poor Site (SI < 16 m)				
Year	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	Site Prep	Fert	Brush	Space	Total
1	4.63	0.13	2.50	15.00	13.88	0.38	7.50	45.00	9.25	0.25	5.00	30.00	134
2	4.63	0.13	2.50	15.00	13.88	0.38	7.50	45.00	9.25	0.25	5.00	30.00	134
3	4.63	0.13	2.50	15.00	13.88	0.38	7.50	45.00	9.25	0.25	5.00	30.00	134
4	4.63	0.13	2.50	15.00	13.88	0.38	7.50	45.00	9.25	0.25	5.00	30.00	134
5	4.63	0.13	2.50	15.00	13.88	0.38	7.50	45.00	9.25	0.25	5.00	30.00	134
Subtotal Yr 1-5	23	0.6	13	75	69	2	38	225	46	1	25	150	668
6 - 10	23	0.6	13	75	69	2	38	225	46	1	25	150	668
Total Yr 1-10	46	1.3	25	150	139	4	75	450	93	3	50	300	1,335

** one person-year is equivalent to 200 person-days



4. Items Requiring Investigation (“To Do List”)

As various issues, objectives and strategies were discussed in the workshop, there were inevitably some that were clouded by lack of information. Either the lack of information itself was the issue (e.g., uncertainty about site index estimates for existing regenerated stands), or the issue could not be resolved until further investigation provided some clarification (e.g., the impact of silvicultural systems on wildlife habitat). These items were added to a running “To Do List” throughout the workshop. At the end of the workshop participants ranked these items by urgency (Table 7).

Table 7. Items identified in the workshop that require investigation, Bulkley TSA

Issue	Rank	Item	Description
1	1	NSR	Update NSR records (in progress).
3	2	Old wildfires	Continue with wildfire area management plans, prescriptions and treatments.
2	3	Fertilization response	Investigate fertilization response of spruce and balsam. (Rob Brockley at MOF Kalamalka Research Station would be a good contact.)
2,3,5	4	Fertilization regimes	Devise appropriate fertilization regimes for conifer species by SI class. (Refer to Dave Yole's report on foliar analysis of Bulkley District). *There should be public consultation and development of fertilization ground rules before any fertilization treatments are implemented.
2,5	5	Operational Adjustment Factor (OAF)	Pursue studies to refine OAF values for modelling regenerated yields; might affect management regimes (esp. density) for product objectives (e.g., change 3000 sph parameter to 2500 sph).
3	6	Density management response	Investigate amount of immature overstocked stands that would respond to density management treatment regime (similar to overstocked wildfire areas).
5	7	Spacing/pruning regimes	Investigate best stand height for spacing and pruning in the Bulkley TSA. (e.g., will knots be too big if stands spaced at 4m height and left to grow until pruning at 6 m height?)
4	8	Understory management in partial cuts	Review current studies to determine acceptable understory density (sph) retained after overstorey removal.
9	9	Green-up	Seek clarification from DM on "commercially acceptable" species for green-up.
2	10	Non-merchantable area	Break down total non-merchantable area identified in TSR analysis report to show area in low site and stocking classes 2,3,4.
2	11	Lodgepole pine stocking classes 2,3,4	Determine economic feasibility of harvesting pine stocking classes 2, 3, 4.
15	12	Non-recoverable losses	Confirm estimates of unsalvaged losses (NRLs).

* added after the workshop



Appendix A. Timber Supply Context

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 administrative constraints is incorporated in the Allowable Annual Cut (AAC).

The base case of the timber supply review (TSR) forecasts future timber supply subject to current administrative constraints and assuming present 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.

Timber Supply and the AAC

The current AAC for Bulkley TSA (895 000 m³/yr) was determined in 1995, and based on the TSR1 timber supply analysis published in 1993. Since then, additional forest requirements have been introduced through the Forest Practices Code (FPC), and the TIPSy model was approved for predicting managed stand yields for TSR timber supply analyses.

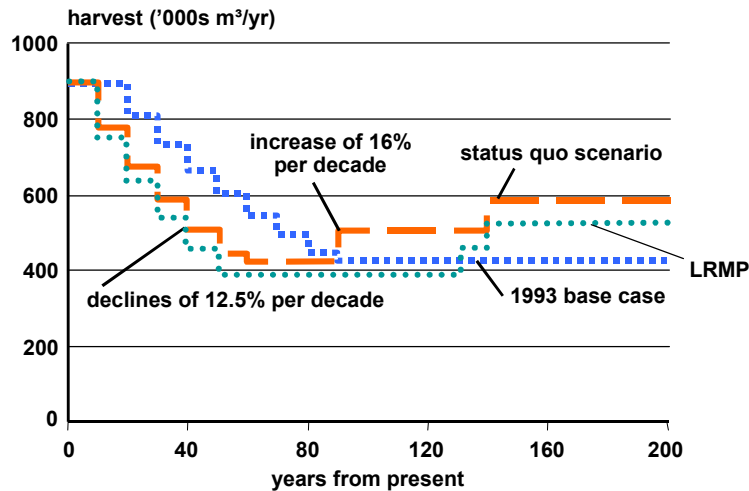
A timber supply analysis undertaken in 1995-96 for the Bulkley LRMP examined two scenarios. The *Status Quo* scenario represented current management as modeled in TSR1 plus the additional requirements of the Forest Practices Code (FPC) and increased yield tables for managed stands. The *LRMP* scenario represented the Status Quo plus management requirements defined by the Bulkley LRMP. Table A-1 compares the timber supply forecasts of the TSR1 Analysis, Status Quo scenario, and LRMP scenario. These forecasts are shown in Figure A-1.

Table A-1. Comparing harvest level forecasts of the TSR1 base case, Status Quo scenario, and LRMP Scenario for Bulkley TSA

	TSR1 Analysis (m ³ /yr)	Status Quo Scenario (m ³ /yr)	LRMP Scenario (m ³ /yr)
Short-term	895 000	895 000	895 000
Mid-term	823 400 – 462 160	424 000	394 000 – 417 000
	9% decline/decade	12.5% decline/decade	13.5% - 14.5% decline/decade
Long-term	424 000	582 000	526 000 – 551 000



Figure A-1. Comparison of the TSR1 Base Case, Status Quo, and LRMP harvest forecasts



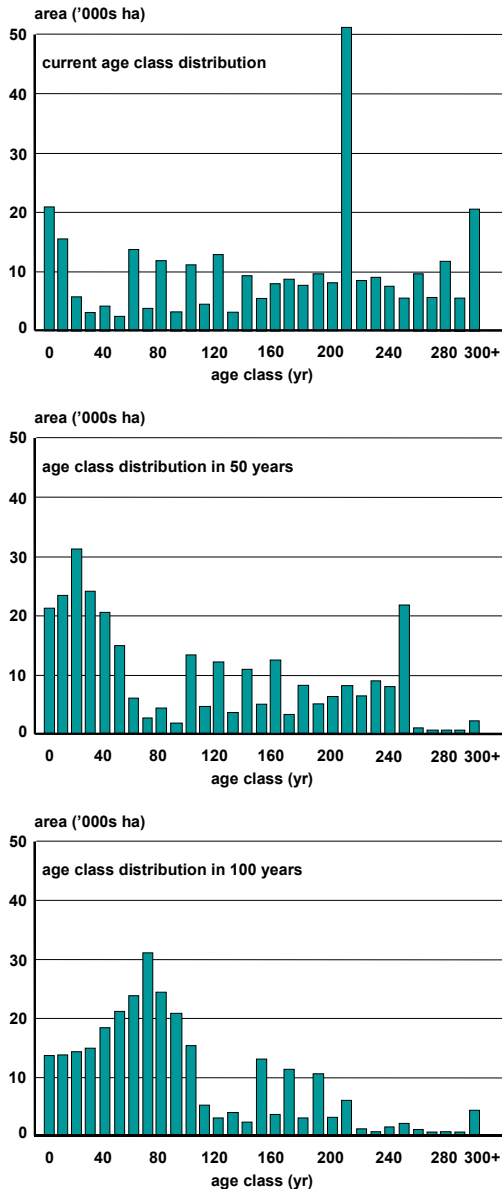
2.4.1.1 Rationing Mature Timber

In all three forecasts the harvest level declines during the transition to managed stands (Figure A-1). This decline is needed to ration the mature stands for harvesting in later periods.

Figure A-2 shows the current Status Quo age class distribution, and the projected age class distributions in 50 and 100 years. Most of the stands are older than minimum harvestable age at the beginning of the planning horizon, while the amount of area nearing these minimum requirements is low. The mature stands must be rationed until some managed stands reach operable size in decade 9.



Figure A-2. Status Quo age class distribution-timber harvesting land base, Bulkley LRMP Analysis 1996



Effects of Increasing Regenerated Stand Volumes

Figure A-3 demonstrates the effects of increasing the volumes for regenerated stands. The TSR1 analysis utilized VDYP to generate managed-stand yield curves—TIPSY had not yet been approved for TSR purposes. In the Status Quo forecast, the yields for managed stands were higher than those used in TSR1, reflecting better knowledge and experience with the growth of managed stands.

After decade 9 the Status Quo harvest forecast increases to 503 000 m³ per year, while the TSR1 base case LTHL of 424 000 m³ per year is achieved and maintained in perpetuity. The Status Quo



mid-term level is maintained until decade 13 when the harvest increases to the LTHL of 582 000 m³ per year.

Figure A-3 shows the transition (estimated) from harvesting natural stands to harvesting managed stands in the Status Quo scenario forecast. The harvest level increases significantly at decade 9 when the greater managed-stand yields start contributing to the harvest forecast.

Figure A-4 depicts the growing stock inventory levels for the Status Quo scenario. The amount of available timber decreases steadily until decade 9 when managed stands begin to contribute. In the TSR1 base case (not shown) the available growing stock volume does not increase until about 140 years from now, illustrating the effects of increasing the volumes for regenerated stands.

Figure A-3. Transition to harvesting managed stands in the Status Quo harvest forecast

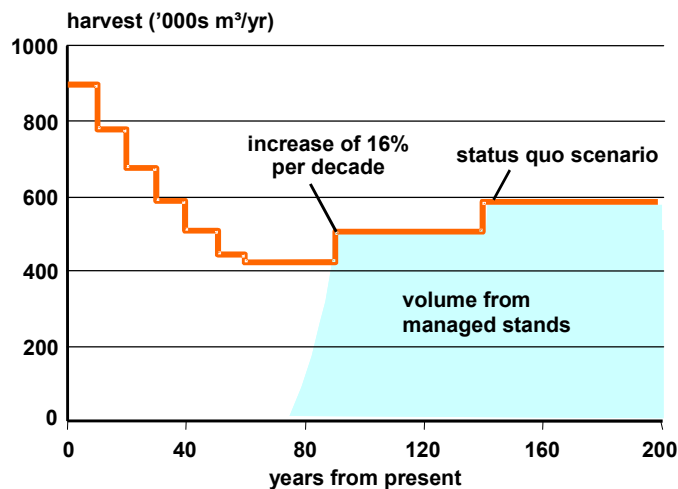
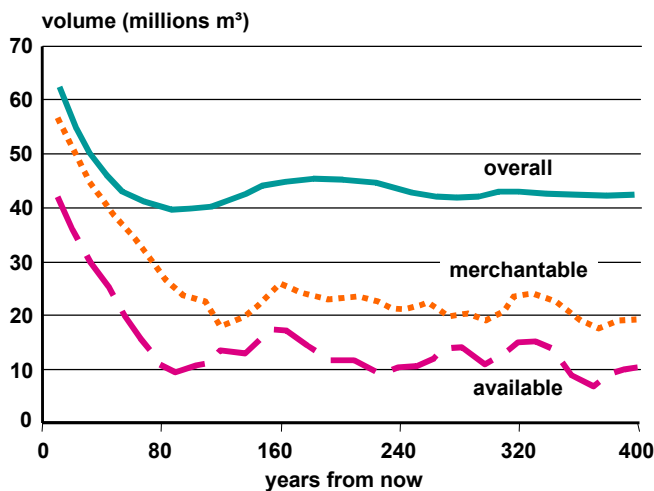


Figure A-4. Growing stock volume, Status Quo scenario, Bulkley TSA





Forest Practices Code Requirements and Assumptions

Certain assumptions were made to model the introduction of the Forest Practices Code. Requirements for Riparian Management Zones and Stand Level Biodiversity were represented by reducing stand volumes by 3.9%. Riparian Reserve requirements were modeled by reducing the area of all zones by 2.4%, a total reduction of 7300 hectares. Landscape Level Biodiversity was modeled by specifying cover constraints specifying that a minimum 21% of the area must be older than 106 years in all zones.

The volume and area reductions combined with cover constraints imposed with the Status Quo forecast caused the short-term harvest level to begin declining one decade earlier than in the TSR 1 base case forecast (Figure 2-2). The rate of decline for the Status Quo (12.5% per decade) is also greater than the TSR 1 base case (9% per decade).

Changing stand volumes has contributed to the reduced harvest levels in the short- to mid-term portions of the Status Quo forecast. The harvest level will increase after decade 9 even though volumes are reduced because the increased yields for managed stands outweigh the effects of decreasing the volumes by 3.9%. This demonstrates that the short to mid-term timber supply is very dependent on the volumes generated by the existing stands.

Also contributing to the decrease in the forecast is the reduction of the timber harvesting land base. The decrease used to account for Riparian Reserves illustrates the effects of net downs on the timber harvesting land base. As environmental and social values reduce operable area the harvest forecast must decrease.

The final assumption used to model the Forest Practices Code restrictions is the use of old-growth forest cover constraints on all zones. Restricting the amount of the land that can be greater than 106 years old affects harvesting from the mature stands upon which the harvest forecast is dependent.

Effects of Different Silvicultural Regimes

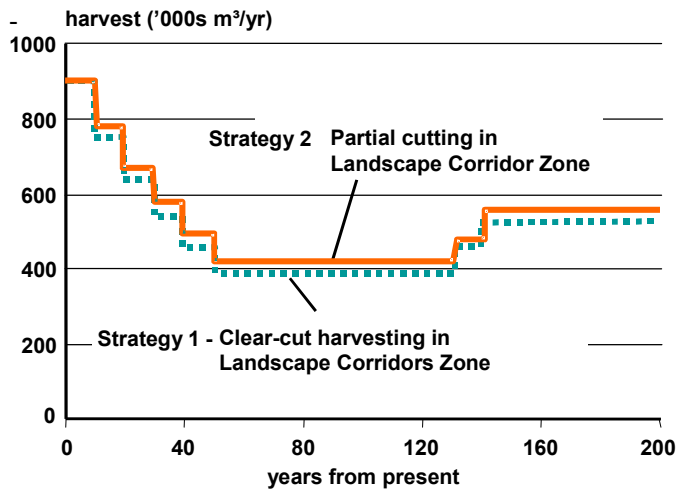
Two strategies were modeled in the LRMP scenario. The first strategy, the LRMP base case in the previous figures and tables, modeled the Landscape Corridors zone using clearcut harvesting with a cover constraint requiring a minimum 70% of the forest in the zone to be greater than 80 years old. In the second strategy, the Landscape Corridors zone was modeled with partial cutting and no cover constraints. Initial harvest entry in this zone was set to equal the mean weighted culmination age for this zone; re-entry was at 30-year intervals; and growth was equal to 30 times the culmination mean annual increment (CMAI) for the zone ($2.4 \text{ m}^3/\text{ha}/\text{yr}$).

Figure A-5 illustrates the effects of utilizing these two silvicultural regimes. The partial cutting alternative increased the mid-term and long-term harvest rates by approximately 6%. Partial cutting also allowed a more gradual decline of 13.5% per decade rather than the clear cutting regime of decline of 14.5% per decade. The long-term harvest level also rises 5% compared to the clear cutting alternative regime.

Employing alternative silvicultural regimes such as partial harvesting helps alleviate some forest cover constraints. Since partial harvesting does not remove all the merchantable older timber in an area, old-growth forest cover constraints will not be violated. This allows the harvest forecast to capture additional volume from older stands in constrained areas.



Figure A-5. Alternative silviculture regimes, LRMP scenario, Bulkley TSA



Timber Supply Dynamics -- Summary

The base case harvest forecast has changed since 1993. This change can be attributed to changes in the Forest Practices Code, as well as the introduction of TIPSy for representing growth of managed stands.

The age class structure of the TSA is characterized by a physical shortage of younger stands approaching minimum harvesting age and the current and scheduled rates of harvest substantially exceeds the growth rate and the long term harvest level. The harvest-forecast decline can be mitigated by utilizing alternative silvicultural methods. Partial harvesting alleviates the constraints set by old-growth forest cover constraints, therefore allowing harvesting to occur in stands that were previously unavailable because of forest cover requirements.



Appendix B. Executive Summary, Incremental Silviculture Strategy for BC

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

- Sustainable Use
- Community Stability
- A Strong Forest Sector

Key Principles

- 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:

- 1 Minimize the anticipated interim reduction in timber supply so that provincial annual harvests of at least 65 million m³ can be achieved.
- 2 Create a long-term timber supply capable of supporting a steady long-term provincial harvest level of at least 75 million m³.
- 3 Over the long term, maintain the production of premium quality logs at or above 10% of total harvest.

Major Silvicultural Strategies

- 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.

Other silvicultural and non-silvicultural strategies must also be implemented to achieve the working targets.

Strategy Implementation

Regional and management unit strategies must be developed, followed by programs and plans to implement them



Appendix C. Summary of Workshop Evaluations–Bulkley TSA (8-9 Feb 2000)

Please circle the number that best represents your view.

1 Length of session	5 too long	4 (1)	3 just right (4)	2	1 too short
2 Level of detail of content	5 too much	4 (1)	3 just right (4)	2	1 not enough
3 Instructional method (style, interaction, clarity)	5 excellent (2)	4 (2)	3 adequate (1)	2	1 poor
4 Relevance to your interests/needs	5 extremely (1)	4 (2)	3 average (2)	2	1 not at all
5 Extent to which your needs were met	5 entirely	4 (1)	3 average (4)	2	1 not at all
6 Usefulness of the handout graphics and texts	5 very (1)	4 (2)	3 adequate (2)	2	1 useless

What were the strengths of this workshop?

- Presence of industry, ministry and consultants to provide information.
- Good facilitators.
- Focus on relations between TSR falldown issues and silv. strategies. Problem > analysis approval was good.
- Covered a lot of issues quickly.

What were the weaknesses of this workshop?

- Some time could have been reduced if information sent to facilitators was put into the desired format..for us to change or add from there.
- Difficulty of linking Districts silv.strategies with this technique was apparent. District didn't fit well into activity ranking exercise.
- Some major licensees weren't here.

How could this workshop be improved?

- More of a presence from all levels of Silviculture and Planning from the different groups mentioned above, (industry, ministry and consultants).
- In this specific case, adapt ranking format to try to reflect District process.
- Tea would be great.

Other comments? (use back if necessary)

Most of the ideas driving this workshop process are already being implemented in the Bulkley TSA to determine silviculture investment. Will the strategy that evolves from this process reflect the existing strategy fairly?