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**THE NEED FOR
FOREST RENEWAL
AND
MANAGEMENT IN
BRITISH COLUMBIA**

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AND
MANAGEMENT IN BRITISH COLUMBIA

Background Paper
for the
Canada - British Columbia
Agreement
on
Forest Renewal and Management

November, 1983

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Executive Summary

1. About 8.2 billion m³ of mature timber is available in British Columbia. Approximately 95 percent of this total is softwoods, primarily hemlock, spruce, balsam and lodgepole pine. The remaining 5 percent is hardwoods, primarily Aspen.
2. This resource supports an annual harvest of up to 75 million m³, approximately one half of Canada's total harvest. A diversified processing industry produces a wide range of products including lumber, veneer, plywood, pulp and paper. In total, the industry generates shipments valued in excess of \$7 billion annually, and provides direct employment for 95,000 persons or approximately 8% of the B.C. labour force. Also, the forest industry, as a basic industry, indirectly supports an additional 15% of the provincial labour force in service industries. Approximately one in four British Columbians depend on the forest industry for their employment.
3. Fully 70% of British Columbia's forest products are exported representing a substantial contribution to Canada's export trade. The major markets vary from product to product, but on an overall basis, the United States and the European Economic Community predominate.
4. World demand for forest products has been predicted to increase sharply in the future. The World Bank projects an 82% increase in wood fibre demand by the year 2000 and a 234% increase by the year 2025. The major growth areas are expected to be paper and wood panel products.
5. In spite of this expanding market, the future of the British Columbia forest product industry is uncertain. In the developed areas of the province the Annual Allowable Cut is already fully committed and few opportunities for expansion exist.
6. In fact, at the present levels of forest management, in the longer term British Columbia's timber harvest is expected to decline. This results from the eventual exhaustion of old growth stands incorporating high volumes of timber accumulated over centuries, and the continuing withdrawal of productive forest land for agriculture, urban development and other uses.
7. This future "fall down" in timber supplies can be alleviated by improved forest management. In spite of present silvicultural activities, over a million hectares of Crown forest land (including 600 thousand hectares of good and medium growing sites) in the province are Not Satisfactorily Restocked. The rehabilitation of the good and medium growing sites alone would add 1.7 million m³ to the long run sustainable yield based upon the production of natural stands. Further increases are likely due to the planting of genetically improved stock, follow up brush treatments and stocking control measures which result in higher yields than obtained on natural stands.

8. Increases in long run yields can also be attained by Juvenile Spacing and Fertilisation. These programs can reduce the time necessary for the stand to reach merchantable size, improve stand quality and reduce the incidence of losses due to insects and disease. Juvenile spacing and fertilisation can increase final yields by as much as 50 percent.
9. A preliminary economic evaluation of NSR reforestation and spacing/fertilisation on a good growing site in the Vancouver forest region indicates a rate of return on both types of investment of between 5 and 10%.
10. Improved forest management is a potentially potent creator of productive short term employment. Many of the activities involved are relatively labour intensive and utilise readily available skills within the forest industry. Each hectare of forest land treated can create between 4 and 4.5 days of employment
11. Failure to improve forest management can result in substantial social and economic costs being imposed on future generations. The projected fall down in timber supplies would result in a major decline in the forest industry. This would create high unemployment rates, massive dislocation of workers and their families and a variety of other social problems.

1.0 The British Columbia Forest Economy

1.1 The Resource

British Columbia ranks as Canada's third largest province with a total area of 95 million hectares. Over 52 million hectares or 55 percent of this total is forest land. Forty seven million hectares or 49 percent of the total is classified as "productive" forest land in the sense that it can grow a crop of timber within a reasonable time frame. The forests on this productive forest land are divided between mature and immature with about 27 million hectares classified as mature and 20 million hectares classified as immature.

The volume of mature timber in the province exceeds 8.2 billion m³. Provincial Crown lands contain almost 96 percent of this total with approximately 3 percent on private lands and the remaining 1 percent on Federal Crown lands. Approximately 95 percent of this volume is made up of softwoods while the remaining 5 percent is hardwoods.

The principal softwood species in British Columbia are hemlock, spruce, balsam and lodgepole pine. These constitute approximately 77 percent of the total volume of mature timber. Aspen is the principal hardwood species making up approximately 60 percent of the volume of mature hardwood timber and 3 percent of the total volume of mature timber.

1.2 The Industry

This vast forest resource supports a large and diversified industry in British Columbia. In 1980, 74.7 million m³ of timber

Table 1

Total Area Classification by Land and Ownership Groups
(Hectares)

<u>Ownership</u>	<u>Provincial</u>	<u>Federal</u>	<u>Crown Grants</u>	<u>Total</u>
Productive Forest Land				
Mature	26 001 347	168 300	649 725	26 819 273
Immature	18 626 686	211 813	1 558 705	20 397 204
Non-Productive Forest Land	<u>4 315 594</u>	<u>69 601</u>	<u>433 323</u>	<u>4 818 518</u>
Total Forest Land	48 943 628	449 714	2 641 753	52 035 094
Non-Forest Land	38 281 503	425 780	1 682 140	40 389 423
Water (Fresh)	<u>2 339 507</u>	<u>6 521</u>	<u>4 729</u>	<u>2 350 757</u>
Total Area	89 564 637	882 015	4 328 622	94 775 274

Source: B.C. Ministry of Forests Inventory Statistics

were harvested in the province, representing approximately one half of Canada's total harvest. Harvesting alone supported a work force in excess of 24,000 persons with salaries and wages of approximately \$600 million. Beyond this, further processing in the wood and pulp and paper industries employed an additional 73,000 persons with wages and salaries of approximately \$1.8 billion.

The wood industry produces a wide range of products and serves a variety of markets. The sawmill and planing mill sector is by far the most important. There are over 300 sawmills in British Columbia (excluding small "farmer" mills.) Two hundred and thirty of these have capacity of less than 700 m³ per eight hour shift. At the other extreme, 11 mills have capacity greater than 1 650 m³ per eight hour shift. In total, this sector shipped approximately 26.4 million m³ of lumber in 1980 worth about \$2.8 billion. The vast majority of this was soft woods primarily spruce, pine, fir and hemlock. This represented 63 percent of all the lumber produced in Canada during 1980.

Table 2

OPERATING SAWMILLS in B.C.
(Eight hour log input m³)

<u>Capacity</u>	<u>Number</u>
Unknown	52
1 - 700	185
701 - 1175	66
1176 - 1650	8
over 1650	<u>11</u>
Total	322

Source: B.C. Ministry of Forests Mill Lists (March, 1983)

Table 3

Major Sectors of the British Columbia Forest Industry in 1980

Sector	Value of Shipments (million \$)	Wages and Salaries	Employees
Logging	2,610	588	24,270
Sawmills and Planing Mills	3,448	894	35,850
Veneer and Plywood Mills	551	161	6,928
Shingle Mills	141	40	1,714
Miscellaneous Other Wood Industries	382	96	5,216
Total Wood Industry	4,522	1,191	49,708
Pulp and Paper	2,832	545	19,066
Other Allied Industries	252	50	2,474
Total Paper and Allied	3,084	595	21,540

Source: Statistics Canada Catalogue 25-202, Canadian Forestry Statistics

Second in relative importance in the wood industry is the veneer and plywood sector. Twenty nine mills operated in British Columbia during 1980 and produced 1.9 million m³ of softwood plywood worth about \$550 million. This represented about 85 percent of total Canadian production. Shake and shingle mills produced products valued at \$142 million in 1980. This was about 80 percent of Canada's total production of these products.

Miscellaneous products from sash, door and other millwork plants, wooden box factories, coffin and casket plants etc. added an additional \$380 million in total shipments in 1980.

In addition to the wood industry, there are 24 pulp and paper mills in British Columbia. Fourteen of these produce only pulp, two produce only paper, while the remainder are integrated pulp and paper operations. Further processing is performed by asphalt roofing manufacturers, paper box and bag manufacturers and other miscellaneous industries.

The total value of pulp, paper and allied industry shipments was \$3.1 billion in 1980. Pulp accounts for approximately \$1.8 billion of this total. An additional \$1.0 billion is accounted for by paper and paper board production with newsprint constituting about 60 percent of this total. Other miscellaneous allied industries account for the remaining \$300 million of total output.

British Columbia mills produced 517 million tonnes of wood pulp in 1980 representing about 28 percent of total Canadian production. British Columbia's share of total newsprint production was considerably less, but is still significant, at 16 percent.

1.3 Markets

Seventy percent of British Columbia's manufactured forest products are exported and they represent a significant contribution to Canada's export trade. In 1980, the total value of British Columbia's forest product exports was \$5.5 billion. This represents a substantial 57 percent of British Columbia's total export revenues. Four products constitute the bulk of forest product exports: softwood lumber, bleached Kraft pulp, newsprint and softwood plywood.

Lumber alone accounted for \$2.5 billion or 44 percent of forest product exports. The dominant market served is the United States which took 50 percent of B.C.'s total output in 1982. This share of total production has attained a high of 70 percent (in 1972) and seldom falls below 50 percent. The United Kingdom is a proportionately declining market. In the mid 1950's, the United Kingdom took 13 percent of British Columbia's total lumber shipments but this has declined below 5 percent in recent years. In contrast, Japan represents a growing market. Shipments to Japan began in the early 1960's and by 1982, 10 percent of British Columbia's total shipments went to this nation. Other nations in total take between 5 and 8 percent of British Columbia's total output, while the domestic Canadian market generally represents less than one third of production. In total, British Columbia contributes 6.5 percent of annual world consumption of softwood lumber.

In the case of bleached Kraft pulp, the European Economic Community is the dominant market area, taking up to one half of British Columbia's total exports. Both the United States and Japan are also

Table 4

Annual Lumber Shipments by Destination
for Selected Years

YEAR	Total B.C. Shipments (000m ³)	Destination (%)				
		Canada	U.S.	EEC	Japan	Other
1973	24,394.6	19	65	6	6	4
1976	25,127.5	25	59	8	6	2
1979	30,069.7	22	61	7	8	2
1982	24,280.6	28	50	7	10	5

Source: Council of Forest Industries of British Columbia Statistical Review.

Table 5

Annual Softwood Plywood Shipments by
Destination for Selected Years

YEAR	Total B.C. Shipments (000m ³)	Destination (%)			
		Canada	EEC	Japan	Other
1973	1,949.7	78	21	*	1
1976	1,897.0	89	11	*	*
1979	2,041.5	78	21	*	1
1982	1,463.7	75	23	1	1

*less than 1 percent

Source: Council of Forest Industries of British Columbia Statistical Review.

Table 6
Annual Bleached Kraft Pulp
Shipments by Destination
for Selected Years*

Year	Total B.C. Exports (000 tonnes)	Destination %			
		U.S.	EEC	Japan	Other
1973	1,773	15	49	24	12
1976	1,947	14	44	17	25
1979	2,281	10	51	26	13
1981	2,381	10	46	24	20

Source: B.C. External Trade Report, Ministry of Industry and Small Business Development, Govt. of B.C.

*This table is based on exports shipments which exceeded \$75,000 in aggregate value. As a result, coverage is incomplete particularly for the U.S. and other markets served by rail.

Table 7
Annual Newsprint Shipments
by Destination for
Selected Years

Year	Total B.C. Shipments (000 tonnes)	Destination (%)			
		Canada	U.S.	Australia	Other
1973	1 334	11	70	4	15
1976	1 327	10	71	5	15
1979	1 353	11	73	6	10
1981	1 158	11	72	4	13

Source: Council of Forest Industries of British Columbia Statistical Review.

B.C. External Trade Report, Ministry of Industry and Small Business Development, Govt. of B.C.

important markets taking jointly up to 40 percent of total exports. The domestic Canadian market represents only about 5 percent of total production. Overall, British Columbia's production constitutes about 9 percent of annual world consumption.

The United States is by far the dominant market for newsprint taking over 70 percent of British Columbia's total output. British Columbia shipments to the United States represent about 10 percent of this nations consumption. Australia is another major market area taking between 4 and 6 percent of annual output while the domestic Canadian market represents between 10 & 11 percent of British Columbia's annual output. In total, British Columbia produces some 6 percent of world newsprint consumption.

The domestic Canadian market is dominant for softwood plywood, taking between 70 and 80 percent of annual output. The United Kingdom and other European Economic Community nations are the most significant export markets representing between 20 and 25 percent of output. In recent years (the 1980's) Japan has begun to import some British Columbia production. However, this still represents a very small one percent of output. British Columbia has consistently provided about 10 percent of world consumption of softwood plywood. Unfortunately, tariff barriers have prevented a more extensive penetration of foreign markets.

1.4 The Role of the Forest Industry in British Columbia

The forest industry is the most important in the province of British Columbia. Its contribution to employment, exports, provincial

revenues and economic growth and development in the province are unparalleled. As well, there are many communities throughout the province which are dependent on the forest resource as their major or only economic base.

Employment in the forest industry constitutes approximately 8 percent of total B.C. employment. Logging accounted for fully 1/3 of total provincial employment in primary industries. Employment in wood based industries accounts for fully 44 percent of total provincial employment in manufacturing. Also, forestry as a basic industry indirectly supports an estimated additional 15 percent of the provincial labour force in service industries. In 1979, the B.C. forest industry (exclusive of its employees) paid an estimated \$688 million in taxes, fees and royalties to the provincial government. This accounted for 21 percent of all budgetary revenue from sources other than personal income tax. A further \$279.4 million was estimated to have been paid to the federal government.

On the basis of the forest industry, the Province of B.C. has been in the forefront of economic progress in Canada over the last 25 years. Provincial population growth of 25.6% over the period 1971-1981 is exceeded only by Alberta. Similarly, B.C.'s labour force has grown faster than the Canadian average. Salaries and wages have shown a similar trend with average weekly earnings the highest in Canada.

2.0 Forest Resource Management

Until quite recently, British Columbia's wood supply was immense in relation to the demand for it. The resource could be treated as a straightforward source of revenue with the rate of exploitation having few long term implications. Timber owners and holders of rights to Crown timber were relatively free to harvest at whatever rate they chose and new Crown timber tenures were made available when requested. As demand increased over time, the limited nature of the resource was recognised. The British Columbia Ministry of Forests Act now requires that the Ministry "... manage, protect and conserve the forest and range resources of the Crown having regard for the immediate and long term economic and social benefits they may confer ..."

To fulfill its modern management responsibilities, the Ministry employs over 4,000 people including professional foresters, agrologists, economists, biologists, engineers and other specialists. The Ministry maintains a strong regional structure with general policy direction and some staff support provided by provincial headquarters in Victoria. Each of six Forest Regions has a head office staffed by professionals and technicians to meet the needs of the area. Each region is further sub-divided into districts with personnel assigned to manage and monitor the local forests.

A key responsibility of the Ministry of Forests is the regulation of harvests throughout the Province. An "annual allowable cut" (AAC) is chosen at a harvest rate consistent with the orderly liquidation of presently mature timber. A key activity in relation to this is forest inventory. Continuous surveys result in periodically revised estimates

of forest cover and the volume of timber in each management area, as well as growth rates for each forest type. This physical accounting of the resource is used, after a number of important adjustments*, to calculate the constant amount of timber which can be harvested over a full growing cycle. This AAC is then allocated for a variety of management units.

The most important management units are Timber Supply Areas (TSA's) and Tree Farm Licensees (TFL's). TSA's consist of provincial Crown land from which the established AAC is normally committed for varying periods to many licensees under a variety of harvesting arrangements. TFL's include some private land as well as provincial Crown land and are committed to a single licensee. The relative importance of TFL's and TSA's in the provincial total AAC is indicated in Table 8. Approximately 68 percent of the AAC is in TSA's, approximately 27 percent is in TFL's while the remaining 5 percent is in other private and Federal lands.

Actual production from these management units is dependant on market demand, but an overall increasing trend is evident. During the recession of 1975, the harvest fell to 50 million m³ but then increased to a record 76 million m³ by 1979 before falling back to a 1981 harvest of 63 million m³. The published harvesting goal of the Ministry of Forests is 75 million m³ per annum.

* Adjustments are made to reflect withdrawals of land and elimination of productive areas for permanent roads, settlements etc.; delays in regeneration; breakage during logging; losses from fire; and other miscellaneous influences.

Table 8

Summary of Annual Allowable Cuts, and Harvesting Allocations
(May, 1983)

Forest Region	Allocated (or Pending) (m ³)	AAC (m ³)
Vancouver	8,742,760	8,900,000
Prince Rupert ^a	7,706,120	6,750,000
Prince George	15,017,660	14,850,000
Cariboo	5,997,200	6,050,000
Kamloops	6,910,470	7,000,000
Nelson	4,478,770	4,569,000
Sub Total	48,750,980	48,119,000
TFL's ^b	19,339,096	19,339,096
Private Lands ^c	(3,000,000)	(3,000,000)
Federal Lands ^d	(300,000)	(300,000)
Total	71,390,076	70,758,096

^a Cassiar T.S.A. excluded. Yield Analysis Pending.

^b Included Crown and Private Lands

^c Outside of T.F.L.'s; rough estimate based on productive forest land yield potentials.

^d Average annual harvest level in 1980 and 1981.

Source: MOF Timber Supply Area Yield Analysis Reports, 1980-82
: MOF Timber Supply Area Annual Allowable Cuts & Apportionment Reports 1981-82.

Another major activity of the Ministry of Forests is protection of the resource from wildfire and insect pests. In 1981/82, 106 thousand hectares and an estimated 5 million m³ of timber were lost to wildfire. Provincial goals are to hold the area and volume lost below 69,000 hectares and 2.57 million m³ per annum. An estimated 12 million m³ of timber are lost to insect pests annually. The most significant problems are the mountain pine and spruce beetles. Most infestations have been expanding and intensifying. Recently, \$11 million was allocated for a two year program aimed at controlling and limiting the spread of these pests.

Table 9

Area and Timber Burned by Wildfires in 1981-82

Region	ha	'000 m ³
Cariboo	1 843	22
Kamloops	1 425	91
Nelson	654	113
Prince George	83 291	3 591
Prince Rupert	18 696	1 045
Vancouver	<u>684</u>	<u>183</u>
Total	106 593	5 051

Source: BCMF Annual Report, 1981-82

A final major activity of the Ministry of Forests is silviculture. Silviculture is aimed at re-stocking denuded forest land and improving the productivity and value of existing stocks. In 1982, 56,000 hectares were prepared for either natural re-stocking or for planting. An additional 60,000 hectares were planted and 3,000 hectares were brushed and weeded to control undesirable vegetation in young stands.

In addition, under the Federal/Provincial Intensive Forest Management Subsidiary Agreement, 3,000 hectares of backlog forest land which had been denuded for a number of years were rehabilitated while 10,000 hectares were planted. Also, 19,000 hectares were spaced in order to select a potential superior crop and remove the less valuable trees and 16,000 hectares were fertilized to promote a rapid acceleration of forest growth.

Most silviculture projects are undertaken by small forestry firms, either through competitive contracts with the Ministry of Forests or under contract with licensees who are responsible for some silviculture work in conjunction with their contract to harvest public timber. Some projects are undertaken by licensees themselves. A small fraction of silviculture work for which the above arrangements are not suitable is undertaken directly by the Ministry of Forests. The present Intensive Forest Management Subsidiary Agreement involves only that part of the silviculture activity on provincial Crown lands which is under direct operational control by the Ministry of Forests. Activities undertaken by licensees are not cost-shared.

Responsibility for administration of silvicultural projects is delegated to field staff in the Ministry of Forests' 46 District Offices. For projects to be undertaken by Ministry of Forests' contract, District staff identify areas to be treated, develop prescriptions for these in accordance with the Province's silvicultural guidelines, advertise the projects, select the successful bidders, and administer the contracts. There would normally be no involvement of regional or Victoria Headquarters staff in these activities between the approval of the budgets from which the projects were funded and some

after the fact monitoring. Delegation of responsibility for individual projects is essential for efficient administration of silviculture in an area the size of B.C. Overall direction of silvicultural activity throughout the province is accomplished through the Ministry of Forests' Management System.

3.0 Future Prospects

The demand for forest products on a world basis has been predicted to increase sharply in the future. The World Bank, in a forecast closely paralleled by other forecasts prepared by the FAO, suggests an 86 percent increase in total demand for all timber products over the period 1976 to the year 2000. Even with increased residue use and recycling, net wood fibre demand is still projected to increase by 82 percent over this period. The major growth area is predicted to be paper products followed closely by wood panel products with expected growth rates of 204 and 176 percent respectively. Although lumber demand is expected to be slower growing, its predominant position in overall world consumption implies that a major quantitative increase will also take place here.

Table 10

World Demand For Wood and Wood Products at Fixed Prices^a

	Roundwood equivalent (million m ³)			% increase on 1976	
	1976	2000	2025	2000	2025
Sawnwood	736.9	1,308	2,582	78	250
Panel products	149.4	413	920	176	516
Paper & paperboard	249.9	760	1,834	204	634
Other Industrial wood	203.9	280	531	32	160
Total Industrial wood	1,340.1	2,761	5,867	106	338
Fuel incl charcoal	1,451.3	2,329	3,481	60	140
Total removals to satisfy wood demand	2,791.4	5,090	9,348	82	234

^a Adjusted for residue use and recycling.

Source: Derived from World Bank (1978).

The potential clearly exists for a major expansion of the British Columbia forest industry. Unfortunately, in the developed portions of the province, the Annual Allowable Cut has already been fully committed. Some additional expansion in pulp production may be possible but very little opportunity exists for the expansion of sawmilling. In fact, at present levels of forest management, British Columbia is faced with a long term reduction in the quality and quantity of timber available for harvest. In spite of a buoyant market, the forest industry faces an era of no growth and ultimately a decline in timber yields.

There are many reasons for these impending problems. First, present harvest levels reflect the high volume accumulated over several centuries in old growth stands. The contribution of these old growth forests will diminish with each decade as harvesting progresses. The younger forest which replaces the old growth contains much less volume when they in turn are ready for harvest. As the total harvest shifts from old growth to younger stands, the harvest level falls as a result.

Second, withdrawal of forest land for other uses is consistently reducing the land base available for forest production. Also, these withdrawals tend frequently to be the most productive forest sites such as valley bottoms. Based upon detailed regional analyses, the Ministry of Forests predicts that as much as 5 percent of the provincial forest land base will be converted to hydro reservoirs, farms, urban centres and other uses over the next twenty years. Future timber harvests must come from the resulting smaller, less productive land base.

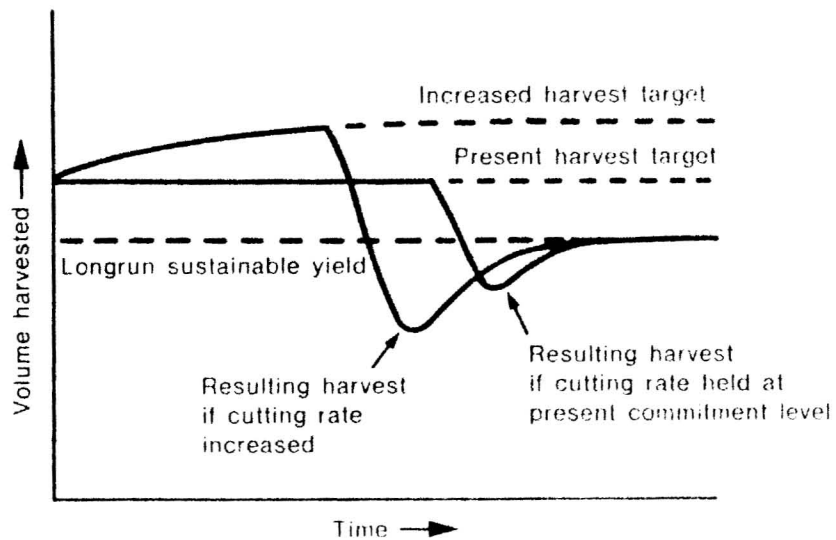
Table 11

Provincial Wood-supply Picture by Region and the Variation
Between Areas Within Regions at Current Commitment Levels¹

Region	Years Until Forecasted Supply Falldown Begins (By Region)	Estimated Range in Years Until Forecasted Falldown Begins (Within Regions)
Bulkley-Northwest	40	5 - 60 +
Cariboo	100 +	10 - 100 +
Kamloops	30	10 - 40 +
Nelson	70	5 - 70 +
Peace River	100 +	20 - 100 +
Prince George	60	5 - 100 +
Prince Rupert	80	10 - 80 +
Vancouver	50	10 - 60 +

1. A more detailed regional breakdown and commentary is contained in Appendix A.

Figure 1



Finally, a proportion of the volume of mature timber cannot be harvested profitably with current or foreseeable technology or market conditions. Some stands are of such a low quality or meagre volume or they are in such small isolated parcels that they cannot be economically exploited. Other sites are sensitive due to high elevations, steepness of slope or other non-timber values which imply they should not be harvested even if economically feasible. This has already resulted in timber shortages in some areas of the province in spite of apparently significant volumes of mature timber. In the future these shortages will become more extreme.

The extent of potential resource shortfalls was investigated in the B.C. Ministry of Forests first "Forest and Range Resource Analysis" published in March 1980. This study concluded that the overall timber supply could fall to two thirds of the present harvest level when the old growth stock is exhausted. There is considerable variation both between and within regions with respect to the timing and extent of the supply reduction. In some regions and in some parts of regions, timber supplies are still plentiful and will remain so for some considerable time. However, in other areas the fall down in supply is imminent, occurring as early as 5 years. Another important conclusion of the Forest and Range Resource Analysis was that increased harvests in the short term would simply intensify the eventual fall down and lead to earlier incidence.

In short, the British Columbia forest industry faces a difficult future. Although long run market trends are strong and hold the promise of significant industry growth, a fundamental resource constraint is evident. The industry has been based upon the harvest of

a standing merchantable crop of old growth timber. The physical limitations of this are now in sight and the industry must make a transition to a smaller more constrained resource base. Given the key role which the forest industry plays in the economy of British Columbia, dealing with this problem is central to the future prosperity of the province.

4.0 The Development Opportunity

The projected fall down in timber supplies outlined in the preceding section is predicated on the current level of resource management. Although the British Columbia Ministry of Forests is committed to a silviculture program, there is considerable scope for expansion and improvement. It is possible through improved forest management to alleviate the worst of this timber supply problem.

For example, in spite of present silviculture activities, there is unsatisfactory regeneration on considerable lands disturbed by harvesting, fire, insects and disease. Each forest region in the province has determined, at least on a preliminary basis, minimum stocking standards taking account of the biological, geological and climatic conditions in the area. These standards set out a number of trees per hectare as well as preferred and acceptable commercial species by subregion. Areas which do not meet these standards are termed Not Satisfactorily Restocked (NSR). Of particular importance are areas which do not meet these standards within a reasonable time after disturbance. This "backlog" NSR requires some form of intervention to achieve its forest production potential.

The area of backlog NSR in British Columbia is extensive and a large proportion of it lies on "good" and "medium" growing sites (see Table 12). The total area represents approximately 2 percent of British Columbia's total productive forest land and a far higher proportion of the most productive forest land in the province. Conservatively, the rehabilitation of good and medium growing sites would add 1.7 million m³ to the long run sustainable yield of timber.

Table 12

Estimated Areas^a of Not Satisfactorily Restocked
Crown Forest Land as of June, 1982

<u>Region</u>	<u>GOOD</u>	<u>MEDIUM</u>	<u>SUBTOTAL</u>	<u>POOR</u>	<u>LOW</u>	<u>TOTAL</u>
	------(hectares)-----					
Cariboo	13 510	34 420	47 930	26 595	875	75 400
Kamloops	7 870	31 720	39 590	15 525	185	55 300
Nelson	12 465	91 545	104 010	50 980	2 110	157 100
Prince George	30 835	367 915	398 750	230 045	11 925	640 720
Prince Rupert	5 115	27 740	32 855	80 825	28 020	141 700
<u>Vancouver</u>	<u>5 317</u>	<u>16 100</u>	<u>21 417</u>	<u>3 544</u>	<u>39</u>	<u>25 000</u>
TOTAL	75 112	569 440	644 552	407 514	43 154	1 095 220

Notes:^a Base data adjusted to reflect reclassification of some back-log NSR and non-commercial brush areas as either Satisfactorily Restocked or as non-productive. Also adjusted to reflect expected natural regeneration on current NSR areas.

Additional increases can be expected as genetically improved stock will be planted in some areas. Also, follow up brush treatments and stocking control measures can result in higher yields than are obtained from natural stands.

Other development potential also exists for British Columbia forests. At the juvenile stage of tree growth, a spacing program can substantially improve the final yield of forest stands. Juvenile spacing involves the selection of potentially superior trees and the removal of the less valuable. This treatment has the effect of reducing the time necessary for the stand to reach merchantable size by augmenting diameter growth. Also, it improves the quality of the stand by increasing the proportion of larger trees and reducing the incidence of losses due to insects, disease and other natural phenomenon. Fertilisation is another program which can increase final yields by ameliorating nitrogen deficiencies in many forest soils. The benefits from fertilisation and juvenile spacing are more than additive, and can jointly increase final yields by up to 50 percent in some instances. Consequently, juvenile spacing and fertilisation should be integrated in any intensive management program.

Overall, improved forest management has the potential to greatly enhance the long run productivity of British Columbia's forests. However, such a program will require the development of a comprehensive approach. First, surveys will be required in order to confirm the areas of need and prescribe the most effective treatments. Second, where planting is necessary, seeds must be procured and seedlings must be grown prior to planting. Also, a program of site rehabilitation

will be required on most backlog NSR lands. As a result of years of neglect, non-commercial brush species have encroached or soil conditions have become adverse on many of these sites. Finally, in some areas, a follow up brushing and weeding program will be required in order to remove the resurgence of undesirable competitive brush growth and to ensure the seedlings reach a "free to grow" stage. All of these elements must be balanced and matched within a comprehensive management program.

In conjunction with such an operational program, it would also be advisable to initiate a research, development and demonstration program. In British Columbia, only 0.5% of Gross Provincial Product is spent annually on research and development as compared to 1% nationally and higher levels internationally. Instances of plantation failure can be avoided by better research or the transfer of existing research to forestry practitioners. The gains from improved forest management can also be enhanced by research in tissue culture, genetics and chemical applications. An effective research and development program can do much to increase the gains from improved forest management and ensure that these gains are realized over the long term.

5.0 The Economics of Improved Forest Management

In order to clarify the costs and benefits of improved forest management, a preliminary economic evaluation of silviculture investment was attempted. At this stage the evaluation only applies to the Vancouver forest region and to the most productive forest land within this area. Also, many of the numbers presently cited must be considered rough approximation and subject to more detailed confirmation. As a result, the analysis is only intended to illustrate the nature of the returns, the pattern of costs over time and differences between different treatments. The reader should not extrapolate the conclusions beyond these limited objectives.

For ease of exposition the area subject to treatment is assumed to be one hectare. Two general projects were evaluated. First, a planting program was applied to one hectare of backlog NSR land. This project involved site rehabilitation one year prior to planting and a brushing and weeding program at the 4th year following planting. Second, an integrated program of juvenile spacing and fertilisation was applied to one hectare of trees at age 11.

The national income benefit of project is defined as the value of goods and services produced over and above that which would exist without the project. In backlog areas, without silviculture investment, the establishment of a commercial stand of timber is unlikely within a reasonable time period. Consequently, in the case of backlog planting, it is assumed that the benefits amount to the full value of the commercial timber harvest from the site. This in turn depends upon the age at harvest and the species planted.

It is assumed here that Douglas fir was the species chosen for planting on the basis of the relative productivity of the site. Based on information from the private sector, it is assumed that age 55 is the selected harvest age. The expected harvest of Douglas fir from a planted class 1 site in the Vancouver forest region is 750 m³/hectare at age 55.

The benefits of a juvenile spacing and fertilisation program amount to the increment to the expected harvest. Based on studies of the relative impact of these activities, the expected total yield would increase by 195 m³/hectare at age 55. The expected total yield of the site subject to juvenile spacing and fertilisation is 945 m³/hectare.

The issue of price trends is important in determining the benefits of a long term forest management investment. The real (1981 dollar) price for grade #2 Douglas fir on the Vancouver log market has averaged \$70.88/m³ over the last five years. However, timber is an increasingly scarce resource. A long run analysis performed by the U.S. Department of Agriculture Forest Service in 1982 estimated a trend increase in real lumber prices of 0.7 percent per annum from the year 1950 through to the mid-1970's. Also, in their opinion, this probably reflects a lower limit on future real price trends. Their market projections indicate a supply-demand gap requiring a more dramatic increase in real prices. For this reason, a trend increase in real prices of 1% per annum over the period until harvest is assumed in this analysis.

Table 13

The Benefits of Improved Management

	Backlog NSR Planting	Juvenile Spacing/ Fertilization
Timber Output (m ³)	750	195
Output Value (1981 dollars)	91,888	21,414

On the basis of the assumptions outlined, the gross benefits of the two forest management projects are presented in table 13. The gross benefits range from \$21 thousand (1981) for Juvenile Spacing and Fertilisation to \$92 thousand (1981) for backlog reforestation. The costs of obtaining these benefits fall into two distinct categories. The primary or direct costs are those goods and services which are used in each silviculture project. Based on the reported average per hectare cost of British Columbia silviculture treatments in the Vancouver forest region, estimated costs by category are presented in table 14.

The second element of national income cost is the associated cost of harvesting the resource. In valuing the gross benefits of each project, the Vancouver log market price was used. This reflects the value of output after harvesting and delivery to water. The estimated average cost of harvesting in the Vancouver forest region is \$11.00/m³ while the estimated average transport cost is \$5.00/m³. The total associated cost of harvesting and transportation ranges from \$3,120/hectare for a Juvenile Spacing/Fertilisation program to \$12,000/hectare for a reforestation program.

Table 14

Direct Costs and Time Flow of Silviculture
Investment (1981 dollars per hectare)

Year	Description	
0	Site rehabilitation	1270
1	Planting ^a	453
4	Brushing and weeding ^b	331
11	Juvenile spacing-fertilization	1180

^a Including an estimated cost of \$250 for planting stock.

^b Brushing and Weeding are not always necessary. However, in some cases brushing and weeding are necessary a number of times before the planting stock reaches a "free to grow" stage. One treatment at year 4 is intended to represent an average requirement.

The final step in the evaluation of silviculture investment is an adjustment for time. The benefits and costs of each project are realised over different time periods. While the direct costs of backlog planting are spread over a 5 year period early in the project cycle, the benefits are realised 55 years after the initial investment. In the case of a spacing/fertilisation project, all direct costs are incurred within one year, while the benefits are realised 44 years later. Society is not indifferent between benefits which are realised immediately and those which are delayed. Delayed benefits are less valuable because they are unavailable for immediate consumption or reinvestment.

The discount rate is means through which dollar benefits and costs, varying widely in timing, can be compared. The choice of an appropriate discount rate is an important issue and has led to an extensive technical literature. In general, there is no absolute consensus. Federal Treasury Board Guidelines suggest, as a rule of thumb, that present values be calculated on the basis of a range of rates, including 5, 10 and 15 percent. In this analysis, calculations are made with both 5 and 10 percent discount rates.

In the Vancouver forest region and on good site class forest land, the analysis indicates that both forest management programs are attractive investments at a 5% discount rate. The benefit/cost ratio for each program substantially exceeds the break even point of 1.0 indicating that the benefits far outweigh costs. At a 10% discount rate, improved forest management is a less attractive investment. The benefit/cost ratio for each intensive forest management program falls below 1.0 indicating negative net benefits from both projects. This

Table 15

Present Discounted Value of Benefits and
Costs of Improved forest Management

A. 1981 Dollars/ha with 5% Discount Rate

	Backlog NSR Planting	Juvenile Spacing/ Fertilisation
Gross Benefits	6278	2502
Direct Costs	1973	1180
Associated Costs	820	365
Net Benefits	3485	957
Benefit/Cost ratios	2.25	1.62

B. 1981 Dollars/ha with 10% Discount Rate

	Backlog NSR Planting	Juvenile Spacing/ Fertilisation
Gross Benefits	486	323
Direct Costs	1908	1180
Associated Costs	63	47
Net Benefits	-1530	-904
Benefit/Cost ratios	0.25	0.26

is not entirely surprising as higher discount rates work unfavorably towards long term investments such as these. Although the dollar benefits are large, discounting at 10% converts these to very small values over periods in excess of 20 years.

Implicitly, the rate of return on investment in intensive forest management, in the Vancouver forest region and on the best growing sites, lies between 5 and 10 percent. In general, this is a conservative estimate as a number of potential economic benefits have been left unevaluated. For example, project benefits were valued at Vancouver log market prices. At this stage, the product is an intermediate input to a sawmill, pulp mill or plywood and veneer operation. Any returns over and above costs of production generated further down the processing chain are also fully attributable to the silviculture investment, since, without the project, these profits could not be realised. While substantial profits may be generated at all levels of further processing in the British Columbia forest products industry, without extremely detailed information on the costs of further processing and final product prices, it is difficult to obtain an estimate of these additional benefits.

6.0 The Social Benefits of Improved Forest Management

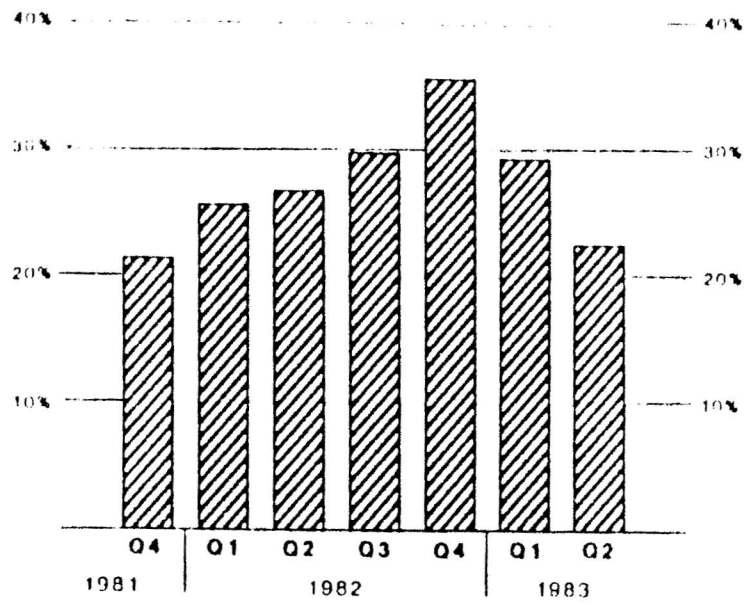
A number of considerations with respect to improved forest management cannot be captured within a strict accounting framework. For example, in the cost calculations, the resources used in improved forest management are properly valued at their full market price. This reflects an implicit assumption of full employment in the markets for both labour and capital. Given the present state of the economy, at least in the short term, this is clearly inappropriate. Unemployment is currently running at levels which have not been seen since the depression of the 1930's. Also, unemployment in the forest industry has been particularly extreme and is projected to remain so for some time in the future.

Figure 2 shows the extent of unemployment over the last 7 quarters among members of the International Woodworkers of America (the major provincial forest workers union.) IWA unemployment was already 21% by the last quarter of 1981, and unemployment increased to over 35% by the last quarter of 1982. While unemployment has fallen in 1983, it still exceeds 20%. In comparison, overall British Columbia unemployment was stable at around 6% during 1981 and even at its peak, reached only 14.7% in December of 1982.

Improved forest management is a potentially potent creator of productive short term employment. Many of the activities involved are relatively labour intensive and utilise readily available skills within the forest industry. Also, for obvious reasons, many potential project

FIGURE 2

IWA Unemployment in B.C.



Source: Research Department, Regional Council No 1, IWA

sites are ideally located to service dependant communities which are particularly seriously affected during the current recession.

Planting itself is a highly labour intensive operation. Each hectare of land planted is estimated to produce an average 1.4 days of employment. Also, other associated post and pre-planting activities such as brushing and weeding, seed collection and nursery operations are similarly labour intensive. At the other extreme, site rehabilitation is generally capital intensive requiring the use of specialised high cost equipment. Employment per hectare is probably one half of that created by planting. Juvenile spacing is almost entirely a labour using operation while fertilisation generally requires a helicopter delivery system. However, in an integrated spacing/fertilisation program, over 75% of total program costs would be a payment to labour.

Table 16 presents a summary of estimated costs and employment per hectare of both backlog reforestation and spacing/fertilisation programs. In terms of short term employment creation, a spacing/fertilisation program is generally superior to backlog re-forestation due to the long lead times and corresponding lags involved with reforestation programs. The total employment impacts of backlog re-forestation are spread over an extended time period. Only a small proportion of the total employment (approximately 16%) is generated in site rehabilitation. Another 32% is generated one year later in the planting stage while approximately 22% is generated at the brushing and weeding stage after a significant 2 to 4 year delay.

Table 16

Estimated Short Term Employment
Impacts of Improved Forest Management

	Person Days/hectare	Cost/hectare (1981 \$)
Backlog Re-forestation		
Seed Collection and Nursery Production	1.4	250
Site Rehabilitation	0.7	261 ¹
Planting	1.4	266 ¹
Brushing and Weeding	<u>1.0</u>	<u>337¹</u>
TOTAL	4.5	1,114
Juvenile Spacing and Fertilisation	3.9	983 ¹

¹ Reported Average Cost per hectare from the B.C. Ministry of Forests Annual Report for 1981/82.

Finally, the remaining employment impacts in the seed collection and nursery production stages are generated as much as two years prior to planting.

In contrast, total employment impacts in a spacing/fertilisation program are generated within a one year period. Since the project impacts are not diffused over an extended time period they can provide a more direct and immediate job creation stimulus. Such projects are more adaptable to short term local and regional needs in terms of job creation.

Another consideration which cannot be captured within a strict accounting framework relates to the long term implications of failing to proceed with improved forest management. As discussed in section 4.0, in the absence of improved forest management, the long run harvest of timber in British Columbia will decline by as much as one third from present levels. Within a benefit/cost framework, there is an implicit assumption of a costless and easy adjustment to such changed levels of economic activity. However, this is unlikely to be the case. Neither the extent of the fall down in timber supplies, its timing nor, for that matter, the geographic distribution of future timber shortages is known with precision. Also, the implications of fall down are not well understood by the public. In general, long run decisions are being made to invest in plant and equipment and regarding location of residence etc. on the assumption of future continuity of timber supplies. Given this fact, future timber shortages could result in substantial social and economic costs being imposed on future generations of British Columbians.

On a minor scale, there are a number of instances which provide illustrations of the type of effects which can be expected. For example, Ocean Falls is a community which was developed on the basis of assumed adequate long run supplies of wood. The closure of the mill entailed and is entailing high unemployment rates and dislocation of workers and their families. This has involved substantial private and public financial costs. The value of residences has declined dramatically and this has presented exceptional difficulties for individuals whose major form of saving has been home ownership. In many cases, substantial re-location costs have been incurred in order to obtain alternative employment. Unemployment itself has resulted in financial losses to individuals as well to government through the Unemployment Insurance Program. Also, large social investments in schools, hospitals, transportation and communication systems have been made redundant.

Events at Ocean Falls pale to insignificance comparative to the potential effects of the projected fall down on the British Columbia economy. A one third decline in the timber supply from current levels would multiply the Ocean Falls experience many times and would have massive and pervasive effects throughout the British Columbia economy. Based upon current employment figures, such a contraction would throw 31,000 British Columbians out of work in both logging and wood based manufacturing industries. Due to the central importance of the forest industry to British Columbia, at least an equivalent number of jobs would be lost in other sectors including the transportation industry, the capital repair and construction industry, the material and supply

industry and, most significantly, the retail and personal service industry. The major effects would be largely localised in forest dependant communities, but every major settlement in British Columbia would be impacted.

It is estimated that one in four jobs in British Columbia owes its existence to the forest industry. It is unlikely that this dependance will change dramatically in the near future. In the final analysis, a major decline in the forest industry may require massive out-migration of workers from the province and this type of adjustment can extend over lengthy time periods. Also, the major burden of adjustment is likely to fall on senior government as the financial ability of the province to respond would be seriously impaired.

Clearly, avoidance or, at least reduction of these social costs may be a principle benefit of investment in improved forest management. The potential jobs saved in the long term varies from forest region to forest region. Based upon current employment levels, harvesting and processing employment generated per hectare of backlog reforestation ranges from a high of 0.8 person years in the Vancouver forest region to a low of 0.2 person years in the Cariboo forest region. Complete reforestation of all "good" and "medium" backlog sites throughout the province could generate total employment of approximately 200 thousand person years. Per hectare employment generated by an integrated spacing/fertilisation program could range from 25% to 50% of that generated by backlog reforestation.

Table 17

Estimated Harvesting and Processing Employment
Generated by Backlog Reforestation

	Good and Medium Backlog Area	Harvesting and Processing Employment per Hectare (person years)	Total Harvesting and Processing Employment (person years)
Vancouver	21,417	0.8	17,134
Prince Rupert	32,855	0.4	13,142
Prince George	398,750	0.3	119,625
Cariboo	47,930	0.2	9,586
Kamloops	39,590	0.3	11,877
Nelson	104,010	0.3	31,203
Total	644,552		202,567

8.0 The Case for Federal Involvement

It is easily seen from the preceding discussion that some remedial action is necessary if a fall down in harvest is to be avoided. Such a fall down would seriously affect employment and incomes throughout the province and result in a dramatic decline in provincial economic activity. Given the apparent opportunity for growth in the forestry sector, allowing such a decline is both unwise and unnecessary. The first and most appropriate policy actions are to satisfactorily re-stock all backlog NSR lands and to intensify management practices on immature stands. Such a program has been proposed for a number of years most recently in the Policy Statement on a Framework for Forest Renewal and Forestry Imperatives.

The most direct responsibility of the Federal government relates to Federal Crown lands. Although these represent only a small proportion (approximately 1%) of the total productive forest land in the province, forest management on these lands should be a Federal priority. The identical problems of inadequate regeneration, undesirable species composition and slow growth are evident here as in the rest of the province. Any forest management program should emphasize backlog reforestation and intensive silviculture. Also, land use planning should be integrated with the surrounding provincial Crown lands and emphasize opportunities for Canada's native people.

Another 5% of the productive forest land in the province is privately held. The vast majority of this is in large blocks controlled by major forest companies, but a number of small private wood lots are concentrated in Southeast Vancouver Island, the Fraser Valley, the Kootenays and the Prince George area. These small private woodlots occupy some of the best growing sites in the province. However, the level of forest management on these lands is very low due to a lack of knowledge of appropriate methods or an inability to afford expert advice. Provision of management services through Forestry Extension, provision of planting stock together with grants and other financial incentives for site rehabilitation could substantially improve this current situation.

Finally, with respect to the major areas of productive forest land held by the provincial crown, although British Columbia is already committed to an intensive management program, financial assistance from Canada is necessary to permit implementation at an expanded level. A number of cost-shared initiatives have already been undertaken in British Columbia under the umbrella authority of the Canada-British Columbia General Development Agreement. The GDA identifies intent and provides for the negotiation of subsidiary Agreements. An Intensive Forest Management Subsidiary Agreement was negotiated within the GDA framework, and entered into on the 17th of May 1979 by the Minister of Regional Economic Expansion and the Minister of Environment for Canada. The powers, duties and functions of the Minister for Regional Economic Expansion under this agreement have since been transferred to Environment under Privy Council Order PC 1982-2726.

The current agreement expires on March 31, 1984. However, Canada has chosen to continue with this type of agreement in the interests of advancing economic development. The specific mechanisms incorporated in the GDA and sub-agreement system have proven to be a well integrated method of coordinating two very complex government systems. Also, the private sector is aware of this now traditional type of agreement, understands how it functions and is generally supportive.

Senior officials at the Deputy Minister level have been appointed as Federal Coordinators in each Province with the responsibility to renegotiate the GDA's. The legislative mandate for a forestry subsidiary agreement lies with the Canadian Forest Service under the Forestry Development and Research Act of 1966-67. This enables the responsible Federal Minister to:

enter into agreements with the government of any province or with any person for forest protection and management or forest utilisation, for the conduct of research related thereto, or for forestry publicity or education.

In total, a renewed and expanded federal-provincial agreement on forest renewal and management, can do much to avoid the consequences of a future fall down in the British Columbia timber harvest. Forest renewal and intensive silviculture activities will serve to maintain a strong forestry sector within the province. It is an opportunity to avoid potential future problems through timely and positive action.

APPENDIX A
TIMBER SUPPLY DATA
BY TIMBER SUPPLY AREA AND REGION^a

Region	TSA	Allocated Cut (m ³)	Pending Allocations (m ³)	MOF Reserve (m ³)	LRSY (m ³)	Uncommitted Cut (m ³)	AAC (m ³)	Remarks
Vancouver	Fraser	1 683 000	-----	17 000	1 461 660	-----	1 700 000	At current rates, a deficit is expected. Increased rates will increase and hasten the deficit. The current commitment is above LRSY; therefore, a reduction in harvest is ultimately in sight unless supply can be increased.
	Kingcome	1 675 090	-----	24 910	1 569 446	-----	1 700 000	Increases of nearly 25% possible without risk to future timber supplies. Thirty percent increase maintainable for sometime into LR before shortages occur.
	Nootka	1 323 330	-----	14 270	1 045 164	62 400	1 400 000	In the short term, present commitment can be maintained. An increase of 30% in the harvest cannot be sustained without subsequent problems. Smaller increases have potential. Commitment is well over LRSY and an ultimate reduction is implied.
	Quadra	1 982 340	-----	17 660	1 956 844	-----	2 000 000	Increases in current harvesting rate can be sustained over the long term, if land losses are kept down.
	Soo	693 000	-----	7 000	600 023	-----	700 000	At current harvesting rate, there is a small deficit. Increased rate will increase the deficit and hasten its occurrence. Short-term supply maintainable, but no place for increases—only decreases or improved forest management.
	Mid Coast (new addition)	1 386 000	-----	-----	900 000*	-----	1 400 000	Current commitments can be maintained for 30 years. Deficits will then occur if alternative species are not used. These species are generally undesirable types—lesser quality wood and poor sites. * Present usage. ** With full use of all areas available, both fully and marginally economically viable.
					7 300 000**			
Prince Rupert	Bulkley	631 080	-----	18 920	616 700*	-----	650 000	Short term—more than satisfies current commitments. Long term—no fall-down on current commitments. Production on LRSY line. Surplus volume produced with modified utilization. Note that, "now", harvest must change to include more balsam in species mix to assure above predictions. * Current. ** Modifying utilization.
					768 400**			
	Morice	3 000 000	-----	16 750	1 439 800*	-----	2 000 000	Current commitment sustainable for 80 to 90 years. Modified utilization to include stands suited to fibre production will delay fall-down by 20 years. Assurance or increase of harvest requires increased investment in silviculture. * Present. ** Modified utilization.
					1 553 400**			

Appendix A (continued)

Region	TSA	Allocated Cut (m ³)	Pending Allocations (m ³)	MOF Reserve (m ³)	LRSY (m ³)	Uncommitted Cut (m ³)	AAC (m ³)	Remarks
Prince Rupert (continued)	Lakes	1 398 450	-----	101 550	1 200 000*	-----	1 500 000	Current Commitments exceed supply in short term. To fulfill them means improved utilization. With improved utilization, the long term has no supply problems for 120 years. * Assumes maximum of all potential utilization.
	Queen Charlotte	450 000	-----	-----	233 000*	-----	450 000	Present demand can be maintained for 30 years; thereafter, there will be a severe shortfall in supply. A 30% "lower" harvest rate "now" could be maintained for 60 years before supply settled close to the LRSY. * Current.
	North Coast	465 130	125 000	9 870	362 000* 431 000**	-----	600 000	Current commitment to licencees and small business could be maintained statically for up to 65 years. Total demand can be met for 30 years, but full utilization would allow total demand to be met for 50 years before a fall-down and would raise the LRSY. * Current methods. ** Full utilization.
	Kalum	445 500	-----	4 500	359 600*	-----	450 000	Within 20 years, severe shortages "if" pulp stands are not utilized or remote areas do not become economical. * Excludes Bell-Irving and Kitimat Supply Blocks and inoperable areas.
	Kispiox	1 088 960	-----	11 040	868 800	-----	1 100 000	Short-term supply in surplus. Long term has room for various increases based on the use of marginal stands: a 1.25 increase in harvest level can be maintained for 130 years. Various increases can be used, bringing different fall-downs after a century.
	Cassiar	nil	N/A	N/A	N/A	-----	N/A	Yield analysis pending.
Prince George	Fort Nelson	1 018 980	-----	-----	1 000 000* 1 981 000**	-----	750 000	Current commitments cannot be met over next 20 years if present supply network and species proportions remain static. If current-species use continues for next 20 years, a shortage of spruce for a following 30 years will ensue. * Estimated short-run yield—mainly coniferous. ** Includes use of deciduous species.
	Peace	1 954 270	-----	45 730	1 385 190* 2 172 816**	-----	2 000 000	Under present usage, a small increase may occur for next 60 years. Beyond this, there is a decrease in supply, taking you very close to LRSY(+). If deciduous stands were used, the LRSY may be increased. * Present usage. ** If deciduous forest is also used.

Appendix A (continued)

Region	TSA	Allocated Cut (m ³)	Pending Allocations (m ³)	MOF Reserve (m ³)	LRSY (m ³)	Uncommitted Cut (m ³)	AAC (m ³)	Remarks
Prince George (continued)	McBride	479 090	-----	20 910	350 000	-----	500 000	Current harvesting rate can be maintained for 70 years; then the supply will be just below the LRSY. Increasing the land base to include the Morkill area would allow the harvesting rate to be sustained indefinitely.
	MacKenzie	2 952 320	-----	-----	2 494 000	-----	2 900 000	Present commitment maintainable for 40 years. Beyond this, deficits will occur. Improved stand utilization would partially offset the downfall.
	Prince George	8 613 000	-----	87 000	8 765 000	-----	8 700 000	Existing commitment can be maintained for short term and long term. An increase in harvesting rate is feasible for 70 years, with the eventual supply falling just below LRSY and just above present commitment.
Cariboo	Quesnel	2 277 000	-----	23 000	2 195 000	-----	2 300 000	The present commitment can be maintained for approximately 150 years, after which there will be a falldown to a level which is 95% LRSY. At present, commitment is above LRSY. Note that the forest is unable to maintain present species proportions used by the mills. If continued, fir will decrease, while pine and balsam will increase.
	Williams Lake	2 482 700	-----	17 300	2 700 000	-----	2 500 000	Short term—problems meeting current commitments due to inability of some supply blocks to produce. Long term—can increase cut to maximize removal of merchantable timber. Falldown after 140 years. Commitment level for "cedar" and "hemlock" can be maintained for only 50 years; thereafter, other species must be used.
	100 Mile House	1 237 500	-----	12 500	1 197 000	-----	1 250 000	Short term—no problem in maintaining current commitment. Long term—both liquidating and rationing old growth provides a "surplus" to commitment. The former method can be sustained for 100 years before a serious falldown. Also, it is small-diameter, poor-quality wood. The latter method decreases severity of falldown but allows overmature timber to exist.
Kamloops	Okanagan	2 675 420	-----	24 580	2 500 000* 5 000 000**	-----	2 700 000	Current commitments can be sustained for 100 years before a falldown to the LRSY. Note: through a full intensive management program, there is much vision of a great increase in harvest to the full, intensive LRSY. * Current. ** Full intensive management.
	Merritt	1 138 800	-----	11 200	980 674	-----	1 150 000	Existing committed can be maintained for next 50 years; thereafter, a decrease in supply. The LRSY, in 150 years, will have declined drastically (86% of commitment to 60% of commitment) due to land alienation.

Appendix A (continued)

Region	TSA	Allocated Cut (m ³)	Pending Allocations (m ³)	MOF Reserve (m ³)	LRSY (m ³)	Uncommitted Cut (m ³)	AAC (m ³)	Remarks
Kamloops (continued)	Lillooet	769 750	9 300	20 950	656 500	-----	800 000	Volume of timber now can supply next 15 years only, without improved access to timber stands. In the long term, a shortfall is expected in 70 years, due to anticipated unsalvageable volume losses. There will then be a deficit to the commitment.
	Kamloops	2 326 500	-----	23 500	1 728 711	-----	2 350 000	Existing commitment can be maintained for 80 years before a falldown. Increasing the commitment level by 5% will result in a falldown after 60 years. LRSY was 75% of commitment level. LRSY was decreasing with options for caribou habitat.
Nelson	Arrow	622 290	-----	-----	652 551	-----	619 000	Short term—insufficient supply to meet crown commitments. Long term—after 20 years at the LRSY, an increase in the harvest rate of 5% can then be maintained for 130 years before a falldown to 92% of the LRSY.
	Boundary	643 190	-----	56 810	612 000	-----	700 000	An increase in volume in the short term is possible. The present commitment can be maintained for 160 years. Note that the higher the short-term harvest, the greater and sooner the ultimate long-term falldown.
	Revelstoke	124 460	-----	5 540	103 100	-----	130 000	Short term has a surplus supply to commitment—20% higher than LRSY. If present harvest level is maintained, a falldown of 29% will occur in 100 years. The higher the long-term harvest rate, the sooner and larger the fall-down.
	Golden	642 400	-----	7 600	431 900	-----	650 000	Harvesting at present level can be continued for 60 years, followed by a fall-down of 40%. Increasing harvest rate by approximately 25% can maintain a supply for 40 years before a sharp drop in volume occurs.
	Invermere	664 400	-----	5 600	490 000	-----	670 000	There is an excess supply available in the short term for harvesting. If harvesting to eliminate this excess, there will be a 20% decrease in available harvest after 50 years. Note that, if lodgepole pines are not harvested soon, they will be lost to the pine beetle—36% decrease in short-term supply.
	Cranbrook	891 000	-----	9 000	934 200	-----	900 000	Short term—deficits will occur in the next 20 years due to inaccessibility and management restraints. In the long term, current commitments can be met for 90 years before a decrease of 17% to the LRSY. Use of problem and veteran forest types allows for an increased volume in short term.
	Kootenay Lake	786 030	105 000	8 970	860 000	-----	900 000	A modest increase in timber cut can be facilitated. Present demand can be supported by making up shortfall in Creston PSYU from surplus in Lardeau PSYU. Major opportunities exist for increasing long-term supply.

^aSources: MOF Timber Supply Area and Yield Analysis Reports 1980-1982; and MOF Timber Supply Area Annual Allowable Cuts and Apportionment Reports 1981-1982.

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