IMPLICATIONS OF ALTERNATIVE HERBICIDE-USE POLICIES FOR FOREST MANAGEMENT IN ONTARIO

by

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A Graduate Thesis Submitted

In Partial Fulfilment of the Requirements

for the Degree of Master of Science in Forestry

School of Forestry

Lakehead University

May, 1995

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ABSTRACT

Whitmore, G.J. 1994. Implications of alternative herbicide-use policies for forest management in Ontario. School of Forestry, Lakehead University, Thunder Bay, Ontario. 289 pp. Advisor: Dr. P.N. Duinker.

Key Words: herbicides, vegetation management, alternatives to herbicides, forest-level analysis, simulation, FORMAN, cost analysis, variable harvest cost curves.

Public sentiment is against herbicide use on public forests in Ontario. Provincial policies are directing research into alternative vegetation management with only limited interaction or support with forest resource based industries. The initiative of this analysis was to substantiate or dismiss the hypothesis that a forest industry could feasibly regenerate a sound wood supply from a forest in Northwestern Ontario under various herbicide-use limitations. Forest-level simulation was used to produce 100-year forecast data for thirteen management scenarios, which covered current levels, reductions in area treated, restrictions on how and where it could be applied, no use of herbicides, and a shift to a flexible wood supply.

Results of the wood-supply analysis revealed that the company's wood-fibre needs from the study forest could be maintained for all scenarios. Due to the age class structure of the forest and the reasonable harvest levels imposed by the company, the most important component of the forest model was its present volume. Thus, even under assumptions of decreased coniferous volume production resulting from non-herbicide silvicultural treatments, only slight increases in harvest area were necessary 70+ years into the forecasts.

The wood supply, area treated with herbicides and silviculture cost response variables provided the information required for sound decisions to be made for a large array of potential herbicide policy changes. Any strategy derived would need to meet the new policy's requirements while minimizing impacts on wood supply and silviculture costs and maintaining a desirable level of flexibility. For the Seine River forest, a step-wise reduction in herbicide use was determined to be the most appropriate strategy. This timing conforms well with forecasts of low need for herbicide treatments and provides adequate time for research and

development of environmentally sound, socially acceptable and economically feasible alternatives to herbicides.

This strategy meets the 20% herbicide use reduction imposed in 1991 and sets the company in a position to meet further changes. Impacts on both wood supply and silvicultural costs were shown to be minor.

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ACKNOWLEDGEMENTS

I would like to thank Dr. P.N. Duinker for his guidance, encouragement, financial support and inspiration as my principal advisor. This study was made possible by the assistance of a number of individuals. Personnel at the Fort Frances Division of Boise Cascade, including Peter Kirby, Woodlands Manager; Paul Jewiss, Forestry Superintendent; Jim Krag, Superintendent, Seine River Operations; Bob Cox, Superintendent, Manitou Operations; Colin Hewitt, Planning Forester; Jim Parsons, Project Forester; Joan Keene, Silviculture Forester, Seine River Forest; and Nick Blacklock, GIS Specialist, gave their time, experience and insights for the development of the computer model of the forest and the various management scenarios. Bob Wagner, Director, Vegetation Management Alternatives Program, OMNR, was instrumental in the direction of the study and helped to develop the thesis into a format which ensured technological transfer. Laird Van Damme, Director, Ontario Advanced Forestry Program, and a member of my thesis committee, assisted in the development of the stand development patterns and gave professional insights at all stages of the study. Wayne Bell, Vegetation Management Specialist, Northwestern Ontario Forest Technology Development Unit, relayed his opinions and gave ideas for alternative silviculture treatments. I must also thank Kevin Topolniski of Fraser Inc. in New Brunswick for urging me on in the final stages of writing. Last but not least I would like to give special thanks to JoAnn Crichlow, Research Assistant, Chair in Forest Management and Policy and who kept me on the up'n'up through my time with the Chair.

1.0 INTRODUCTION

1.1 PROBLEM STATEMENT

While the annual harvest area in Ontario has increased only 8% over the last decade, from 196 377 ha in 1981 (Smyth and Campbell, 1987) to 211 000 ha in 1990 (OMNR, 1991[1]), there has been a 55% increase in areas artificially regenerated. This substantial increase in reforestation is due largely to an increased awareness of Ontarian and Canadian policymakers of the need to invest in forests for the future, and also, an overwhelming public sentiment towards proper care for the forests of Canada (Environics, 1989). A commitment to reclamation of forest sites which did not develop back to their "pre-harvest" species composition (backlog), in addition to more intensive silviculture on annual harvest areas, has meant a considerable increase in the use of silvicultural tools, especially in silvicultural tending with herbicides (Figure 1). In 1989 alone, over 89 thousand hectares of Crown land in Ontario were treated aerially with herbicides, up over 32 thousand hectares from 1986 figures (OMNR, 1991[1]).

Public awareness and concern over the use of herbicides in the forest has been increasing in Canada. Results of this concern include the severe restriction of

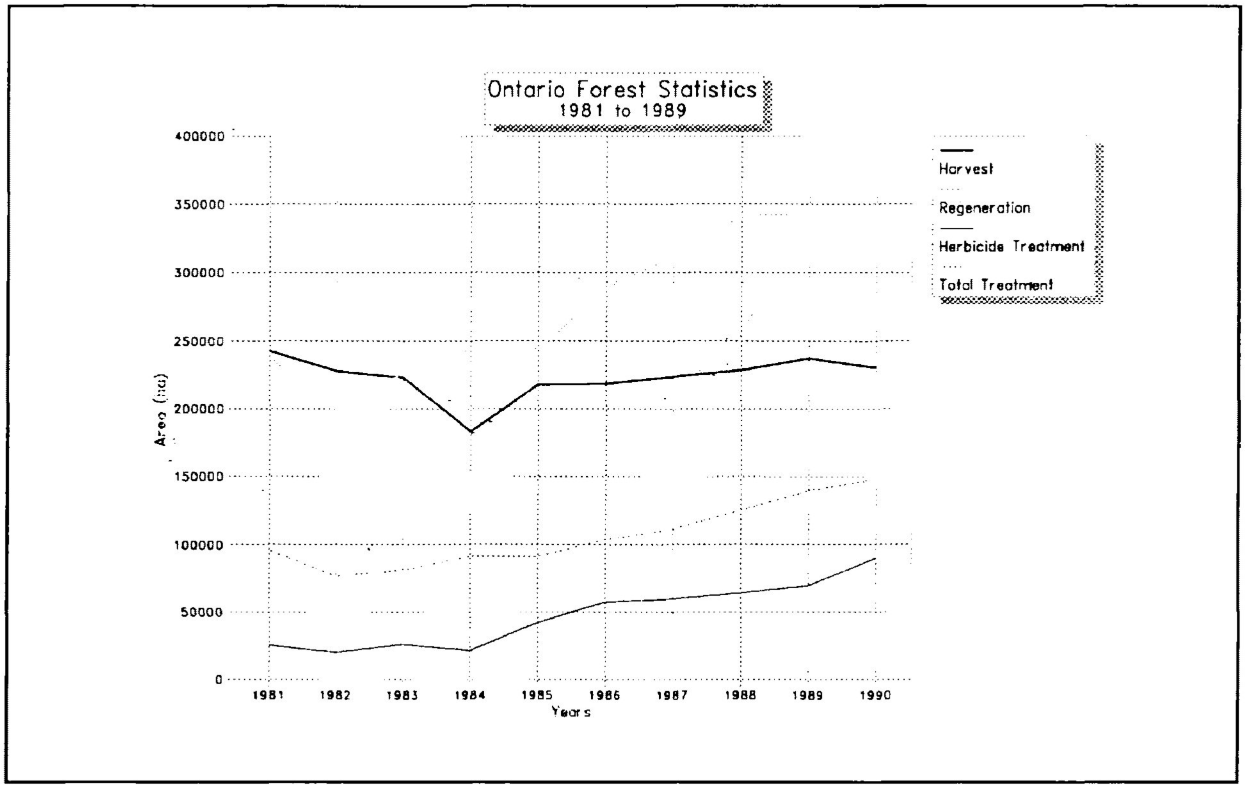

Figure 1. Harvested, regenerated, chemically tended (aerial) and total silvicultural treatment areas in Ontario from 1981 to 1990 (Source: Smyth and Campbell, 1987; and OMNR, 1991[1]).

herbicide use by some provinces (Saskatchewan and Alberta) and limitations on use of some registered herbicides in others such as Ontario. These policies assume (or fail to consider) that if vegetation management methods other than herbicides were applied to selected and suitable forest sites, and if research created effective and efficient alternative treatments, the amount of herbicide applied could be drastically reduced with little effect on the long-term viability of the forest products industry.

The government of Ontario has recently implemented a policy which acknowledges concerns over herbicide use and is intensively seeking the development of environmentally-sound, effective, cost-efficient and socially acceptable alternatives (OMNR, 1991[2]). The Vegetation Management Alternatives Program (VMAP) is seeking alternatives to herbicides and a better understanding of ecosystem dynamics through research, education and field delivery (Wagner, 1991). The introduction of the VMAP in 1990 was accompanied by a 20% reduction in forest areas treated with herbicides.

To substantiate or dismiss hypotheses on the need for herbicide use to deliver an economical and sustainable supply of quality wood fibre, an investigation of a range of alternative herbicide programs was performed on a forest management unit in Northwestern Ontario using forest-level analysis. The few impact assessments completed on the use of herbicides in forest management in the past, as well as public opinion, have focused on the environmental and human-health implications and risks associated with the use of herbicides, but have neglected to analyze potential consequences of not using herbicides or alternative vegetation management strategies (Dietz, 1985; Duinker, 1991). In this study, forest-level simulation are used to examine how forest management might have to change, and how forests and their wood-fibre yields may be altered under reduced-herbicide-use policies that differ from continuation of the present "business-as-usual" policy of Ontario.

1.2 STUDY OBJECTIVE

The objective of this study is to develop a framework for the evaluation of forest management's ability to accommodate changes to Ontario's present herbicide policy and maintain present wood-supply levels to industry at reasonable costs.

1.3 SCIENTIFIC JUSTIFICATION

This study focused on the hypothesis that Ontario forest industries could feasibly maintain current wood-supply objectives under a policy of reduced herbicide use but not under a policy of no herbicide use. This hypothesis was tested by analyzing wood-supply and associated costs of treatment scheduling resulting from a variety of alternative management strategies meant to reflect possible management responses to changes to the current herbicide policy in Ontario.

The alternative management strategies, developed in cooperation with the study area's forest managers, reflect hypotheses on how the present herbicide policy in Ontario may change in an attempt to address public concerns over herbicide use on public forests. Since no wood-supply studies centred on herbicide use have been performed on an Ontario forest to date, this study provided a framework for future analyses in Ontario and elsewhere.

The proved efficacy of herbicides and their low financial cost made them the vegetation management tool of choice in forestry. However, recent concerns over potential health risks due to herbicide use, especially use on public lands, brought about the development of provincial policies involving immediate reductions in herbicide treatment levels and a move to greater dependence on alternatives.

Due to the long time span required for trees to grow to operable dimensions (at least 40+ years for most species in Canada), empirical studies of responses to silviculture treatments are only available for the early stages of development. While a complete data set reflecting the development of a forest stand through to rotation age after a silviculture treatment would be ideal for analysis, no such data is yet available. To facilitate potential outcomes from today's actions, the responses of stands to various treatments were estimated using a combination of empirical data and professional judgement based on scientific research. Thus, the volume development patterns which reflect responses of forest productivity are themselves hypotheses. The theory behind them was that different treatments would result in different rates and levels of softwood and hardwood volume development over time. Sensitivity analysis was used to determine how crucial these development patterns were to 100-year wood-supply projections for the study forest. If large changes to the development patterns produced only small changes to the response variable (forest productivity based on harvest volume per hectare) then they would be deemed insensitive, and visa versa.

Though the knowledge-base for impact assessments such as this is limited, society cannot afford to wait for a more concrete understanding; information is required now to make decisions on issues likely to affect future events (Baskerville, 1990; Duinker et al., 1992). An iterative approach which starts now, based on what information is available, a series of assumptions, bounded by sound judgement, and periodically calibrated with more accurate representations of the system's dynamics, is a responsible approach to planning under high levels of uncertainty. Proper use of analytic techniques such as sensitivity analysis will ensure that sensible routes are pinpointed and possibly followed. Identifying all assumptions used in the analysis and limitations of the approach will give scientific credibility to the process used and allow for replication and/or application of the technique.

2.0 LITERATURE REVIEW

2.1 ONTARIO HERBICIDE CONFLICT

Chemical herbicides were thrust into the public spotlight principally with the use of three phenoxy herbicides, 2,4,5-T, Silvex and 2,4-D, by the U.S. military in the Vietnam conflict and from the discovery of a dioxin contaminant in 2,4,5-T and Silvex (Newton and Knight, 1981; Van Strum, 1983). Both herbicides were contaminated with a class of chemical known as dioxin. The specific dioxin found in 2,4,5-T and Silvex, that is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), is not found in 2,4-D (Walstad and Dost, 1984). TCDD is the most toxic chemical substance known to humankind (Anon, 1985). Obviously, with a chemical so toxic being found in 2,4,5-T and Silvex, the most commonly used herbicides of the time (Walstad and Dost, 1984), public concern rang loud. While the low levels of TCDD (routinely less than 5 parts per trillion) likely represented less risk to public and environmental health than the herbicides themselves (Walstad and Dost, 1984), controversy over the use of TCDD led to an immense amount of research on the phenoxy herbicides. Phenoxies are now more understood than any other pesticide or toxicant in the world today (Newton and Knight, 1981).

Most research has concluded that the dioxin-contaminated phenoxies pose no threat to human health if used as directed and if proper safety precautions are followed when handling the products (Walstad and Dost, 1984; Sutton, 1985). However, public pressure prevailed as the cost to regain registration through court battles outweighed the foreseeable profits, and the chemical industry (primarily Dow Chemical) did not pursue registration and thus stopped manufacture of 2,4,5-T and Silvex in 1983 for use in the United States (Walstad and Dost, 1984).

Public opinion was swayed by books written by environmental activists such as Rachel Carson (1962), author of SILENT SPRING (often said to be a key instigator of the environmental movement). The increased public awareness of potential health hazards from man-made chemicals helped build up zealous anti-chemical groups such as Citizens Against Toxic Herbicides, Citizens Against Toxic Sprays, Northwest Coalition for Alternatives to Pesticides, and the National Veterans Task Force on Agent Orange (Van Strum, 1983). The list of groups against chemical use does not stop there, however. Other organizations which focus on environmental issues also opposed the use of chemical pesticides/herbicides: Friends of the Earth, Southern Coalition for the Environment, National Council of Churches, Interfaith Centre on Corporate Responsibility, Citizen Soldier, National Association of Farmworker Organizations, and the Sierra Club (Van Strum, 1983). Though most of these groups were located/headquartered in the United States, they must have indirectly influenced Canadian thinking on herbicides.

While the fight against 2,4,5-T and Silvex was finally settled in the United States (2,4,5-T ceased to be produced in 1984), chemicals in general were still a major public concern. Attention shifted to the banning of other commonly used chemicals, especially the phenoxy herbicide 2,4-D, and pushing for tighter and more stringent controls and screening processes for chemicals. Other countries around the world, including Canada, did not pull registration of 2,4,5-T (Sutton, 1985). In Canada, the use of 2,4,5-T is permitted by the federal government for use as a tool in silvicultural vegetation management. However, a number of provincial governments (e.g. British Columbia, Ontario, Saskatchewan and Quebec (Sutton, 1985)) currently do not have 2,4,5-T registered for forest management. Obviously there was public pressure in Canada (and still is) against herbicides and/or the spraying of herbicides.

In Ontario, a major "voice" for environmental issues is the Ontario Environment Network (OEN) which is supported by 87 Ontario citizens groups (Appendix I). In a 1991 action agenda, OEN pushed for a ban on aerial spraying of chemical herbicides in tandem with a move towards "the use of appropriate modified cutting practices and natural regeneration" (Maynes, 1991). The Conservation Council of Ontario (CCO), an organization representing 31 member organizations (combined membership of over a million people) formulated an environmental strategy for Ontario (Appendix I). The CCO's stand on chemical pesticides (in general) was to reduce the dependence upon them by developing and using a greater number of alternatives (CCO, 1990).

One of the purposes for the production of "An Environmental Strategy for Ontario" by the CCO was to provide the Ontario Round Table on Environment and Economy (ORTEE) with "concrete recommendations for a provincial sustainable development strategy" (CCO, 1990). A Forestry Sector Task Force was also organized "to examine the forestry sector and to make recommendations on implementing a sustainable development strategy" to the ORTEE (Forestry Sectoral Task Force, 1991). The Task Force members represented universities, government, industry, and non-government organizations (Appendix I). While individual opinions ranged from an immediate ban, to a stepwise reduction with eventual elimination of use of chemicals as a forest management tool, the Task Force did agree that research into the development of "safe, effective and efficient alternatives to the use of chemical herbicides and insecticides" should be encouraged (Forestry Sectoral Task Force, 1991). Ontario's youth have also formed an opinion on the use of herbicides. They desire a change to the use of alternatives to pesticides (Public Focus, 1990).

Health risks perceived by the public regarding the use and presence of chemical herbicides (especially phenoxies) in the environment includes cancer, mortality, organ abnormalities, and birth defects in any organisms coming in contact with them (Walstad and Dost, 1984). While a fear of possible detrimental effects from herbicides exists, the reality in present terms, that the use of herbicides (aerial) "is associated with a lower risk to both site productivity and human health than any alternative" (Walstad and Dost, 1984), is also an important consideration. The debate goes on. However, in recent years, the trend has moved to political judgements being made on the basis of public concern and not on science. Evidence for this includes restriction of the use of 2,4,5-T, promotion of reduced dependence on herbicides, and an increase of research in Ontario towards the development and use of alternatives. Public opinion as documented in a number of surveys completed from 1984 to 1989 showed that seven in ten people of both Ontario and Canada either disapproved or strongly disapproved of "the use of chemical pesticides and herbicides in Canada's forests" (Environics, 1989).

2.2 FOREST VEGETATION MANAGEMENT IN ONTARIO

The reforestation of harvested forest sites usually requires some form of vegetation management of on-site competing vegetation to be successful. The reduction of competing vegetation improves one or more of the following stand attributes: survival; height, diameter or basal area growth; tree and stand volume; crown length and width; needle colour and length; tree vigour; and resistance to pests such as insects (Stewart, 1987). In addition to the tree-specific effects, there are other direct and indirect effects such as increased harvests, increased stand value, lower harvest costs, and earlier return on investment resulting from vegetation management (Stewart, 1987). Thus, if commercial forests are to be effectively and economically managed, vegetation management must be practised (Walstad et al., 1987).

There are several silvicultural vegetation management practices available to the forest manager including harvest, site preparation, tending (stand release), and stand improvement (Walstad et al., 1987). A summary of the major attributes associated with a number of types of forest vegetation management was compiled by Walstad et al. (1987) and is supplied in Appendix II.

Vegetation management has evolved through time to what it is today (Table 1). Primitive hand- and cattle-drawn implement use have slowly progressed to dependence on herbicides, and finally to management based on ecological and environmental principles (including use of herbicides).

Table 1. The evolution of vegetation management through time.

Period	Significant Accomplishments
6000 B.C.-1800 A.D.	Magic and superstition gradually discarded. Primitive hand- and cattle-drawn implements used. Early documents written about weeds.
1801-1900	Improved ploughs, cultivators, mowers and disks developed during horse-drawn era. Prototype sprayers invented for applying inorganic pesticides. Weed control "proved" beneficial in crop production. Scientific publications on weeds and weed control appeared.
1901-1940	Transition to mechanized implements occurred. Inorganic herbicides developed. Research and extension programs established.
1941-1968	Plant growth regulators discovered. Organic herbicides synthesized and marketed. Research and extension rapidly expanded. Major increases achieved in crop production, attributable in part to weed control.
1969-1987	Major breakthroughs in plant physiology, biochemistry, and genetics continued to occur. Organic herbicides further developed and refined for operational use. Regulatory activities expanded and strengthened. Concept of vegetation management adopted. Energy efficiency and environmental impacts became important parameters for evaluating techniques.

Source: Adapted from Walstad and Kuch (1987)[1]

The various silvicultural methods available to the forest manager for vegetation management as cited by Sutton (1985) are as follows:

(i) Manual (e.g. pre-release and/or release tending treatments with Sandviks, chainsaws and/or brush saws);

(ii) Mechanical (e.g. disk trenching or shear blading);

(iii) Prescribed burn (e.g. site preparation with light/heavy controlled fire);

(iv) Biological (e.g. cattle or sheep);

(v) Systems based (e.g. advanced timing and selection of harvest methods); and

(vi) Chemical (e.g. herbicide used alone or in combination with other methods for site preparation and/or tending).

Traditionally, herbicides have been used in three areas of forest vegetation management: (i) site preparation; (ii) tending; and (iii) reclamation of backlog areas.

Site preparation is any form of soil disturbance which is used to precede the establishment of a tree crop by either artificial or natural methods (Brown, 1983). Its purpose is to prepare microsites for seeds, seedlings, vegetative cuttings or root suckers, to eliminate competing vegetation and to control spacing and stocking of the new stand (Brown, 1983). Site preparation is usually accomplished mechanically, chemically, mechanically and chemically, or with a prescribed burn (Sutton, 1985).

Tending is the selective control of weeds (undesirable vegetation) in the presence of crop trees (desirable vegetation) (Sutton, 1985). Its purpose is to act as either a pre-release measure, which is a preventative treatment used to control weeds on the site before the vigour of the crop trees is at risk, or as a release treatment, which "rescue[s] established but declining crop trees" (Sutton, 1985). Tending is usually executed chemically or manually within the early development stage of a stand when tree vigour is high and the trees are more able to take advantage of the changed growing conditions (Newton et al., 1987).

While both chemical and non-chemical methods for site preparation and tending have been available to the forest manager in Ontario for decades, the trend has been towards the use of chemicals, especially for tending purposes. Most scientists and foresters have observed herbicides to be an extremely effective and economical tool for the control of competing vegetation (Newton, 1975; McCormack, 1981; Day, 1984; Stewart et al., 1984; Sutton, 1985; Malik and Vanden Born, 1986; Walstad et al., 1987). This support for the use of chemical herbicides was a factor in the promotion of chemical treatment on Forest Management Agreement lands in Ontario by OMNR. Indeed, the following statement appears in the Ontario Timber Management Planning Manual: "...in the event that appropriate herbicides are not or cease to be licensed for forestry use in Ontario, the company's [industry's] obligation to tend if necessary will no longer hold" (OMNR, 1986[1]).

There were five herbicides registered for silvicultural use on the forests of Ontario in 1991: glyphosate; hexazinone; 2,4-D; triclopyr; and simazine. Glyphosate (Vision®) was licensed for aerial and ground application for both site preparation and tending, hexazinone (Velpar-L®, Velpar-ULW® and Pronone®) was licensed for ground and aerial application, 2,4-D was licensed for aerial and ground application, and triclopyr (Release®), for ground application (Campbell, 1991). Due to governmental restrictions, constant delays, general controversy over herbicides and that registered herbicides must be well researched for crop tolerances and efficacies, the registration of other herbicides for forestry use is unlikely (Campbell, 1991). Current research addresses environmental and health issues, long-term crop benefits and effective use of herbicides (Campbell, 1991).

2.2.1 Changing Attitudes to Herbicides in Ontario

The objective of forest management on Crown Lands in Ontario during the 1980s was to "provide for an optimum continuous contribution to the economy by forest-based industries consistent with sound environmental practices and to provide for other uses of the forest" (OMNR, 1986[1]).

The Ontarian and Canadian governments worked together to meet this goal with the Canada-Ontario Forest Resource Development Agreement (COFRDA). COFRDA was a 50/50 cost-sharing agreement between the two levels of government which had the following three main objectives:

1. To encourage and support forest management activity in order to increase the sustainable supply of wood fibre from the forest resource and ensure the long-term viability and competitiveness of the forest industry in Ontario;

2. To improve and increase the utilization of the forest resource to enhance future forest industry development opportunities; and

3. To contribute to the economic development of the Ontario forest sector, including the improvement of employment opportunities in the sector (Smyth and Campbell, 1987).

A system of forest tenure known as Forest Management Agreements (FMAs) was introduced as part of Ontario's Crown Timber Act in 1979. Lands managed under FMAs had the responsibility for timber management activities, including regeneration, set primarily on the shoulders of the tenure holder (Roots and Quinby, 1992). The major advantage for FMA holders was that as regeneration efforts proved successful, an immediate increase in the sustainable harvest level could often be realized. However, these agreements were also dependent on a high level of provincial funding, which in has continued to decrease (Duckert, 1992). Renewal of these 20-year agreements, which are subject to review every five years, has been slow, even when the holder has been shown to meet all of the conditions.

Changing times, an increase in the public's awareness of the environment around them, and the expiration of the COFRDA agreement in March 1989, brought about considerable change in forest management in Ontario. Some of those changes were reflected in the Northern Forestry Program which was funded ($50 million) under the cost-sharing agreement called the Northern Ontario Development Agreement (NODA) (Rosen and Kuntz, 1992). While the COFRDA pushed for supply and utilization of timber resources, the Northern Forestry Program focused "on providing better tools and management decisions for Ontario's forests with both economic and environmental benefits" (Rosen and Kuntz, 1992). In addition to these changes at the provincial and provincial/federal levels, the federal government acknowledged that the care of the Canadian environment was not only a national obligation, but one which must be considered on an international, global scale as set out in Canada's Green Plan. The Green Plan had over $3 billion in funding available (over five years) of which a major proportion was to be used to find the most environmentally suitable methods to practice sustainable development (Anon, 1990).

In May 1991, the Honourable Bud Wildman, then Minister of Natural Resources, announced the beginning of "a new system of forest management in Ontario" based upon a sustainable forestry approach. Sustainable forestry focuses on the long-term health of forest ecosystems as well as social, cultural and economic opportunities and benefits (OMNR, 1991[2]).

In an effort to implement sustainable forestry, the government dedicated additional funding ($10 million) to the following new initiatives:

1. An independent audit of the province's boreal forest to determine the level of artificial and natural regeneration in harvested areas;

2. A four-person working group to co-ordinate the development of a comprehensive forest policy framework, through a broad public consultation process, by the end of 1992;

3. An old-growth ecosystem conservation strategy to be developed in conjunction with the scientific community, interest groups and the public;

4. Community forest projects to be established in four communities to test options for increasing local involvement in forest management;

5. Expansion of the province's silvicultural program through an enlarged research program and the field testing of alternatives to current practices, including options to reduce the use of chemical herbicides; and

6. A private woodlands strategy to promote sustainable forestry on private lands, mainly in southern Ontario (OMNR, 1991[2]).

The initiative of interest for this study was of course the fifth one listed above, which would yield alternatives for vegetation management in an effort to reduce the use of chemical herbicides. The public concern over use of chemicals in the forest was acknowledged and the infrastructure to provide "environmentally-sound, effective, cost-efficient and socially acceptable alternatives to chemical herbicides" was funded (OMNR, 1991[2]). The Vegetation Management Alternatives Program (VMAP) was designed "to gradually reduce the dependence on herbicides in Ontario forest management by developing alternatives and a better understanding of forest ecosystems through research, education and field delivery" (Wagner, 1991). In 1991, Ontario forest managers faced a 20% reduction in aerial application of herbicides. The goal of the Ontario government was to systematically reduce "dependence on herbicides as new alternatives [were] developed" (OMNR, 1991[2]). The integration of new tools with those available to forest managers would also require more sophisticated and technical methods of decision-making.

3.0 METHODS

3.1 ANALYTICAL APPROACH

While a change to the herbicide use policy in Ontario would undoubtedly affect the growth pattern of individual stands, a method was required which would provide an indication of the impact on the forest as a whole. Forest-level analysis using simulation was used to forecast how a forest might evolve in the event of different scenarios of management. To do this, models meant to reflect the forest and activities within it were produced "to compress the forest into a comprehensible format" (Baskerville, 1990). By creating a model which looks, acts, reacts and accurately represents the variability of a forest, emphasis can be placed on the processes which drive change in the forest over time.

Model development required the characterization of the present forest conditions and management techniques. Alternative management strategies were then devised to reflect possible reactions to herbicide policy changes. To accommodate the strategic goals set by each alternative, alternative silvicultural treatments were selected and/or envisioned with changes in vegetation management efficacy and/or cost, dependent on the management scenario. Variables were chosen and later used for comparative analysis and the formation of a logical decision.

3.2 TOOLS CHOSEN FOR ANALYSIS

Forest simulation was chosen as the method for this analysis primarily for its straightforward, bookkeeping approach which allowed a high level of awareness to how the forest was reacting to various methods of management. A well-tested simulation program (FORest MANagement - FORMAN (Wang et al., 1987)) was readily available for use and the forests of Ontario had recently been characterized for FORMAN.

Thus, by using simulation as a tool, a nearly complete mathematical formulation of the case-study forest was available, the techniques were easily understood and useable, and all the steps involved in a simulation could be retraced. The increased level of understanding of the process and cause-effect relationships added to the legitimacy of the results.

3.2.1 The FORMAN Model

The FORest MANagement (FORMAN) simulation model is a "sequential inventory projection model used in forest level analysis" (Wang et al., 1987). This model is not statistical, but is a bookkeeping and updating device which allows quantitative representations of the forest dynamics and the management strategies to be tracked over time (Walker, 1989; Baskerville, 1990; Duinker et al., 1992).

The model required extensive data input to describe the present and future states of the forest as a result of time and/or management techniques, and the rules and levels of harvest, silviculture and costs. Walker (1989) captured the methods used in the FORMAN model to describe the forest structure, the management strategies, and the stages followed in the simulation of a forest in Figure 2. The formation of the forest structure data sets used to reflect reality (to the highest level possible) determined the level of validity of the results (Duinker et al., 1992). Only with effective representation of these rules into a consistent model such as FORMAN could worthwhile forecasts of the future be made.

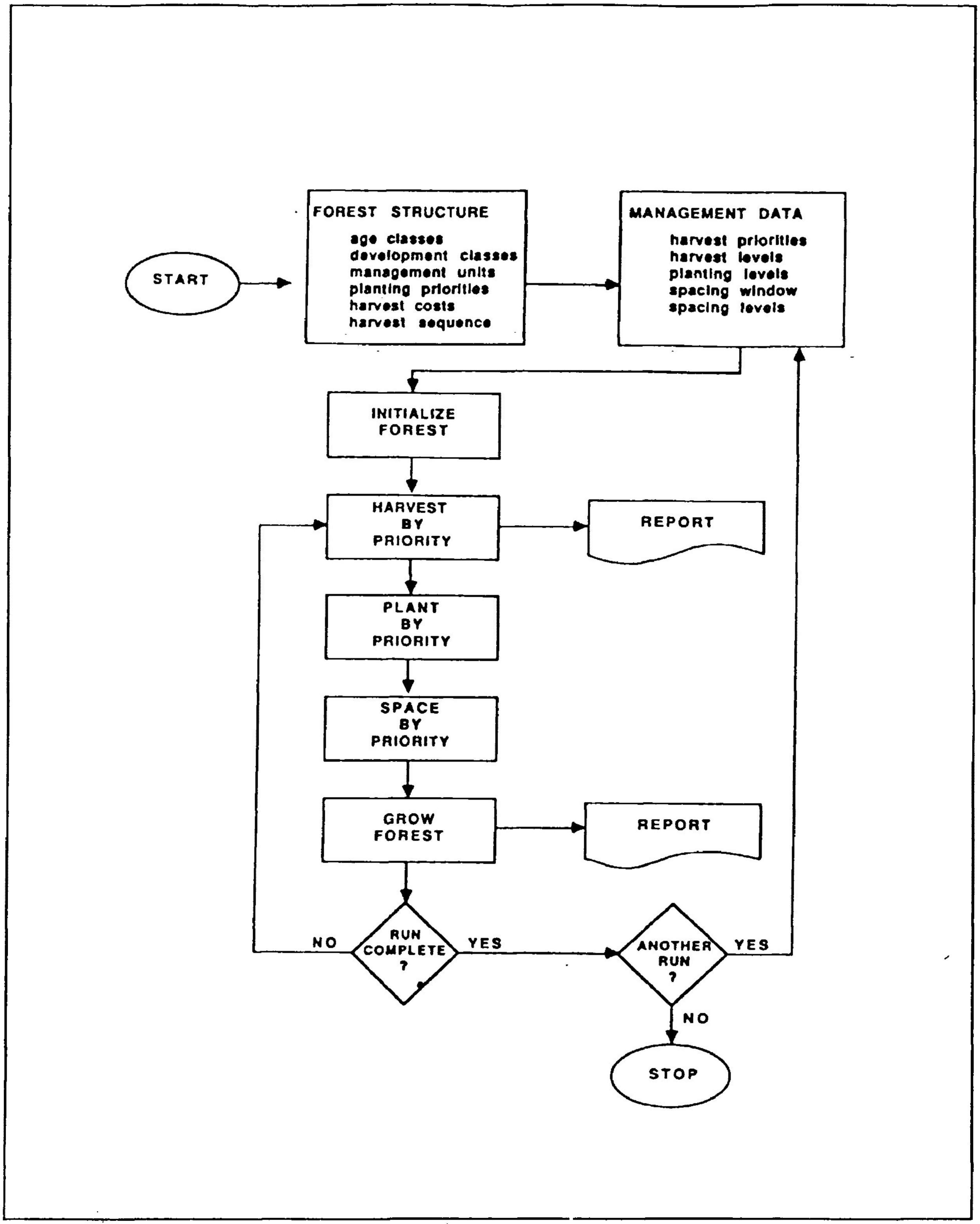

Figure 2. Flowchart of the input and processing steps of the FORMAN model. (Source: Walker, 1989)

3.2.2 The FORMANCP Model

FORMANCP (Williams, 1991), a modified version of FORMAN 2.1, was chosen as the simulation tool for this study. FORMANCP opens links to CROPLAN (a program developed by Williams (1991) which creates and examines the files for Benefit Cost Analysis (BCA) necessary for running FORMANCP), has run-time graphics, and includes discounted values of harvest and silviculture costs, harvest value and present net worth values for forecasts (Williams, 1991). Otherwise, FORMANCP produces identical results to FORMAN 2.1; however, the addition of run-time graphics and the calculation of discount and present net worth values greatly enhances the usefulness of the model and sharpens the analysis of alternative management scenarios for a forest.

3.3 THE CASE-STUDY FOREST

The Seine River Forest Management Unit (SRFMU) was selected as the case-study forest. The SRFMU, managed under a Forest Management Agreement (FMA) by the Fort Frances Division of Boise Cascade Canada Ltd., is located within the Fort Frances District of the Northwest Region of Ontario (Figure 3). The total area of the SRFMU is 280 273 ha of which 46 373 ha are water and 267 221 ha are Crown land. Of the available Crown lands, 650 ha are non-forested and 25 722 ha are non-productive forest (Table 2).

The production forest (194 476 ha) is dominated by jack pine, black spruce and trembling aspen (Table 3). The primary product from the forest was softwood (jack pine and spruce) with only a small amount of hardwood (poplar) used. Thus, all vegetation competing with softwood regeneration, except on hardwood sites, was considered competition; primarily poplar, pincherry, birch, raspberry and grasses. An in-depth account of the respective productive forest and protection forest areas is provided in Appendix III.

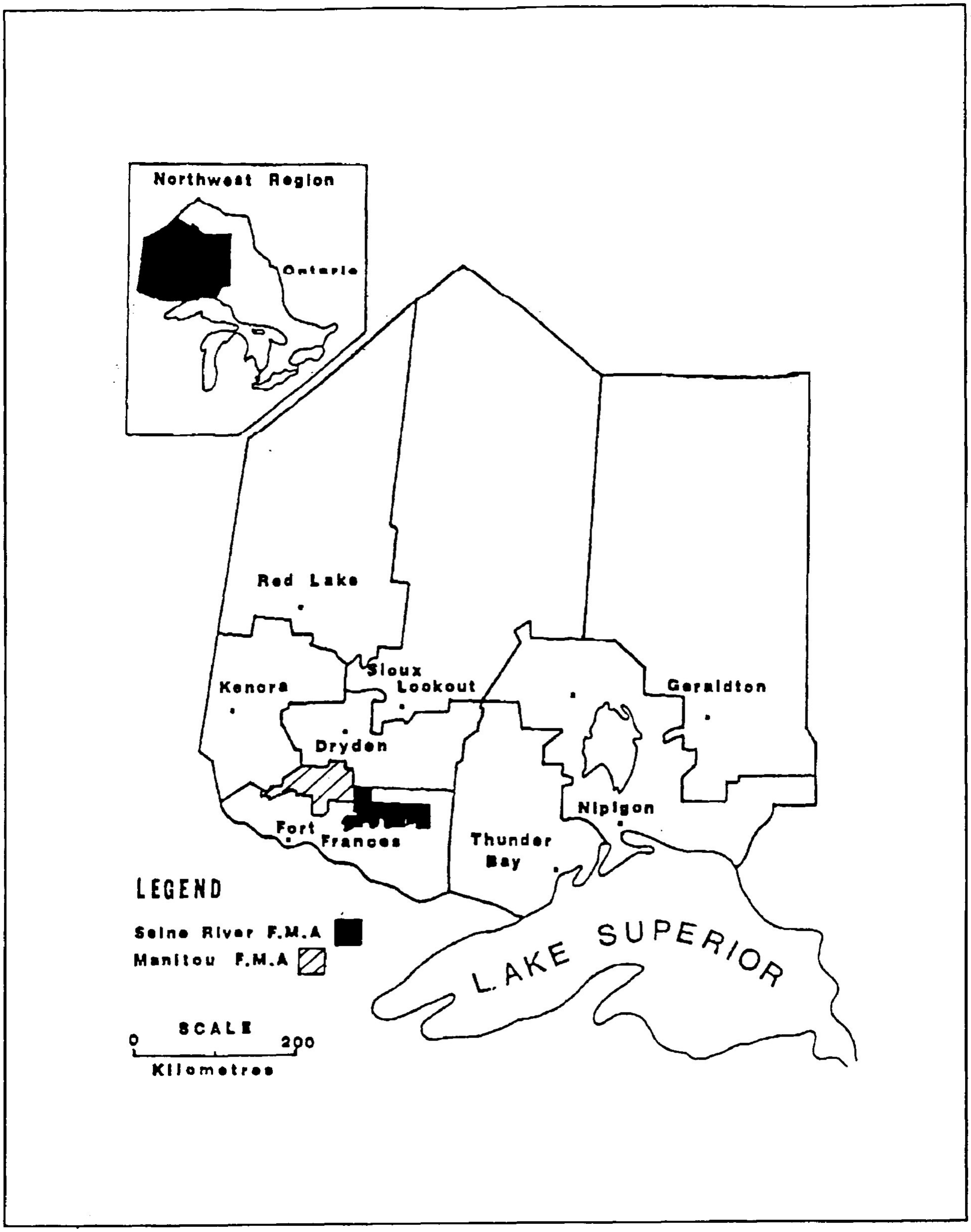

Figure 3. Map of the Seine River Forest Management Unit and the surrounding area of Northwestern Ontario.
(Source: Boise Cascade Canada Ltd.- Fort Frances Div., 1991)

Table 2. Summary of the total area of the Seine River Forest Management Unit as of 1991.

LAND CLASS		AREA (ha)
Water		46 373
Non-forested land		650
Forested land	Non-productive	25 722
	Productive	194 476
Total		267 221

(Source: Boise Cascade Canada Ltd.- Fort Frances Div., 1991)

Table 3. Summary of all the productive areas by tree species in the Seine River Forest Management Unit as of 1991.

Working Group Species	Protection Forest (ha)	Production Forest (ha)	Total (ha)
White Pine (Pw)	0	969	969
Red Pine (Pr)	0	1304	1304
Jack Pine (Pj)	214	74572	74786
Spruce-all (S)	0	253	253
Black Spruce (Sb)	946	53705	54651
White Spruce (Sw)	0	253	253
Balsam Fir (Bf)	99	10945	11044
White Cedar (Ce)	129	2402	2531
Tamarack (L)	18	70	88
Ash (A)	0	98	98
Soft Maple (Ms)	0	1636	1636
Trembling Aspen (Po)	426	36755	37181
Black Poplar (Pb)	0	98	98
White Birch (Bw)	398	9 186	407
Total	2230	192246	194476

(Source: Boise Cascade Canada Ltd.- Fort Frances Div., 1991)

3.3.1 Representing Forest State for Modelling

As with any simulation model, the present state of the forest must be represented, as well as the rules by which change would occur, in the form of a mathematical model. The present state of the study forest was reflected with the following parameters:

1. Forest type (forest areas dominated by one species of tree (working group));

2. Aggregate group (sub-groupings of forest types separated on the basis of stand composition and stocking);

3. Aggregate number (sub-groupings of aggregate groups based on site class);

4. Age class (sub-groupings of aggregate numbers based on five-year age classes); and

5. Volume development patterns (curve sets used to describe the net merchantable volume (NMV) of coniferous and deciduous components per hectare over stand age for each aggregate number).

3.3.2 Forest Type Aggregates

Forest type aggregates were compiled and aggregated from 1985 Ontario Forest Resource Inventory (FRI) data updated to the end of 1990 for depletions and free-to-grow status. While FRI data are not the most suitable database for forecasting and forest-level analysis (FRI stand interpretation was done by aerial photo interpretation with photo scales of 1:15 840 and only minimal ground-truthing, and was never intended for use in simulation models), it was the only account of the study forest's resources available in the Seine River Forest.

Each of these forest types was simulated separately to add a higher level of control over changes in management made within each type. To aid the reader in comprehending the assumptions made in forming the respective aggregate groups and aggregate numbers, the explanations are noted by forest type.

Table 4. The area and percent of the total area of forest types being managed in the Seine River Forest Management Unit.

FOREST TYPE	AREA	
	Hectares	Percent
Spruce/Fir	66 888	38
Jack Pine	74 983	42
Poplar	35 866	20
Total	177 737	100

3.3.2.1 Jack Pine Aggregations

The jack pine forest type occupied 42% of the total area (74 983 ha), of which the majority was mature to overmature (Figure 4). The jack pine (Pj) aggregate groups reflect conditions used by Boise Cascade managers to decide on methods of management for regenerating the sites. These conditions, which were also used for the aggregation of the spruce and poplar forest types, include:

- <u>site class</u>: identified through age-height relationships of a stand's working group species which are compared to species specific site class curves prepared by Plonski (1981). Order of site class in terms of productivity, from highest to lowest, are: X, 1, 2, and 3 with site class

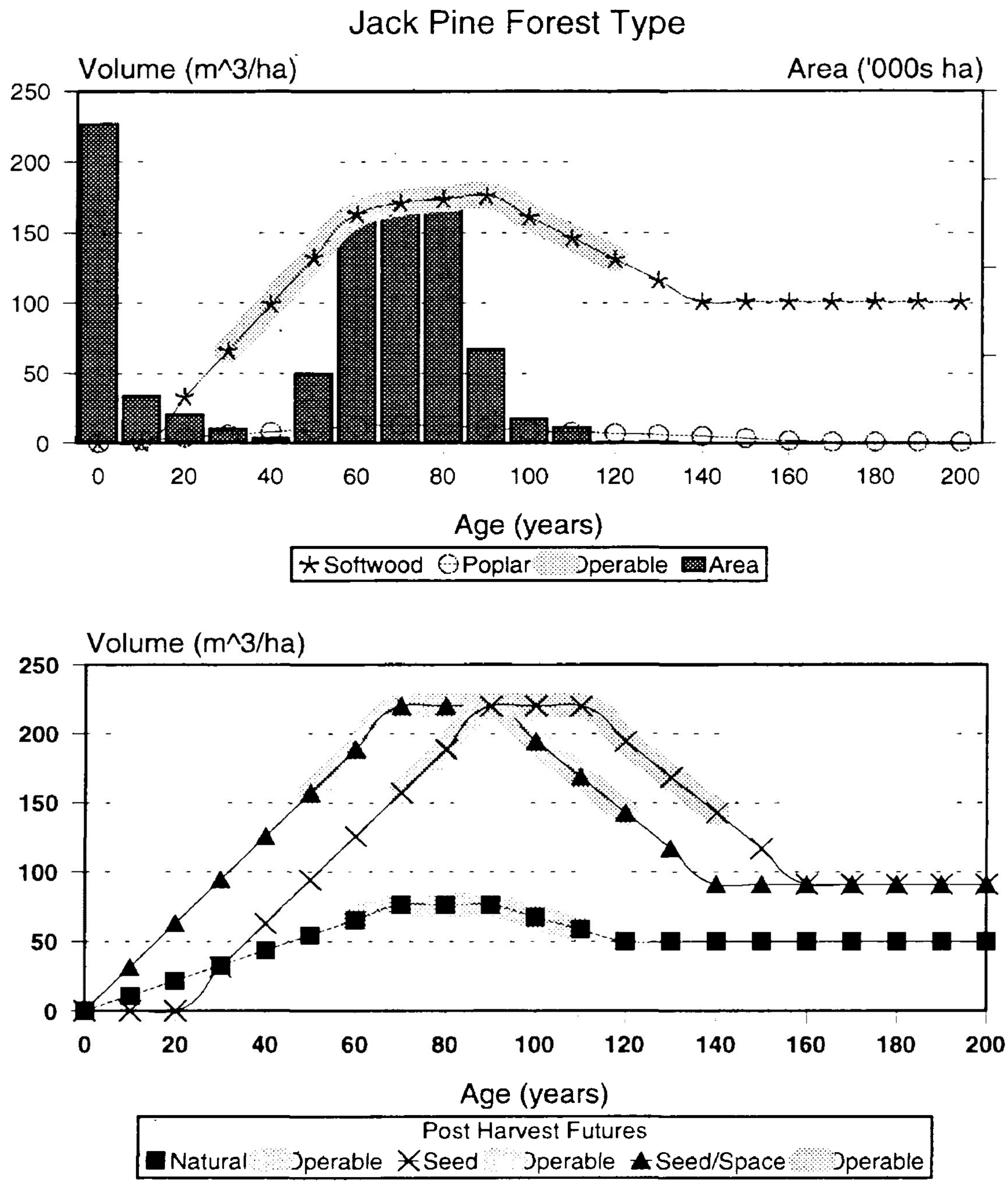

Figure 4. Age class distribution of the jack pine forest type and the typical present and future volume development patterns used.

representing any poor site (shallow soil) regardless of age-height numbers;

- <u>coniferous and/or hardwood component</u>: determined through summarization of a stand's species composition; and

- <u>stocking of stands</u>: values representing the relationship of a stand's actual volume to Plonski's (1981) normal volume.

The three aggregate groups formed were Pj-1, Pj-2 and Pj-3 (Table 5; Appendix IV).

<u>Pj-1 Aggregate Group</u>: Jack pine aggregate group Pj-1 is made up of stands having a Pj Working Group (WG) and an overall stand composition of coniferous trees only (i.e. the stands are all 100% coniferous). While the original intention was to break this aggregate group into stands with stocking greater than or equal to (ge) 70% and stocking less than or equal to (le) 60%, analysis of the Pj stands revealed that there was an insignificant area with stocking le 60%. Consequently, those areas were both incorporated into the Pj-1 aggregate group. This area was separated into site classes X+1, 2 and 3 to produce aggregate numbers 1, 2 and 3 respectively. As with the formation of the forest types, the information used for producing all of the detailed aggregate groups and aggregate numbers also came from the 1991 FRI.

Pj-2 Aggregate Group. The Pj-2 aggregate group is composed of stands with a coniferous component of le 70%. Aggregate Numbers 4, 5 and 6 relate to site classes X+1, 2 and 3 respectively.

Pj-3 Aggregate Group. All Pj stands with an 80 or 90% coniferous component are contained in aggregate group Pj-3. Aggregate Numbers 7, 8 and 9 were formed after the group was divided into site classes X+1, 2 and 3 respectively.

Table 5. Summary of the rules for and the stratification of the Jack Pine forest type in the Seine River Forest Management Unit.

Aggregate Group	Aggregate Number	Stand Component		Stocking	Site Class	Area (ha)
		Coniferous	Hardwood			
Pj-1	1	100%	0%	ge 70%	X & 1	2 496
	2				2	25 963
	3				3	2 880
	Subtotal					31 339
Pj-2	4	le 70%	ge 30%	nc	X & 1	1 450
	5				2	10 937
	6				3	896
	Subtotal					13 283
Pj-3	7	80 or 90%	10 or 20%	nc	X & 1	2 985
	8				2	24 225
	9				3	3 151
	Subtotal					30 361
Total						74 983

nc - not considered
ge - greater than or equal to
le - less than or equal to

3.3.2.2 Spruce Aggregations

The Spruce forest type (Sp) was also mature, but on average, was assumed to maintain volume (Figure 5). Spruce was originally envisioned to include only black and white spruce since there were no differences in the management strategies used by Boise Cascade for these two forest types. However, since Bf was used interchangeably with Sp at the mill and all the Bf sites were to be converted to black spruce after harvest, it was assimilated into the Sp forest type as well (Table 6; Appendix V).

Spruce Forest Type Aggregations. The spruce aggregate groups were formed based on site class, coniferous and hardwood component, stocking of stands, and presence of balsam fir. The spruce forest type was divided into five aggregate groups: Sp-1, Sp-2, Sp-3, Sp-4 and Sp-5.

Sp-1 Aggregate Group. The Sp-1 aggregate group is composed of stands having a 100% coniferous component of which ge 50% is black spruce, and stocking is le 60%. The group was split into site classes X+1, 2 and 3 to yield aggregate numbers 10, 11 and 12 respectively.

Sp-2 Aggregate Group. The Sp-2 aggregate group is similar to Sp-1 except that stands have stocking values ge 70%. Dividing the group into site classes X+1, 2 and 3 yielded aggregate numbers 13, 14 and 15 respectively.

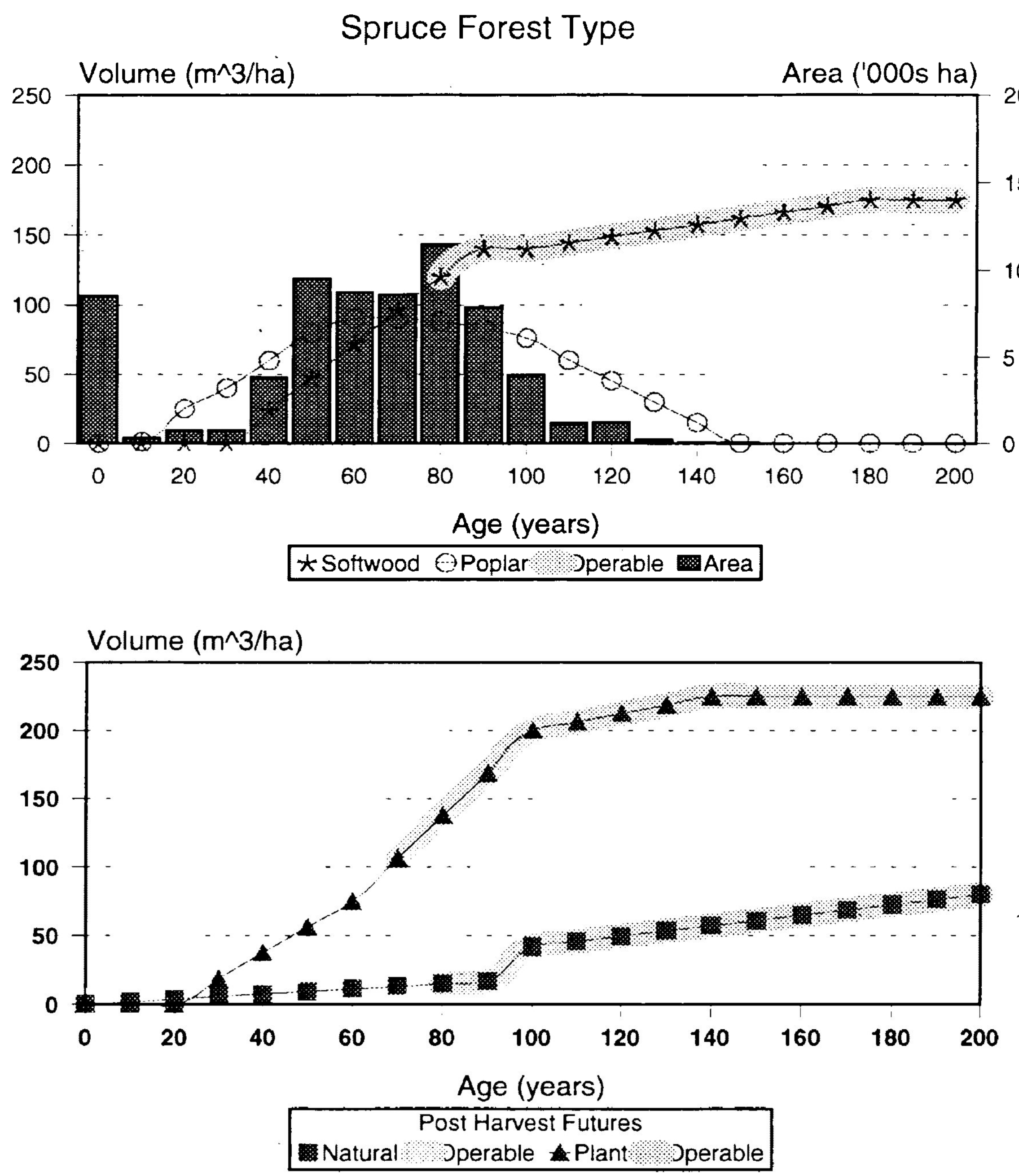

Figure 5. Age class distribution of the spruce forest type and the typical present and future volume development patterns used.

Sp-3 Aggregate Group. The Sp-3 aggregate group is composed of stands with a coniferous component of le 70%. The group was divided into site classes X+1 and 2 (there was no site class 3) which were then labelled as aggregate numbers 16 and 17 respectively.

Sp-4 Aggregate Group. The Sp-4 aggregate group is made up of stands with an 80 or 90% coniferous component. The area was then divided into aggregate numbers 18 and 19 which represent site classes X+1 and 2 respectively.

Sp-5 Aggregate Group. The Sp-5 aggregate group is composed of stands with a Bf working group. Division of the area by site classes X+1 and 2 yielded the aggregate numbers 20 and 21 respectively.

Table 6. Summary of the rules for and the stratification of the Spruce/Fir forest type in the Seine River Forest Management Unit.

Aggregate Group	Aggregate Number	Stand Component		Stocking	Site Class	Area (ha)
		Coniferous	Hardwood			
Sp-1	10	100% (Sb ge 50%)	0%	le 60%	X & 1	4 275
	11				2	6 175
	12				3	1 848
	Subtotal					12 298
Sp-2	13	100% (Sb ge 50%)	0%	ge 70%	X & 1	7 008
	14				2	3 056
	15				3	629
	Subtotal					10 693
Sp-3	16	le 70%	ge 30%	nc	X & 1	10 975
	17				2	1 593
	Subtotal					12 568
Sp-4	18	80 or 90%	10 or 20%	nc	X & 1	17 079
	19				2	2 391
	Subtotal					19 470
Sp-5	20	nc	nc	nc	X & 1	10 870
	21				2	989
	Subtotal					11 859
Total						66 888

nc - not considered
ge - greater than or equal to
le - less than or equal to

3.3.2.3 Poplar Aggregates

The poplar forest type (Po) is composed of stands having Poplar as their WG. The age class distribution of the Po forest type was on average immature to mature (Figure 6). One aggregate group was initially considered for conversion to black spruce (Po stands with spruce and/or pine making up 50% of the stand component). However after simulating the Po forest type, it was found that this conversion was unnecessary and likely improbable, especially in consideration of planting stock shortages and the more important need to convert BF stands to spruce. Planting of spruce was therefore allocated to the spruce forest type only. The final decision was to manage all Po sites with natural regeneration as the silvicultural prescription (Table 7; Appendix VI).

Poplar Forest Type Aggregations. The poplar aggregates were created from conditions of site class, coniferous and hardwood component, and stocking of stands. The aggregate groups formed from the poplar forest type were: Po-1, Po-2, Po-3 and Po-4.

Po-1 Aggregate Group. The Po-1 aggregate group is composed of stands with a hardwood component ge 60% and stocking of le 40%. Division of the area into site classes 2 and 3 yielded the aggregate numbers 22 and 23 respectively.

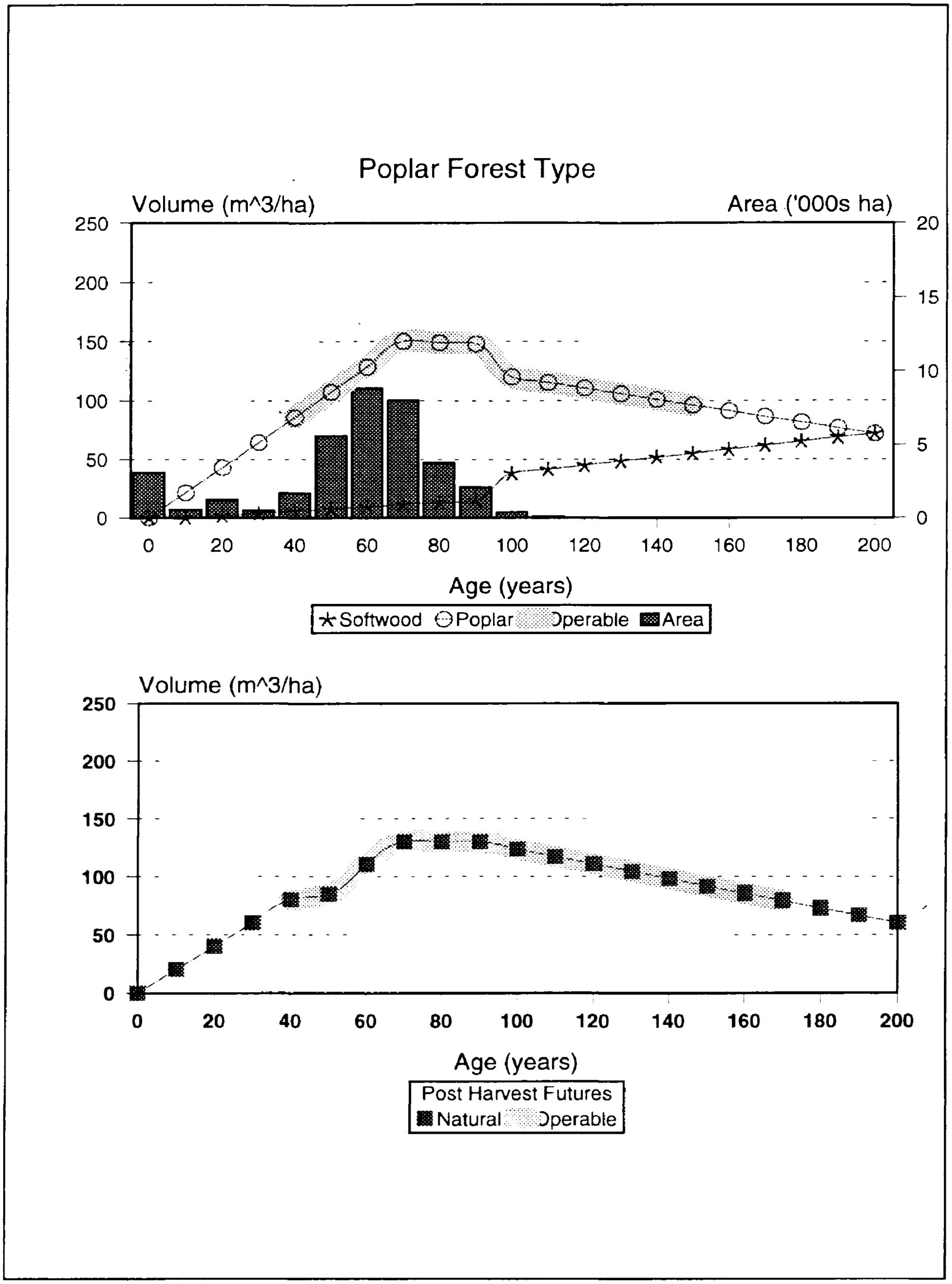

Figure 6. Age class distribution of the poplar forest type and the typical present and future volume development patterns used.

Po-2 Aggregate Group. The Po-2 aggregate group is composed of stands with a hardwood component ge 60% and stocking ge 50%. The area was divided by site classes 1, 2 and 3 which formed aggregate numbers 24, 25 and 26 respectively.

Po-3 Aggregate Group. The Po-3 aggregate group is composed of stands with a hardwood component le 50% and the presence of Bf in the stand composition. Division of the area by site classes 2 and 3 produced aggregate numbers 27 and 28.

Po-4 Aggregate Group. The Po-4 aggregate group is composed of stands with a hardwood component of le 50% and the presence of Pj and/or Sp in the stand composition. Site classes 29 and 30 are represented in aggregate numbers 29 and 30 respectively.

Table 7. Summary of the rules for and the stratification of the Poplar forest type in the Seine River Forest Management Unit.

Aggregate Group	Aggregate Number	Stand Component		Stocking	Site Class	Area (ha)
		Coniferous	Hardwood			
Po-1	22	le 40%	ge 60%	le 40%	2	2 643
	23				3	1 191
	Subtotal					3 834
Po-2	24	le 40%	ge 60%	ge 50%	X & 1	1 220
	25				2	13 799
	26				3	10 450
	Subtotal					25 545
Po-3	27	ge 50% Bf present	le 50%	nc	2	2 103
	28				3	3 158
	Subtotal					5 261
Po-4	29	ge 50% Pj/Spruce	le 50%	nc	2	457
	30				3	845
	Subtotal					1 302
Total						35 866
Grand Total						177 737

nc - not considered
ge - greater than or equal to
le - less than or equal to
Bf - balsam fir; Pj - jack pine; Spruce - white or black spruce

3.3.3 Volume Development Patterns

Volume Development Patterns (VDPs) were required to represent the quantity of net merchantable volume in cubic metres (NMm^3) which would grow in each aggregation as a function of time. The VDPs used to represent the SRFMU in its present, future, regeneration and spacing (pre-commercial thinning) states were taken wholly, or in part, from the NorthWestern Ontario FORMAN Forest Class Definitions (NWOFFCD) developed by Thompson (1990) of the Ontario Ministry of Natural Resources (OMNR).

The VDP set produced by Thompson (1990) was based solely on natural stands (i.e. stands not previously harvested). Neither Not Sufficiently Restocked stands (NSR stands) or harvested stands regenerating in the free-to-grow (FTG) state were included in his compilations. Thompson (pers. comm., 1991) noted that the VDPs were based on FRIs completed for the SRFMU from 1981 to 1985. Primary (softwood/coniferous) volumes consisted of combinations of jack pine, spruce-all, white spruce, black spruce, balsam fir, white pine, red pine and larch while secondary (hardwood) volumes were based strictly on poplar. Volume estimates for periods from 120 to 200 years were based almost entirely on professional judgement.

The methods used by Thompson (1991) to adjust the stocking levels of stands to a uniform level had some problems, primarily due to the complexity of the procedure used (Appendix VII). In addition to stocking, the aggregation of a variety of combinations of site classes led to very generalized estimates of volume. While the VDPs identified some forest classes (Note: Thompson's forest classes are referred to as aggregate numbers in this study) as having a poor productive capacity, this was likely due to the mixture of high and low productivity sites (e.g. aggregation of site classes X, 1, 2 and 3) into one aggregate. Since the curves must represent the various production potentials, the overall potential was unduly low for some sites and high for others.

The aggregations for the SRFMU were the result of finer divisions than those that the NWOFFCD yield curves were based on, so adjustments were required. The changes made were based on the expertise of the Boise Cascade managers, professional judgement and review of literature. Initially, percentage factors were applied to the NWOFFCD yield curve sets. However, a number of the yield curves chosen were modified further. For example, the Pj optimized regeneration and spacing yield curves were based entirely on professional judgement and review of literature.

The jack pine aggregations (aggregate numbers 1 to 9) were given optimistic regeneration VDPs. The volume production potential of the sites were adapted from spacing trials studied and projected to sixty years by Bell et al. (1990) (Appendix VIII). Approximately 75% of the volumes found by their projections were used as volumes for the jack pine VDPs. This factor was used to reflect final stand stocking of 80% which exists on most Pj plantations where the plantation stock has grown free of competing vegetation (e.g. poplar) in the crown layer or is Free-To-Grow (FTG) in Ontario (Willcocks et al., 1990) and another 5% to show some conservatism. I believe the result more closely reflected the true productive potential of the individual aggregates while still maintaining the overall forest level productivity.

The VDPs used to describe the dynamics of the present management system, along with the present area/age class structure and operability limits for each aggregate, are found in Appendix IX. To aid the reader, the VDPs were grouped by aggregate number to allow for easy scanning from present state to possible future states resulting from the particular management regime.

3.3.3.1 Assumptions

Due to limited empirical data for the present forest and especially for the future forest and that the future can never be fully known, many assumptions had to be made regarding the development of the forest aggregates. The assumptions are as follows:

1. Volume development patterns derived from analysis of 1989 FRI data by the Ontario Ministry of Natural Resources (the Northwestern Ontario FORMAN Forest Class Definition (NWOFFCD) yield curve set) provided the initial estimates for aggregation productivity;

2. After the aggregate groups were formed, the Boise Cascade managers pointed out which set of curves best fit each aggregate group using

expertise and knowledge of the SRFMU and results from management practices. Assumptions developed are as follows:

(i) Present and Future Yield Curves

All the present and future yield curves were based on the NWOFFCD yield curve set except for the Sp-5 aggregate group. According to specific conditions within aggregates, each of the curves was scaled. Sp-5 (balsam fir) VDPs were created with professional judgement and literature which both supported greater potential productivity than expressed in the NWOFFCD yield curve set.

(ii) Artificial Regeneration Yield Curves

Pj Forest Type: Artificial regeneration yield curves for the Pj forest type were made by modifying NWOFFCD yield curves, based on curves derived to 60 years by Bell et al. (1990) (Appendix VIII). The assumption used was that 75% of the volumes recorded by Bell et al. (1990) (75% represented an average stocking of 80% less 5% for a conservative estimate for Pj plantations) of the curves presented by Bell et al. (1990) as the maximum volume at 60 years. The curves were then projected to higher values based on Plonski's Normal Yield Tables (Plonski, 1981) and reduced to NMm^3 based on Ontario cull tables (Morawski et al., 1958).

Sp Forest Type: Regeneration yield curves for the Sp-5 aggregate group (balsam fir) were devised by the author with the aid of supporting literature (Payandeh et al., 1989). Regeneration curves for Sp (other than Sp-5) and Po are modifications of the NWOFFCD yield curve set; percentage factors were used to increase/decrease the volume estimates based on the expertise of Boise cascade managers.

(iii) Spacing Volume Development Patterns

Spaced Pj and Pr sites have identical development patterns to those they are originating from, except that they become operable 10 to 15 years earlier.

(iv) Pr Regeneration Volume Development Patterns

Red pine VDPs were formed from the Plonski red pine (Pr) plantation curves (Plonski, 1981). Cull was assumed to be zero for ages younger than 100. Percentage factors were used to reduce the estimates of volume growth to reflect the different growing conditions of the SRFMU (i.e. plantation sites would be on cutovers, not abandoned farmland; the SRFMU has a more northerly location).

While the assumptions listed above were a source of concern for the long-range projections made in this study, they also served to point out areas where more research was required. Less dependence on questionable assumptions will ultimately lead to more accurate forecasts. However, Ontario can not afford to move blindly from one forest management system to another. By using assumptions based on professional judgement and available research information, a plausible view of the future can be achieved.

3.3.4 Present Strategy of Management

The present strategy of management, from here on referenced as the Business-As-Usual (BAU) scenario, reflects Boise Cascade's system of management used on the SRFMU under normal operating conditions. This management strategy involved wood supply, silviculture, and weed control objectives.

3.3.4.1 Wood Supply

Harvest scheduling followed a policy of minimizing softwood volume loss in softwood dominated sites and minimizing hardwood volume loss in hardwood sites. The annual required wood-supply from the SRFMU was 300 000 NMm^3 of wood-fibre: 240 000 NMm^3 of coniferous wood, (140 000 NMm^3 from the jack pine forest type and 100 000 NMm^3 from the spruce forest type) and a hardwood (poplar) volume of 60 000 NMm^3 obtained both indirectly from softwood sites and directly from hardwood sites. The harvest area necessary to sustain this wood-fibre requirement was approximately 2 200 ha/yr based on past experience.

3.3.4.2 Vegetation Management

Vegetation management efforts on the SRFMU were influenced by the FMA, wood-fibre needs (primarily softwood) as previously discussed, and the competition problem the included site preparation, method of regeneration, species planted or seeded, and harvest area (ha/yr). Site preparation (SIP) occurred on 86% of clearcut harvest treatments (1 900 ha/yr), of which 1 600 ha/yr is mechanical and 300 ha/yr is mechanical and chemical SIP. Regeneration of the harvested area included 11% to natural regeneration (200 ha/yr), 17% was planted (400 ha) which was evenly split between Pj and Sb, 69% of the harvested area (1 500 ha/yr) was seeded to jack pine, and 3% of the harvest area (100 ha/yr) was lost to roads and landings.

Herbicide Program: The weed control program consisted of site preparation and tending. Chemical site preparation was allocated to 300 ha/yr; 90% (270 ha/yr) aerially applied and 10% (30 ha/yr) by ground application methods. Tending was performed on 1 200 ha/yr with aerial application of herbicide (Vision®). Funding for the weed control program was considered to be sufficient to implement all needs. A complete account of the silvicultural prescriptions and their associated costs is given in section 3.4.

3.4 SILVICULTURE PRESCRIPTIONS AND ASSOCIATED COSTS

Silviculture prescriptions are working hypotheses of what treatment or treatments are necessary to produce a desirable outcome (Tappeiner and Wagner, 1987). For the BAU scenario, the silvicultural prescriptions were based on the procedures used by Boise Cascade, while for the alternative scenarios, the prescriptions included alternative silviculture treatments not currently used.

Silvicultural prescriptions used included one or a combination of:

(i) site preparation (mechanical, chemical or mechanical and chemical);

(ii) regeneration (natural, seeding or planting);

(iii) tending (chemical treatment two years after establishment, two and five years after establishment, or three years after establishment); and

(iv) pre-commercial thinning (on virgin, natural, or seeded sites 10-20 years after establishment).

The intensity of silvicultural prescriptions was dependent on the potential for hardwood competition on the sites. Thus, poplar stands received no silvicultural treatments while sites with high poplar components (e.g. aggregate groups Pj-2 and Sp-3) received the most intensive silvicultural prescriptions (Table 9).

Table 8. Summary of silvicultural treatments and their assumed costs used in the construction of management scenarios.

Category	Type	Specifics	Acronym	Cost ($/ha)
Regeneration	Natural		N	$0.00
	Seeding		S	$7.00
	Planting		P	$630.00
	Planting Large Stock		P-L	$700.00
Site Preparation	Mechanical	Light	M	$170.00
		Heavy	HM	$400.00
		Heavy Site-Specific	HSSM	$500.00
	Mechanical/ Chemical	Light	MC	$310.00
		Heavy	HMC	$400.00
Tending	Chemical		C#	$140.00
	Ground	Brush Saw	BS#	$400.00
	Planning	Girdling	G-#	$100.00 to $250.00
Spacing	Pre-Commercial Thinning		PCT	$400.00

3.5 ALTERNATIVE METHODS OF VEGETATION MANAGEMENT AND THEIR ASSOCIATED COSTS

In most of the scenarios, it was necessary to maintain a level of vegetation management while either reducing or eliminating the use of herbicides. A variety of alternatives for vegetation management were available as mentioned previously. Alternatives included a pre-harvest girdling program, more effective mechanical site preparation techniques (heavy-mechanical and heavy-site-specific-mechanical), the planting of large, vigorous growing stock, pre-commercial thinning with either brush saw or leader snipping, and ground application techniques for herbicides including stem injection, back-pack sprayers and mechanical methods (e.g. Bracke herbicider). For each of the scenarios, alternatives were selected based on their strategic direction; reduction of herbicides, restriction on how herbicides are applied, elimination of herbicide use, or change in wood supply.

3.5.1 Pre-harvest Girdling Program

For a pre-harvest girdling program, the poplar component in treated stands would be girdled two to three years before the scheduled harvest time. Over the time till harvest, the shade-intolerant poplar trees exhaust carbohydrates stored in their root systems since they continually sucker as a reaction to the girdling, but are unsuccessful due to shade from the standing forest around them (Whitfield, 1989). Risks to the wood supply due to this time factor stem from events which could occur to the yet-to-be-harvested stands including fires, windthrow, pests, or deterioration of the poplar component into an unusable state.

It was assumed that the necessary work force required for a girdling program on the SRFMU would be available, primarily since girdling can be done in any season and thus timed with labour availability (Bell pers. comm. in Sept., 1991). Another assumption was the unrestricted availability of the necessary girdling tools. Several girdling tools are often needed for any one stand, and some tools such as the L'il Beaver Power Girdler® have restrictions on their use (Whitfield, 1989).

Pre-harvest girdling treatments were scheduled for mature and overmature stands. The costs involved with a girdling program for a mature forest are dependent on the tools used (e.g. L'il Beaver mechanical girdler), operator experience and expertise, terrain, stand density, and debris. In determining the costs, because the forecasts are long term, it was assumed that the tools would be available, experienced labourers would be available, and that the entire area of the two aggregate groups with a 10 to 20% poplar component (Sp-3 and Pj-3) would be treatable.

Costs of girdling programs could vary considerably, dependent on the factors listed above. The most optimistic figures available, which were adapted to the cost figures in this study, were with the L'il Beaver, with costs of $0.75 to $1.25 per tree on average (Whitfield, 1991).

Stem counts were obtained from Plonski's Normal Yield Tables (Plonski, 1981) at representative ages (when harvesting was expected to occur) and then multiplied by a factor of 15% to derive rough estimates of the number of stems to be girdled and thus the girdling costs per hectare. This percentage represents the average poplar component of stands which would be considered for a pre-harvest girdling treatment. The costs derived were as follows:

Site Class	Cost ($/hectare)	
	Pj-3	Sp-4
X+1	100	200
2	150	250
3	200	-

3.5.2 Mechanical Site-Preparation Techniques

The aim of mechanical site-preparation is to create conditions which will allow for planting, sowing, and/or natural regeneration (Sutton, 1985, 1990, Stewart, 1987; Orländer et al., 1990) to secure the survival and growth of the growing stock for the following tree crop (Nutter and Douglas, 1978). Recently, the trend has been towards more effective, site-specific systems (Hunt and McMinn, 1988; Hunt, 1989; Orländer et al., 1990). The use of more site-specific prescriptions could improve control of adverse factors which affect seedling survival and growth (McMinn, 1982).

In consideration of the advantages of SIP listed above, Heavy Mechanical (HM) and Heavy-Site-Specific-Mechanical (HSSM) site preparation were designated for use on areas where chemical treatments were either reduced or omitted. Planting of high-quality planting stock on areas given a good treatment of site preparation has been shown both empirically and through experimentation to reduce or eliminate the need for later tending treatments (Stewart, 1987).

HM site preparation involved the use of more severe methods than the light site preparation (i.e. TTS disk trenching, barrels and chains, and Bräcke mounding) used in BAU management. The methods envisioned involved root rakes, ploughs or large mounds to reduce competition from undesirable vegetation. The cost of HM site preparation was set at $400/ha (OMNR, 1986[2]; Bell, 1991) which relates to a 235% increase over normal BAU site-preparation costs ($170 per ha).

HSSM site preparation would use a variety of tools for site preparation, when necessary, on individual harvest blocks. The use of a single site-preparation treatment over large blocks with diverse landscapes and conditions was deemed inappropriate for the affected aggregates of this study. Because of increased costs for management (i.e. in planning specific SIP treatments for the treatment sites), capital investment for various SIP tools, transportation and supervision costs, the costs for HSSM treatment were set at $500/ha (294% increase over BAU SIP costs).

3.5.3 Planting of Larger Growing Stock

The first few years in the development of planted conifers is well known to be the major determining factor of their future survival and productivity (Smith, 1986; Stewart, 1987; Walstad and Kuch, 1987[2]; Bell, 1991; Day, 1991 and Towill et al., 1992). Large growing stock has the capacity for larger height increments in the establishment phase than small stock; thus, it can better match the height growth of competing vegetation (Towill et al., 1992). Larger stock is also less susceptible to frost heaving and rodent damage than smaller stock (Towill et al., 1992). Less restricted growth due to the use of large planting stock would allow for faster establishment on very productive sites, especially when used in combination with effective methods of site preparation (Stewart, 1987). The cost for planting larger growing stock was set at $700/ha for both pine and spruce species (a 10% increase over that for normal sized stock).

3.5.4 Manual Thinning Treatments

Manual thinning/weeding treatments are used to remove competing vegetation (usually hardwoods but sometimes conifers also) and to space the desired vegetation (usually conifer species) to give remaining trees more growing space, sunlight, nutrients and water (Day, 1991). Manual methods used for these programs include sandviks, chain saws, brush saws and just recently, leader snipping/clipping (Anon., 1991). The cost for a manual thinning treatment was set at $400/ha. While leader clipping was demonstrated to be both faster and safer than using brush saws, and thus less expensive (40%), this technique was still in the experimental stage (Anon., 1991).

3.5.5 Ground Application Techniques for Applying Chemicals

Like aerial chemical application, ground application of herbicides was used to control competing hardwood vegetation. The advantage of using ground application techniques is that a higher level of control is possible during application which can reduce the risk of unexpected drift. Disadvantages include higher insurance costs, higher level of exposure to chemicals for the on-ground personnel, and more difficult supervision of the work (Bell, pers. comm., 1991). Ground application of herbicides would include both site-preparation and tending treatments.

For site preparation, a method of ground application which was being experimented with by Boise Cascade was the Bräcke herbicider. This machine is capable of scarifying and applying herbicide (liquid or granular) at the same time. For tending, mist blowers carried by either machines or personnel could be used. The cost for ground site preparation was set at $310/ha (based on $140/ha for glyphosate and $170/ha for Bracke SIP) and tending costs with mist blowers was set at $300 per hectare (based on $200/ha for glyphosate and $100/ha as the rate for personnel).

3.5.6 Summary of Alternative Silviculture Treatments

The alternative treatments described above all serve to meet the demands of management strategies devised to change the amount of or the way in which herbicides were used. Thus, it is the change in the decision variables (cost, area treated and forest level wood supply) from the current levels which is important to understand. As shown in Table 9, there are 16 silvicultural prescriptions used as alternatives. Each prescription has associated responses and was used in one or more management strategies.

Table 9. Summary of alternative silviculture treatments and changes from the BAU scenario used in alternative management strategies.

Alternative Silviculture Treatment			Change from BAU				Treatments Used											
							Reduced Use			Restricted Use				No Use			Wood Supply	
Reg.	SIP	Tend	Silviculture Cost (Δ $/ha)	Treatment Activity (Δ ha/yr)	Volume per ha (Δ %)	Time to Operability (Δ years)	67HP	50HP	40HP	ATOA	ATOB	ATOC	NAA	NWC	OWCA	OWCB	FWSGW	FWSN
S	M	G3	-40 to 790	-1	0 to -15	0 to 5	✔	✔	✔						✔	✔	✔	
P	M	G3	60 to 110	-1	0	0	✔	✔							✔	✔	✔	
P	M		60 to 110	-1	0	0			✔									
P-L	HMC	C3	20	-1	0	0			✔									
S	HMC	C3	-50	-1	0	0			✔									
P-L	HM	-	-80	-2	0	0		✔	✔									
P	HM	C2,5	-140 to 190	-1	0 to -15	0 to 10				✔	✔	✔						
S	HM	C2,5	-140 to 190	-1	0 to -15	0 to 5				✔	✔	✔						
P,S	M,MC	GC2 5	320	-2	0	0							✔					
P,S	M	GC3	160	-1	0	0							✔					
P,S	HSSM	BS5,7	710 to 880	-3	0 to -15	10									✔	✔		
P,S	HSSM	BS5	590	-1	0 to -10	10									✔	✔		
P,S	HSSM	-	-90 to 330	-1	-10 to -20	5 to 10								✔			✔	✔
P-L	HSSM	-	-20 to 400	-3 to -1	-10 to -20	10 to 15								✔			✔	
P-L		-	70	0	0	0								✔			✔	
N		-	-1220 to 0	-3 to 0	0	0											✔	

Δ Delta (change)

3.6 DECISION RESPONSE VARIABLES

To simply the reporting and decision making process, key response variables were chosen. Since the effect of a change in herbicide use policy on forest management was the question to be answered, herbicide use and wood supply were two obvious variables. A third variable, silvicultural cost, was also selected due to the increasing reliance on industry by the provincial government, to fund their own silvicultural programs.

3.6.1 Wood Supply

Wood supply response variables were used to gauge changes that occurred as a result of modifications in management. Since the volume levels harvested from each forest type were not fixed for all the scenarios (the two FWS scenarios had flexible levels), a variable which could be compared independently of the sustainable harvest levels was needed. Thus, the response variable chosen to represent wood supply was Average Harvest Volume per Hectare (AHVH).

Average annual harvest area was calculated by averaging the periodic (5-year) totals from the FORMANCP short reports and then dividing by five. Average harvest volume per hectare was calculated by dividing the sustained harvest volume by the average annual harvest area.

3.6.2 Herbicides

Treatment activity, or the number of hectares treated with herbicides in any one year, was selected as the response variable for herbicide use. Determination of treatment area was a simple bookkeeping task completed under FORMANCP. As noted previously, FORMANCP allows harvest costs to be specified when making simulation runs. This cost file was used to yield TA values in the following manner:

Reviewed the silviculture prescriptions for each aggregation (e.g. Pj-2, site class X&1; aggregate number 4) and determined the number of times herbicides were applied to particular forest areas (e.g. one hectare of aggregate number 4 treated with silviculture received herbicides three times: once from mechanical-chemical SIP and two more from tendings 2 and 5 years after planting and thus its treatment area was three)

2. Determined what forest classes received "x" number of herbicide treatments. For example, for the jack pine forest type under the BAU scenario, three aggregates (Pj-4, Pj-5, and Pj-6) could receive three herbicide treatments when treated with silviculture, while three other Pj aggregates (Pj-7, Pj-8 and Pj-9) could receive only one herbicide treatment);

3. Produced a <u>treatment area file</u> (a modified cost file) which described all possible development pattern transfer routes which would result in herbicide treatments being scheduled. Instead of using a cost, a value of "1000" was used (since FORMANCP summarizes this field in thousands);

Treatment area file for jack pine aggregations that receive 3 treatment of herbicide for every silviculture treatment scheduled.

```
-9  45   35  25 0.040
11  46 1000
12  46 1000
13  47 1000
14  47 1000
46  46 1000
47  47 1000
```

4. Produced runs with each treatment area file for the forest types which received silvicultural treatments (Pj and Sp);

5. Summarized results from the short reports for every time period and multiplied by their corresponding number of treatments to yield treatment area responses.

A complete example of TA derivation is supplied in Appendix XI.

3.6.3 Silviculture Costs

The cost of the silvicultural treatments for each management strategy was an important indicator since the cost of alternative treatments was so variable and because cost is something which is easy to relate to for most people. To include changes in time of investment as well as level, discounted values were used. These values were direct outputs from the FORMANCP simulation program.

3.7 ALTERNATIVE MANAGEMENT STRATEGIES

Management strategies define goals and objectives and express a plan for how they are expected to be achieved, and the rules and limitations which guide their actions. Thirteen strategies were devised for this study by myself, my supervisor, and the forest managers of Boise Cascade. The twelve alternative scenarios are explained based on how they differ from the BAU scenario (Table 9).

3.7.1 Reduced Herbicide Use

There were two paths which could be followed in a reduced herbicide program scenario. One strategy would have been to reduce herbicide application rates for the forest by specific amounts and therefore leave the program unchanged except for the amount of active ingredient applied to the forest. The second strategy involved the removal of areas to be treated from the herbicide program.

This choice of the second herbicide reduction strategy was based on the following assumptions:

1). Decrease of the application rate of herbicides applied could decrease the efficacy of the herbicide for control of competing vegetation, thereby increasing the chance of retreatment and increasing total herbicide use;

2) A reduction in area treated not only maintains the efficacy of the herbicides, but also leaves larger areas untreated and increase the need for alternative vegetation management practices; and

3) With the advent of new ultra-low-volume herbicides able to effectively control vegetation at very low levels of active ingredient (e.g. <0.25 kg/ha a.i.), the kilograms of herbicide use becomes a misleading statistic (Wagner pers. comm., 1991).

Three levels of herbicide reduction were selected for this study; 33, 50 and 60%.

3.7.1.1 67% Herbicide Program (67HP) Scenario

To achieve the 33% reduction in the treatment area of the BAU herbicide program, a pre-harvest girdling program was planned for stands with a 10 or 20% poplar component, which normally would be tended once, three years following planting. The two aggregate groups in the SRFMU fitting this description are Pj-3 and Sp-4, which together make up 28% of the total area (30 361 ha and 19 470 ha respectively). The yields from these two aggregate groups were assumed to be the same as if treated with herbicides, since if properly orchestrated, pre-harvest girdling effectively removes the threat of poplar sprouting and suckering after harvest.

The wood-supply results for this scenario remained constant with the BAU scenario since yield was assumed to be maintained. However, the area treated with herbicides, the amount of herbicides applied in the forest and the costs changed. Due to restrictions in FORMANCP, the numbers reported represent averages over five-year periods. For example, when a stand in aggregate number 4 (Pj-2; Scl X+1) was harvested and then scheduled for regeneration, it was assumed to receive a mechanical/chemical site preparation and two chemical tendings. The chemical tendings were given at two and five years after planting; however, the treatment activity was tabulated immediately (i.e. three hectares treated for every hectare regenerated) even if the treatments did not occur till the next 5-year time period. It was assumed that the numbers will average out over time. A complete account of the silvicultural prescriptions and their associated costs is supplied in Appendix X.

3.7.1.2 50% Herbicide Program Scenario

The 50% Herbicide Program (50HP) scenario was used to explore the effects of a 50% reduction in treatment activity. The 50% reduction was achieved by using the assumptions of the 67HP scenario and also removing the Sp-5 aggregate group from the herbicide program. Of the five aggregate groups in the Spruce forest type, the Sp-5 aggregate group had the highest planting priority (it received treatment before all others) and thus was expected to produce the additional 17% reduction. This aggregate group would normally have been planted to black spruce, mechanically site prepared and chemically tended two and five years after planting. To replace the use of chemicals in the silvicultural treatment of these sites, a pre-harvest girdling treatment was employed on sites containing poplar, in addition to heavy mechanical site preparation and the planting of large black spruce stock. Heavy mechanical site preparation was expected to remove advanced balsam fir regeneration and larger planting stock was assumed to give crop trees an edge over competition on the site. A complete account of the silvicultural prescriptions and their associated costs is supplied in Appendix X.

3.7.1.3 40% Herbicide Program Scenario

The 40% Herbicide Program (40HP) scenario was devised to reduce herbicide treatment activity by 60%. Again, the assumptions of the 67HP scenario applied here. However, to reduce the treatment activity to 40% of BAU levels, changes were made to the silviculture treatments of three additional aggregate groups: Pj-2, Sp-3, and Sp-5.

The silvicultural prescription for the Pj-2 aggregate group was changed to heavy mechanical plus chemical site preparation (HMC), planting of large jack pine stock (SCL X+1 and 2) and seeding of jack pine (SCL 3) and only one chemical tending (rather than two). Aggregate group Sp-3 had a silvicultural prescription of mechanical plus chemical site preparation, planting to black spruce and two chemical tendings in the BAU scenario. For this aggregate tendings were reduced to one and HMC site preparation was used in combination with the planting of large black spruce stock to maintain control over competing vegetation. The Sp-5 aggregate group's BAU silvicultural prescription of mechanical site preparation, planting of black spruce and two chemical tendings was changed to conform to one chemical tending. To accomplish this, heavy mechanical site preparation (HM) and planting of large black spruce stock was used. These prescriptions and their associated costs are tabulated in Appendix X.

3.7.2 Restricted Herbicide Use

Restrictions are often imposed on forest management and they are likely to occur in the future in one form or another. Two types of restricted use were investigated in this study; aerial tending as the only type of herbicide treatment (i.e. site preparation with herbicides was not allowed) and no aerial application of herbicides (i.e. herbicides could be used but only when applied from the ground). The Aerial-Tending-Only (ATO) scenarios were developed to investigate the implications of using only aerially-applied chemicals for tending. Alternatives were used in place of the chemical site-preparation used in the BAU scenario.

The two alternatives implemented were HM and HSSM site preparation. The first two scenarios, ATO-A and ATO-B employed HM site preparation, while in the ATO-C scenario, HSSM site preparation was used. Changes to the volume development patterns and treatment costs were also made for each scenario as follows:

(i) ATO with reduced/delayed conifer volumes but with BAU site preparation costs (ATO-A);

(ii) ATO with reduced/delayed conifer volumes and higher site preparation costs (ATO-B); and

(iii) ATO with conifer volumes maintained and considerable increases in site preparation costs (ATO-C);

3.7.2.1 Aerial-Tending-Only-A Scenario

The ATO-A scenario used HM site preparation rather than mechanical-chemical (MC) site preparation. The two aggregate groups affected are Pj-2 and Sp-3. For this scenario, these aggregate groups were assumed to lose 15% of their primary volume which reappeared as poplar (secondary) volume. There was no cost increase associated with this change since the cost of HM SIP was assumed to be the same as the cost of normal mechanical site preparation ($170/ha) for this scenario. All assumptions are tabulated in Appendix X.

3.7.2.2 Aerial-Tending-Only-B Scenario

The Aerial-Tending-Only-B (ATO-B) scenario was developed to shed light on the implications of higher costs in addition to the reduced yields specified in scenario ATO-A. The cost of HM SIP was increased by $230 to $400 per hectare. These changes as well as the changes in volume development patterns are tabled in Appendix X.

3.7.2.3 Aerial-Tending-Only-C Scenario

The ATO-C scenario was developed under the assumption that with HSSM used to replace chemical site preparation, the yield expectations of the BAU scenario could be maintained. Thus, there were no differences in the associated yields, however, silvicultural costs increased by $330 per hectare (since HSSM SIP costs $500/ha while normal SIP costs only $170/ha). These changes and all other assumptions are tabled in Appendix X.

3.7.2.4 No-Aerial Application Scenario

The No-Aerial-Application (NAA) scenario was devised to accommodate public concerns for aerial spraying of herbicides. In this management scenario, aerial application of herbicide was not allowed; instead herbicides were applied exclusively with ground application techniques for both SIP and tending. Thus, the changes made involved a switch to ground application systems for chemicals. While the mode of application and the respective costs were changed from the those of the BAU scenario, volume development patterns are assumed to remain the same. Specific changes of treatments and their associated costs are listed in Appendix X.

3.7.3 No Herbicide Use

These scenarios were developed to investigate the possibility of not using herbicides at all but still maintaining a high level of competition control. The Other-Weed-Control (OWC) scenarios were used to investigate the effects of using alternatives to herbicides for all vegetation management practices. Vegetation management treatments used included pre-harvest girdling, PCT, and HSSM site preparation. Sites which were not treated with herbicides in the BAU scenario were not changed. Two OWC scenarios were developed to test the sensitivity of silviculture treatment response (i.e. wood-fibre production):

(i) OWC with BAU conifer volumes and increased silviculture costs (OWC-A); and

(ii) OWC with decreased BAU conifer volumes and increased silviculture costs (OWC-B);

3.7.3.1 Other-Weed-Control-A Scenario

For the Other-Weed-Control-A (OWC-A) scenario, the assumption that the alternative vegetation management practices would yield the same output as the BAU scenario was made. However, costs of the alternative treatments were higher than the treatments used in the BAU scenario. All the assumptions made for the OWC-A scenario are tabled in Appendix X.

3.7.3.2 Other-Weed-Control-B Scenario

The Other-Weed-Control-B (OWC-B) scenario was identical to the OWC-A scenario in its assumptions of alternatives to herbicides and costs; however, it was assumed that there were volume losses due to the exclusion of herbicide use in some of the aggregate groups. Aggregate groups Pj-2, Sp-3 and Sp-5 lost 15% of their BAU volumes and aggregate group Sp-1 lost 10% of its BAU volume. The Sp aggregate was assumed to lose 5% volume less than the Pj aggregate since spruce is a more tolerant species and slightly less effected by poplar competition. The two aggregate groups which were treated with pre-harvest girdling (Pj-3 and Sp-4) were assumed to retain their volumes as were Pj-1 and Sp-2 which were unchanged. Assumptions made for this scenario are listed in Appendix X.

3.7.3.3 No-Weed-Control Scenario

The No-Weed-Control (NWC) scenario explored the consequences of not using tending treatments at all, either chemically or manually, for silvicultural prescriptions. Instead, emphasis was placed on site preparation techniques and use of larger, healthier planting stock.

The HSSM SIP treatment was employed on all sites which were site prepared in the BAU scenario. Large planting stock was used for all sites normally planted (both Pj and Sb) and reductions in the coniferous component of volume development patterns were made. Aggregate groups Pj-1, Sp-1 and Sp-2 (except for Aggregate number 12) lost 10% of their primary (coniferous) volume and gained 10% in their secondary (hardwood) volumes. Aggregate groups Pj-3, Sp-4 and Sp-5 all lost 15% of their primary volumes and gained 15% in their secondary volumes, while aggregate groups Pj-2 and Sp-3 both lost 20% of their primary volumes, which was gained in their secondary volumes. The assumptions made in discerning what percentage decrease should be placed on what sites were based primarily on common sense. The more drastic the change from BAU silvicultural specifications, the larger the decrease in primary volume. The limits of volume decreases from 10 to 20% were judgement calls made on the basis of experience with sites which were treated with HSSM in the past and some speculation on the advantage of using larger planting stock. These assumptions are all tabled in Appendix X.

3.7.4 Wood Supply Change

The wood supply change scenarios were devised to examine some of the implications of new pulping facilities which would be capable of using all types of wood fibre in any proportion. Two Flexible-Wood-Supply (FWS) scenarios were formulated to investigate the implications to herbicide use:

(i) FWS where management took advantage of the natural regenerative nature of the forest. Decreased conifer volumes, increased hardwood volumes and zero artificial regeneration levels and costs were assumed; and

(ii) FWS where management took advantage of the most productive coniferous tree species (jack pine and red pine) by use of intensive silviculture (a combination of site preparation, seeding or planting, chemical tending, and PCT where necessary) and the natural regenerative ability of poplar. Spruce was omitted from harvest scheduling altogether due to its low productivity in relation to pines and poplar. Increased conifer volumes, decreased hardwood volumes and increased silviculture costs were assumed. Silviculture levels were increased for the jack pine aggregations to ensure the necessary amount of wood-fibre is produced.

3.7.4.1 Flexible-Wood-Supply-N Scenario

The Flexible-Wood-Supply-Natural scenario (FWS-N) was perhaps an abstract concept since pulping facilities are dependent on particular mixes of wood fibre to produce their desired products (e.g. newsprint). However, in the event of technological advancement to the point that this restriction no longer holds, and chemicals are prohibited for use in forest management, how would the structure of the forest be affected over time? The FWS-N scenario reviewed possible effects of using any type of wood fibre and natural regeneration. Since only natural regeneration is used, there are no post-harvest silvicultural prescriptions or associated costs (Appendix X).

3.7.4.2 Flexible-Wood-Supply-GW Scenario

The Flexible-Wood-Supply-GW (FWS-GW) scenario was the most presumptuous of the scenarios created in this study. Wood fibre was harvested only from the Pj forest type (211 000 NMm^3/yr), the Po forest type (59 000 NMm^3/yr) and their fallout volumes (30 000 NMm^3/yr). While the Po forest type was managed as in the BAU scenario (i.e. with natural regeneration), the Pj forest type received considerable change to its silvicultural program including an increase in the maximum annual PCT treatment area which was increased to 1 100 ha/yr. The most significant additional treatment was the planting of red pine (Pr) on the most productive Pj forest types (i.e. site class X+1; aggregate numbers 1, 4 and 7). Other differences in the silvicultural prescription included a pre-harvest girdling treatment for the Pj-3 aggregate group (replaced two chemical tendings for aggregate numbers 7, 8 and 9) and one chemical tending (rather than two) for aggregate number 4 (assumed that the planted Pr will keep up to or exceed the growth of competing vegetation on this site). All of these assumptions can be found tabled in Appendix X.

3.8 SENSITIVITY ANALYSIS

Sensitivity analysis is an important procedure used to discover relationships which exist between data and a dependent response variable. When dealing with questionable data, forecasts/estimates produced from it are always suspect. While sensitivity analysis can not improve the accuracy of the estimates, it can provide additional insight to critical data-response relationships. It is for this reason that sensitivity analysis has been used so widely in forest-related studies. Some examples of the use of sensitivity analysis in forestry include: habitat supply analysis (McCallum, 1993), economic analysis (Williams, 1991; Willcocks et al., 1990), and wood-supply analysis (Hauer, 1989; Willcocks et al., 1990).

Data were deemed sensitive if minor changes to them resulted in major changes in the response variable. An example of such a situation would be a 30% increase in the value of "y" response variable due to an increase of 10% in the value of "x" data. If this relationship also holds true for other positive and/or negative modifications of x values, then the relationship may be described as a ratio; in this case, a 1:3 ratio which would indicate that for every 1% change in x, there will be a 3% change in y.

In this study, the x-data in question were the Volume Development Patterns (VDPs). A considerable amount of professional judgement was used to describe the volume development patterns since there was little empirical evidence to support their creation, especially those which represented responses to artificial regeneration treatments.

Steps in the sensitivity analysis included:

(i) Identification of a response variable;

(ii) Determination of the response variable elements to be tested;

(iii) Setting of levels of change in the data to provide for adequate interpretation of the data-response relationships;

(iv) Altering the data and running the model to produce the responses; and

(v) Analysis and interpretation of the data-response relationships.

Average Harvest Volume per Hectare (AHVH) was chosen as the response variable because of its inherent links to both wood-fibre productivity and harvest scheduling. The relationship tested was the change in AHVH resulting from changes to the VDPs of the BAU scenario. Analysis of only the BAU VDPs was assumed adequate for this sensitivity analysis since the minor changes which did occur in the VDPs of the other scenarios affected only the values of the patterns - their general shape was maintained.

The VDPs were analyzed in groups based on their function in the wood supply of the management scenario. Groupings of VDPs were chosen to enable an effective and efficient analysis of what would have been an infeasible task (i.e. testing the VDPs individually and in their numerous combinations with each other). These groups were as follows:

(1) All VDPs used to describe the forest;

(2) VDPs for future (natural) and regeneration (seeding, planting and PCT) forest; and

(3) VDPs for the regeneration forest.

Interpretation of the results from the three groups provided insight into effects of other groupings of VDPs:

(1) Response due to present forest VDPs =

Group 1 response - Group 2 response; and

(2) Response due to future forest VDPs =

Group 2 response - Group 3 response.

In addition, each forest type (Pj and Sp) was run separately under FORMANCP, which pinpointed sensitivity further. Adjustments to the VDPs (Figure 4) included: (1) scaling (multiplication of the data by a factor which increased or decreased its value by a specified percentage) of the entire pattern; (2) scaling of the peak (maximum) values in the pattern; and (3) scaling of the tail values

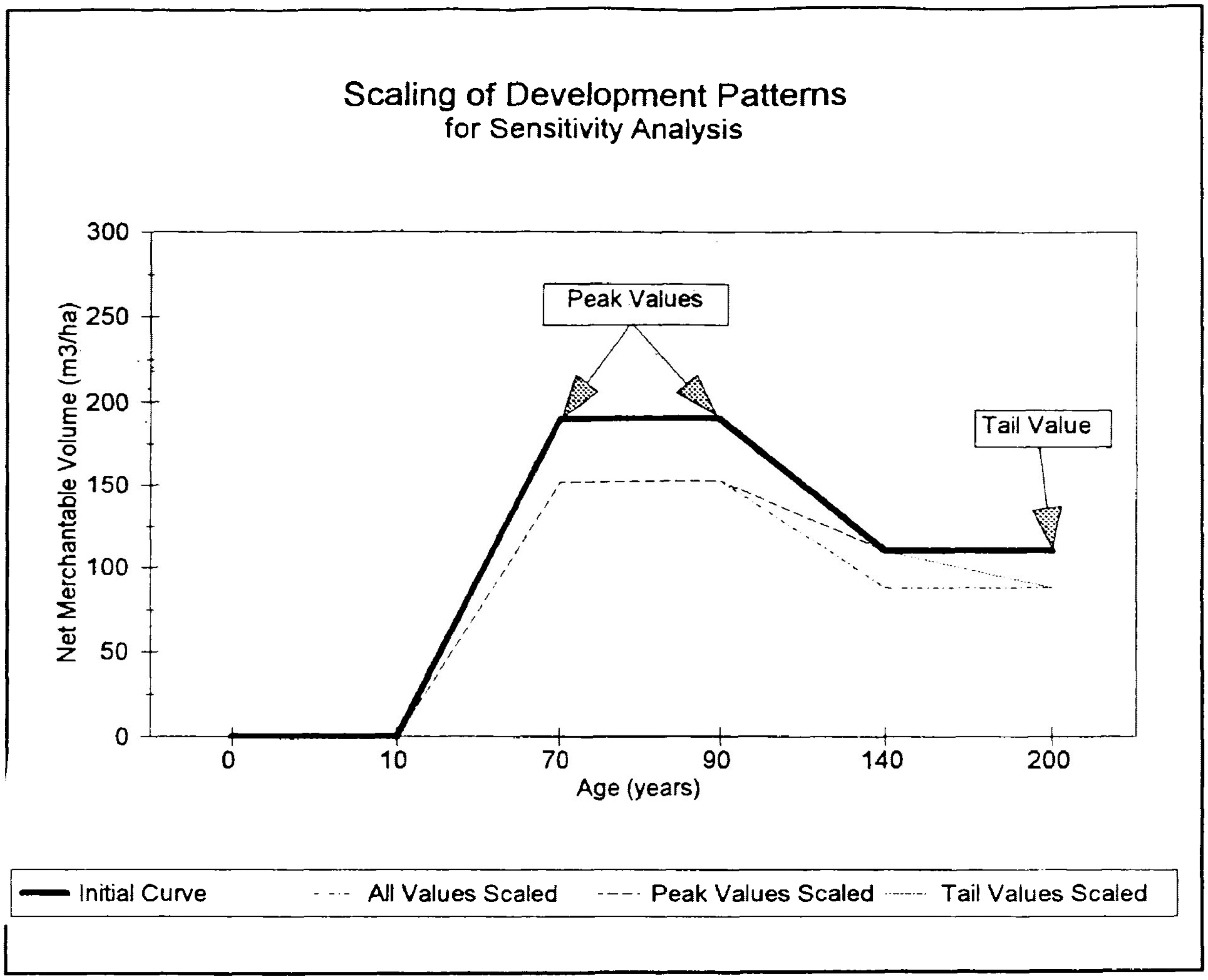

Figure 7. Representation of changes made to a volume development pattern for sensitivity analysis.

(values representing over-maturity and volume loss). The specific scaling factors used are shown in Table 10.

Table 10. Scaling factors used to increase and decrease the three groupings of volume development patterns for use in their sensitivity analysis.

Changes	Scaling of Volume Development Patterns (%)		
	Entire VDP	Peak Values	Tail Values
1	+ 15	+ 30	+ 30
2	+ 10	+ 20	+ 20
3	+ 5	+ 10	+ 10
4	- 10	- 10	- 10
5	- 20	- 20	- 20
6	- 30	- 30	- 30

The response variable, average harvest volume per hectare, was calculated by dividing the average periodic (5-year total) harvest volume by the average periodic harvest area. Due to the low utilization of the poplar forest type, as demonstrated in the basic analysis, sensitivity analysis was not performed on it (i.e. less than 5% of annual harvest area for the BAU scenario occurs in the Po forest type). Responses to adjustments of the VDPs of the Pj and Sp forest types were then summarized to give insights into their effects at the forest level. An additional level of interpretation was made on the forest types individually.

4.0 RESULTS AND DISCUSSION

4.1 PRESENT MANAGEMENT

The BAU scenario for the SRFMU was feasible; however, there were some areas of concern. The spruce forest type could not produce the volume desired by the company, the jack pine forest type had untapped potential, the poplar forest type was not fully utilized, and there were large fluctuations in the chemical treatment activity over the 100-year forecast period.

4.1.1 Wood Supply

Potential problem areas revealed from the wood-supply analysis were as follows:

(i) The spruce forest type was able to provide only 91 000 NMm^3/yr with a planting program of 200 ha/yr.

(ii) The balsam fir forest type had the potential to produce an annual harvest of 21 000 NMm^3 after seventy years if all harvested areas in the first 30 years were planted to spruce. At this point it was decided that the balsam fir forest type would be run with the spruce forest type, since the sites were being converted to black spruce;

(iii) Conversion of poplar to black spruce was found to be impractical in consideration of the poor availability of Sb planting stock for the SRFMU.

(vi) Poplar harvest areas were determined by first considering the poplar yields from harvests in the Pj and Sp forest types.

After deciphering the nature of these problem areas in managing the Seine River forest, the simulation process was initiated for the BAU scenario.

The forest types were simulated in the following order:

1. Spruce Forest Type;
2. Jack Pine Forest Type; and
3. Poplar Forest Type.

The spruce forest type was run with a harvest level of 91 000 NMm^3/yr and a planting level of 200 ha/yr (Appendix XII); as shown in Figure 8, this was its maximum sustainable harvest level. Regeneration efforts remain constant at the maximum of 200 ha/yr but harvest ~~levels~~ areas fluctuate dramatically during the 65- to 100-year time period, which relates to the harvest of regenerating areas in their early stages of operability (Figure 9).

At a harvest level of 149 000 NMm^3, the primary growing stock decreases dramatically from approximately 6.2 million NMm^3 to 1.5 million NMm^3 at 45 and 65 years (Figure 10) and from 70 to 100 years, it increases to 3.5 million NMm^3. (Appendix XII). The areas harvested and regenerated remain identical at around 1 020 ha/yr and the areas spaced remain steady at the maximum of 100 ha/yr (Figure 11).

The spruce and jack pine forest types yielded an average of 32 000 NMm^3/yr and 12 500 NMm^3/yr of poplar wood-fibre respectively which meant that only 16 000 NMm^3/yr was required directly from the poplar forest type (Appendix XII). Figure 12 shows the effect that the low Po harvest level has on its operable volume: areas aging are larger than the harvest level which results in a decrease in net merchantable volume levels of poplar growing stock. Figure 13 illustrates the low harvest levels (an average of 152 ha/yr) which are partially responsible for the above shifts in growing stock. The final volumes achieved in the BAU scenario were 149 000 NMm^3/yr of Pj, 91 000 NMm^3/yr of Sp, 6 000 NMm^3/yr of miscellaneous conifer and 60 000 NMm^3/yr of Po for a total wood-supply of 306 000 NMm^3/yr (Table 11 and Figure 14).

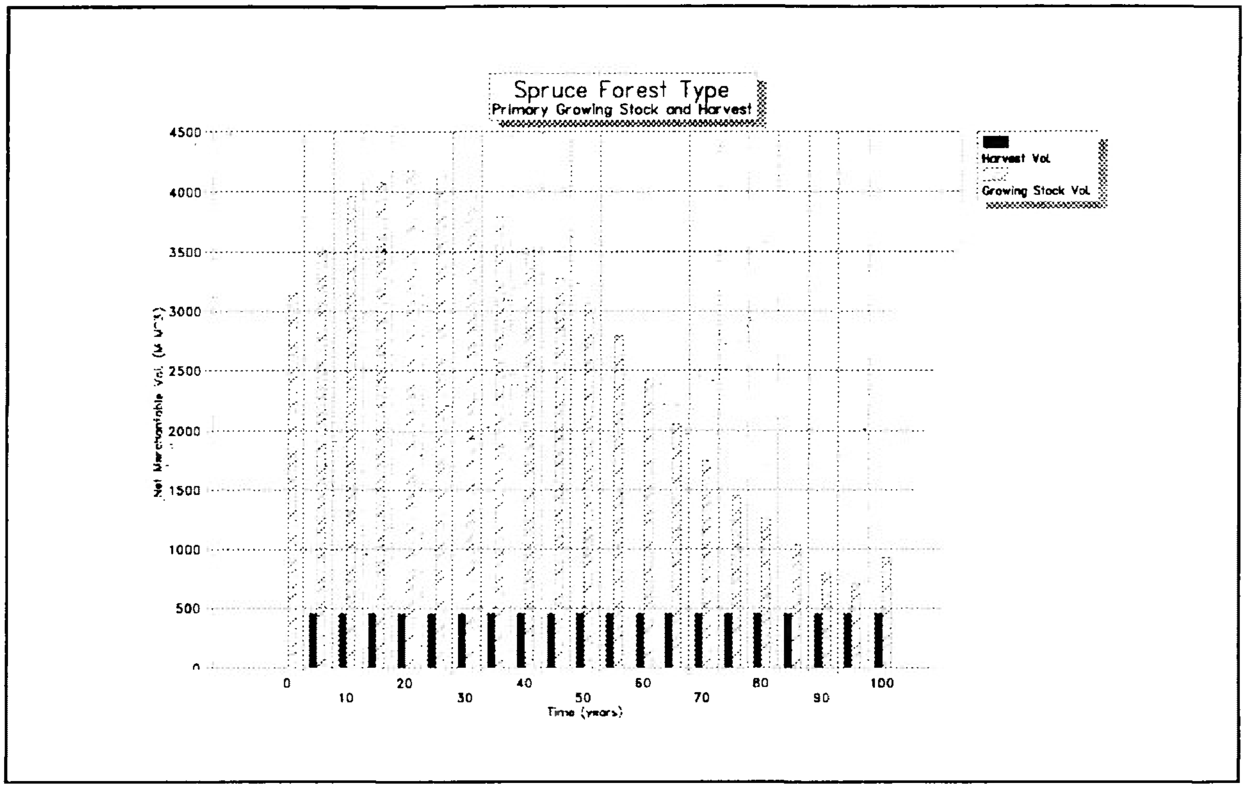

Figure 8. The Spruce Forest Type's primary growing stock and harvest volumes at five-year intervals in time for the BAU scenario.

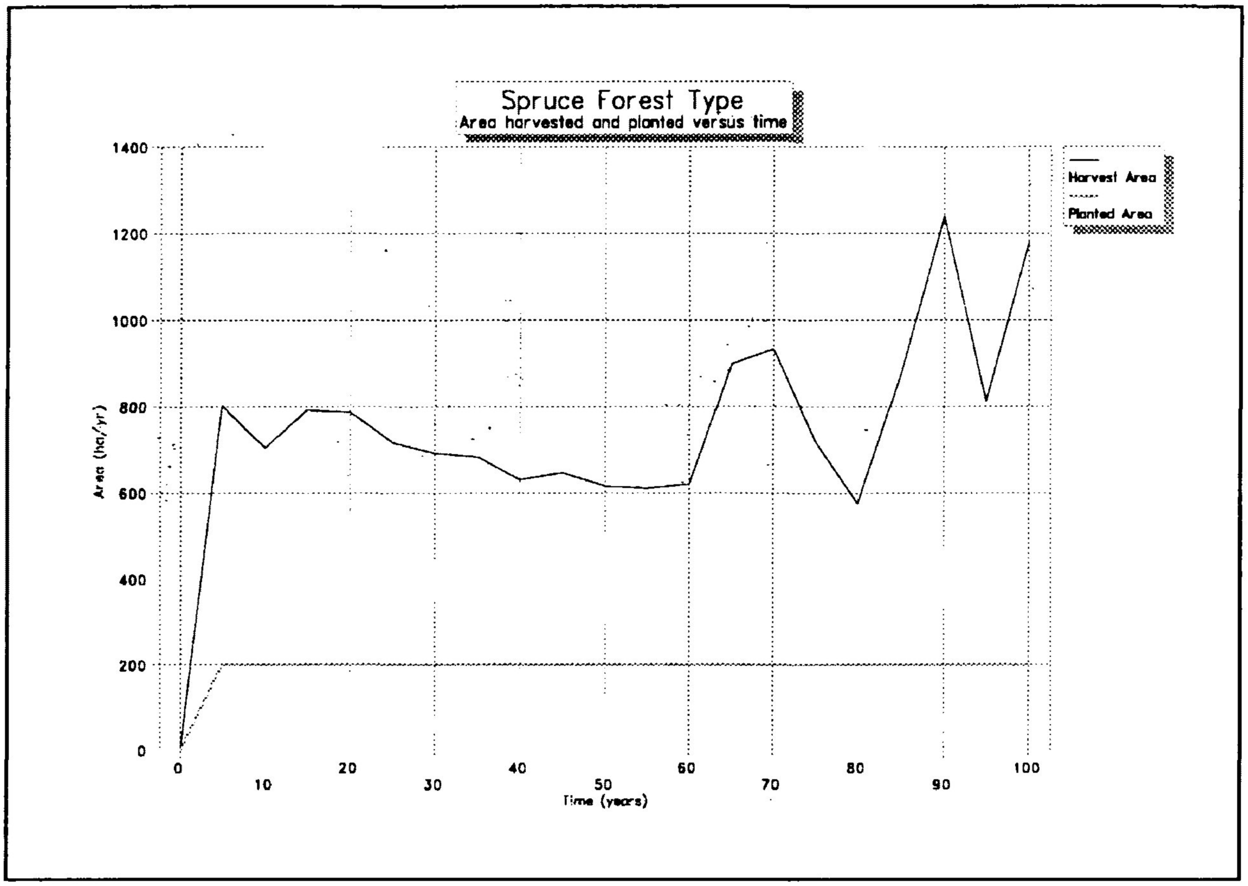

Figure 9. The Spruce Forest Type's harvested and regenerated areas as a function of time for the BAU scenario.

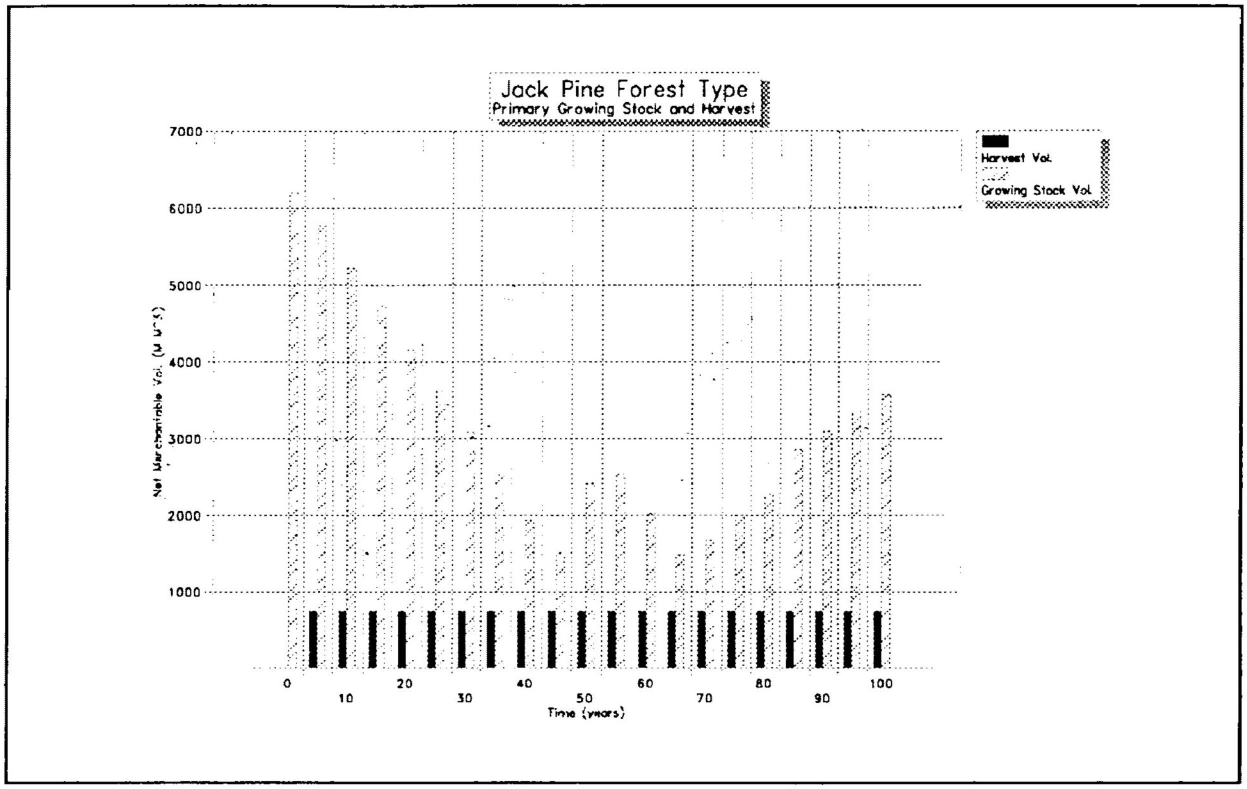

Figure 10. The Jack Pine Forest Type's primary growing stock and harvest volumes at five-year intervals in time for the BAU scenario.

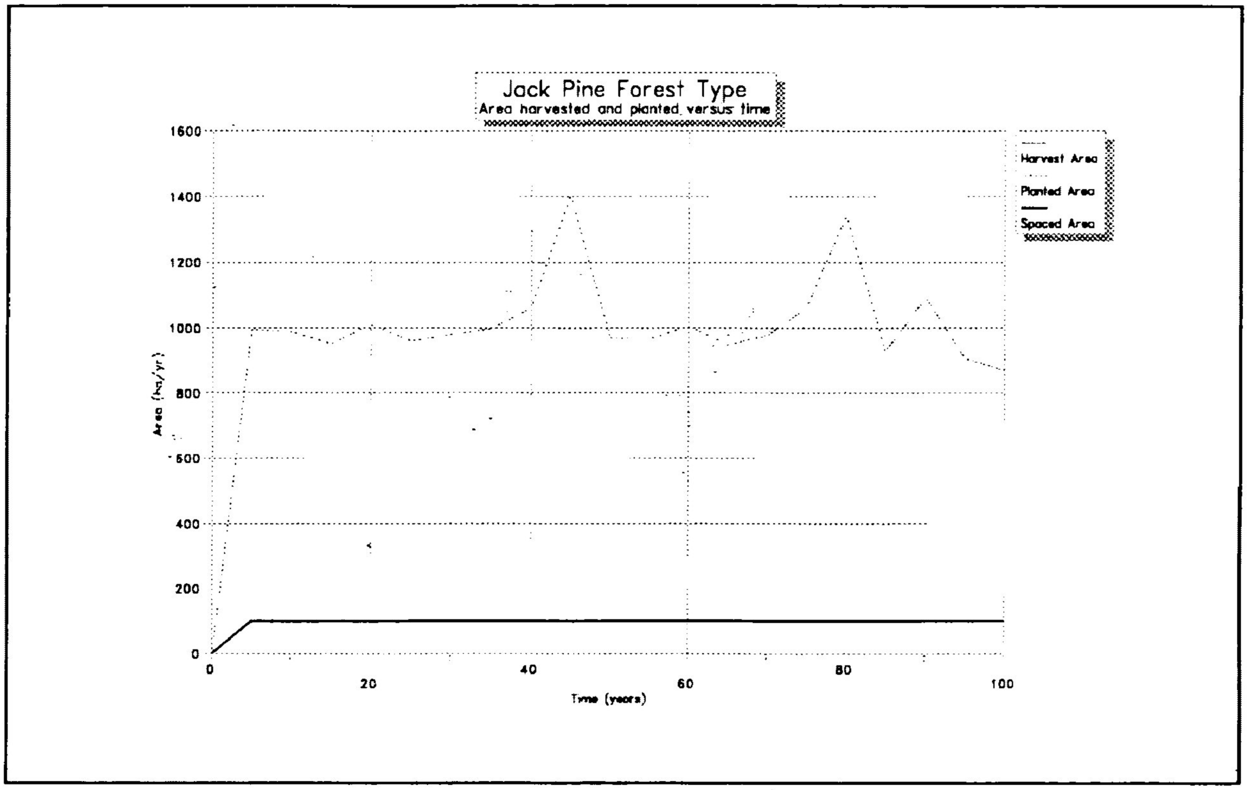

Figure 11. The Jack Pine Forest Type's harvested, regenerated and spaced areas as a function of time for the BAU scenario.

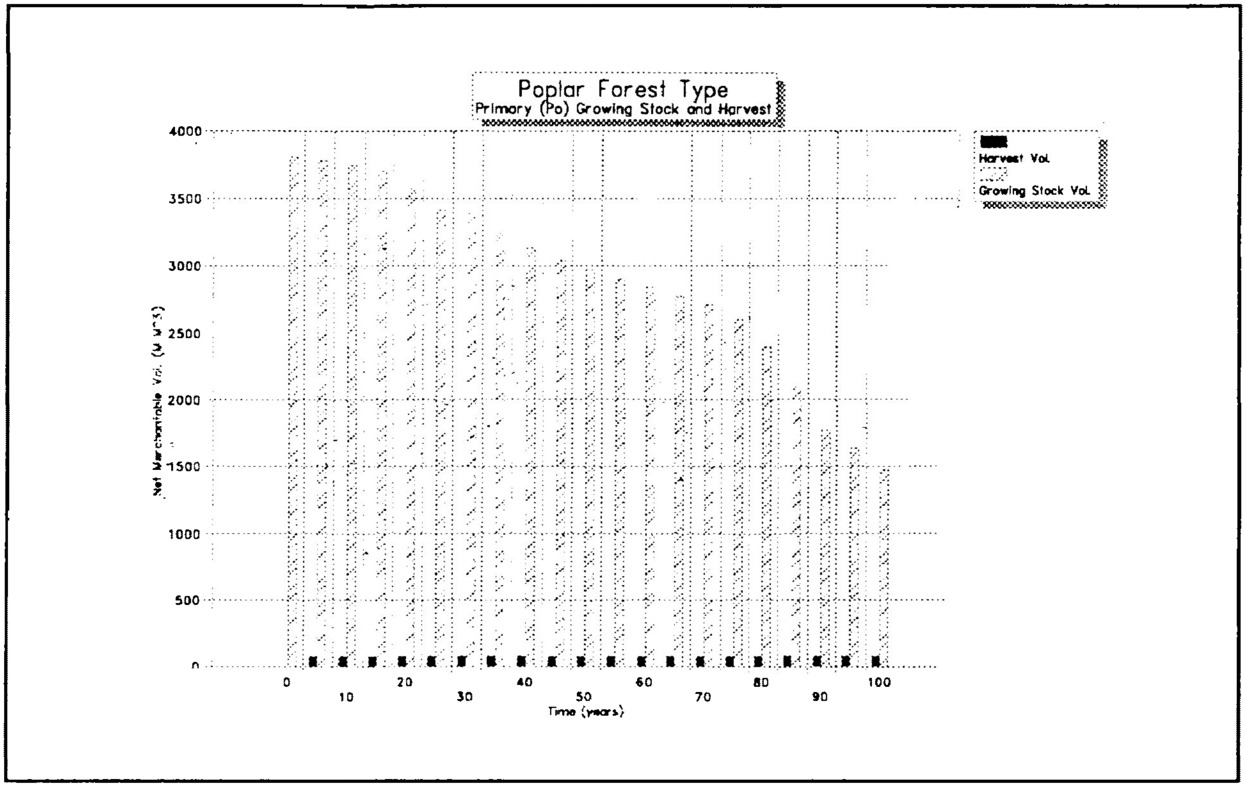

Figure 12. The Poplar Forest Type's primary growing stock and harvest volumes at five-year intervals in time for the BAU scenario.

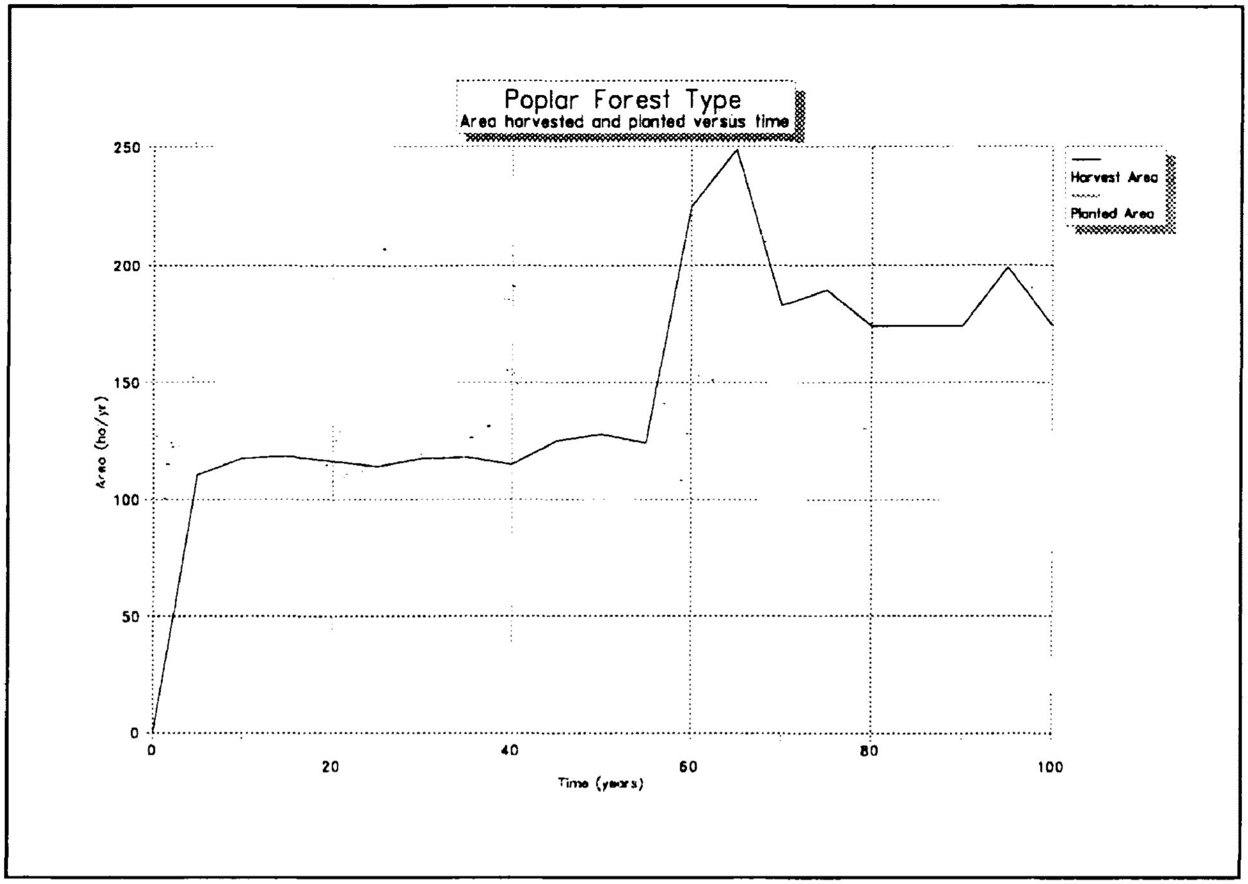

Figure 13. The Poplar Forest Type's harvested and regenerated areas as a function of time for the BAU scenario.

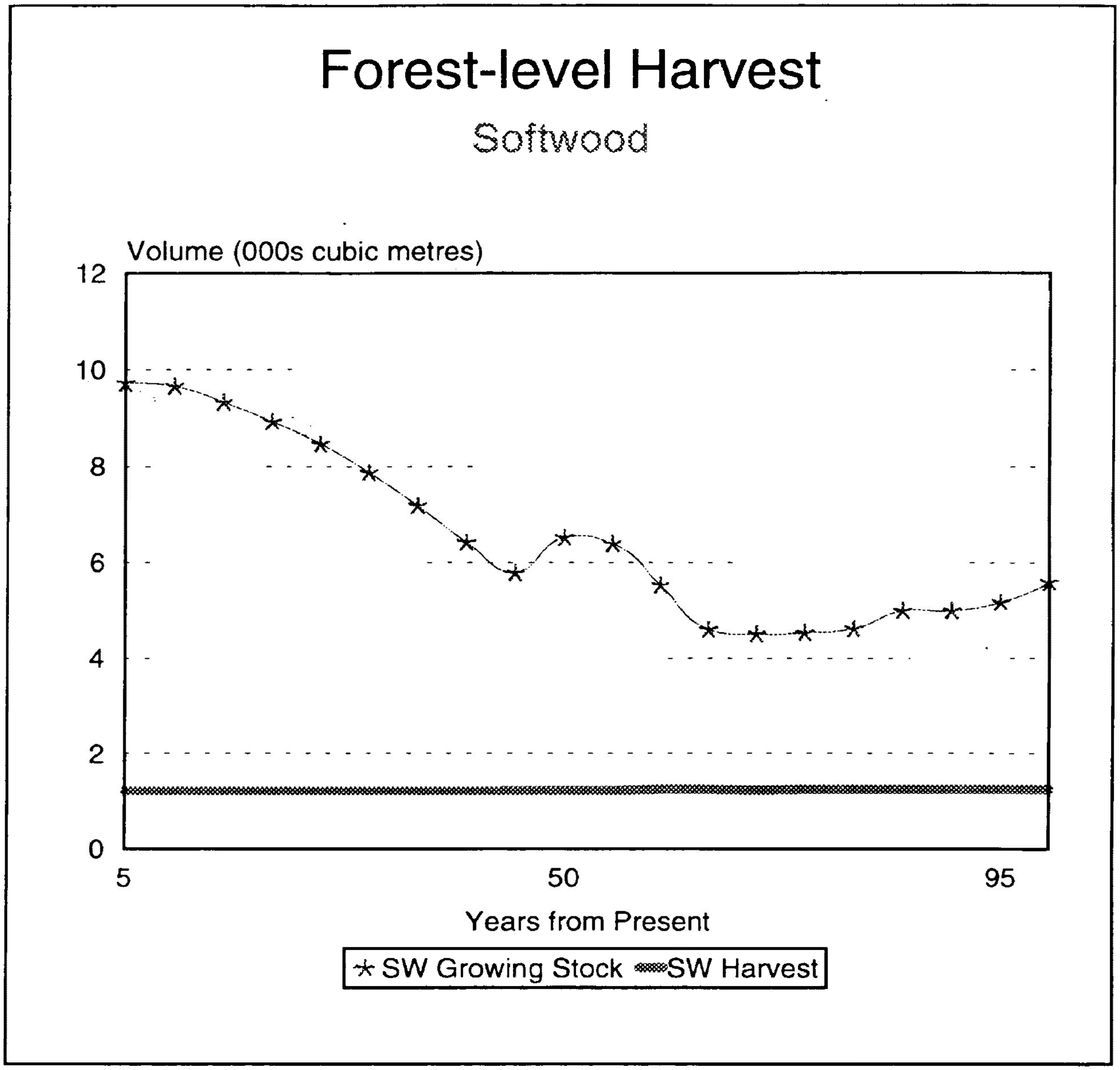

Figure 14. Softwood fibre supply and harvest level for the BAU scenario.

Table 11. The wood-supply and regeneration for forest level analysis of the Seine River Forest Management Unit under the Business-As-Usual management scenario.

Forest Type	Wood-Supply		Regeneration		
	Softwood (NMm^3/yr)	Hardwood (NMm^3/yr)	Planted (ha/yr)	Seeded (ha/yr)	Spaced (ha/yr)
Spruce	91 000	32 000	200		
Jack Pine	149 000	12 000	151	869	100
Poplar	6 000	16 000			
Total	246 000	60 000	351	869	100

To supply 100 000 m^3/yr of softwood fibre from the Sp forest type, the planting program would need to be increased to at least 600 ha/yr; a level 200% higher than could be supplied in 1991. However, the jack pine forest type easily provided its wood-supply requirement. If a large spacing program, say 1 600 ha/yr, was implemented (a level exceeding the area seeded per year) in addition to the present regeneration specifications, a maximum sustainable yield of 204 000 NMm^3/yr could be achieved. Since seeding was the predominant method of regenerating jack pine sites in the Seine River Forest, a larger PCT program should be considered for the management of those sites to decrease operational rotation periods and thus its maximum sustainable yield.

The poplar forest type could have provided much more volume. The stands lost volume due to aging and a slow conversion to coniferous stands. While this was desirable due to the market area's low demand for poplar wood fibre, the sites could have been much more productive if managed as poplar-producing stands. For more intensive poplar management to occur, a market would be necessary such as if the Boise Cascade mill could use a higher proportion of poplar.

4.1.2 Herbicide Use

Herbicide use occurred primarily within the jack pine forest type, as a result of its large regeneration program. The periods where high levels of TA occurred (40 to 55 years into the forecast), which were a result of sudden rises in the areas required to be planted rather than seeded (i.e. sites which were given three treatments of herbicides), would likely be difficult to implement at an operational level (Figure 15). However, Kirby (pers. comm., 1991) stated that the company was seriously thinking about a jack pine forest type regeneration program comprised of 100% seeding. If, in addition to this change, mechanical and chemical SIP were performed on most if not all the sites, there could be a reduction in yearly herbicide use due to a reduced need for chemical tending of these sites. This option would be even more effective with the inclusion of PCT treatments after 10 to 20 years of stand development. Pre-commercial thinning treatments would serve not only to space the jack pine stems, but also to weed

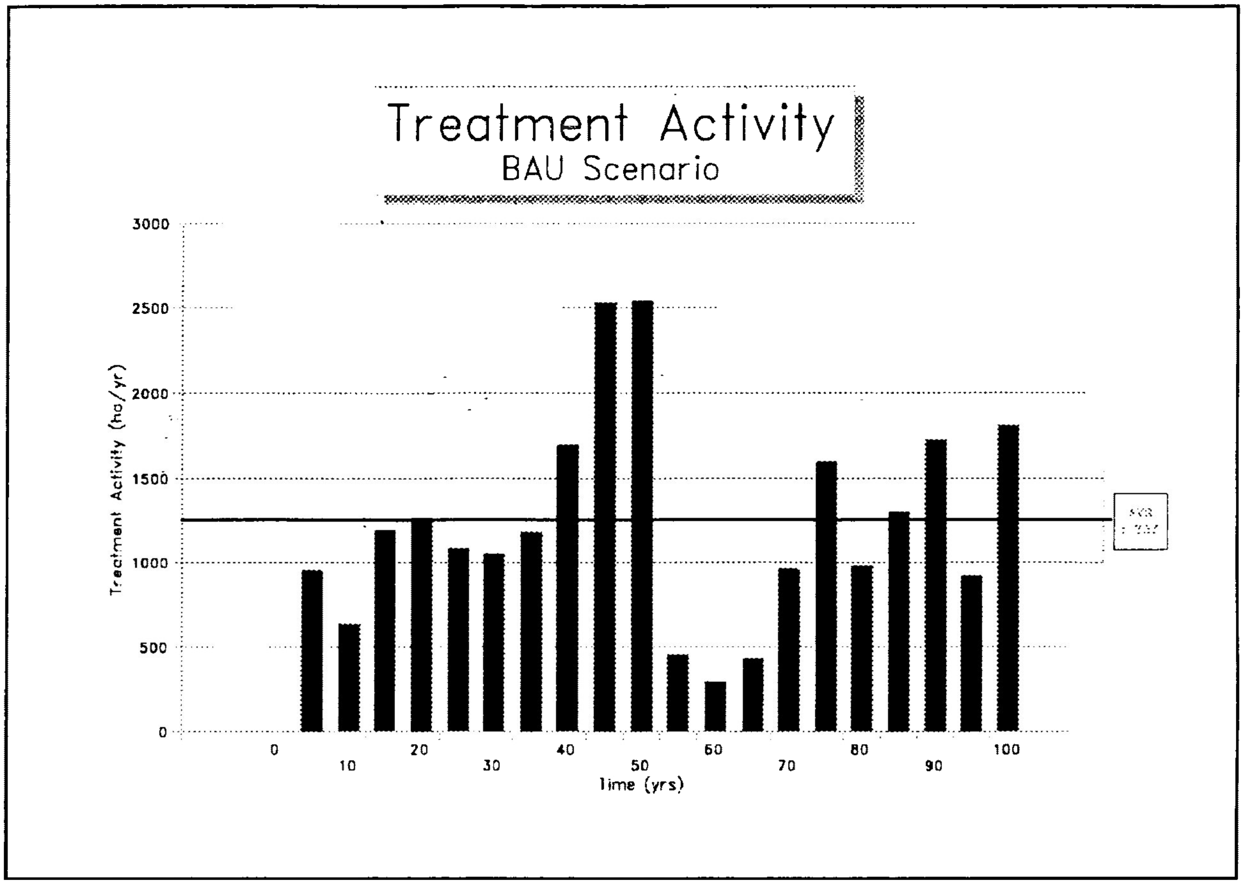

Figure 15. The average annual treatment activity in the BAU scenario for the 100-year forecast period.

out unwanted competing vegetation such as poplar, paper birch and pincherry.

4.2 ALTERNATIVE MANAGEMENT

4.2.1 Reduced Herbicide Use

The scenarios used to investigate a policy of reduced herbicide use (67HP, 50HP and 40HP) were revealed in this study to be very promising alternatives (Note: simulation reports of the basic analysis for all scenarios are supplied in

Appendix XII). Volume output remained consistent with the BAU scenario and annual average silviculture costs increased by less than 3% for the three herbicide reduction scenarios. In addition to the desired reduction in treatment area, there are several other advantages which occur from these scenarios.

With a herbicide reduction policy, herbicides were retained as a silvicultural tool. With the impetus put on the reduction of treatment areas rather than a reduction in the total amount of herbicide used, forest management was directed toward use of alternative methods of vegetation management as well as more-site-specific use of the tools. With a wider variety of silvicultural tools available and a large, trained workforce, the costs of vegetation management alternatives perhaps could decrease and possibly deliver more socially acceptable forest management program.

4.2.2 Restricted Herbicide Use

The Aerial-Tending-Only scenarios (ATO-A, ATO-B and ATO-C) were also shown to be economically feasible alternatives. While Boise Cascade relied heavily on mechanical site-preparation, chemical SIP was only starting to be used (300 ha/yr), so changes in the wood supply, treatment area and cost response variables, due to the elimination of chemical SIP, were minor.

While restriction of herbicide application to ground methods (NAA scenario) did not change either wood supply or treatment area, silvicultural costs for were increased by 28%.

4.2.3 No Herbicide Use

Although the Other-Weed-Control scenarios (OWC-A and OWC-B) were still viable options with regard to wood supply, harvest area increased over time due to the less effective alternative silviculture treatments and costs were substantially higher (a 37% increase in annual silviculture costs for both). The substantial increases in silvicultural costs occurred because of the assumption that non-herbicide treatments were more expensive. However, if the costs of these treatments were to decrease to levels more comparable to herbicide treatment costs, rather than remain fixed, the differences would likely be much lower.

The No-Weed-Control scenario was an extreme approach to vegetation management in that only non-chemical SIP was allowed. The increase in silvicultural costs for this scenario was the second highest of the scenarios tested. Softwood volume output per hectare was substantially decreased due to lower future yield expectations, which resulted in a higher average annual harvest area. However, the volume requirements for the mill were still maintained and the forest received no herbicides.

4.2.4 Wood Supply Change

The FWS scenarios assumed changes in the wood supply requirements and the silvicultural prescriptions: Thus, a more thorough review of their results is given for each scenario individually.

Flexible-Wood-Supply-GW: The wood supply requirements were taken from the Pj and Po forest types only in this scenario. The Pj forest type was able to sustain an average harvest of 213 000 NMm^3/yr of softwood volume and an average of 20 200 NMm^3/yr of hardwood volume with an average harvest area of 1 531 ha/yr. The remainder of the wood-supply requirement was obtained from the Po forest type with 59 000 NMm^3/yr of hardwood volume and 9 600 NMm^3/yr of softwood volume from an average of 503 ha/yr. The Sp forest type was not directly managed for wood supply which essentially meant a 38% decrease in the wood-supply landbase. Treatment activity decreased by 40%, but average annual silviculture costs increased by 57%, due primary to the large increase in the pre-commercial thinning program.

The major advantages of this scenario were that the landbase required to fulfil the wood supply and TA were decreased, and the productive potential of the forest was used. Of course, this required a substantial silvicultural investment on the lands which were intensively managed and it assumed that the industry would invest capital to develop pulping facilities capable of using any type of wood fibre. It is difficult to measure many of the possible advantages of such a scenario. Perhaps the annual area cost charged by the government could be decreased since the Sp forest type was not being harvested or maybe the Sp forest type area could be developed for some other profitable purpose. In any case, use of a scenario such as this would broaden the scope of management.

Flexible-Wood-Supply-N: The FWS-N scenario also differed considerably from the BAU scenario. These differences included changes in the source of the wood supply, the silvicultural treatments, the economic figures and the final structure of the forest.

The wood-supply requirements were taken first from the Po forest type, then the Pj forest type and finally from the Sp forest type. This order followed a decreasing capability for natural regeneration and productivity of the three forest types. When the maximum sustainable yield was attained from the Po forest type, wood fibre was extracted from the Pj forest type with the Sp forest type used to top it off. The wood supply was obtained from the Po forest-type (27%), the Pj forest type (50%), and the Sp forest-type (23%) as shown in Table 12.

Table 12. Wood-supply harvest levels for the FWS-N alternative management scenario.

Forest Type	Wood-supply Volumes ('000s NMm^3)		Total	
	Conifer	Poplar	Volume ('000s NMm^3)	%
Po	10	72	82	27
Pj	130	19	149	50
Sp	50	19	69	23
Total	190	110	300	100

The harvest area averages for the Po, Pj and Sp forest types were 697, 1 085 and 480 ha/yr respectively for an total average yearly harvest of 2 262 ha/yr, which was 313 ha/yr more than in the BAU scenario. In addition, fluctuations in yearly harvest levels in each forest type were greater in the FWS-N scenario.

While there were no silvicultural costs for this scenario, in practice, there would likely be increased costs for harvesting techniques used to promote natural regeneration. The Po and Pj forest types would likely still be clearcut. However, on Pj sites, methods which would allow for self-seeding such as delimbing at the stump, and skidding methods which would expose more mineral soil to act as a seedbed, would possibly be used. In the Sp forest type, methods such as strip cutting, leaving advanced regeneration, and other innovative methods of uneven-aged management would be used. An analysis of how harvest costs could change due to harvest method was beyond the scope of this study, however, this is a necessary step if this scenario were to be considered as the management strategy.

Volume output from the forest per unit area decreased, but there were no artificial regeneration costs. Advantages which could arise from the implementation of this scenario include: not using any herbicides could give the company credibility in the eyes of the public and the environmental movement at large which may open new markets; a decrease in silvicultural investments would be possible; and an incentive to develop new mill technology and/or open new markets to allow this scenario to work. Disadvantages of this scenario include: larger annual harvest areas to maintain current wood supply requirements; likely higher per-unit-costs for wood-fibre extraction due to a younger forest and thus smaller piece size; a reduction in the age of the forest if present harvest levels were maintained; and possible socio-economic repercussions in the form of reduced employment and thus the local economy due to the elimination of silviculture.

4.2.6 Summary of Basic Analysis Results

The large amount of numbers produced in such an analysis makes it difficult to determine the best course of action. However, by reviewing the variations in growing stock conditions compared to that for the BAU scenario, as well variables which represent herbicide use (treatment activity), silvicultural costs (difference in cost between BAU and alternatives) and average annual harvest area together, an idea of the practicality of the scenarios under the different strategic directions can be seen.

The Pj growing stock was more effected by the use of less effective silvicultural treatments (Figure 16) than the Sp growing stock levels (Figure 17) due primarily to the larger Pj silviculture program. The FWS scenarios appear to be quite different than the other scenarios since both softwood and hardwood were considered equally as wood-fibre (i.e. neither is secondary). For this reason there was a considerable increase in operable volume per hectare for the wood supply scenarios. Growing stock levels for the forest were declining for the first sixty years, but levelled out for all but the no use scenarios (Figure 18). The wood supply scenario which used a large intensive silviculture program with a reduced landbase (FWS-GW) had a more stable growing stock, earlier on, than all other scenarios investigated.

Review of the decision variables together revealed that the best strategy to follow in order to get the greatest reduction in treatment area with the least amount of change, would be the reduced use scenarios (Figure 19). If herbicides were highly restricted or banned completely, a change to the FWS-N scenario should seriously be considered, since the condition on herbicides is met and 100% savings on herbicides are realized with only a minor increase in AHVH. Not having herbicides as a tool while still trying to maintain the same level of control over competition would require large increases in expenditures, but would have only minor decreases in harvest volume per hectare.

A progressional approach would likely be the most sensible long-term strategy since it is unclear what policy will be adopted in the future. One possibility might be to adopt first the 67HP scenario, then the 50HP or 40HP scenario, and then either consider a change to an FWS-N or an OWC scenario. Suppose a policy requiring a stepwise reduction in use of herbicides were implemented (such as that advocated by the Forestry Sectoral Task Force of the Ontario Round Table on Environment and Economy in 1992 (Forestry Sectoral Task Force, 1992)). As the need for alternatives increased with each reduction in herbicide-use, the supply of alternative vegetation management tools and contractors to do the work would also increase and costs may come down to more attractive levels due to competition.

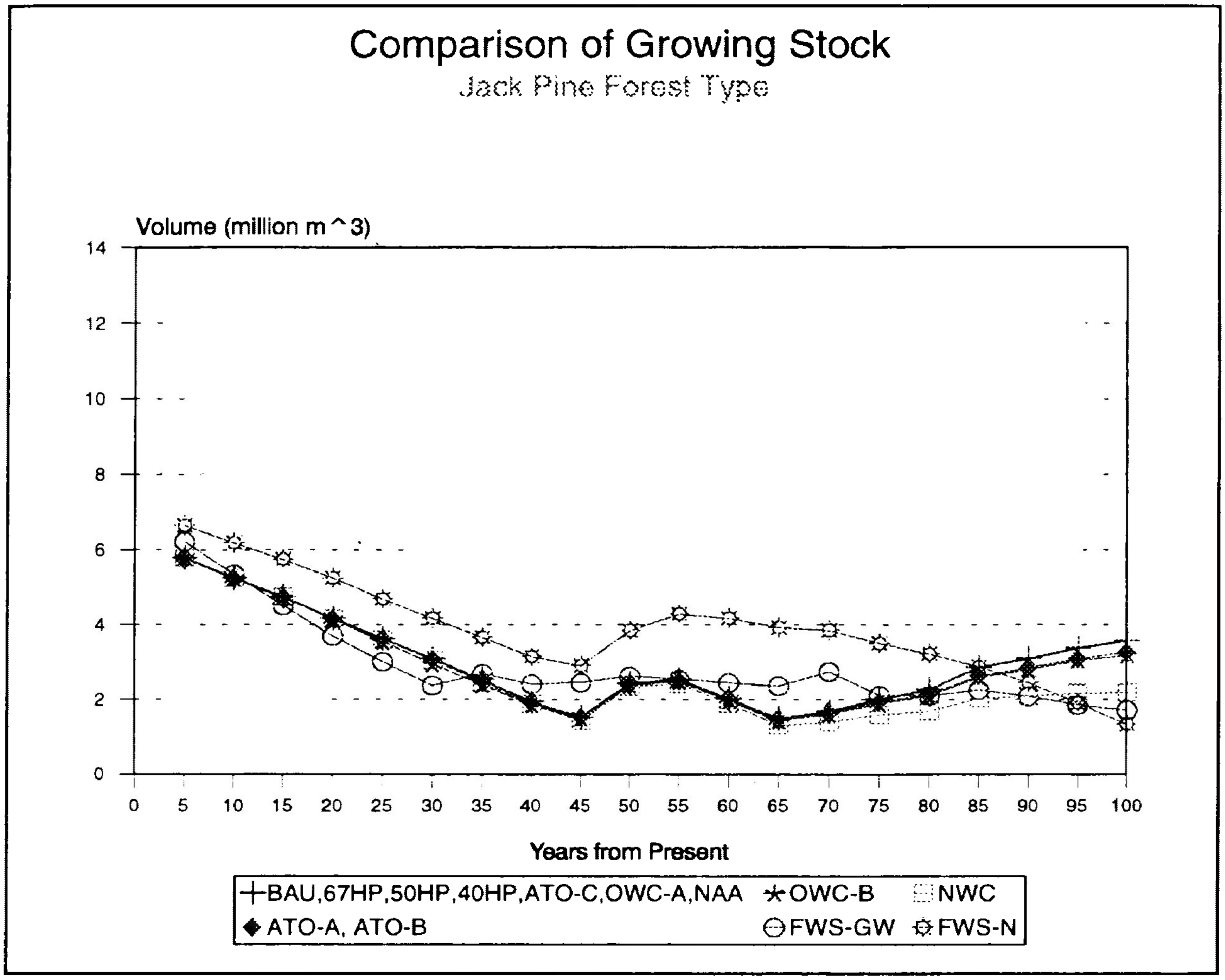

Figure 16. Comparison of the primary growing stock levels of all scenarios in the jack pine forest type.

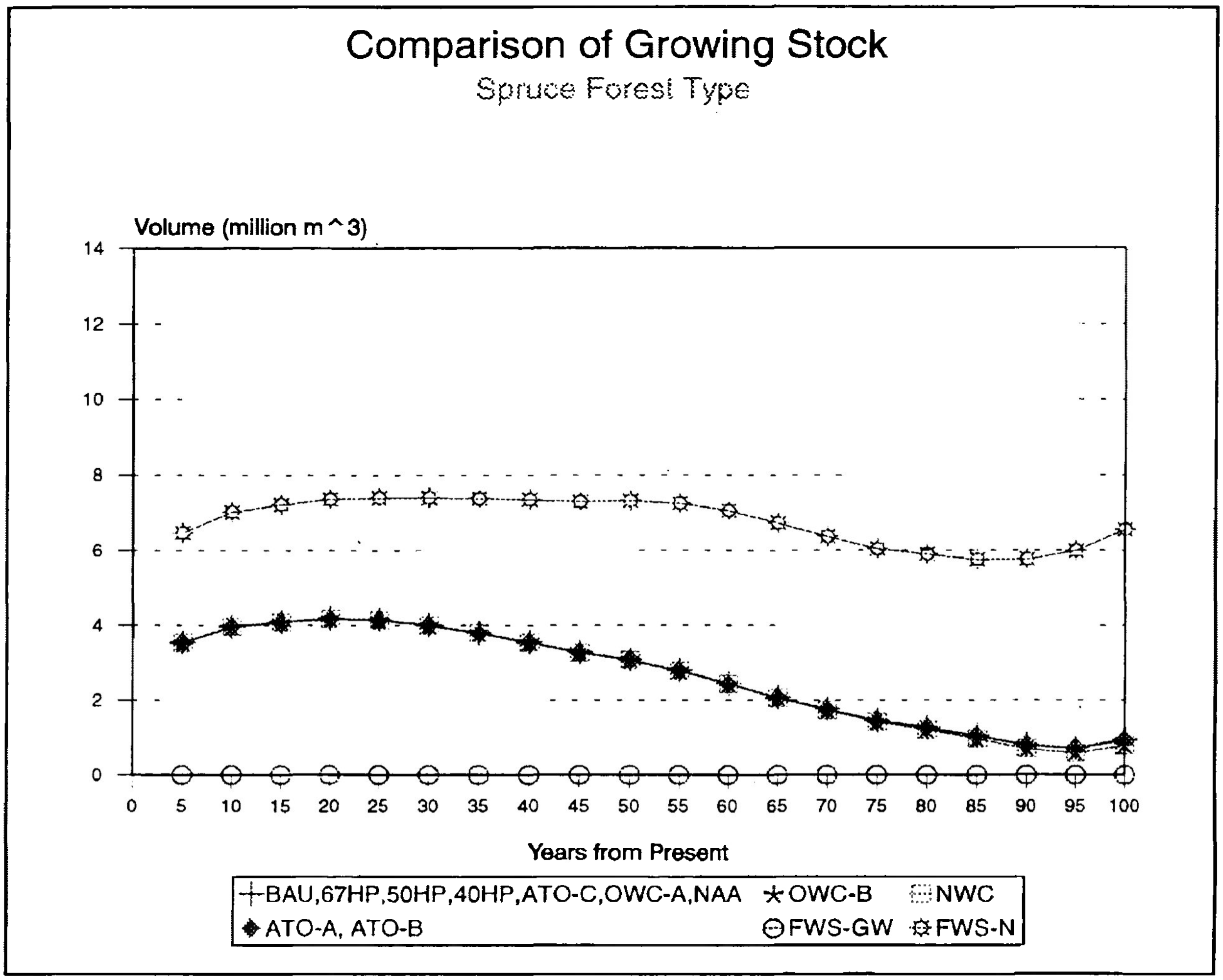

Figure 17. Comparison of primary growing stock for all scenarios in the Spruce forest type.

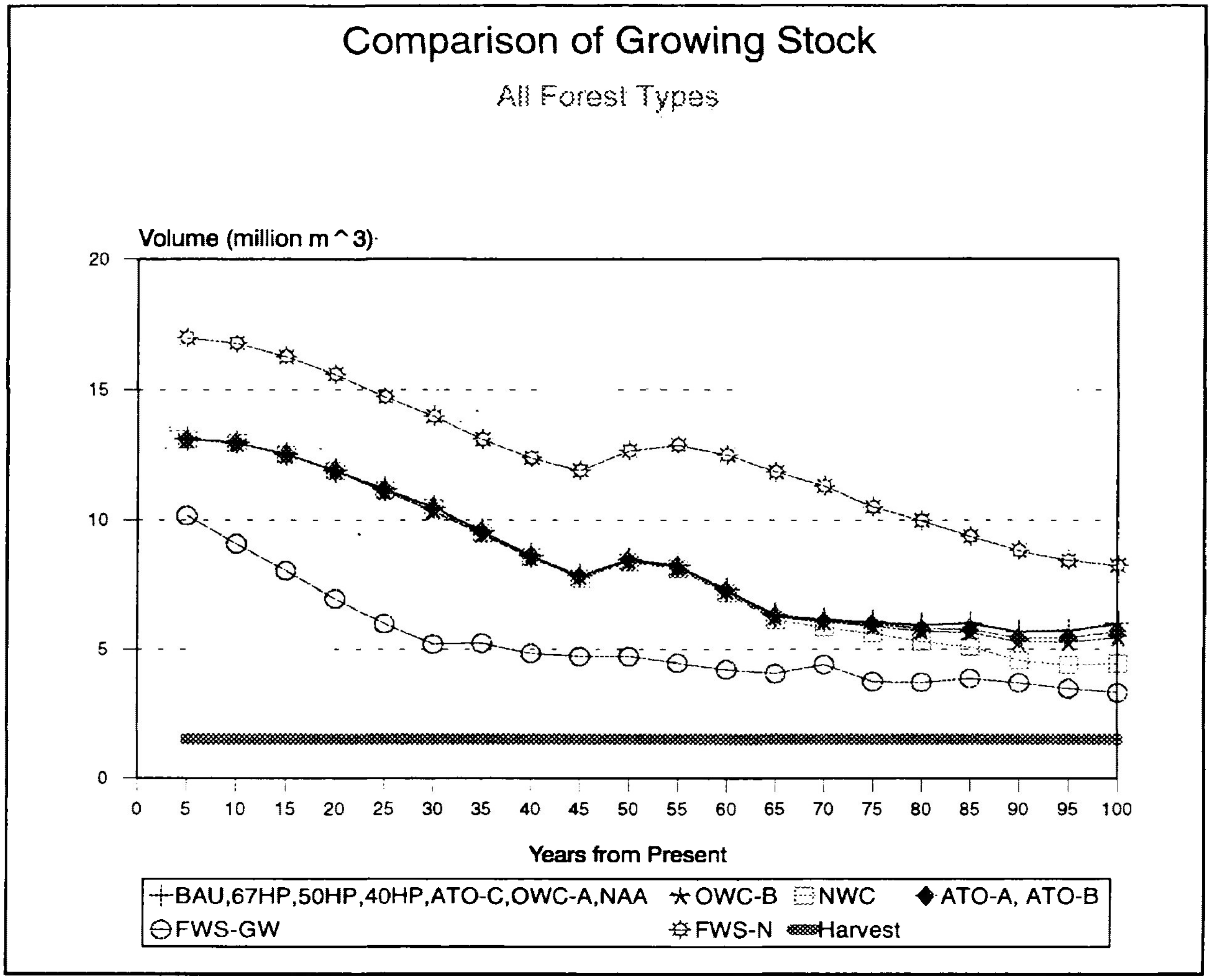

Figure 18. Comparison of primary growing stock levels for all scenarios for the forest.

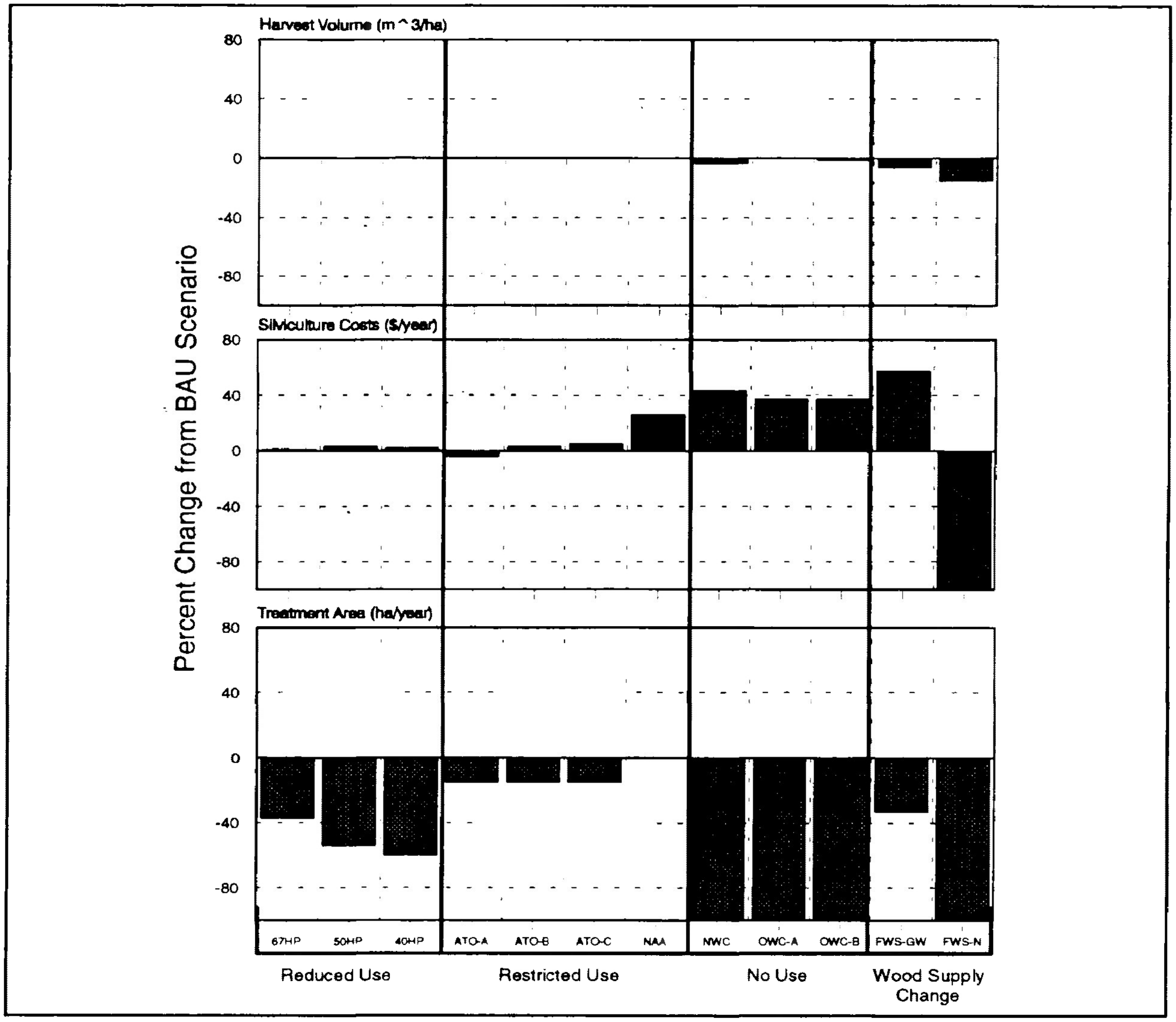

Figure 19. Comparison of response variables from alternative management scenarios with the Business-As-Usual Scenario.

4.3 SENSITIVITY ANALYSIS

Results presented here are from the sensitivity analysis performed on the VDPs of the BAU scenario. Interpretation of the results indicated that average harvest volume per hectare was primarily dependent on the volume development patterns that describe the present forest.

Positive and negative scaling factors applied to all values in the VDPs produced strong responses from both the Pj forest type (Figure 20) and the Sp forest type (Figure 21). Interpretation of these results showed that it was the present VDPs that contributed most to the responses. A similar result occurred when the peak values of the VDPs were altered. As illustrated in Figures 22 and 23, it was again the present VDPs which were responsible for the majority of change in the Average Harvest Volume per Hectare (AHVH).

Average harvest volume per hectare was insensitive to adjustments made to the tail values of VDPs. The Pj forest type showed virtually no response (Figure 24) and the Sp forest type showed only slight response to the changes (Figure 25). Thus, effects on the response variable were primarily due to VDPs of the present forest.

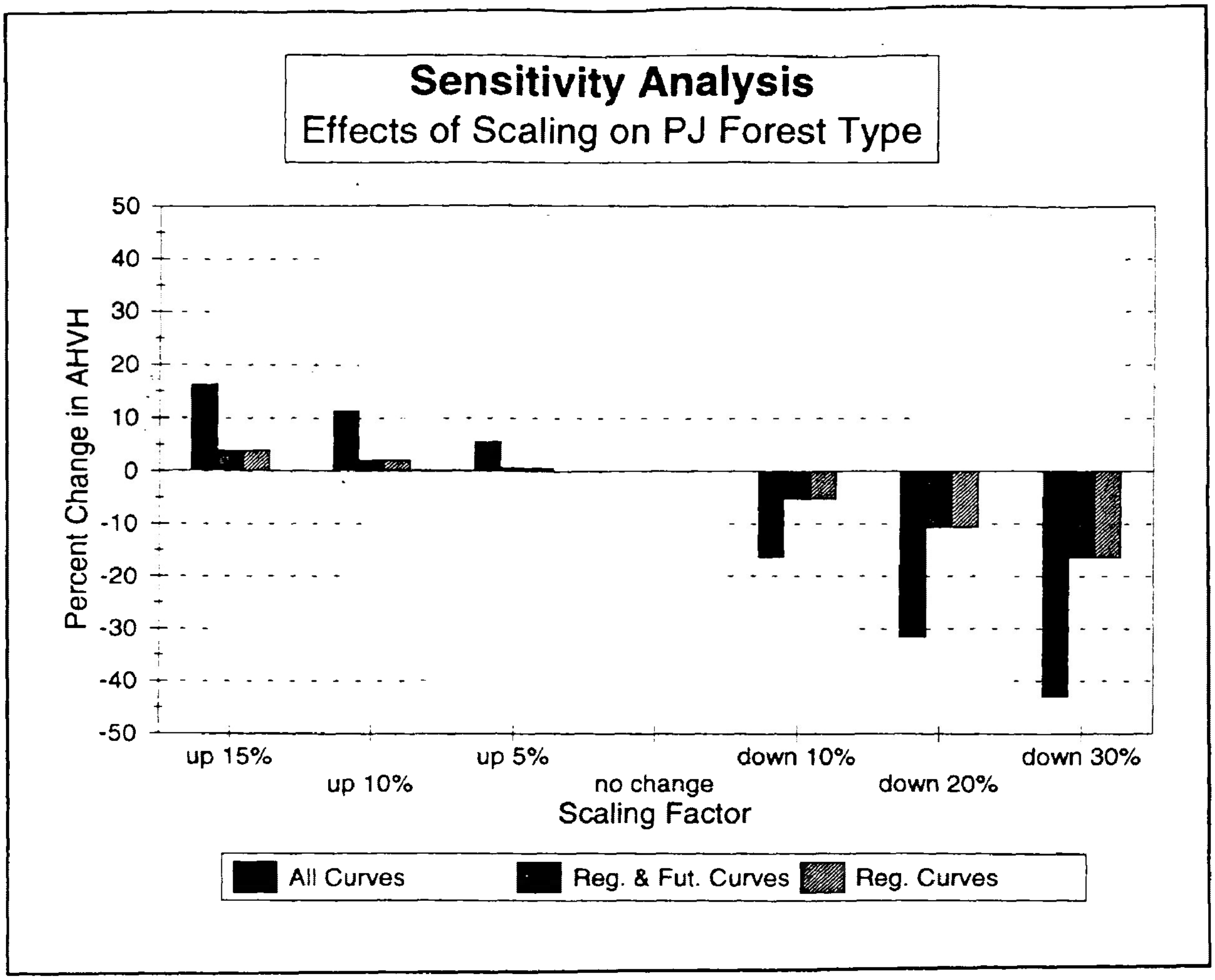

Figure 20. Percent change in average jack pine harvest volume per hectare due to increases and decreases of all values of the volume development patterns.

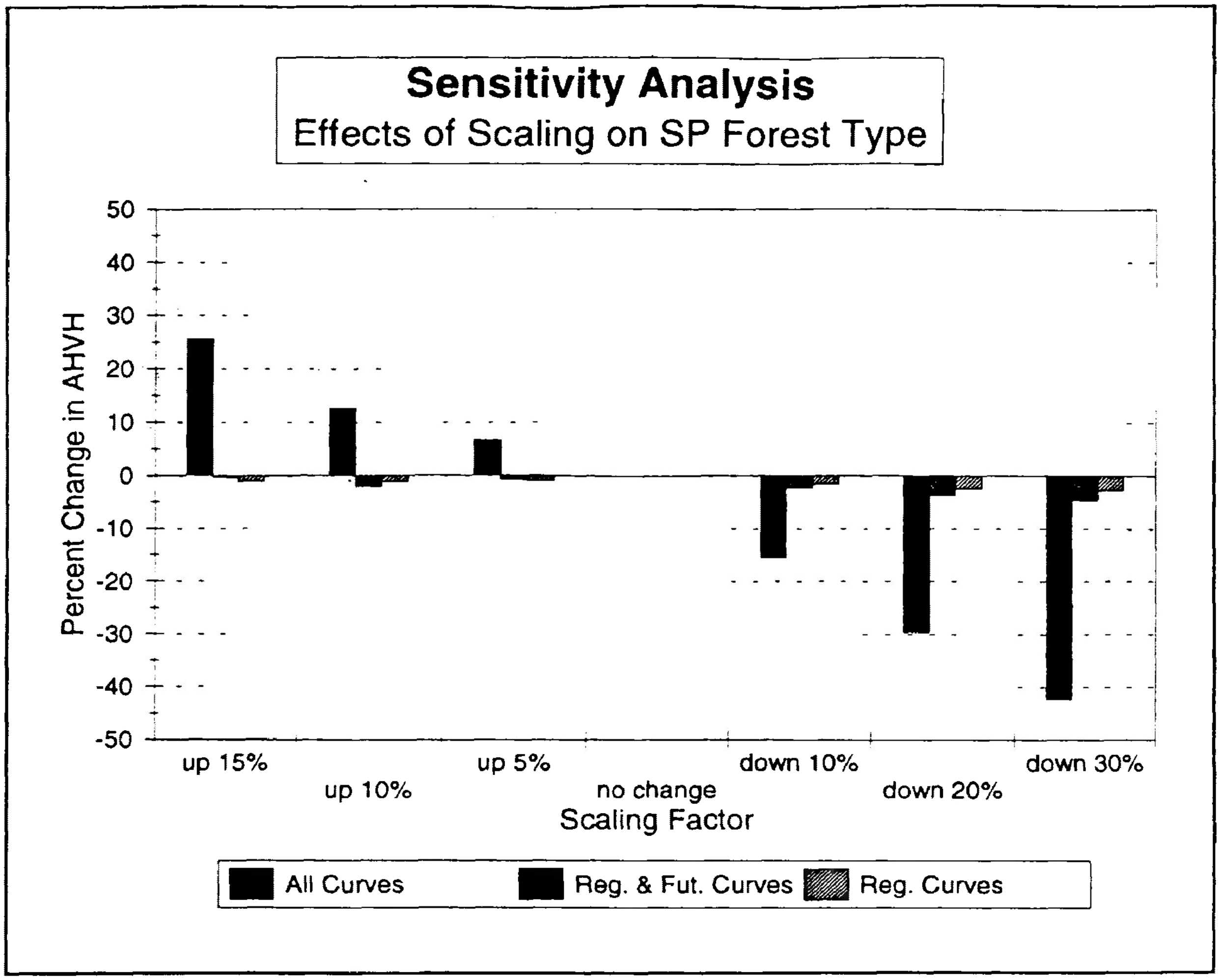

Figure 21. Percent change in average spruce harvest volume per hectare due to increases and decreases of all values of the volume development patterns.

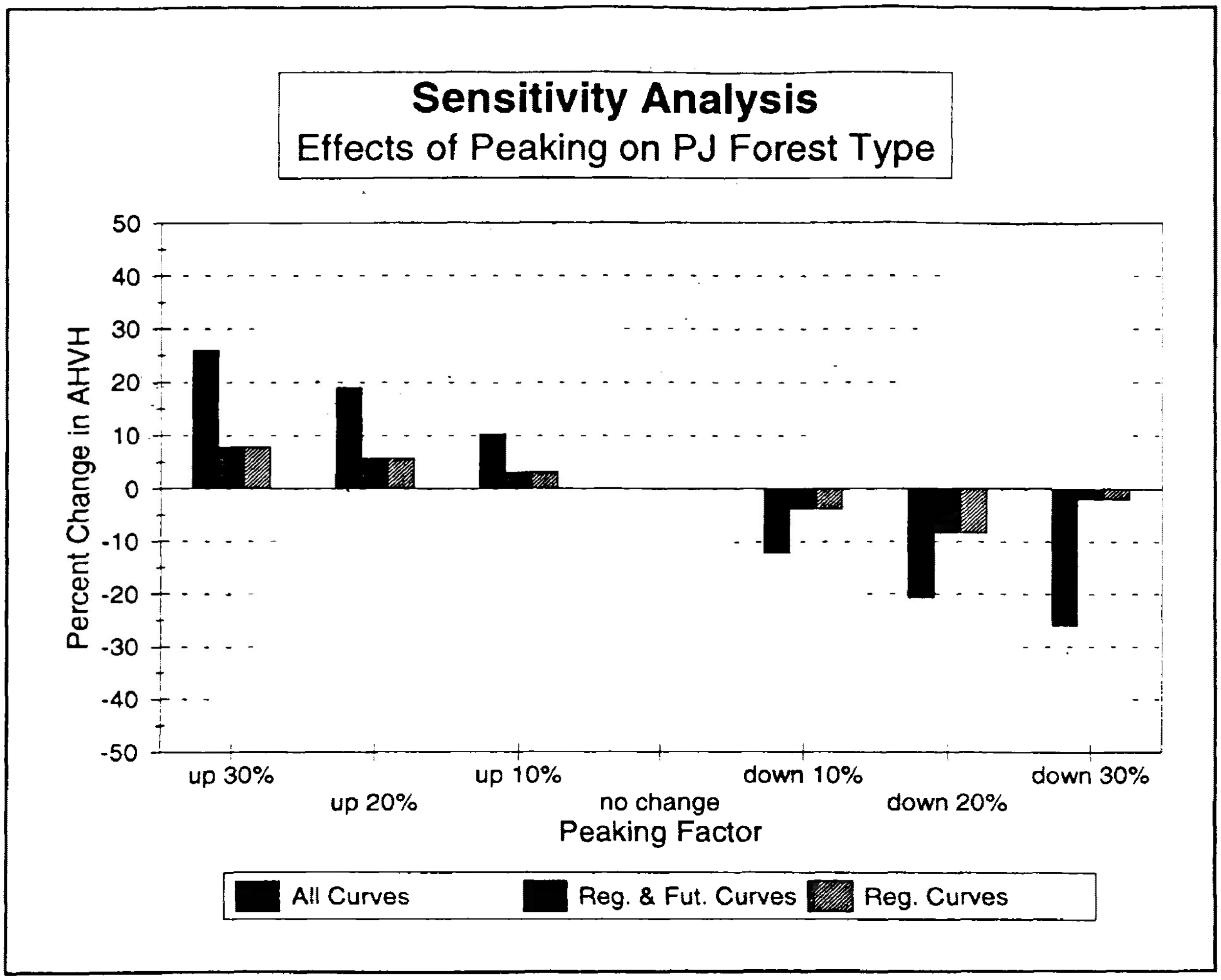

Figure 22. Percent change in average jack pine harvest volume per hectare due to increases and decreases of peak values of the volume development patterns.

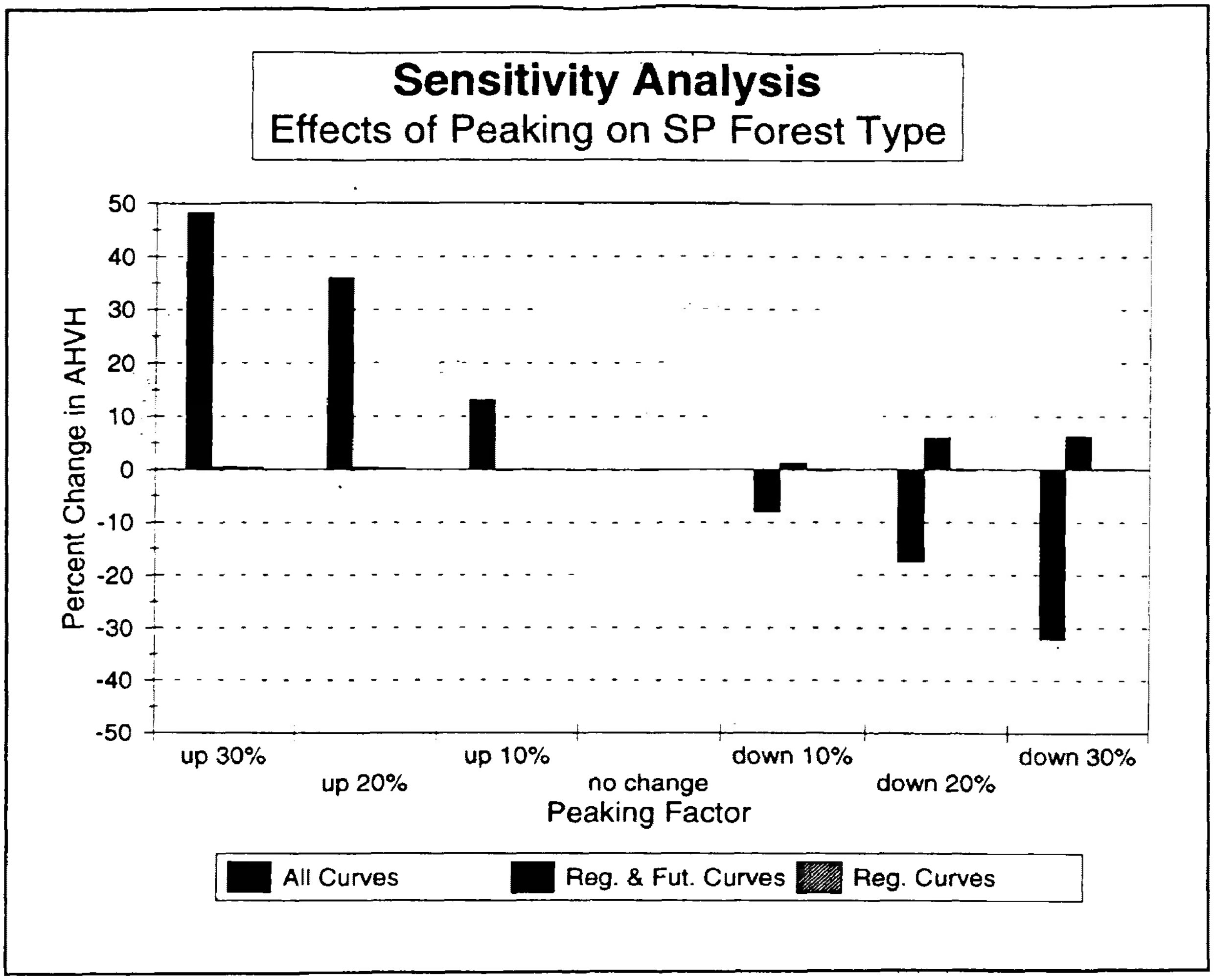

Figure 23. Percent change in average spruce harvest volume per hectare due to increases and decreases of peak values of the volume development patterns.

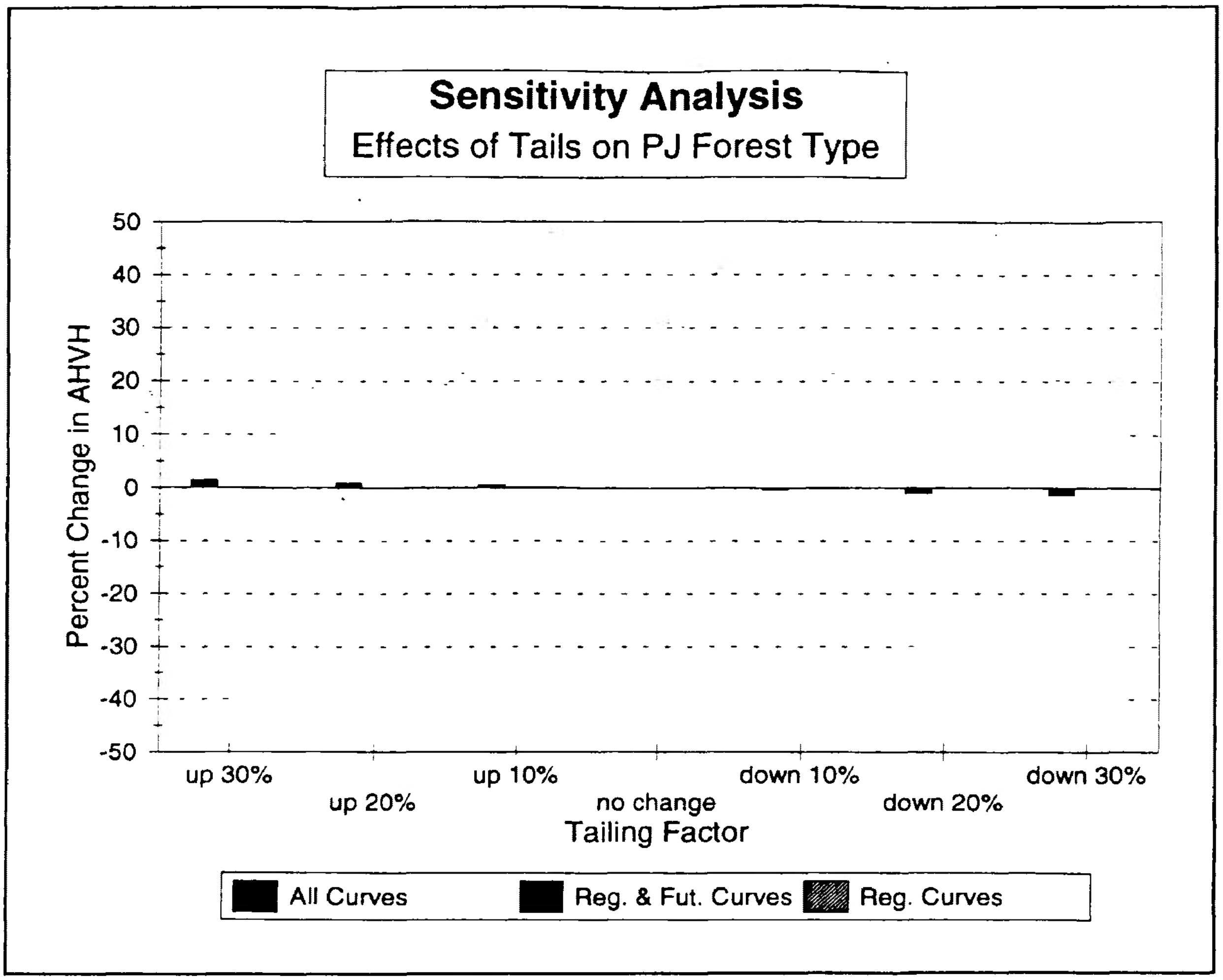

Figure 24. Percent change in average jack pine harvest volume per hectare due to increases and decreases of tail values of the volume development patterns.

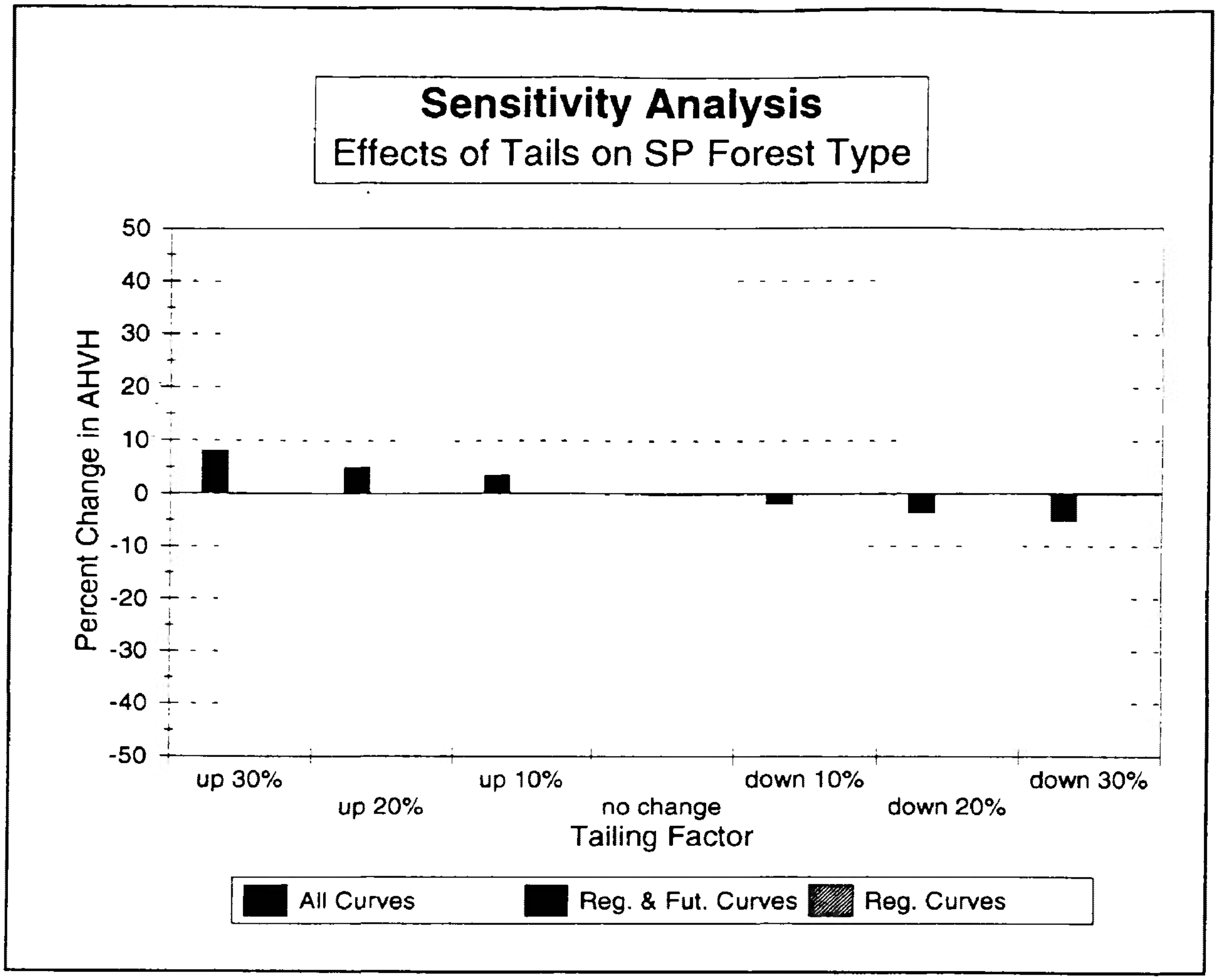

Figure 25. Percent change in average spruce harvest volume per hectare due to increases and decreases of tail values of the volume development patterns.

The sensitivity or insensitivity of AHVH to changes in the VDPs, which essentially controlled both the potential average volume per hectare of the forest and harvest area, were also affected by several other factors including:

- Age-class distribution;
- Harvest scheduling rule;

- Silviculture levels;
- Harvest levels; and
- Simulation period.

The area of the SRFMU was reasonably well distributed over age classes except for large areas in the 5- and 10-year age classes of the Pj and Sp forest types (Figure 26). As can be seen from the BAU's simulation age-class patterns shown in Figure 27, the harvest levels resulted in younger forests for both Pj and Sp forest types over the 100-year simulation period. The Pj forest type had dramatic changes occur to its age-class structure (i.e. Pj: 6 age classes to 4 age classes; Sp: 7 to 6) over a shorter time (i.e. 60 years for the Pj forest type as compared to 100 years for the Sp forest type). These differences between Pj and Sp forest-type age-class dynamics resulted from differences in harvest levels, silviculture levels, and the VDPs which expressed Sp as slower growing and better able to maintain merchantable volume on the stump.

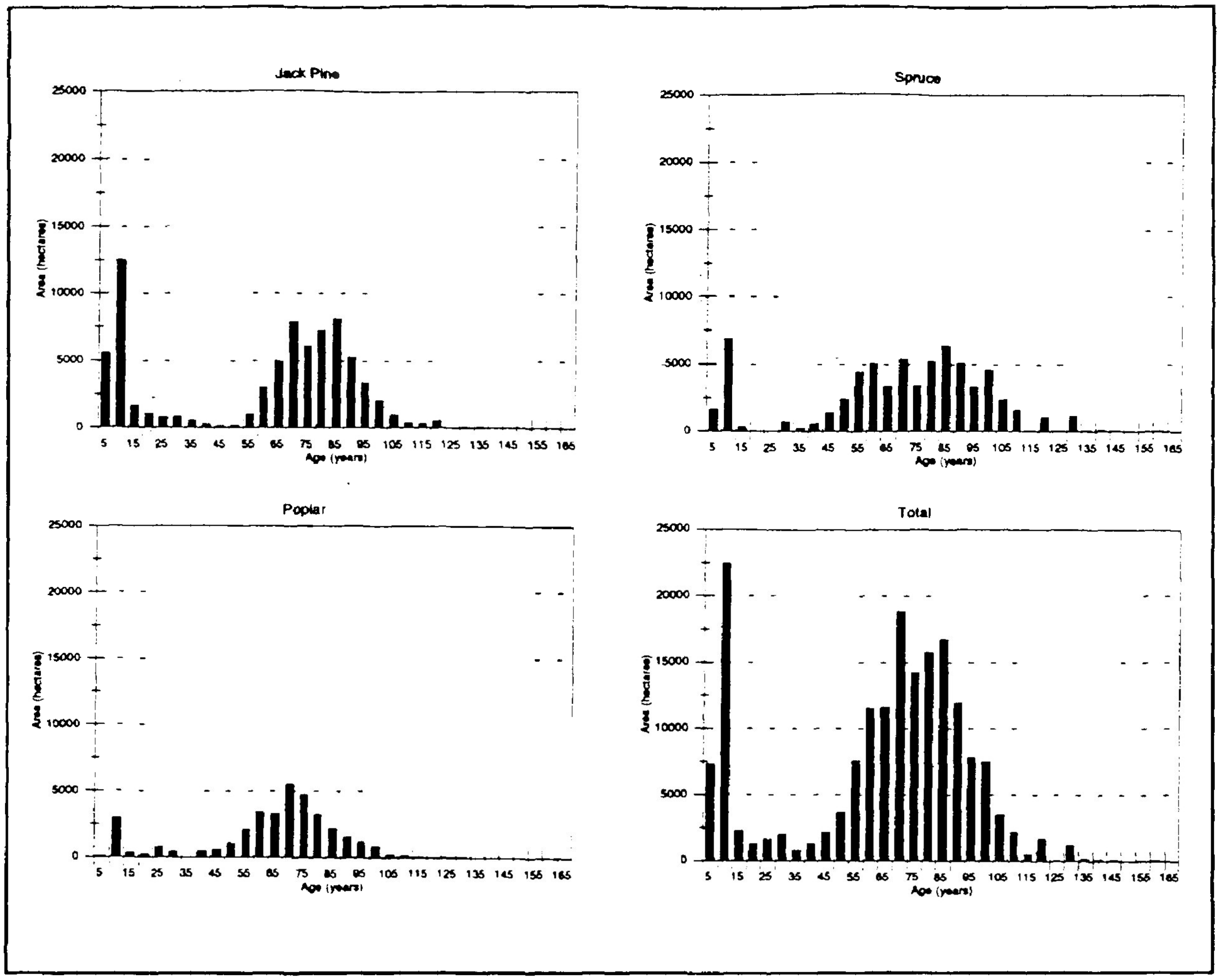

Figure 26. Initial age-class distributions of the Pj, Sp, Po and combined forest types.

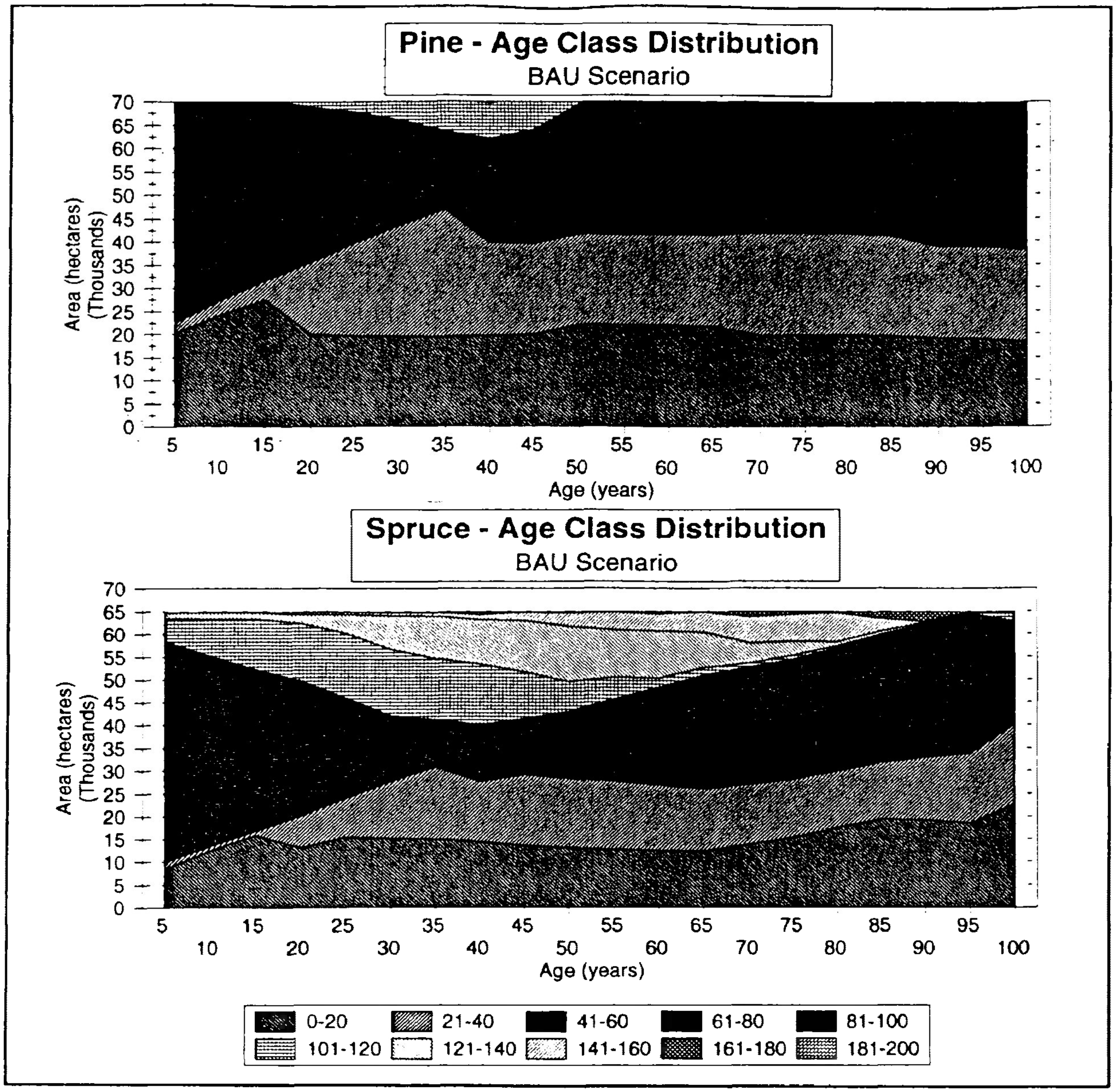

Figure 27. Age class distributions of the Pj and Sp forest types from the BAU scenario simulation runs.

The effects from these factors culminated in the harvest scheduling of areas. The harvest areas of the Pj forest type were almost entirely dependent on the present forest for wood-fibre for the first 70 years, after which they were entirely dependent on volume from artificial regeneration and pre-commercial thinning treatments (Figure 28). The Sp forest type did not have volume harvested from anything but the present and naturally regenerating forest for the first 90 years of the simulation, after which only about 50% of its volume was harvested from the artificially regenerated forest (Figure 29). Obviously, the simulation time-period would need to be longer, in the magnitude of 200 years, for the Sp or the Pj forest types' wood supplies to show any significant responses from changes to the regeneration yield curves.

This insensitivity of volume output per hectare to assumptions of decreases in coniferous volume in response to reduced herbicide use (for the 100-year forecast) means that VDPs representing future responses could have been changed by any factor within reason (e.g. up 30% decrease) and it would not have substantially altered any of the results of this study. While changes to the VDPs which describe the present forest would have produced drastic differences, the present forest is the most understood when comparing it to forests originating from artificial regeneration, pre-commercial thinning, or natural regeneration after harvesting. Since the present VDPs affect the wood supply the most, the forecasts can be assumed to be representative of the future wood supply on the SRFMU. However, efforts to ensure the present VDPs are representative of their aggregations would be a wise investment for the management of this forest. The second most important set of VDPs describe the treated Pj forest type (artificial regeneration and PCT); refinement of these curves with empirical data would enhance long-term volume output results.

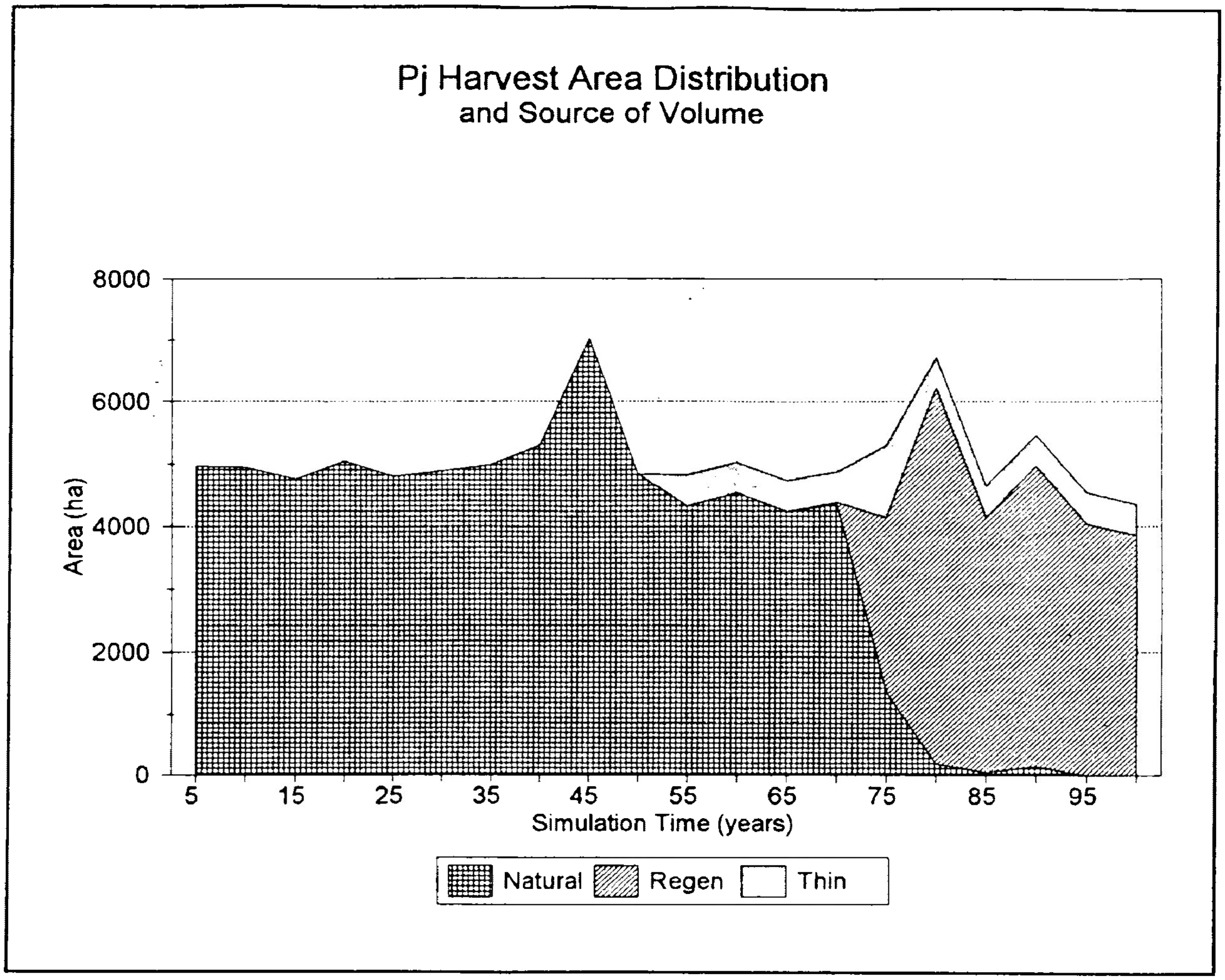

Figure 28. Jack pine harvest area distribution and source of volume for the BAU scenario.

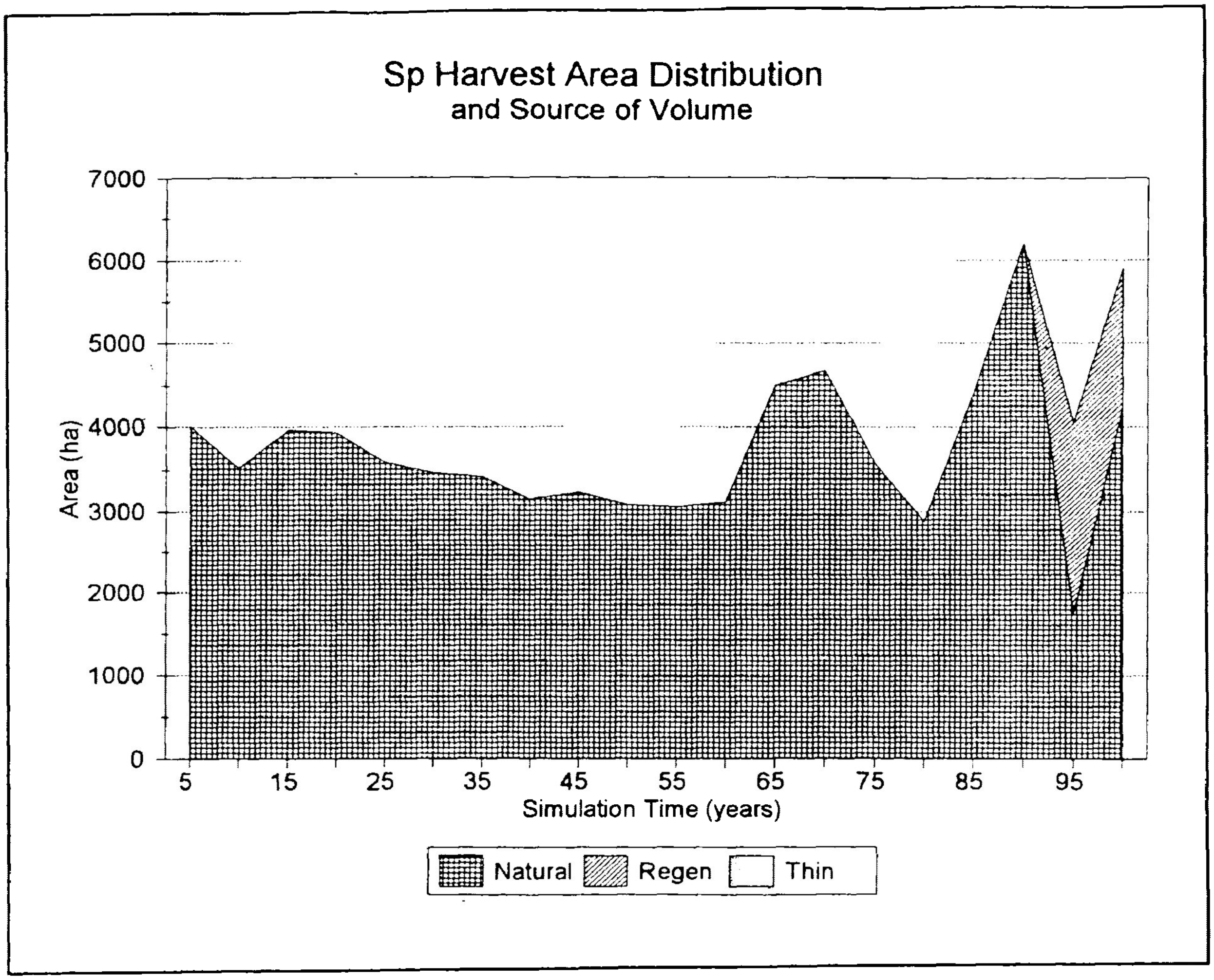

Figure 29. Spruce harvest area distribution and source of volume for the BAU scenario.

5.0 CONCLUSIONS

Comparison of the current system of management with alternative strategies calling for reductions of up to 60% in herbicide use revealed that only minor increases in silvicultural costs (<3%) would be required, with no change in the wood supply. Indiscriminant restriction of herbicide use would require large increases in silvicultural expenditures (over 25%). Similarly, substitution of all herbicide treatments with non-herbicide ground-based alternatives required an increase in the silviculture budget of approximately 37% with noticeable decreases in harvest volume per hectare. A change to a flexible wood supply was feasible if natural regeneration was used, but was a very expensive alternative when the land-base was decreased and intensive management was used.

These results support the hypothesis of this study, that Ontario's forest industries could maintain an economically feasible wood supply under a policy of reduced herbicide use but not under a policy of no herbicide use. Stepwise reductions of up to 60% of the current levels of herbicide-treated areas, when replaced with non-herbicide alternatives, resulted in only modest increases in costs and slight reductions in the softwood growing-stock levels.

Sensitivity analysis of the volume development patterns revealed that the volume dynamics of the present forest were the critical element in the harvest scheduling of the forest, and heavily influenced the level of herbicide treatment as well as the harvest costs for the management of the forest. Effects of management interventions today, while influencing the present sustainable harvest volume, will not be directly encountered for seventy to eighty years, when the last of the present forest is harvested.

The logical route to follow in managing the Seine River forest, under the assumptions and limitations of the day, should be to implement a stepwise reduction of the herbicide program; first by 30% and then by 50% of 1991 levels. Due to a low need for herbicides in the first three decades of this forest's development, there should be ample time for either the acceptance by the public that herbicides are an environmentally sound method of vegetation management, or the development of more economical, non-herbicide vegetation management techniques. From this point, the company would be well-poised to commit completely to alternatives to herbicides if necessary. Another logical long-term strategy is a move to a flexible wood supply where natural reproduction and thus advanced harvesting techniques to promote it are used. However, this scenario would require change on a grand scale, from the development of advanced harvesting techniques to the re-fitting of pulping facilities, preparation for planned fluctuations in product production, employment levels, overall production costs and possibly even a changed market strategy.

The structure of this analysis provides a systematic method for quantifying notions of how management and the forest would be effected by a change in the provincial herbicide policy of Ontario. For instance, it can be demonstrated that if herbicide use was not allowed, silvicultural costs could increase from 37 to 50%, average harvest area would likely increase, wood supply demands would be met. The ability of this framework to provide the necessary information to make sound, defendable management decisions and anticipate the possible implications from herbicide reduction/elimination policies indicate its strength. While the procedures developed for this study can be easily and legitimately applied to analyze potential effects of policies on wood supplies of other forests, the results are particular to the Seine River Forest. Forest models are characterizations of the landbase being studied; their age-class distribution, species composition, productivity, management, costs, investments, history, etc. Differences in one or more of these parameters change the model and thus the basis on which decisions can be made. Use of this study's results to diagnose potential implications to other forests would most likely result in an inappropriate strategy being chosen, to the detriment of the forest and/or the wood supply.

Forest-level analyses such as this provide decision-makers with the necessary insight to make more informed decisions about the effects of their actions or inactions made today. They also serve to highlight areas requiring more research. Three candidates for future research arising from this study are: (i) characterization of advanced harvesting techniques; (ii) spatial analysis; and (iii) benefit-cost analysis.

The promotion of silvicultural systems where advanced harvesting techniques are used to either promote or retain regeneration on sites being harvested was investigated in this study with the no-weed-control scenario. However, the full impacts of the scenario could not be uncovered due to the lack of suitable data to describe effects on growth and yield, their costs, and other unforseen effects. Harvesting techniques used to promote natural regeneration such as a two-pass shelterwood system, harvesting with advanced regeneration protection and controlled skidding, processing at the stump and strip cutting should be researched and the information integrated into a model such as this.

A spatial model could provide the decision-maker(s) with the necessary information to make estimates on: (i) harvest feasibility (regarding locations of scheduled harvests); (ii) road costs; (iii) harvest block restrictions (adjacency rules, maximum size, green-up periods, etc.); and (iv) hauling distances and costs, to name only a few. Much of the information derived from a spatial model would also contribute to an economic analysis (e.g. haul distance).

While basic costs of forest management such as silviculture and harvesting were analyzed in this study, the "economic picture" of this forest remains incomplete. Effort should be made to integrate as many of the costs and benefits involved from management strategies as possible into the forest model. With this information, benefit-cost analysis could be used to evaluate the economic worth of one strategy versus another. An initial summarization of well known costs and benefits could eventually be expanded to include multiple-use values including wildlife, biodiversity, and aesthetics. A forest-level model which incorporated the above research with this study would provide for much more informed decisions being made and would broaden the views of forest management.

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APPENDICES

APPENDIX I

ORGANIZATIONS CONCERNED WITH THE USE OF HERBICIDES IN FOREST MANAGEMENT

SUPPORTING GROUPS OF THE ONTARIO ENVIRONMENTAL NETWORK

APPENDIX 2: SUPPORTING GROUPS

THE UNDERSIGNED organizations support this agenda as a statement by Ontario environmental groups of the principles and priorities for achieving environmental sustainability.

- Algoma Manitoulin Nuclear Awareness
- Artists Alliance for the Environment
- Association of Peel People Evaluating Agricultural Land (APPEAL)
- Assuring Protection for Tomorrow's Environment (Elmira)
- Avon Hiking Trail
- Botany Conservation Group, University of Toronto
- Bruce Nuclear Awareness
- Canadian Institute for Environmental Law and Policy
- Canadian Environmental Law Association
- Canadian Organic Growers
- Canadian Physicians for Aid and Relief
- Citizens for a Safe Environment
- Citizens' Clearinghouse on Waste Management
- Citizens' Network on Waste Management
- Clean North (Sault Ste. Marie)
- Clean Water Alliance: Environment Group
- Coalition Advocating Responsible Development - Haldimand-Norfolk
- Corridor Area Ratepayers Association
- County of Lanark Environmental Action Network
- Dummer Environment Watch
- Durham Nuclear Awareness
- Earth First-Ottawa
- East Coast Ecosystems
- Eco-Action
- Elora Environmental Action Group
- Energy Action Council of Toronto
- Environmental Action Ontario
- Environmental Minds of Grey-Bruce
- Environmentalists Plan Toronto
- Families Against a Toxic Environment
- Friends of the Earth
- Friends of the Rainforest
- Friends of the Spit
- Food Chain
- Grassroots Humewood
- Great Lakes United
- Guelph Field Naturalists
- Guideposts for a Sustainable Future
- Haldimand-Norfolk Organization for a Pure Environment
- Hike Ontario
- Hockley Valley Community Association Inc.
- Interfaith Development Education Association of Burlington
- Keep the Escarpment Environment Protected
- Lakefield Environmental Action Forum
- Maidstone Against Dumping
- Minto Environmental Group
- Mitchell and Area Environmental Group
- Niagara Ecosystems Taskforce (NET Force)
- Niagara Citizens for Modern Waste Management
- Nipissing Environmental Watch
- Nipissing Naturalists
- Norfolk Field Naturalists
- North Bay Peace Alliance
- Northwatch
- Nuclear Awareness Project
- Ontario Public Health Association
- Ontario Public Interest Research Group (OPIRG)-Provincial
- OPIRG-Brock
- OPIRG-Carleton
- OPIRG-Guelph
- OPIRG-Ottawa
- OPIRG-Peterborough
- OPIRG-Toronto
- Owen Sound Field Naturalists
- Parkdale Environmental Action
- Pembroke and Area Bird Club
- Pesticides Action Group-Guelph
- Pickering Rural Association
- Pollution Probe
- Preservation of Agricultural Lands Society
- Sault Naturalists Club
- Save the Rouge Valley System
- Sierra Club of Eastern Canada
- Solar Energy Society of Canada
- St. Clair River International Citizens' Network
- Storrington Citizens Against Trash
- Sudbury Citizens' Movement
- Temagami Wilderness Society
- Temiskaming Environmental Action Committee
- Tiny Ratepayers Against Pollution
- Toronto Environmental Alliance
- Tottenham Environment Committee
- Toxic Waste Research Coalition
- Waterloo Public Interest Research Group
- West Burlington Citizens' Group
- Wildlands League
- Windsor Occupational Safety and Health Group

MEMBER ORGANIZATIONS OF THE CONSERVATION COUNCIL OF ONTARIO

MEMBERSHIP

The Council currently has 31 Member Organizations with a combined membership of over 1 million people. Our current member organizations are:

THE BRUCE TRAIL ASSOCIATION
CANADIAN INSTITUTE OF FORESTRY (Southern Ontario Section)
CANADIAN LAND RECLAMATION ASSOCIATION (Ontario Chapter)
CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS (Ontario Chapter)
CANOE ONTARIO, ENVIRONMENTAL CONCERNS COMMITTEE
COUNCIL OF OUTDOOR EDUCATORS OF ONTARIO
FEDERATION OF ONTARIO COTTAGERS' ASSOCIATIONS INC.
FEDERATION OF ONTARIO NATURALISTS
THE GARDEN CLUBS OF ONTARIO
HIKE ONTARIO
JUNIOR FARMERS' ASSOCIATION OF ONTARIO
THE METROPOLITAN TORONTO ZOO
NATIONAL CAMPERS & HIKERS ASSOCIATION OF ONTARIO
NORTHERN ONTARIO TOURIST OUTFITTERS ASSOCIATION
ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
ONTARIO CAMPING ASSOCIATION
ONTARIO FEDERATION OF AGRICULTURE
ONTARIO FEDERATION OF LABOUR
ONTARIO FORESTRY ASSOCIATION
ONTARIO INSTITUTE OF AGROLOGISTS
ONTARIO MEDICAL ASSOCIATION
ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
ONTARIO PROFESSIONAL PLANNERS INSTITUTE
ONTARIO SOCIETY FOR ENVIRONMENTAL EDUCATION
ONTARIO SOCIETY FOR ENVIRONMENTAL MANAGEMENT
ONTARIO SOIL AND CROP IMPROVEMENT ASSOCIATION
ONTARIO WORKERS' OCCUPATIONAL SAFETY AND HEALTH CENTRE
POLLUTION CONTROL ASSOCIATION OF ONTARIO
THE SIERRA CLUB OF ONTARIO
SOIL AND WATER CONSERVATION SOCIETY (Ontario Chapter)
WILDLANDS LEAGUE (Chapter of Canadian Parks and Wilderness Society)

MEMBERS OF THE ONTARIO FORESTRY SECTOR TASK FORCE

November 1991

To the Reader:

The Forestry Sector Task Force was set up to examine the forestry sector and to make recommendations on implementing a sustainable development strategy to the Ontario Round Table on Environment and Economy. The members of the Task Force are:

Chair: **John Naysmith**, Director, School of Forestry, Lakehead University
David Balsillie, Assistant Deputy Minister, Policy, Ministry of Natural Resources
Ted Boswell, President, E.B. Eddy Forest Products
Robert Cormier, Native Entrepreneur
Brennain Lloyd, Northwatch
Terry Quinney, Ontario Federation of Anglers and Hunters
Michelle Swenarchuk, Canadian Environmental Law Association
Wally Vrooman, Vice-President, Environmental Affairs, Canadian Pacific Forest Products
Jerry Woods, Canadian Paperworkers Union

In this report, the members of the Task Force present their views on ways that government, non-government organizations, and private industry can best promote a healthy environment and economic development in the forestry sector.

The final report will be released for general public comment in January. The Round Table will consider the recommendations contained in the final report in preparing its overall strategy for sustainable development for the Province of Ontario.

Individuals, groups, or organizations who wish to comment on this draft report may do so in writing or in person. For more information please contact the Round Table at (416) 327-2032. For long distance call collect. Please send written comments to:

Forestry Task Force
The Ontario Round Table on Environment and Economy
Suite 1003, 790 Bay Street
Toronto, Ontario
M7A 1Y7

Tel: (416) 327-2032
Fax: (416) 327-2197

APPENDIX II

SUMMARY OF THE MAJOR ATTRIBUTES ASSOCIATED WITH A NUMBER OF TYPES OF FOREST VEGETATION MANAGEMENT

Practice	General Method	Specific Technique	Applicable Region	Principal Advantages	Principal Disadvantages
Harvesting	Clearcutting	Conventional	All	Facilitates efficient even-aged management Removes overstory competition Disturbs residual shrubs and hardwoods Most economical method of logging Most reliable method of reforestation if planting is done Beneficial to many wildlife species	Seedling stock may not be adapted to the site Aids pioneering vegetation Promotes sprouting May cause errosion and associated adverse impacts Habitat changes may alter composition of wildlife species Asthetically less pleasing
		Minimum disturbance	Northwest	Same as preceding plus: 1. Hinders pioneering vegetation 2. Helps protect site quality	Same as preceding except: 1. Aids residual rather than pioneering vegetation 2. Logging more costly than conventional clearcutting
	Seed-tree and sheltenwood systems		South and North-west	Ameliorates harsh environmental conditions for seedlings Less expensive natural regeneration possible Ensures seedling adaptation to site (unless planted) Aesthetically more pleasing (at least temporarily) than clearcutting	Difficult and costly to perform on steep terrain Difficult to control number and distribution of seedlings Aids understory shrubs and hardwoods Multiple entries can damage advanced regeneration and remaining trees Unsuitable for thin-barked species susceptible to stem decay from logging damage Increases incidence of root rot and dwarf mistletoe diseases Damage possible to high value residuals from lightning, windthrow, and insects Logging more costly than clearcutting
	Selection harvesting		South, North-east, and Inland North-west	Facilitates all-aged or uneven-aged management Provides a relatively continuous stream of revenue Inexpensive natural regeneration possible Ensures seedling adaptation to site Helps protect site quality and maintain stable environmental conditions Aesthetically more pleasing than clearcutting Perpetuates stable habitat for some wildlife species Reduces the chances of catastrophic losses from fire and natural agents	Succession can lead to gradual dominance by low-value hardwoods Generally less profitable and more complicated than even-aged management Multiple entries can damage advanced regeneration and disturb soils Increases incidence of root rot diseases Logging more costly than clearcutting Precludes opportunities to use genetically improved stock or change species
Site preparation	Prescribed burning	Broadcast burning	All	Reduces risk of subsequent wildfire Provides suitable environment for seeding and planting Facilitates access for planting and other silvicultural activities Provides some control of residual shrubs and hardwoods	Requires precise weather and site conditions to ensure: 1. Adequate disposal of slash 2. Minimum risk of escape 3. Compliance with smoke management regulations Occupational hazards are inherent in any technique utilizing fire

* Extracted from Table 6-1 from Walstad et al. (1987)

Practice	General Method	Specific Technique	Applicable Region	Principal Advantages	Principal Disadvantages
				Successional patterns similar to that caused by natural wildfires Reasonably inexpensive when done under suitable conditions Improves forage for wildlife and livestock (Note: This may lead to seedling damage in some situations)	Can be detrimental to soils and site quality Aggravates sprouting and germination problems with fire-adapted species Generally requires pretreatment via mechanical or chemical means Exposed environment for new seedlings can be too harsh
		Burning of piles and windrows	All	Same as preceding plus: 1. Minimizes risk of escape during burning 2. Weather and fuel conditions do not have to be quite so stringent 3. Makes entire area suitable for planting or seeding	Same as preceding plus: 1. Requires costly mechanical or manual methods to pile or windrow the material 2. Piling or windrowing operations must be carefully done to ensure that material is burnable and that soils are not adversely impacted 3. Terrain must be suitable for operation of mechanical equipment
	Mechanical methods	Various types of heavy equipment	All	Reduces risk of subsequent wildfire Residual vegetation frequently uprooted or damaged Provides suitable environment for seeding or planting Facilitates access for planting and other silvicultural activities Occupational safety is reasonable if work is done carefully Sensitive areas can be treated with little controversy or risk of off-site damage	Expensive, energy-intensive approach Not applicable on steep slopes or excessively wet soils Can cause serious soil damage and loss of site productivity Follow-up burning generally required to dispose of material Does not control sprouting vegetation unless it is uprooted Creates ideal conditions for invasion of pioneering vegetation Can aggravate problems with pest animals Exposed environment for new seedlings can be too harsh
	Chemical methods	Broadcast application (usually aerial application)	All	Provides effective control of many residual species Applicable to steep slopes and difficult sites Generally the safest, most efficient, and most cost-effective mode of application, especially for large, remote areas; indirect costs can be substantial, however	Adequate training and precautions are required for proper application Follow-up burning or mechanical treatment generally required Treatments are confined to specific seasons of the year and vegetation conditions Efficacy often dependent upon weather conditions Legal impediments and regulatory restrictions can be limiting Can be a controversial form of treatment
		Ground application (usually spot, band, or individual stem treatments)	All	Same as preceding plus: 1. Efficacy tends to be greater 2. Treatments can often be applied yearround 3. Can be tailored to small areas, boundaries, and buffer strips 4. Environmental precautions required tend to be less restrictive	Same as preceding plus: 1. Frequency of occupational injuries associated with labor-intensive methods is inherently greater 2. Occupational exposure to chemicals is greater 3. Not feasible on adverse terrain or in brushy conditions

Practice	General Method	Specific Technique	Applicable Region	Principal Advantages	Principal Disadvantages
					4. Costs tend to be higher 5. Production rates are lower
	Manual methods	Slashing	Northwest	Can be used when or where machines are inoperable and chemicals are unsuitable Relatively small areas can be treated High-value trees or plants can be saved	Primarily restricted to brushfield reclamation and stand conversion projects Hazardous occupational practice even after extensive safety training (involves power saws and machetes) Expensive, labor-intensive approach Does not control sprouting species Adjunct treatment with fire, mechanical, or chemical treatment usually required
		Mulching and scalping	Northwest	Same as preceding plus: 1. Done in conjunction with planting 2. Can improve soil moisture conditions and seedling survival	Only effective on forbs and grasses Careful installation of mulching material (paper or plastic) required Not stable on excessively steep ground Scalping less effective than mulching Expensive, labor-intensive approach
Release	Chemical methods	Broadcast application (usually aerial application)	All	Same as for broadcast chemical site preparation plus: 1. Use of broad-spectrum, selective herbicides can provide adequate control of competing vegetation without damaging conifers 2. Most widely tested and used method of release	Same as for broadcast chemical site preparation except: 1. Follow-up burning or mechanical treatments are inappropriate 2. Correct timing is critical to avoid damage to conifers
		Ground applications (usually directed foliar or basal sprays)	All	Same as for ground chemical site preparation plus: 1. Generally the most effective and selective treatment, provided the conditions are practical and economical	Same as for ground chemical site preparation except: 1. Follow-up burning or mechanical treatments are inappropriate 2. Conifers can be damaged unless care is taken during application
	Manual methods	Various types of hand tools and power saws	All	Highly selective treatment Minimizes potential for adverse environmental impacts Reasonably efficient means of treating small, sensitive areas where other methods are inappropriate Can be done in conjunction with precommercial thinning	Highly hazardous occupational practice Expensive, labor-intensive practice Difficult to perform on adverse sites and under brushy conditions Multiple treatments may be required to control resprouting vegetation Conifers can be accidentally cut or set back by "thinning shock" Silvicultural benefits largely undocumented, except when done in conjunction with precommercial thinning

Practice	General Method	Specific Technique	Applicable Region	Principal Advantages	Principal Disadvantages
	Biological methods	Livestock grazing	South and Northwest	Can be an effective, efficient, and inexpensive means of controlling herbs and shrubs Can generate supplemental revenue Promotes multiple-use management	Livestock must be adapted to forest conditions Conifer seedlings can be damaged, killed, or eaten Careful herd management required Stream pollution, disease transmission, and displacement of wildlife are possible Implementation of effective grazing programs can be complex Silvicultural benefits largely undocumented
Timber stand improvement	Chemical methods	Broadcast application (aerial and mist blower application)	South	Same as for broadcast chemical release	Same as for broadcast chemical release except: 1. Aerial application restricted to treatment of intermediate to codominant-sized hardwoods 2. Ground treatment with mist blowers restricted to treatment of understory species on gentle topography 3. Some herbicide applications may affect desirable hardwoods
		Individual treatments (usually tree injection)	South and Northeast	Provides both maximum degree of control and selectivity Treatments can be applied year-round Can be tailored to small areas, boundaries, and buffer strips Reduces need for vegetation control measures in subsequent rotations Tree spacing can be adjusted at the same time	Same as for ground chemical release except conifer damage is likely if "backflash" (translocation of herbicide from hardwoods to conifers via the root systems) occurs
	Manual methods	Power saws		Same as for manual site prep and release plus: 1. Merchantable material can be harvested 2. Tree spacing can be adjusted at the same time 3. Conifer damage can generally be avoided	Same as for manual release plus: 1. Stumps capable of sprouting may become serious competitors in the subsequent rotation
	Prescribed burning	Broadcast understory burning	South and Northwest	Same as for site prep broadcast burning except: 1. Provisions for regeneration are not an important consideration except for shelterwood reforestation in the Northwest 2. Normal plant successional sequence is delayed 3. Need for vegetation control measures in subsequent rotations is reduced 4. An inexpensive silvicultural practice, particularly in the South	Same as for site prep broadcast burning except: 1. Neither mechanical nor chemical treatment is required as adjunct measures 2. Valuable hardwood stems may be adversely affected 3. Danger of crown scorch or bole damage to conifers if fire becomes too hot 4. Restricted in Northwest to shelterwood system of reforestation, where even here it is a risky proposition due to the chance of fire escape

APPENDIX III

A SUMMARY OF THE PRODUCTIVE FOREST OF THE SEINE RIVER FOREST MANAGEMENT UNIT

TABLE 4.8.1

AREA SUMMARY OF ALL LAND OWNERSHIPS*

for the five year term

from April 1, 1992 to March 31, 1997

SEINE RIVER FOREST

SUMMARY OF TOTAL AREA (HA)		
Water		46373
Non-Forested Land		822
Forested Land		
- Non-Productive Forest	27672	
- Productive Forest	205406	
		233078
Unsurveyed		0
Total Area		280273

SUMMARY OF PRODUCTIVE FOREST (HA)							
		PRODUCTION FOREST					
			FTG Land Base				
WG	PROTECTION FOREST SC 4 & ISLANDS	B&S and/or NSR 2-6	PFR	Regular	Subtotal	Subtotal	TOTAL
Pw	0	90	177	810	987	1077	1077
Pr	0	50	340	1033	1373	1423	1423
Pj	250	17014	16598	43741	60339	77353	77603
S	0	0	57	211	268	268	268
Sb	1155	7440	10058	37966	48024	55464	56619
Sw	0	25	81	169	250	275	275
Bf	225	1027	3381	7448	10829	11856	12082
Ce	129	118	470	2004	2474	592	2721
La	18	0	31	44	75	75	93
A	0	0	0	109	109	109	109
Ms	0	0	406	1236	1642	1642	1642
Po	684	3229	13137	23945	37082	40311	40995
Pb	0	0	0	112	112	112	112
Bw	421	28	2915	7023	9938	9966	10387
TOTAL	2883	29021	47651	125851	173502	202523	205406

* This summary is not required to be completed for FMA forests.

TABLE 4.8.2

AREA SUMMARY OF ALL CROWN LAND*

for the five year term from April 1, 1992 to March 31, 1997

SEINE RIVER FOREST

SUMMARY OF TOTAL AREA (HA)		
Water		46373
Non-Forested Land		650
Forested Land		
- Non-Productive Forest	25722	
- Productive Forest	194476	
		220198
Unsurveyed		0
Total Area		267221

SUMMARY OF PRODUCTIVE FOREST (HA)

WG	PROTECTION FOREST SC 4 & ISLANDS	PRODUCTION FOREST					TOTAL
		B&S and/or NSR 2-6	FTG Land Base			Subtotal	
			PFR	Regular	Subtotal		
Pw	0	90	174	705	879	969	969
Pr	0	47	253	994	1257	1304	1304
Pj	214	16475	16199	41898	58097	74572	74786
S	0	0	57	196	253	253	253
Sb	946	7374	9755	36576	46331	53705	[illegible]651
Sw	0	25	71	157	228	253	253
Bf	99	1019	2936	6990	9926	10945	11044
Ce	129	100	421	1881	2302	2402	2531
La	18	0	26	44	70	70	88
A	0	0	0	98	98	98	98
Ms	0	0	401	1235	1636	1636	1636
Po	426	3005	12087	21663	33750	36755	37181
P	0	0	0	98	98	98	98
Bw	398	28	2569	6589	9158	9186	9584
TOTAL	2230	28163	44959	119124	164083	192246	194476

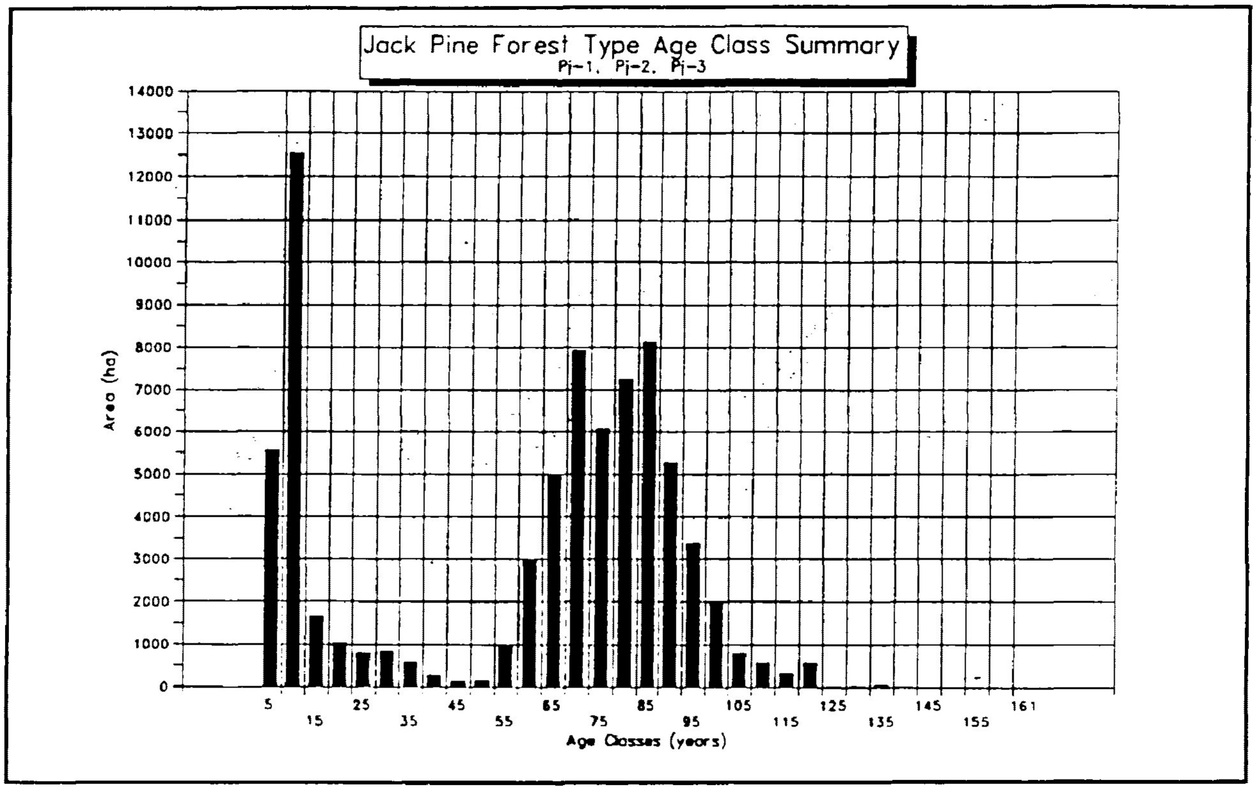
* Crown ownership FRI code 1.

APPENDIX IV

A SUMMARY OF FOREST AGE CLASSES WITHIN EACH AGGREGATION NUMBER FOR THE JACK PINE FOREST

Forest Type: Jack Pine (Pj)

Aggregation	Pj-1			Pj-2			Pj-3			Total
Stocking	ge 70%			all			all			
% Coniferous Component	100%			70%			80% or 90%			
Site Class	X + 1	2	3	X + 1	2	3	X + 1	2	3	
Aggregate No.s	1	2	3	4	5	6	7	8	9	
Age Class	Area (hectares)									
5	128	4377	1080	0	0	0	0	0	0	5585
10	1020	9572	340	143	985	0	0	480	0	12540
15	14	46	22	54	439	8	65	991	0	1639
20	24	129	0	186	260	0	41	409	0	1049
25	5	53	0	0	145	21	63	518	0	805
30	0	109	111	0	0	46	0	389	175	830
35	0	23	0	0	360	0	0	55	114	552
40	54	27	0	0	0	0	44	142	0	267
45	0	53	5	0	0	0	0	78	0	136
50	0	24	0	22	0	0	48	57	0	151
55	3	44	0	24	158	0	221	521	11	982
60	114	544	17	110	750	145	357	642	335	3014
65	246	1303	0	100	1215	39	103	1875	64	4945
70	306	1472	49	393	1384	57	590	3359	319	7929
75	30	865	275	49	1443	191	68	2563	585	6069
80	163	1566	196	87	934	160	565	3242	349	7262
85	54	2228	296	7	884	0	93	4417	165	8144
90	35	1526	299	0	677	154	180	1995	426	5292
95	0	1593	121	0	371	25	84	683	480	3357
100	232	258	22	119	471	0	0	804	128	2034
105	0	151	47	144	46	13	245	311	0	957
110	28	0	0	0	31	0	50	320	0	429
115	40	0	0	0	41	0	89	165	0	335
120	0	0	0	0	318	37	0	206	0	561
125	0	0	0	0	0	0	0	3	0	3
130	0	0	0	0	25	0	18	0	0	43
135	0	0	0	0	0	0	61	0	0	61
140	0	0	0	12	0	0	0	0	0	12
145	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0
Total	2496	25963	2880	1450	10937	896	2985	24225	3151	74983



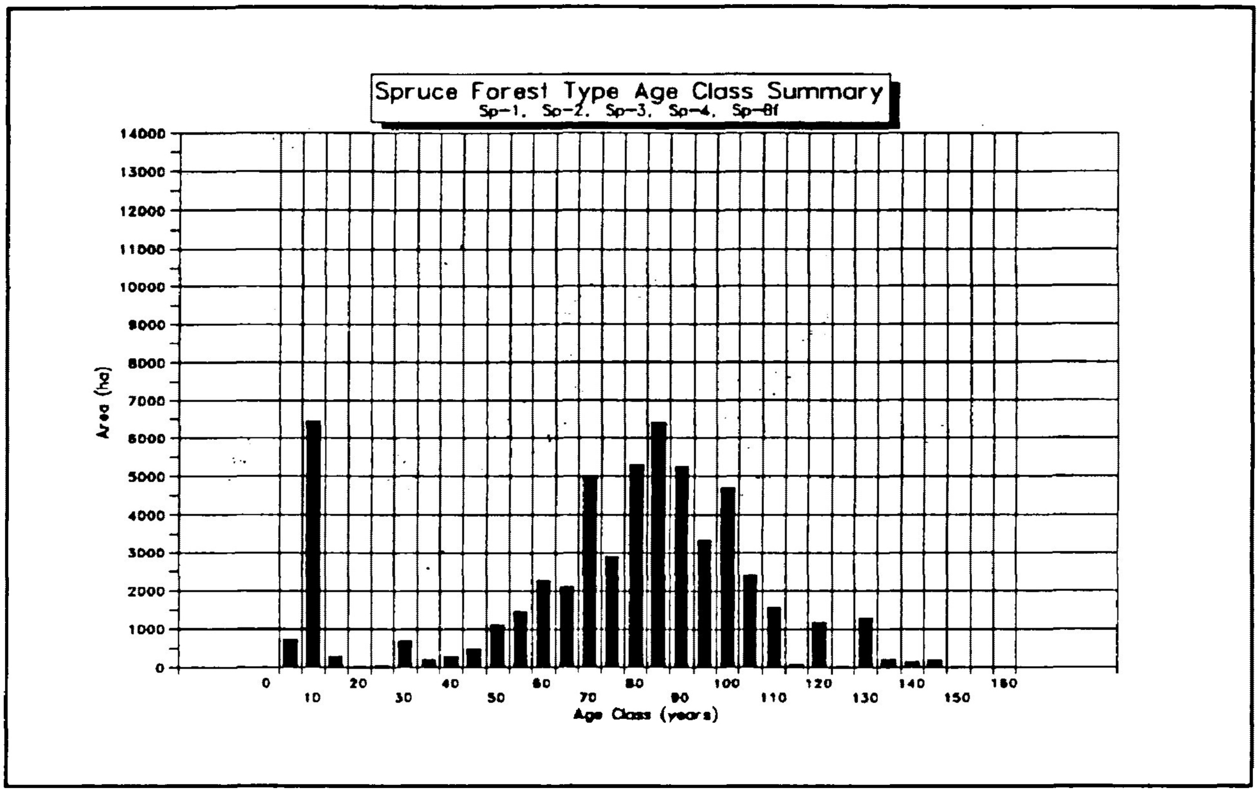
The initial age class distribution of the Jack Pine Forest Type of the Seine River Forest Management Unit as of 1991.

APPENDIX V

A SUMMARY OF FOREST AGE CLASSES WITHIN EACH AGGREGATION NUMBER FOR THE SPRUCE FOREST TYPE

Forest Type: Spruce (Sp)

Aggregation	Sp-1			Sp-2			Sp-3		Sp-4		Sp-5		Total
Stocking	le 60%			ge 70%			all		all		all		
% Coniferous Component	100% (ge 50% Sb)			100% (ge 50% Sb)			le 70%		80 % or 90%				
Site Class	X + 1	2	3	X + 1	2	3	X + 1	2	X + 1	2	X + 1	2	
Aggregate No.s	10	11	12	13	14	15	16	17	18	19	20	21	
Age Class	Area (hectares)												
5	239	380	117	0	0	0	0	122	0	0	0	776	1634
10	1434	4070	861	0	0	0	0	193	0	51	241	16	6866
15	29	0	0	0	0	0	11	69	14	148	0	13	284
20	0	0	0	0	0	0	0	0	0	19	0	0	19
25	0	0	0	14	0	0	0	0	10	0	0	0	24
30	27	9	0	70	0	0	81	0	517	0	3	0	707
35	7	0	0	8	39	0	0	37	0	104	42	0	237
40	32	0	0	59	0	0	109	0	67	0	268	0	535
45	6	9	0	27	131	0	195	18	84	11	870	54	1405
50	161	15	0	121	60	0	162	0	538	10	1340	0	2407
55	116	21	0	99	21	0	467	25	617	0	3073	0	4439
60	62	35	0	359	7	0	657	39	888	91	2925	0	5063
65	213	60	0	249	12	0	1008	0	571	18	1130	78	3339
70	248	116	0	514	259	9	1706	49	1877	150	427	33	5388
75	235	70	9	566	95	0	496	16	1287	89	495	0	3358
80	165	109	23	899	258	64	1663	219	1617	164	37	0	5218
85	218	120	46	1209	140	28	1687	76	2775	64	0	0	6363
90	244	192	107	642	204	24	798	173	2341	342	19	0	5088
95	332	57	0	660	93	62	768	0	1260	59	0	0	3291
100	118	378	130	833	459	145	491	378	1198	448	0	0	4578
105	181	238	48	439	211	27	361	72	609	148	0	19	2353
110	101	96	36	103	279	178	286	0	339	181	0	0	1599
115	5	0	31	0	25	0	0	0	16	0	0	0	77
120	52	95	136	29	382	25	0	45	119	198	0	0	1081
125	14	0	0	0	0	23	0	0	0	0	0	0	37
130	10	91	215	62	292	6	29	62	328	51	0	0	1146
135	4	0	31	42	10	0	0	0	0	0	0	0	87
140	17	0	34	0	21	0	0	0	0	45	0	0	117
145	0	0	24	0	38	0	0	0	0	0	0	0	62
150	5	9	0	0	0	0	0	0	0	0	0	0	14
155	0	0	0	0	20	0	0	0	0	0	0	0	20
160	0	5	0	4	0	38	0	0	7	0	0	0	54
165	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	4275	6175	1848	7008	3056	629	10975	1592	17079	2391	10870	989	66888



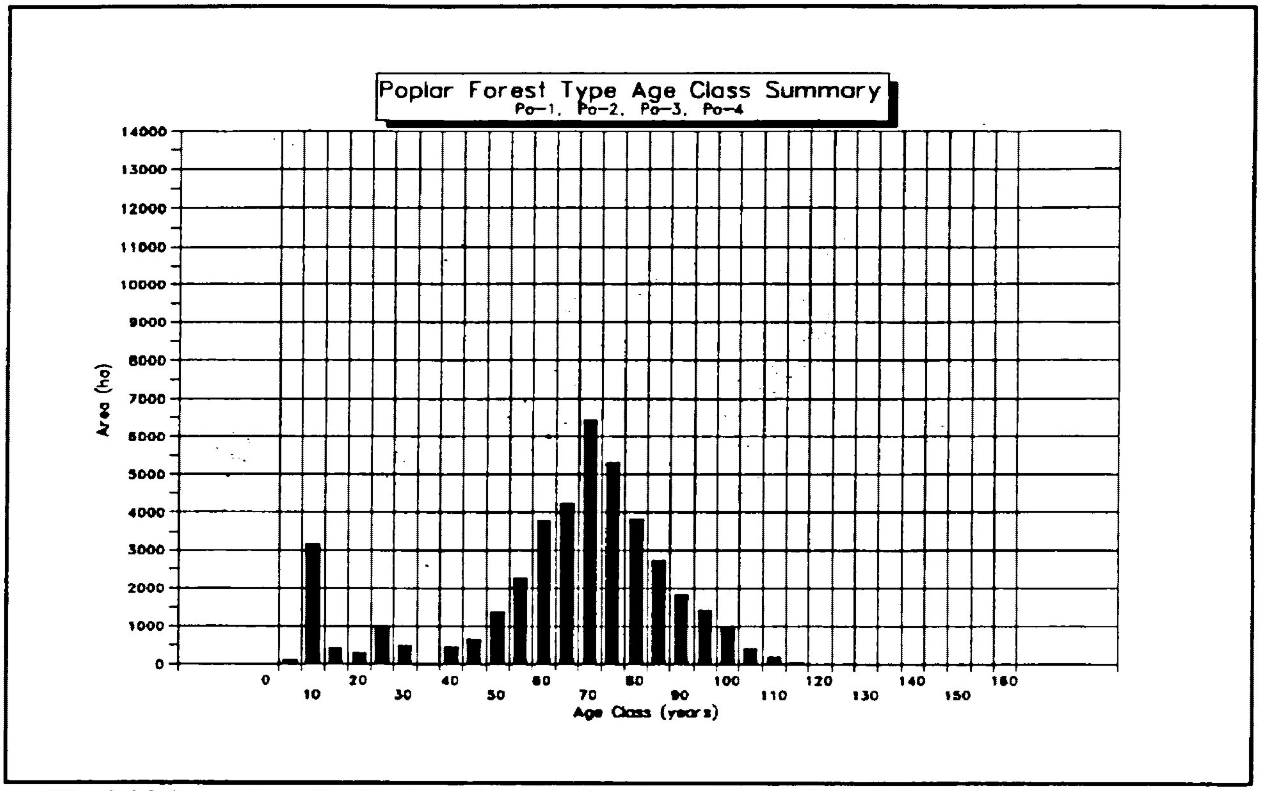
The initial age class distribution of the Spruce Forest Type of the Seine River Forest Management Unit as of 1991.

APPENDIX VI

A SUMMARY OF FOREST AGE CLASSES WITHIN EACH AGGREGATION NUMBER FOR THE POPLAR FOREST TYPE

Forest Type: Poplar (Po)

Aggregation	Po-1		Po-2			Po-3		Po-4		Total
Stocking	le 40%		ge 50%					nc		
% Coniferous Component	le 50%		le 50%			ge 60% (Bf present)		ge 60% (Pj/Sp present)		
Site Class	2	3	X + 1	2	3	2	3	2	3	
Aggregate No.s	22	23	24	25	26	27	28	29	30	
Age Class	Area (hectares)									
5	106	0	0	0	0	0	0	0	0	106
10	2292	653	0	15	0	0	0	35	0	2995
15	0	0	0	201	0	123	0	17	0	341
20	165	0	0	47	0	0	0	0	0	212
25	0	0	0	515	220	42	0	0	0	777
30	8	14	0	55	283	31	68	0	0	459
35	0	0	0	4	0	0	0	0	0	4
40	0	0	307	84	57	23	0	23	0	494
45	0	0	110	218	184	100	0	0	0	612
50	0	0	144	664	197	80	0	16	0	1101
55	0	0	218	1427	240	111	36	121	0	2153
60	0	0	84	2268	763	53	120	139	10	3437
65	0	7	21	734	1751	0	696	0	111	3320
70	0	0	105	1853	2566	184	420	56	352	5536
75	0	0	120	2411	1058	400	556	42	182	4769
80	12	0	0	1517	943	283	488	0	15	3258
85	0	11	0	898	836	252	200	0	21	2218
90	50	48	51	525	277	317	217	0	75	1560
95	0	218	23	209	478	0	223	0	42	1193
100	0	198	0	37	513	33	85	8	15	889
105	10	0	1	64	79	71	0	0	0	225
110	0	42	10	53	5	0	28	0	0	138
115	0	0	26	0	0	0	21	0	22	69
120	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0
Total	2643	1191	1220	13799	10450	2103	3158	457	845	35866



The initial age class distribution of the Poplar Forest Type of the Seine River Forest Management Unit as of 1991.

APPENDIX VII

NORTH WESTERN ONTARIO FORMAN FOREST CLASS DEFINITIONS AND YIELD CURVES

FORES. CLASS DEFIN TION

CLASS	PRESENT	FUTURE	REGENERATED
1	PO-LEAVE - High Competition PO and BW Stands		
	PO & BW SI X,1,2 REG & PFR WG stocking >= 70%	PO Class 1 (SI 2) Primary vol 10% Secondary vol 90% 0 yr delay Stand stocking use Present 1 ave * 0.9	nil planned
2	PO-CONVERT - Moderate Competition PO and BW Conversion Candidates		
	PO & BW SI X,1,2 REG & PFR WG stocking <= 60% A N D PO & BW SI 3 REG & PFR WG stocking >= 10%	PO Class 2 (SI 3) Primary vol 10% Secondary vol 90% 0 yr delay Stand stocking use Present 2 average.	Heavy SIP Plant B/R sb,sw Tend twice vision SB Class 7 (SI 1) Primary vol 70% Secondary vol 30% ~~20 yr advance~~ Stocking -use Pres 7 adjust vol to 100% * Pres2 average
3	PJ SB SHALLOW - Low Competition PJ and SB Shallow Sites		
	PJ SI X,1,2 PFR SI 3 PRF & REG WG stocking >= 10% A N D SB & S SI X,1,2 PFR SI 3 PFR & REG WG stocking <= 80% A N D SW SI 3 ALL WG stocking >= 10%	PJ Class 3 (SI 3) Primary vol 80% Secondary vol 20% 0 yr delay Stand stocking use Present 3 weighted average * 0.5	Light SIP D/S @ 30MM/ha Tend No PJ Class 3 (SI 3) Primary vol 90% Secondary vol 10% 10 yr advance Stand stocking use Present 3 weighted average * 0.5
4	PJ SANDY SITES - Low Competition PJ		
	PJ SI X,1,2 REG WG stocking >= 80%	PJ Class 4 (SI 2) Primary vol 70% Secondary vol 30% 6 yr delay Stand stocking use Present 4 average * 0.6	Light SIP A/S @ 50MM/ha Tend No PJ Class 4 (SI 2) Primary vol 90% Secondary vol 10% 10 yr advance Stand stocking use Pres 4 average *0.9

For M.U. : Standard N.W.R. Regional Forest Classes For T.P.P.	Updated MAY 29, ~~1989~~ 1990
	By John Thomson Bob White

CLASS	PRESENT	FUTURE	REGENERATED
5	PJ HIGH COMPETITION - PJ and SB Conversion Candidates		
	PJ SI X,1,2 REG WG stocking <= 80%	PO Class 2 (SI 1) Primary vol 40% Secondary vol 60% 0 yr delay Stand stocking use Present 2 adjust vol to 100% * Pres 5 average	Light SIP Plant C/S pj, sb Tend 2-4-D PJ Class 5 (SI 1) Primary vol 90% Secondary vol 10% 10 year advance Stand Stocking use Pres 5 average
6	SB MODERATE COMPETITION - Moderate Competition SB Sites		
	SB SI 2 REG WG stocking >= 10%	PO Class 2 (SI 3) Primary vol 40% Secondary vol 60% 0 yr delay Stand stocking use Pres 2 adjust vol to 100% * Present 6 average stocking	Light SIP Plant C/S sb,sw Tend vision SB Class 6 (SI 2) Primary vol 90% Secondary vol 10% 20 year advance Stand stocking use Present 6 average
7	SB HIGH COMPETITION - High Competition SB Sites		
	SB SI X,1 REG WG stocking >= 10%	POCONVERT2 (SI 2) Primary vol 30% Secondary vol 70% 5 yr delay Stand stocking use Present 2 adjust vol to 100% and * by Present 7 average.	HEAVY SIP Plant B/R sb,sw Tend Vision SB Class 7 (SI 1) Primary vol 90% Secondary vol 10% 20 yr advance Stand stocking use Present 7 average.
8	SB WET - Lowland Wet SB sites		
	SB SI 3 REG & PFR WG stocking >= 80%	SB Class 8 (SI 3) Primary vol 100% Secondary vol 0% 20yr delay Stand stocking use Pres 8 average *0.8	Leave for natural
9	BF LIGHT COMPETITION - Sites for Conversion		Light SIP -No Tend Plant C/S sb,pj
	BF SI X,1,2 PFR WG stocking >= 10% A N D BF SI 3 REG & PFR WG stocking >=10%	SB Class 9 (SI 3) Primary vol 70% Secondary vol 30% 0 yr delay Stand stocking use Present 9 average.	SB Class 6 (SI 2) Primary vol 80% Secondary vol 20% 20 yr advance Stand stocking use Pres 6 adjust vol to 100% * Present 6 average stocking

CLASS	PRESENT	FUTURE	REGENERATED
10	BF HIGH COMPETITION - BF Sites Conversion Candidates		
	BF SI X,1,2 REG WG stocking >= 10%	BF Class 10 (SI 1) Primary vol 30% Secondary vol 70% 20 yr advance Stand stocking use Present 10 average	Heavy SIP & Chem Plant B/R sb Tend 2-4-D SB Class 7 (SI 1) Primary vol 60% Secondary vol 40% 20 year advance Stocking -use Class 7 adjust vol to 100% * Pres 10 ave
11	PW PR SHALLOW SITES - for Conversion to PJ		
	PW & PR SI 2 & 3 REG WG stocking >= 10% A N D PW & PR SI X,1,2,3 PFR WG stocking >= 10%	PO-Convert2 (SI 3) Primary vol 30% Secondary vol 70% 0 yr delay Stand stocking use Present 2 adjust vol to 100% * Present 11 average stocking.	Modify cut-shelter Light SIP Tend No PR Class 11 (SI 3) Primary vol 90% Secondary vol 10% 10 yr delay Stand stocking use Present 11 average * 0.9
12	PW PR DEEP SITES - to be maintained in present WG		
	PW PR SI X,1 REG WG stocking >= 10%	Present 2 (SI 3) Primary vol 30% Secondary vol 70% 5 yr delay Stand stocking use Present 2 adjust vol to 100% * Present 11 average stocking.	Light SIP Plant B/R pr Tend No PR Class 12 (SI 1) Primary vol 90% Secondary vol 10% 10 yr delay Stand stocking use Present 12 average stocking * 1.1

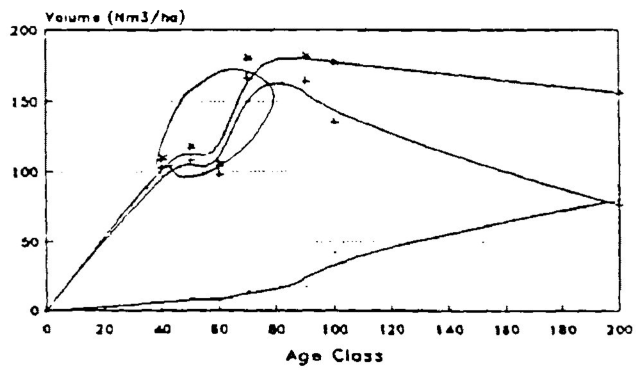
Percentage of Classes Moving To "0" Curves. These represent areas to be harvested once; thereafter they are lost to production.

Class	% of class taken out	Reason	Assign to new class # called
1	2%	Rds & Landings 3	1RDS&LAN
2	2%	"	2RDS&LAN
3	10%	"	3 "
4	12%	"	4 "
5	11%	"	5 "
6	4%	"	6 "
7	4%	"	7 "
8	0%	"	8 NONE
9	4%	"	9 "
10	4%	"	10RDS&LA
11	0%	"	11 NONE
12	0%	"	12 NONE

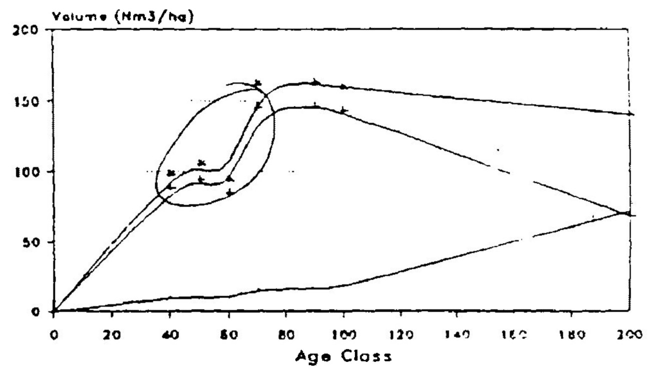
SEINE RIVER FOREST GROWTH CURVES

For CLASS #1-PoLeave

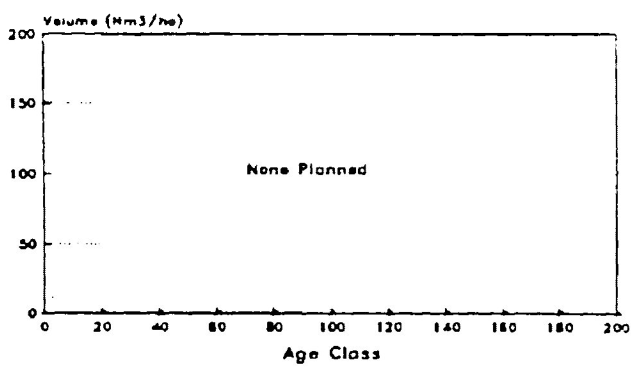
Present Curve

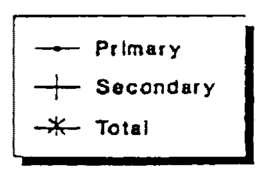


Future Curve



Regenerated Curve





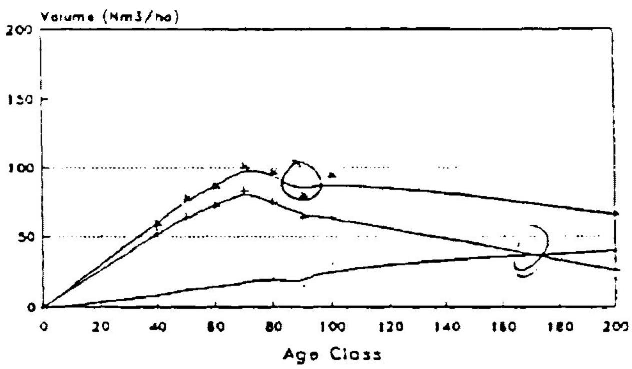
M.U. #340

Updated Nov. 22, 1990

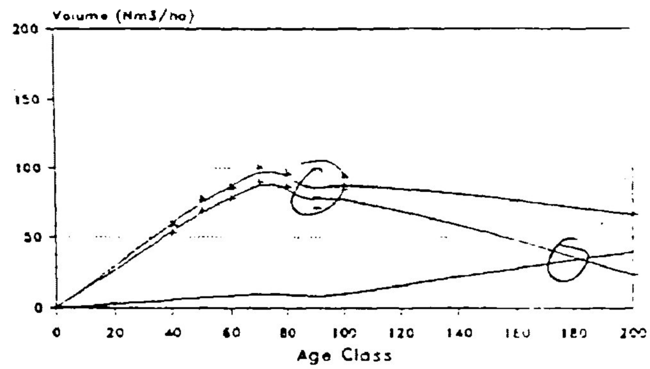
SEINE RIVER FOREST GROWTH CURVES

For CLASS #2-PoConvt

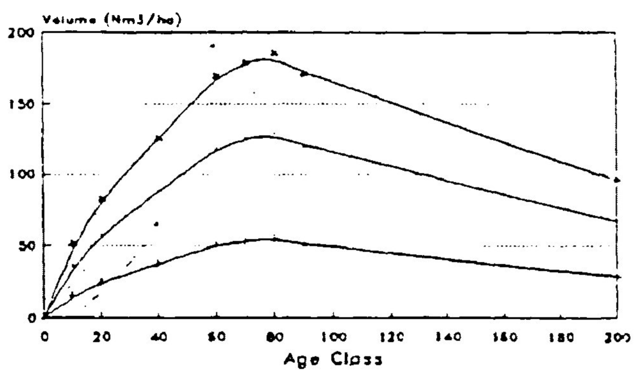
Present Curve

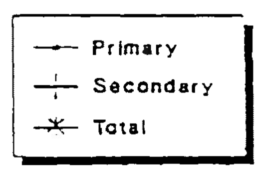


Future Curve



Regenerated Curve





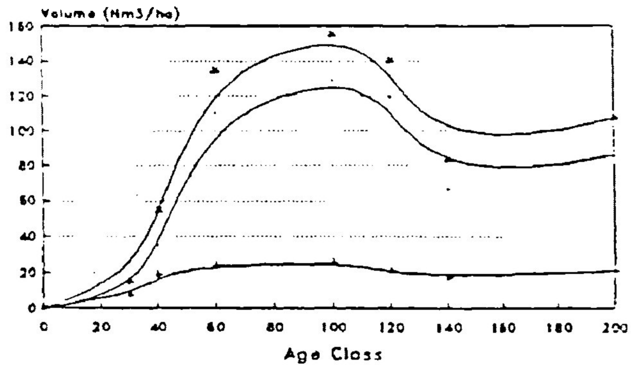
M.U. #340

Updated Nov. 22, 1990

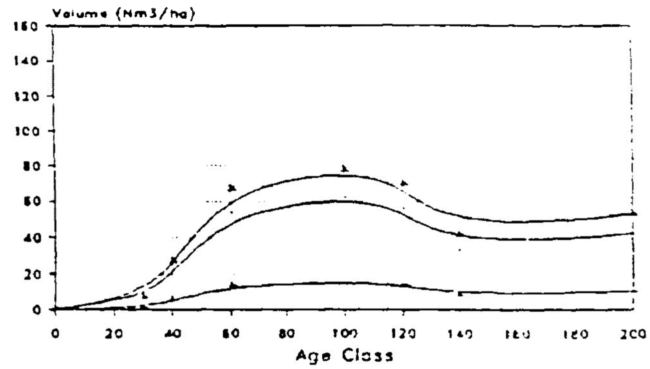
SEINE RIVER FOREST GROWTH CURVES

For CLASS #3-PiSbSh

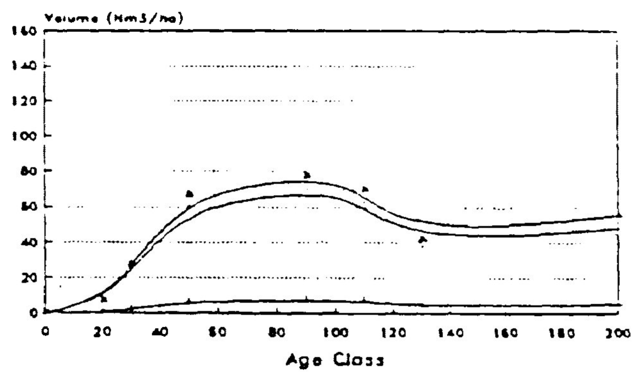
Present Curve

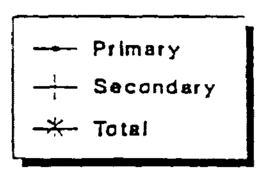


Future Curve



Regenerated Curve





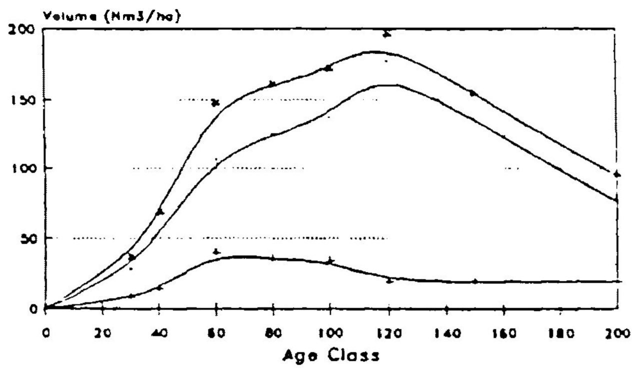
M.U. #340

Updated Nov. 22, 1990

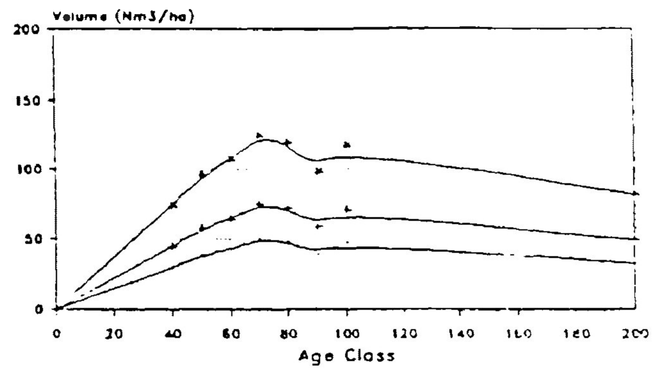
SEINE RIVER FOREST GROWTH CURVES

For CLASS #5-PjHiCom

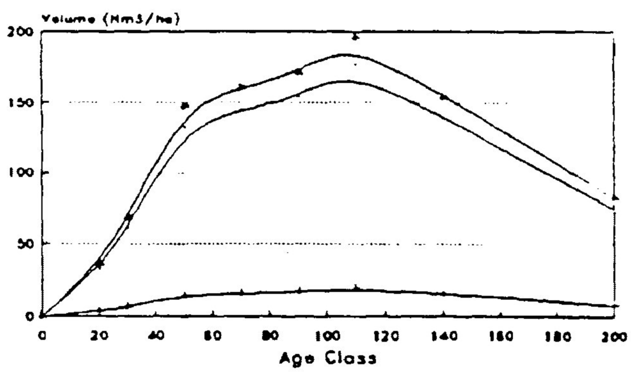
Present Curve

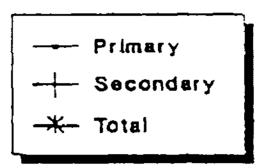


Future Curve



Regenerated Curve



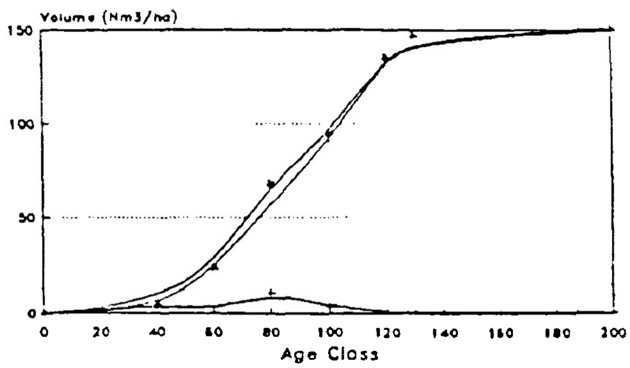


M.U. #340

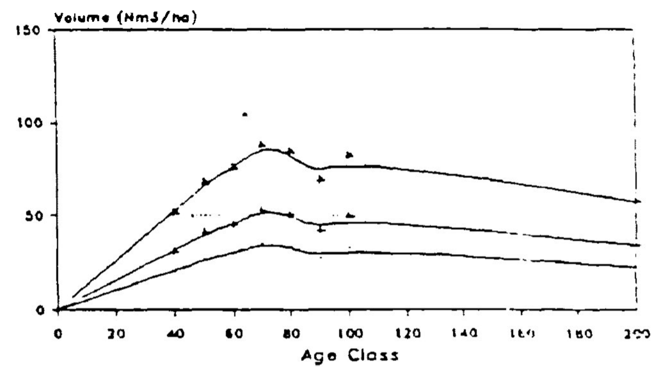
Updated Nov. 22, 1990

SEINE RIVER FOREST GROWTH CURVES *For CLASS #6–SbMoCom*

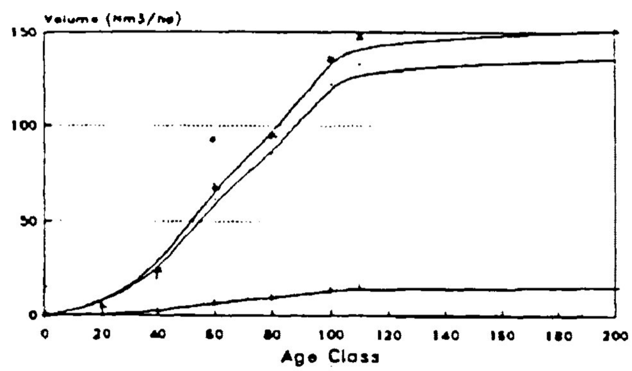
Present Curve

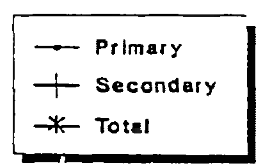


Future Curve



Regenerated Curve



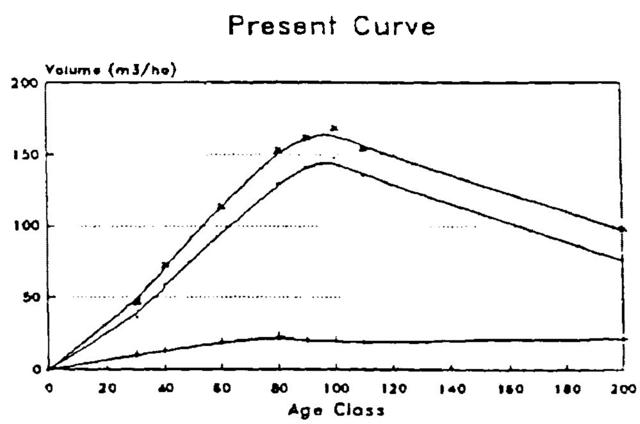


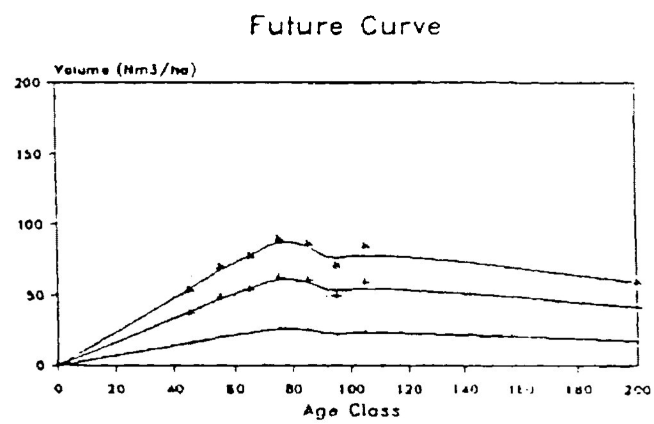
M.U. #340

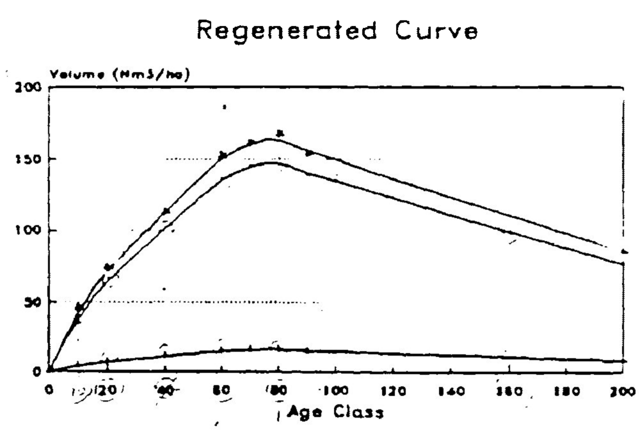
Updated Nov. 22, 1990

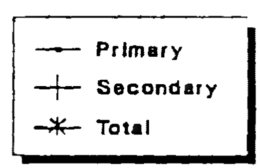
SEINE RIVER FOREST GROWTH CURVES

For CLASS #7-SbHiCom









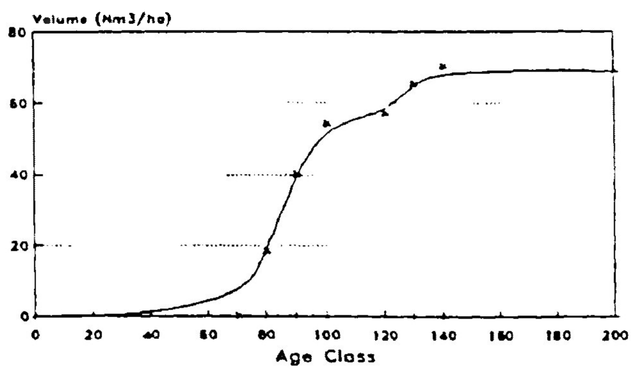
M.U. #340

Updated Nov. 22, 1990

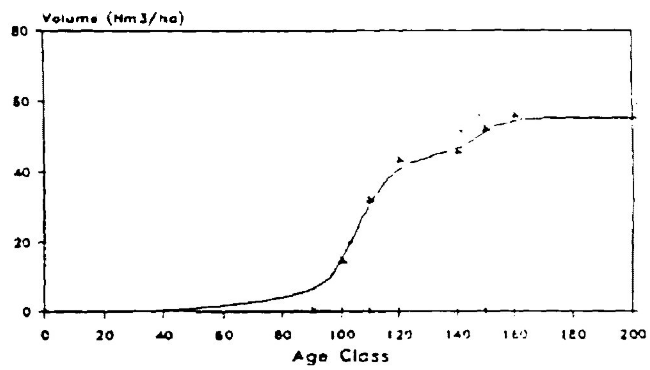
SEINE RIVER FOREST GROWTH CURVES

For CLASS #8-SbWet

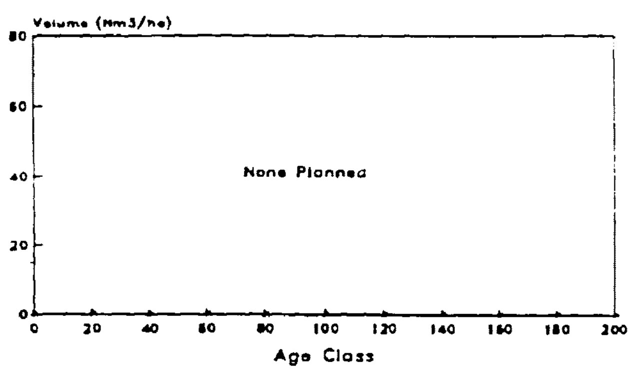
Present Curve

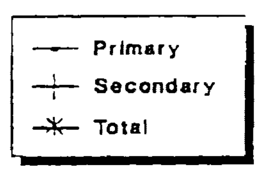


Future Curve



Regenerated Curve





M.U. #340

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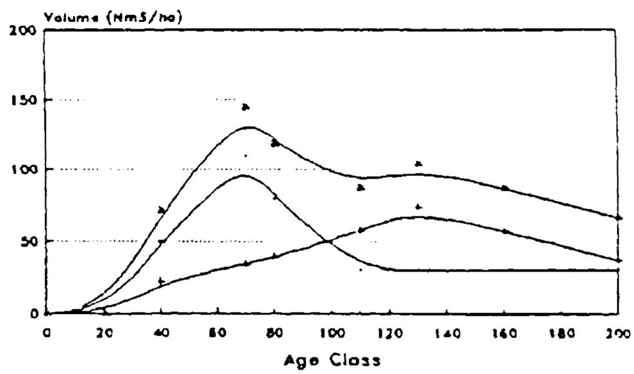
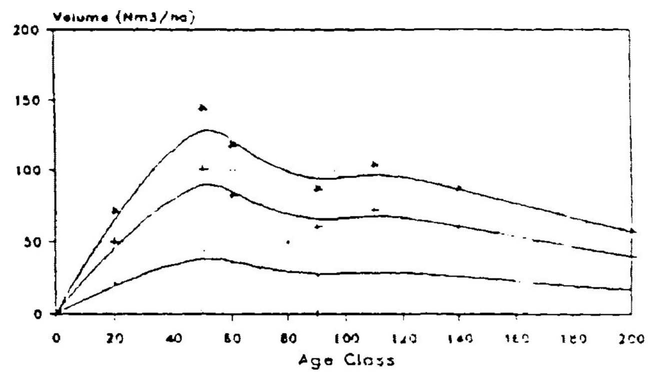
SEINE RIVER FOREST GROWTH CURVES — *For CLASS #10–BfHCom*

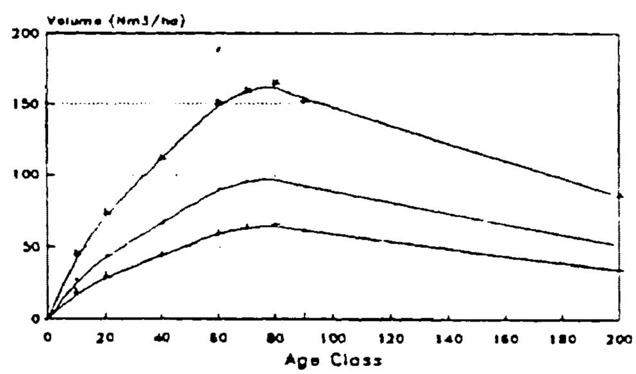
Present Curve



Future Curve



Regenerated Curve



—•— Primary
—+— Secondary
—✳— Total

M.U. #340

Updated Nov. 23, 1990

APPENDIX VIII

JACK PINE AND BLACK SPRUCE YIELD CURVES FROM SPACING TRIALS

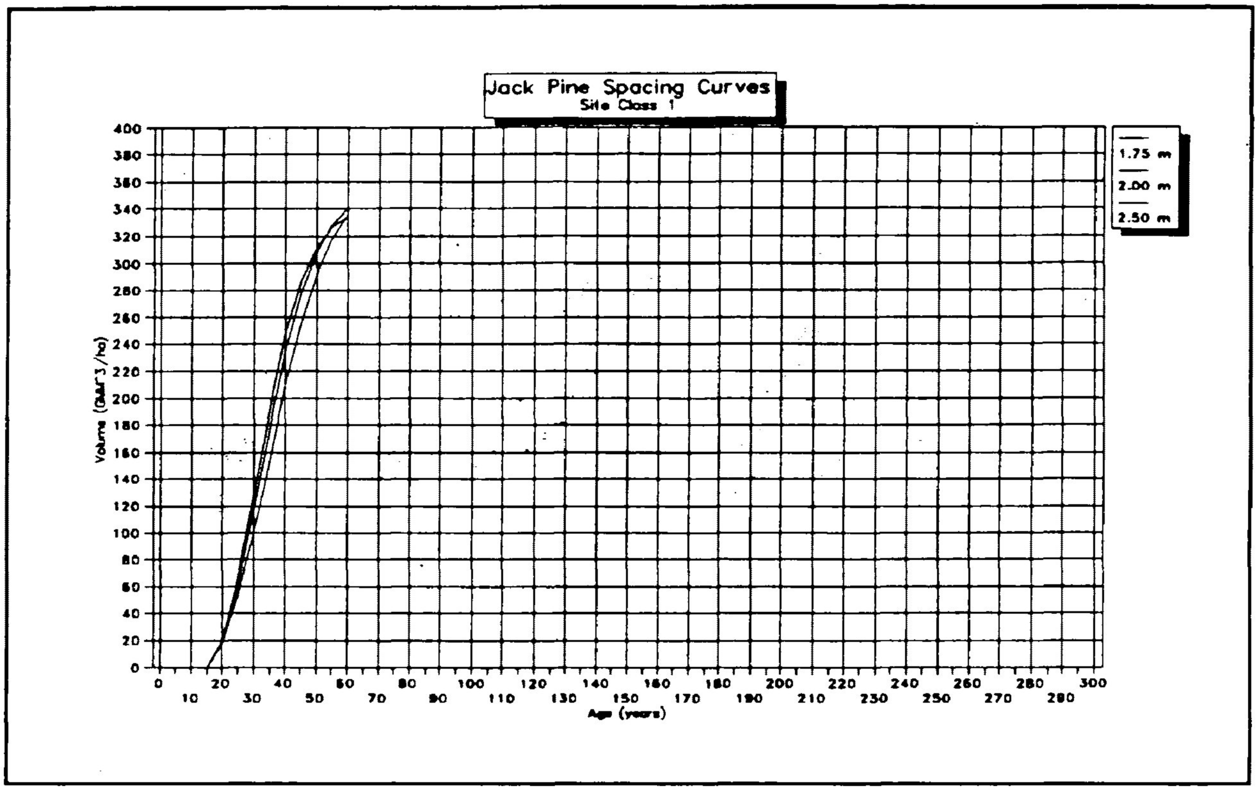


Figure 1. The results from regression analysis of jack pine spacing trials on site class X+1 (Bell et. al., 1990).

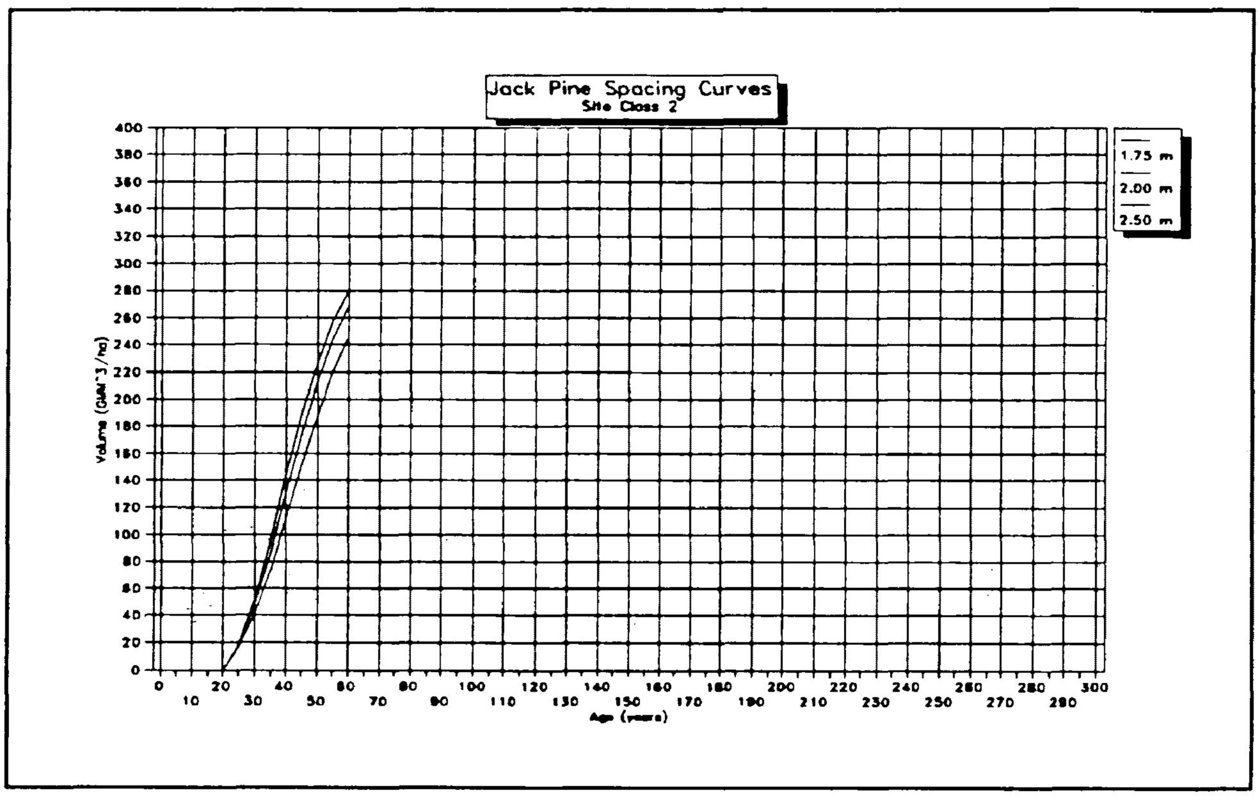


Figure 2. The results from regression analysis of jack pine spacing trials on site class 2 sites (Bell et. al., 1990).

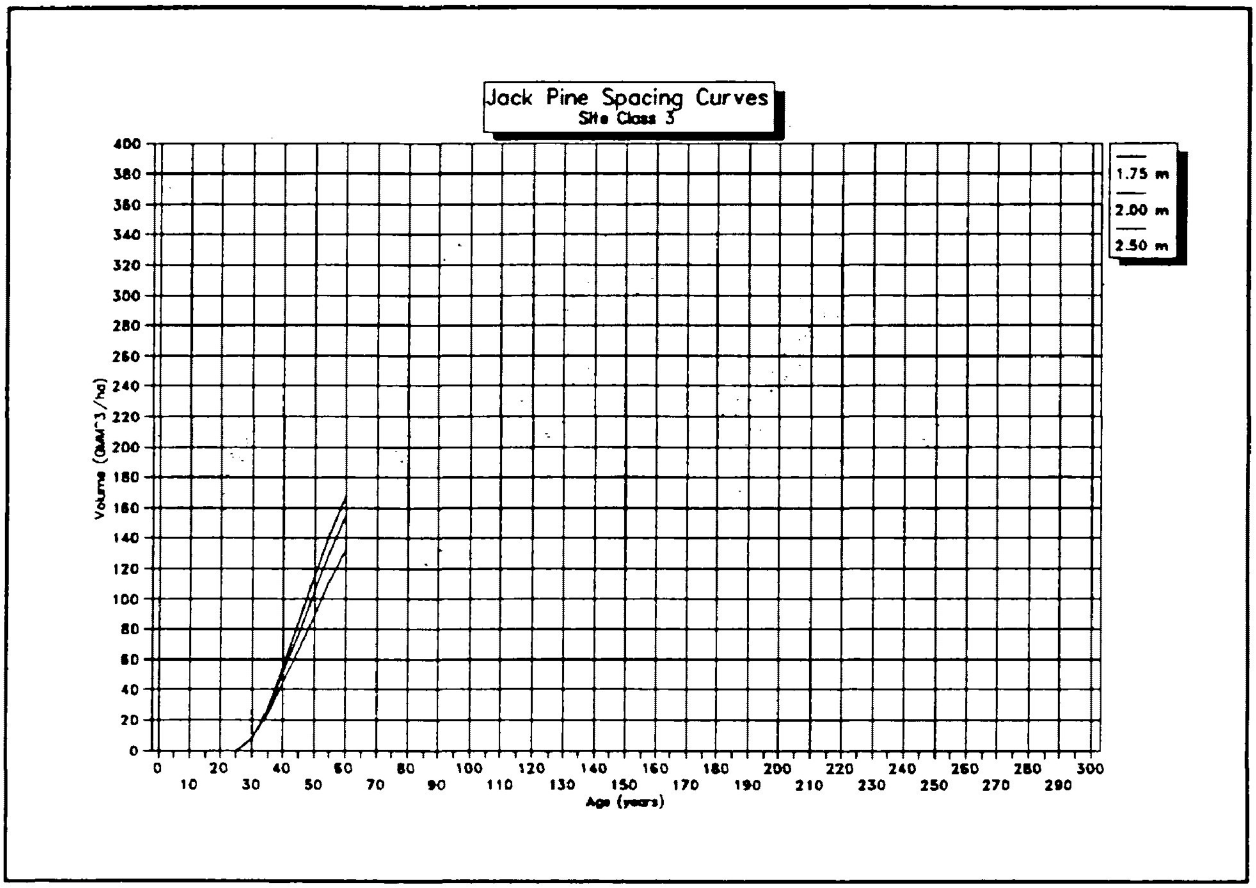


Figure 3. The results from regression analysis of jack pine spacing trials on site class 3 sites (Bell et. al., 1990).

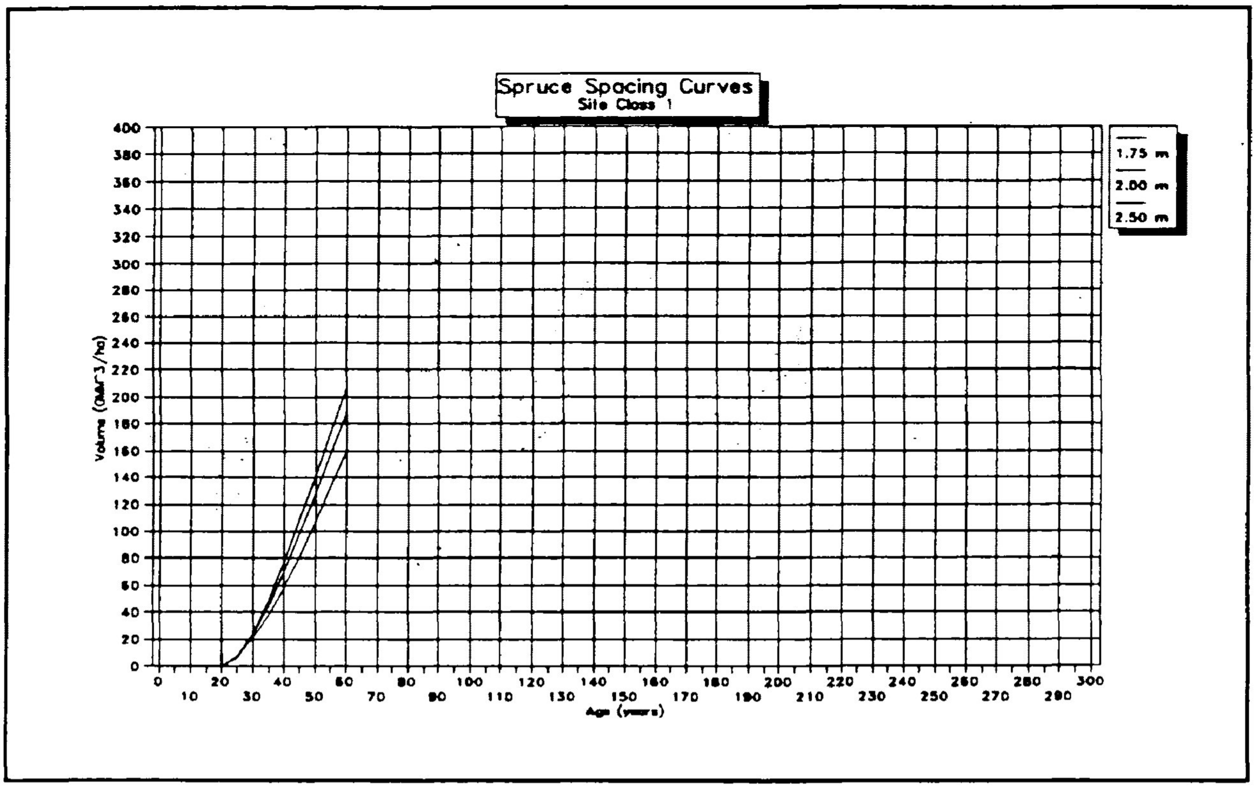


Figure 4. The results from regression analysis of black spruce spacing trials on site class X+1 (Bell et. al., 1990).

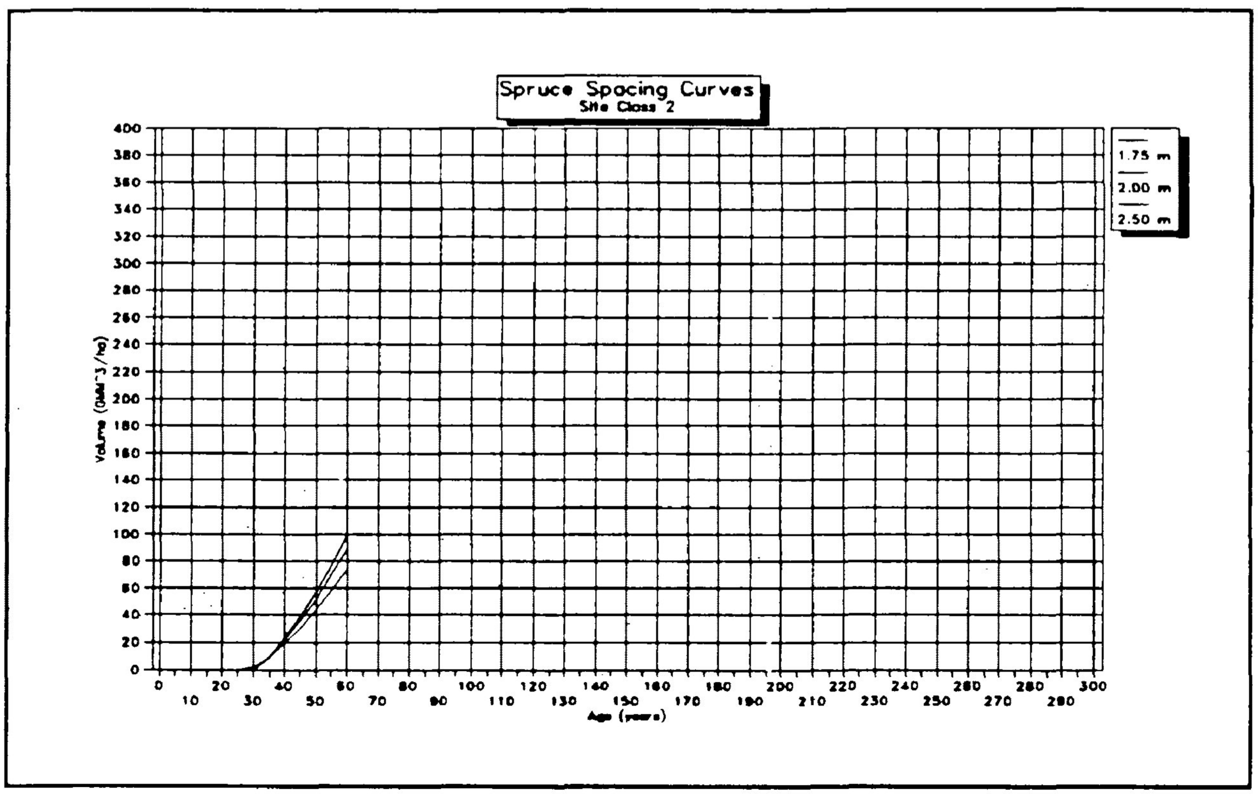


Figure 5. The results from regression analysis of black spruce spacing trials on site class 2 sites (Bell et. al., 1990).

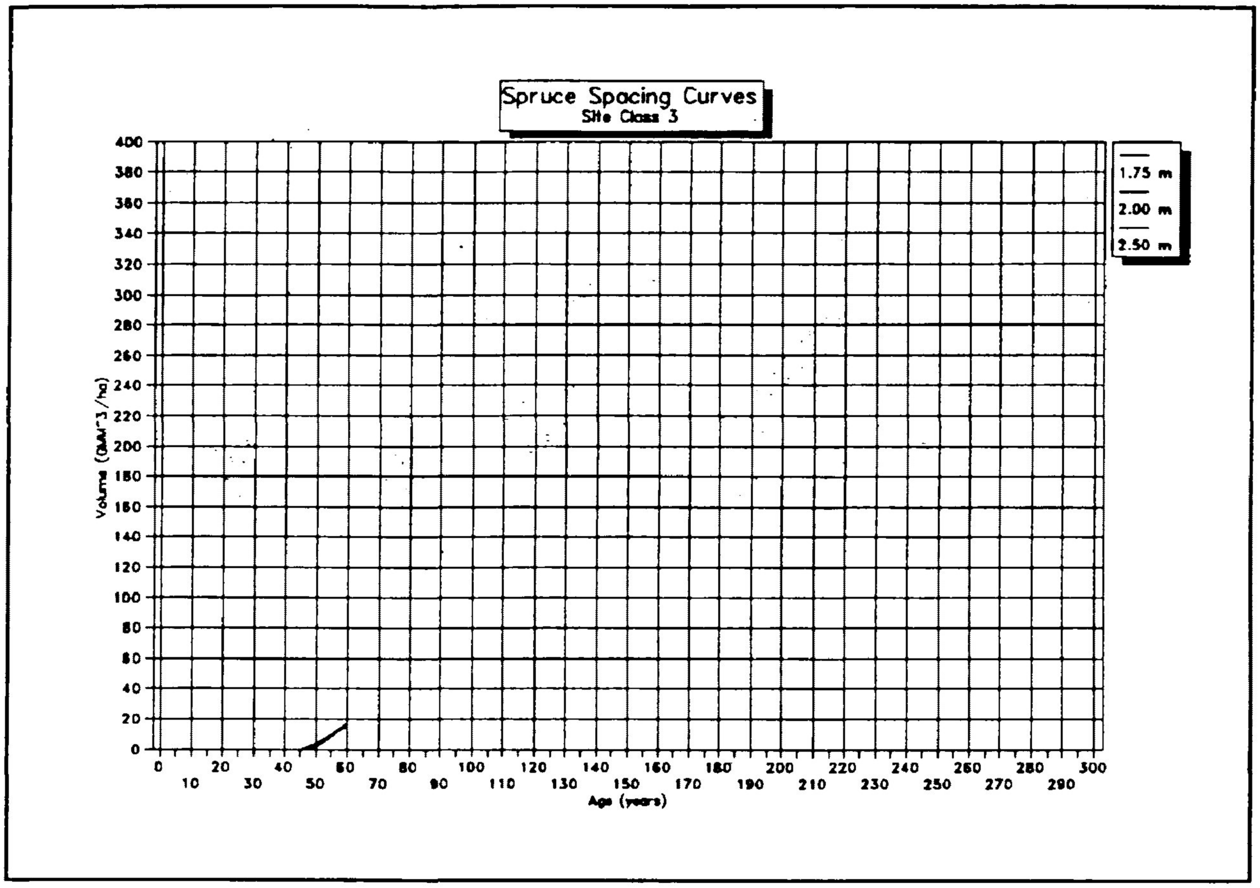


Figure 6. The results from regression analysis of black spruce spacing trials on site class 3 sites (Bell et. al., 1990).

APPENDIX IX

VOLUME DEVELOPMENT PATTERNS USED FOR THE BUSINESS-AS-USUAL MANAGEMENT SCENARIO

PRESENT YIELD CURVE AND OPERABILITY LIMIT SUMMARY FOR THE BAU SCENARIO

Aggregate		Site	Yield	Oper. Limits	
Group	No.	Class	Curve	First (NMM^3/YRS)	Last (NMM^3/YRS)
Pj-1	1	X+1	5	140/55	99/140
	2	2	7	135/55	90/140
	3	3	9	120/60	75/140
Pj-2	4	X+1	11	150/90	140/145
	5	2	13	120/80	80/190
	6	3	15	90/80	80/150
Pj-3	7	X+1	5	140/55	99/140
	8	2	7	135/55	90/140
	9	3	17	50/90	45/145
Sp-1	10	X+1	19	100/105	99/--
	11	2	21	100/110	99/--
	12	3	17	50/90	45/145
Sp-2	13	X+1	19	100/105	99/--
	14	2	21	100/110	99/--
	15	3	23	60/125	59/--
Sp-3	16	X+1	25	120/80	119/--
	17	2	27	120/85	119/--
Sp-4	18	X+1	25	120/80	119/--
	19	2	27	120/85	119/--
Sp-Bf	20	X+1	1	80/55	40/105
	21	2	3	80/60	40/100
Po-1	22	2	29	52/40	51/160
	23	3	29	52/40	51/160
Po-2	24	X+1	31	103/40	102/155
	25	2	33	93/40	92/150
	26	3	35	77/40	76/160
Po-3	27	2	33	93/40	92/150
	28	3	35	77/40	76/160
Po-4	29	2	37	52/40	51/--
	30	3	39	47/40	46/--

FUTURE YIELD CURVE AND OPERABILITY LIMIT SUMMARY FOR THE BAU SCENARIO

Aggregate		Site	Yield	Oper. Limits	
Group	No.	Class	Curve	First (NMM^3/YRS)	Last (NMM^3/YRS)
Pj-1	1	X+1	6	70/55	60/110
	2	2	8	60/55	50/110
	3	3	10	50/45	40/115
Pj-2	4	X+1	12	40/55	30/--
	5	2	14	40/60	30/200
	6	3	16	40/45	35/--
Pj-3	7	X+1	6	70/55	60/110
	8	2	8	60/55	50/110
	9	3	18	25/90	20/160
Sp-1	10	X+1	20	35/70	30/--
	11	2	22	30/70	20/--
	12	3	18	25/90	20/160
Sp-2	13	X+1	20	35/70	30/--
	14	2	22	30/70	20/--
	15	3	24	50/145	49/--
Sp-3	16	X+1	26	15/80	14/--
	17	2	28	14/80	13/--
Sp-4	18	X+1	26	15/80	14/--
	19	2	28	14/80	13/--
Sp-Bf	20	X+1	2	30/35	29/120
	21	2	4	30/35	29/80
Po-1	22	2	30	45/40	44/170
	23	3	30	45/40	44/170
Po-2	24	X+1	32	88/40	87/170
	25	2	34	79/40	78/170
	26	3	36	66/40	65/170
Po-3	27	2	34	79/40	78/170
	28	3	36	66/40	65/170
Po-4	29	2	62	53/40	52/160
	30	3	63	48/40	47/160

REGENERATION YIELD CURVE AND OPERABILITY LIMIT SUMMAR FOR THE BAU SCENARIO

Aggregate		Site	Yield	Oper. Limits	
Group	No.	Class	Curve	First (NMM^3/YRS)	Last (NMM^3/YRS)
Pj-1	1	X+1	43	150/50	140/120
	2	2	44	140/50	120/130
	3	3	45	120/50	100/130
Pj-2	4	X+1	46	120/60	100/190
	5	2	47	120/60	100/190
	6	3	48	50/80	40/160
Pj-3	7	X+1	49	150/50	140/120
	8	2	50	140/50	120/130
	9	3	51	30/--	29/--
Sp-1	10	X+1	52	120/70	119/--
	11	2	53	120/75	119/--
	12	3	54	30/--	29/--
Sp-2	13	X+1	55	120/70	119/--
	14	2	56	120/75	119/--
	15	3	57	50/145	49/--
Sp-3	16	X+1	58	100/70	99/--
	17	2	59	100/70	99/--
Sp-4	18	X+1	60	100/70	99/--
	19	2	61	100/70	99/--
Sp-Bf	20	X+1	41	100/70	99/--
	21	2	42	100/70	99/--
Po-1	22	2	30	60/60	59/130
	23	3	30	60/60	59/130
Po-2	24	X+1	32	88/40	87/170
	25	2	34	79/40	78/170
	26	3	36	66/40	65/170
Po-3	27	2	34	79/40	78/170
	28	3	36	66/40	65/170
Po-4	29	2	62	100/45	90/135
	30	3	63	100/55	90/110

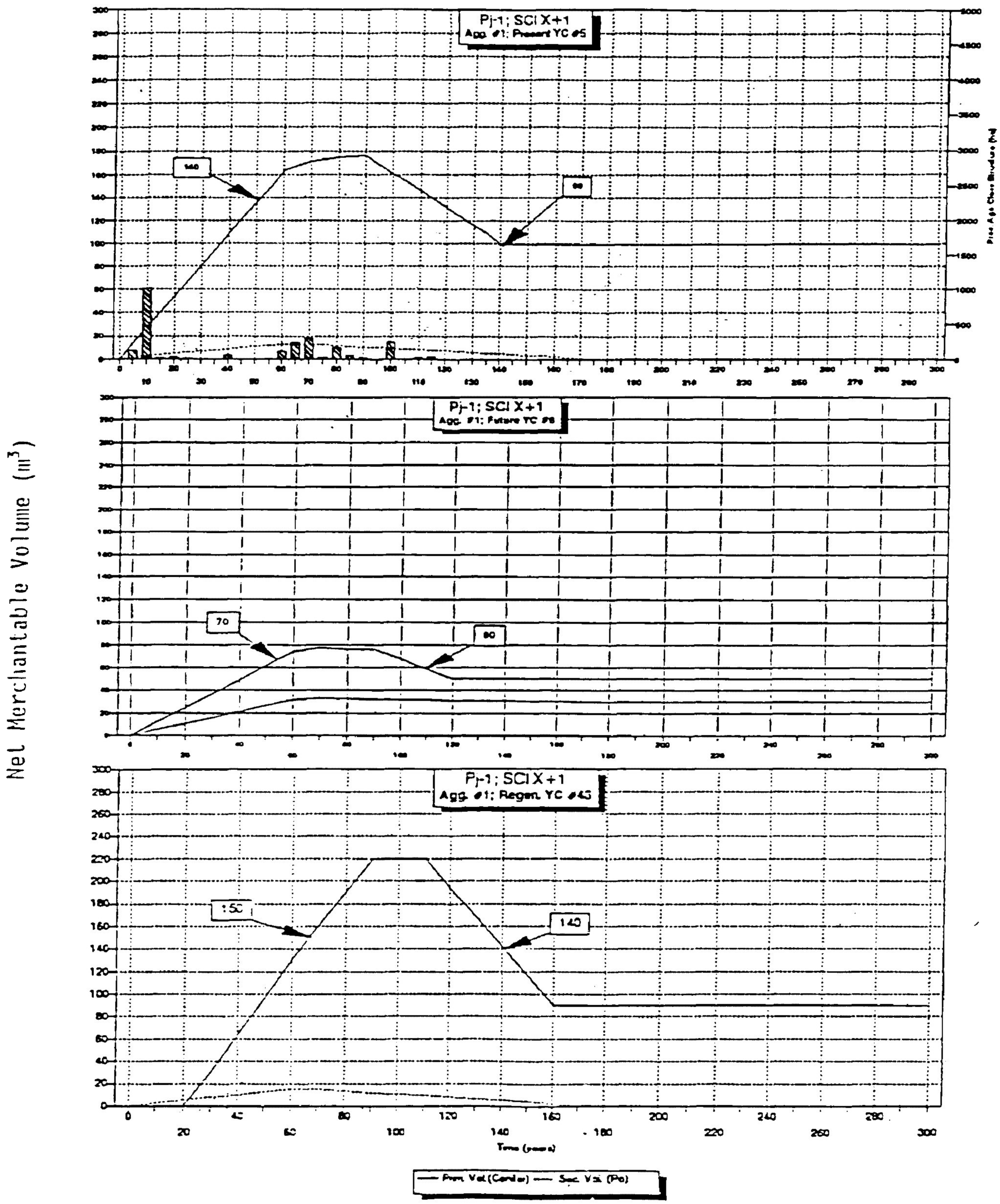


Figure 1.a) The present, future and regeneration curves for aggregate number 1 (Pj-1; SCl X+1).
Note: numbers in boxes represent the operable net merchantable volume limits.

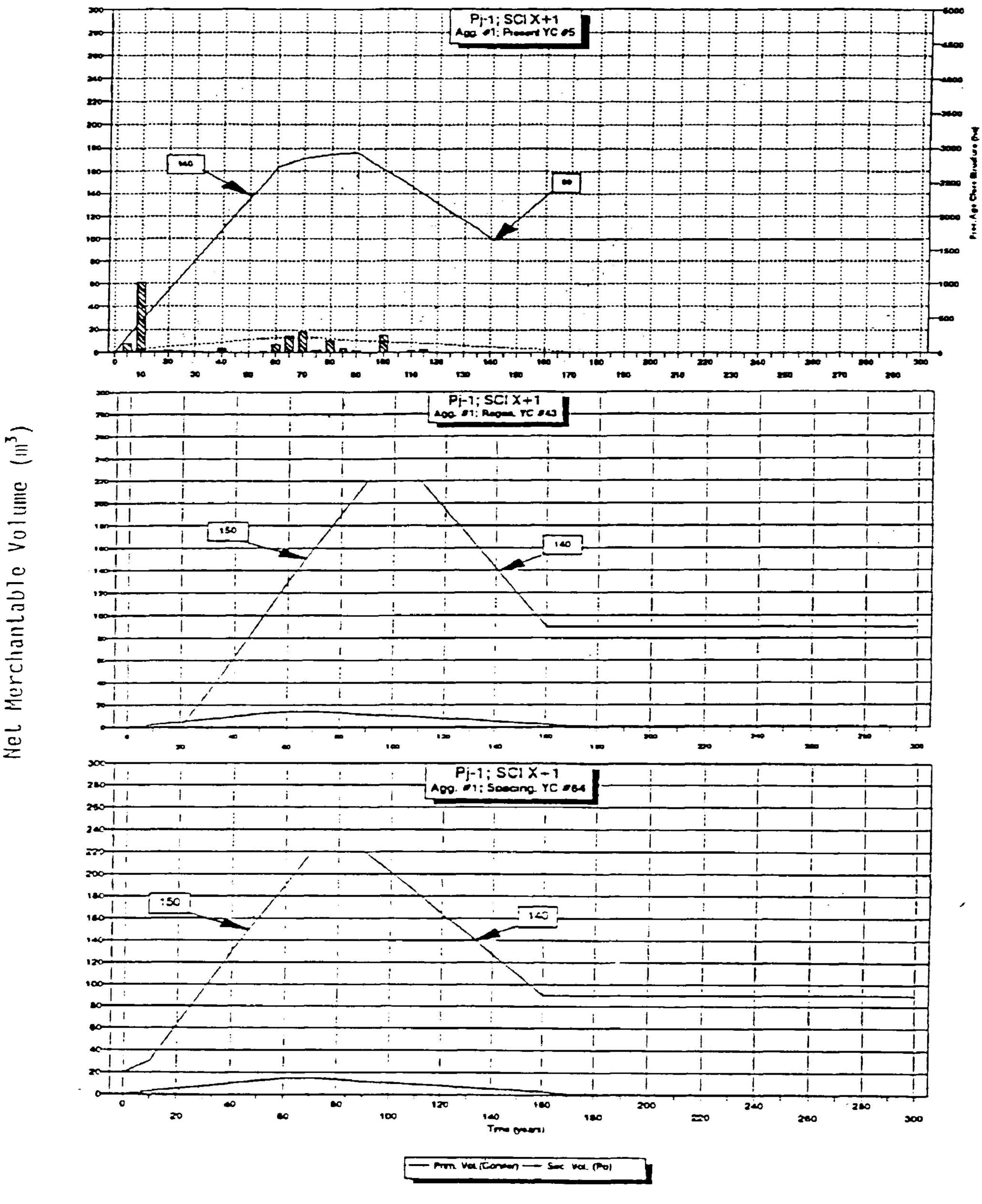


Figure 1.b) The present, regeneration and spacing yield curves for aggregate number 1 (Pj-1; SCI X+1).
Note: numbers in boxes represent the operable net merchantable volume limits.

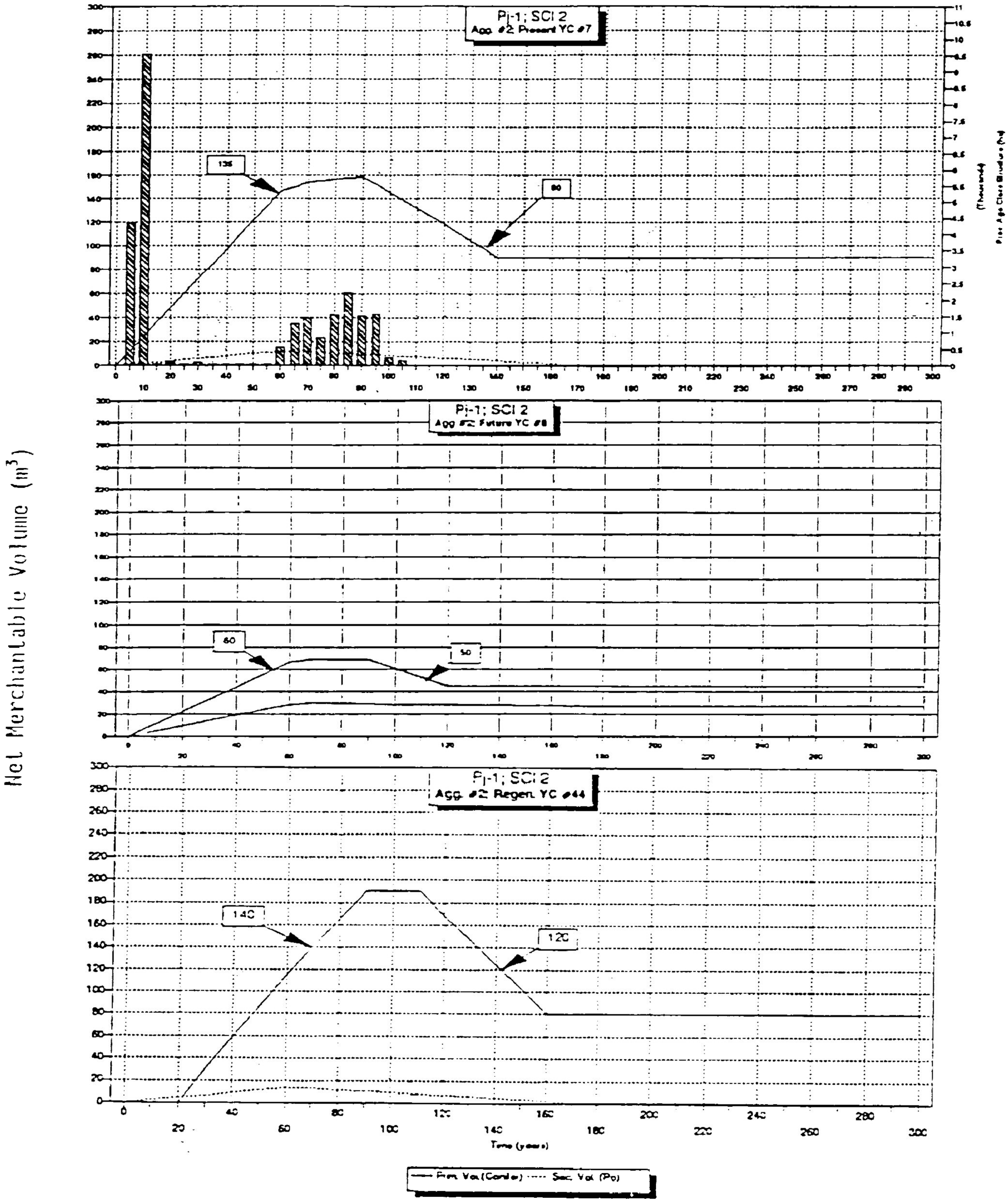


Figure 2.a) The present, future and regeneration curves for aggregate number 2 (Pj-1: SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

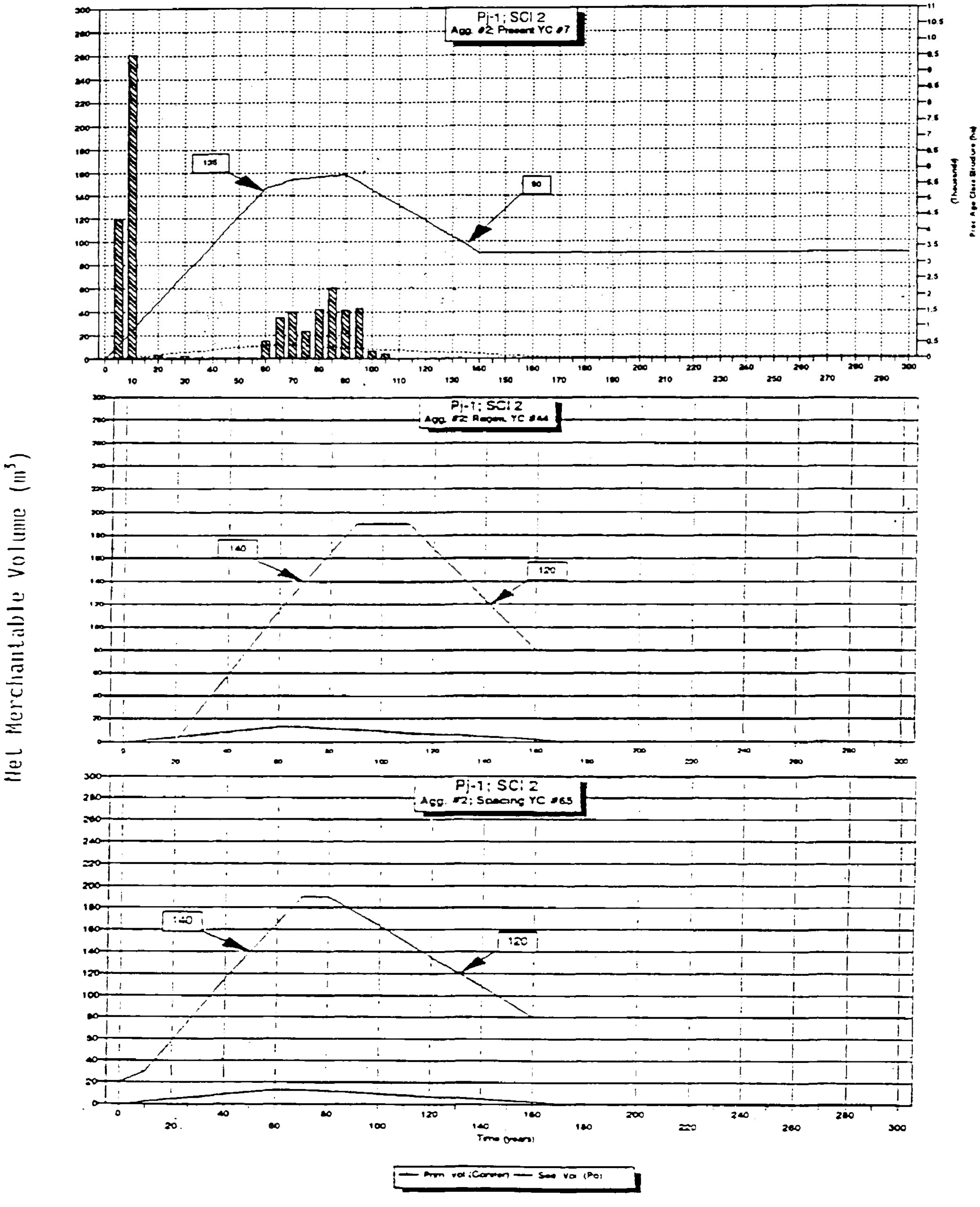


Figure 2.b) The present, regeneration and spacing yield curves for aggregate number 2 (Pj-1; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

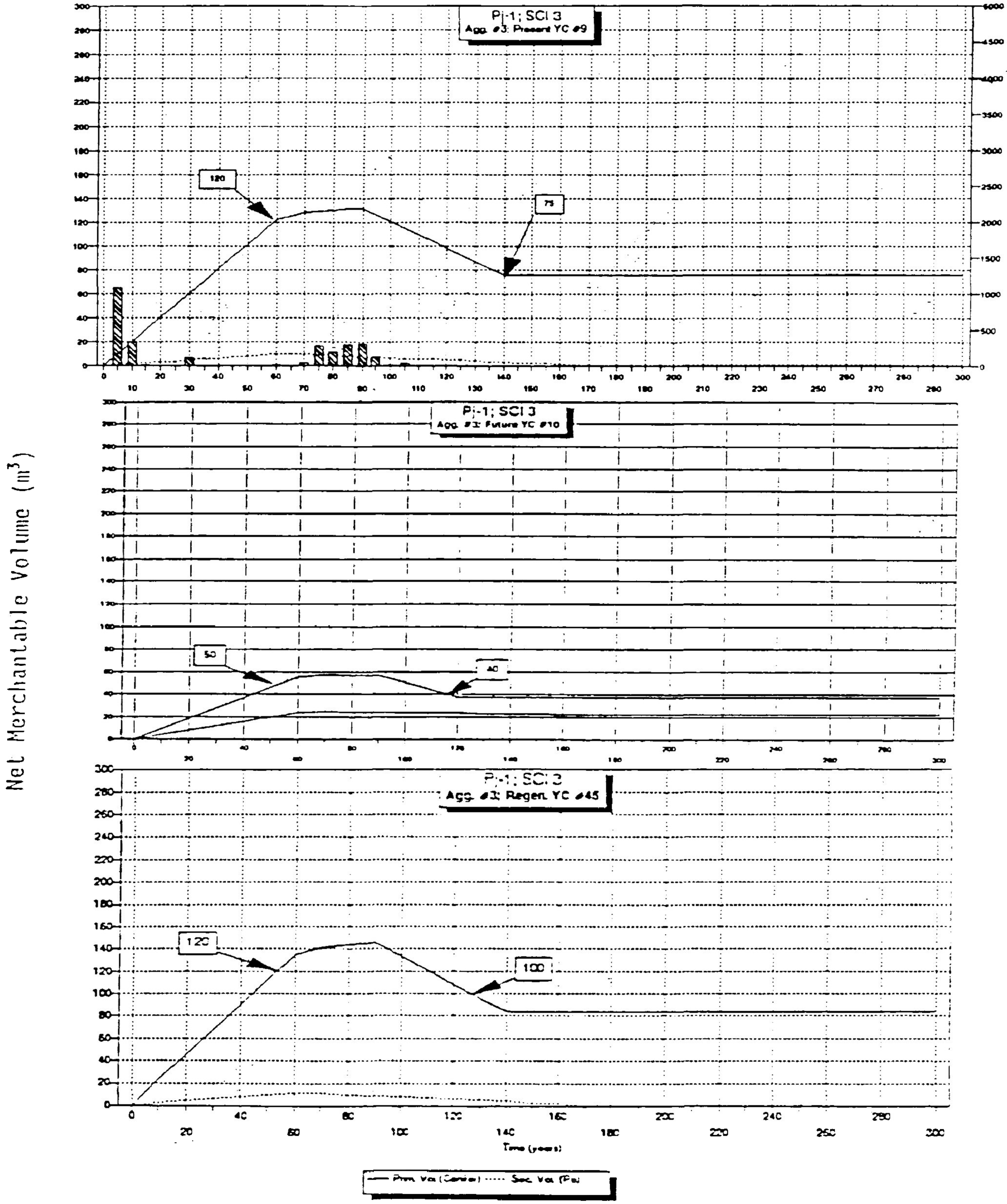


Figure 3.a) The present, future and regeneration curves for aggregate number 3 (Pj-1; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

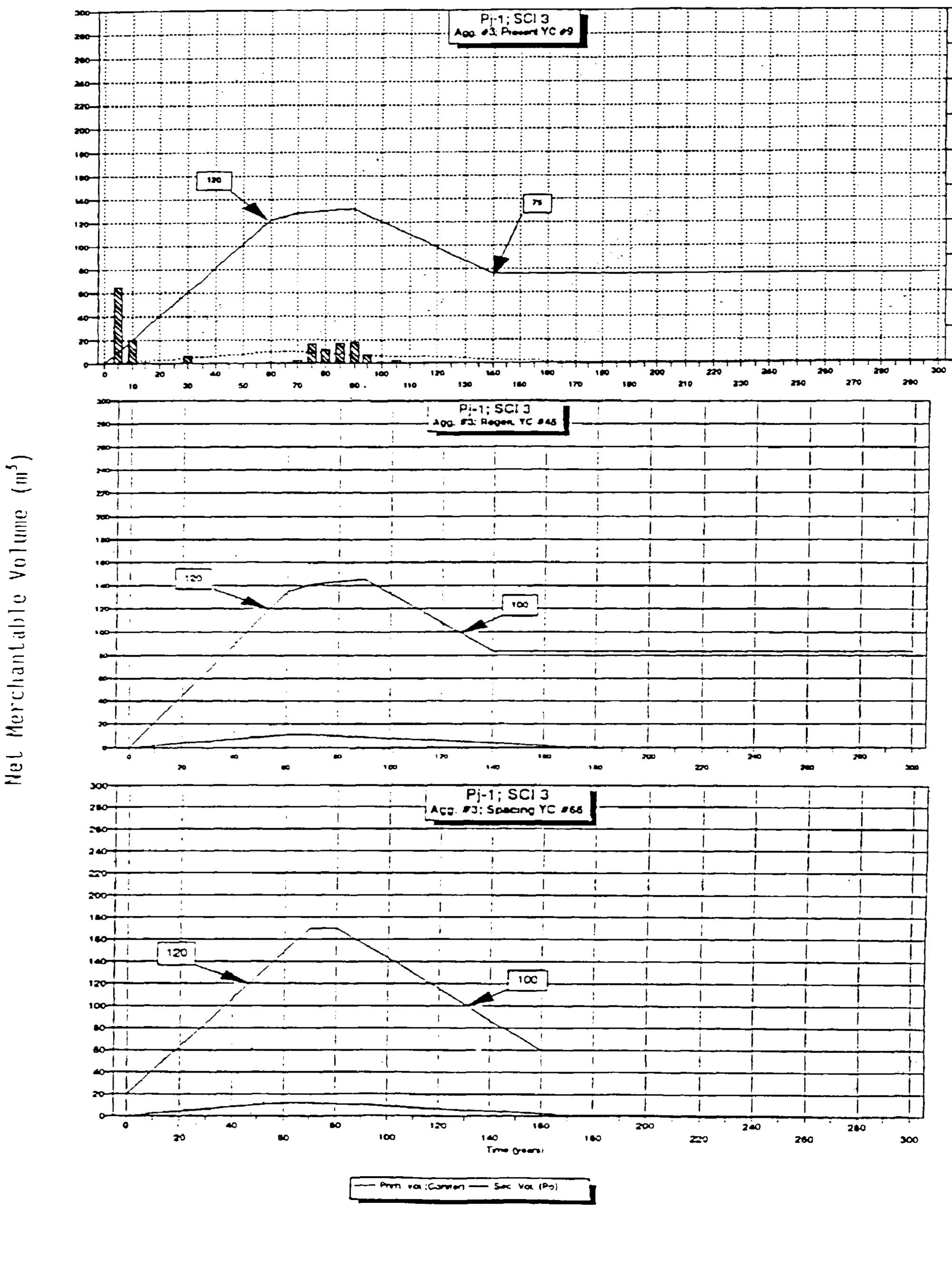


Figure 3.b) The present, regeneration and spacing yield curves for aggregate number 3 (Pj-1; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

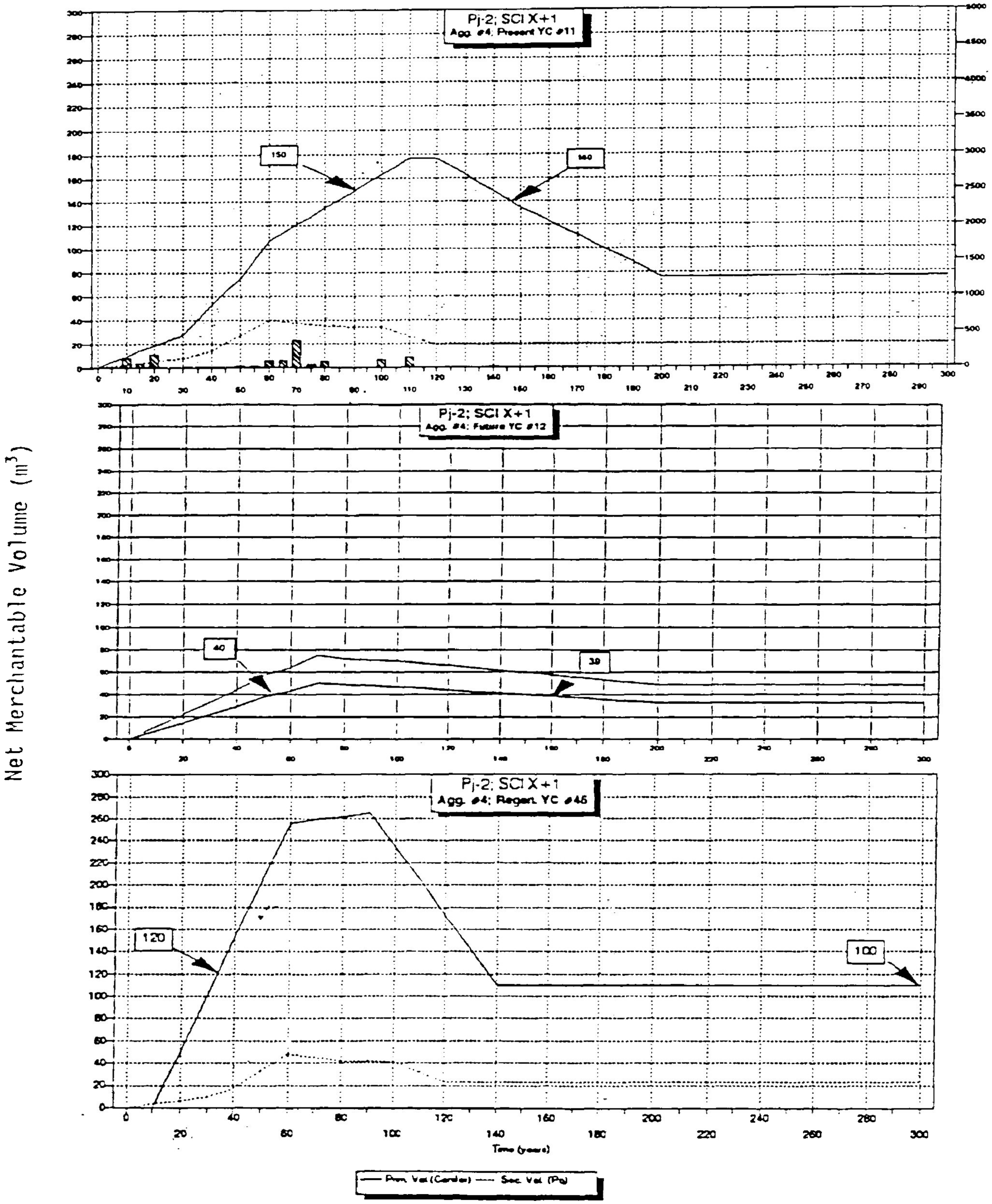


Figure 4. The present, future and regeneration curves for aggregate number 4 (Pj-2; SCI X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

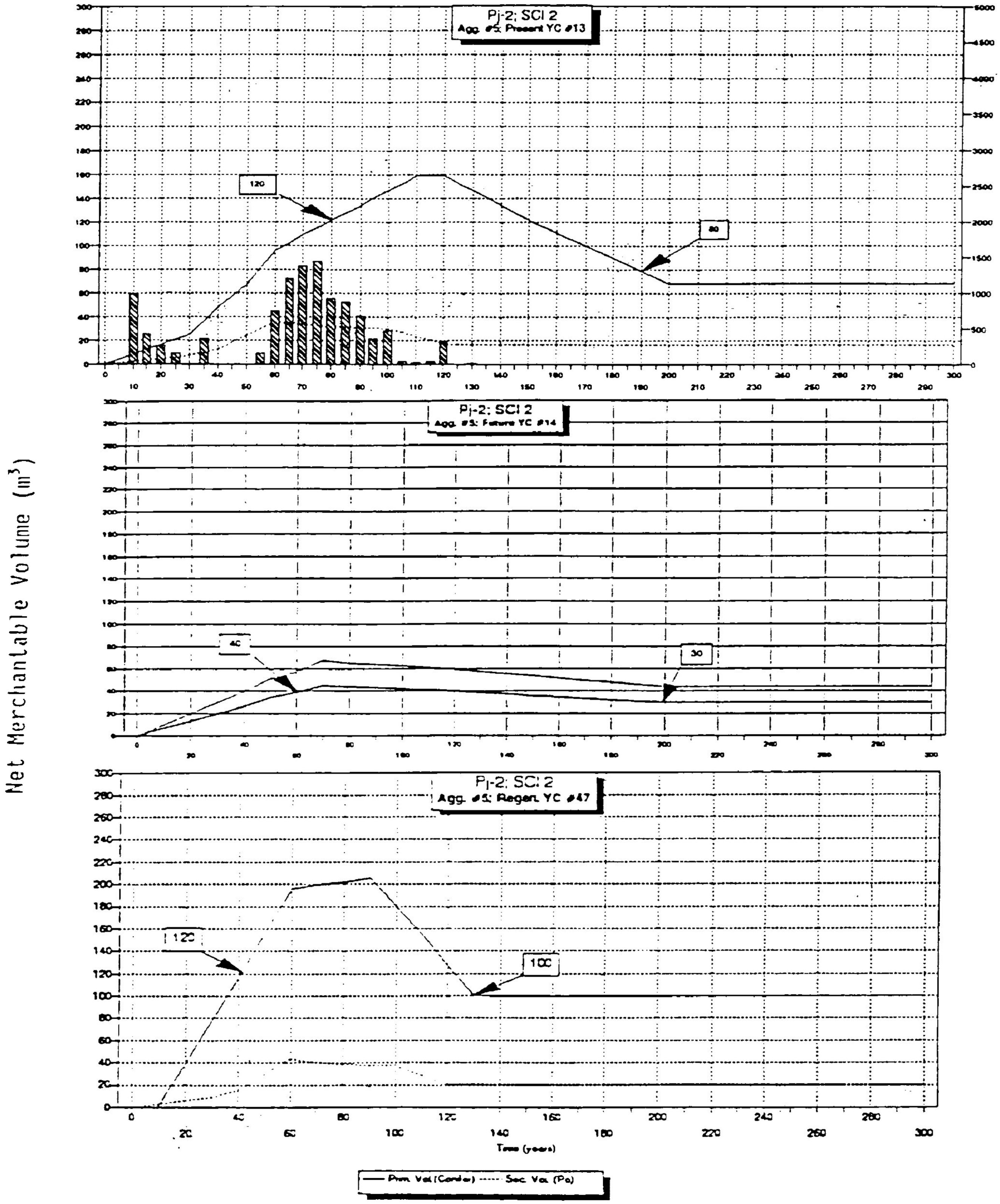


Figure 5. The present, future and regeneration curves for aggregate number 5 (Pj-2; SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

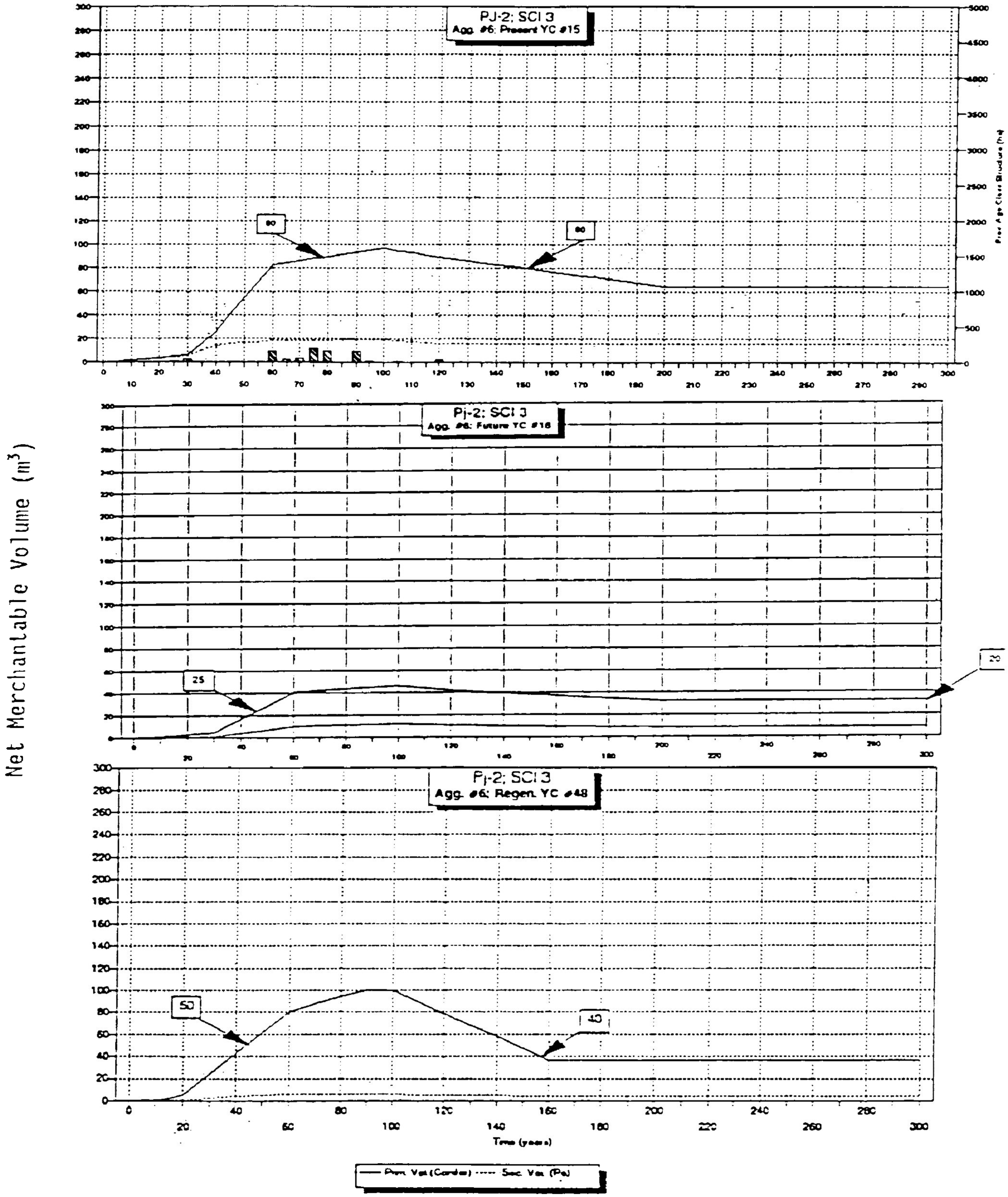


Figure 6.a) The present, future and regeneration curves for aggregate number 6 (Pj-2: SCI 3). Note: numbers in boxes represent the operable net merchantable volume limits.

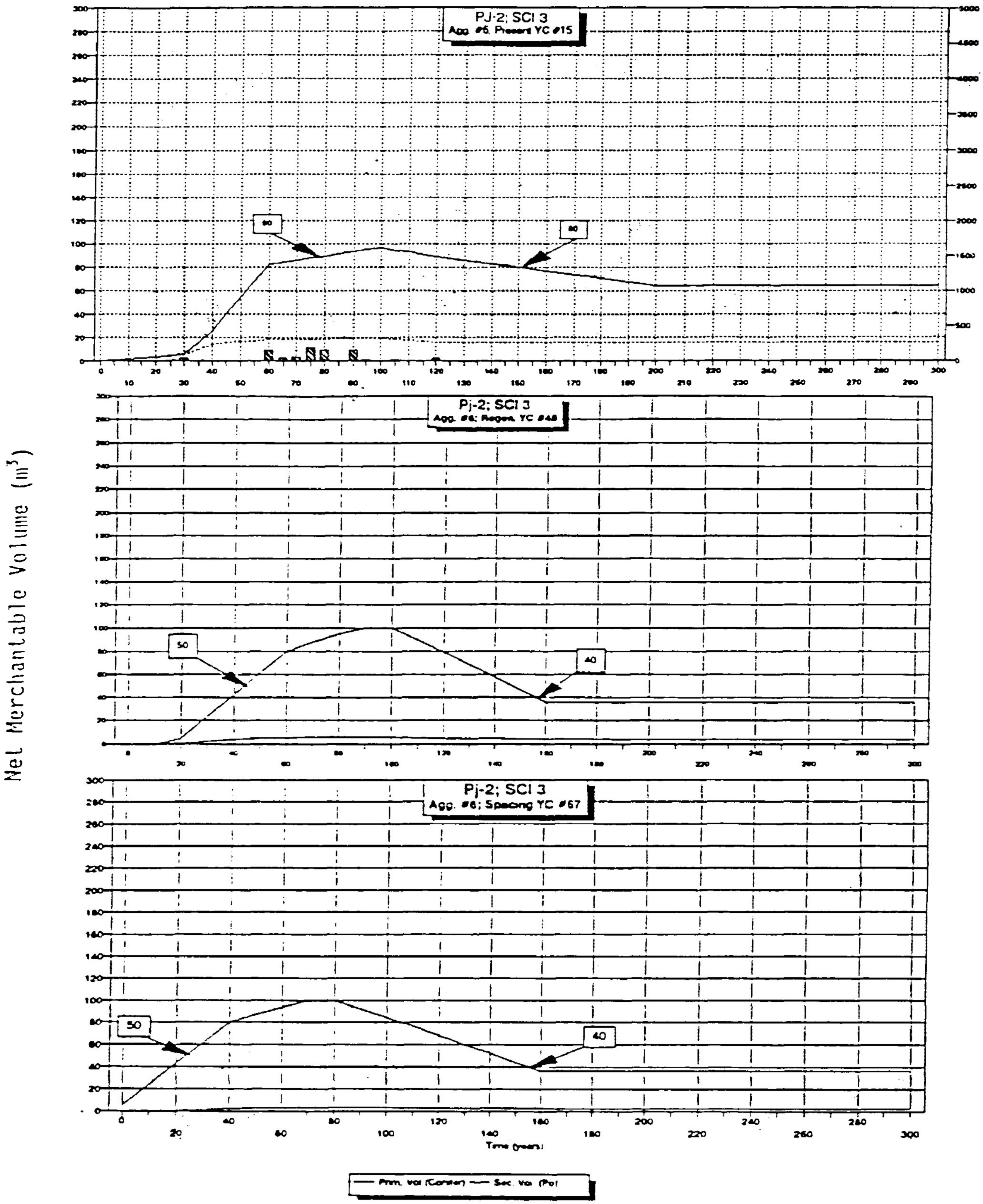


Figure 6.b) The present, regeneration and spacing yield curves for aggregate number 6 (Pj-2: SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

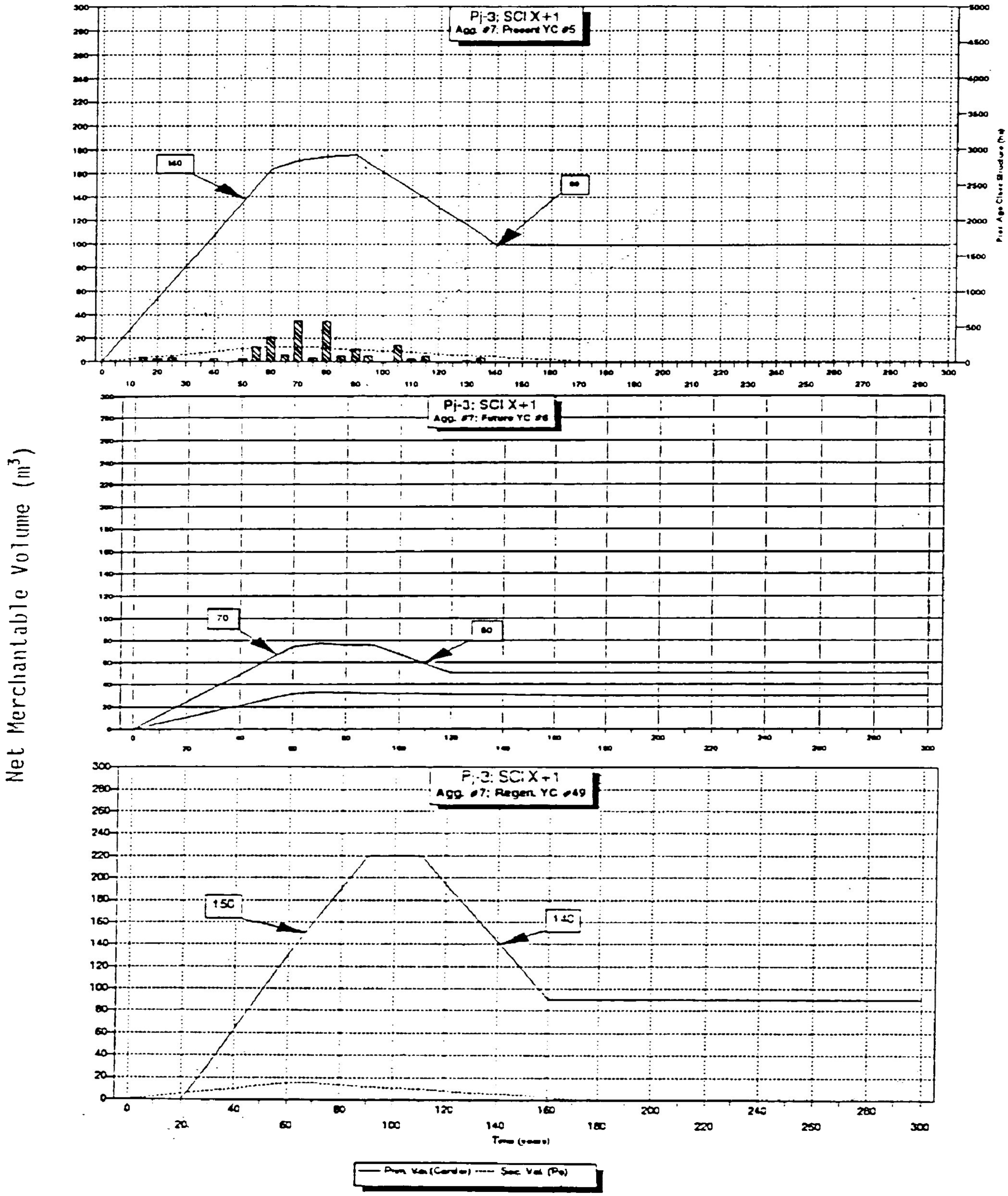


Figure 7.a) The present, future and regeneration curves for aggregate number 7 (Pj-3; SCl X+1).
Note: numbers in boxes represent the operable net merchantable volume limits.

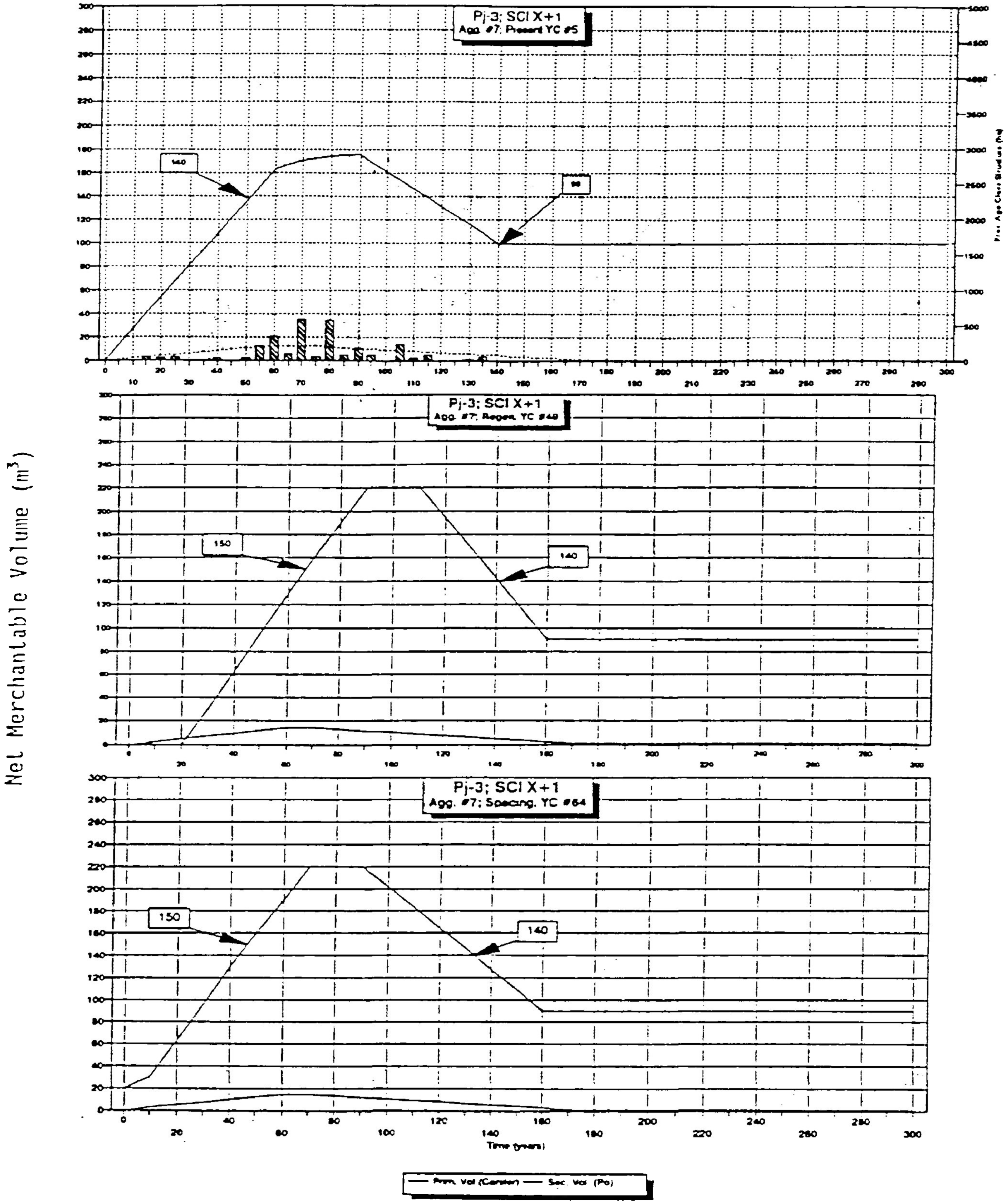


Figure 7.b) The present, regeneration and spacing yield curves for aggregate number 7 (Pj-3; SCl X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

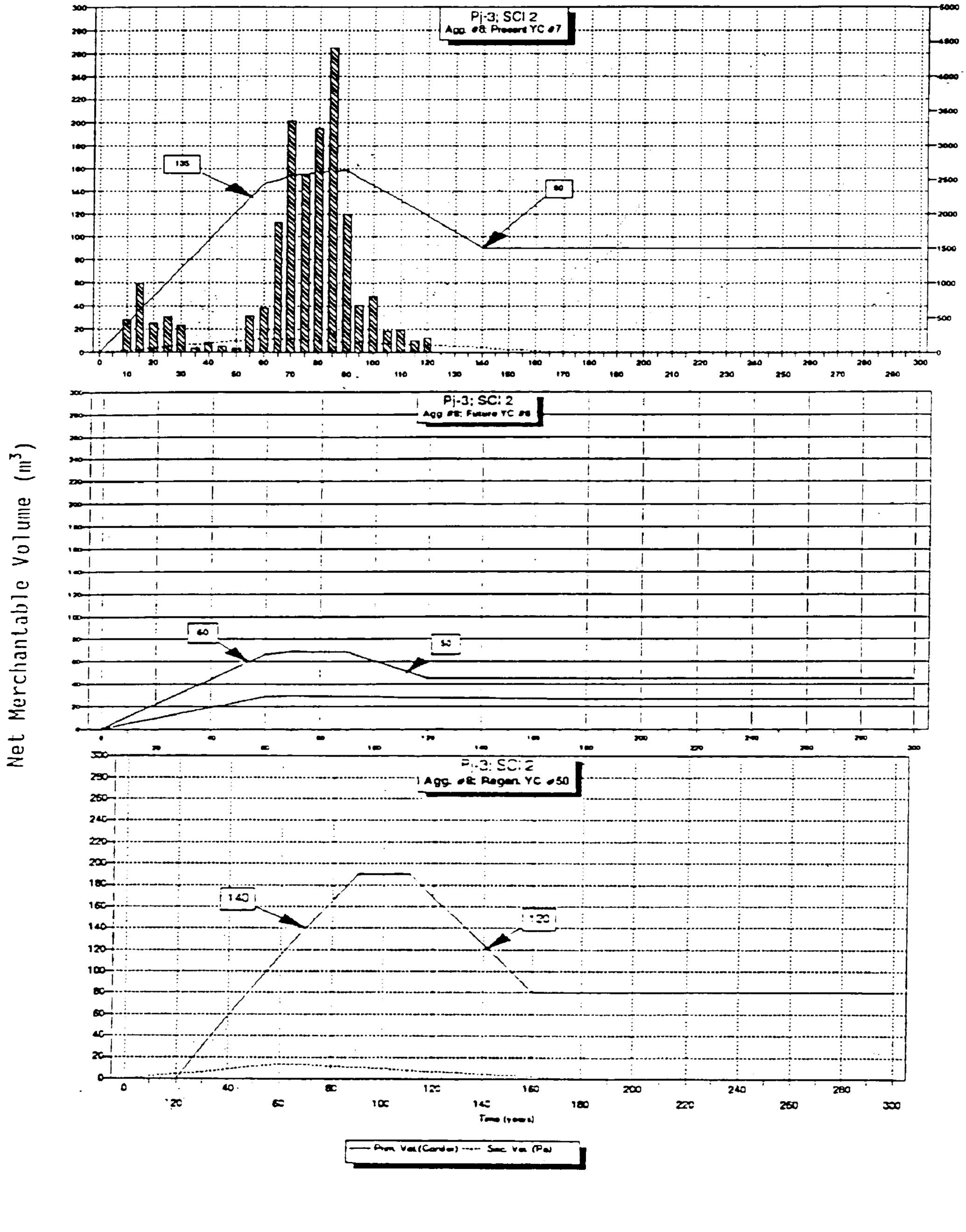


Figure 8.a) The present, future and regeneration curves for aggregate number 8 (Pj-3; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

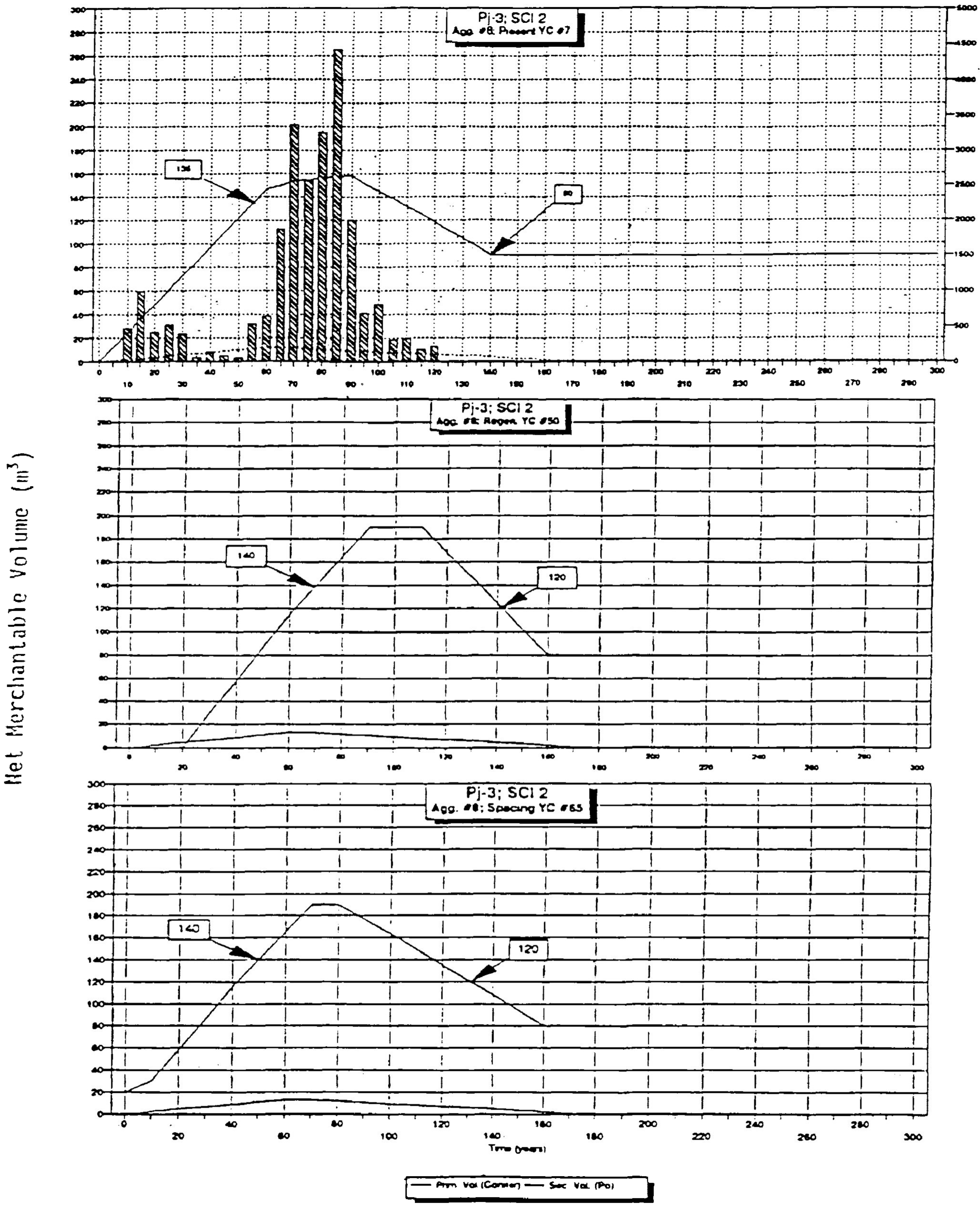


Figure 8.b) The present, regeneration and spacing yield curves for aggregate number 8 (Pj-3; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

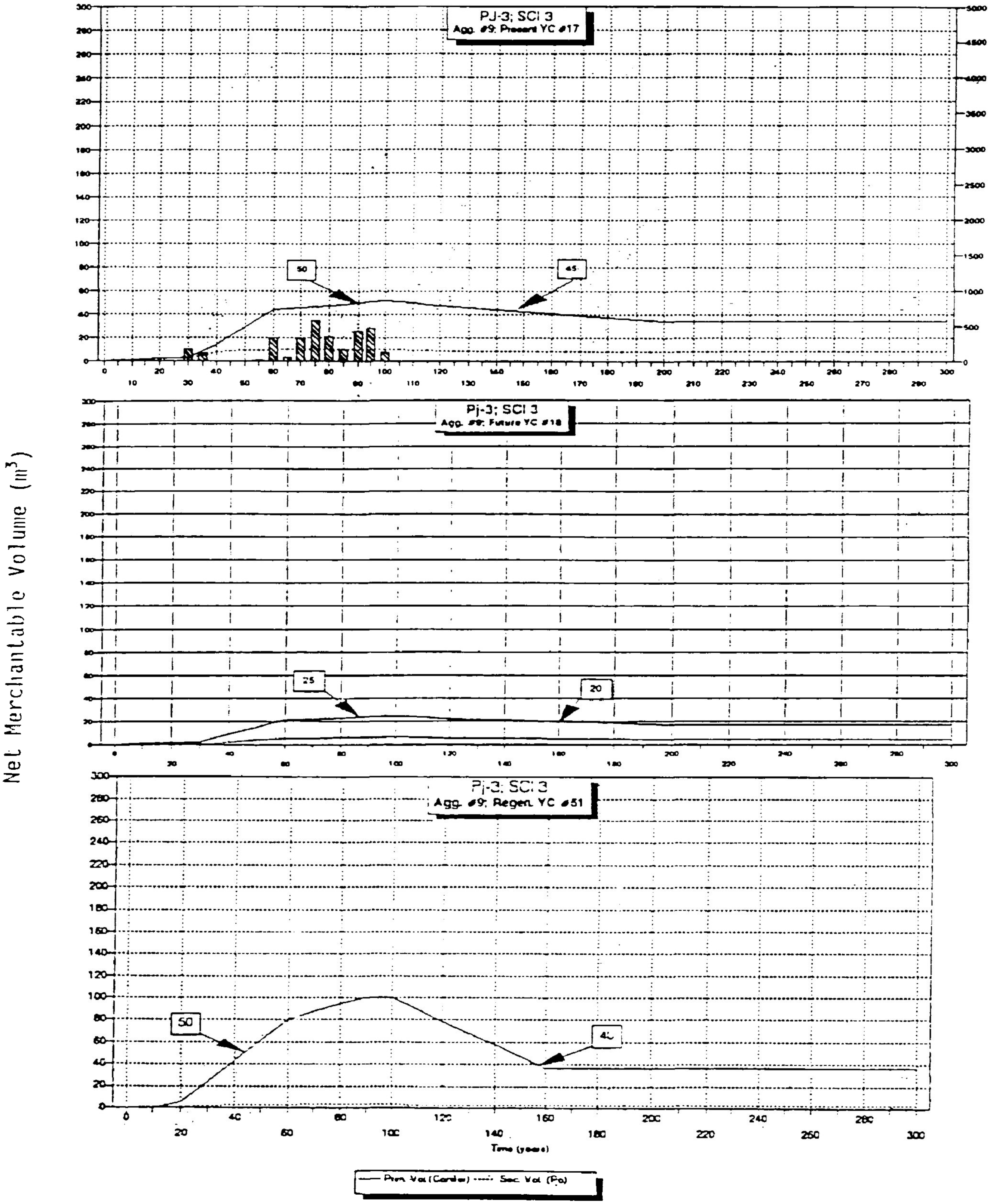


Figure 9.a) The present, future and regeneration curves for aggregate number 9 (Pj-3; SCI 3). Note: numbers in boxes represent the operable net merchantable volume limits.

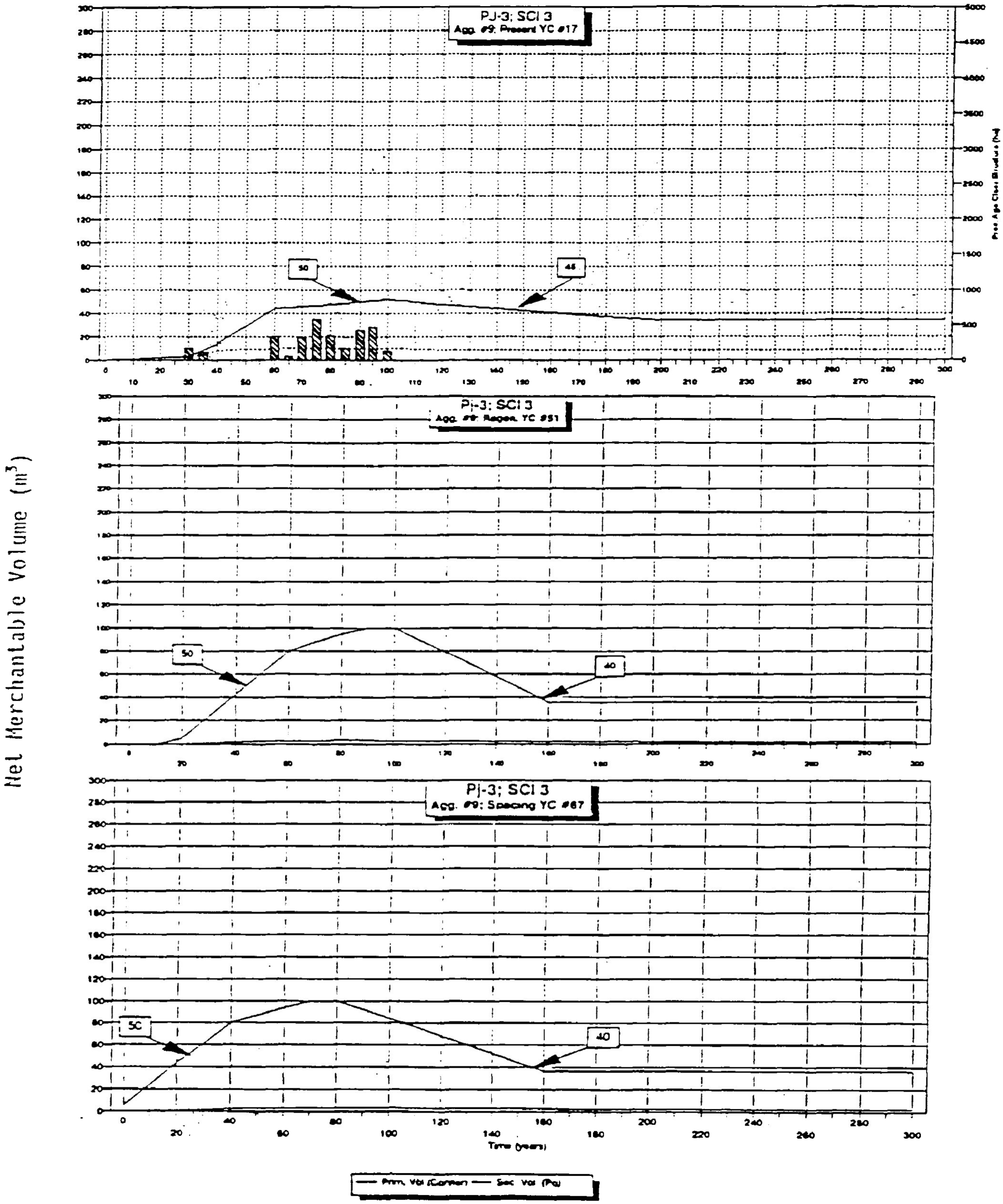


Figure 9.b) The present, regeneration and spacing yield curves for aggregate number 9 (Pj-3; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

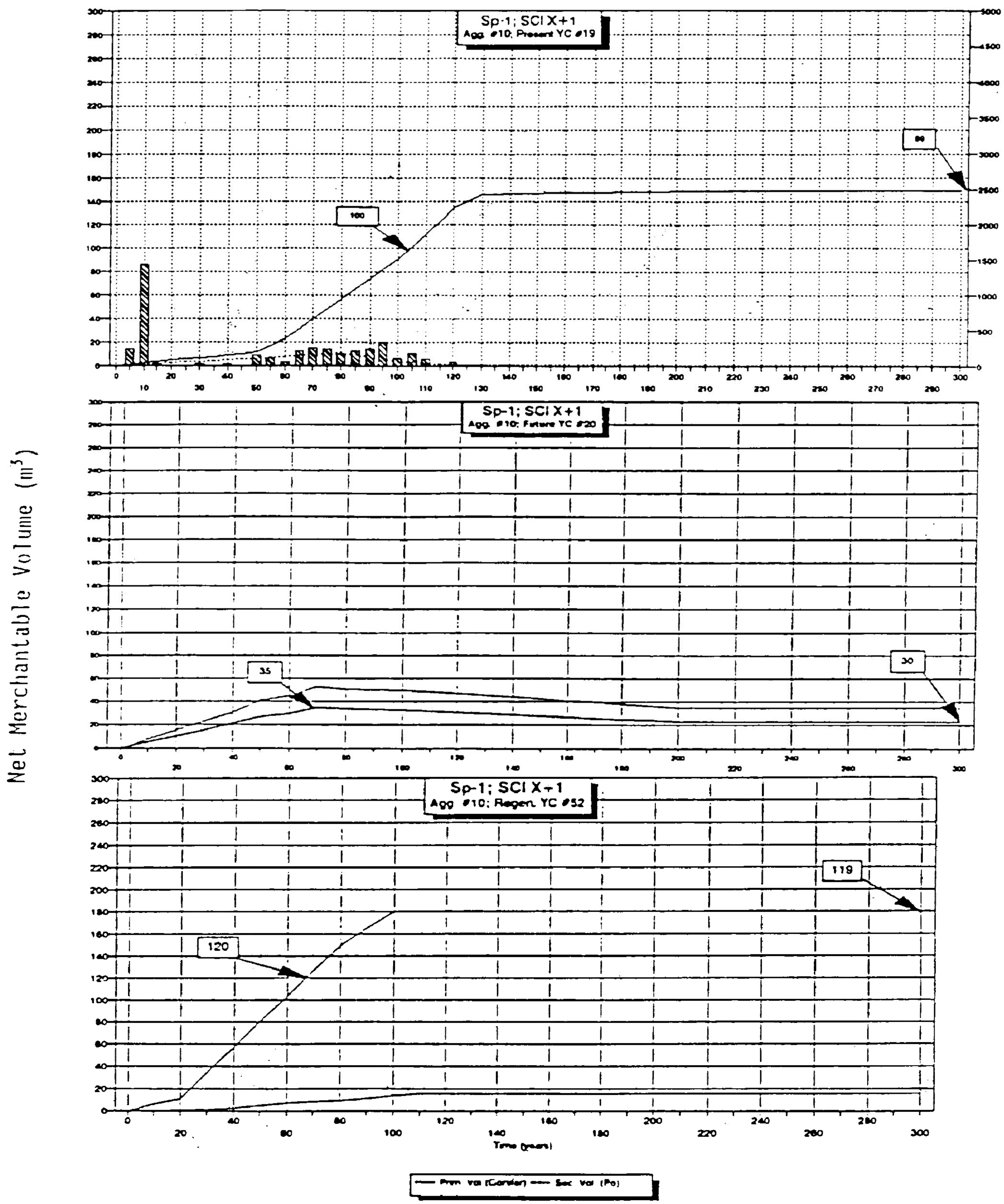


Figure 10. The present, future and regeneration curves for aggregate number 10 (Sp-1; SCI X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

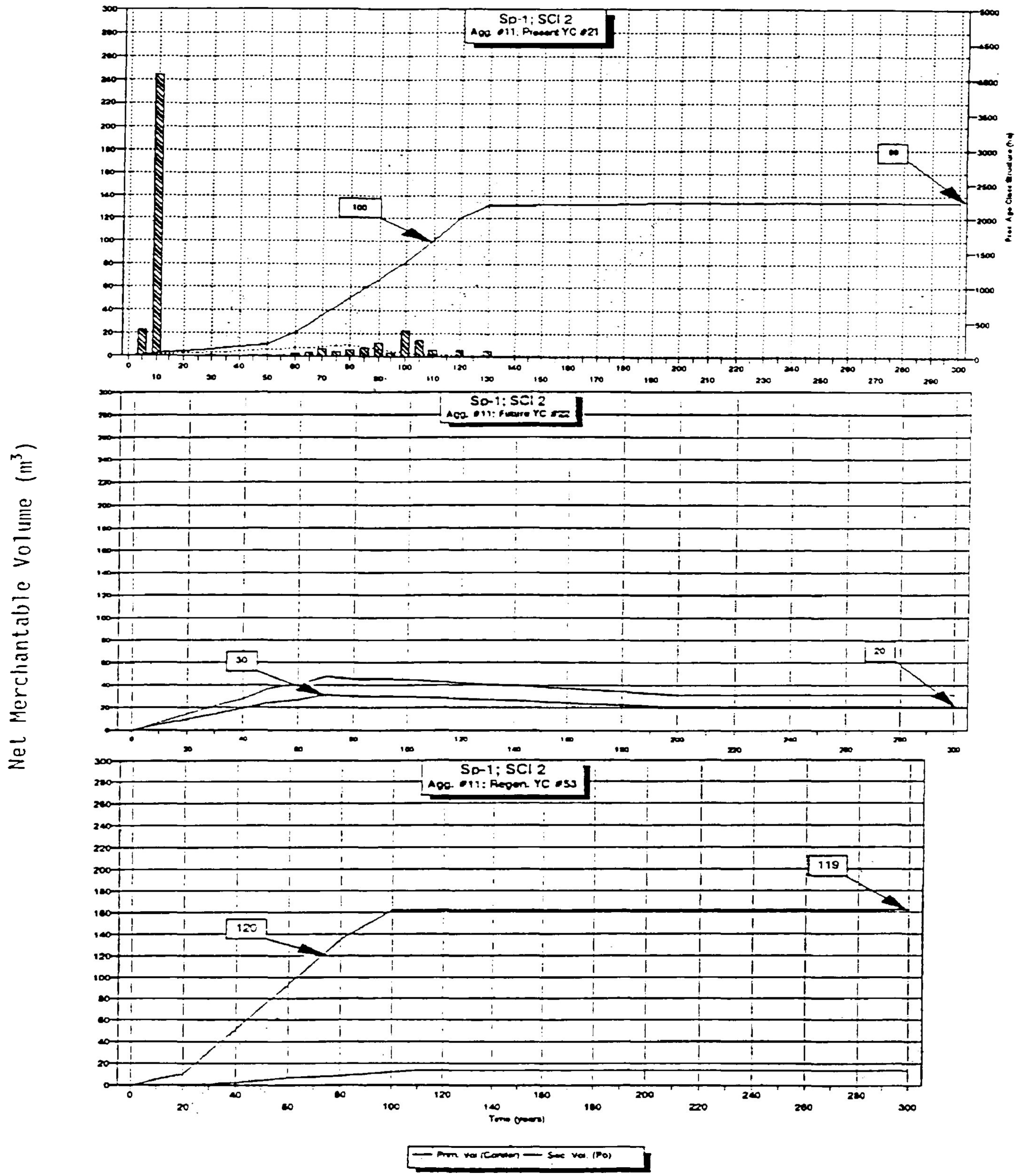


Figure 11. The present, future and regeneration curves for aggregate number 11 (Sp-1: SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

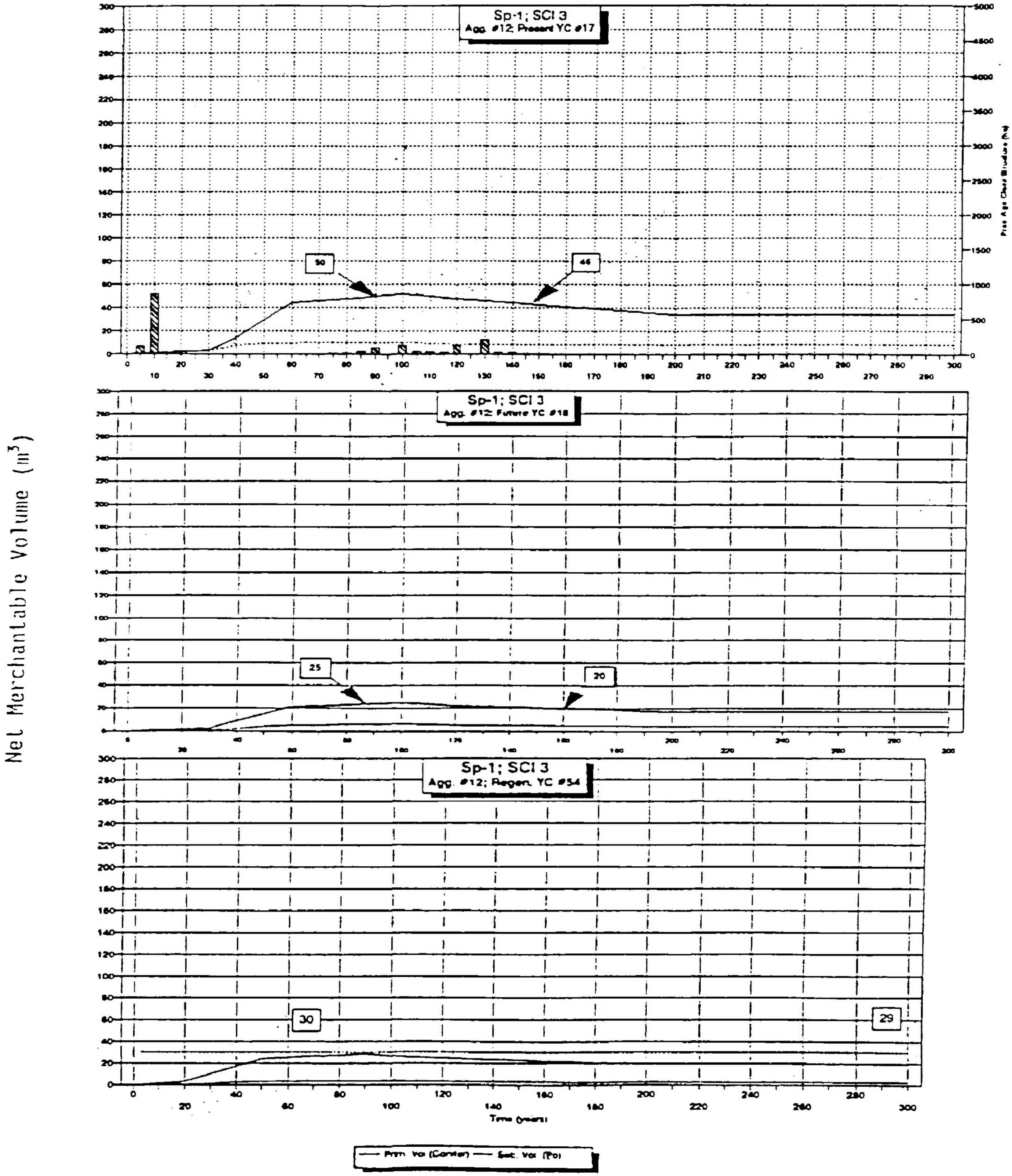


Figure 12. The present, future and regeneration curves for aggregate number 12 (Sp-1; SCI 3). Note: numbers in boxes represent the operable net merchantable volume limits.

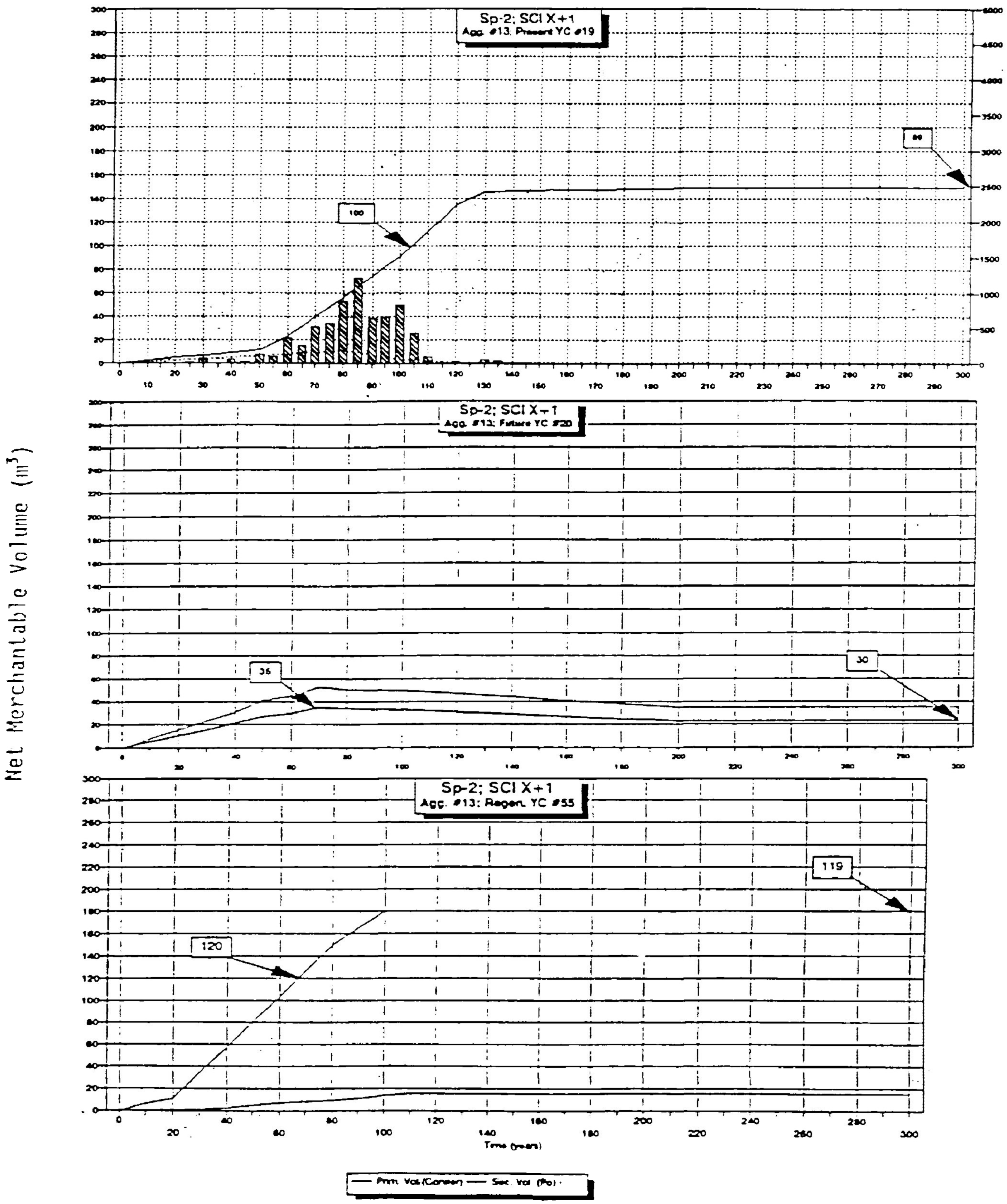


Figure 13. The present, future and regeneration curves for aggregate number 13 (Sp-2; SCI X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

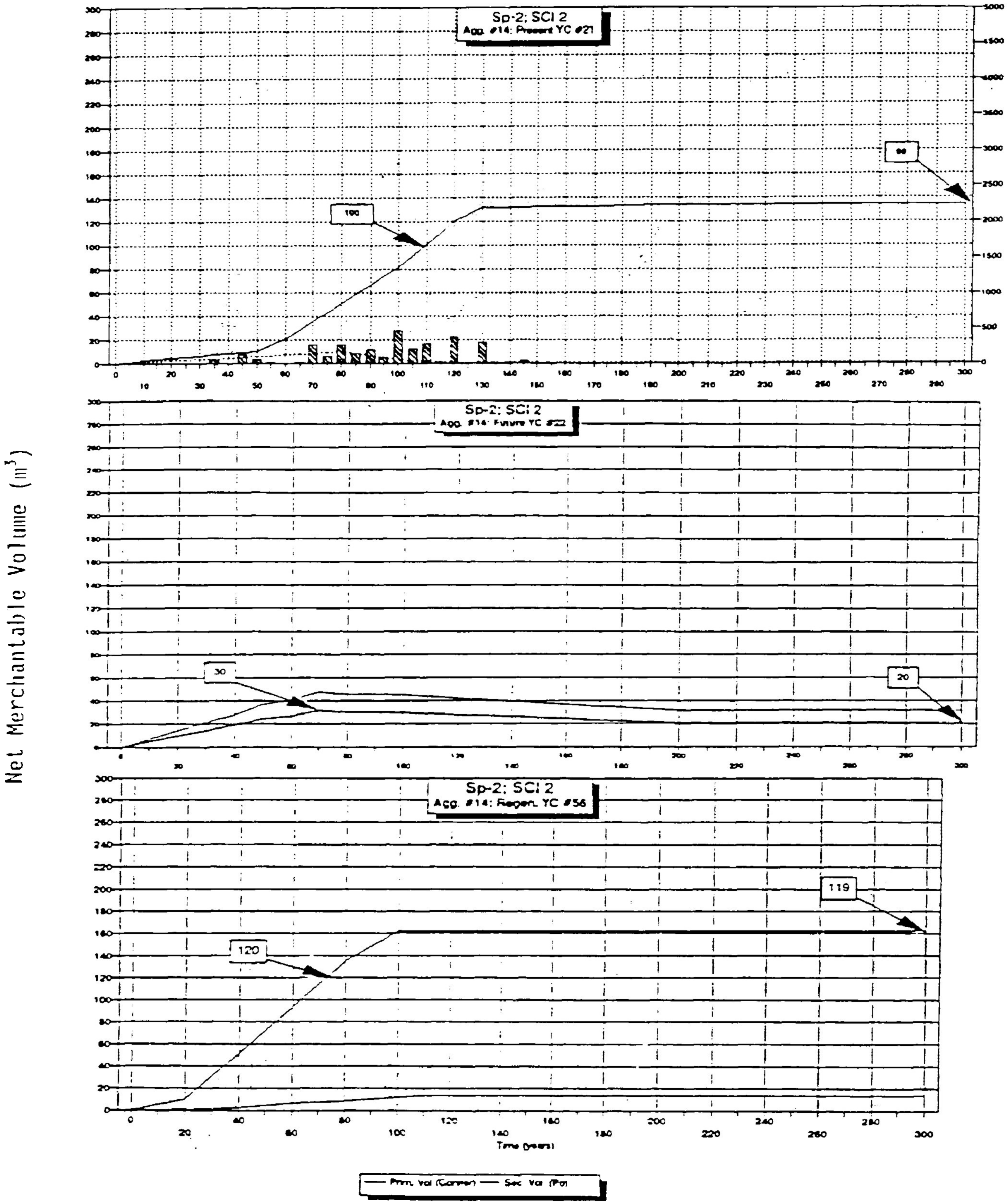


Figure 14. The present, future and regeneration curves for aggregate number 14 (Sp-2: SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

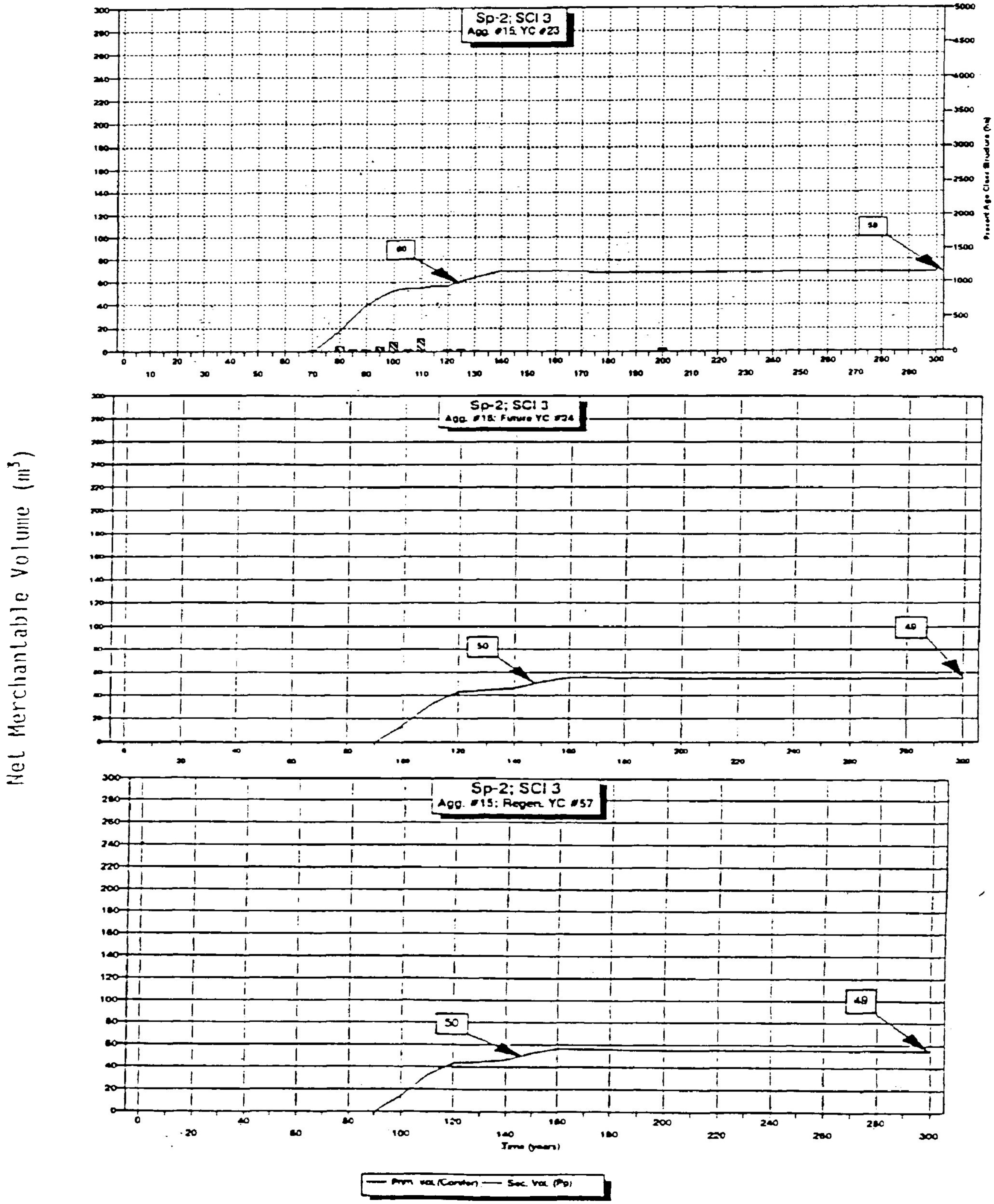


Figure 15. The present, future and regeneration curves for aggregate number 15 (Sp-2; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

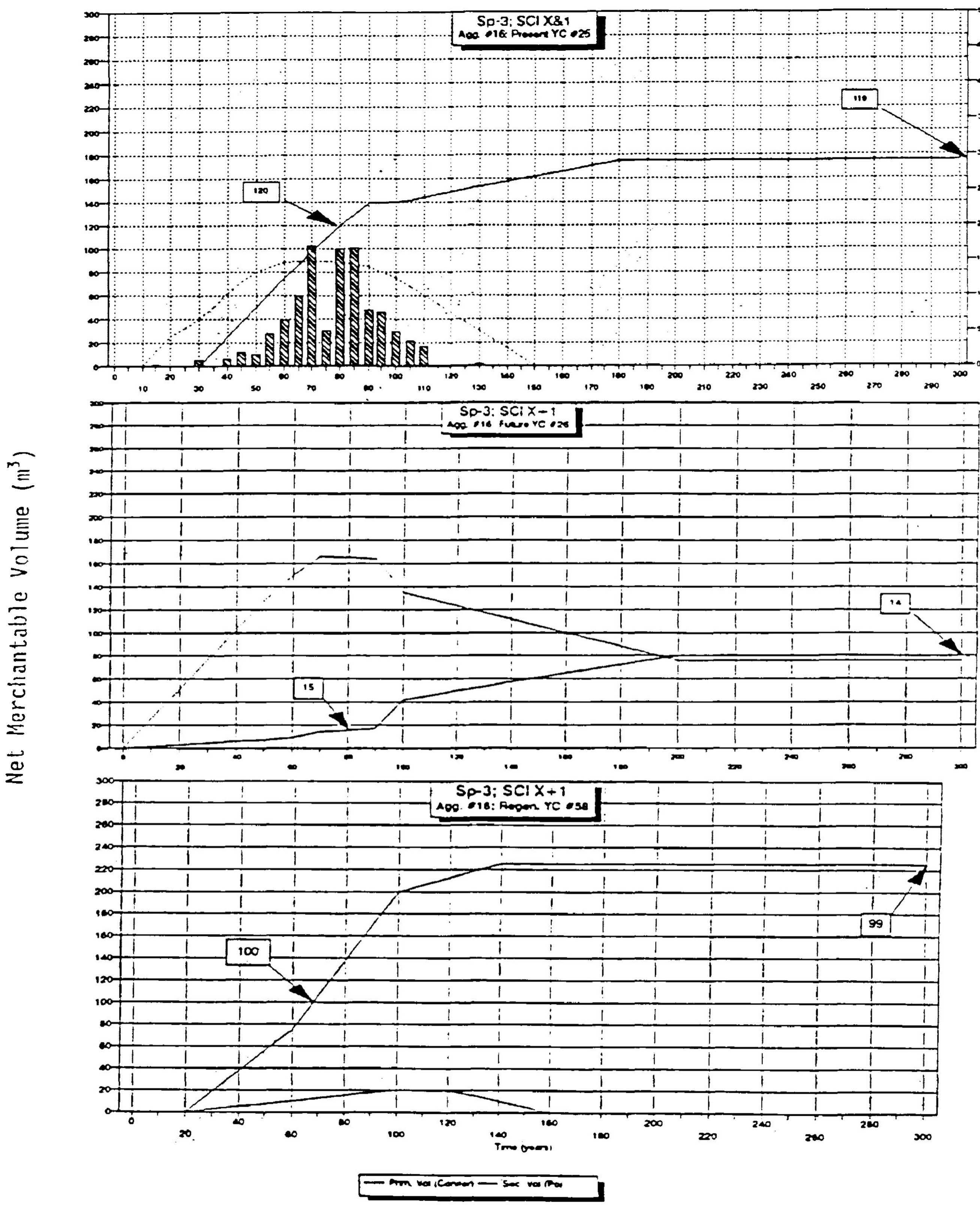


Figure 16. The present, future and regeneration curves for aggregate number 16 (Sp-3; SCl X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

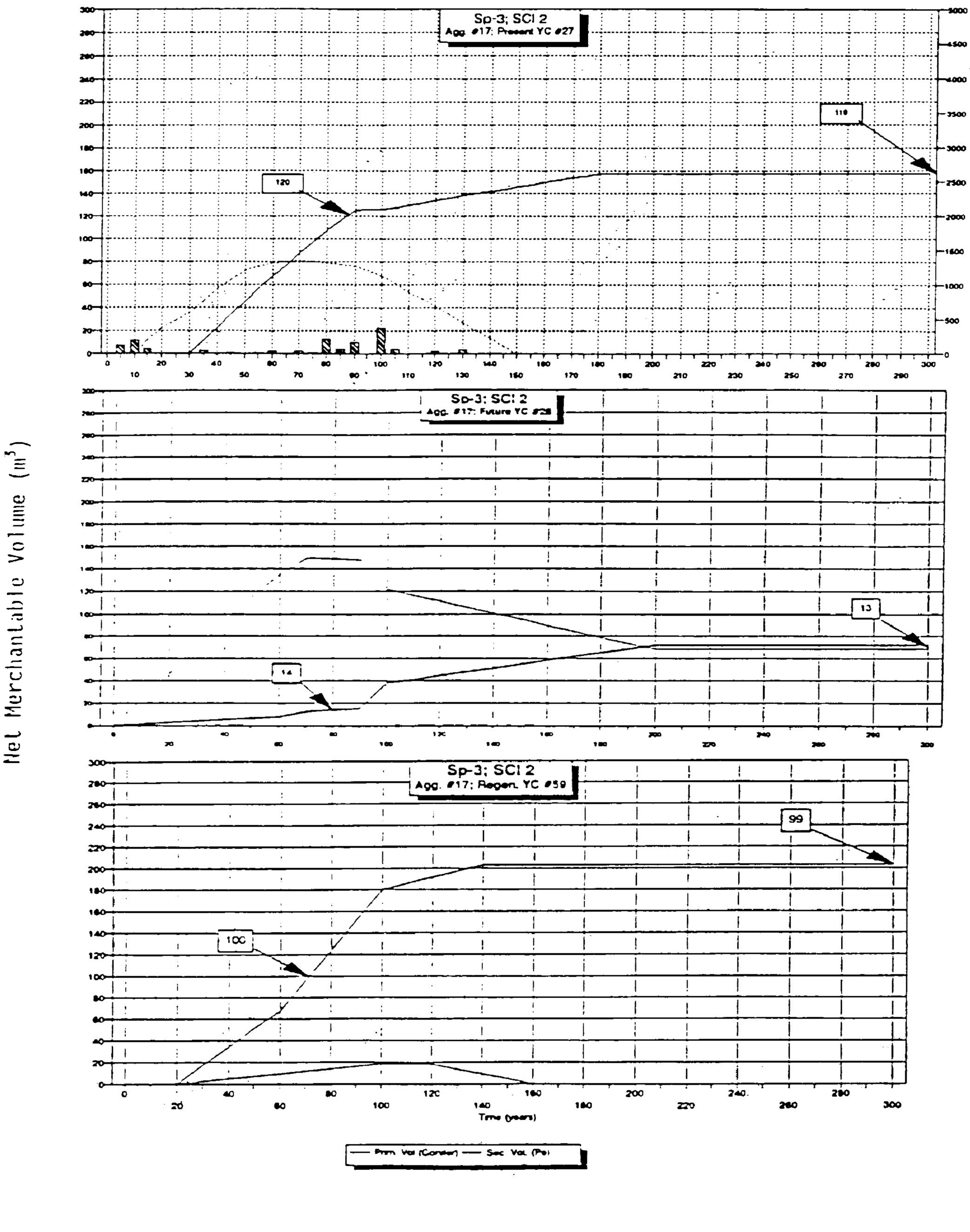


Figure 17. The present, future and regeneration curves for aggregate number 17 (Sp-3; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

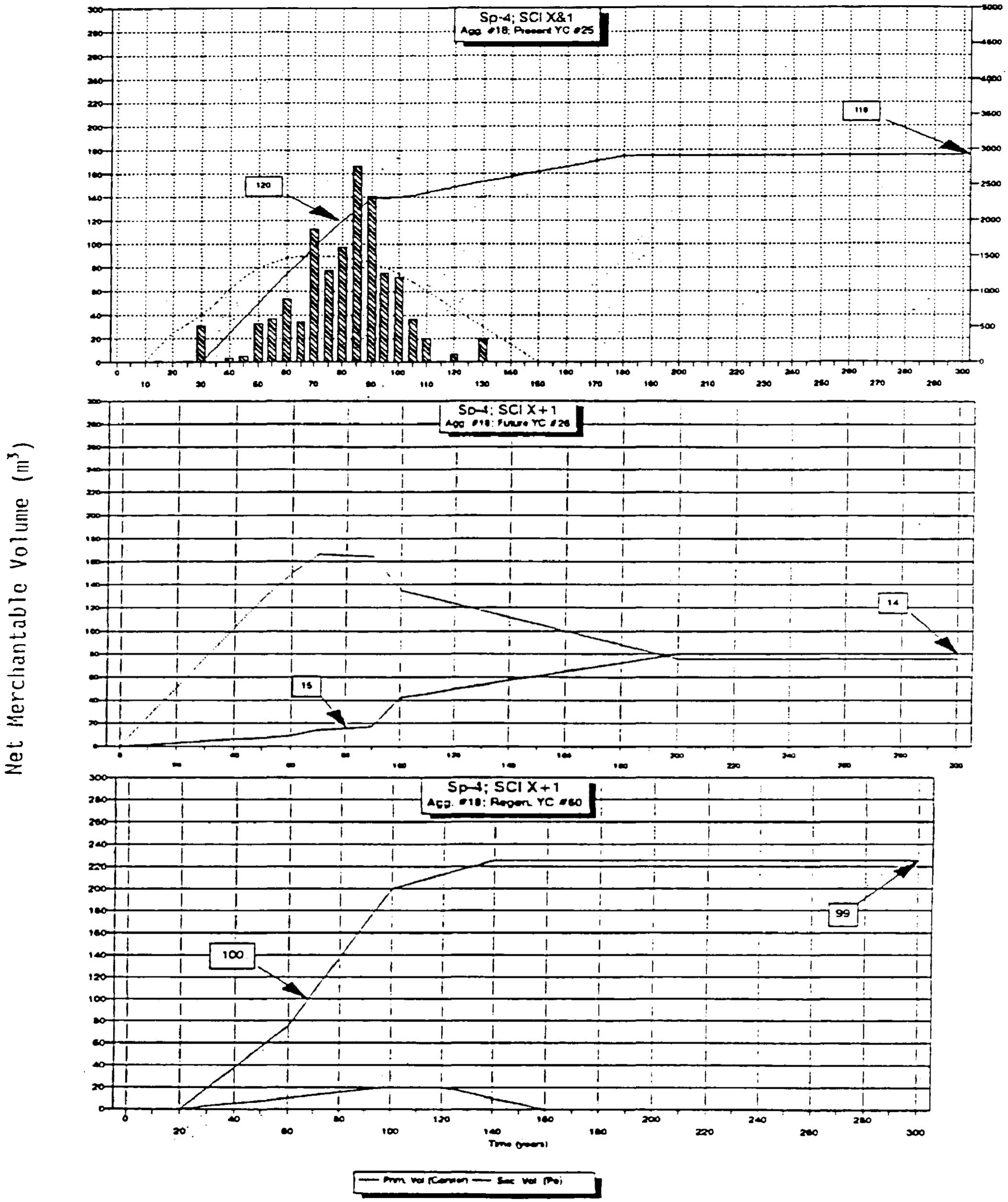


Figure 18. The present, future and regeneration curves for aggregate number 18 (Sp-4: SCl X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

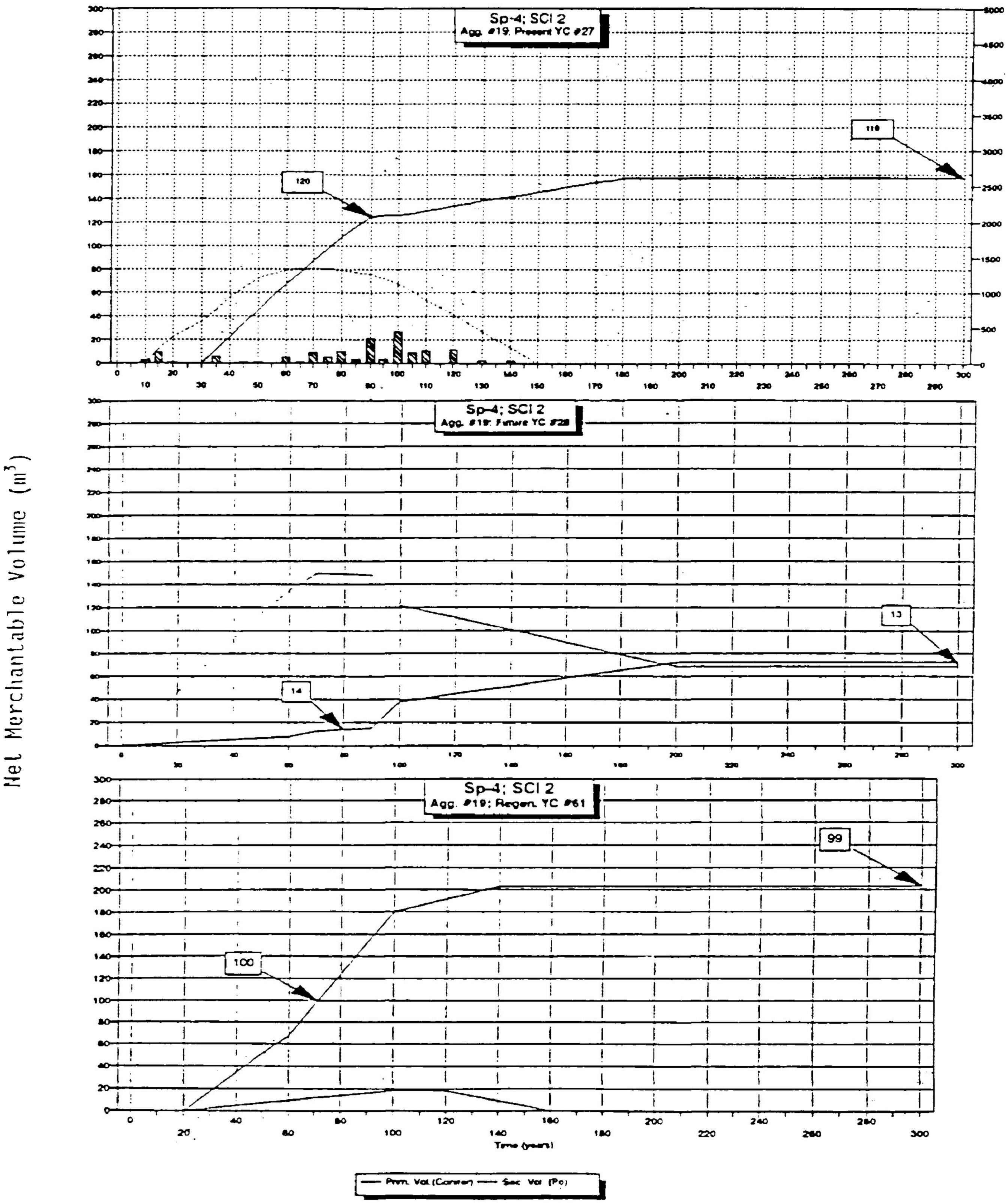


Figure 19. The present, future and regeneration curves for aggregate number 19 (Sp-4; SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

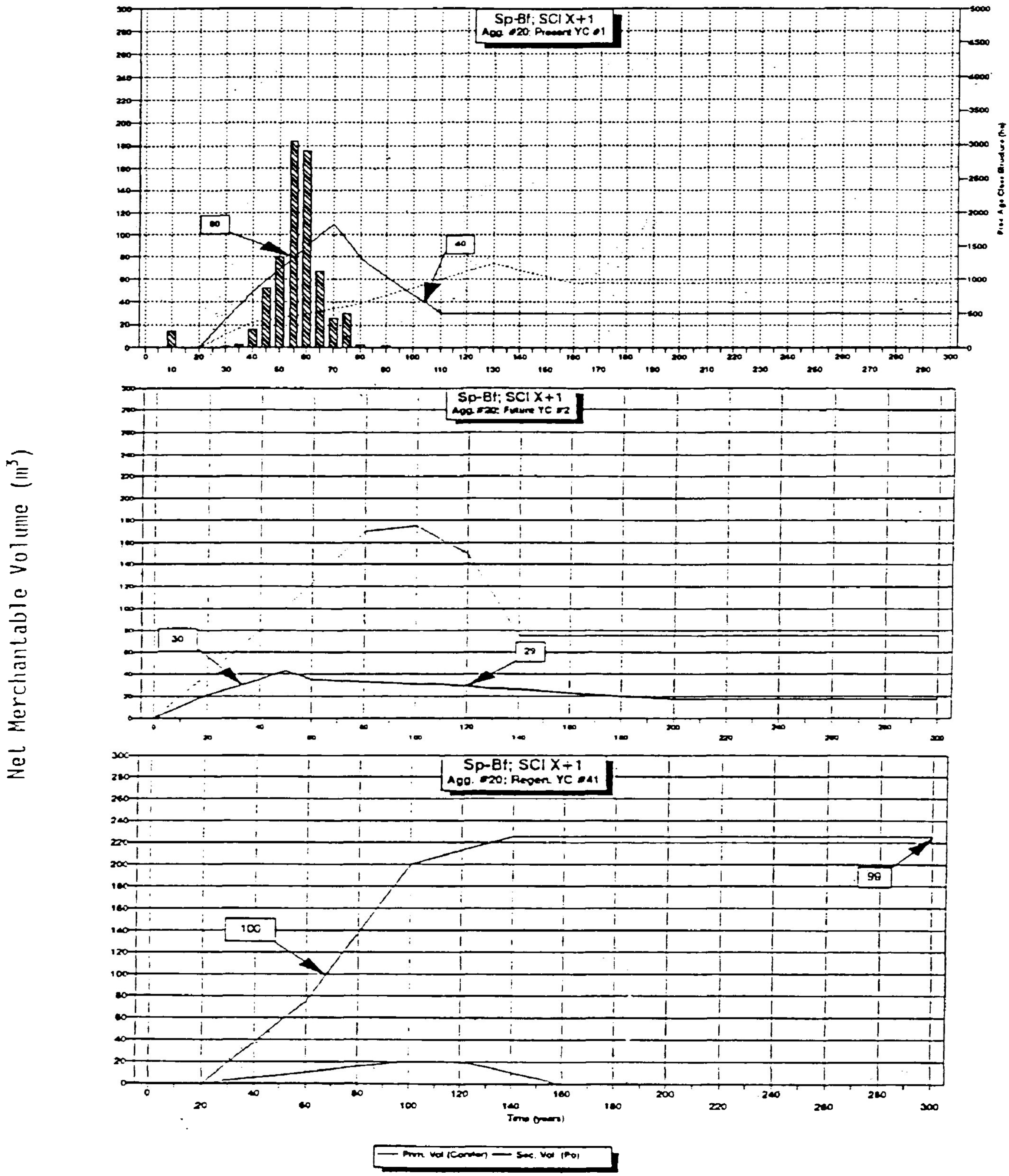


Figure 20. The present, future and regeneration curves for aggregate number 20 (Sp-Bf; SCl X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

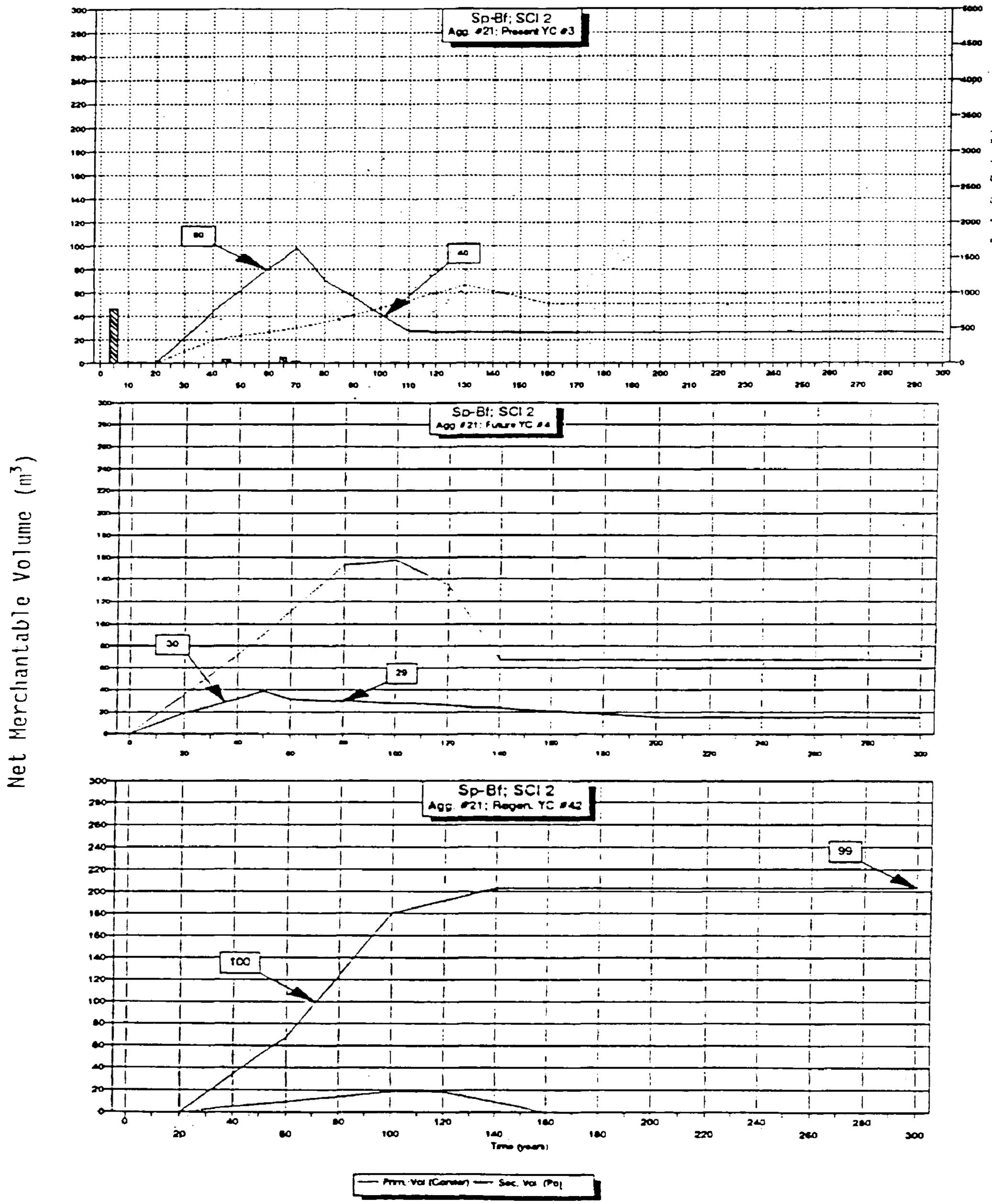


Figure 21. The present, future and regeneration curves for aggregate number 21 (Sp-Bf: SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

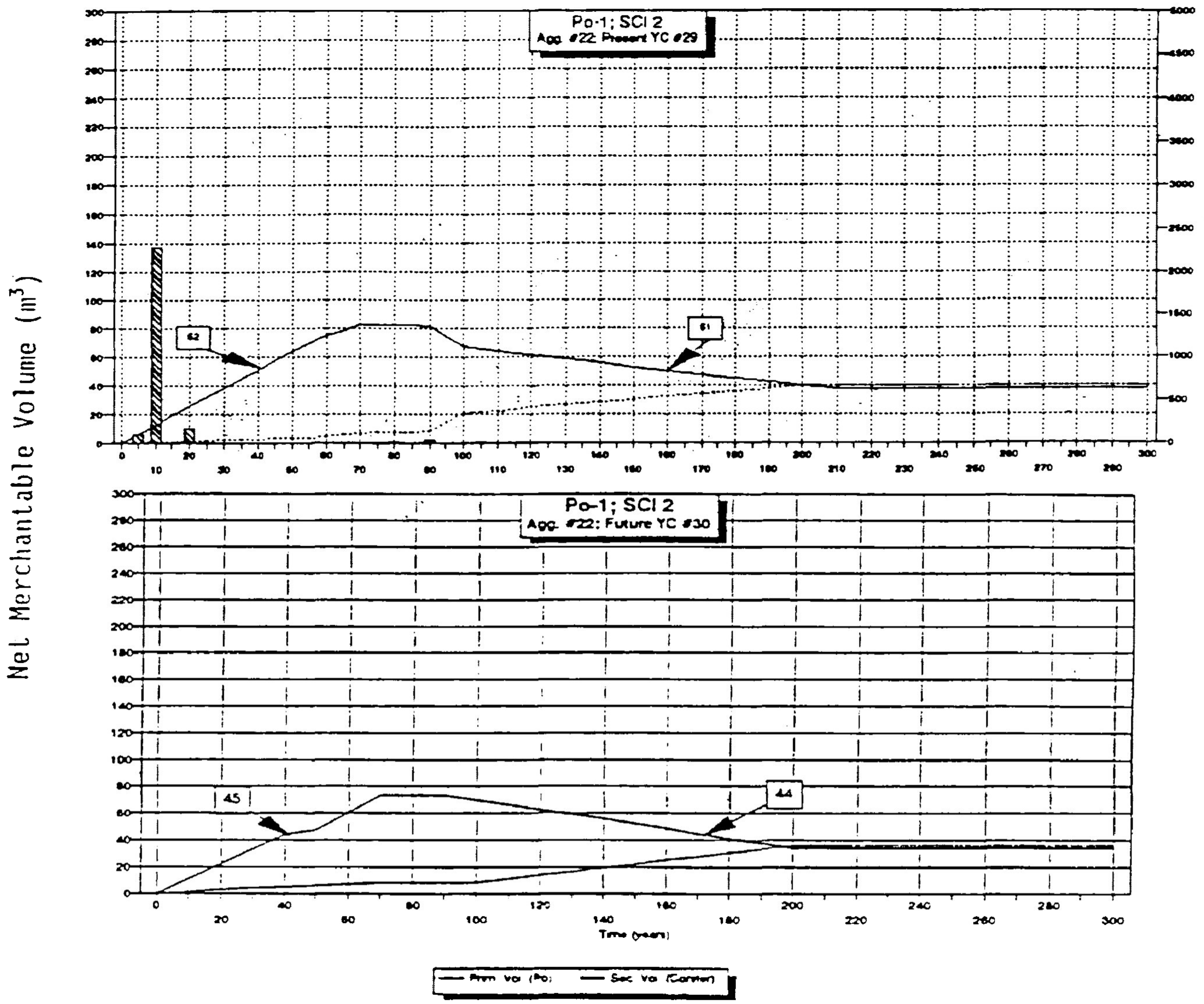


Figure 22. The present and future yield curves for aggregate number 22 (Po-1: SCI 2).
Note: numbers in boxes represent the operable net merchantable volume limits.

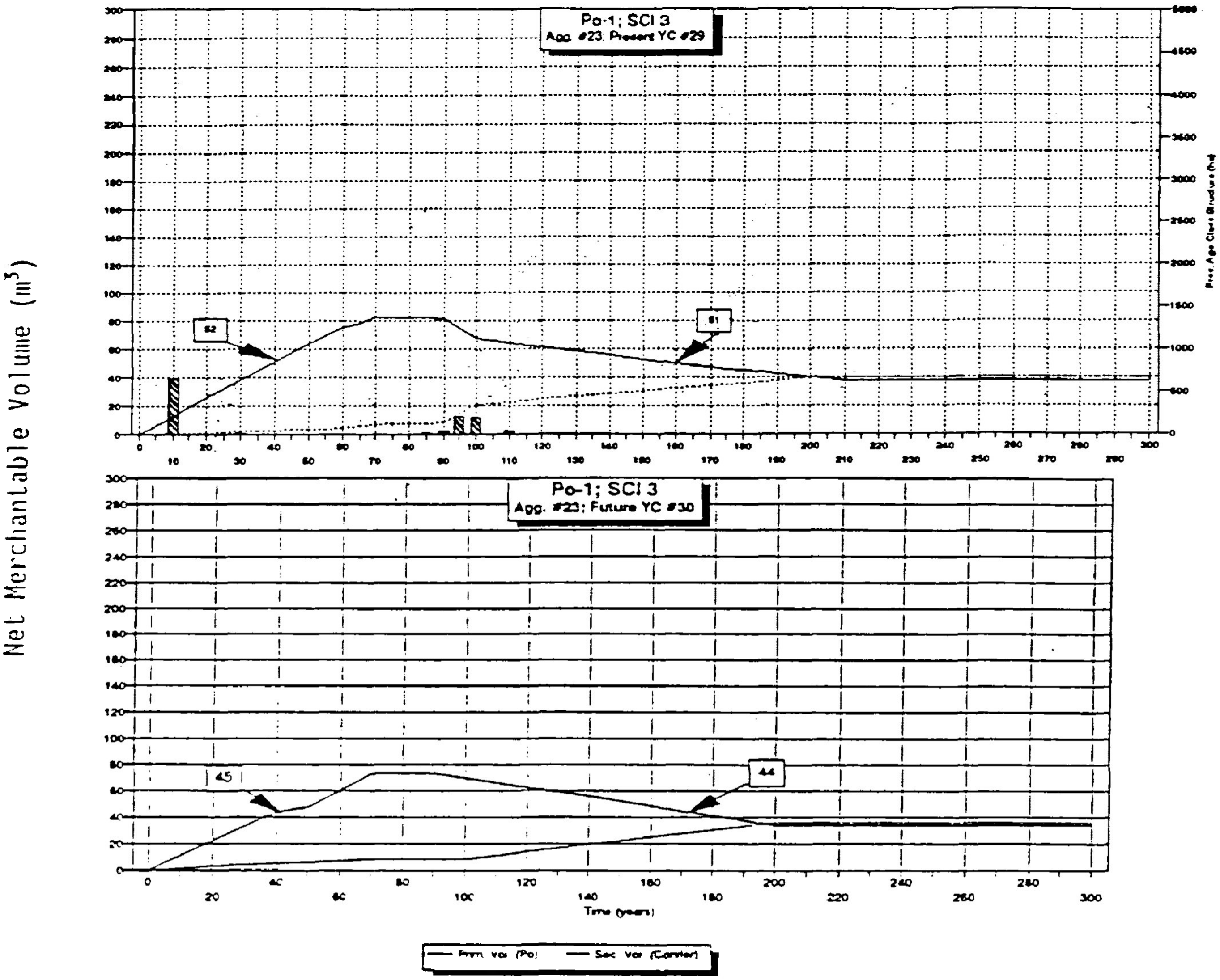


Figure 23. The present and future yield curves for aggregate number 23 (Po-1; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

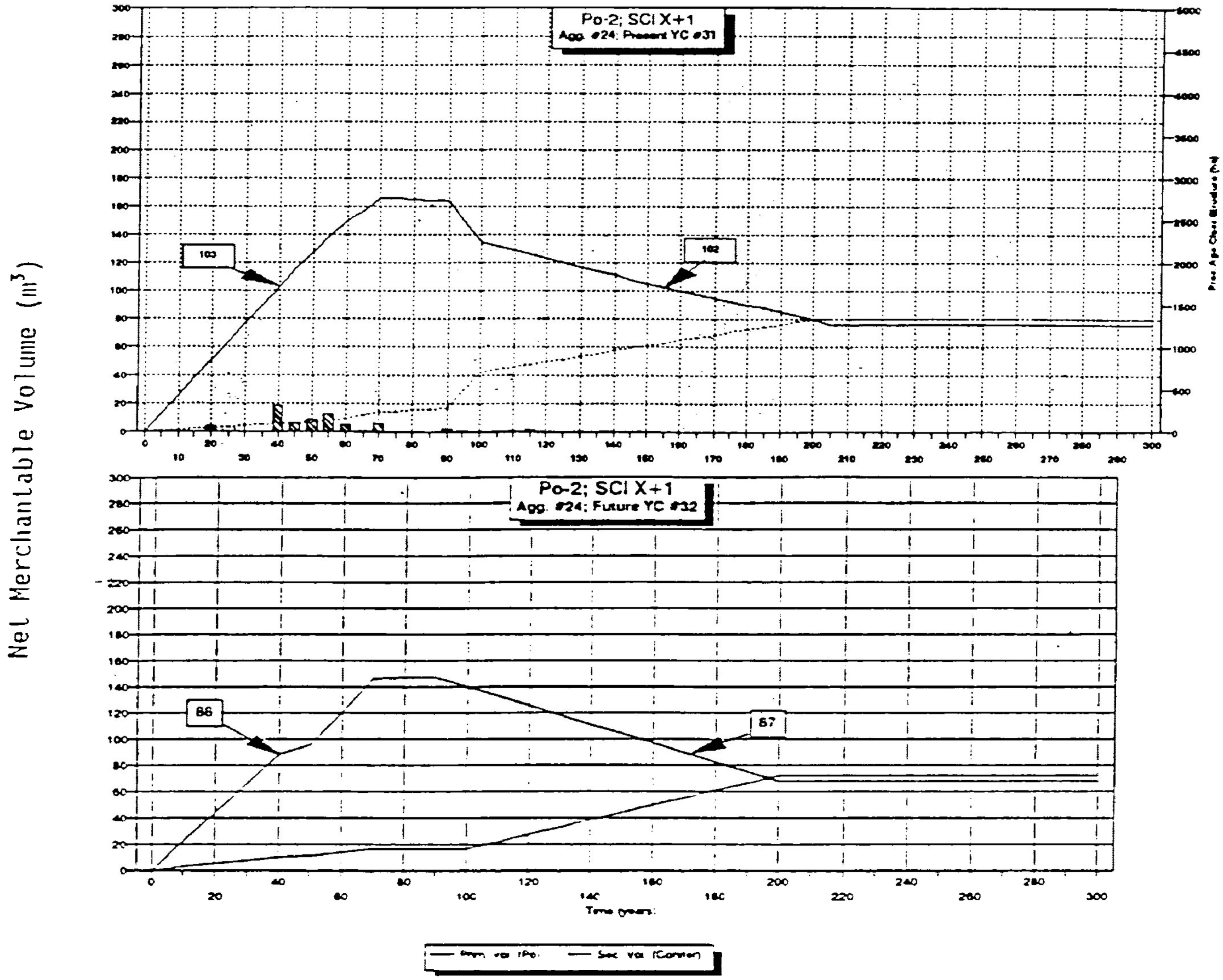


Figure 24. The present and future yield curves for aggregate number 24 (Po-2; SCI X+1). Note: numbers in boxes represent the operable net merchantable volume limits.

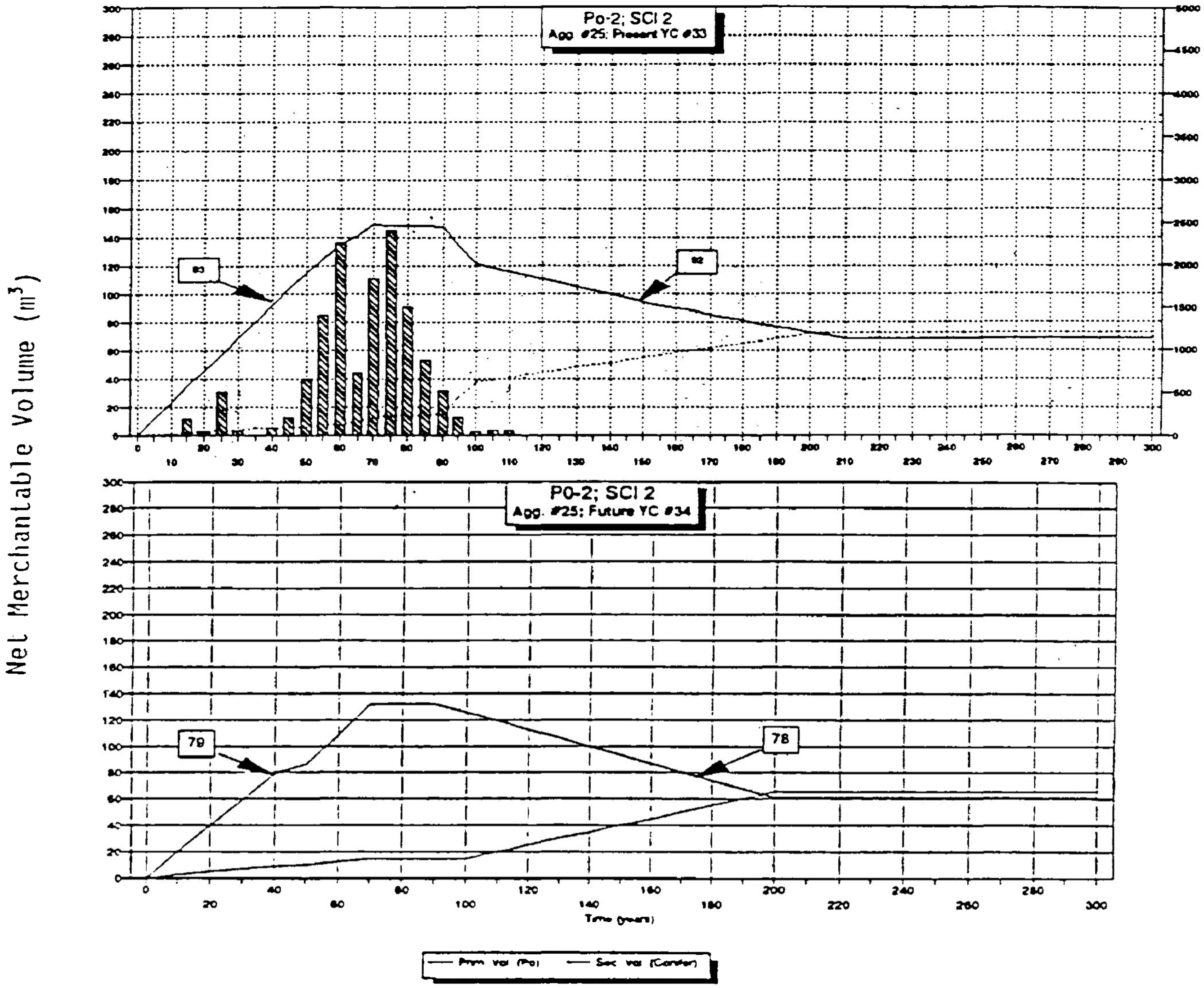


Figure 25. The present and future yield curves for aggregate number 25 (Po-2; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

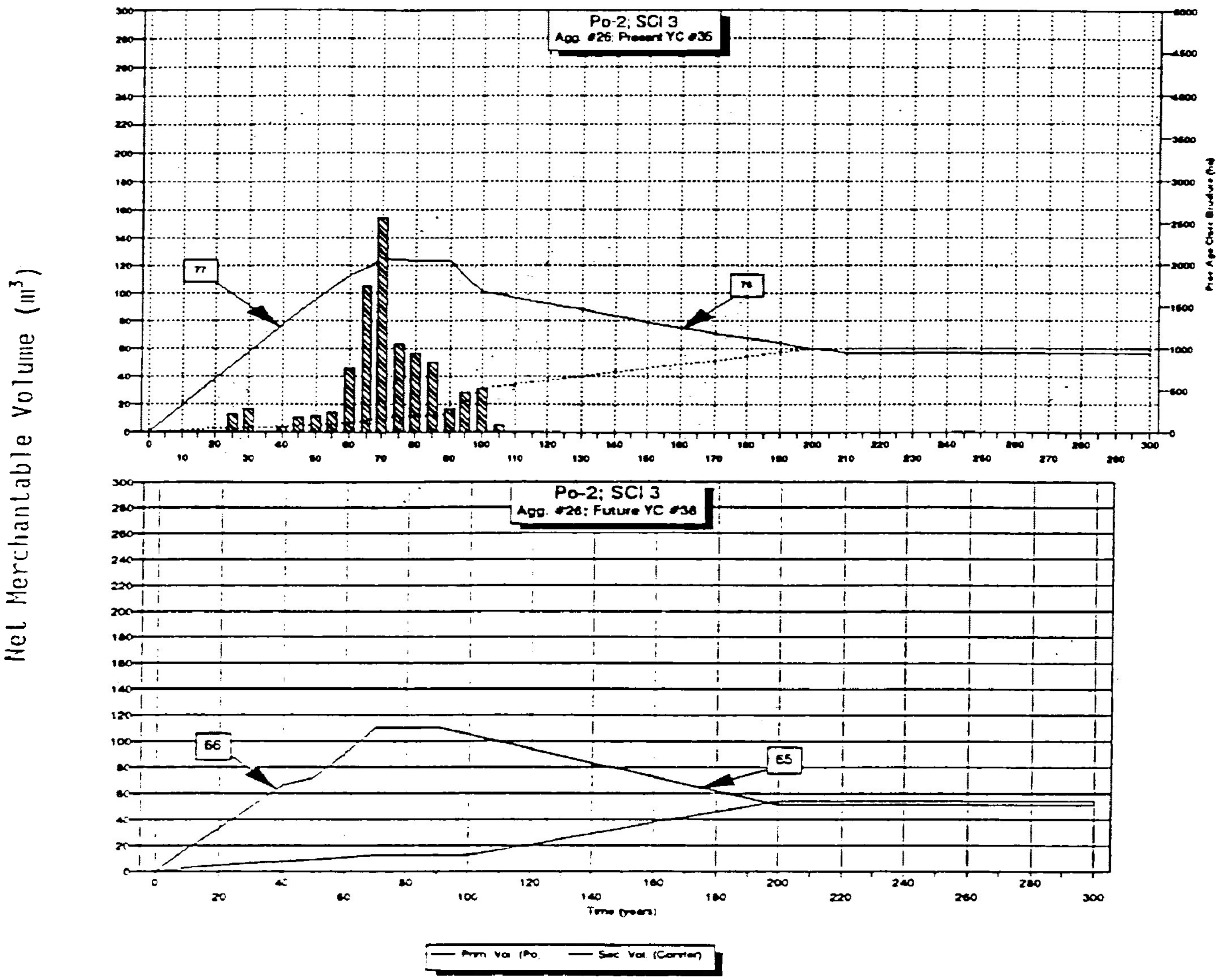


Figure 26. The present and future yield curves for aggregate number 26 (Po-2; SCl 3).
Note: numbers in boxes represent the operable net merchantable volume limits.

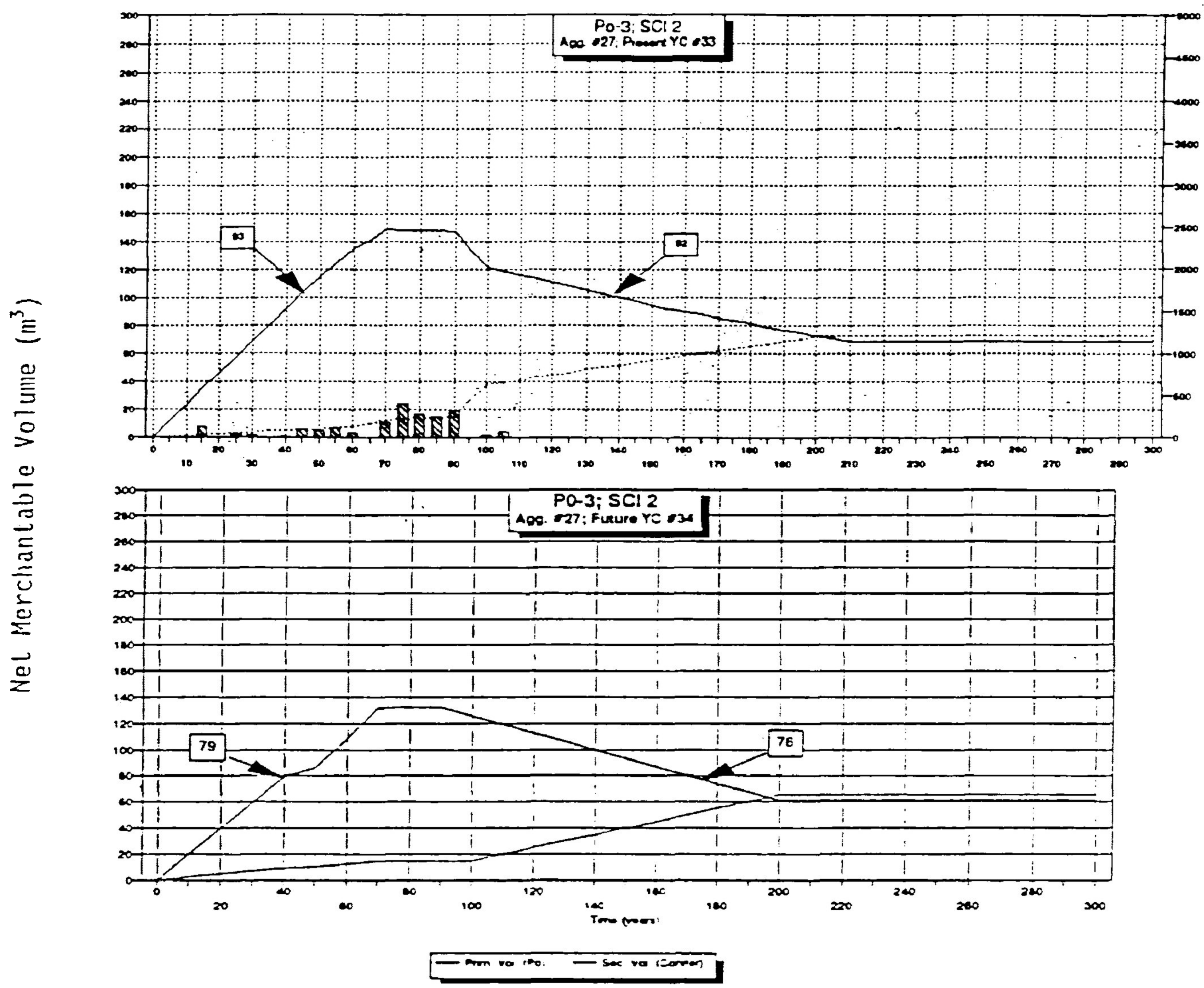


Figure 27. The present and future yield curves for aggregate number 27 (Po-3: SCI 2). Note: numbers in boxes represent the operable net merchantable volume limits.

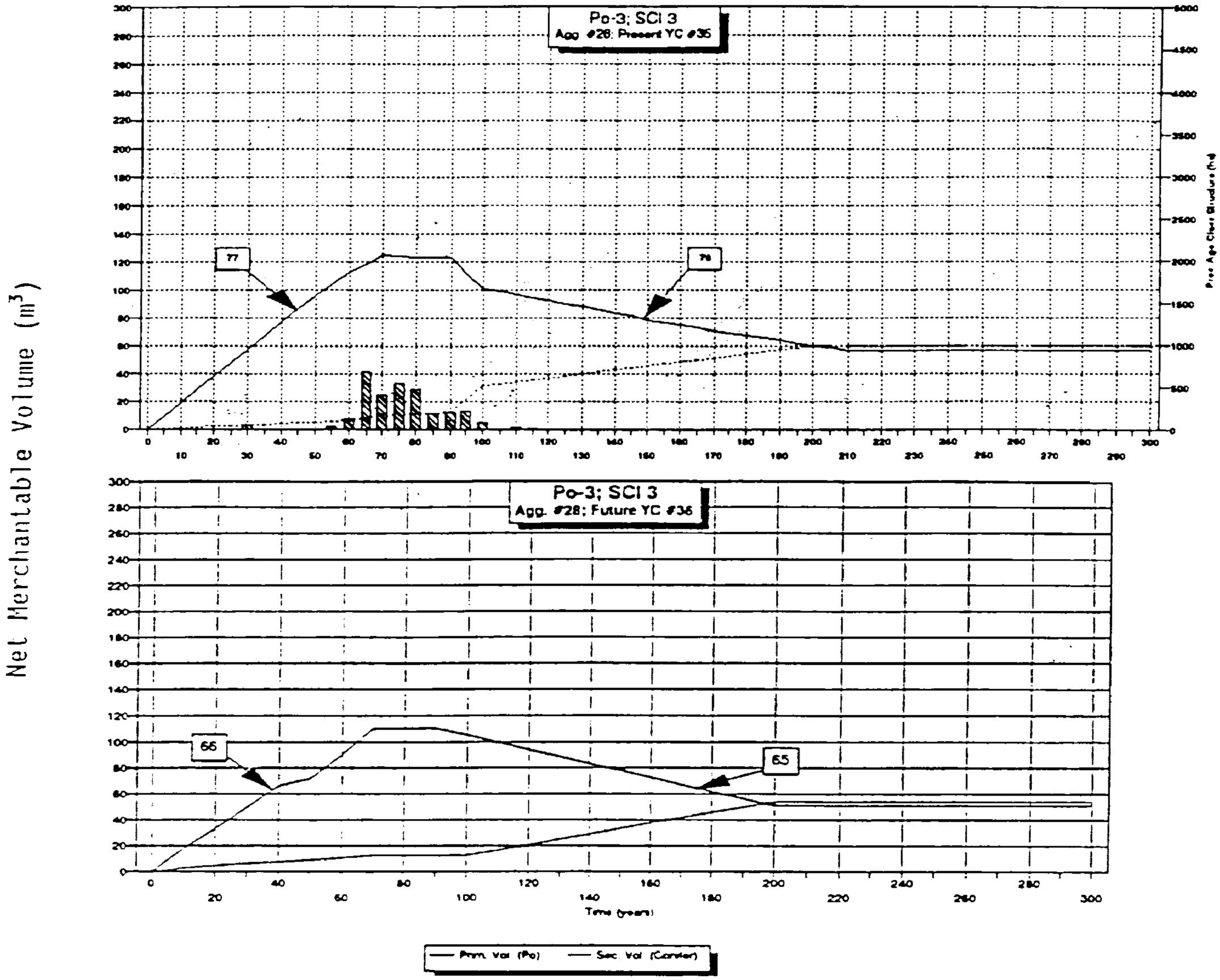


Figure 28. The present and future yield curves for aggregate number 28 (Po-3; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

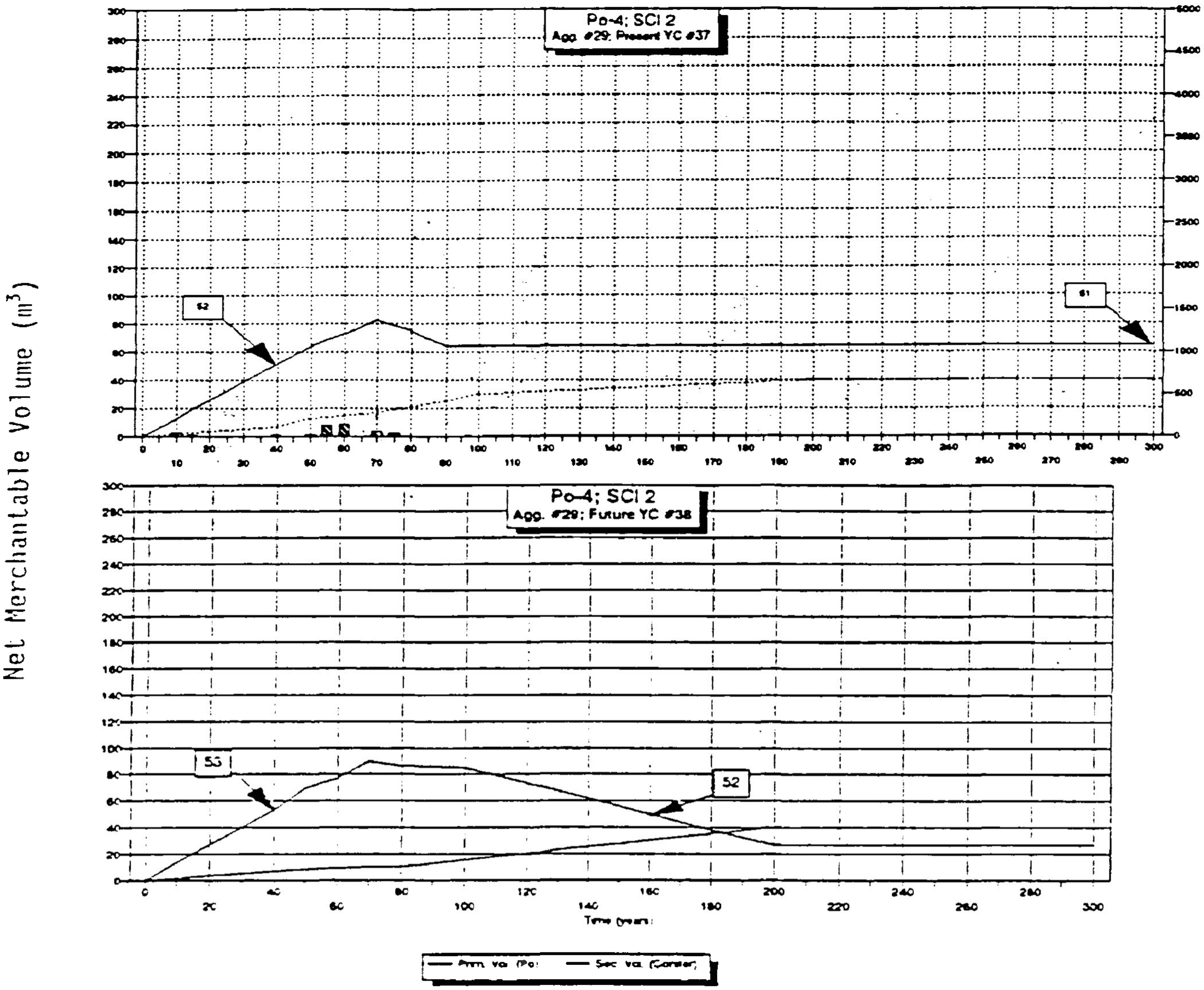


Figure 29. The present and future yield curves for aggregate number 29 (Po-4; SCl 2). Note: numbers in boxes represent the operable net merchantable volume limits.

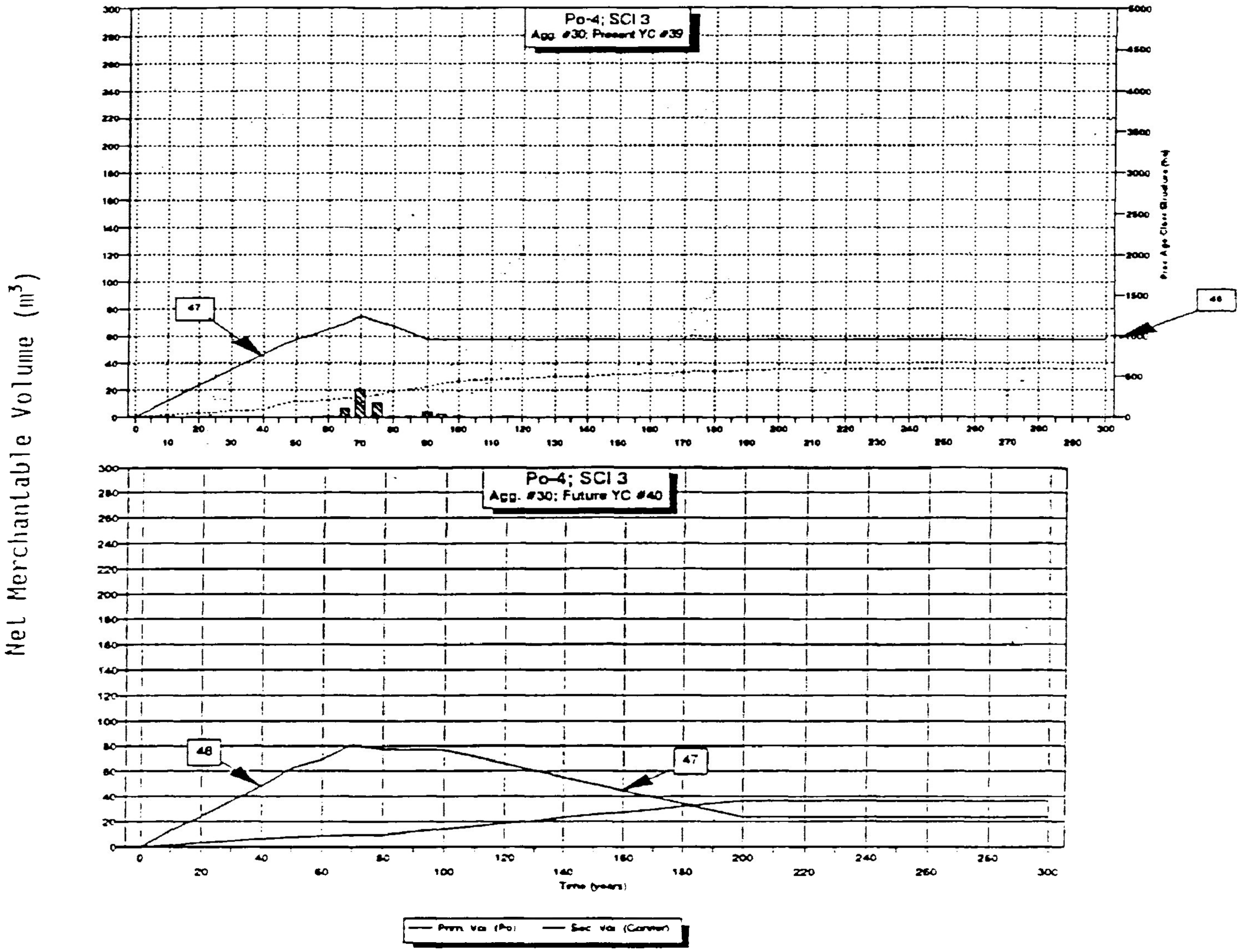


Figure 30. The present and future yield curves for aggregate number 30 (Po-4; SCl 3). Note: numbers in boxes represent the operable net merchantable volume limits.

APPENDIX X

SILVICULTURE TREATMENT SPECIFICATIONS AND COSTS

LIST OF TABLES

Table 1. The silvicultural specifications under the 67% Herbicide Program scenario and the associated costs per hectare and percent yield of BAU curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	MC	C2,5	1.0	$630+310+280=1 220
	5	P/Pj	MC	C2,5	1.0	$630+310+280=1 220
	6	S/Pj	MC	C2,5	1.0	$ 7+310+280= 597 (*997)
Pj-3	7	S/Pj	M	G-3	1.0	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	MC	C2,5	1.0	$630+310+280=1 220
	17	P/Sb	MC	C2,5	1.0	$630+310+280=1 220
Sp-4	18	P/Sb	M	G-3	1.0	$630+170+200=1 000
	19	P/Sb	M	G-3	1.0	$630+170+250=1 050
Sp-Bf	20	P/Sb	M	C2,5	1.0	$630+170+140=1 080
	21	P/Sb	M	C2,5	1.0	$630+170+140=1 080
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; MC = Mechanical/Chemical;
C# = chemical treatment at # years; M# = mechanical treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 2. The silvicultural specifications for the aggregates under the 50% Herbicide Program scenario and the accompanying costs per hectare and percent yield of BAU curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	MC	C2,5	1.0	$630+310+280=1 220
	5	P/Pj	MC	C2,5	1.0	$630+310+280=1 220
	6	S/Pj	MC	C2,5	1.0	$ 7+310+280= 597 (*997)
Pj-3	7	S/Pj	M	G-3	1.0	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	MC	C2,5	1.0	$630+310+280=1 220
	17	P/Sb	MC	C2,5	1.0	$630+310+280=1 220
Sp-4	18	P/Sb	M	G-3	1.0	$630+170+200=1 000
	19	P/Sb	M	G-3	1.0	$630+170+250=1 050
Sp-Bf	20	P-L/Sb	HM	-	1.0	$700+300+ 0=1 000
	21	P/Sb	M		1.0	$700+300+ 0=1 000
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; P-L = Plant large stock; N = Natural
M = Mechanical; MC = Mechanical/Chemical
C# = chemical treatment at # years; G-3 = Girdle 3 years prior to harvest
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 3. The silvicultural specifications for the aggregates under the 40% Herbicide Program scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P-L/Pj	HMC	C3	1.0	$700+400+140=1 240
	5	P-L/Pj	HMC	C3	1.0	$700+400+140=1 240
	6	S/Pj	HMC	C3	1.0	$ 7+400+140= 547 (*947)
Pj-3	7	S/Pj	M	G-3	1.0	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P-L/Sb	HMC	C3	1.0	$700+400+140=1 240
	17	P-L/Sb	HMC	C3	1.0	$700+400+140=1 240
Sp-4	18	P/Sb	M	G-3	1.0	$630+170+200=1 000
	19	P/Sb	M	G-3	1.0	$630+170+250=1 050
Sp-Bf	20	P-L/Sb	HM	-	1.0	$700+300+ 0=1 000
	21	P/Sb	M		1.0	$700+300+ 0=1 000
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; P-L = Plant large stock; N = Natural
M = Mechanical; HM = Heavy mechanical; HMC = Heavy mechanical + chemical
C# = chemical treatment at # years; G-3 = Girdle 3 years prior to harvest
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 4. The silvicultural specifications for the aggregates under the Aerial-Tending-Only (A) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	HM	C2,5	0.85	$630+170+280=1 080
	5	P/Pj	HM	C2,5	0.85	$630+170+280=1 080
	6	S/Pj	HM	C2,5	0.85	$ 7+170+280= 457 (*857)
Pj-3	7	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	8	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	9	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	HM	C2,5	0.85	$630+170+280=1 080
	17	P/Sb	HM	C2,5	0.85	$630+170+280=1 080
Sp-4	18	P/Sb	M	C3	1.0	$630+170+140= 940
	19	P/Sb	M	C3	1.0	$630+170+140= 940
Sp-Bf	20	P/Sb	M	C2,5	1.0	$630+170+140=1 080
	21	P/Sb	M	C2,5	1.0	$630+170+140=1 080
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; HM = Heavy mechanical; MC = Mechanical/Chemical;
C# = chemical treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 5. The silvicultural specifications for the aggregates under the Aerial-Tending-Only (B) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep..	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	HM	C2,5	0.85	$630+400+280=1 310
	5	P/Pj	HM	C2,5	0.85	$630+400+280=1 310
	6	S/Pj	HM	C2,5	0.85	$ 7+400+280= 687 (*1 087)
Pj-3	7	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	8	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	9	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	HM	C2,5	0.85	$630+400+280=1 310
	17	P/Sb	HM	C2,5	0.85	$630+400+280=1 310
Sp-4	18	P/Sb	M	C3	1.0	$630+170+140= 940
	19	P/Sb	M	C3	1.0	$630+170+140= 940
Sp-Bf	20	P/Sb	M	C2,5	1.0	$630+170+140=1 080
	21	P/Sb	M	C2,5	1.0	$630+170+140=1 080
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; Heavy Mechanical; MC = Mechanical/Chemical;
C# = chemical treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 6. The silvicultural specifications for the aggregates under the Aerial-Tending-Only (C) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	HSSM	C2,5	1.0	$630+500+280=1 410
	5	P/Pj	HSSM	C2,5	1.0	$630+500+280=1 410
	6	S/Pj	HSSM	C2,5	1.0	$ 7+500+280= 787 (*1 187)
Pj-3	7	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	8	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
	9	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-1	10	P/Sb	M	C2	1.0	$630+170+140= 940
	11	P/Sb	M	C2	1.0	$630+170+140= 940
	12	S/Pj	M	C3	1.0	$ 7+170+140= 317 (*717)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	HM	C2,5	0.85	$630+500+280=1 410
	17	P/Sb	HM	C2,5	0.85	$630+500+280=1 410
Sp-4	18	P/Sb	M	C3	1.0	$630+170+140= 940
	19	P/Sb	M	C3	1.0	$630+170+140= 940
Sp-Bf	20	P/Sb	M	C2,5	1.0	$630+170+140=1 080
	21	P/Sb	M	C2,5	1.0	$630+170+140=1 080
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; HM = Heavy mechanical; HSSM = Heavy site-specific mechanical
C# = chemical treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 7. The silvicultural specifications for the aggregates under the No-Aerial-Application scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	MGC	GC2,5	1.0	$630+310+600=1 540
	5	P/Pj	MGC	GC2,5	1.0	$630+310+600=1 540
	6	S/Pj	MGC	GC2,5	1.0	$ 7+310+600= 917 (*1 317)
Pj-3	7	S/Pj	M	GC3	1.0	$ 7+170+300= 477 (*877)
	8	S/Pj	M	GC3	1.0	$ 7+170+300= 477 (*877)
	9	S/Pj	M	GC3	1.0	$ 7+170+300= 477 (*877)
Sp-1	10	P/Sb	HSSM	GC2	1.0	$630+170+300=1 100
	11	P/Sb	HSSM	GC2	1.0	$630+170+300=1 100
	12	S/Pj	HSSM	GC2	1.0	$ 7+170+300= 477 (*877)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	MGC	GC2,5	1.0	$630+310+600=1 540
	17	P/Sb	MGC	GC2,5	1.0	$630+310+600=1 540
Sp-4	18	P/Sb	M	GC3	1.0	$630+170+300=1 100
	19	P/Sb	M	GC3	1.0	$630+170+300=1 100
Sp-Bf	20	P/Sb	M	GC2,5	1.0	$630+170+600=1 400
	21	P/Sb	M	GC2,5	1.0	$630+170+600=1 400
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; MGC = Mechanical + ground chemical; HSSM = Heavy site-specific mechanical
GC# = Ground chemical treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 8. The silvicultural specifications for the aggregates under the Other-Weed_Control (A) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	HSSM	BS5,7	1.0	$630+500+800=1 930
	5	P/Pj	HSSM	BS5,7	1.0	$630+500+800=1 930
	6	S/Pj	HSSM	BS5,7	1.0	$ 7+500+800=1 307
Pj-3	7	S/Pj	M	G-3	1.0	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10	P/Sb	HSSM	BS5	1.0	$630+500+400=1 530
	11	P/Sb	HSSM	BS5	1.0	$630+500+400=1 530
	12	S/Pj	HSSM	BS5	1.0	$ 7+500+400= 907 (*1 307)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	HSSM	BS5,7	1.0	$630+500+800=1 930
	17	P/Sb	HSSM	BS5,7	1.0	$630+500+800=1 930
Sp-4	18	P/Sb	M	G-3	1.0	$630+170+200=1 000
	19	P/Sb	M	G-3	1.0	$630+170+250=1 050
Sp-Bf	20	P/Sb	HSSM	BS5,7	1.0	$630+500+800=1 930
	21	P/Sb	HSSM	BS5,7	1.0	$630+500+800=1 930
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; HSSM = Heavy site-specific mechanical
C# = chemical treatment at # years; BS# = Brush saw treatment at # years
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 9. The silvicultural specifications for the aggregates under the Other-Weed-Control (B) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pj	HSSM	BS5,7	0.85	$630+500+800=1 930
	5	P/Pj	HSSM	BS5,7	0.85	$630+500+800=1 930
	6	S/Pj	HSSM	BS5,7	0.85	$ 7+500+800=1 307
Pj-3	7	S/Pj	M	G-3	1.0	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10	P/Sb	HSSM	BS5	0.9	$630+500+400=1 530
	11	P/Sb	HSSM	BS5	0.9	$630+500+400=1 530
	12	S/Pj	HSSM	BS5	0.9	$ 7+500+400= 907 (*1 307)
Sp-2	13	P/Sb	M		1.0	$630+170+ 0= 800
	14	P/Sb			1.0	$630+ 0+ 0= 630
	15	N			1.0	
Sp-3	16	P/Sb	HSSM	BS5,7	0.85	$630+500+800=1 930
	17	P/Sb	HSSM	BS5,7	0.85	$630+500+800=1 930
Sp-4	18	P/Sb	M	G-3	1.0	$630+170+200=1 000
	19	P/Sb	M	G-3	1.0	$630+170+250=1 050
Sp-Bf	20	P/Sb	HSSM	BS5,7	0.85	$630+500+800=1 930
	21	P/Sb	HSSM	BS5,7	0.85	$630+500+800=1 930
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; HSSM = Heavy site-specific mechanical
C# = chemical treatment at # years; BS# = Brush saw treatment at # years; G-3 = Girdle 3 years prior to harvest
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 10. The silvicultural specifications for the aggregates under the No-Weed-Control scenario and the accompanying costs per hectare and percent yield of the BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	S/Pj	HSSM		0.9	$ 7+500+ 0= 507 (*907)
	2	S/PJ	HSSM		0.9	$ 7+500+ 0= 507 (*907)
	3	S/Pj	HSSM		0.9	$ 7+500+ 0= 507 (*907)
Pj-2	4	P-L/Pj	HSSM		0.8	$700+500+ 0=1 200 (*1 600)
	5	P-L/Pj	HSSM		0.8	$700+500+ 0=1 200 (*1 600)
	6	S/Pj	HSSM		0.8	$ 7+500+ 0= 507 (*907)
Pj-3	7	S/Pj	HSSM		0.85	$ 7+170+100= 277 (*677)
	8	S/Pj	HSSM		0.85	$ 7+170+150= 327 (*727)
	9	S/Pj	HSSM		0.85	$ 7+170+200= 377 (*777)
Sp-1	10	P-L/Sb	HSSM		0.9	$700+500+ 0=1 200
	11	P-L/Sb	HSSM		0.9	$700+500+ 0=1 200
	12	S/Pj	HSSM		0.9	$ 7+500+ 0= 507 (*907)
Sp-2	13	P-L/Sb	HSSM		0.9	$700+500+ 0=1 200
	14	P-L/Sb			1.0	$700+ 0+ 0= 700
	15	N			1.0	
Sp-3	16	P-L/Sb	HSSM		0.8	$700+500+ 0=1 200
	17	P-L/Sb	HSSM		0.8	$700+500+ 0=1 200
Sp-4	18	P-L/Sb	HSSM		0.85	$630+170+200=1 000
	19	P-L/Sb	HSSM		0.85	$630+170+250=1 050
Sp-Bf	20	P-L/Sb	HSSM		0.85	$630+500+800=1 930
	21	P-L/Sb	HSSM		0.85	$630+500+800=1 930
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; P-L = Plant large stock; N = Natural
M = Mechanical; HSSM = Heavy site-specific mechanical
PJ = Jack Pine; SB = Black Spruce
* cost if spaced.

Table 11. The silvicultural specifications for the aggregates under the Flexible-Wood-Supply (N) scenario and the accompanying costs per hectare and percent yield of the BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep..	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	N			1.0	
	2	N			1.0	
	3	N			1.0	
Pj-2	4	N			1.0	
	5	N			1.0	
	6	N			1.0	
Pj-3	7	N			1.0	
	8	N			1.0	
	9	N			1.0	
Sp-1	10	N			1.0	
	11	N			1.0	
	12	N			1.0	
Sp-2	13	N			1.0	
	14	N			1.0	
	15	N			1.0	
Sp-3	16	N			1.0	
	17	N			1.0	
Sp-4	18	N			1.0	
	19	N			1.0	
Sp-Bf	20	N			1.0	
	21	N			1.0	
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

N = Natural
PJ = Jack Pine; SB = Black Spruce; Po = Poplar

Table 12. The silvicultural specifications for the aggregates under the Flexible-Wood-Supply (GW) scenario and the accompanying costs per hectare and percent yield of BAU yield curves.

Agg. Gr.	Agg. No.	Regen./ Species	Site Prep.	Tending (Type,yr)	PCT of BAU Yield	Cost ($/ha)
Pj-1	1	P/Pr	M		NEW	$700+170+ 0= 870 (*1 270)
	2	S/PJ	M		1.0	$ 7+170+ 0= 177 (*577)
	3	S/Pj	M		1.0	$ 7+170+ 0= 177 (*577)
Pj-2	4	P/Pr	MC	C2	NEW	$700+310+140=1 150 (*1 450)
	5	P/Pj	MC	C2,5	1.0	$630+310+280=1 220
	6	S/Pj	MC	C2,5	1.0	$ 7+310+280= 597 (*997)
Pj-3	7	P/Pr	M	G-3	NEW	$ 7+170+100= 277 (*677)
	8	S/Pj	M	G-3	1.0	$ 7+170+150= 327 (*727)
	9	S/Pj	M	G-3	1.0	$ 7+170+200= 377 (*777)
Sp-1	10					
	11					
	12					
Sp-2	13					
	14					
	15					
Sp-3	16					
	17					
Sp-4	18					
	19					
Sp-Bf	20					
	21					
Po-1	22	N			1.0	
	23	N			1.0	
Po-2	24	N			1.0	
	25	N			1.0	
	26	N			1.0	
Po-3	27	N			1.0	
	28	N			1.0	
Po-4	29	N			1.0	
	30	N			1.0	

S = Seeded; P = Planted; N = Natural
M = Mechanical; MC = Mechanical/Chemical;
C# = chemical treatment at # years
PJ = Jack Pine; SB = Black Spruce; Pr = Red Pine
* cost if spaced.

APPENDIX XI

SAMPLE CALCULATIONS OF TREATMENT AREA, REAL FOREST AREA TREATED AND ACTIVE INGREDIENT

Examples shown represent the calculations made for period 1 (1992-1997) for the BAU scenario:

Real Forest Area Treated:

Summation of average area treated with herbicide in all Forest Types.

Forest Type	Real Area (ha)
Spruce	152
Jack Pine	609
Total	761

Treatment Area

Average annual treatment area (hectares treated) over the 100-year simulation period.

Forest Type	Herbicide Treatments (ha/yr)			Total
	1	2	3	
SP	1	196	0	197
PJ	545	0	7	552
Total	546	196	7	569

Active Ingredient:

Average annual level of glyphosate active ingredient applied to the forest in kilograms per hectare (tending rate = 1.5 kg/ha; site preparation rate = 2.1 kg/ha)

Forest Type	Active Ingredient (kg/yr)		Total
	Tending	SIP	
SP	589.5	0 0	589.5
PJ	839.4	15.1	854.5
Total	1 428.9	15.1	1 444.0

APPENDIX XII

REPORT ON FOREST MANAGEMENT ACTIVITIES AND AGE-CLASS DISTRIBUTIONS RESULTING FROM FORMANCP RUNS OF THE VARIOUS SCENARIOS

SHORT REPORT FOR PJ IN THE BAU SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: YC3.BAU
FOREST CLASS FILE: PJ2.BAU
COST FILE: COST.BAU

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT	REAL.
5	5778	763.	0	745000	43666	0	4963	4963	500	14901	1298	0	200	66686.	29418.
10	5244	732	0	745000	43940	0	4945	4945	500	14901	1040	0	200	79049.	44292.
15	4733	700	0	745000	48916	0	4751	4751	500	14901	1677	0	200	83170	49207
20	4159	683	0	745000	42549	0	5049	5049	500	14900	1527	0	200	77013	41575.
25	3621	673	0	745000	45303	0	4804	4804	500	14898	1421	0	200	85425.	50928
30	3081	649	0	745000	44424	0	4891	4891	500	14899	1369	0	200	77836	43260.
35	2526	672	0	745000	47088	0	4986	4986	500	14901	1905	0	200	64872.	26885
40	1936	667	0.	745000	58298	0	5301	5301	500	14900	3243	0	200	43683.	4850
45	1515	641	0	745000	89403	0	7027	7027	500	14897	4234	0	200	33308.	0
50	2418	618	0	745000	100451	0	4834	4834	500	14901	5011	0	200	2088.	0.
55	2538	627	0	745000	62936	0	4828	4828	500	14901	1471	0	199	2667	0
60	2023	633	0	745000	59687	0	5029	5029	500	14900	1008	0	201	0	0
65	1487	642	0	745000	57018	0	4738	4738	500	14900	863	0	200	0	0
70	1672	639	0	745000	70199	0	4878	4878	500	14902	1749	0	199	0.	0
75	1998	620	0	745000	97766	0	5304	5304	500	14900	3074	0	200	0	0
80	2272	651	0	745000	62801	0	6721	6721	500	14900	1886	0	200	0	0
85	2656	683	0.	745000	61033	0	4642	4642	500	14900	1586	0	200	0	0
90	3092	709	0	745000	63631	0	5460	5460	500	14900	1916	0	200	0	0
95	3366	727	0.	745000	62307	0	4534	4534	500	14900	1460	0	200	0.	0
100	3567	708	0	745000	92650	0	4351	4351	500	14901	2944	0	200	0.	0

1

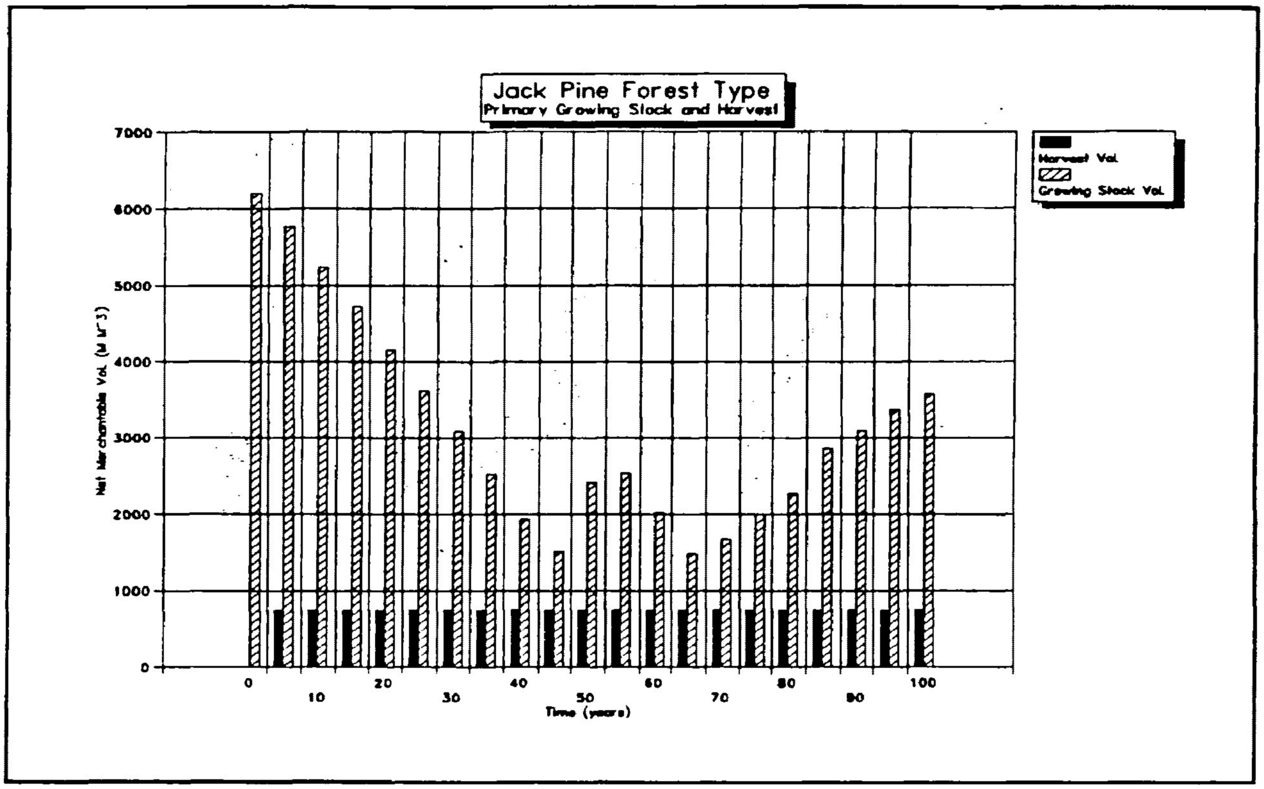
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4584	170	0	0	0
30	19549	24135	3138	1489	18218	5661	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7616	1218	54	0	0
50	22205	19549	24135	2472	197	4176	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	630	0	0	0	0	0
65	21738	19982	19708	10664	662	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10966	650	0	0	0	0	0
80	19949	21366	19694	11352	373	0	0	0	0	0
85	21641	19066	19822	12012	191	0	0	0	0	0
90	21545	19429	19393	11696	869	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13024	206	0	0	0	0	0

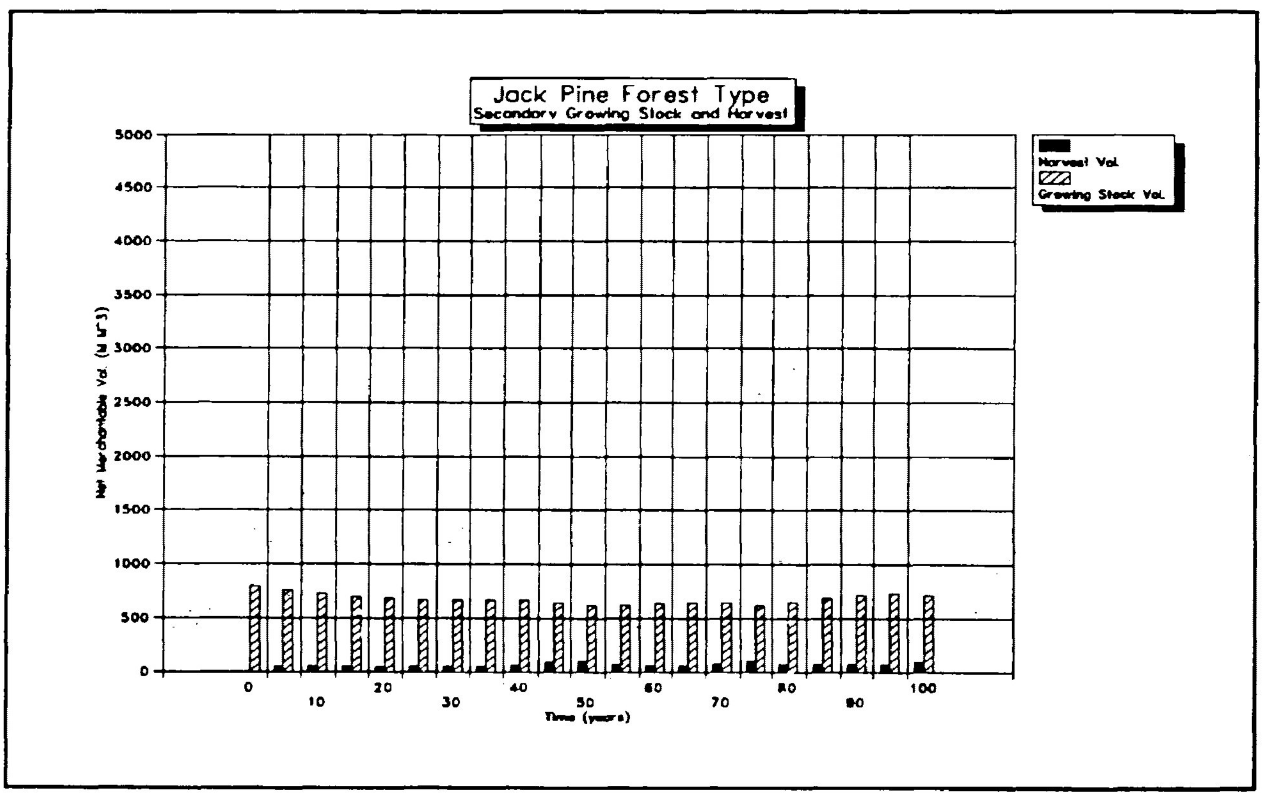
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	672	745	45	0	0	4804	4804	500	0	16	27	11
30	3081	649	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	58	0	0	5301	5301	500	0	18	27	9
45	1514	641	745	89	0	0	7027	7027	500	0	19	28	9
50	2417	618	745	100	0	0	4834	4834	500	0	20	28	8
55	2538	626	745	62	0	500	4328	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	16	27	11
75	1998	619	745	67	2771	1160	1373	5304	500	0	18	28	12
80	2271	650	745	62	6041	500	180	6721	500	0	16	27	11
85	2855	682	745	61	4090	500	52	4642	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	11
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	11

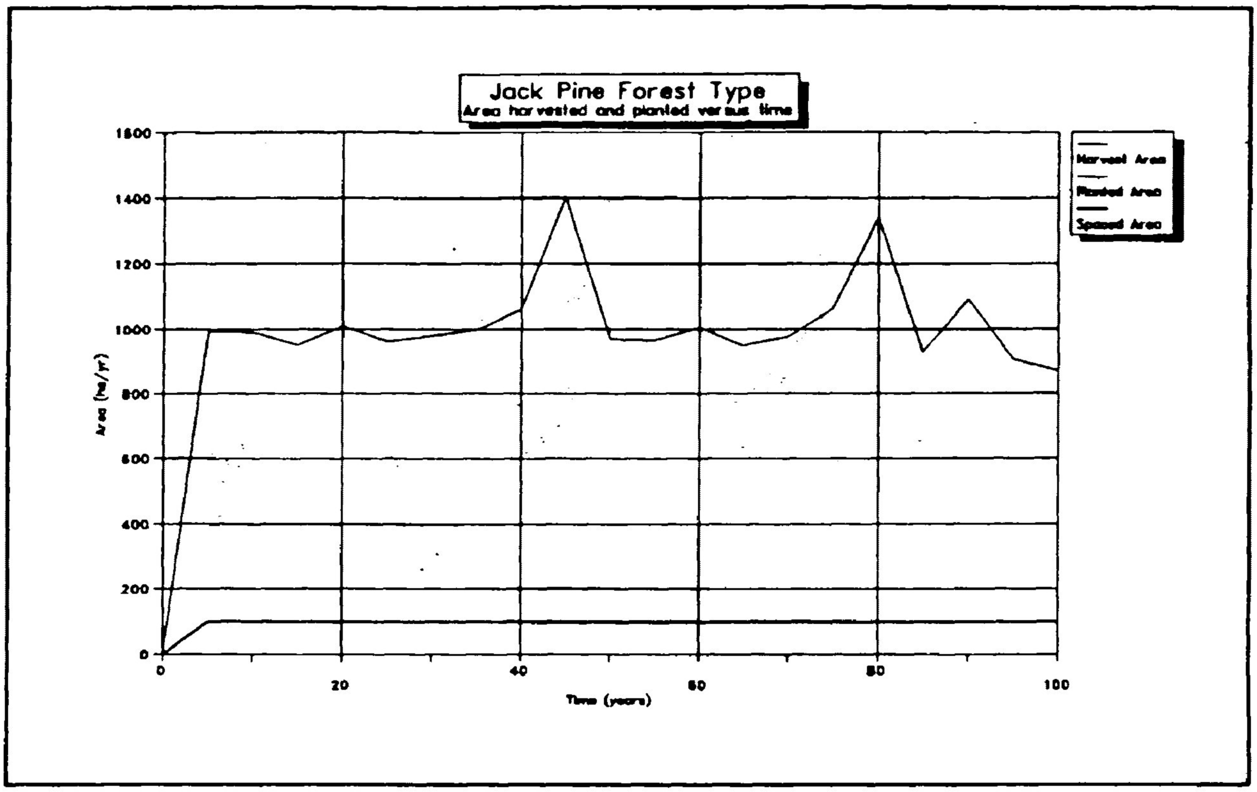
HARVEST COST	76357 91
PLANT., THIN. & MAINTENANCE	9642 14
TOTAL BENEFIT	136562 10
PNW (EXCL. HARVEST COST)	126921 02
PNW (INCL. HARVEST COST)	52563 89



The Jack Pine Forest Type's primary growing stock and harvest volumes at five-year intervals in future time.



The Jack Pine Forest Type's secondary growing stock and harvest volumes at five-year intervals in future time.



The Jack Pine Forest Type's harvested, regenerated and spaced areas as a function of time.

SHORT REPORT FOR SP IN THE BAU SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE YC3.BAU
FOREST CLASS FILE: BB-BF.BAU
COST FILE: COST.BAU

R E P O R T, O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	3527	2664	0	455000	170462	0	4011	1000	0	9100	1075	0	0	19699.	0.
10	3960	2437	0.	455000	236661	0	3525	1000	0	9099	1080	0	0	18771.	0.
15	4083	2308	0.	455000	132017	0	3966	1000	0	9099	1080	0	0	46996.	0.
20	4173	2160.	0.	455000	171710	0	3940	1000	0	9101	1080	0	0	48149.	0.
25	4135	2003	0	455000	182894	0	3589	1000	0	9101	1080	0	0	21935.	0.
30	4003	1903	0	455000	160646	0	3467	1000	0	9100	1066	0	0	14547.	0.
35	3791	1852.	0	455000	114667	0	3418	1000	0	9101	889	0	0	4742.	0.
40	3537	1851	0.	455000	107301	0	3149	1000	0	9099	857	0	0	707.	0.
45	3274	1905	0	455000	70786	0	3234	1000	0	9101	890	0	0	426.	0.
50	3073	2038.	0	455000	31596	0	3082	1000	0	9099	829	0	0	72	0.
55	2791	2208.	0.	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0.
60	2433	2404	0	455000	29283	0	3111	1000	0	9101	889	0	0	954.	0.
65	2050	2398	0	455000	244973	0	4500	1000	0	9102	1080	0	0	11316.	0.
70	1745	2432	0	455000	241651	0	4671	1000	0	9101	1080	0	0	18877.	0.
75	1449	2643	0.	455000	75191	0	3578	1000	0	9099	920	0	0	1755.	0.
80	1260	2925	0.	455000	6579	0	2880	1000	0	9100	929	0	0	50.	0.
85	1039	3070	0	455000	180767	0	4390	1000	0	9100	1070	0	0	573	0.
90	803	2910	0.	455000	533679	0	6206	1000	0	9102	1172	0	0	884	0.
95	711	3128	0	455000	162944	0	4059	1000	0	9101	1076	0	0	1270.	0.
100	935	3223	0	455000	287601	0	5900	1000	0	9099	1066	0	0	934.	0.

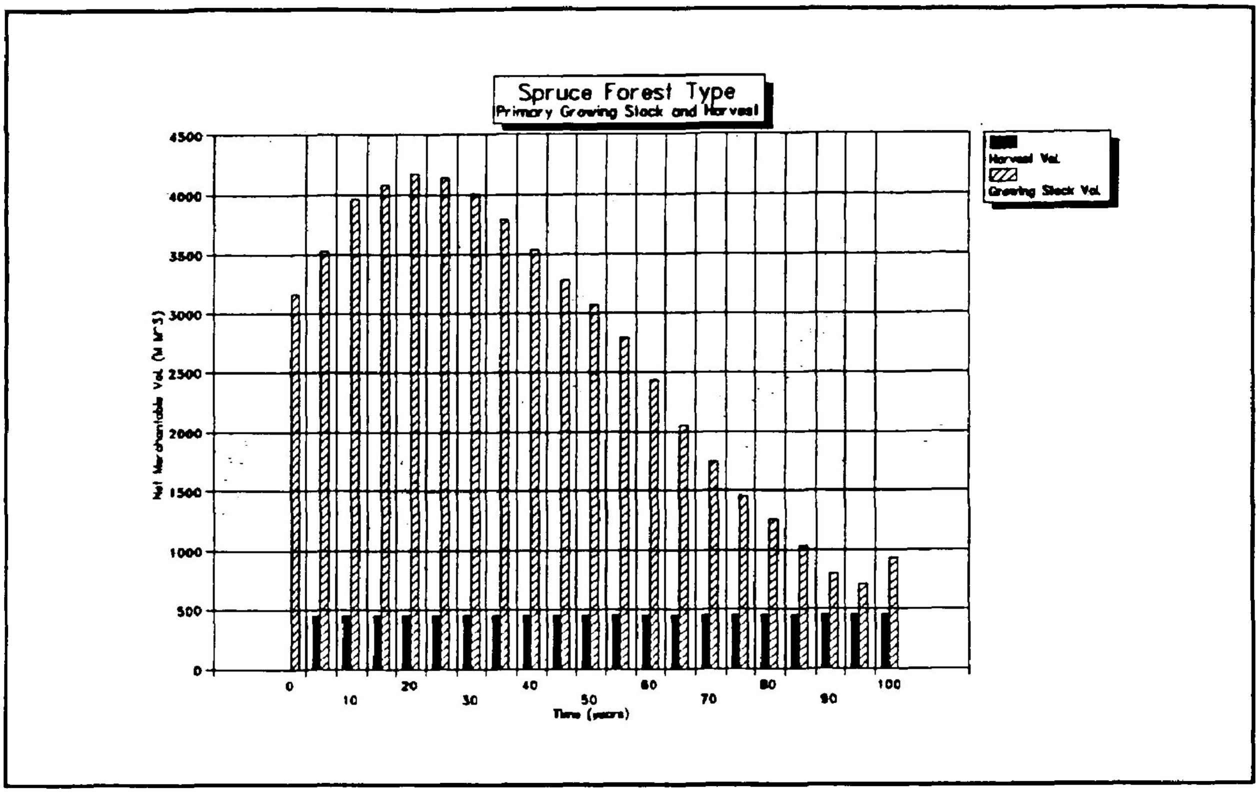
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	199	0	37
10	12533	959	8521	15710	18509	7098	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	100	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	100	7
40	14414	13087	6979	1642	4021	13616	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	346	56
55	12883	14962	15781	1002	1001	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	851	4710	6362	259	56
75	15345	12883	11144	14606	399	655	3424	6115	259	56
80	15860	12528	12133	9776	6706	412	809	6353	259	56
85	15629	12490	13323	10847	7499	258	618	4144	0	74
90	15519	13756	13268	10161	9665	170	256	2037	0	74
95	17054	15345	12883	10274	8948	145	141	32	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

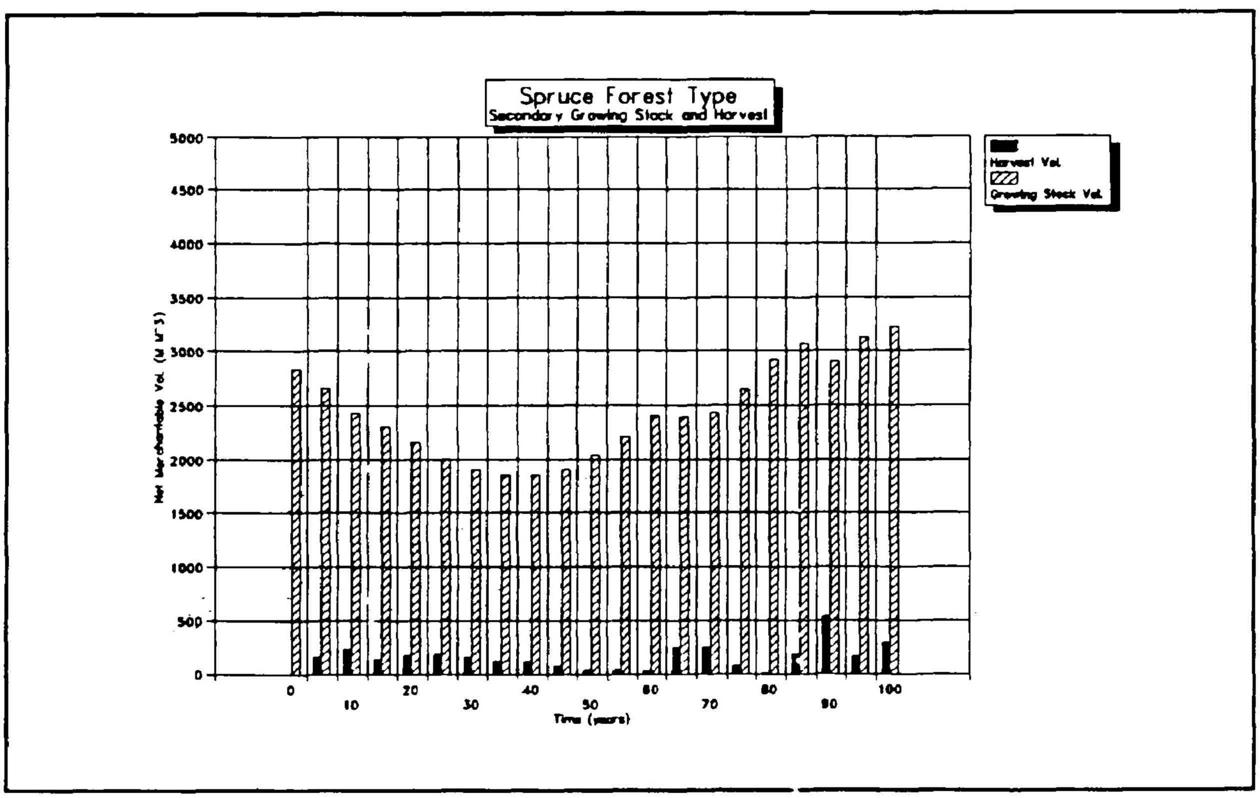
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	9	18	9
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	9
45	3274	1905	455	70	0	0	3234	1000	0	2234	9	17	8
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1663	0	4237	1000	0	4900	10	23	13

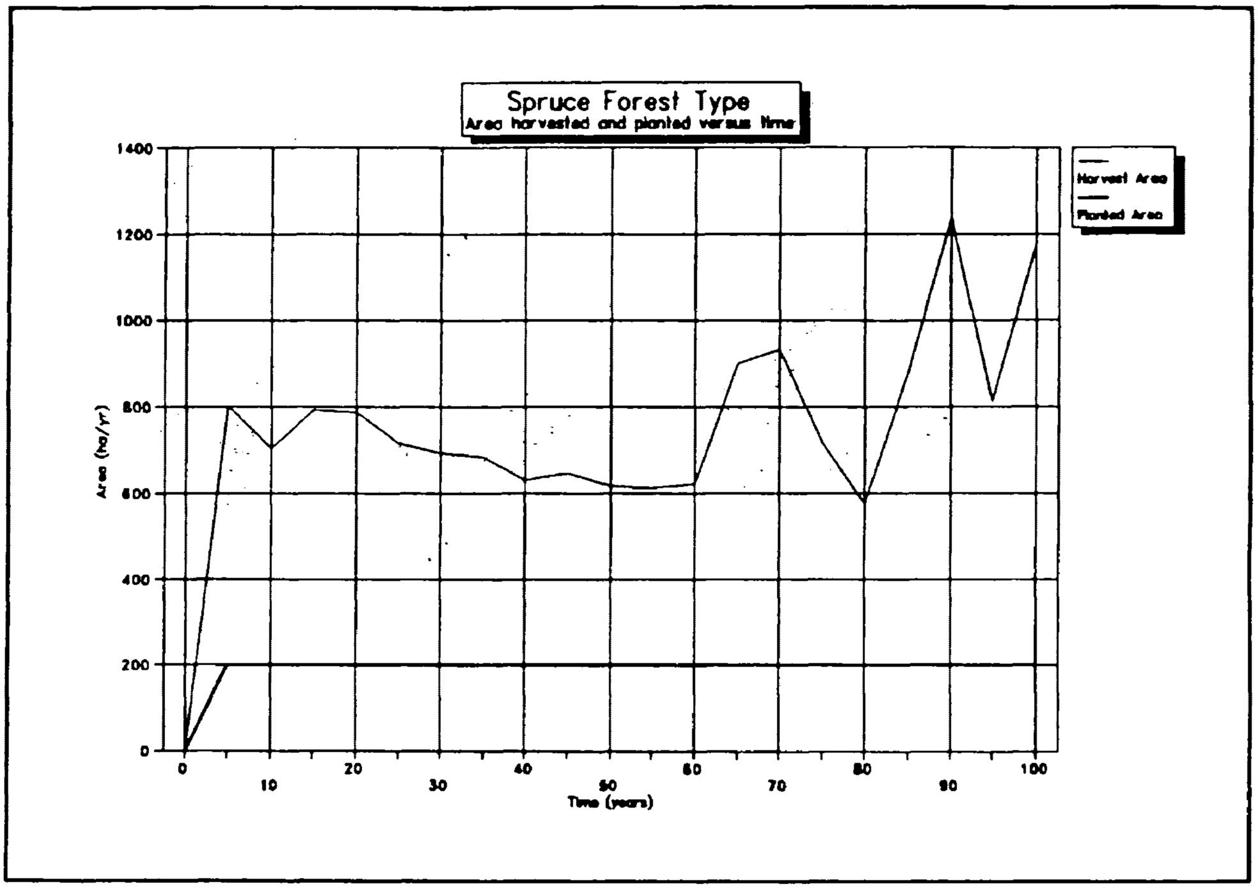
HARVEST COST	45412 46
PLANT, THIN, & MAINTENANCE	5133 54
TOTAL BENEFIT	99169 22
NPV (EXCL HARVEST COST)	94035 65
NPV (INCL HARVEST COST)	48623 18



The Spruce Forest Type's primary growing stock and harvest volumes at five-year intervals in future time.



The Spruce Forest Type's secondary growing stock and harvest volumes at five-year intervals in future time.



The Spruce Forest Type's harvested and regenerated areas as a function of time.

SHORT REPORT FOR PO IN THE BAU SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

80000	80000	80000	80000	80000	80000	80000	80000	80000	80000
80000	80000	80000	80000	80000	80000	80000	80000	80000	80000

PLANTING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE YC2.BAU
FOREST CLASS FILE PO.BAU
COST FILE COST.BAU

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL
5	3777	410	0	80000	10933	0	553	0	0	1601	0	0	0	41492.	34183
10	3747.	451	0.	80000	14723	0	588	0	0	1600	0	0	0	51965	44321
15	3700	512.	0	80000	15407	0	593	0	0	1600	0	0	0	78045.	70336
20	3565	595	0	80000	14155	0	581	0	0	1600	0	0	0	111831.	103332.
25	3413	699	0.	80000	13920	0	571	0	0	1600	0	0	0	132200.	124573.
30	3391	788.	0.	80000	15116	0	588	0	0	1600	0	0	0	122043.	114359
35	3243	865.	0	80000	14723	0	590	0	0	1600	0	0	0	114387.	105725
40	3139	942	0	80000	13169	0	574	0	0	1600	0	0	0	109593.	100315
45	3049	993.	0.	80000	16617	0	625	0	0	1601	0	0	0	96914	82497
50	2976	1029	0	80000	18598	0	641	0	0	1602	0	0	0	84073.	66311
55	2906	1060	0.	80000	19253	0	620	0	0	1600	0	0	0	85831.	60918
60	2847	1061	0.	80000	45446	0	1123	0	0	1599	0	0	0	126787	54742
65	2778	1058	0.	80000	49230	0	1243	0	0	1600	0	0	0	139154	59165
70	2712	1077	0.	80000	33111	0	914	0	0	1600	0	0	0	113196.	63338.
75	2602	1078	0.	80000	49229	0	947	0	0	1600	0	0	0	186505.	106521.
80	2399	1079	0.	80000	49565	0	870	0	0	1600	0	0	0	282561.	202521.
85	2094	1087	0	80000	49565	0	870	0	0	1600	0	0	0	383994.	303954
90	1799	1094	0	80000	49565	0	870	0	0	1600	0	0	0	395914.	315874
95	1638	1086	0	80000	49022	0	995	0	0	1600	0	0	0	230927.	150922
100	1473	1075	0	80000	49565	0	870	0	0	1600	0	0	0	260172.	180132.

1

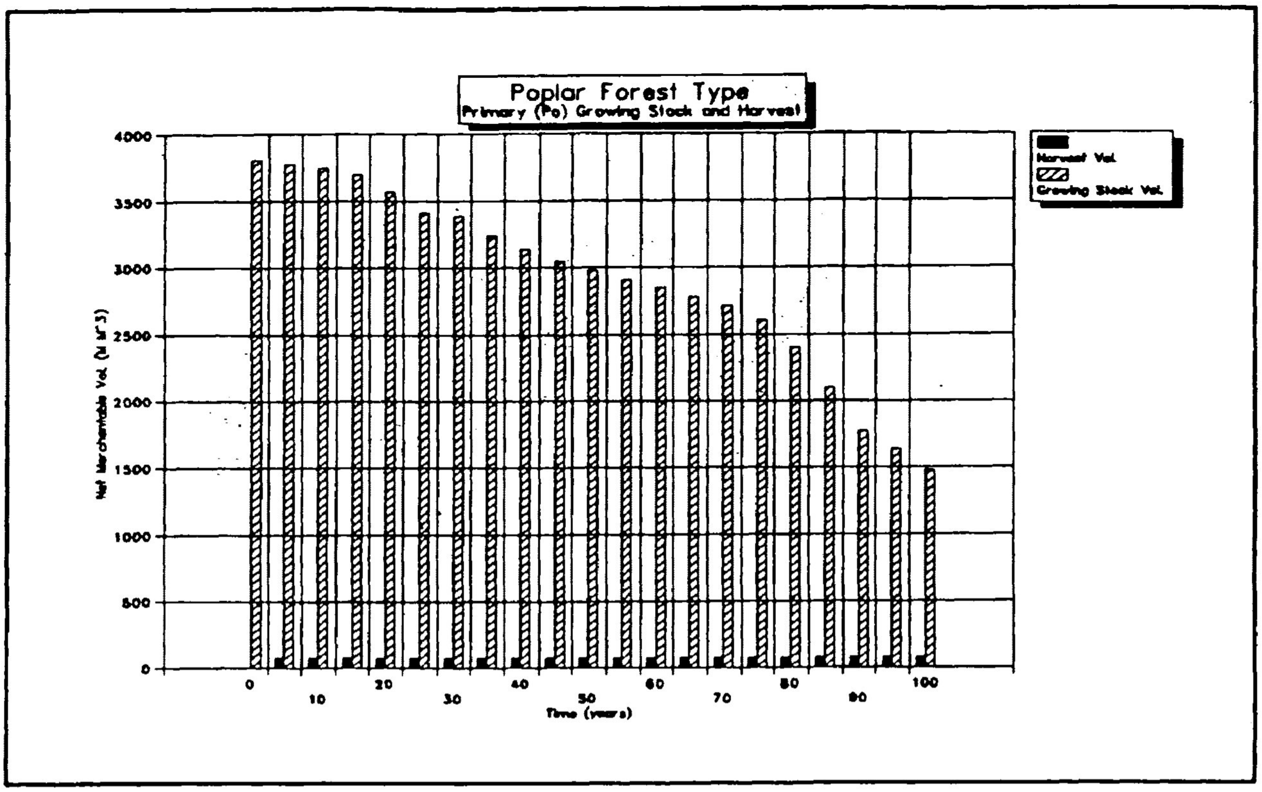
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	3618	1682	7083	16375	5684	619	0	0	0	0
10	3891	1484	4228	16547	7429	1282	0	0	0	0
15	4149	1810	2144	14009	10535	2148	86	0	0	0
20	1837	4269	1521	9710	14662	2062	200	0	0	0
25	2315	3618	1682	7083	15815	3950	398	0	0	0
30	2333	3891	1484	4228	15860	5804	1261	0	0	0
35	2333	4149	1810	2144	13319	8913	2148	45	0	0
40	2330	1837	4269	1521	9123	12963	2639	179	0	0
45	2323	2315	3618	1682	6489	16170	3886	398	0	0
50	2377	2333	3891	1484	3510	14383	5690	1193	0	0
55	2430	2333	4149	1810	1517	11852	8820	1950	0	0
60	2460	2330	1837	4269	1028	7703	12928	2306	0	0
65	3009	2323	2315	3618	1319	5387	13937	2953	0	0
70	3627	2377	2333	3891	1484	2572	13833	4764	0	0
75	3900	2430	2333	4149	1579	1066	11392	8012	0	0
80	4227	2460	2330	1837	4121	880	7595	11411	0	0
85	3974	3009	2323	2315	3618	1888	5387	12607	540	0
90	3601	3627	2377	2333	3891	1253	2572	12835	2372	0
95	3557	3900	2430	2333	4149	1579	1066	10522	5325	0
100	3605	4227	2460	2330	1837	4121	880	6602	8801	0

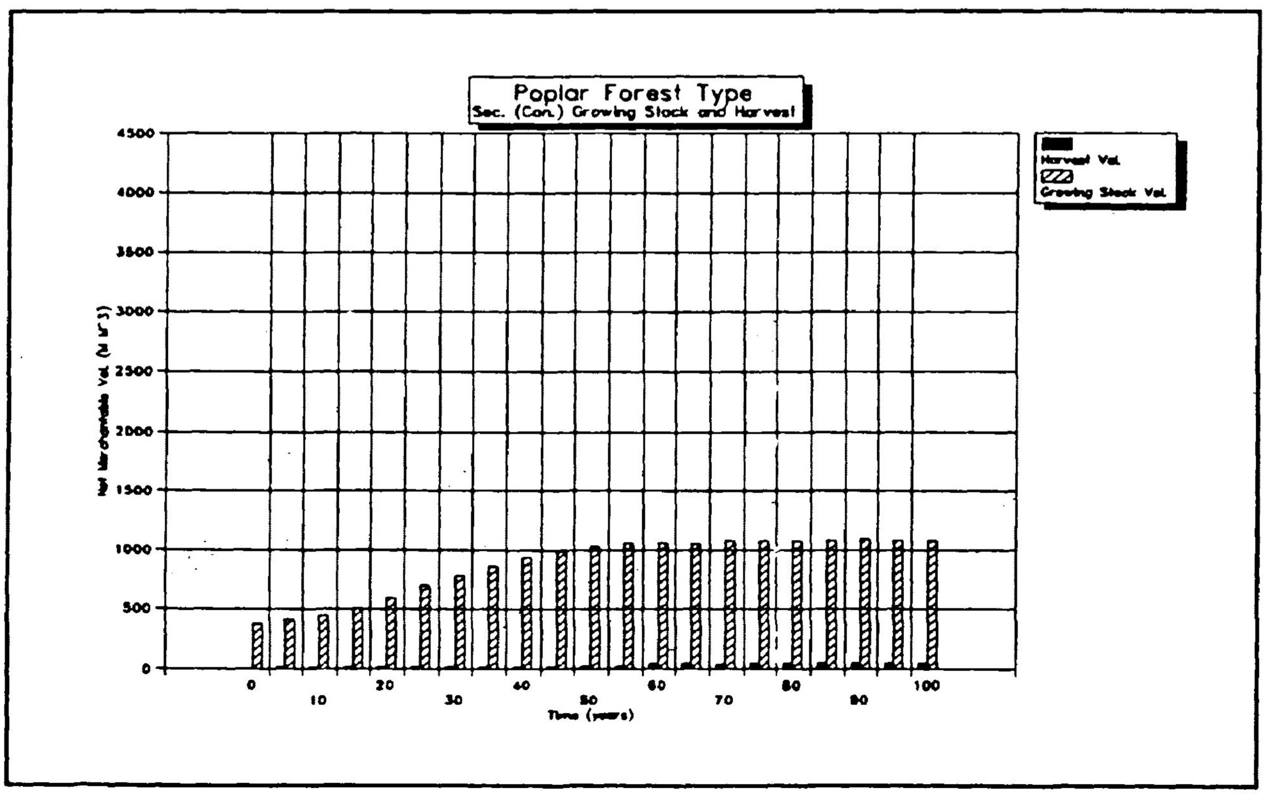
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIN	SEC	PRIN	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	(M$)	(M$)	(M$)
0	3806	373											
5	3777	409	80	10	0	0	553	0	0	553	1601	3072	1471
10	3746	451	80	14	0	0	588	0	0	588	1600	3167	1567
15	3699	511	80	15	0	0	593	0	0	593	1600	3105	1505
20	3565	594	80	14	0	0	581	0	0	581	1600	3153	1553
25	3412	698	80	13	0	0	571	0	0	571	1600	3147	1547
30	3390	787	80	15	0	0	588	0	0	588	1600	3177	1577
35	3243	864	80	14	0	0	590	0	0	590	1600	3166	1566
40	3138	942	80	13	0	0	574	0	0	574	1600	3128	1528
45	3049	992	80	16	0	0	625	0	0	625	1601	3213	1612
50	2975	1028	80	18	0	0	641	0	0	641	1602	3259	1657
55	2905	1060	80	19	0	0	620	0	0	620	1600	3276	1676
60	2846	1061	80	65	0	0	1123	0	0	1123	1599	3932	2333
65	2770	1057	80	49	0	0	1243	0	0	1243	1600	4028	2428
70	2712	1077	80	33	0	0	914	0	0	914	1600	3624	2024
75	2602	1078	80	49	0	0	947	0	0	947	1600	4029	2429
80	2398	1078	80	49	0	0	870	0	0	870	1600	4039	2439
85	2093	1086	80	49	0	0	870	0	0	870	1600	4039	2439
90	1778	1094	80	49	0	0	870	0	0	870	1600	4039	2439
95	1638	1086	80	49	0	0	995	0	0	995	1600	4024	2424
100	1472	1075	80	49	0	0	870	0	0	870	1600	4039	2439

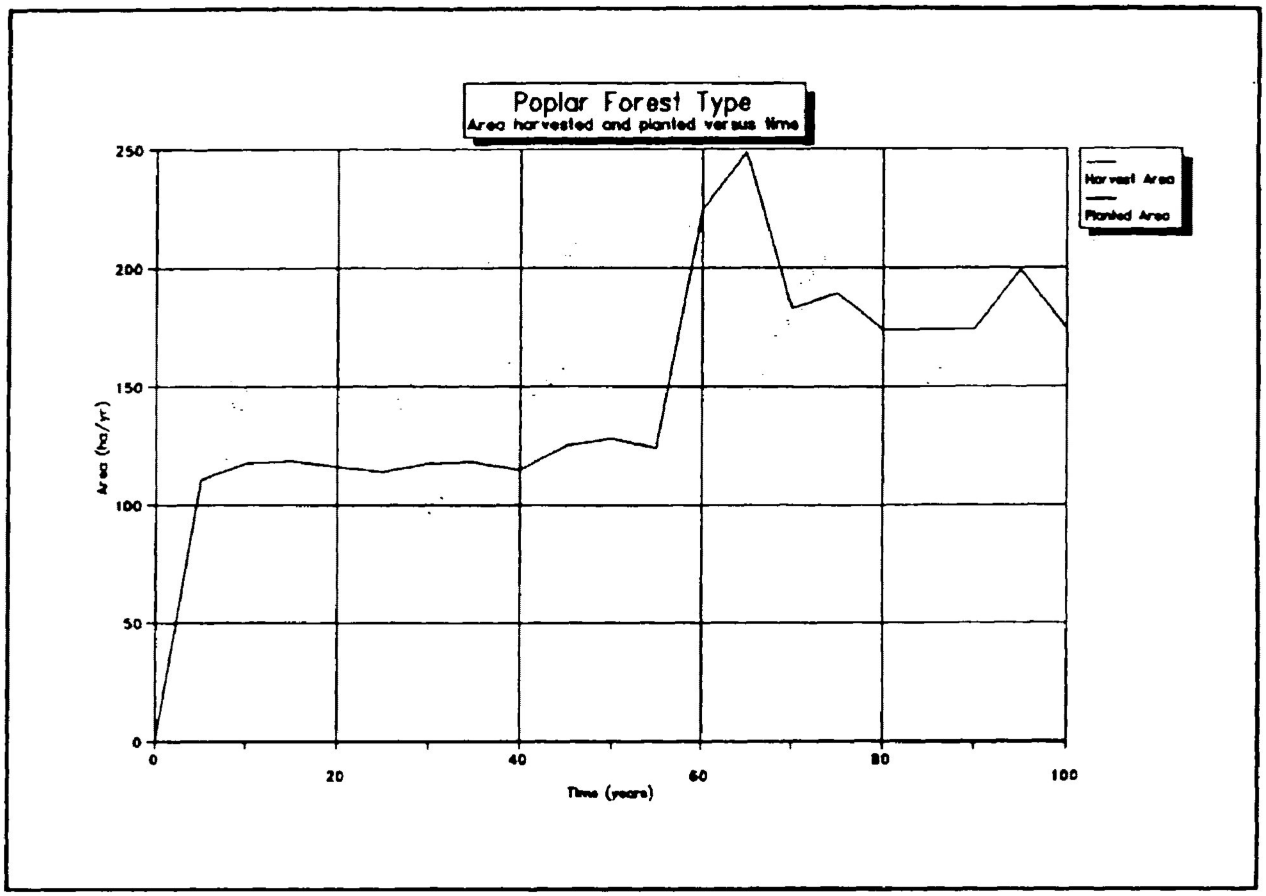
HARVEST COST	7985.91
PLANT., THIN. & MAINTENANCE	.00
TOTAL BENEFIT	16135.55
PNW (EXCL HARVEST COST)	16135.55
PNW (INCL HARVEST COST)	8149.64



The Poplar Forest Type's primary growing stock and harvest volumes at five-year intervals in future time.



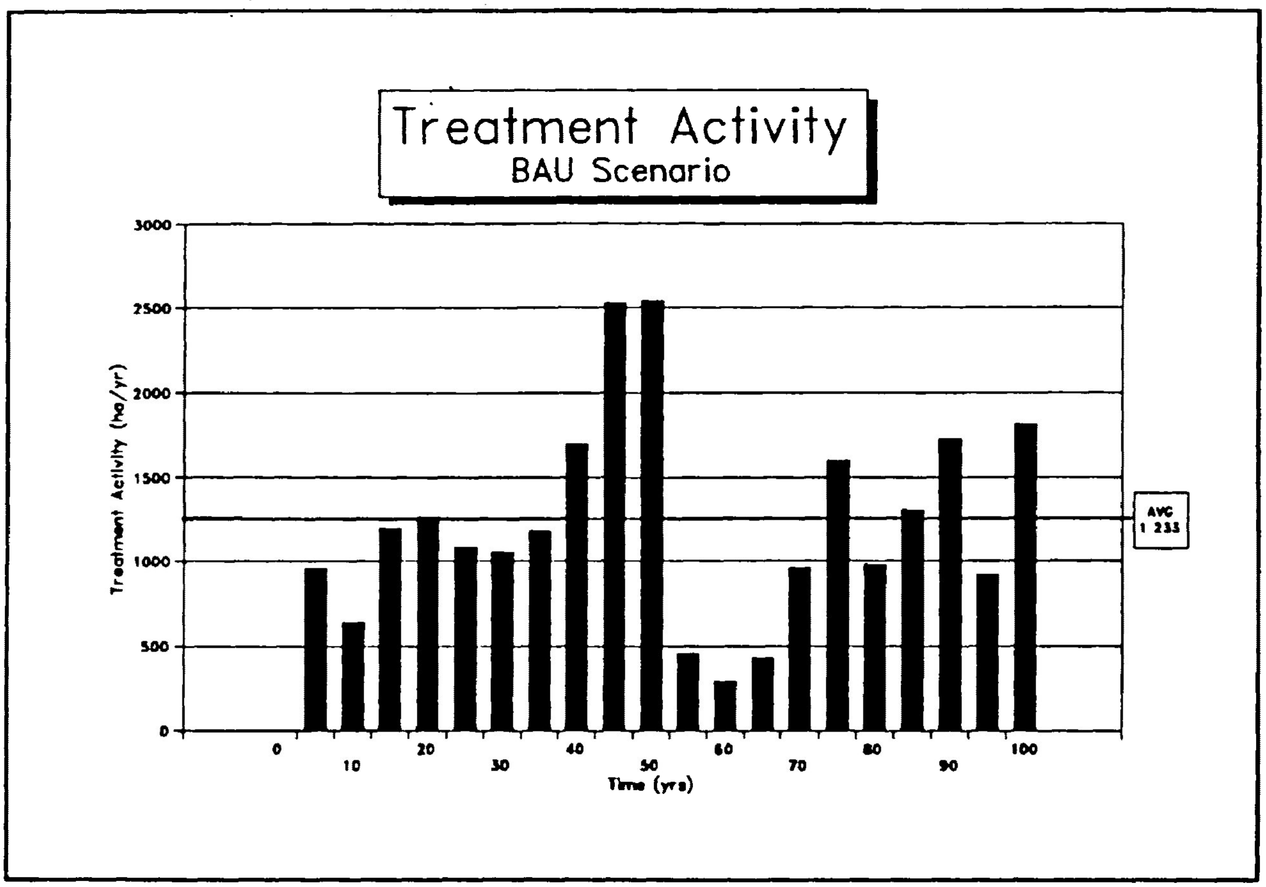
The Poplar Forest Type's secondary growing stock and harvest volumes at five-year intervals in future time.



The Poplar Forest Type's harvested and regenerated areas as a function of time.

The wood-supply and regeneration results from the forest level analysis of the Seine River Forest Management Unit under the Business-As-Usual management scenario.

Forest Type	Wood-Supply		Regeneration		
	Softwood (m^3/yr)	Hardwood (m^3/yr)	Planted (ha/yr)	Seeded (ha/yr)	Spaced (ha/yr)
Spruce	91 000	32 000	200	-	-
Jack Pine	149 000	12 000	151	869	100
Poplar	6 000	16 000	-	-	-
Total	246 000	60 000	351	869	100



The treatment activity for the BAU scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE 67%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.6hp
FOREST CLASS FILE: pj2.mau
COST FILE: cost.6hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)					MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	5778	763.	0.	745000	43666	0	4963	4963	500	14901	1289	0	200	64686.	29418.
10	5244	732	0	745000	43940	0	4945	4945	500	14901	1048	0	200	79049.	44292.
15	4733	700	0.	745000	48916	0	4751	4751	500	14901	1675	0	200	83170.	49207.
20	4159.	683.	0.	745000	42549	0	5049	5049	500	14900	1565	0	200	77013.	41575.
25	3621	673.	0.	745000	45303	0	4804	4804	500	14898	1422	0	200	85425.	50928.
30	3081	669.	0.	745000	44424	0	4891	4891	500	14899	1397	0	200	77836.	43260.
35	2526	672.	0.	745000	47088	0	4986	4986	500	14901	1925	0	200	64872.	26885.
40	1936	667.	0	745000	58298	0	5301	5301	500	14900	3262	0	200	43683.	4050.
45	1515	641.	0.	745000	89403	0	7027	7027	500	14897	4395	0	200	33308.	0.
50	2418	618	0.	745000	100451	0	4834	4834	500	14901	5017	0	200	2088.	0.
55	2538	627.	0	745000	62936	0	4828	4828	500	14901	1473	0	199	2667.	0.
60	2023	633	0	745000	59687	0	5029	5029	500	14900	1018	0	203	0.	0.
65	1487	642	0.	745000	57018	0	4738	4738	500	14900	873	0	200	0.	0.
70	1672	639.	0.	745000	70199	0	4878	4878	500	14902	1753	0	199	0.	0.
75	1998	620.	0.	745000	97766	0	5304	5304	500	14900	3096	0	200	0.	0.
80	2272	653	0.	745000	62001	0	6721	6721	500	14900	2023	0	200	0.	0.
85	2856	683.	0.	745000	61033	0	4642	4642	500	14900	1610	0	200	0.	0.
90	3092	709.	0.	745000	63631	0	5460	5460	500	14900	1944	0	200	0.	0.
95	3366	727.	0.	745000	62307	0	4534	4534	500	14900	1459	0	200	0.	0.
100	3567	708.	0.	745000	92650	0	4351	4351	500	14901	2961	0	200	0.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5481	706	36	0	0
35	19495	27490	4193	1072	13857	6961	1428	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	7	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	835	0	0	0	0	0
65	21718	19982	19708	10664	660	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10966	850	0	0	0	0	0
80	19949	21366	19694	11352	371	0	0	0	0	0
85	21641	19066	19822	12012	191	0	0	0	0	0
90	21565	19429	18393	11696	669	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13824	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (IN M3)		HARVEST (IN M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	672	745	45	0	0	4804	4804	500	0	16	27	11
30	3081	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	58	0	0	5301	5301	500	0	18	27	9
45	1514	641	745	89	0	0	7027	7027	500	0	19	28	9
50	2417	618	745	100	0	0	4834	4834	500	0	20	28	8
55	2538	626	745	62	0	508	4320	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	16	27	11
75	1998	619	745	97	2771	1160	1373	5304	500	0	18	28	12
80	2271	650	745	62	6041	500	180	6721	500	0	17	27	10
85	2855	682	745	61	4090	500	52	4642	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	10

HARVEST COST	74357.91
PLANT, THIN, & MAINTENANCE	9721.55
TOTAL BENEFIT	136563.10
PWB (EXCL. HARVEST COST)	126841.60
PWB (INCL. HARVEST COST)	52483.68

SHORT REPORT FOR SP IN THE 67%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE yc3.6hp
FOREST CLASS FILE: sb-bf.bau
COST FILE cost.6hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL
5	3527	2664	0	455000	170462	0	4011	1000	0	9100	1075	0	0	19699.	0.
10	3960	2437	0	455000	236661	0	3525	1000	0	9099	1080	0	0	18771.	0.
15	4083	2308	0	455000	132017	0	3964	1000	0	9099	1080	0	0	46996.	0.
20	4173	2160	0	455000	171710	0	3940	1000	0	9101	1080	0	0	48149.	0
25	4135	2003	0	455000	182894	0	3589	1000	0	9101	1080	0	0	21935.	0.
30	4003	1903	0	455000	160668	0	3467	1000	0	9100	1066	0	0	14547.	0
35	3791	1852	0	455000	114667	0	3418	1000	0	9101	989	0	0	4742.	0.
40	3537	1851	0	455000	107301	0	3149	1000	0	9099	857	0	0	707.	0.
45	3274	1905	0	455000	78786	0	3234	1000	0	9101	890	0	0	426.	0.
50	3073	2038	0	455000	31596	0	3082	1000	0	9099	829	0	0	72.	0.
55	2791	2208	0	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0.
60	2433	2404	0.	455000	29283	0	3111	1000	0	9101	891	0	0	954.	0.
65	2050	2398	0.	455000	244973	0	4500	1000	0	9102	1080	0	0	11316.	0.
70	1745	2432	0.	455000	241651	0	4671	1000	0	9101	1080	0	0	18877.	0.
75	1449	2643	0.	455000	75191	0	3578	1000	0	9099	931	0	0	1755.	0.
80	1260	2925	0.	455000	6579	0	2880	1000	0	9100	974	0	0	50.	0.
85	1039	3070	0.	455000	188767	0	4390	1000	0	9100	1077	0	0	573.	0.
90	801	2910	0.	455000	533679	0	6206	1000	0	9102	1179	0	0	684.	0.
95	711	3128	0.	455000	362944	0	4859	1000	0	9101	1076	0	0	1270.	0.
100	935	3223	0.	455000	287601	0	5900	1000	0	9099	1066	0	0	934.	0.

1

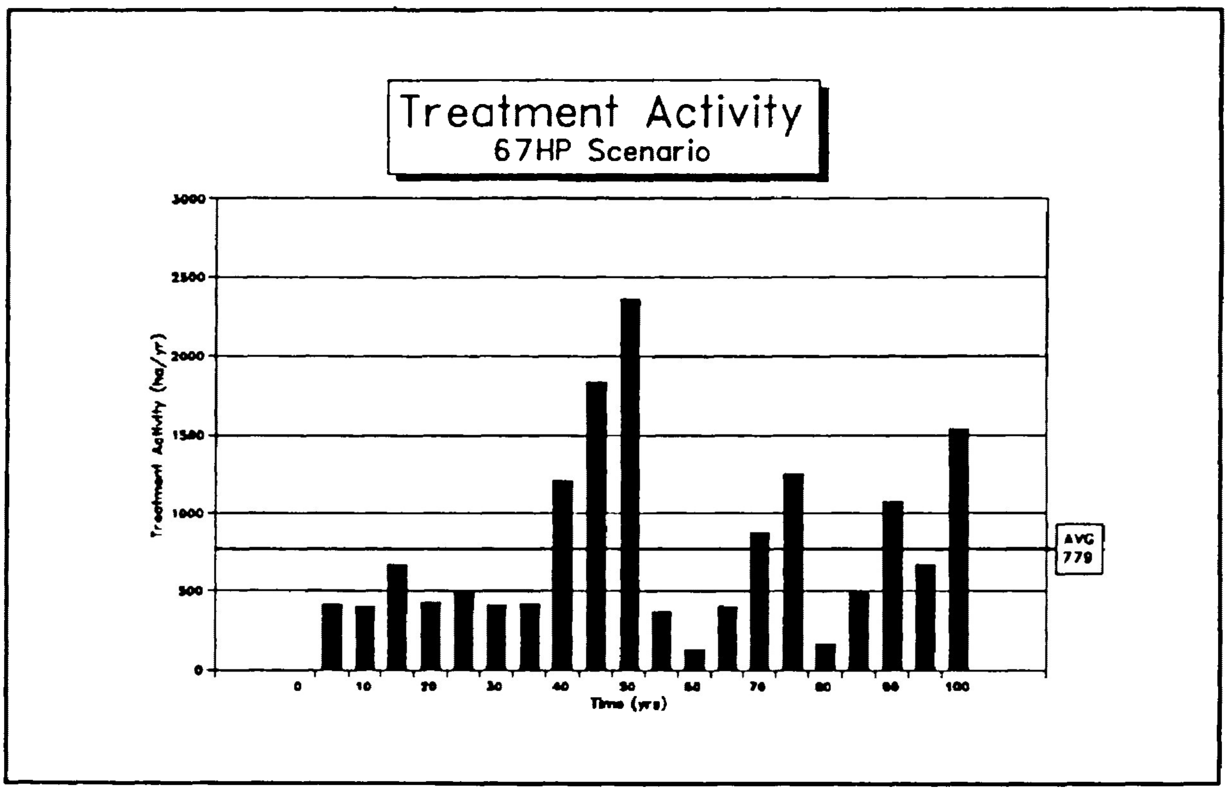
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7898	1413	136	7	0
15	15781	1005	4447	16066	15849	18187	1444	100	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7894	13967	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8567	822	100	7
40	14414	13087	6979	3642	4021	13616	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	366	56
55	12883	14962	15781	1002	1001	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	905	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	851	4718	6362	259	56
75	15345	12883	11144	14806	399	855	3424	8115	259	56
80	15860	12528	12133	9770	6706	412	809	6353	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15539	13756	13268	10161	9645	170	254	2037	0	74
95	17054	15345	12883	10274	8940	145	141	32	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	9	18	8
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	8
45	3274	1905	455	78	0	0	3234	1000	0	2234	9	17	8
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	188	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1663	0	4237	1000	0	4900	10	21	11

HARVEST COST	45412 46
PLANT., THIN. & MAINTENANCE	5137 85
TOTAL BENEFIT	99169 20
NPV (EXCL. HARVEST COST)	94032 15
NPV (INCL. HARVEST COST)	48619 68



The treatment activity for the 67HP scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE 50%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE. yc3.5hp
FOREST CLASS FILE. pj2.Hau
COST FILE cost.5hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL.
5	5778	763	0	745000	43664	0	4963	4963	500	14901	1289	0	200	64686.	29418
10	5244	732	0	745000	43940	0	4945	4945	500	14901	1048	0	200	79049.	44292
15	4733	700	0	745000	48916	0	4751	4751	500	14901	1675	0	200	83170.	49207
20	4159	683	0	745000	42549	0	5049	5049	500	14900	1565	0	200	77013.	41575
25	3623	673	0	745000	45383	0	4804	4804	500	14898	1422	0	200	85425.	50928
30	3081	669	0	745000	44424	0	4891	4891	500	14899	1397	0	200	77836	43260
35	2526	672	0	745000	47088	0	4986	4986	500	14901	1925	0	200	64872.	26885
40	1936	667	0	745000	58298	0	5301	5301	500	14900	3262	0	200	43683	4850
45	1515	641	0	745000	89403	0	7027	7027	500	14897	4395	0	200	33308.	0.
50	2418	618	0	745000	100451	0	4834	4834	500	14901	5017	0	200	2088	0
55	2538	627.	0	745000	62936	0	4828	4828	500	14901	1473	0	199	2667.	0.
60	2023	633	0	745000	59687	0	5029	5029	500	14900	1018	0	201	0.	0
65	1487	642.	0	745000	57018	0	4738	4738	500	14900	873	0	200	0	0.
70	1672	639	0	745000	70199	0	4878	4878	500	14902	1753	0	199	0.	0.
75	1998	620	0	745000	97766	0	5304	5304	500	14900	3096	0	200	0.	0
80	2272	651	0	745000	82881	0	6721	6721	500	14900	2023	0	200	0.	0
85	2856	683.	0	745000	81033	0	4642	4642	500	14900	1610	0	200	0.	0
90	3092	709	0	745000	63631	0	5460	5460	500	14900	1944	0	200	0.	0.
95	3366	727	0	745000	62307	0	4534	4534	500	14900	1459	0	200	0.	0.
100	3567	708	0	745000	92650	0	4351	4351	500	14901	2961	0	200	0.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	630	0	0	0	0	0
65	21718	19982	19708	10664	660	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10966	650	0	0	0	0	0
80	19949	21366	19694	11352	371	0	0	0	0	0
85	21641	19064	19822	12012	191	0	0	0	0	0
90	21545	19429	19393	11696	669	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13024	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	780	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	672	745	45	0	0	4804	4804	500	0	16	27	11
30	3081	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	58	0	0	5301	5301	500	0	18	27	9
45	1514	641	745	89	0	0	7027	7027	500	0	19	28	9
50	2417	618	745	100	0	0	4834	4834	500	0	20	28	8
55	2538	626	745	62	0	508	4320	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	16	27	11
75	1998	619	745	97	2771	1160	1373	5304	500	0	18	28	10
80	2271	650	745	82	6041	500	180	6721	500	0	17	27	10
85	2855	682	745	61	4090	500	52	4642	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	10

HARVEST COST	74357.91
PLANT, THIN, & MAINTENANCE	9721.55
TOTAL BENEFIT	136563.10
PNW (EXCL. HARVEST COST)	126841.40
PNW (INCL. HARVEST COST)	52483.68

SHORT REPORT FOR SP IN THE 50%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE: yc3.5hp
FOREST CLASS FILE: eb-bf.bau
COST FILE cost.5hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	3527.	2664.	0.	455000	170462	0	6011	1000	0	9100	1195	0	0	19699.	0.
10	3960	2437.	0.	455000	236461	0	3525	1000	0	9099	1200	0	0	18771.	0.
15	4083.	2308.	0.	455000	132017	0	3966	1000	0	9098	1200	0	0	46896.	0.
20	4173	2160.	0.	455000	171710	0	3940	1000	0	9101	1200	0	0	48149.	0.
25	4135	2003	0.	455000	182894	0	3589	1000	0	9101	1200	0	0	21935.	0.
30	4003	1903	0.	455000	160668	0	3467	1000	0	9100	1176	0	0	14547.	0
35	3791	1852	0.	455000	114667	0	3418	1000	0	9101	920	0	0	4762.	0.
40	3537	1851.	0	455000	107301	0	3149	1000	0	9099	862	0	0	707.	0.
45	3274	1905.	0	455000	70786	0	3234	1000	0	9101	891	0	0	426.	0.
50	3073	2038	0	455000	31596	0	3082	1000	0	9099	829	0	0	72.	0.
55	2791	2208	0	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0.
60	2433	2404	0	455000	29283	0	3111	1000	0	9101	917	0	0	954.	0.
65	2050	2398	0	455000	244973	0	4580	1000	0	9102	1200	0	0	11316.	0.
70	1745	2432.	0.	455000	241651	0	4671	1000	0	9101	1200	0	0	38877.	0.
75	1449	2643.	0.	455000	75191	0	3578	1000	0	9099	967	0	0	1755.	0.
80	1260	2925	0	455000	6579	0	2880	1000	0	9100	974	0	0	50	0
85	1039	3070	0	455000	180767	0	4390	1000	0	9100	1077	0	0	573.	0
90	801	2910.	0	455000	533679	0	6206	1000	0	9102	1179	0	0	684.	0.
95	711	3128	0.	455000	182944	0	4059	1000	0	9101	1195	0	0	1270.	0.
100	935	3223	0	455000	287601	0	5980	1000	0	9099	1174	0	0	934	0

1

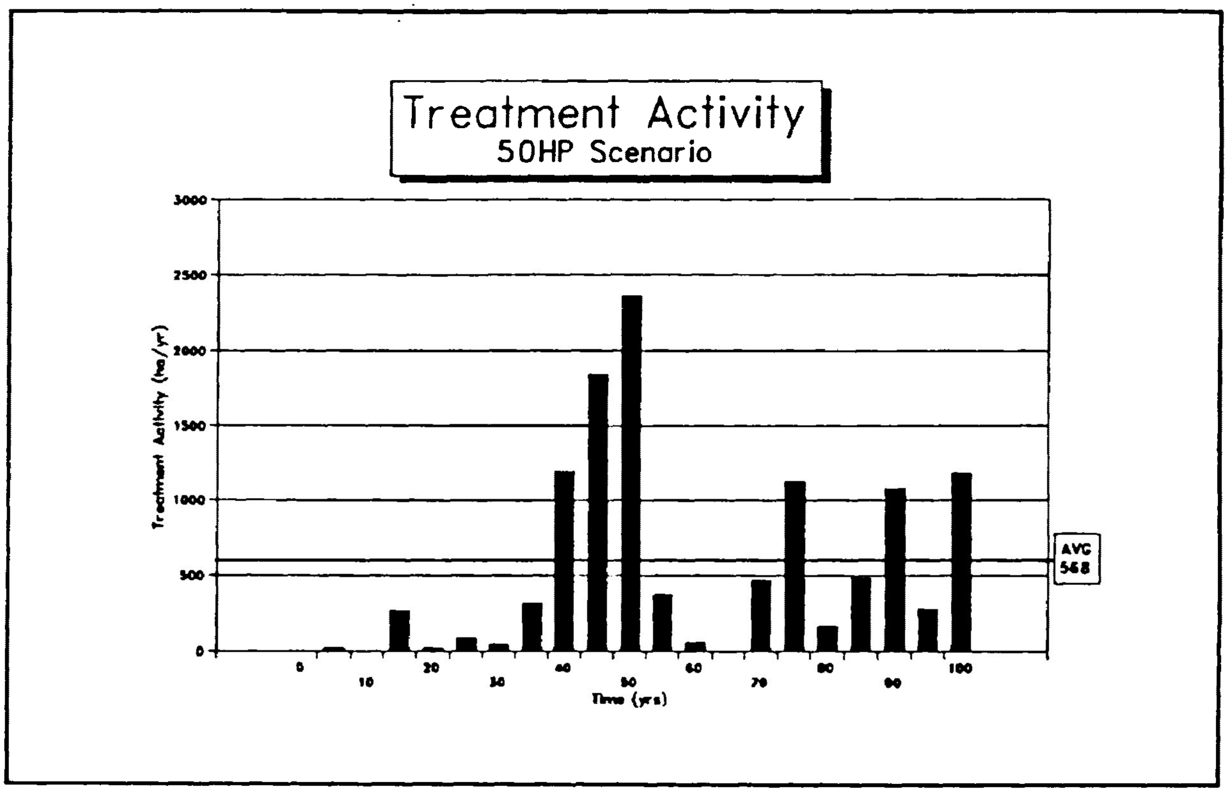
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	10738	6959	1345	109	0	37
10	12533	959	8521	15710	10509	7898	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	180	7	0
20	13087	6979	2798	10781	16510	12189	1981	555	7	0
25	15442	8540	1460	7894	13967	13930	3931	632	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	827	100	7
40	14414	13087	6979	1642	4821	13616	9416	1169	555	7
45	13623	15442	8540	1159	2790	10300	10768	1522	632	30
50	13268	15020	12533	915	1354	4759	12376	2259	366	56
55	12883	14962	15781	1002	1001	5047	10975	3178	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	905	1653	8175	4009	18	56
70	13756	13268	13011	12270	395	851	4718	6362	259	56
75	15345	12883	11144	14606	399	855	3424	8125	259	56
80	15860	12528	12133	9770	6706	412	809	8757	259	56
85	15629	12490	13323	10847	7499	258	618	4149	0	74
90	15519	13756	13268	10161	9645	170	256	2017	0	74
95	17054	15345	12883	10274	8947	145	341	37	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	22	12
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	22	12
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	22	12
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	9
45	3274	1905	455	70	0	0	3234	1000	0	2234	9	17	8
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	10	16	6
65	2049	2397	455	244	0	0	4580	1000	0	3580	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	22	12
90	800	2910	455	533	0	0	6206	1000	0	5206	10	24	14
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1641	0	4237	1000	0	4900	10	21	11

HARVEST COST	45412 46
PLANT, THIN, & MAINTENANCE	5595 41
TOTAL BENEFIT	99169 20
NPV (EXCL HARVEST COST)	93573 78
NPV (INCL. HARVEST COST)	48161 32



The treatment activity for the 50HP scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE 20%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.5hp
FOREST CLASS FILE: pj2.bau
COST FILE: cost.5hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD										
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)			MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	5778	763.	0.	745000	43666	0	4963	4963	500	14901	1290	0	200	64686.	29418.
10	5244.	732.	0.	745000	43940	0	4945	4945	500	14901	1048	0	200	79049.	44292.
15	4733.	700.	0.	745000	48916	0	4751	4751	500	14901	1684	0	200	83170.	49207.
20	4159	683.	0.	745000	42549	0	5049	5049	500	14900	1566	0	200	77013.	41575.
25	3621	673.	0.	745000	65303	0	4804	4804	500	14898	1425	0	200	85425.	50928.
30	3081	669.	0.	745000	44424	0	4891	4891	500	14899	1398	0	200	77836.	43260.
35	2526	672.	0.	745000	47088	0	4986	4986	500	14901	1933	0	200	64872.	26885.
40	1936	667	0.	745000	58298	0	5301	5301	500	14900	3299	0	200	43683.	4850.
45	1515	641	0.	745000	89603	0	7027	7027	500	14897	4399	0	200	33308.	0.
50	2418	618	0.	745000	100451	0	4834	4834	500	14901	5096	0	200	2088.	0.
55	2538	627.	0	745000	62936	0	4828	4828	500	14901	1479	0	199	2667.	0.
60	2023	633	0.	745000	59687	0	5029	5029	500	14900	1017	0	201	0.	0.
65	1487	642	0	745000	57018	0	4738	4738	500	14900	873	0	200	0.	0.
70	1672.	639	0	745000	70199	0	4878	4878	500	14902	1769	0	199	0.	0.
75	1998.	620	0	745000	97766	0	5304	5304	500	14900	3131	0	200	0.	0.
80	2272	651.	0	745000	62801	0	6721	6721	500	14900	2027	0	200	0.	0.
85	2856	683.	0.	745000	61033	0	4642	4642	500	14900	1614	0	200	0.	0.
90	3092	709	0.	745000	63631	0	5460	5460	500	14900	1909	0	200	0.	0.
95	3366	727.	0	745000	62307	0	4534	4534	500	14900	1468	0	200	0.	0.
100	3567	708	0.	745000	92650	0	4351	4351	500	14901	2996	0	200	- 0.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23348	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	630	0	0	0	0	0
65	21718	19982	19708	10664	660	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10966	650	0	0	0	0	0
80	19949	21366	19694	11352	371	0	0	0	0	0
85	21641	19066	19822	12012	191	0	0	0	0	0
90	21545	19429	19393	11696	667	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13824	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	672	745	65	0	0	4804	4804	500	0	16	27	11
30	3081	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	58	0	0	5301	5301	500	0	18	27	9
45	1514	641	745	89	0	0	7027	7027	500	0	19	28	9
50	2417	618	745	100	0	0	4834	4834	500	0	20	28	8
55	2538	626	745	62	0	508	4320	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	16	27	11
75	1998	619	745	97	2771	1160	1373	5304	500	0	18	28	10
80	2271	650	745	62	6041	500	180	6721	500	0	17	27	10
85	2855	682	745	61	4090	500	52	4642	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	10

HARVEST COST	76157 91
PLANT. THIN. & MAINTENANCE	9757 87
TOTAL BENEFIT	136543 10
PNW (EXCL HARVEST COST)	126805 30
PNW (INCL HARVEST COST)	52447 37

SHORT REPORT FOR SP IN THE 20%HP SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000.	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE. yc3.5hp
FOREST CLASS FILE eb-bf.bau
COST FILE. cost.5hp

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	3527.	2664.	0.	455000	170462	0	4011	1000	0	9100	1134	0	0	19699.	0.
10	3960.	2437.	0.	455000	236661	0	3525	1000	0	9099	1141	0	0	18771.	0.
15	4083	2308.	0.	455000	132817	0	3966	1000	0	9099	1141	0	0	46996.	0.
20	4173.	2160	0.	455000	171710	0	3940	1000	0	9101	1141	0	0	48149.	0.
25	4135.	2003.	0.	455000	182894	0	3589	1000	0	9101	1141	0	0	21935.	0.
30	4003	1903.	0.	455000	160668	0	3467	1000	0	9100	1117	0	0	14547.	0.
35	3791	1852.	0.	455000	114667	0	3418	1000	0	9101	905	0	0	4742.	0.
40	3537	1851.	0.	455000	107301	0	3149	1000	0	9099	860	0	0	707.	0.
45	3274	1905.	0.	455000	70786	0	3234	1000	0	9101	892	0	0	426.	0.
50	3073	2038.	0.	455000	31596	0	3082	1000	0	9099	829	0	0	72.	0.
55	2791	2208	0	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0.
60	2433	2404.	0	455000	29283	0	3111	1000	0	9101	887	0	0	954.	0.
65	2050	2398.	0	455000	244973	0	4500	1000	0	9102	1141	0	0	11316.	0.
70	1765	2432.	0	455000	241651	0	4671	1000	0	9101	1141	0	0	18877.	0.
75	1449	2643	0	455000	75191	0	3578	1000	0	9099	949	0	0	1755.	0.
80	1260	2925	0.	455000	6579	0	2880	1000	0	9100	975	0	0	50.	0.
85	1039.	3070.	0.	455000	180767	0	4390	1000	0	9100	1088	0	0	573.	0.
90	801	2910	0	455000	533679	0	6206	1000	0	9102	1197	0	0	684.	0.
95	711	3128	0	455000	162944	0	4059	1000	0	9101	1134	0	0	1270	0
100	935	3223	0	455000	287601	0	5900	1000	0	9099	1120	0	0	934	0

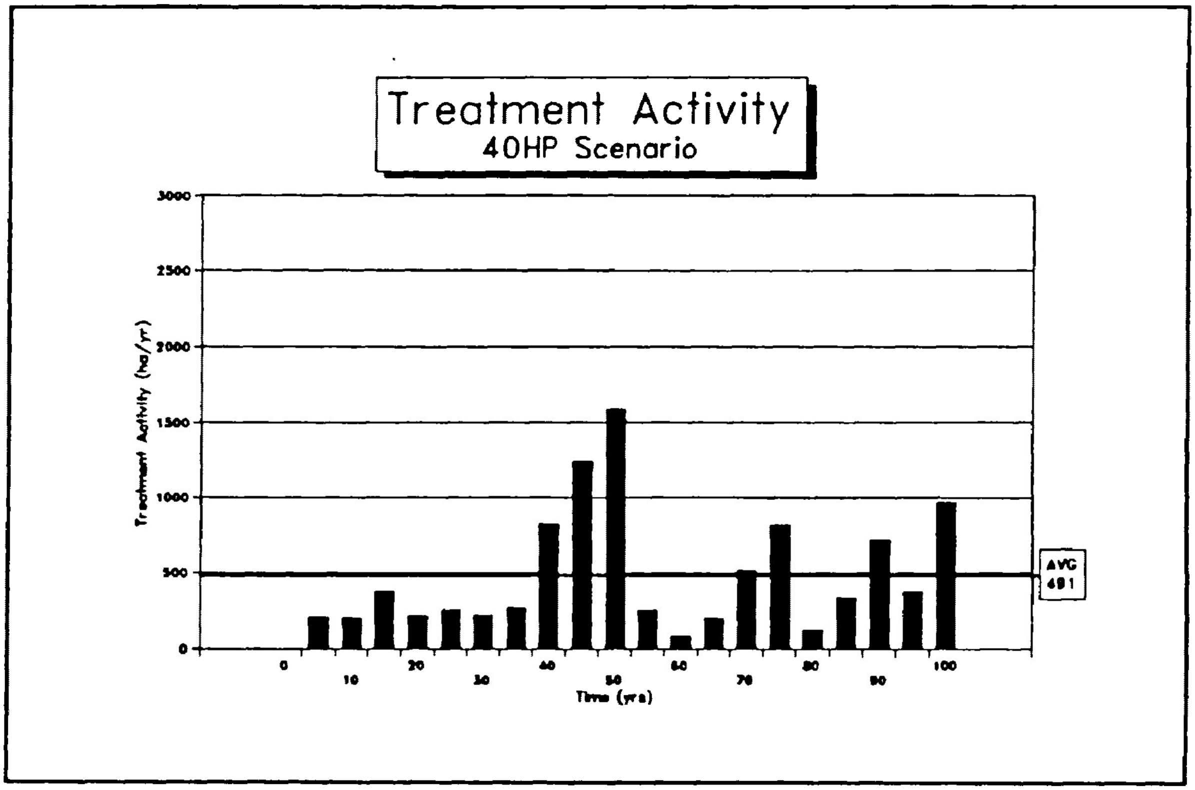
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7098	1413	136	7	0
15	15781	1005	4447	16066	15849	18187	1444	100	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9688	15828	6587	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	100	7
40	14414	13087	6979	1642	4021	13616	9418	1149	555	7
45	13623	15442	8540	1159	2790	18500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	746	56
55	12883	14962	15781	1002	1801	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	851	4718	6362	259	56
75	15345	12883	11144	14606	399	655	3424	6115	259	56
80	15860	12528	12133	9770	6786	412	809	6351	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15519	13756	13268	10161	9645	170	256	2077	0	74
95	17054	15345	12883	10274	8942	145	141	31	0	74
100	17535	15060	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (IN M3)		HARVEST (IN M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2309	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	9
45	3274	1905	455	70	0	0	3234	1000	0	2234	9	17	8
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1765	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3058	10	19	9
100	935	3223	455	287	1663	0	4237	1000	0	4900	10	21	11

HARVEST COST	45412 46
PLANT, THIN, & MAINTENANCE	5367 22
TOTAL BENEFIT	99169 20
PNW (EXCL. HARVEST COST)	93801 98
PNW (INCL. HARVEST COST)	48389 51



The treatment activity for the 40HP scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE ATO-A SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3-a.ato
FOREST CLASS FILE: pj2.bau
COST FILE: eqst-a.ato

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	5778	763.	0.	745000	43666	0	4963	4963	500	14901	1293	0	200	64686.	29418.
10	5244	732.	0.	745000	43940	0	4945	4945	500	14901	1040	0	200	79049.	44292.
15	4732	701.	0.	745000	48916	0	4751	4751	500	14901	1614	0	200	83170.	49207.
20	4159	683.	0.	745000	42549	0	5049	5049	500	14900	1521	0	200	77013.	41575.
25	3621	674.	0.	745000	45303	0	4804	4804	500	14898	1400	0	200	85425.	50928.
30	3081	670.	0.	745000	44424	0	4891	4891	500	14899	1363	0	200	77836.	43260.
35	2526	673.	0.	745000	47088	0	4986	4986	500	14901	1836	0	200	64872.	26885.
40	1932.	669.	0.	745000	58298	0	5301	5301	500	14900	2980	0	200	43683.	4850.
45	1511	645.	0.	745000	89403	0	7027	7027	500	14897	3834	0	200	33308.	0.
50	2405.	626.	0.	745000	100451	0	4834	4834	500	14901	4470	0	200	2088.	0.
55	2523	634	0	745000	62954	0	4829	4829	500	14900	1392	0	199	2667.	0.
60	2005	644.	0.	745000	59687	0	5029	5029	500	14900	1005	0	201	0.	0.
65	1466	654.	0.	745000	57018	0	4738	4738	500	14900	863	0	200	0.	0.
70	1639	654.	0.	745000	78732	0	4888	4888	500	14901	1651	0	199	0.	0.
75	1923	635.	0.	745000	101209	0	5408	5408	500	14901	2837	0	200	0.	0.
80	2139	672.	0.	745000	62380	0	6729	6729	500	14900	1056	0	200	0.	0.
85	2631	709	0.	745000	62569	0	4700	4700	500	14900	1552	0	200	0.	0.
90	2840	742.	0.	745000	65264	0	5514	5514	500	14900	1802	0	200	0.	0.
95	3089	762.	0.	745000	66098	0	4660	4660	500	14900	1460	0	200	0.	0.
100	3261	735	0.	745000	186965	0	4756	4756	500	14901	2737	0	200	0.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21991	19730	20077	10304	630	0	0	0	0	0
65	21719	19982	19708	10663	660	0	0	0	0	0
70	19430	22205	19549	10626	922	0	0	0	0	0
75	19484	22148	19495	10966	639	0	0	0	0	0
80	20063	21367	19694	11237	371	0	0	0	0	0
85	21763	19067	19822	11889	191	0	0	0	0	0
90	21725	19430	19393	11515	669	0	0	0	0	0
95	22351	19484	18576	11791	530	0	0	0	0	0
100	21603	19952	17508	13463	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	673	745	45	0	0	4804	4804	500	0	16	27	11
30	3080	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2525	673	745	47	0	0	4986	4986	500	0	16	27	11
40	1932	669	745	58	0	0	5301	5301	500	0	18	27	9
45	1510	645	745	89	0	0	7027	7027	500	0	18	28	10
50	2404	625	745	100	0	0	4834	4834	500	0	19	28	9
55	2522	633	745	62	0	508	4321	4829	500	0	16	27	11
60	2005	643	745	59	0	492	4537	5029	500	0	16	27	11
65	1465	654	745	57	0	500	4238	4738	500	0	15	27	12
70	1639	654	745	70	36	500	4352	4888	500	0	16	27	11
75	1922	635	745	101	2886	1160	1362	5408	500	0	17	28	11
80	2139	672	745	62	6049	500	180	6729	500	0	16	27	11
85	2631	709	745	62	4148	500	52	4700	500	0	16	27	11
90	2840	741	745	65	4875	500	139	5514	500	0	16	27	11
95	3089	762	745	66	4160	500	0	4660	500	0	16	27	11
100	3260	735	745	106	4256	500	0	4756	500	0	17	28	11

HARVEST COST	74357 77
PLANT, THIN, & MAINTENANCE	9303 95
TOTAL BENEFIT	136582 70
NPV (EXCL. HARVEST COST)	127278 70
NPV (INCL. HARVEST COST)	52920 94

SHORT REPORT FOR SP IN THE ATO-A SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE ycJ-a.ate
FOREST CLASS FILE sb-bf.bau
COST FILE cost-a.ate

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	3527	2664	0	455000	170462	0	4011	1000	0	9100	1075	0	0	19699.	0
10	3960	2437	0	455000	238661	0	3525	1000	0	9099	1080	0	0	18771.	0
15	4083	2308	0	455000	132017	0	3966	1000	0	9099	1080	0	0	46996.	0
20	4173	2160	0	455000	171710	0	3940	1000	0	9101	1080	0	0	48149.	0
25	4135	2003	0	455000	182894	0	3589	1000	0	9101	1080	0	0	21935.	0
30	4003	1903	0	455000	160660	0	3467	1000	0	9100	1066	0	0	14547.	0
35	3791	1852	0	455000	114667	0	3418	1000	0	9101	889	0	0	4742	0
40	3537	1851	0	455000	107301	0	3149	1000	0	9099	857	0	0	707.	0
45	3274	1905	0	455000	78786	0	3234	1000	0	9101	871	0	0	426.	0
50	3073	2038	0	455000	31596	0	3082	1000	0	9099	829	0	0	72.	0
55	2791	2208	0	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0
60	2433	2404	0	455000	29281	0	3111	1000	0	9101	889	0	0	954.	0
65	2050	2398	0	455000	244973	0	4500	1000	0	9102	1080	0	0	11316	0
70	1745	2432	0	455000	241651	0	4671	1000	0	9101	1080	0	0	18877.	0.
75	1449	2643	0	455000	75191	0	3578	1000	0	9099	920	0	0	1755.	0
80	1260	2926	0	455000	6579	0	2880	1000	0	9100	928	0	0	50.	0
85	1039	3070	0	455000	188767	0	4390	1000	0	9100	995	0	0	573	0
90	881	2910	0	455000	533679	0	6204	1000	0	9102	1055	0	0	604	0
95	711	3128	0	455000	162944	0	4059	1000	0	9101	1076	0	0	1270	0
100	935	3223	0	455000	287601	0	5900	1000	0	9099	1066	0	0	934.	0

1

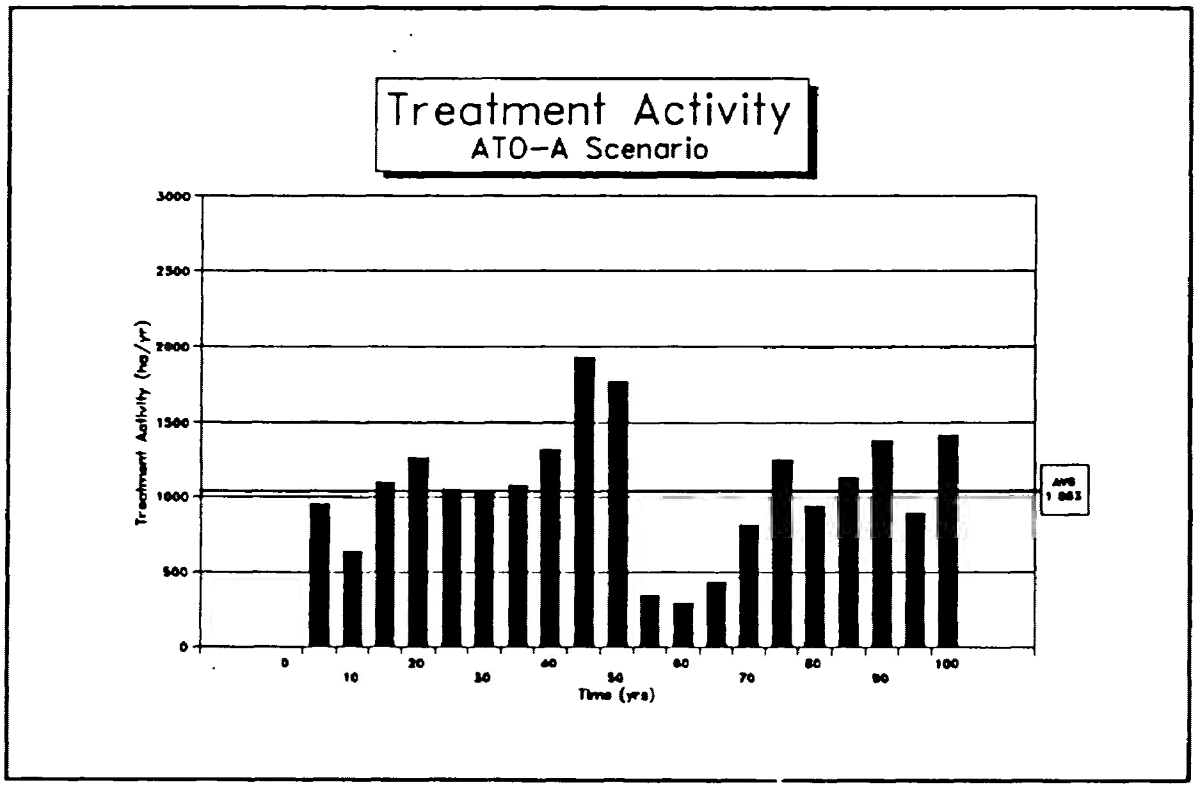
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8560	1460	12912	16786	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7898	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	150	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	150	7
40	14414	13087	6979	1642	4021	13818	9418	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1550	532	30
50	13288	15020	12533	915	1354	6759	12376	2259	366	56
55	12883	14962	15781	1002	1001	5047	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	1959	0	56
65	12490	13623	15270	8527	985	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	853	4718	6361	259	56
75	15345	12883	11144	14606	399	655	3424	8115	259	56
80	15860	12528	12133	9770	8704	412	809	6351	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15519	13756	13268	10161	9645	170	254	2037	0	74
95	17054	15345	12883	10274	8940	145	141	37	0	74
100	17535	15860	12528	10520	3030	5319	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	9	18	9
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	8
45	3274	1905	455	78	0	0	3234	1000	0	2234	9	17	8
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	835	3223	455	287	1663	0	4237	1000	0	4900	10	21	11

HARVEST COST	85412 46
PLANT, THIN, & MAINTENANCE	5123 18
TOTAL BENEFIT	99169 20
PNW (EXCL HARVEST COST)	94046 02
PNW (INCL HARVEST COST)	8633 55



The treatment activity for the ATO-A scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE ATO-B SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE yc3-b.ato
FOREST CLASS FILE pj2.mau
COST FILE cost-b.bto

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT.	REAL.
5	5778	763.	0	745000	43666	0	4963	4963	500	14901	1301	0	200	64686.	29418.
10	5244.	732.	0	745000	43940	0	4945	4945	500	14901	1040	0	200	79049.	44292
15	4732	701.	0	745000	48916	0	4751	4751	500	14901	1716	0	200	83170.	49207.
20	4159	683.	0	745000	42549	0	5049	5049	500	14900	1530	0	200	77013.	41575
25	3621	674	0	745000	45303	0	4804	4804	500	14898	1434	0	200	85425.	50928.
30	3081	670	0	745000	44424	0	4891	4891	500	14899	1373	0	200	77836.	43260
35	2526	673	0	745000	47088	0	4986	4986	500	14901	1950	0	200	60872	26885
40	1932	669	0	745000	58298	0	5301	5301	500	14900	3412	0	200	43683	4850
45	1511	645	0	745000	89403	0	7027	7027	500	14897	4490	0	200	33308	0
50	2405	626	0	745000	100451	0	4834	4834	500	14901	5359	0	200	2088	0
55	2523	634	0	745000	62954	0	4829	4829	500	14900	1520	0	199	2667	0
60	2005	644	0	745000	59687	0	5029	5029	500	14900	1010	0	201	0	0
65	1466	654	0	745000	57018	0	4738	4738	500	14900	863	0	200	0	0
70	1639	654	0	745000	70732	0	4888	4888	500	14901	1834	0	199	0	0.
75	1923	635	0	745000	101209	0	5408	5404	500	14901	3262	0	200	0	0
80	2139	672	0	745000	62300	0	6729	6729	500	14900	1907	0	200	0	0
85	2631	709	0	745000	62569	0	4700	4700	500	14900	1598	0	200	0.	0
90	2840	742	0	745000	65266	0	5514	5514	500	14900	2019	0	200	0	0.
95	3089	762	0.	745000	66098	0	4660	4660	500	14900	1565	0	200	0.	0
100	3261	735	0	745000	106965	0	4756	4756	500	14901	3181	0	200	0.	0

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22168	19495	27490	2630	481	488	0	0	0	0
60	21991	19730	20077	10304	630	0	0	0	0	0
65	21719	19982	19708	10663	660	0	0	0	0	0
70	19430	22205	19549	10626	922	0	0	0	0	0
75	19484	22168	19495	10966	639	0	0	0	0	0
80	20063	21367	19694	11237	371	0	0	0	0	0
85	21763	19067	19822	11889	191	0	0	0	0	0
90	21725	19430	19393	11515	669	0	0	0	0	0
95	22351	19484	18576	11791	530	0	0	0	0	0
100	21603	19957	17508	13463	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	673	745	45	0	0	4804	4804	500	0	16	27	11
30	3080	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2525	673	745	47	0	0	4986	4986	500	0	17	27	10
40	1932	669	745	58	0	0	5301	5301	500	0	18	27	9
45	1510	645	745	89	0	0	7027	7027	500	0	19	28	9
50	2404	625	745	100	0	0	4834	4834	500	0	20	28	8
55	2522	633	745	62	0	508	4321	4829	500	0	16	27	11
60	2005	643	745	59	0	492	4537	5029	500	0	16	27	11
65	1465	654	745	57	0	500	4238	4738	500	0	15	27	12
70	1638	654	745	70	36	500	4352	4888	500	0	16	27	11
75	1922	635	745	101	2886	1160	1362	5408	500	0	18	28	10
80	2139	672	745	62	6049	500	180	6729	500	0	17	27	10
85	2631	709	745	62	4148	500	52	4700	500	0	16	27	11
90	2840	741	745	65	4875	500	139	5514	500	0	17	27	10
95	3089	762	745	66	4160	500	0	4660	500	0	16	27	11
100	3260	735	745	106	4256	500	0	4756	500	0	18	28	10

HARVEST COST	74357 77
PLANT, THIN, & MAINTENANCE	9866 96
TOTAL BENEFIT	136582 70
PNW (EXCL. HARVEST COST)	126715 70
PNW (INCL. HARVEST COST)	52357 93

SHORT REPORT FOR SP IN THE ATO-B SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3-b.ato
FOREST CLASS FILE: nb-bf.bau
COST FILE: cost-b.ato

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	3527	2664	0	455000	178662	0	4011	1000	0	9100	1075	0	0	19699.	0
10	3960	2437	0	455000	236661	0	3525	1000	0	9099	1080	0	0	18771.	0.
15	4083	2308	0	455000	132017	0	3966	1000	0	9099	1080	0	0	46996.	0.
20	4173	2180	0	455000	171710	0	3940	1000	0	9101	1080	0	0	48149.	0
25	4135	2003	0	455000	182894	0	3589	1000	0	9101	1080	0	0	21935	0
30	4003	1903	0	455000	160668	0	3467	1000	0	9100	1066	0	0	14547	0
35	3791	1852	0	455000	114667	0	3418	1000	0	9101	889	0	0	4742.	0
40	3537	1851	0	455000	107301	0	3149	1000	0	9099	857	0	0	707.	0.
45	3274	1905	0	455000	70786	0	3234	1000	0	9101	901	0	0	426	0
50	3073	2038	0	455000	31596	0	3087	1000	0	9099	829	0	0	72.	0
55	2791	2208	0	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0
60	2433	2404	0	455000	29283	0	3111	1000	0	9101	889	0	0	954.	0
65	2050	2398	0	455000	244973	0	4580	1000	0	9102	1000	0	0	11316	0
70	1745	2432	0	455000	241651	0	4671	1000	0	9101	1080	0	0	18877	0
75	1449	2643	0	455000	75191	0	3578	1000	0	9099	920	0	0	1755	0
80	1260	2926	0	455000	6579	0	2080	1000	0	9100	930	0	0	50.	0
85	1039	3070	0	455000	180767	0	4390	1000	0	9100	1118	0	0	573.	0
90	801	2910	0	455000	533679	0	6206	1000	0	9102	1248	0	0	684	0
95	711	3128	0	455000	162944	0	4059	1000	0	9101	1076	0	0	1270	0
100	935	3223	0	455000	207601	0	5900	1000	0	9099	1066	0	0	934.	0

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	189	0	37
10	12533	959	8521	15710	18509	7098	1413	136	7	0
15	15781	1005	4447	16066	15849	10197	1444	100	7	0
20	13087	6979	2798	10781	16510	12180	1981	555	7	0
25	15442	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8567	822	100	7
40	14414	13087	6979	1642	4021	13616	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10760	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	366	56
55	12883	14962	15781	1002	1001	5047	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	851	4718	6362	259	56
75	15345	12883	11144	14806	399	655	3424	8115	259	56
80	15860	12528	12133	9770	4786	412	809	6351	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15519	13756	13268	10361	9665	170	256	2037	0	74
95	17054	15345	12883	10274	8965	145	141	30	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2300	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	9	18	9
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	9
45	3274	1905	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3062	1000	0	2062	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2080	1000	0	1080	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1663	0	4237	1000	0	4900	10	21	11

HARVEST COST	85412 86
PLANT, THIN, & MAINTENANCE	5148 01
TOTAL BENEFIT	99169 20
PNV (EXCL. HARVEST COST)	90829 18
PNV (INCL. HARVEST COST)	88616 71

SHORT REPORT FOR PJ IN THE ATO-C SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3-c.ato
FOREST CLASS FILE: pj2.bau
COST FILE: cost-c.ato

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	5778.	763.	0.	745000	43666	0	4963	4963	500	14901	1305	0	200	64686.	29418.
10	5244.	732.	0.	745000	43940	0	4945	4945	500	14901	1840	0	200	79049.	44292.
15	4733.	700.	0.	745000	48916	0	4751	4751	500	14901	1761	0	200	83170.	49207.
20	4159.	683.	0.	745000	42549	0	5849	5849	500	14900	1534	0	200	77013.	41575.
25	3621.	673.	0.	745000	45303	0	4804	4804	500	14898	1448	0	200	85425.	50928.
30	3081.	669.	0.	745000	44424	0	4891	4891	500	14899	1377	0	200	77836.	43260.
35	2526.	672.	0.	745000	47888	0	4986	4986	500	14901	1998	0	200	64872.	26885.
40	1936.	667.	0.	745000	58298	0	5301	5301	500	14900	3599	0	200	43683.	4850.
45	1535	641.	0.	745000	89403	0	7027	7027	500	14897	4776	0	200	33308.	0.
50	2418	618.	0.	745000	108451	0	4834	4834	500	14901	5765	0	200	2088.	0.
55	2538	627	0.	745000	62936	0	4828	4828	500	14901	1576	0	199	2667.	0.
60	2023	633.	0	745000	59687	0	5029	5029	500	14900	1012	0	201	0.	0.
65	1487	642	0.	745000	57018	0	4738	4738	500	14900	863	0	200	0.	0.
70	1672	639.	0.	745000	70199	0	4878	4878	500	14902	1898	0	199	0.	0.
75	1998	620.	0.	745000	97766	0	5304	5304	500	14900	3427	0	200	0	0.
80	2272	651	0.	745000	62801	0	6721	6721	500	14900	1927	0	200	0.	0
85	2856	683	0.	745000	61033	0	4642	4642	500	14900	1623	0	200	0.	0.
90	3092.	709	0.	745000	63631	0	5460	5460	500	14900	2094	0	200	0.	0.
95	3366	727.	0.	745000	62307	0	4534	4534	500	14900	1566	0	200	0.	0.
100	3567	708	0	745000	92650	0	4351	4351	500	14901	3311	0	200	0.	0.

1

AGE CLASS STRUCTURE (HA)

TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	304	0	0	0
20	20077	15551	1732	8821	23148	3297	186	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	786	36	0	0
35	19495	27490	4193	1072	11957	6961	1620	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	6374	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	630	0	0	0	0	0
65	21718	19982	19788	10664	680	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10964	650	0	0	0	0	0
80	19949	21366	19694	11352	371	0	0	0	0	0
85	21641	19066	19822	12012	191	0	0	0	0	0
90	21545	19429	19393	11696	669	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13824	286	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	16	27	11
20	4158	683	745	42	0	0	5849	5849	500	0	16	27	11
25	3621	672	745	45	0	0	4804	4804	500	0	16	27	11
30	3081	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	58	0	0	5301	5301	500	0	18	27	9
45	1514	641	745	89	0	0	7027	7027	500	0	19	28	9
50	2417	618	745	108	0	0	4834	4834	500	0	20	28	8
55	2538	626	745	62	0	500	4320	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	16	27	11
75	1998	619	745	97	2771	1160	1373	5304	500	0	18	28	10
80	2271	650	745	62	6041	500	180	6721	500	0	17	27	10
85	2855	682	745	61	4090	500	52	4642	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	10

HARVEST COST	76357 91
PLANT, THIN, & MAINTENANCE	18105 80
TOTAL BENEFIT	130563 10
NPV (EXCL. HARVEST COST)	126457 30
NPV (INCL. HARVEST COST)	62899 43

SHORT REPORT FOR SP IN THE ATO-C SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE: yc3-c.ato
FOREST CLASS FILE: sb-bf.bau
COST FILE: cost-c.ato

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.
5	3527	2664.	0.	455000	178462	0	4011	1000	0	9100	1075	0	0	19499.	0.
10	3960	2437.	0.	455000	236661	0	3525	1000	0	9099	1080	0	0	18771.	0.
15	4083	2308.	0.	455000	132017	0	3966	1000	0	9099	1080	0	0	46996.	0.
20	4173	2160.	0.	455000	171710	0	3940	1000	0	9101	1080	0	0	48149.	0.
25	4135.	2003.	0.	455000	182894	0	3589	1000	0	9101	1080	0	0	21935.	0.
30	4003.	1903.	0.	455000	168664	0	3467	1000	0	9100	1066	0	0	14547	0.
35	3791	1852	0.	455000	114667	0	3418	1000	0	9101	889	0	0	4742	0.
40	3537	1851	0.	455000	107301	0	3149	1000	0	9099	857	0	0	707	0.
45	3274	1905	0.	455000	70786	0	3234	1000	0	9101	914	0	0	426	0.
50	3073	2038	0.	455000	31596	0	3082	1000	0	9099	829	0	0	72	0.
55	2791	2208	0.	455000	27071	0	3063	1000	0	9100	822	0	0	30.	0.
60	2433	2404	0.	455000	29283	0	3111	1000	0	9101	889	0	0	954	0.
65	2050	2398	0.	455000	244973	0	4500	1000	0	9102	1080	0	0	11316	0.
70	1745	2432	0.	455000	241651	0	4671	1000	0	9101	1080	0	0	10877	0.
75	1449	2643	0.	455000	75193	0	3578	1000	0	9899	920	0	0	1755.	0.
80	1260	2925	0.	455000	6579	0	2880	1000	0	9100	932	0	0	50	0.
85	1039	3070	0.	455000	188767	0	4390	1000	0	9100	1172	0	0	573.	0.
90	801	2910	0.	455000	533679	0	6206	1000	0	9102	1332	0	0	684	0.
95	711	3128	0.	455000	162944	0	4859	1000	0	9101	1076	0	0	1270.	0.
100	935	3223	0.	455000	287601	0	5900	1000	0	9099	1066	0	0	934.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16706	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18589	7898	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	100	7	0
20	13087	6979	2798	10781	16510	12108	1981	555	7	0
25	15442	8540	1460	7094	13847	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13055	8587	822	100	7
40	14414	13087	6979	1642	4021	13616	9416	1149	555	7
45	13623	15442	8540	2159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	8759	12376	2259	346	56
55	12883	14962	15781	1002	1801	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4809	18	56
70	13756	13268	13011	12270	335	851	4738	6362	259	56
75	15345	12883	11144	14606	399	655	3420	6115	259	56
80	15860	12528	12133	9770	6786	412	809	6353	259	56
85	15629	12490	13323	10847	7699	258	618	4148	0	74
90	15519	13756	13268	10161	9645	170	356	3037	0	74
95	17054	15345	12883	10274	8940	145	141	30	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	9	18	9
40	3537	1850	455	107	0	0	3149	1000	0	2149	9	18	9
45	3274	1905	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	9	16	7
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1745	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1880	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1663	0	4237	1000	0	4900	10	23	13

HARVEST COST	45412 46
PLANT., THIN. & MAINTENANCE	5507 40
TOTAL BENEFIT	99169.20
NPV (EXCL. HARVEST COST)	94021 79
NPV (INCL. HARVEST COST)	48609 32

SHORT REPORT FOR PJ IN THE OWC-A SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE: yc3-a.owc
FOREST CLASS FILE: pj2.bau
COST FILE. cost-a.owc

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)					MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL.	
5	5770.	763.	0.	745000	43666	0	4963	4963	500	14901	1314	0	200	64686.	29418.	
10	5244.	732.	0	745000	43980	0	4945	4945	500	14901	1848	0	200	79049.	44292.	
15	4732	700.	0.	745000	40916	0	4751	4751	500	14901	1992	0	200	83170.	49207.	
20	4159.	683.	0.	745000	42549	0	5049	5049	500	14900	1593	0	200	77013.	41575.	
25	3621	673.	0.	745000	45303	0	4804	4804	500	14898	1525	0	200	85425.	50928.	
30	3081	669.	0.	745000	44424	0	4891	4891	500	14899	1429	0	200	77836.	43260.	
35	2526	672.	0.	745000	47088	0	4986	4986	500	14901	2275	0	200	64872.	26885.	
40	1936.	667.	0.	745000	58298	0	5301	5301	500	14900	4597	0	200	43683.	4850.	
45	1515	641.	0.	745000	89403	0	7027	7027	500	14897	6425	0	200	33308.	0.	
50	2417	618.	0.	745000	100451	0	4834	4834	500	14901	7759	0	200	2088.	0.	
55	2538	627.	0.	745000	62954	0	4829	4829	500	14900	1871	0	199	2667.	0.	
60	2022	633.	0.	745000	59687	0	5029	5029	500	14900	1032	0	201	0.	0.	
65	1486	642.	0.	745000	57018	0	4738	4738	500	14900	873	0	200	0.	0.	
70	1671	639.	0.	745000	70228	0	4878	4878	500	14902	2313	0	199	0.	0.	
75	1998	620.	0.	745000	97818	0	5307	5307	500	14901	4413	0	200	0.	0.	
80	2271.	651.	0.	745000	62001	0	6721	6721	500	14900	2178	0	200	0.	0.	
85	2855.	803.	0.	745000	63862	0	4643	4643	500	14900	1749	0	200	0.	0.	
90	3091.	709.	0.	745000	63631	0	5460	5460	500	14900	2613	0	200	0.	0.	
95	3365.	727.	0.	745000	62317	0	4535	4535	500	14900	1783	0	200	0.	0.	
100	3566	708.	0.	745000	92650	0	4351	4351	500	14901	4334	0	200	0.	0.	

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	28985	1341	344	0	0	0
15	27490	4193	1072	14365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	8461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2830	481	488	0	0	0	0
60	21991	19730	20077	10304	630	0	0	0	0	0
65	21719	19982	19708	10663	660	0	0	0	0	0
70	19430	22205	19549	10626	922	0	0	0	0	0
75	19474	22148	19495	10966	649	0	0	0	0	0
80	19952	21367	19694	11348	371	0	0	0	0	0
85	21844	19067	19822	12008	191	0	0	0	0	0
90	21549	19430	19393	11691	449	0	0	0	0	0
95	22131	19474	18576	12021	530	0	0	0	0	0
100	21359	19841	17508	13818	286	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	6203	799											
5	5778	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	40	0	0	4751	4751	500	0	17	27	10
20	4158	683	745	42	0	0	5049	5049	500	0	16	27	11
25	3621	672	745	45	0	0	4804	4804	500	0	16	27	11
30	3081	669	745	44	0	0	4891	4891	500	0	16	27	11
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1935	666	745	58	0	0	5301	5301	500	0	19	27	8
45	1514	641	745	89	0	0	7027	7027	500	0	21	28	7
50	2417	618	745	100	0	0	4034	4834	500	0	22	28	6
55	2537	626	745	62	0	508	4321	4829	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	78	36	500	4342	4878	500	0	17	27	10
75	1997	619	745	97	2775	1160	1372	5307	500	0	19	28	9
80	2271	650	745	62	6041	500	180	6721	500	0	17	27	10
85	2855	802	745	61	4091	500	52	4643	500	0	16	27	11
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3364	726	745	62	4035	500	0	4535	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	19	28	9

HARVEST COST	74357 84
PLANT, THIN, & MAINTENANCE	11461 12
TOTAL BENEFIT	136563 30
PNW (EXCL. HARVEST COST)	125102 20
PNW (INCL. HARVEST COST)	50744 36

SHORT REPORT FOR SP IN THE OWC-A SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST

HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3-a.owc
FOREST CLASS FILE: ob-bf.bau
COST FILE cost.owc

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL.
5	3527	2664.	0.	455000	170462	0	4011	1000	0	9100	1911	0	0	17699.	0.
10	3960	2437.	0.	455000	236661	0	3525	1000	0	9099	1930	0	0	18771.	0.
15	4083	2308.	0.	455000	132017	0	3966	1000	0	9099	1930	0	0	46996.	0.
20	4173	2160	0.	455000	171710	0	3940	1000	0	9101	1930	0	0	48149.	0.
25	4135	2003	0.	455000	182894	0	3589	1000	0	9101	1930	0	0	21935.	0.
30	4003	1903.	0.	455000	160668	0	3467	1000	0	9100	1888	0	0	14547.	0.
35	3791	1852.	0.	455000	114667	0	3418	1000	0	9101	1177	0	0	4742.	0.
40	3537	1851.	0.	455000	107301	0	3149	1000	0	9099	1082	0	0	707.	0.
45	3274	1905.	0.	455000	70786	0	3234	1000	0	9101	1125	0	0	426.	0.
50	3073	2038	0.	455000	31596	0	3082	1000	0	9099	954	0	0	72.	0.
55	2791	2208	0.	455000	27071	0	3063	1000	0	9100	917	0	0	30.	0.
60	2433	2404	0.	455000	29283	0	3111	1000	0	9101	1183	0	0	956.	0.
65	2050	2398	0.	455000	244973	0	4500	1000	0	9102	1930	0	0	11316.	0.
70	1745	2432	0.	455000	241651	0	4671	1000	0	9101	1930	0	0	10877.	0.
75	1449	2643	0.	455000	75191	0	3578	1000	0	9099	1230	0	0	1755.	0.
80	1260	2925	0.	455000	6579	0	2080	1000	0	9100	1067	0	0	50.	0.
85	1039	3070	0.	455000	180767	0	4390	1000	0	9100	1580	0	0	573.	0.
90	801	2910	0.	455000	533679	0	6206	1000	0	9102	1781	0	0	684.	0.
95	711	3128	0.	455000	162944	0	4059	1000	0	9101	1912	0	0	1270.	0.
100	935	3223	0.	455000	287601	0	5980	1000	0	9099	1884	0	0	934.	0.

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7898	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	100	7	0
20	13087	6979	2798	10781	16530	12188	1981	655	7	0
25	15442	8540	1460	7894	13947	12910	3831	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	100	7
40	14414	13087	6979	1642	4021	13616	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	346	56
55	12883	14962	15781	1002	1001	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4889	18	56
70	13756	13268	13013	12270	335	851	4718	6362	259	56
75	15345	12883	11144	14606	399	655	3424	8115	259	56
80	15860	12528	12133	9770	6786	412	809	6353	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15519	13756	13268	10161	9645	170	256	2017	0	74
95	17054	15345	12883	10274	8940	145	141	30	0	74
100	17535	15860	12528	10520	3830	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2032											
5	3526	2663	455	170	0	0	4011	1000	0	3011	11	20	9
10	3959	2436	455	236	0	0	3525	1000	0	2525	11	21	10
15	4082	2308	455	132	0	0	3966	1000	0	2966	11	19	8
20	4172	2159	455	171	0	0	3940	1000	0	2940	11	20	9
25	4135	2003	455	182	0	0	3589	1000	0	2589	11	20	9
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1850	455	107	0	0	3149	1000	0	2149	10	18	8
45	3274	1905	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2037	455	31	0	0	3082	1000	0	2082	10	16	6
55	2791	2208	455	27	0	0	3063	1000	0	2063	10	16	6
60	2433	2404	455	29	0	0	3111	1000	0	2111	10	16	6
65	2049	2397	455	244	0	0	4500	1000	0	3500	11	22	11
70	1745	2431	455	241	0	0	4671	1000	0	3671	11	21	10
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2080	1000	0	1080	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	11	19	8
100	935	3223	455	287	1863	0	4237	1000	0	4900	10	23	13

HARVEST COST	45012 46
PLANT., THIN., & MAINTENANCE	8581 53
TOTAL BENEFIT	99169 20
NPV (EXCL. HARVEST COST)	90587 66
NPV (INCL. HARVEST COST)	45175 20

SHORT REPORT FOR PJ IN THE OWC-B SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 5 - 10

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: YC3-B.OWC
FOREST CLASS FILE: PJ2.RAW
COST FILE: COST.OWC

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL
5	5778.	763	0	745000	43666	0	4963	4963	500	14901	1314	0	200	64686	29418
10	5244	732	0	745000	43940	0	4945	4945	500	14901	1048	0	200	79049	44292.
15	4725	700	0	745000	48916	0	4751	4751	500	14901	1992	0	200	83170.	49207.
20	4141.	682.	0.	745000	42549	0	5049	5049	500	14900	1593	0	200	77013	41575.
25	3545.	673.	0	745000	45303	0	4804	4804	500	14898	1525	0	200	85425	50928
30	2946	669	0	745000	44424	0	4891	4891	500	14899	1429	0	200	77836.	43260
35	2386	672	0	745000	47088	0	4986	4986	500	14901	2275	0	200	64872.	26885
40	1856	668	0.	745000	58298	0	5301	5301	500	14900	4597	0	200	43683.	4850
45	1485	644	0	745000	89403	0	7027	7027	500	14897	8425	0	199	33308	0
50	2371	626	0	745000	108451	0	4838	4838	500	14901	7751	0	201	2088.	0
55	2484	634	0	745000	64463	0	5010	5010	500	14901	1894	0	200	2667.	0.
60	1965	643	0	745000	61292	0	5283	5283	500	14900	1085	0	199	0.	0
65	1425	652	0	745000	57018	0	4738	4738	500	14900	873	0	200	0	0
70	1596	646	0	745000	77902	0	4777	4777	500	14900	2897	0	200	0	0
75	1876	633	0.	745000	94443	0	5386	5386	500	14901	3897	0	200	0.	0
80	2094	670	0	745000	62300	0	6729	6729	500	14900	2180	0	200	0.	0
85	2582	706	0	745000	63174	0	4825	4825	500	14900	1631	0	200	0.	0
90	2791	740	0.	745000	65264	0	5514	5514	500	14900	2632	0	200	0.	0
95	3036	761.	0	745000	64987	0	4632	4632	500	14900	1788	0	200	0.	0.
100	3183	736	0	745000	106956	0	4750	4750	500	14901	4387	0	200	0	0

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	394	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2660	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22152	19495	27490	2624	481	488	0	0	0	0
60	22176	19730	20077	10119	630	0	0	0	0	0
65	22158	19982	19708	10224	660	0	0	0	0	0
70	19869	22205	19549	10187	922	0	0	0	0	0
75	19800	22152	19495	10966	311	0	0	0	0	0
80	20184	21552	19694	10931	371	0	0	0	0	0
85	21630	19506	19822	11583	191	0	0	0	0	0
90	21717	19758	19393	11195	669	0	0	0	0	0
95	22454	19697	18580	11471	530	0	0	0	0	0
100	21700	20073	17693	13060	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	6203	799											
5	5778	763	745	63	0	0	4963	4963	500	0	16	27	11
10	5243	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4724	700	745	48	0	0	4751	4751	500	0	17	27	10
20	4140	682	745	42	0	0	5049	5049	500	0	16	27	11
25	3544	672	745	45	0	0	4804	4804	500	0	16	27	11
30	2946	669	745	46	0	0	4891	4891	500	0	16	27	11
35	2385	672	745	47	0	0	4986	4986	500	0	17	27	12
40	1856	668	745	50	0	0	5301	5301	500	0	19	27	8
45	1485	644	745	89	0	0	7027	7027	500	0	21	28	7
50	2370	625	745	100	0	0	4838	4838	500	0	22	28	6
55	2483	634	745	64	0	0	5010	5010	500	0	16	27	11
60	1964	642	745	61	0	0	5283	5283	500	0	16	27	11
65	1425	651	745	57	0	500	4238	4738	500	0	15	27	12
70	1596	645	745	77	36	500	4241	4777	500	0	17	28	11
75	1876	633	745	94	3192	1160	1034	5386	500	0	18	28	10
80	2094	669	745	62	6049	500	180	6729	500	0	17	27	10
85	2582	706	745	63	4162	611	52	4825	500	0	16	27	11
90	2791	739	745	65	4875	500	139	5514	500	0	17	27	10
95	3036	761	745	66	4132	500	0	4632	500	0	16	27	11
100	3183	735	745	106	4250	500	0	4750	500	0	19	28	9

HARVEST COST	74357 82
PLANT, THIN, & MAINTENANCE	11477 03
TOTAL BENEFIT	136595 70
PNW (EXCL. HARVEST COST)	125118 70
PNW (INCL. HARVEST COST)	50760 85

SHORT REPORT FOR SP IN THE OWC-B SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000.	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: YC3-B.OWC
FOREST CLASS FILE: SB-SP.BAU
COST FILE: COST.OWC

R E P O R T, O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	ROT.	REAL.
5	3527	2664	0	455000	170462	0	4011	1000	0	9100	1911	0	0	19699.	0
10	3960	2437	0	455000	236441	0	3525	1000	0	9099	1930	0	0	18771.	0
15	4083	2308.	0	455000	132017	0	3966	1000	0	9099	1930	0	0	66996.	0.
20	4173	2160	0	455000	171710	0	3940	1000	0	9101	1930	0	0	48149.	0
25	4135	2003	0	455000	182894	0	3589	1000	0	9101	1930	0	0	21935	0
30	4003	1904	0	455000	160668	0	3467	1000	0	9100	1888	0	0	14547.	0
35	3791	1853	0	455000	114667	0	3418	1000	0	9101	1177	0	0	4742	0
40	3537	1853	0	455000	107301	0	3149	1000	0	9099	1082	0	0	707	0
45	3274	1908	0	455000	70786	0	3234	1000	0	9101	1125	0	0	426	0
50	3073	2042	0	455000	31596	0	3082	1000	0	9099	954	0	0	72.	0.
55	2791	2213	0	455000	27071	0	3063	1000	0	9100	917	0	0	30	0
60	2433	2410	0	455000	29283	0	3111	1000	0	9101	1183	0	0	954	0.
65	2050	2404	0	455000	244973	0	4500	1000	0	9102	1930	0	0	11316	0
70	1730	2439	0	455000	241651	0	4671	1000	0	9101	1930	0	0	18877	0
75	1416	2650	0	455000	75191	0	3578	1000	0	9099	1230	0	0	1755	0
80	1206	2934	0	455000	6579	0	2880	1000	0	9100	1067	0	0	50	0
85	963	3080	0	455000	180767	0	4390	1000	0	9100	1580	0	0	573	0
90	699	2923	0	455000	533679	0	6206	1000	0	9102	1781	0	0	684.	0.
95	581	3134.	0	455000	175064	0	4610	1000	0	9101	1912	0	0	1270	0
100	786	3228	0	455000	294499	0	5982	1000	0	9099	1888	0	0	934.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7998	1413	136	7	0
15	15781	1005	4447	16066	15849	10187	1444	180	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	100	7
40	14414	13087	6979	1642	4021	13016	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	346	56
55	12883	14962	15781	1002	1001	5047	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4889	18	56
70	13756	13268	13011	12270	335	851	4718	6342	259	56
75	15345	12883	11144	14606	394	655	3424	6115	259	56
80	15860	12528	12133	9770	6706	412	809	6353	259	56
85	15629	12490	13323	10847	7499	258	618	4148	0	74
90	15519	13756	13268	10161	9645	170	256	2037	0	74
95	17054	15345	12883	10274	8940	145	141	30	0	74
100	18086	15860	12528	10694	2305	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	11	20	9
10	3959	2436	455	236	0	0	3525	1000	0	2525	11	21	10
15	4082	2308	455	132	0	0	3966	1000	0	2966	11	19	8
20	4172	2159	455	171	0	0	3940	1000	0	2940	11	20	9
25	4135	2003	455	182	0	0	3589	1000	0	2589	11	20	9
30	4002	1903	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1852	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1852	455	107	0	0	3149	1000	0	2149	10	18	8
45	3274	1908	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2041	455	31	0	0	3082	1000	0	2082	10	16	6
55	2791	2213	455	27	0	0	3063	1000	0	2063	10	16	6
60	2433	2409	455	29	0	0	3111	1000	0	2111	10	16	6
65	2049	2403	455	244	0	0	4500	1000	0	3500	11	22	11
70	1729	2438	455	241	0	0	4671	1000	0	3671	11	21	10
75	1415	2649	455	75	0	0	3578	1000	0	2578	10	17	7
80	1205	2933	455	6	0	0	2880	1000	0	1880	10	16	6
85	962	3080	455	180	0	0	4390	1000	0	3390	10	20	10
90	698	2922	455	533	0	0	6206	1000	0	5206	10	29	19
95	581	3134	455	175	2878	0	1732	1000	0	3610	11	20	9
100	786	3228	455	294	1745	0	4237	1000	0	4982	10	21	11

HARVEST COST	45412.46
PLANT, THIN, & MAINTENANCE	8581.53
TOTAL BENEFIT	99181.02
NPV (EXCL. HARVEST COST)	90599.48
NPV (INCL. HARVEST COST)	45187.82

SHORT REPORT FOR PJ IN THE NWC SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745000	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP. CROWN

CURVE SET FILE. yc3.mwc
FOREST CLASS FILE: pj2.bau
COST FILE: cost.mwc

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	5778.	763.	0.	745000	43666	0	4963	4963	500	14901	2542	0	200	64686.	29418.
10	5244.	736.	0.	745000	43940	0	4945	4945	500	14901	2507	0	200	79049.	44292.
15	4732.	706.	0.	745000	48916	0	4751	4751	500	14901	2720	0	200	83170.	49207.
20	4157.	697.	0.	745000	42549	0	5049	5049	500	14900	2587	0	200	77013.	41575.
25	3608.	692.	0.	745000	45303	0	4804	4804	500	14898	2537	0	200	85425.	50928.
30	3059.	691.	0.	745000	44624	0	4891	4891	500	14899	2511	0	200	77836.	43260.
35	2442.	697.	0.	745000	47088	0	4986	4986	500	14901	2843	0	200	64872.	26085.
40	1879	698.	0.	745000	58298	0	5301	5301	500	14900	3991	0	200	63683.	4850.
45	1418	683	0.	745000	89403	0	7027	7027	500	14897	5018	0	200	33308.	0.
50	2325.	666	0.	745000	100506	0	4838	4838	500	14901	5131	0	200	2088.	0.
55	2416.	678.	0.	745000	64202	0	4891	4891	500	14900	2653	0	199	2667.	0.
60	1889	695.	0	745000	60955	0	5096	5096	500	14900	2374	0	201	0.	0.
65	1305.	716.	0	745000	58375	0	4810	4810	500	14900	2439	0	200	0	0.
70	1394.	721.	0.	745000	79662	0	5018	5018	500	14899	3329	0	199	0.	0.
75	1590	706.	0.	745000	107363	0	5851	5851	500	14900	3990	0	200	0.	0.
80	1683	735.	0.	745000	77187	0	7415	7415	500	14901	3912	0	200	0.	0.
85	2026.	758	0.	745000	82542	0	5634	5634	500	14900	2994	0	200	0.	0.
90	2087	783.	0.	745000	86037	0	6340	6340	500	14901	3342	0	200	0.	0.
95	2169	797	0	745000	87392	0	5739	5739	500	14900	3226	0	200	0.	0.
100	2185.	767.	0.	745000	125025	0	5583	5583	500	14901	4134	0	200	0.	0.

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21380	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23168	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	8961	1629	36	0	0
40	19730	20077	15551	1732	5375	7587	2680	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2672	197	4174	0	0	0	0
55	22152	19495	27490	2626	481	488	0	0	0	0
60	22057	19730	20077	10238	630	0	0	0	0	0
65	21852	19982	19708	10530	660	0	0	0	0	0
70	19635	22205	19549	10621	922	0	0	0	0	0
75	19815	22152	19495	10966	384	0	0	0	0	0
80	20775	21433	19289	10864	371	0	0	0	0	0
85	23094	19200	19822	18425	191	0	0	0	0	0
90	23918	19635	19066	9489	644	0	0	0	0	0
95	25240	19915	18004	9247	426	0	0	0	0	0
100	25128	20664	17343	9391	286	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (IN M3)		HARVEST (IN M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	6203	799											
5	5778	763	745	43	0	0	4963	4963	500	0	17	27	10
10	5244	735	745	43	0	0	4945	4945	500	0	17	27	10
15	4731	706	745	48	0	0	4751	4751	500	0	17	27	10
20	4157	696	745	42	0	0	5049	5049	500	0	17	27	10
25	3607	692	745	45	0	0	4804	4804	500	0	17	27	10
30	3059	691	745	44	0	0	4891	4891	500	0	17	27	10
35	2441	696	745	47	0	0	4986	4986	500	0	17	27	10
40	1878	698	745	58	0	0	5301	5301	500	0	18	27	8
45	1418	683	745	89	0	0	7027	7027	500	0	20	28	8
50	2324	666	745	100	0	8	4830	4838	500	0	20	28	8
55	2415	677	745	64	0	500	4391	4891	500	0	17	27	10
60	1888	694	745	60	0	492	4604	5096	500	0	17	27	10
65	1305	715	745	58	0	500	4310	4810	500	0	17	27	10
70	1393	721	745	79	36	500	4482	5018	500	0	18	28	10
75	1590	705	745	107	2901	1923	1027	5851	500	0	19	28	9
80	1682	734	745	77	7093	142	180	7415	500	0	19	28	9
85	2025	757	745	82	4755	827	52	5634	500	0	19	28	11
90	2087	783	745	86	5391	808	139	6340	500	0	18	29	11
95	2169	797	745	87	5442	297	0	5739	500	0	19	28	11
100	2184	767	745	125	4961	622	0	5583	500	0	19	29	11

HARVEST COST	74357 65
PLANT, THIN, & MAINTENANCE	15352 80
TOTAL BENEFIT	136496 10
NPV (EXCL. HARVEST COST)	121143 30
NPV (INCL. HARVEST COST)	46985 67

SHORT REPORT FOR SP IN THE NWC SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):
455000 455000 455000 455000 455000 455000 455000 455000 455000 455000
455000 455000 455000 455000 455000 455000 455000 455000 455000 455000

PLANTING LEVEL (HA/ITERATION):
1000 1000 1000 1000 1000 1000 1000 1000 1000 1000
1000 1000 1000 1000 1000 1000 1000 1000 1000 1000

SPACING LEVEL (HA/ITERATION):
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.nwc
FOREST CLASS FILE: sb-bf.bau
COST FILE: cost.nwc

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	ROT.	REAL.
5	3527.	2664.	0.	455000	170462	0	4011	1000	0	9100	1200	0	0	19699.	0.
10	3960	2437.	0.	455000	236461	0	3525	1000	0	9099	1200	0	0	18771.	0.
15	4083.	2300.	0.	455000	132017	0	3966	1000	0	9099	1200	0	0	46996.	0.
20	4173.	2160.	0.	455000	171710	0	3940	1000	0	9101	1200	0	0	48149.	0.
25	4135.	2003.	0.	455000	182094	0	3589	1000	0	9101	1200	0	0	21935.	0.
30	4003.	1904.	0.	455000	160668	0	3467	1000	0	9100	1200	0	0	14547.	0.
35	3791	1853.	0.	455000	114667	0	3418	1000	0	9101	1200	0	0	4742.	0.
40	3537.	1853.	0.	455000	107301	0	3149	1000	0	9099	1199	0	0	707.	0.
45	3274.	1900.	0.	455000	70786	0	3234	1000	0	9101	1200	0	0	426.	0.
50	3073.	2842.	0	455000	31596	0	3082	1000	0	9099	1200	0	0	72.	0.
55	2791.	2213.	0.	455000	27071	0	3063	1000	0	9100	1200	0	0	30.	0.
60	2433.	2410.	0	455000	29283	0	3111	1000	0	9101	1201	0	0	954.	0.
65	2050	2404.	0.	455000	244973	0	4500	1000	0	9102	1200	0	0	11316.	0.
70	1730	2439.	0.	455000	241651	0	4671	1000	0	9101	1200	0	0	18877.	0.
75	1416	2650.	0.	455000	75191	0	3578	1000	0	9099	1201	0	0	1755.	0.
80	1206.	2934.	0	455000	6579	0	2880	1000	0	9100	1200	0	0	50.	0.
85	963.	3081.	0.	455000	180767	0	4390	1000	0	9100	1199	0	0	573.	0.
90	698.	2924.	0.	455000	533679	0	6206	1000	0	9102	1200	0	0	684.	0.
95	581	3136.	0	455000	175115	0	4613	1000	0	9100	1200	0	0	1270.	0.
100	778	3231	0	455000	294499	0	5982	1000	0	9099	1200	0	0	934.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18738	4959	1345	189	0	37
10	12533	959	8521	15710	18509	7098	1413	136	7	0
15	15781	1005	4447	16066	15649	10187	1444	180	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15642	8540	1460	7094	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15828	6507	806	180	7
35	14962	15781	1005	2251	7516	13855	8587	822	180	7
40	14414	13087	6979	1642	4021	13616	9416	1149	555	7
45	13623	15642	8540	1159	2790	10500	10768	1602	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	346	56
55	12883	14962	15781	1802	1801	5067	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4889	18	56
70	13756	13268	13011	12270	335	851	4719	6362	259	56
75	15345	12883	11144	14606	399	655	3424	6115	259	56
80	15860	12528	12133	9770	6706	412	809	6353	259	56
85	15629	12490	13323	10847	7499	258	618	4168	0	74
90	15519	13756	13268	10161	9645	170	256	2037	0	74
95	17054	15345	12883	10274	8940	145	141	30	0	74
100	18089	15860	12528	10691	2305	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2300	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1903	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1852	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1852	455	107	0	0	3149	1000	0	2149	10	18	8
45	3274	1900	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2841	455	31	0	0	3082	1000	0	2082	10	16	6
55	2791	2213	455	27	0	0	3063	1000	0	2063	10	16	6
60	2433	2409	455	29	0	0	3111	1000	0	2111	10	16	6
65	2049	2403	455	244	0	0	4500	1000	0	3500	10	22	12
70	1729	2438	455	241	0	0	4671	1000	0	3671	10	21	11
75	1415	2649	455	75	0	0	3578	1000	0	2578	10	17	7
80	1205	2934	455	6	0	0	2880	1000	0	1880	10	16	6
85	962	3080	455	180	0	0	4390	1000	0	3390	10	20	10
90	698	2924	455	533	0	0	6206	1000	0	5206	10	29	19
95	580	3136	455	175	2881	0	1732	1000	0	3613	10	20	10
100	776	3231	455	294	1745	0	4237	1000	0	4982	10	23	13

HARVEST COST	65612 44
PLANT, THIN, & MAINTENANCE	5988 35
TOTAL BENEFIT	99181.85
PNB (EXCL. HARVEST COST)	93192 70
PNB (INCL. HARVEST COST)	27780 26

SHORT REPORT FOR PJ IN THE NAA SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

745000	745000	745080	745000	745000	745000	745000	745000	745000	745000
745000	745000	745000	745000	745000	745000	745000	745000	745000	745000

PLANTING LEVEL (HA/ITERATION):

8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000

SPACING LEVEL (HA/ITERATION):

500	500	500	500	500	500	500	500	500	500
500	500	500	500	500	500	500	500	500	500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE: yc3.naa
FOREST CLASS FILE: pj2.bmu
COST FILE: cost.naa

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	ROT.	REAL.
5	5778.	763.	0.	745000	43666	0	4963	4963	500	14901	1744	0	200	64686.	29418.
10	5244.	732.	0.	745000	43940	0	4945	4945	500	14901	1230	0	200	79049.	44292.
15	4733.	700.	0.	745000	48916	0	4751	4751	500	14901	2239	0	200	83170.	49207.
20	4159	683.	0.	745000	42549	0	5049	5049	500	14900	2215	0	200	77013.	41575.
25	3621	673.	0.	745000	45303	0	4804	4804	500	14898	1947	0	200	85425.	50928.
30	3081	669.	0.	745000	44424	0	4891	4891	500	14899	1905	0	200	77836.	43260.
35	2526	672.	0.	745000	47088	0	4986	4986	500	14901	2669	0	200	64872.	26885.
40	1936	667	0.	745000	50298	0	5301	5301	500	14900	4231	0	200	43683.	4850.
45	1515	641.	0.	745000	89403	0	7027	7027	500	14897	5696	0	200	33308.	0.
50	2418	618.	0.	745000	100451	0	4834	4834	500	14901	6394	0	200	2098.	0.
55	2538	627.	0.	745000	62936	0	4828	4828	500	14901	1719	0	199	2667.	0.
60	2023	633.	0.	745000	59687	0	5029	5029	500	14900	1139	0	201	0.	0.
65	1487	642.	0.	745000	57018	0	4738	4738	500	14900	890	0	200	0.	0.
70	1672.	639.	0.	745000	70199	0	4878	4878	500	14902	2073	0	199	0.	0.
75	1998	620.	0	745000	97764	0	5304	5304	500	14900	3920	0	200	0.	0.
80	2272	651	0.	745000	62001	0	6721	6721	500	14900	2492	0	200	0.	0.
85	2856	683.	0.	745000	61033	0	4642	4642	500	14900	2288	0	200	0.	0.
90	3092	709	0.	745000	63631	0	5460	5460	500	14900	2719	0	200	0.	0.
95	3366	727	0.	745000	62307	0	4534	4534	500	14900	1812	0	200	0.	0.
100	3567	708.	0	745000	92650	0	4351	4351	500	14901	3780	0	200	0.	0.

1

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	24135	3138	1489	21300	20985	1341	344	0	0	0
15	27490	4193	1072	16365	21270	1958	384	0	0	0
20	20077	15551	1732	8821	23148	3297	106	0	0	0
25	19708	20189	2380	4155	21626	4504	170	0	0	0
30	19549	24135	3138	1489	18218	5461	706	36	0	0
35	19495	27490	4193	1072	11857	6961	1628	36	0	0
40	19730	20077	15551	1732	5375	7587	2640	0	0	0
45	19982	19708	20189	2380	1782	7414	1218	59	0	0
50	22205	19549	24135	2472	197	4174	0	0	0	0
55	22148	19495	27490	2630	481	488	0	0	0	0
60	21990	19730	20077	10305	630	0	0	0	0	0
65	21718	19982	19708	10664	660	0	0	0	0	0
70	19429	22205	19549	10627	922	0	0	0	0	0
75	19473	22148	19495	10966	650	0	0	0	0	0
80	19949	21366	19694	11352	371	0	0	0	0	0
85	21641	19066	19822	12012	191	0	0	0	0	0
90	21545	19429	19393	11696	669	0	0	0	0	0
95	22127	19473	18576	12026	530	0	0	0	0	0
100	21357	19838	17507	13824	206	0	0	0	0	0

MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	6203	799											
5	5770	762	745	43	0	0	4963	4963	500	0	16	27	11
10	5244	732	745	43	0	0	4945	4945	500	0	16	27	11
15	4732	700	745	48	0	0	4751	4751	500	0	17	27	10
20	4158	683	745	42	0	0	5049	5049	500	0	17	27	10
25	3621	672	745	45	0	0	4804	4804	500	0	17	27	10
30	3081	669	745	44	0	0	4891	4891	500	0	17	27	10
35	2526	672	745	47	0	0	4986	4986	500	0	17	27	10
40	1936	666	745	50	0	0	5301	5301	500	0	19	27	8
45	1514	641	745	89	0	0	7027	7027	500	0	20	28	8
50	2417	618	745	100	0	0	4834	4834	500	0	21	28	7
55	2538	626	745	62	0	508	4320	4828	500	0	16	27	11
60	2022	632	745	59	0	492	4537	5029	500	0	16	27	11
65	1486	641	745	57	0	500	4238	4738	500	0	15	27	12
70	1671	639	745	70	36	500	4342	4878	500	0	17	27	10
75	1998	619	745	97	2771	1160	1373	5304	500	0	19	28	9
80	2271	650	745	62	6041	500	180	6721	500	0	17	27	10
85	2855	682	745	61	4090	500	52	4642	500	0	17	27	10
90	3091	709	745	63	4821	500	139	5460	500	0	17	27	10
95	3365	726	745	62	4034	500	0	4534	500	0	16	27	11
100	3566	707	745	92	3851	500	0	4351	500	0	18	28	10

HARVEST COST	74357.91
PLANT. THIN. & MAINTENANCE	12439.92
TOTAL BENEFIT	136563.10
PNW (EXCL. HARVEST COST)	124123.20
PNW (INCL. HARVEST COST)	49765.33

SHORT REPORT FOR SP IN THE NAA SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

455000	455000	455000	455000	455000	455000	455000	455000	455000	455000
455000	455000	455000	455000	455000	455000	455000	455000	455000	455000

PLANTING LEVEL (HA/ITERATION):

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.naa
FOREST CLASS FILE: nb-bf.bau
COST FILE: cost.naa

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	ROT.	REAL.
5	3527	2664.	0.	455000	170462	0	4011	1000	0	9100	1390	0	0	19699.	0.
10	3960.	2437.	0.	455000	236661	0	3525	1000	0	9099	1400	0	0	18771.	0.
15	4083.	2308.	0.	455000	132017	0	3966	1000	0	9099	1400	0	0	46996.	0.
20	4173	2160	0.	455000	171710	0	3940	1000	0	9101	1400	0	0	48149.	0.
25	4135.	2003.	0.	455000	182894	0	3589	1000	0	9101	1400	0	0	21935.	0.
30	4003	1903	0.	455000	160668	0	3467	1000	0	9100	1369	0	0	14547.	0.
35	3791	1852.	0.	455000	114667	0	3418	1000	0	9101	990	0	0	4742.	0.
40	3537	1851.	0.	455000	107301	0	3149	1000	0	9099	921	0	0	707.	0.
45	3274	1905.	0.	455000	70786	0	3234	1000	0	9101	971	0	0	426.	0.
50	3073	2038.	0.	455000	31596	0	3082	1000	0	9099	863	0	0	72.	0.
55	2791.	2208.	0.	455000	27071	0	3063	1000	0	9100	848	0	0	30.	0.
60	2433	2404.	0.	455000	29283	0	3111	1000	0	9101	990	0	0	954.	0.
65	2050.	2398.	0.	455000	244973	0	4500	1000	0	9102	1400	0	0	11316.	0.
70	1765.	2432	0.	455000	241651	0	4671	1000	0	9101	1400	0	0	18877.	0.
75	1449	2643	0.	455000	75191	0	3578	1000	0	9099	1058	0	0	1755.	0.
80	1260	2925.	0.	455000	6579	0	2880	1000	0	9100	1076	0	0	50.	0.
85	1039	3070	0.	455000	180767	0	4390	1000	0	9100	1293	0	0	573.	0.
90	801	2910.	0.	455000	533679	0	6206	1000	0	9102	1462	0	0	686.	0.
95	711	3128.	0.	455000	162944	0	4059	1000	0	9101	1390	0	0	1270.	0.
100	935.	3223	0.	455000	287601	0	5900	1000	0	9099	1368	0	0	934.	0.

AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16706	18738	4959	1345	109	0	37
10	12533	959	8521	15710	18509	7098	1413	136	7	0
15	15781	1005	4467	16866	15849	10187	1444	100	7	0
20	13087	6979	2798	10781	16510	12188	1981	555	7	0
25	15442	8540	1460	7894	13947	13910	3931	532	30	0
30	15020	12533	959	4240	9686	15028	6507	806	100	7
35	14962	15781	1005	2251	7516	13855	8587	822	100	7
40	14414	13087	6979	1642	4021	13618	9416	1149	555	7
45	13623	15442	8540	1159	2790	10500	10768	1502	532	30
50	13268	15020	12533	915	1354	6759	12376	2259	346	56
55	12883	14962	15781	1002	1801	5847	10975	3179	0	56
60	12528	14414	13087	6979	1157	2114	10592	3959	0	56
65	12490	13623	15270	8527	985	1653	8175	4089	18	56
70	13756	13268	13011	12270	335	851	4718	6362	259	56
75	15345	12883	11144	14606	399	655	3424	6115	259	56
80	15860	12528	12133	9770	6706	412	809	6351	259	56
85	15629	12490	13323	10847	7499	250	618	4168	0	74
90	15518	13756	13268	10161	9665	170	256	2017	0	74
95	17054	15345	12883	10274	8940	165	161	30	0	74
100	17535	15860	12528	10520	3030	5339	0	0	0	74

MANAGEMENT UNIT # 1

	GROWING STOCK (IN M3)		HARVEST (IN M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3526	2663	455	170	0	0	4011	1000	0	3011	10	20	10
10	3959	2436	455	236	0	0	3525	1000	0	2525	10	21	11
15	4082	2308	455	132	0	0	3966	1000	0	2966	10	19	9
20	4172	2159	455	171	0	0	3940	1000	0	2940	10	20	10
25	4135	2003	455	182	0	0	3589	1000	0	2589	10	20	10
30	4002	1902	455	160	0	0	3467	1000	0	2467	10	19	9
35	3790	1851	455	114	0	0	3418	1000	0	2418	10	18	8
40	3537	1850	455	107	0	0	3149	1000	0	2149	10	18	8
45	3274	1905	455	70	0	0	3234	1000	0	2234	10	17	7
50	3073	2037	455	31	0	0	3082	1000	0	2082	9	16	7
55	2791	2208	455	27	0	0	3063	1000	0	2063	9	16	7
60	2433	2404	455	29	0	0	3111	1000	0	2111	10	16	6
65	2049	2397	455	244	0	0	4500	1000	0	3500	10	22	12
70	1765	2431	455	241	0	0	4671	1000	0	3671	10	21	11
75	1449	2642	455	75	0	0	3578	1000	0	2578	10	17	7
80	1259	2925	455	6	0	0	2880	1000	0	1882	10	16	6
85	1039	3070	455	180	0	0	4390	1000	0	3390	10	20	10
90	800	2910	455	533	0	0	6206	1000	0	5206	10	29	19
95	711	3128	455	162	2327	0	1732	1000	0	3059	10	19	9
100	935	3223	455	287	1643	0	4237	1000	0	4900	10	23	13

HARVEST COST	45612 46
PLANT, THIN, & MAINTENANCE	6625 92
TOTAL BENEFIT	99369 20
NPV (EXCL. HARVEST COST)	92741 28
NPV (INCL. HARVEST COST)	47338 82

SHORT REPORT FOR PJ IN THE FWS-GW SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):
1065000 1065000 1065000 1065000 1065000 1065000 1065000 1065000 1065000 1065000
1065000 1065000 1065000 1065000 1065000 1065000 1065000 1066000 1065000 1065000

PLANTING LEVEL (HA/ITERATION):
8000 8000 8000 8000 8000 8000 8000 8000 8000 8000
8000 8000 8000 8000 8000 8000 8000 8000 8000 8000

SPACING LEVEL (HA/ITERATION):
5500 5500 5500 5500 5500 5500 5500 5500 5500 5500
5500 5500 5500 5500 5500 5500 5500 5500 5500 5500

SPACING WINDOW 10 - 20

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.fws
FOREST CLASS FILE: pj2.fws
COST FILE: cost-gw.fws

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT	SPACE	POT	REAL.
5	5472	746	0	1065000	65553	0	7059	7059	5500	21301	2013	0	1747	64686.	15483
10	4445	703	0	1065000	64847	0	6902	6902	5500	21301	1661	0	2200	66157.	17701.
15	3852	663	0	1065000	68117	0	6779	6779	5500	21299	1734	0	2200	57206	10316
20	3063	630	0	1065000	82482	0	8494	8000	5500	21300	2458	0	2020	37493	0
25	2398	609.	0.	1065000	75668	0	6911	6911	5500	21299	2179	0	2179	37669.	0.
30	1785	586.	0	1065000	90504	0	6861	6861	5500	21300	3293	0	2137	18689	0
35	2201	484.	0	1065000	109588	0	7386	7386	5500	21300	7090	0	2201	0.	0
40	1932	478.	0	1065000	96262	0	7994	7994	5500	21299	2157	0	2188	0.	0
45	1974	478.	0.	1065000	83662	0	7852	7852	5500	21301	1530	0	2081	0.	0
50	2147	472.	0	1065000	92179	0	8028	8000	5500	21301	2339	0	2059	0.	0
55	2073	468.	0	1065000	79723	0	9793	8000	5500	21301	2247	0	2179	0	0
60	1986	460	0	1065000	90444	0	7929	7929	5500	21300	2675	0	2197	0	0
65	1869	492	0	1065000	77592	0	7202	7202	5500	21299	2877	0	2200	0.	0
70	2249	488	0.	1065000	106609	0	7883	7883	5500	21298	4443	0	2199	0.	0
75	1624	487	0	1065000	110175	0	7418	7418	5500	21300	4648	0	2201	0.	0
80	1673	428	0.	1065000	141839	0	8660	8000	5500	21299	7124	0	2200	0.	0
85	1808	443.	0.	1065000	72349	0	7465	7465	5500	21299	2107	0	2070	0	0
90	1634	447.	0.	1065000	82375	0	8090	8000	5500	21300	1877	0	2029	0.	0
95	1386	463	0	1063000	75246	0	7137	7137	5500	21299	2306	0	2137	0.	0.
100	1232	482	0	1065000	80284	0	7259	7259	5500	21300	2573	0	2083	0.	0

1

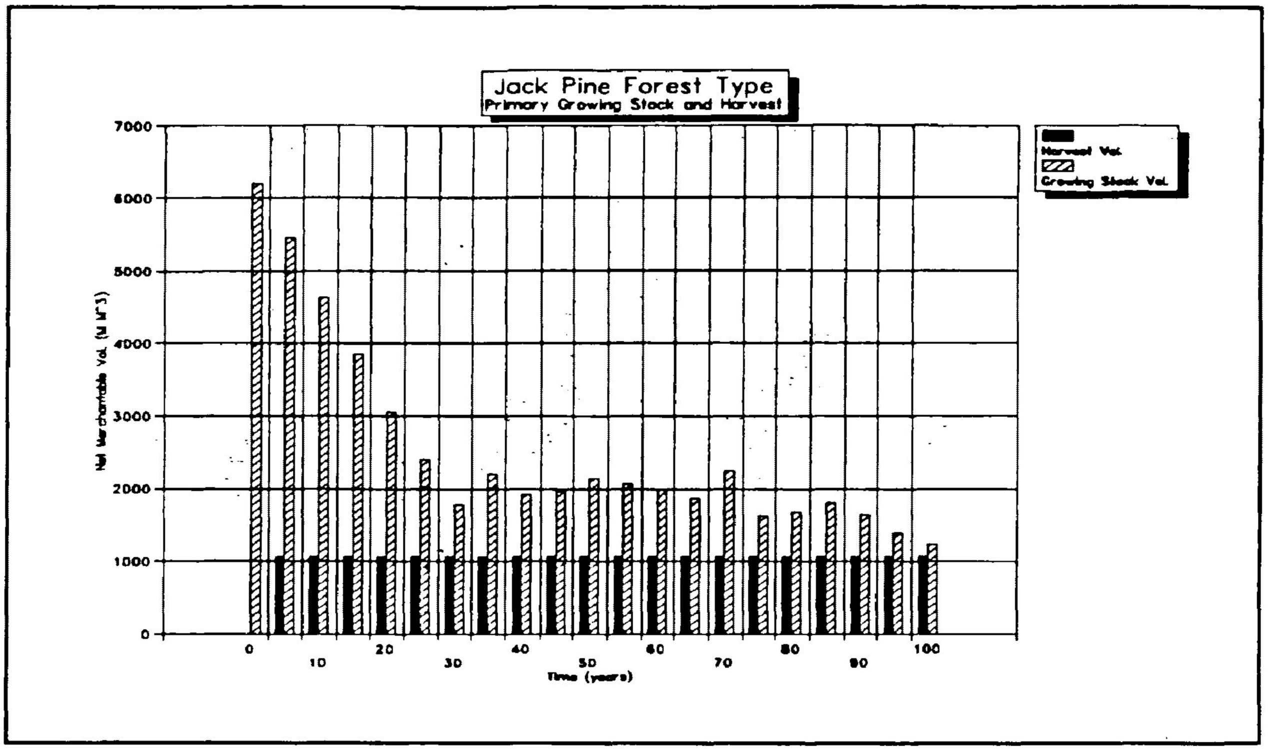
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20389	2380	4155	25419	18259	2315	115	0	0	0
10	26231	3138	1489	21300	19574	964	36	0	0	0
15	31543	4193	1072	16365	17592	1891	76	0	0	0
20	26158	15551	1732	8821	17611	2823	36	0	0	0
25	29234	20189	2380	4155	14321	2453	0	0	0	0
30	29086	26231	3138	1489	9917	2871	0	0	0	0
35	29045	31543	4193	815	4366	2790	0	0	0	0
40	29652	26158	15543	675	704	0	0	0	0	0
45	29152	29234	13466	836	44	0	0	0	0	0
50	30093	29086	12201	1331	21	0	0	0	0	0
55	31260	29045	10890	1426	111	0	0	0	0	0
60	33667	27309	8321	3154	281	0	0	0	0	0
65	33602	28084	8872	2004	170	0	0	0	0	0
70	32952	29323	8705	1572	180	0	0	0	0	0
75	32807	30916	7683	1094	232	0	0	0	0	0
80	30432	33656	8273	0	371	0	0	0	0	0
85	31163	31259	9967	152	191	0	0	0	0	0
90	31426	29836	10737	594	139	0	0	0	0	0
95	31633	29288	11217	594	0	0	0	0	0	0
100	31352	29101	12127	152	0	0	0	0	0	0

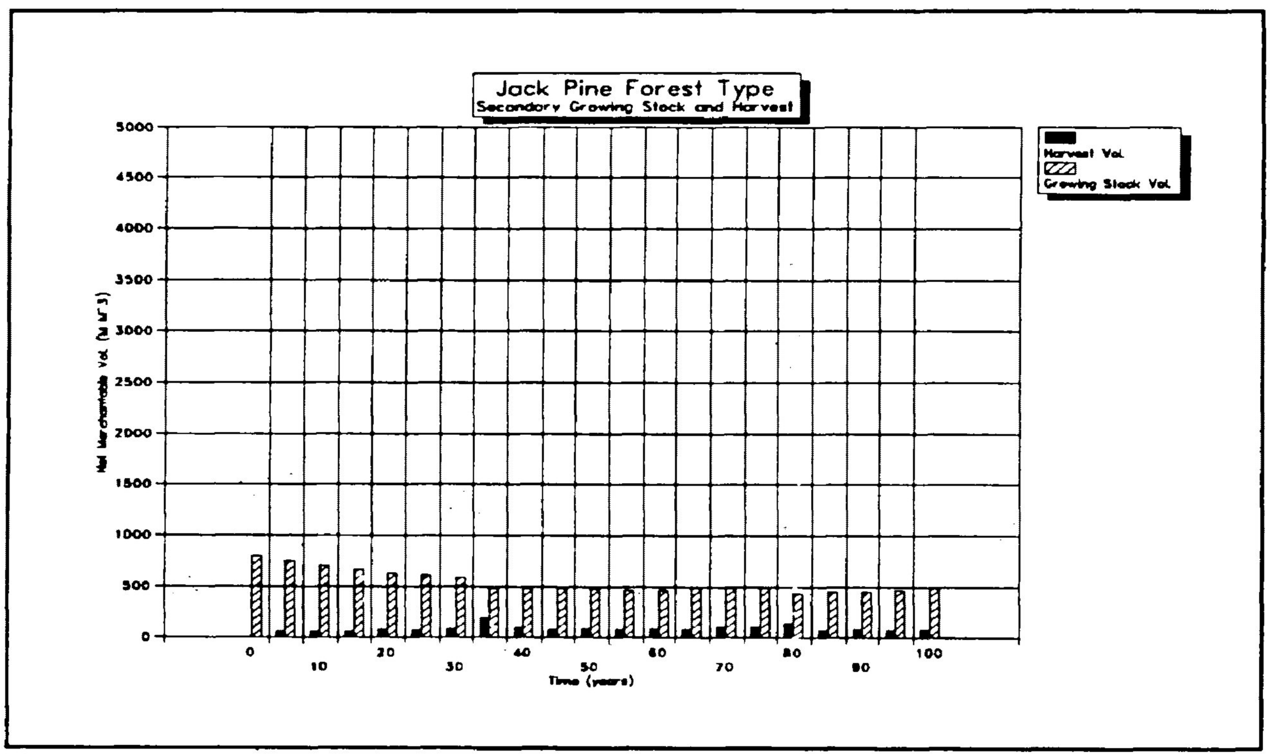
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	6203	799											
5	5471	746	1065	65	0	0	7059	7059	5500	0	25	38	13
10	4444	702	1065	64	0	0	6902	6902	5500	0	25	38	13
15	3851	662	1065	68	0	0	6779	6779	5500	0	25	38	13
20	3062	630	1065	82	0	0	8494	8000	5500	494	25	39	14
25	2397	609	1065	75	0	0	6911	6911	5500	0	25	39	14
30	1785	585	1065	90	0	0	6861	6861	5500	0	26	39	13
35	2201	483	1065	109	0	8	7378	7386	5500	0	30	42	12
40	1931	478	1065	96	0	6715	1279	7994	5500	0	25	39	14
45	1974	478	1065	83	0	7829	23	7852	5500	0	24	39	15
50	2146	472	1065	92	0	7658	370	8000	5500	28	25	39	14
55	2073	467	1065	79	1917	7831	45	8000	5500	1793	25	39	14
60	1986	460	1065	90	756	6901	272	7929	5500	0	26	39	13
65	1869	491	1065	77	222	6558	422	7202	5500	0	26	39	13
70	2249	488	1065	106	2164	5293	426	7883	5500	0	27	39	12
75	1623	486	1065	110	1505	4671	1242	7418	5500	0	28	40	12
80	1671	427	1065	141	4912	3513	235	8000	5500	660	30	40	10
85	-1807	443	1065	72	0	7413	52	7465	5500	0	25	39	14
90	1635	446	1065	82	0	7951	139	8000	5500	90	25	39	14
95	1386	463	1065	75	442	6695	0	7137	5500	0	25	39	14
100	1231	481	1065	80	2049	5210	0	7259	5500	0	25	39	14

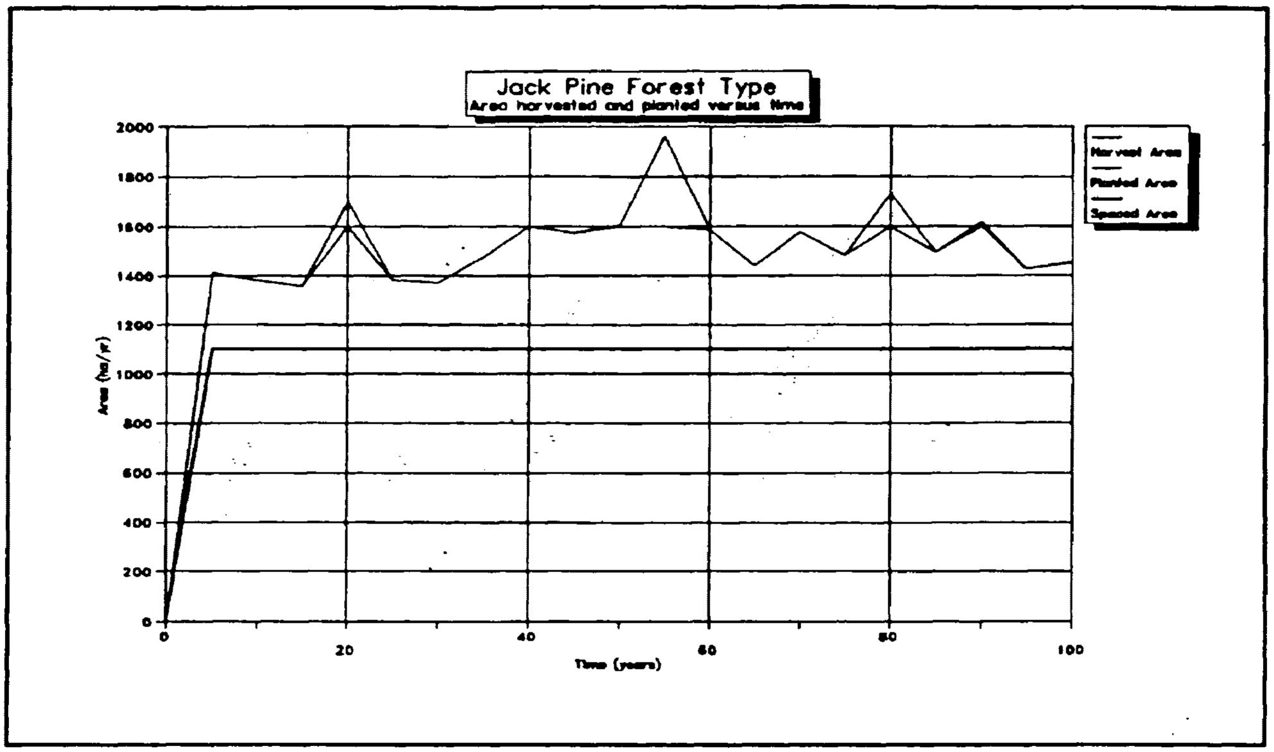
HARVEST COST	106295 60
PLANT, THIN, & MAINTENANCE	22897 94
TOTAL BENEFIT	196362 70
NPV (EXCL. HARVEST COST)	173464 70
NPV (INCL. HARVEST COST)	67169 12



The Jack Pine Forest Type's primary growing stock and harvest volumes at five-year intervals for the FWS-GW scenario.



The Jack Pine Forest Type's secondary growing stock and harvest volumes at five-year intervals for the FWS-GW scenario.



The Jack Pine Forest Type's annual harvested, regenerated and thinned areas for the FWS-GW scenario.

SHORT REPORT FOR PO IN THE FWS-GW SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

295000	295000	295000	295000	295000	295000	295000	295000	295000	295000
295000	295000	295000	295000	295000	295000	295000	295000	295000	295000

PLANTING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc2.bau
FOREST CLASS FILE: po3.bau
COST FILE: cost.fws

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)					MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.		REAL.
5	3582	365.	0.	295000	40263	0	2255	0	0	5902	0	0	0	41492.		14411.
10	3369	367.	0.	295000	31063	0	2205	0	0	5900	0	0	0	38343.		12198.
15	3152	378	0.	295000	30057	0	2043	0	0	5900	0	0	0	50664		24699
20	2854	408	0.	295000	30473	0	1995	0	0	5900	0	0	0	79348.		52467.
25	2540.	447.	0.	295000	40641	0	2059	0	0	5901	0	0	0	97621.		70650.
30	2354	473.	0.	295000	47164	0	2214	0	0	5901	0	0	0	91084.		63452.
35	2040	510.	0.	295000	30529	0	2800	0	0	5900	0	0	0	84490		57498
40	1904	526	0	295000	35386	0	2030	0	0	5901	0	0	0	63151		34945
45	1774	497	0.	295000	65553	0	2490	0	0	5900	0	0	0	48770.		20780
50	1656	444	0.	295000	87367	0	2793	0	0	5903	0	0	0	35688		15305
55	1560	368	0.	295000	189577	0	3080	0	0	5901	0	0	0	29890		10432
60	1499	268	0.	295000	134906	0	3511	0	0	5900	0	0	0	20507		3133
65	1459	232	0.	295000	67187	0	2853	0	0	5900	0	0	0	26368		0.
70	1428	238	0.	295000	25684	0	3403	0	0	5900	0	0	0	4860		0.
75	1399	235	0.	295000	32089	0	2596	0	0	5899	0	0	0	0.		0.
80	1384	236	0.	295000	32011	0	2588	0	0	5899	0	0	0	0.		0
85	1379	235	0.	295000	32881	0	2552	0	0	5900	0	0	0	0.		0
90	1376	234	0.	295000	32053	0	2494	0	0	5900	0	0	0	42		0.
95	1389	233	0.	295000	31988	0	2419	0	0	5901	0	0	0	0.		0.
100	1378	229	0.	295000	32474	0	2748	0	0	5899	0	0	0	0.		0.

1

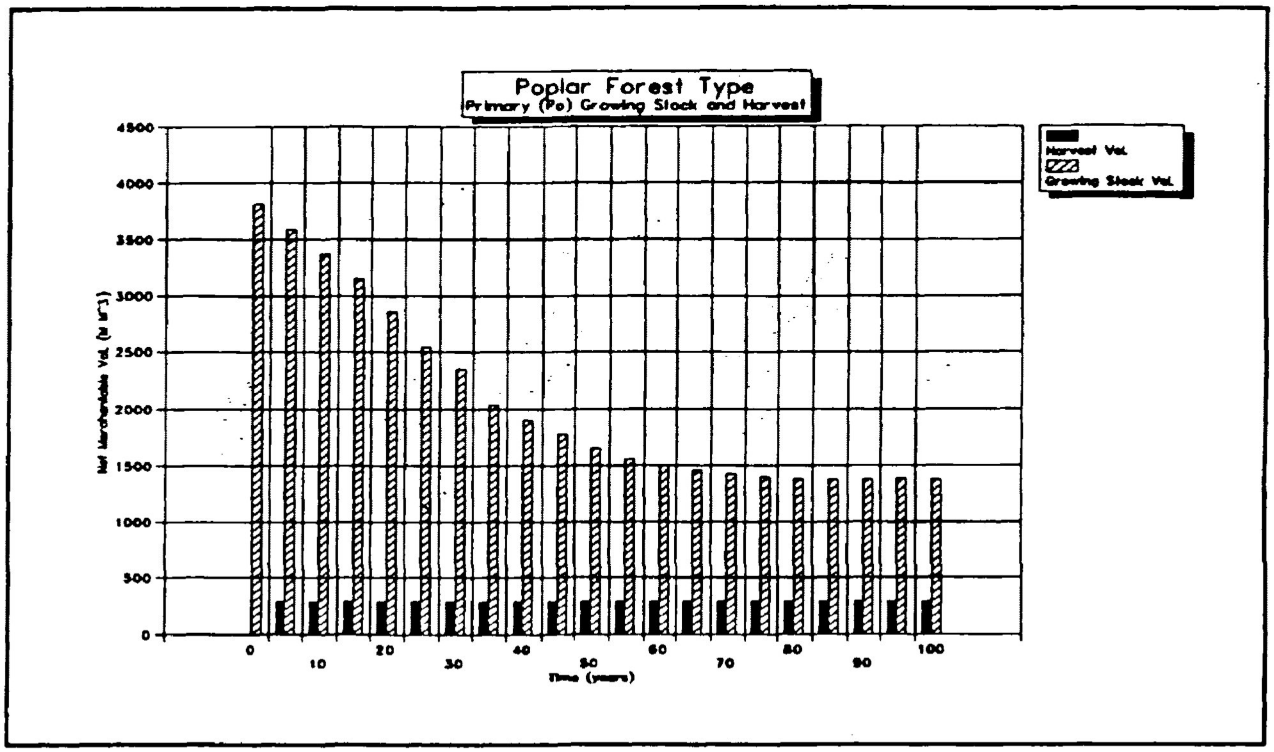
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	3618	1682	7083	16375	5684	419	0	0	0	0
10	5593	1484	4228	16547	5727	1282	0	0	0	0
15	7468	1810	2144	14009	7982	1462	64	0	0	0
20	6606	4269	1521	9710	11143	1412	200	0	0	0
25	8498	3618	1682	7083	12358	1224	398	0	0	0
30	8302	5593	1484	4228	12514	1479	1261	8	0	0
35	8311	7468	1810	2144	10605	3016	1462	45	0	0
40	8268	6606	4269	1521	7001	5628	1389	179	0	0
45	8303	8498	3618	1682	3117	8085	1160	398	0	0
50	8734	8302	5593	1484	1182	7191	1365	1010	0	0
55	9313	8311	7468	1810	476	3496	2923	1864	0	0
60	10393	8268	6606	4269	450	737	3933	205	0	0
65	11874	8303	8498	3602	1280	278	1106	0	0	0
70	12237	8734	8302	5229	359	0	0	0	0	0
75	12847	9313	8241	4460	0	0	0	8	0	0
80	12363	10393	7857	4248	0	0	0	8	0	0
85	11440	11874	7509	4038	0	0	0	8	0	0
90	11139	12237	7431	4054	0	0	0	0	0	0
95	10230	12847	7922	3862	0	0	0	0	0	0
100	10853	12363	8642	3803	0	0	0	0	0	0

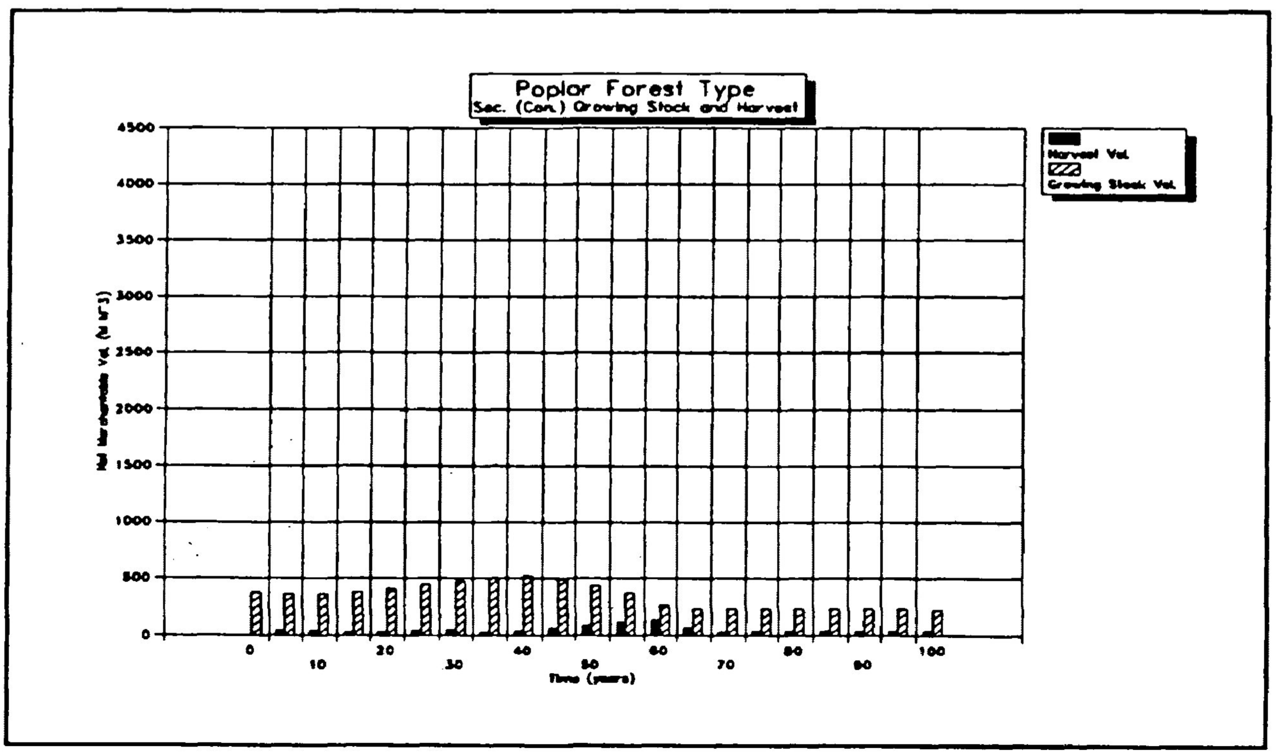
MANAGEMENT UNIT # 1

	GROWING STOCK (IN M3)		HARVEST (IN M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	MM$	MM$	MM$
0	3806	373											
5	3581	365	295	40	0	0	2255	0	0	2255	5	11	6
10	3368	366	295	31	0	0	2205	8	0	2205	5	11	6
15	3152	377	295	30	0	0	2043	0	0	2043	5	11	6
20	2853	408	295	30	0	0	1995	0	0	1995	5	11	6
25	2539	447	295	40	0	0	2059	0	0	2059	5	11	6
30	2353	473	295	47	0	0	2214	0	0	2214	5	11	6
35	2039	509	295	30	0	0	2080	0	0	2080	5	11	6
40	1904	525	295	35	0	0	2030	0	0	2030	5	11	6
45	1773	496	295	65	0	0	2490	0	0	2490	5	11	6
50	1655	444	295	87	0	0	2793	0	0	2793	5	12	7
55	1560	368	295	109	0	0	3080	0	0	3080	5	13	8
60	1498	268	295	134	0	0	3511	0	0	3511	5	13	8
65	1459	231	295	67	0	0	2853	0	0	2853	5	11	6
70	1427	237	295	25	0	0	3403	0	0	3403	5	10	5
75	1398	235	295	32	0	0	2596	0	0	2596	5	11	6
80	1384	236	295	32	0	0	2588	0	0	2588	5	11	6
85	1378	234	295	32	0	0	2552	0	0	2552	5	11	6
90	1376	234	295	32	0	0	2494	0	0	2494	5	11	6
95	1389	232	295	31	0	0	2419	0	0	2419	5	11	6
100	1378	229	295	32	0	0	2748	0	0	2748	5	11	6

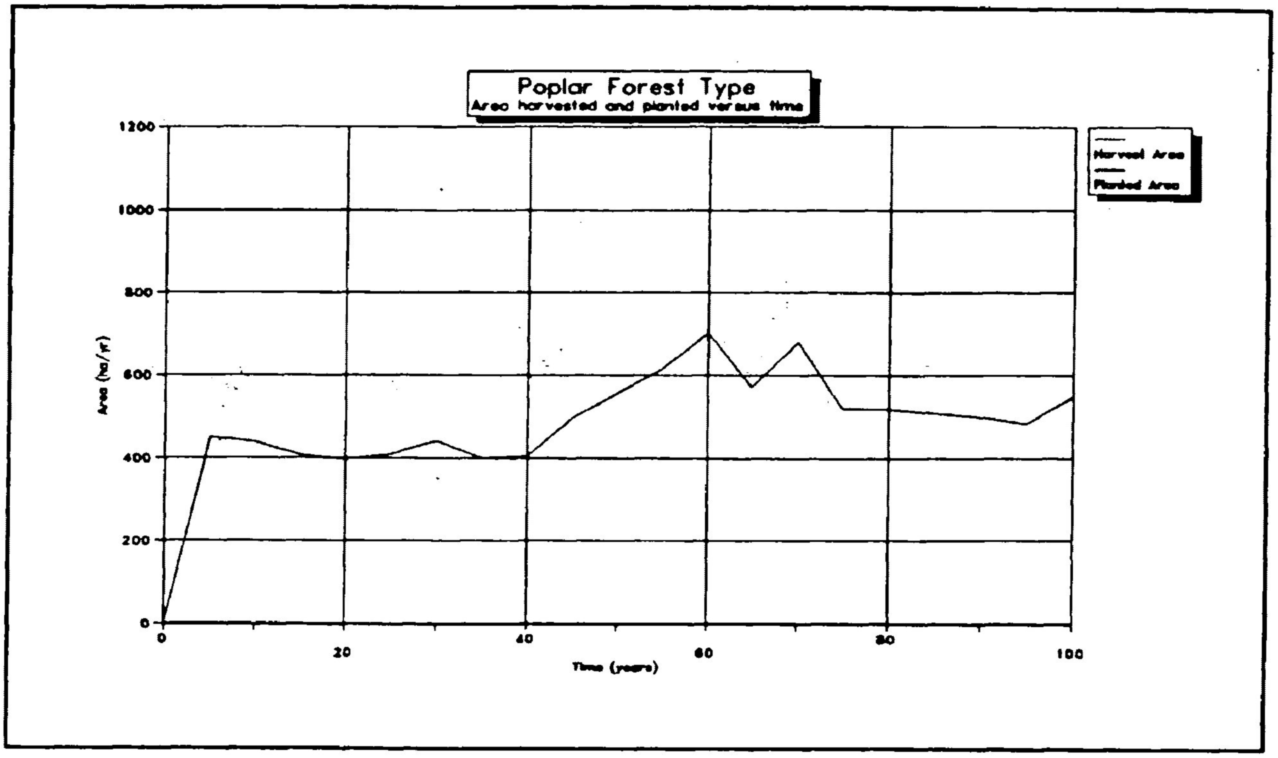
HARVEST COST	29446.53
PLANT, THIN, & MAINTENANCE	.00
TOTAL BENEFIT	56821.79
PNV (EXCL HARVEST COST)	56821.79
PNV (INCL HARVEST COST)	27375.26



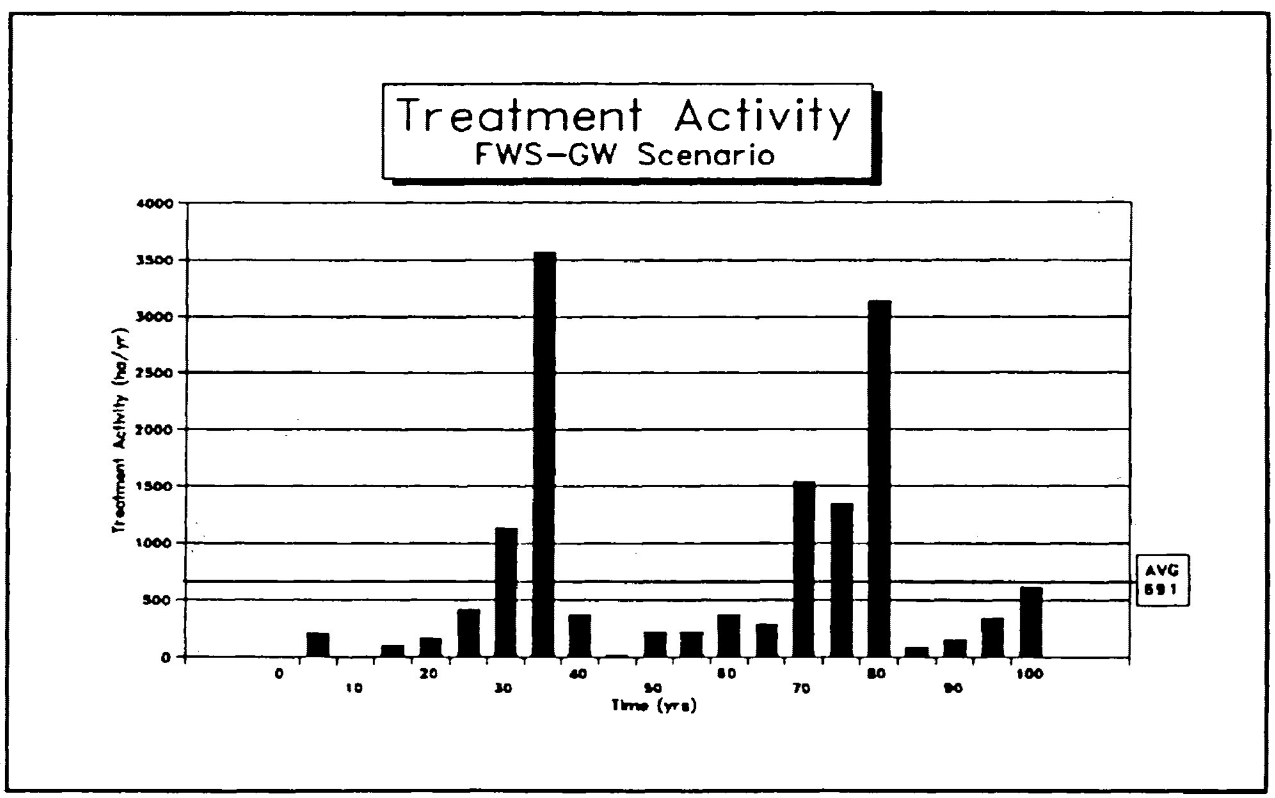
The Poplar Forest Type's primary (Po) growing stock and harvest volumes at five-year intervals for the FWS-GW scenario.



The Poplar Forest Type's secondary (conifer) growing stock and harvest volumes at five-year intervals for the FWS-GW scenario.



The Poplar Forest Type's annual harvest areas for the FWS-GW scenario.



The treatment activity for the FWS-GW scenario for the 100-year forecast period.

SHORT REPORT FOR PJ IN THE FWS-N SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

650000	650000	650000	650000	650000	650000	650000	650000	650000	650000
650000	650000	650000	650000	650000	650000	650000	650000	660000	650000

PLANTING LEVEL (HA/ITERATION):

0	0	0	0	0.	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc3.fws
FOREST CLASS FILE: pj2.bau
COST FILE: cost-gw.fws

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD											
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)				MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT	REAL
5	5869	773.	0.	650000	37653	0	4362	0	0	13001	0	0	0	64686.	33625.
10	5422	758	0.	650000	37928	0	4344	0	0	13001	0	0	0	82655.	52105.
15	4986	748	0.	650000	42196	0	4199	0	0	13002	0	0	0	90963.	60884.
20	4482	758	0.	650000	36340	0	4462	0	0	13000	0	0	0	88138.	56809.
25	3901	782	0.	650000	38045	0	4292	0	0	12999	0	0	0	101058.	70145.
30	3353	812	0.	650000	36250	0	4445	0	0	12999	0	0	0	96443.	64989.
35	2793	856	0.	650000	40931	0	4395	0	0	13001	0	0	0	86030.	52180.
40	2230	909	0.	650000	39329	0	4575	0	0	13001	0	0	0	70199.	33245.
45	1935	964	0.	650000	56726	0	4856	0	0	13000	0	0	0	62690.	12860.
50	2817	1019	0.	650000	71468	0	6356	0	0	13002	0	0	0	41743.	0
55	3193	1089	0	650000	60467	0	4116	0	0	13000	0	0	0	11506.	0
60	2995	1172	0	650000	64237	0	4354	0	0	12999	0	0	0	5515.	0
65	2658	1258	0	650000	52244	0	4320	0	0	13000	0	0	0	749	0
70	2482	1361	0	650000	45925	0	4085	0	0	13000	0	0	0	0	0
75	2136	1355	0	650000	159725	0	6552	0	0	13001	0	0	0	183.	0
80	1854	1361	0	650000	154881	0	6579	0	0	13000	0	0	0	0.	0
85	1509	1361	0	650000	168941	0	6681	0	0	13000	0	0	0	448	0
90	1169	1280	0.	650000	254394	0	8777	0	0	13001	0	0	0	3324	0.
95	714	1190	0.	650000	273379	0	9131	0	0	13000	0	0	0	145	0.
100	180	1154	0	650000	231855	0	7645	0	0	13000	0	0	0	45.	0.

1

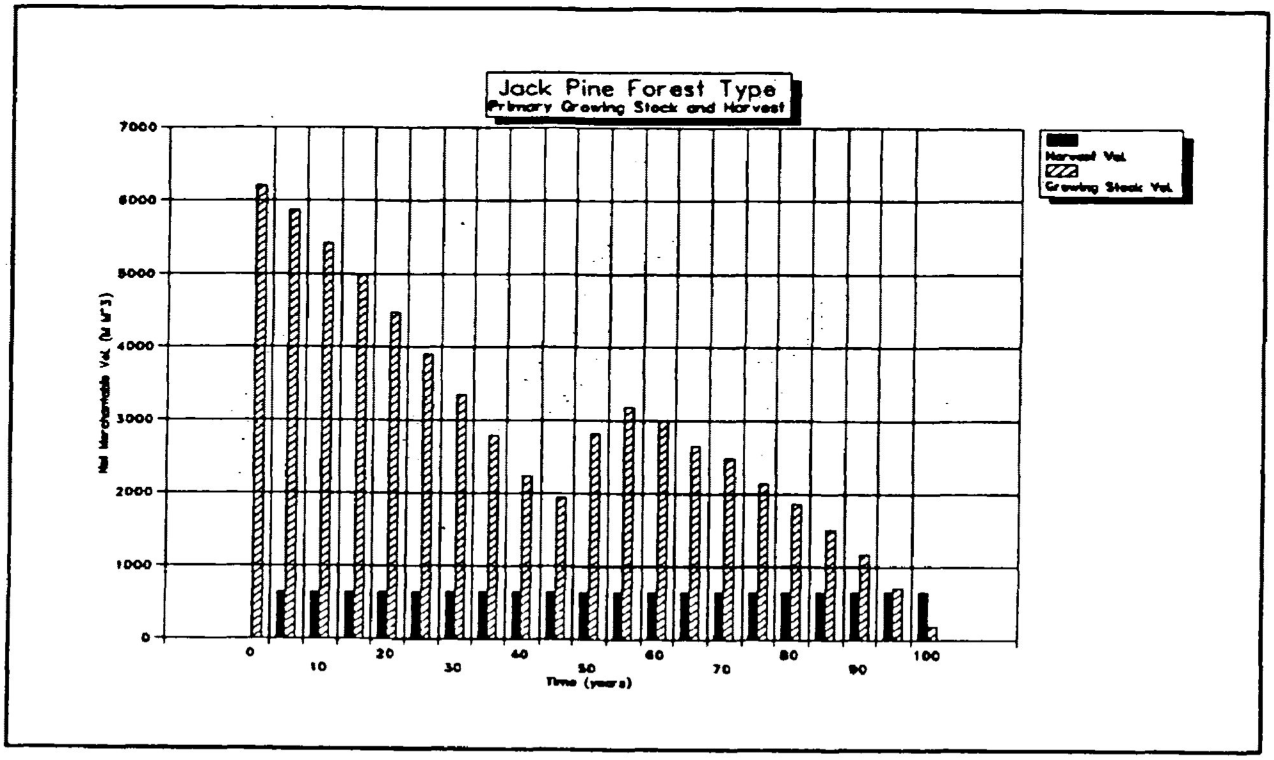
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	20189	2380	4155	25419	18259	2215	115	0	0	0
10	23534	3138	1489	21300	21586	1341	344	0	0	0
15	26288	4193	1072	16365	22472	1958	384	0	0	0
20	18323	15551	1732	8821	24902	3297	106	0	0	0
25	17367	20189	2380	4155	23533	4938	170	0	0	0
30	17297	23534	3138	1489	20336	4196	706	36	0	0
35	17398	26288	4193	1072	15156	6961	1628	36	0	0
40	17594	18323	15551	1732	8024	8828	2480	0	0	0
45	17707	17367	20189	2380	3681	8188	3441	59	0	0
50	18271	17297	23534	3138	1147	7205	1970	80	0	0
55	20182	17398	26288	4193	661	4010	0	0	0	0
60	19903	17594	18323	14347	630	1935	0	0	0	0
65	19682	17707	17367	17188	660	128	0	0	0	0
70	19146	18271	17297	17075	922	21	0	0	0	0
75	16875	20182	17398	16848	1059	370	0	0	0	0
80	19311	19903	17594	12979	2596	349	0	0	0	0
85	21536	19682	17707	8661	4656	490	0	0	0	0
90	23897	19146	18271	8754	1762	922	0	0	0	0
95	20509	16875	20182	4941	1094	1051	0	0	0	0
100	31168	19311	19903	502	0	1848	0	0	0	0

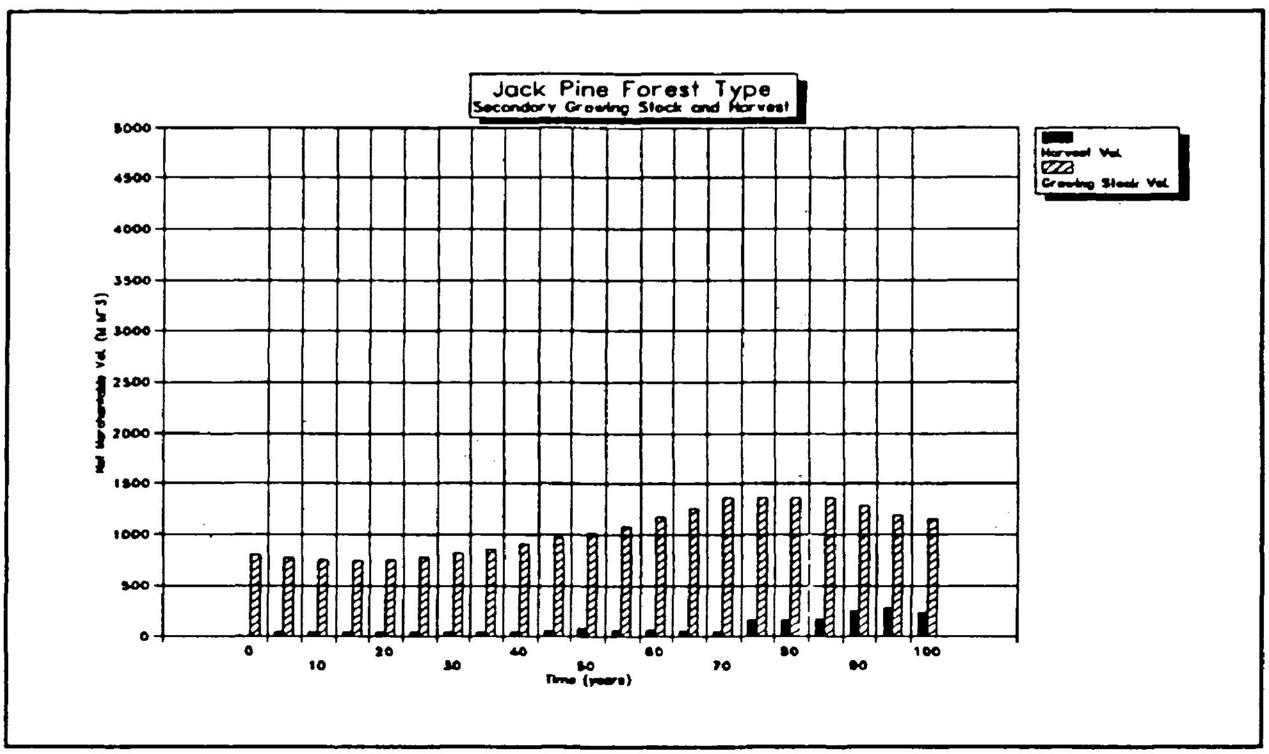
MANAGEMENT UNIT 0)

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED				VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	NATUR	PLANT	THIN	NATUR	COST MM$	MM$	MM$
0	6203	799											
5	5868	773	650	37	0	0	4362	0	0	4362	13	23	10
10	5421	757	650	37	0	0	4344	0	0	4344	13	23	10
15	4985	747	650	42	0	0	4199	0	0	4199	13	23	10
20	4481	757	650	36	0	0	4462	0	0	4462	13	23	10
25	3901	782	650	38	0	0	4292	0	0	4292	12	23	11
30	3352	812	650	36	0	0	4445	0	0	4445	12	23	11
35	2792	855	650	40	0	0	4395	0	0	4395	13	23	10
40	2230	908	650	39	0	0	4575	0	0	4575	13	23	10
45	1934	964	650	56	0	0	4856	0	0	4856	13	24	11
50	2816	1018	650	71	0	0	6356	0	0	6356	13	24	11
55	3193	1088	650	60	0	0	4116	0	0	4116	13	24	11
60	2994	1172	650	64	0	0	4354	0	0	4354	12	24	12
65	2657	1258	650	52	0	0	4320	0	0	4320	13	24	11
70	2482	1361	650	45	0	0	4085	0	0	4085	13	23	10
75	2136	1354	650	159	0	0	6552	0	0	6552	13	26	13
80	1854	1361	650	154	0	0	6579	0	0	6579	13	26	13
85	1508	1360	650	168	0	-0	6681	0	0	6681	13	26	13
90	1168	1280	650	254	0	0	8777	0	0	8777	13	29	16
95	713	1189	650	273	0	0	9131	0	0	9131	13	29	16
100	179	1154	650	231	0	0	7645	0	0	7645	13	28	15

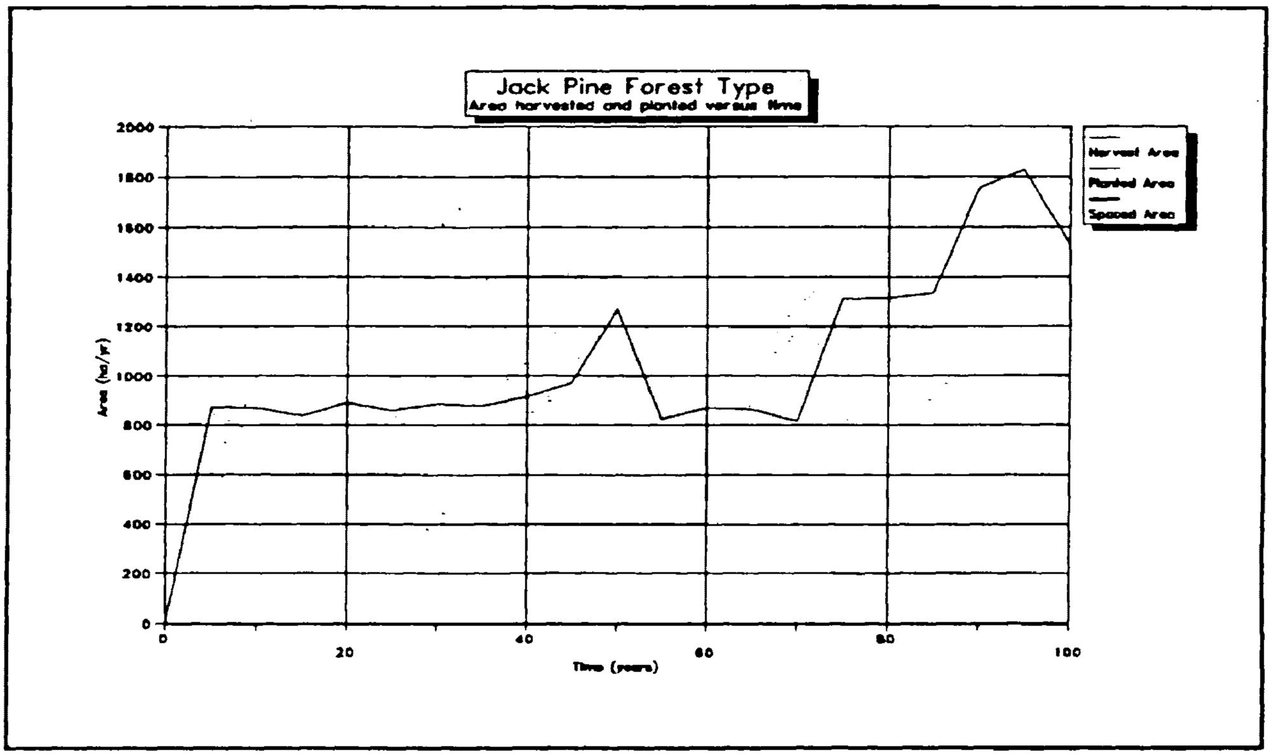
HARVEST COST	64877 86
PLANT. THIN. & MAINTENANCE	00
TOTAL BENEFIT	119606 10
PNW (EXCL. HARVEST COST)	119606 10
PNW (INCL. HARVEST COST)	54728 23



The Jack Pine Forest Type's primary growing stock and harvest volumes at five-year intervals for the FWS-N scenario.



The Jack Pine Forest Type's secondary growing stock and harvest volumes at five-year intervals for the FWS-N scenario.



The Jack Pine Forest Type's annual harvests for the FWS-N scenario.

SHORT REPORT FOR SP IN THE FWS-N SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

250000	250000	250000	250000	250000	250000	250000	250000	250000	250000
250000	250000	250000	250000	250000	250000	250000	250000	250000	250000

PLANTING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP CROWN

CURVE SET FILE yc3.fws
FOREST CLASS FILE ob-bf.bau
COST FILE cost-qu.fws

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD												
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)					MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	3731	2728	0	250000	98495	0	2296	0	0	4999	0	0	0	19699	346
10	4370	2643	0	250000	60600	0	2294	0	0	5001	0	0	0	19117	0
15	4692	2516	0	250000	77273	0	2273	0	0	5000	0	0	0	46996	10628
20	4971	2388	0	250000	77273	0	2273	0	0	5000	0	0	0	58213	21845
25	5146	2246	0	250000	89656	0	2520	0	0	5000	0	0	0	37624	2108
30	5227	2171	0	250000	54115	0	2177	0	0	5000	0	0	0	16247	0
35	5262	2111	0	250000	23325	0	1944	0	0	5000	0	0	0	4762	0
40	5267	2077	0	250000	4292	0	1826	0	0	5000	0	0	0	707	0
45	5250	2041	0	250000	10221	0	1828	0	0	4999	0	0	0	426	0
50	5293	2025	0	250000	3351	0	1803	0	0	5000	0	0	0	72	0
55	5319	1924	0	250000	100749	0	2442	0	0	5000	0	0	0	3950	0
60	5235	1815	0	250000	121273	0	2594	0	0	5000	0	0	0	4954	0
65	5105	1614	0	250000	238825	0	3429	0	0	5001	0	0	0	13060	0
70	4931	1431	0	250000	262637	0	3568	0	0	5001	0	0	0	20045	0
75	4773	1262	0	250000	254960	0	3424	0	0	5000	0	0	0	10080	0
80	4660	1241	0	250000	126072	0	2840	0	0	5000	0	0	0	4353	0
85	4531	1216	0	250000	178277	0	2675	0	0	5001	0	0	0	1094	0
90	4388	1370	0	250000	27093	0	1624	0	0	5001	0	0	0	797	0
95	4430	1556	0	250000	24789	0	2116	0	0	5001	0	0	0	1555	0
100	4801	1749	0	250000	36126	0	2012	0	0	5000	0	0	0	1015	0

1

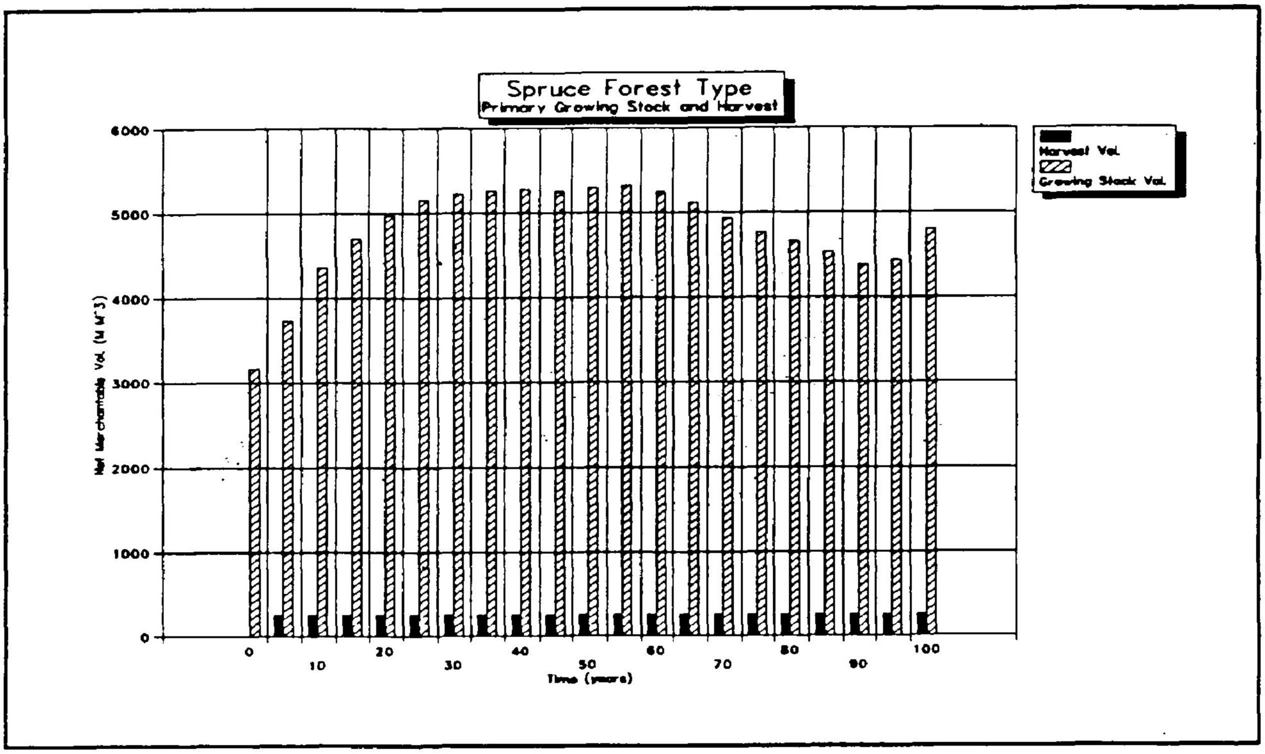
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	8540	1460	12912	16786	18728	4959	1345	189	0	37
10	10818	959	8521	15710	19303	7336	2017	206	16	0
15	12835	1005	4447	16066	18731	10187	1444	155	16	0
20	8448	6979	2798	11345	18598	13586	2580	616	16	0
25	9136	8540	1460	8366	14652	17577	4501	615	39	0
30	9360	10818	959	6240	11753	19088	7098	1456	100	16
35	9243	12835	1005	2251	10248	18878	10387	923	100	16
40	8914	8448	6979	1642	6500	17855	12275	1711	555	7
45	8467	9136	8540	1159	4898	13937	16079	2108	532	30
50	7775	9360	10818	915	3084	11253	16995	3780	806	180
55	7401	9243	12835	1002	1950	9887	16300	5366	822	100
60	7899	8914	7468	6979	1598	6323	15892	8108	1149	555
65	8667	8467	6984	8527	1156	4710	12256	11456	2108	555
70	10268	7775	5915	9575	915	3022	10160	12998	3395	862
75	12033	7401	4697	9680	989	1775	9326	12761	5346	876
80	13015	7899	4121	3270	6716	1433	5883	13235	8109	1205
85	13261	8667	4999	1877	7499	1019	4012	9987	11407	2148
90	12507	10268	6567	561	7761	780	2427	8235	12894	2781
95	10563	12033	7100	1229	8046	735	1261	7557	12555	3807
100	9255	13015	7855	2913	1636	5391	1177	4760	12692	6192

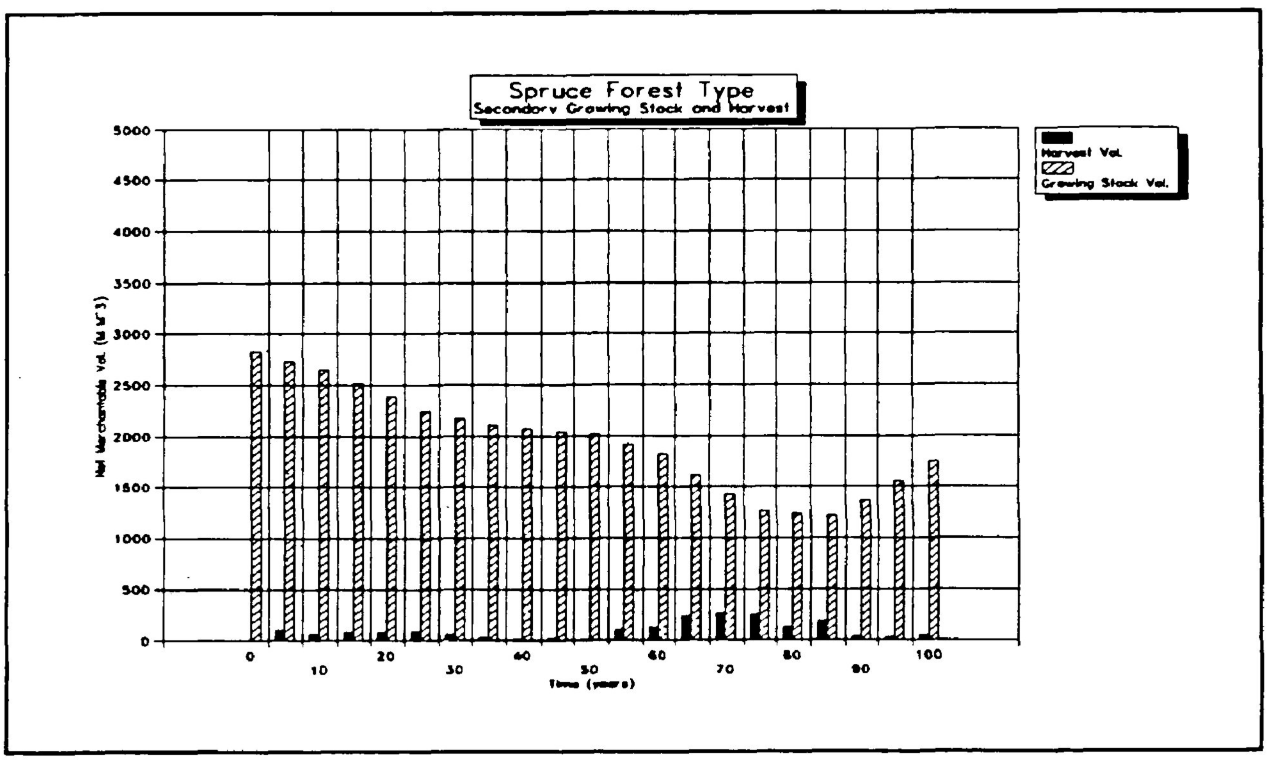
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3163	2832											
5	3731	2728	250	98	0	0	2296	0	0	2296	4	11	7
10	4370	2642	250	60	0	0	2294	0	0	2294	5	10	5
15	4691	2515	250	77	0	0	2273	0	0	2273	5	10	5
20	4971	2387	250	77	0	0	2273	0	0	2273	5	10	5
25	5146	2246	250	89	0	0	2520	0	0	2520	5	10	5
30	5227	2170	250	54	0	0	2177	0	0	2177	5	10	5
35	5262	2111	250	23	0	0	1944	0	0	1944	5	8	4
40	5267	2077	250	4	0	0	1826	0	0	1826	5	8	3
45	5250	2040	250	10	0	0	1828	0	0	1828	4	8	4
50	5293	2024	250	3	0	0	1803	0	0	1803	5	8	3
55	5318	1924	250	100	0	0	2442	0	0	2442	5	11	6
60	5234	1815	250	121	0	0	2594	0	0	2594	5	11	6
65	5105	1614	250	238	0	0	3429	0	0	3429	5	14	9
70	4930	1431	250	262	0	0	3568	0	0	3568	5	15	10
75	4773	1261	250	254	0	0	3424	0	0	3424	5	15	10
80	4660	1240	250	126	0	0	2840	0	0	2840	5	11	6
85	4530	1215	250	178	0	0	2675	0	0	2675	5	13	8
90	4387	1370	250	27	0	0	1624	0	0	1624	5	9	4
95	4430	1556	250	24	0	0	2116	0	0	2116	5	9	4
100	4801	1749	250	36	0	0	2012	0	0	2012	5	9	4

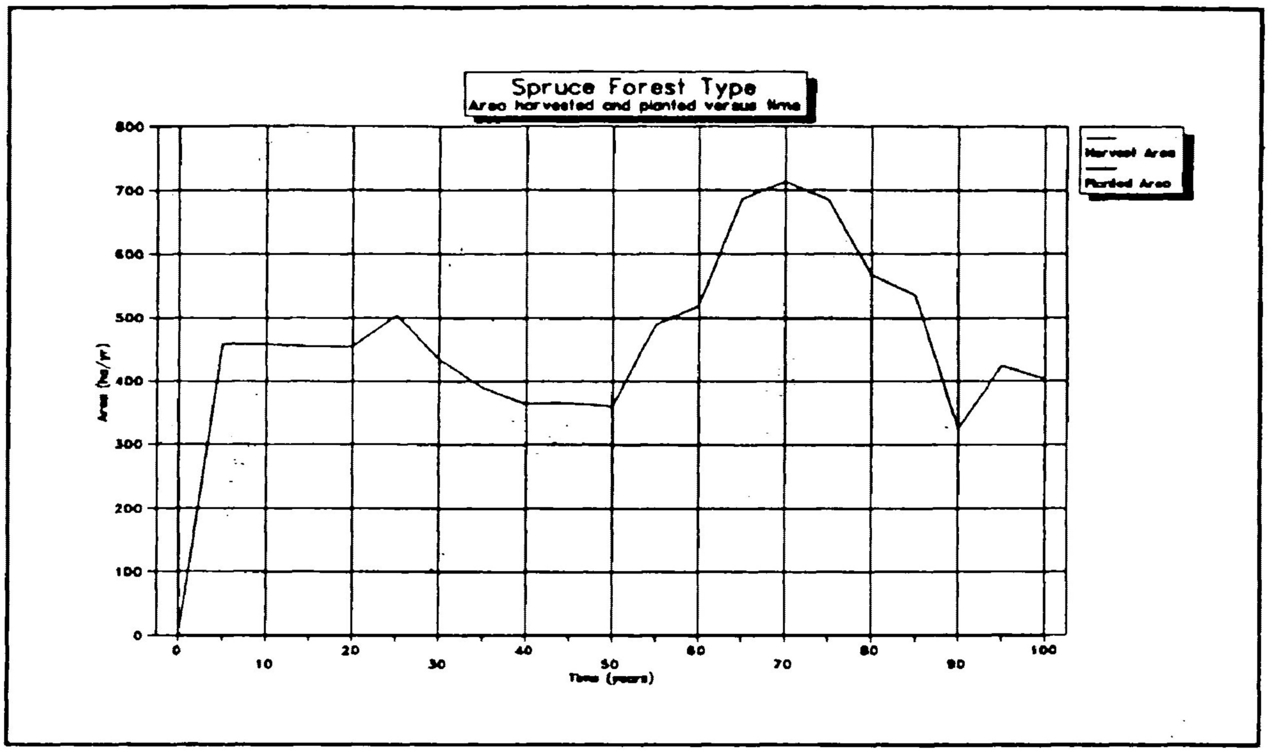
HARVEST COST	24951 80
PLANT., THIN. & MAINTENANCE	00
TOTAL BENEFIT	53193 45
NPV (EXCL. HARVEST COST)	53193 45
NPV (INCL. HARVEST COST)	28241 64



The Spruce Forest Type's primary growing stock and harvest volumes at five-year intervals in time for the FWS-N scenario.



The Spruce Forest Type's secondary growing stock and harvest volumes at five-year intervals in time for the FWS-N scenario.



The Spruce Forest Type's annual harvest levels for the FWS-N scenario.

SHORT REPORT FOR PO IN THE FWS-N SCENARIO

FORMAN VERSION 2.1

BACKGROUND HARVEST
HARVEST LEVEL (M3/ITERATION):

360000	360000	360000	360000	360000	360000	360000	360000	360000	360000
360000	360000	360000	360000	360000	360000	360000	360000	360000	360000

PLANTING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

SPACING LEVEL (HA/ITERATION):

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

HARVEST RULES

%	RULE1	%	RULE2	TIME RANGE
100	1 0 0	0	0 0 0	0 - 100

TIMBER VALUES ($/M3):

PRODUCT - 45 NON-PRODUCT - 35 SECONDARY VOL - 25
REAL DISCOUNT RATE - .040

OWNERSHIP: CROWN

CURVE SET FILE: yc2.bau
FOREST CLASS FILE: po3.bau
COST FILE: cost-gw.fws

R E P O R T O N T H E F O R E S T

	RESIDUAL FOREST			STATISTICS FOR THE PERIOD													
	OPERABLE VOLUME (M3)			VOLUME CUT (M3)			AREA (HA)			COSTS ($1000)					MORTALITY (M3)	
TIME	PRIMARY	SECONDARY	PRODUCT	PRIMARY	SECONDARY	PRODUCT	CUT	PLANT	SPACE	HARVEST	PLANT	MAINT.	SPACE	POT.	REAL
5	3521	349.	0.	360000	53986	0	3077	0	0	7202	0	0	0	41492.	10235.
10	3248.	327.	0.	360000	52871	0	2906	0	0	7199	0	0	0	35551.	7382.
15	2977.	326.	0.	360000	36927	0	2572	0	0	7200	0	0	0	45467.	13683
20	2630	339.	0	360000	36530	0	2420	0	0	7200	0	0	0	68303.	36611.
25	2265	367.	0	360000	41735	0	2459	0	0	7201	0	0	0	88746.	56575.
30	2035	365	0	360000	60370	0	2968	0	0	7201	0	0	0	76811.	42577.
35	1669	389.	0	360000	38299	0	2466	0	0	7200	0	0	0	76876.	44048
40	1514	382.	0	360000	46746	0	2655	0	0	7202	0	0	0	51016.	16507.
45	1382	320.	0.	360000	98547	0	3392	0	0	7200	0	0	0	32831.	8575.
50	1254.	241.	0	360000	110872	0	3459	0	0	7201	0	0	0	18265.	2704.
55	1144	205.	0.	360000	68923	0	3092	0	0	7200	0	0	0	9771.	0.
60	1070	205	0	360000	38467	0	4404	0	0	7199	0	0	0	121.	0.
65	995	204.	0.	360000	35335	0	4409	0	0	7201	0	0	0	136.	0.
70	895	195.	0	360000	41535	0	4879	0	0	7200	0	0	0	0	0.
75	779	186	0	360000	39625	0	3341	0	0	7202	0	0	0	0.	0.
80	666	180.	0	360000	39833	0	3524	0	0	7199	0	0	0	0.	0.
85	565	175	0	360000	40356	0	3735	0	0	7201	0	0	0	0.	0.
90	437	169.	0	360000	42249	0	5028	0	0	7200	0	0	0	0.	0.
95	377	161.	0	360000	42541	0	4325	0	0	7201	0	0	0	0.	0.
100	193	155	0.	360000	41633	0	4564	0	0	7200	0	0	0	0.	0.

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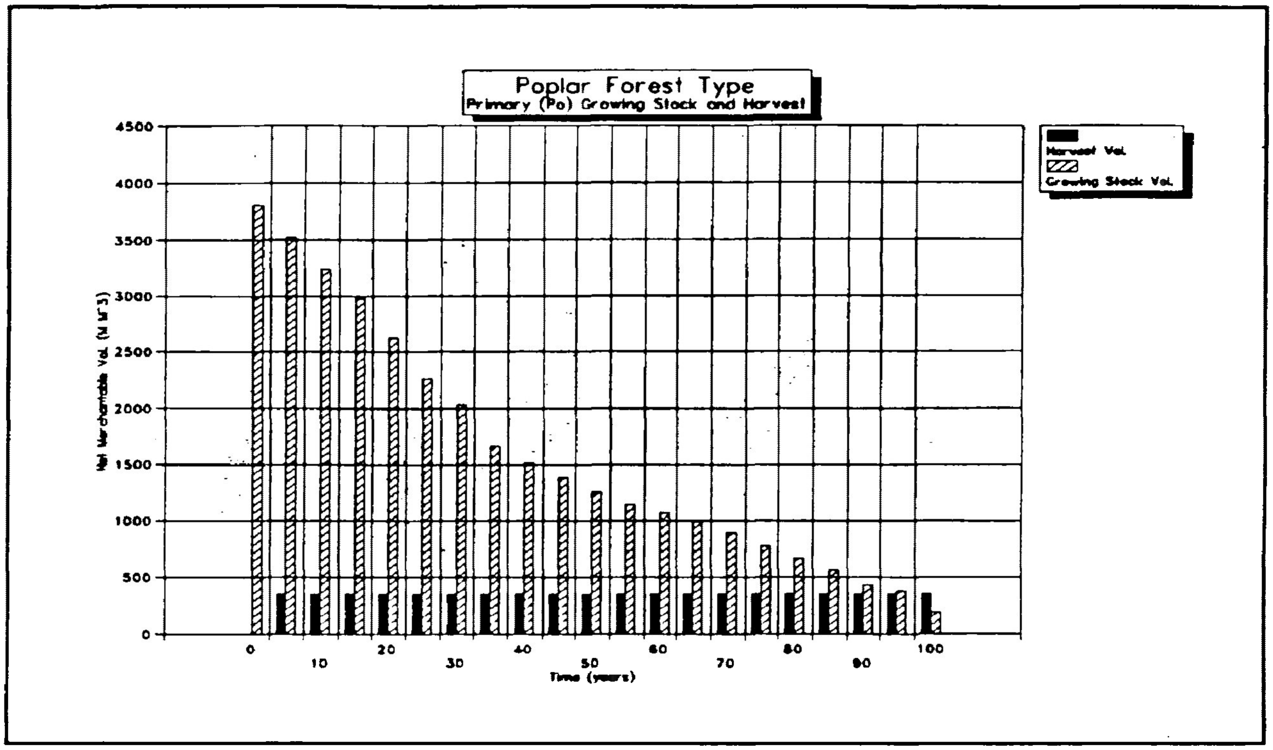
AGE CLASS STRUCTURE (HA)

	AGE CLASS									
TIME	0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
5	3618	1682	7083	16375	5684	619	0	0	0	0
10	6415	1484	4228	16111	5391	1232	0	0	0	0
15	8991	1810	2144	13586	7627	783	0	0	0	0
20	8658	4269	1521	9602	9955	815	41	0	0	0
25	10975	3618	1682	7083	10647	815	41	0	0	0
30	10357	6415	1484	4228	10947	688	742	0	0	0
35	10419	8991	1810	2144	8502	2212	783	0	0	0
40	10313	8658	4269	1521	8427	2840	792	41	0	0
45	10548	10975	3618	1682	2137	5109	751	41	0	0
50	11481	10357	6415	1484	1182	3942	0	0	0	0
55	11972	10419	8991	1810	476	269	924	0	0	0
60	12598	10313	8658	3292	0	0	0	0	0	0
65	14347	10548	7623	2543	0	0	0	0	0	0
70	15364	11481	4836	3180	0	0	0	0	0	0
75	16784	11972	1746	4359	0	0	0	0	0	0
80	17033	12598	1624	3806	0	0	0	0	0	0
85	16153	14347	2615	1746	0	0	0	0	0	0
90	15479	15364	4018	0	0	0	0	0	0	0
95	15628	16784	2449	0	0	0	0	0	0	0
100	16612	17033	1216	0	0	0	0	0	0	0

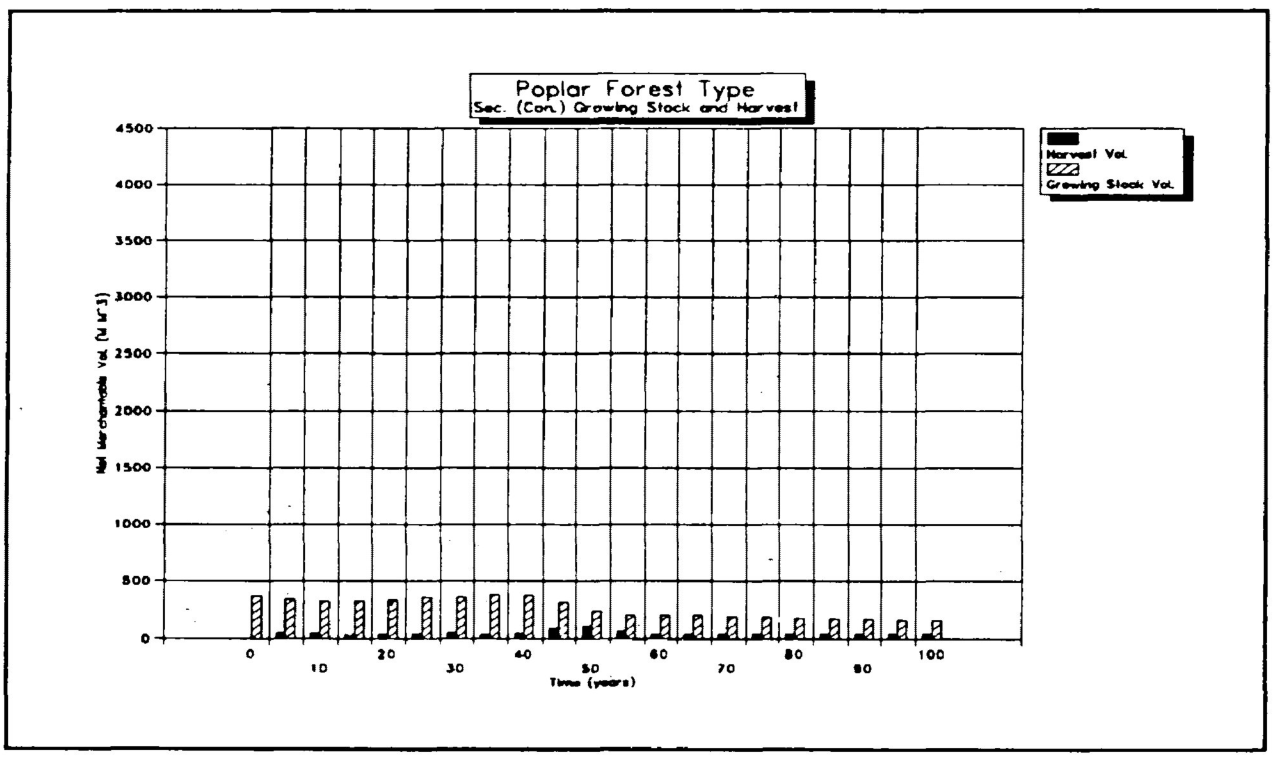
MANAGEMENT UNIT # 1

	GROWING STOCK (M M3)		HARVEST (M M3)		AREA HARVESTED			AREA TREATED			COST	VALUE GAIN	NET VALUE
YR	PRIM	SEC	PRIM	SEC	PLANT	THIN	MATUR	PLANT	THIN	MATUR	MM$	MM$	MM$
0	3806	373											
5	3521	349	360	53	0	0	3077	0	0	3077	7	13	6
10	3247	327	360	52	0	0	2906	0	0	2906	7	13	6
15	2977	325	360	36	0	0	2572	0	0	2572	7	13	6
20	2629	339	360	36	0	0	2420	0	0	2420	7	13	6
25	2264	367	360	41	0	0	2459	0	0	2459	7	13	6
30	2034	364	360	60	0	0	2968	0	0	2968	7	14	7
35	1669	388	360	38	0	0	2466	0	0	2466	7	13	6
40	1514	382	360	46	0	0	2655	0	0	2655	7	13	6
45	1382	320	360	98	0	0	3392	0	0	3392	7	15	8
50	1253	240	360	110	0	0	3459	0	0	3459	7	15	8
55	1144	205	360	68	0	0	3092	0	0	3092	7	14	7
60	1069	204	360	38	0	0	4404	0	0	4404	7	13	6
65	994	203	360	35	0	0	4409	0	0	4409	7	13	6
70	894	194	360	41	0	0	4879	0	0	4879	7	13	6
75	778	185	360	39	0	0	3341	0	0	3341	7	13	6
80	666	179	360	39	0	0	3524	0	0	3524	7	13	6
85	564	174	360	40	0	0	3735	0	0	3735	7	13	6
90	436	169	360	42	0	0	5028	0	0	5028	7	13	6
95	377	161	360	42	0	0	4325	0	0	4325	7	13	6
100	193	154	360	41	0	0	4564	0	0	4564	7	13	6

HARVEST COST	35933 20
PLANT, THIN, & MAINTENANCE	00
TOTAL BENEFIT	69189 20
NPW (EXCL. HARVEST COST)	69189 20
NPW (INCL. HARVEST COST)	33255 91



The Poplar Forest Type's primary growing stock (Po) and harvest volumes at five-year intervals for the FWS-N scenario.



The Poplar Forest Type's secondary growing stock (Con.) and harvest volumes at five-year intervals for the FWS-N scenario.