INTEGRATED DETAILED FOREST MANAGEMENT PLAN

Ref: H-065

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

APPENDICES

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EXECUTIVE SUMMARY

Ref: H-065

EXECUTIVE SUMMARY

This Detailed Forest Management Plan (DFMP) is the first to be completed for the Upper Hay Forest Area and is a joint effort between TOLKO Industries Ltd. and Footner Forest Products Ltd. ("the Companies"). Through the incorporation of dissolved landbase concept, the Companies are managing the landbase as a volume supply area, which ensures that the ecological, economic, and social values for both coniferous and deciduous timber throughout the forest management area are sustainable.

The DFMP was completed for the joint Forest Management Agreement (FMA) area, which the Companies signed in September 2002. The FMA encompasses a gross area of approximately 3.56 million hectares (ha) in northwestern Alberta and includes a number of overlapping tenure holders, commercial trappers and outfitters, as well as a diverse Aboriginal population. There is also a significant oil & gas sector within the FMA boundaries.

Although guided by separate mission statements and corporate values, the two companies are committed to developing resource management plans that are ecologically suitable, economically feasible, and socially acceptable. As part of plan development, the Companies established three working groups (Ecological, Economic, and Social and Communication), each representing a unique aspect of sustainable forest management. This public involvement plan was critical in the selection of goals, objectives, and strategies that guided plan development and lead to the selection of the preferred forest management strategy (PFMS).

Five resource management goals were identified during the process and included ecological stewardship, community interests, consultation, stakeholder investments and commercial user co-operation. The Companies, through the public involvement process, were able to identify a number of goals, objectives and strategies to ensure that these management goals will be achieved.

Through the determination of the net landbase, the gross area was netted down to a productive area of 1.77 million hectares. Following the completion of the net productive landbase, the Companies completed a timber supply analysis which included the development of 10 yield curves, to determine the Annual Allowable Cut (AAC) and subsequent harvest sequencing based on the compartments and operating areas which make up the FMA. Harvest priorities and compartment selection incorporated forest health and forest protection objectives, existing volume supply agreements, and cost control strategies.

The preferred management strategy selected by the Companies achieves the goals and objectives identified through the public involvement process and follows a two-pass, even flow harvest over two rotations and includes a number of additional constraints. The resulting AAC was determined to be 1 680 000 m^3 for coniferous and 1 884 000 m^3 for deciduous.

As the results indicate, the Annual Allowable Cut has increased. To accommodate the increase, the Companies have developed a ramp-up strategy that proposes the harvest of 6 000 000 m^3 of conifer and 5 000 000 m^3 of deciduous over the first five-year period. The Companies are exploring expansion plans to utilize the full Annual Allowable Cut to bring additional ecological, social and economic benefits to the area. In addition to participating in a number of programs and research initiatives, the Companies will use the precautionary principle and utilization of the full AAC will only occur if continued monitoring of resource goals, objectives and strategies validate the harvest level.

As part of the Companies commitment to continual improvement and public involvement, the Companies intend to continue making use of the High Level Forests Public Advisory Committee and other mechanisms to continue ongoing discussions with the public, stakeholders and interest groups following the submission of the plan.

SECTION 1: INTRODUCTION

Ref: H-065

1.0 INTRODUCTION

The DFMP describes how TOLKO Industries–High Level and Footner Forest Products Ltd. will jointly manage the FMA area in a sustainable manner. This represents the first integrated DFMP by these two companies for this landbase.

Preparing the DFMP involved balancing economic, ecological, and social values to achieve a preferred management strategy that would apply to both Footner Forest Products Ltd. (FFP) and TOLKO Industries–High Level. The preferred management strategy outlines how the Companies will achieve the goals set out in the DFMP.

In December 1996, High Level Lumber Division (HLLD) signed a Forest Management Agreement with the Alberta government. With the signing of this agreement, the provincial government transferred the responsibility of forest management planning for the area to HLLD, with all plans and development subject to government approval.

In June 1999, Footner Forest Products Ltd., a joint-venture company owned by Ainsworth Lumber Co. Ltd. and Grant Forest Products Corp., signed a Letter of Agreement with the Government of Alberta to build an oriented strand board (OSB) mill near the town of High Level.

The Letter of Agreement with FFP and TOLKO's FMA provided the foundation for the development of a joint FMA which was signed in September 2002.

1.1 COMPANY BACKGROUND

1.1.1 FOOTNER FOREST PRODUCTS

Construction of the OSB mill began in the fall of 1999. In the first year of operations, Footner Forest Products hired approximately 450 people for forestry operations, planning and production of OSB. Deciduous quotas from other areas continue to contribute to the annual volume available for processing.

Mission Statement

"Footner Forest Products Ltd. will be the best manufacturer of wood-based structural products. We will accomplish this by maintaining a safe, open environment that will consistently challenge all team members to fully participate and individually grow. We firmly believe that this environment will provide a maximum return for our shareholders."

Values

- Safety will not be compromised.
- We will manufacture products that will consistently meet or exceed our customers' expectations in quality, delivery, product services and performances.
- Footner Forest Products Ltd. will challenge all team members to achieve excellence through a process of continuous improvement and personal development and participation in an open and supportive team environment.
- Our success is dependent on all team members developing an understanding and respect for all other members of the Footner Forest Products Team.

- Footner Forest Products is committed to establishing mutually beneficial long-term relationships with all members of the community, including our vendors and contractors.
- Footner Forest Products will achieve world-class status and maximize shareholder value and product excellence at the lowest possible cost.
- As a member of the community, we will be responsible stewards of the environment.
- Integrity is the cornerstone of our business.

1.1.2 TOLKO INDUSTRIES–HIGH LEVEL

TOLKO Industries Ltd. is a private, family-owned company whose primary business is the marketing and manufacturing of speciality forest products. Founded in 1961, the company has expanded to now include nine manufacturing divisions and four marketing divisions, which span British Columbia, Alberta, Manitoba, and most recently Saskatchewan.

As a leading marketer and manufacturer of speciality forest products, TOLKO Industries Ltd.–High Level Lumber Division is committed to building a sustainable future. Even though each division is an autonomous business unit, they are collectively guided by a shared vision, mission and values, and are strengthened by their commitment to be customer-oriented and focused on results. In addition, TOLKO has a strategic plan in place to ensure sustainability of the resource. (For further information on sustainability, refer to the company's website at www.tolko.com.)

Mission Statement

"To be an environmentally responsible and innovative company that prospers and grows by serving the needs of diverse customers in world markets with products derived from the forest."

Values

- RESPECT – Respect for people is the foundation for all our business practices.
- PROGRESSIVENESS – Being progressive is essential for the health of the company.
- INTEGRITY – Integrity is essential in all business relationships.
- OPEN COMMUNICATION – Open communication will enhance employee job satisfaction and performance.
- PROFIT – Profits are essential to the success of the company, employees and business partners.

Forested land managed by TOLKO makes an important contribution to the quality of life for many communities by providing a diverse range of environmental, social, and economic benefits. However, the security of the company's future also depends on maintaining the health and sustainability of the forest resource under its stewardship. Therefore, the need to balance the environmental, social, and economic values with the requirements of the company to ensure a healthy, sustainable resource, guides the TOLKO in every step of the resource management process–from harvest planning and road development, through harvesting operations, reforestation and forest protection. In all aspects, the company is committed to professional and sustainable resource management.

Chronology of HLLD

- 1960s – North Peace Logging and Lumber started as a small contract sawmill in High Level.
- 1968 – Taken over by Swanson Lumber out of Edmonton.
- 1973 – Mill burned completely, and several privately owned satellite mills were used to feed the planer mill.
- 1976 – Construction began on the present mill.
- 1977 – Mill opened in 1977.
- 1981 – Canadian Forest Products Ltd. (CanFor) out of Vancouver purchased Swanson Lumber.
- 1990 – Daishowa Canada purchased the facility.
- 1992 – High Level mill became a subsidiary of Daishowa-Marubeni International Ltd. (DMI).
- 1999 – TOLKO Industries Ltd. purchased the facility.

1.1.3 VOLUME SUPPLY AGREEMENTS

Both TOLKO and FFP also have Contractual Wood Supply Agreements (VSA's) with local Aboriginal groups. These groups include the Dene Tha First Nation, Netaskinan Development Corporation (Tall Cree First Nation), and Askee Development Corporation (Little Red River Cree Nation). In addition, Paddle Prairie Metis Settlement also has a Volume Supply Agreement with FFP.

These agreements ensure that local Aboriginal groups benefit from the forestry activities, and can also participate in the planning and management of the forest resources.

1.2 MANAGEMENT PHILOSOPHY

The ability of the Companies to provide raw materials to manufacturing facilities depends on responsible forest management and achieving a balance in multiple use of that resource. Management personnel, who also provide direction to the Woodlands department, develop corporate strategies. The Woodlands planning department draws on employees, various stakeholders, and members of the public to develop plans that demonstrate an innovative and sensitive approach to resource land management.

The Companies are committed to developing resource management plans that are ecologically suitable, economically feasible and socially acceptable. Principles that are followed to support this commitment are:

- Maintain and/or improve the health and productivity of forest ecosystems and biological diversity.
- Agreement to manage for what is on the landscape.
- Share in gains and losses.
- Actively promote stakeholder and public participation through open communication.

- Comply with all applicable legislation.
- Evaluate resource management performance through internal and external audits.
- Practise adaptive management by enhancing employee knowledge and expertise.

1.3 INTEGRATION OF DOCUMENT

This document is integrated in two ways. First, it is a joint submission between Footner Forest Products and TOLKO Industries Ltd.–High Level. In terms of the DFMP, both companies share common goals, objectives and, where applicable, strategies. The preferred management strategy is shared across the dissolved landbase.

Second, the document has several module components that were submitted to Alberta Sustainable Resource Department, Land and Forest Division during development of the plan. These include the Terms of Reference, Public Involvement Plan, Table of Contents, Goals and Objectives, Net Landbase, and Growth and Yield Curves. These individual submissions were reviewed by members of the public through three working groups that were established for development of the DFMP.

1.4 DOCUMENT DEVELOPMENT

A number of changes have occurred since the Preliminary Forest Management Plan (PFMP) was released. While the PFMP set the cut level for TOLKO Industries Ltd.–High Level, the following factors significantly changed the principles and philosophies used to develop this DFMP:

- The inclusion of black spruce and jack pine;
- The cut level;
- A change in ownership;
- The inclusion of Footner Forest Products; and
- The subsequent agreement to manage on a dissolved landbase.

The approved Integrated Terms of Reference (Appendix A) signalled the start of the Companies' integration. It outlined the strategies that each company used individually to involve the public, the timber supply analysis, performance monitoring, timelines to completion, planning team members and roles, planning process, and common challenges and issues.

In October 2001, the Companies moved closer to integrating their activities on the landbase when they agreed to manage it using the dissolved landbase concept. Through this, the Companies have the freedom to manage for what exists on the landbase, rather than splitting the landbase by species cover type as determined by an inventory. As a result of these changes occurring relatively late in the process, the provincial government offered the Companies an extension to allow them time to model operations on a dissolved landbase.

The Companies have defined a dissolved landbase as follows:

"A mutual volume supply area (FMA) that is sustainably managed in a balance of social, ecological and economic values for both coniferous and deciduous timber throughout the forest management area."

Managing a dissolved landbase with this level of co-operation and at this scale has not been undertaken previously in Alberta. There are several issues on an operational level that must be resolved to achieve the full value that is possible from this style of forest management. The Companies will build on their co-operative approach and develop solutions to resolve these issues during the period covered by this DFMP. These solutions and results will be reflected in the next DFMP.

1.5 PUBLIC INVOLVEMENT PLAN

At the beginning of the DFMP process, the Companies issued individual Public Involvement Plans. Since that time, however, a single approach that combined both plans was implemented. Details regarding the Public Involvement Plan, as well as a summary of the issues and concerns that were brought forward during the process can be found in Appendix B.

1.6 PLANNING TEAM DESCRIPTION

The planning team is made up of representatives from government, industry and First Nations that have a timber quota on or adjacent to the FMA. It is the responsibility of this team to communicate feedback, resolve issues and give direction to the working groups. The team will also deal with strategic issues, and will communicate feedback to the public and public advisory committee. For simplicity, focus and continuity, the planning team will continue to be the principal vehicle, and will meet on a regular basis. Once the DFMP has been approved, it is anticipated that detailed operational issues and maintenance of the DFMP will be dealt with at a local level.

TABLE 1-1: GENERAL RESPONSIBILITY

COMPANY/ AFFILIATION	PERSONNEL/POSITION	GENERAL RESPONSIBILITY
Footner	Barry Gladders Woodlands Manager	♦ Liaison with SRD and stakeholders ♦ Technical review and strategic planning
TOLKO	Tom Hoffman R.P.F. Woodlands Manager	♦ Liaison with SRD and stakeholders ♦ Technical review and strategic planning
Footner	Tim Gauthier R.P.F. Strategic Planning Forester	♦ Strategic Planning ♦ Growth and Yield ♦ Operational Sequencing
TOLKO	Marcel LeCoure Divisional Forester	♦ Project planning and administration ♦ Timber Supply Analysis ♦ Public Involvement Plan ♦ Detailed Forest Management Plan
DMI	Wayne Thorp R.P.F. General Manager Woodlands	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
DMI	Frank Oberle R.P.F. Management Forester	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
Zama Mills Ltd./ Che K'li Enterprises	Gabriel Didzena	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
Netaskinan Development Corporation	Keith Badger	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
Little Red River Forestry	Hal Jeske R.P.F.	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
Local Advisory Committee	Tom Friesen	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues
La Crete Sawmills	Aaron Doepel	♦ Strategic planning ♦ Growth and Yield Analysis ♦ Operational and sequencing issues

TABLE 1-2: SRD CONTACTS

CONTACT	LOCATION	POSITION
	Upper Hay Forest Area	
Gail Tucker	High Level	Manager, Land Management Upper Hay Forest Area Northwest Boreal Region
Ted Edwards R.P.F.	High Level	Forester Upper Hay Forest Area Northwest Boreal Region
Kim Morton	High Level	Wildlife Biologist Fish and Wildlife Division Northwest Boreal Region
	Regional Level	
Ken McCrae	Peace River	Acting Regional Director Northwest Boreal Region
Marty O'Byrne R.P.F.	Peace River	Forester Northwest Boreal Region
Mark Townsend R.P.F.	Peace River	Forester Northwest Boreal Region
Mike Maximchuk	Peace River	Forest Health Officer Northwest Boreal Region
	Provincial Level	
Doug Sklar R.P.F.	Edmonton HO	Executive Director Forest Management Branch
Stephen Wills R.P.F.	Edmonton HO	Forester Forest Management Branch

1.7 COMMITMENTS TO PROVIDE TIMBER

Footner Forest Products has signed a 10-year renewable VSA to supply La Crete with best-quality aspen (*Populus tremuloides*), and balsam poplar (*Populus balsamifera*) saw logs. TOLKO Industries–High Level has a VSA to provide a volume of conifer to La Crete sawmills.

Until ASRD has formally approved a single FMU for the FMA (F26), the other tenures in the area are the following:

- DMI – incidental deciduous from FMU F24 and F25, amounting to 179 837 m^3/yr.
- Netaskinan Development Corporation (Tallcree First Nation), – deciduous quota in F24 (F5 – pure and incidental) for 65 735 m^3/yr and F24 (F2 – incidental) for 14 265 m^3/yr.
- Che K'Li Enterprises – deciduous quota in F25 for 2229 m^3/yr.
- Precision Lumber Products Inc. – deciduous quota in F24 for 12 192 m^3/yr.
- Ridgeview Mills Ltd. – deciduous quota in F24 for 12 192 m^3/yr.

The provincial government has reserved the right to allocate the following:

- 38 736 m^3/yr of coniferous AAC in F11 East and 38 736 m^3/yr of deciduous AAC in F11 East for allocations, with the assistance of a Local Advisory Committee (LAC); and
- 29 904 m^3/yr of coniferous AAC in F11 West and 6578 m^3/yr of deciduous AAC in F24 (F2) for Miscellaneous Timber Use purposes, with the assistance of a LAC.

(Note: There are several small sawmills in the La Crete area including Precision Lumber Products Ltd., Crestview Sawmills Ltd., Evergreen Lumber, and Ridgeview Mills Ltd.)

SECTION 2:
FMA RELATIONSHIPS

Ref: H-065

2.0 FMA RELATIONSHIPS

2.1 ABORIGINAL PROGRAM

A large part of the Companies' success is the result of working with the Aboriginal communities within the Companies' operating areas. This co-operation, which provides mutual benefits for all parties, in part involves capacity building through development of forestry skills, industry knowledge and on-site training.

2.1.1 GUIDING VISION

Footner Forest Products Ltd. and TOLKO Industries Ltd. are committed to working with Aboriginal communities and individuals on the basis of mutual understanding, respect and trust. The Companies are sensitive to the cultural values and traditions of each community with which they work. Consistent with the rights under relevant First Nation Treaties, the Natural Resources Transfer Agreement and Metis Settlements Legislation, the Companies support community member involvement in forest management and decision-making. They also acknowledge the need to achieve sustainable forest management on areas used for traditional activities by Aboriginal communities, and support the need for consultation, traditional and modern economic development, and education/training for Aboriginal people.

Principles

The Companies are committed to:

- Approaching all interactions with Aboriginal community members in the spirit of fairness and respect;
- Fostering adequate input and consultation to encourage mutual understanding and co-operation between the Aboriginal communities and the Companies;
- Maintaining a positive relationship with the Aboriginal communities that encompasses the best interests of the communities and the Companies;
- Making training and education available to prospective Aboriginal employees; and
- Providing Aboriginal communities with opportunities to participate in employment and business development endeavours.

Guidelines

The Companies will:

1. Maintain person who will act as the liaison with Aboriginal communities to:

- Consult on local Aboriginal issues and concerns;
- Encourage Aboriginal input into the forest management planning process;
- If requested, provide information to assist in negotiation of wood supply agreements;
- Facilitate business development opportunities where feasible; and

- Support reviews of proposed business ventures.

2. If all parties are supportive, participate in developing a centralized support organization that could provide advisory and resource services to the Aboriginal communities and the Companies. Some possible objectives of this concept include the following:

- Provide advice to the Companies and Aboriginal communities about local issues of mutual interest and concern;
- Foster harmonious community relations;
- If requested, assist in wood supply negotiations;
- Assist in business development opportunities;
- Provide assistance in the recruiting and screening process for new employees; and
- Other support initiatives as agreed to from time to time.

3. Provide skill development and training to Aboriginal community members to encourage employment and advancement opportunities by:

- Clarifying employer expectations of all employees;
- Assisting in developing a "career path" within the Companies for interested employees; and
- Providing training opportunities in all relevant areas that will enable employees to make meaningful work contributions in the field of forest industry.

4. Provide awareness training to non-Aboriginal employees in Aboriginal history and culture, including traditional knowledge and values.
5. Establish a co-operative management procedure between the Aboriginal communities and the Companies that incorporates:

- Respect for cultural sites;
- Acknowledgement and respect for existing rights (i.e., treaty, traditional use, etc.);
- Fair and open consultation process;
- Economic opportunities for Aboriginal community members (relating to the needs and work of the Companies);
- Commitment to sustainable development;
- Development of initiatives to ensure wildlife and habitat protection.

2.1.2 COMMUNITY RELATIONS AND COMMUNICATIONS

The Companies are committed to developing and maintaining positive community relations and open communications with the Aboriginal communities. This entails consultation and information exchange on matters of importance to all parties, including how the Companies' business affects the communities.

- Each community is recognized as having its own governing system and community requirements.
- The Aboriginal communities will be encouraged to participate in the High Level Forest Public Advisory Committee to discuss the Companies' proposed forestry projects.
- At the request of specific Aboriginal communities, the Companies will participate in special meetings held to review and consult on forest projects proposed for development in traditional use areas.
- Community concerns will be reviewed and considered during the planning stages of any new project by the Companies.

2.1.3 BUSINESS AND EMPLOYMENT OPPORTUNITIES

Aboriginal businesses will be supported and encouraged to work with the Companies in a positive manner that is founded on mutual need and integrity. Employment opportunities and the necessary training will be made available to Aboriginal community members.

- The Companies will work with communities to develop business opportunities that are beneficial and satisfactory to all parties.
- Wherever possible, Aboriginal businesses, whether wholly owned or as part of a joint venture, will provide products and/or services that are cost-effective and competitive with non-Aboriginal businesses.
- The Companies are committed to continuing to keep the communities informed about employment opportunities, and will assist them in developing the recruiting and screening processes for prospective employees.

2.1.4 TRAINING AND EDUCATION

The Companies are committed to training Aboriginal employees to ensure their skill sets and knowledge are equivalent to non-Aboriginal employees. Employees who have not finished Grade 12 will be provided with opportunities and encouragement to complete this level of education, and to proceed with post-secondary education if desired.

- Information sessions will be provided within the communities to inform the members of the skills and knowledge required by the Companies for their employees.
- Each new employee will be assessed for the skills and knowledge necessary to fulfil employment requirements, and provided with an opportunity to remedy any deficiencies.
- The Companies will work with pre-established educational institutions to develop Aboriginal

training programs that will meet the needs of Aboriginal employees.

- Forums, resource materials and media articles will be used to create an expanded awareness and understanding among the Companies' employees about Aboriginal and treaty rights, traditional forest values, and modern Aboriginal aspirations and needs.

2.1.5 FOREST MANAGEMENT–TRADITIONAL METHODS AND CULTURE

Aboriginal knowledge related to the land and renewable natural resources has developed over hundreds of years. It is rooted in traditional cultural beliefs that the land and life should be viewed as a whole, and must be protected out of respect for past, present and future generations. This entails a responsibility for both the natural elements of the land and the well-being of its human inhabitants. Participation by Aboriginal people in land management planning can help to integrate this knowledge and understanding into modern sustainable forest management.

Traditional knowledge held by Aboriginal community members in the region is a respected component of the Companies' business operations. The long-standing use of the land by Aboriginal people is recognized, and the Companies will endeavour to minimize the overall impact of forest operations on those uses.

The Companies will continue to evolve in their management planning by incorporating an adaptive management[1] system. This will involve, where practical, co-operative planning, operational reviews, technical analysis and enhanced communication with the Aboriginal communities.

Where traditional methods and cultural values appear to conflict with forest industry projects, mechanisms will be established to resolve overlapping uses of the areas, and Aboriginal people will be consulted on ways to mitigate the effects, as follows:

- Where gaps exist, joint work initiatives will be developed to identify and record <u>traditional knowledge</u> of the area. Where databases are already established (e.g., databases created by the First Nations, the Companies or the provincial government), all new information gathered will be integrated.
- Where gaps exist, joint work initiatives will be developed to identify and record <u>traditional use areas</u>, including trap lines, ancestral sites and burial grounds, etc. Where databases are already established, all new information gathered will be forwarded for inclusion.
- Guidelines and partnership values will be established to incorporate traditional knowledge of the forested landbase into forest management practices, planning and training.

[1] *Essentially, adaptive management is a system that incorporates continual improvement of management policies and practices by observing and learning from the outcomes of operational programs.*

2.2 ABORIGINAL RELATIONS

The Companies joint FMA forms the basis of a forestry partnership that will have an impact on regional Aboriginal communities, which are both directly and indirectly, affected by the forestry activities. The joint DFMP recognizes the close and important ties the Companies have with the Aboriginal communities in the FMA region.

On occasion, the forest industry has experienced some difficulties in dealing with Aboriginal interests that seem to be overwhelmed by resource development. This has occurred even with thorough, well-intentioned consultation, and industry has sometimes encountered difficulties in achieving a consensus-based decision with Aboriginal communities.

2.2.1 ABORIGINAL AND TREATY RIGHTS[2]

The Companies are committed to understanding and respecting existing Aboriginal and treaty rights and the interests of the Aboriginal peoples of Canada[3]. As part of this, the Companies continue their pro-active approach to working with Aboriginal, provincial and federal governments.

The Government of Alberta is responsible for managing the natural resources and approving access to public lands. Under the Natural Resources Transfer Act of 1930, Alberta exerted its ownership of and jurisdiction over natural resources. With this, the provincial government assumed responsibility for ensuring that Aboriginal communities and First Nations would be appropriately consulted on activities planned on public land.

It is recognized that Aboriginal people are concerned about the impacts of forest development in their communities. The Government of Alberta acts as the facilitator for both the Companies and the Aboriginal communities while development plans are being considered for approval and implementation.

The document[4] Strengthening Relationships, the Government of Alberta's Aboriginal Policy Framework, states:

> "…Where consultation is required on land and resource issues relating to an infringement of an existing treaty, NRTA or other constitutional right, it is the Government of Alberta's role to consult affected Aboriginal people. This is not the role of industry.

The document further states:

> "…The Government of Alberta encourages a 'good neighbour' approach based on respect, open communication and co-operation. It expects those who propose natural resource developments to consult with and consider the views, values and experience of communities and people that could be affected by their developments.

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[2] *Canada entered into several treaties with First Nations between 1871 and 1921. There are 11 "numbered" treaties covering the prairie provinces, northern Ont., Yukon, parts of B.C. and the NWT. In Alberta. the Companies' DFMP and FMA is located in Treaty 8 territory. Treaties were intended by Canada to extinguish Aboriginal title and convert Aboriginal land rights into treaty land rights. Existing Aboriginal and treaty rights have been recognized and affirmed by s. 35 of the Constitution Act, 1982. Section 52 of that same Act states that any law that infringes existing Aboriginal and treaty rights is of no force or effect to the extent of that inconsistency. The Supreme Court of Canada has repeatedly held that governments (and those relying on governmental authority) must justify any infringement of existing Aboriginal or treaty rights. Unjustified infringements are contrary to law.*

[3] *The Constitution Act, 1982 identifies Indians, Metis and Inuit as the Aboriginal peoples of Canada.*

[4] *Strengthening Relationships – The Government of Alberta's Aboriginal Policy Framework, September 2000, Page 15.*

> Alberta will continue to require developers to undertake historical resources impact and mitigation studies of historical resources sites. In recognition of the importance of First Nations cultural sites, the Government of Alberta encourages industry and First Nations to co-operate on timely baseline studies of such sites on public lands."

The Companies are committed to ensuring this will be accomplished through ongoing research, adaptive management methods, and integrated communication processes that support various related Aboriginal initiatives.

Treaty 8 and NRTA Rights (hunting, trapping, fishing and gathering) are generally exercised on unoccupied public land. Prior to the *Constitution Act, 1982*, Aboriginal and treaty rights discussions tended to be academic. Historically, legal recognition of Aboriginal rights depended on the good will of the Crown, and were not enforceable. Gradually, courts across Canada accepted, to some degree, that there could be pre-existing Aboriginal rights, independent of Crown, legislative or executive action. This acceptance of the concept of Aboriginal and treaty rights was eventually reflected in a major constitutional amendment.

In April 1982, *s. 35* of the *Constitution Act, 1982* came into force, recognizing and affirming existing Aboriginal and treaty rights. Although entrenched in the Constitution, these rights were not defined. Notwithstanding this lack of definition, any law inconsistent with an existing Aboriginal or treaty right is of no force or effect (*s. 52*). An academic right then became a legally enforceable right. Canadian courts across Canada have been defining existing and specific Aboriginal and treaty rights, and governments have been negotiating the meaning of this constitutional provision ever since.

2.2.2 FMA AREA AND THE REGION'S ABORIGINAL FOOTPRINT

The FMA encompasses a significant portion of the lands upon which reside four of the five Bands associated with the North Peace Tribal Council[5]. Much of the area, as claimed by the region's Aboriginal people (including First Nations and Metis), is traditionally used for hunting, trapping and fishing as well as for recreational and spiritual purposes.

The Companies recognize that many members of the Aboriginal community depend on the forest for economic and traditional pursuits, including spiritual wellness. As a result of this understanding, the Companies have undertaken a number of initiatives to ensure that Aboriginal people are directly involved in planning and decision making regarding activities that may affect them.

During the development of this plan, representatives from each of the local First Nations businesses were part of the Planning Team and were directly involved in the Public Involvement Plan (PIP). In addition, representatives from the Companies annually display the General Development Plan (GDP) and Annual Operating Plans (AOP) to each of the local First Nations communities to identify any potential area(s) of concern.

The Companies will seek additional opportunities to ensure that the First Nations continue to be involved in the planning process and the development of future forest management plans.

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[5] *The North Peace Tribal Council consists of five Bands in the region; Dene Tha' First Nation, Beaver First Nation, Little Red River Cree Nation, Tallcree First Nation and the Lubicon Lake Band.*

2.2.3 COMMUNICATION AND PUBLIC CONSULTATION

The Companies are committed to ensuring, to the extent possible, that their forest practices afford business opportunities that are in concert with the aspirations and desires of the region's Aboriginal communities.

The Companies have adopted a number of methods to secure a strong communication process with the First Nations and Aboriginal communities associated with the FMA area. This includes development of a joint public involvement concept that helps to ensure an integrated approach to regional Aboriginal relations. In addition, the Companies have numerous programs aimed at ongoing partnerships with Aboriginal people in the region.

The Aboriginal relations concept developed by the Companies includes a process whereby the Aboriginal communities can participate in the DFMP development process. This consultation provides opportunities for the Aboriginal community to better understand the basic requirements of the forest industry, and in turn helps the Companies to become better educated about regional Aboriginal issues and special interests.

In addition to the Aboriginal communities, the Companies recognize other resource users of the region and are committed to good communication practices. As part of these communications practices, the Companies have a process in place to ensure that all trappers are notified and consulted well in advance of any harvesting activity occurring in a registered fur management area.

2.3 COMMUNITY PROFILES

2.3.1 FIRST NATIONS

The four bands[6] in the region are believed to have approximately 7300 members. Alberta Aboriginal Affairs and Northern Development estimates that approximately 5250 members live on the reserves in the FMA area, and 350 live on public land in the vicinity. Approximately 1700 live off reserve, most likely in urban areas such as High Level, Fort Vermilion or larger centres such as Edmonton.

2.3.1.1 DENE THA' FIRST NATION

The Dene Tha' Indian Band has a number of reserves (I.R. 207, 209-214) totalling 30 038 ha. These reserves are accessible by winter road, permanent road, water, and rail. The total registered population is approximately 2352 people. The Dene Tha' speak the Dene or Athapaskan Chipewyan language.

Municipal services include water and sewer systems, a fire truck, a water truck, and a sewer truck. Facilities available on the reserve include a school, teacherages, a band office, various public works buildings, and a fire hall. The communities have developed a number of commercial and construction ventures.

2.3.1.2 BEAVER FIRST NATION

The Beaver First Nation consists of two reserves: Boyer River covering 4249 ha and Child Lake covering 2826 ha. The total registered population is approximately 705 people. The reserves are accessible by road, and the native language is Athapaskan Beaver.

The community has two water treatment plants and a water truck for distribution. RCMP provides policing services. Facilities available on the reserve include an administration building and various public works buildings.

2.3.1.3 LITTLE RED RIVER CREE NATION

The Little Red River Cree Nation has two reserves: Fox Lake, and John D'or Prairie. A third community, Garden River, is located within Wood Buffalo National Park. These reserves cover approximately 24 472 ha. The reserves and community have approximately 3631 members. The native language of these people is Algonquian Cree.

Municipal services include water and sewer systems, a water truck, garbage collection, and a fire truck. Facilities available on the reserves include a band office, a fire hall, a recreation hall, various public works buildings, a community hall, schools, and teacherages. It has several existing businesses, which include two on-reserve stores, a fly-in fishing resort, Little Red Air Service, a forest fire fighting company, and a forestry holding company[7].

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[6] *For the purposes of these numbers the Lubicon Lake Band statistics have not been included, as census statistical information is sketchy. The Lubicon Lake Indian Band has a population of approximately 236 Aboriginal people, which speak the Algonquian Cree language. The Lubicon Lake Indian Band is currently negotiating a long-standing land claims settlement.*

[7] *See website at: http://www.lrrcn.ab.ca.*

2.3.1.4 TALLCREE FIRST NATION

The Tallcree Indian Band has several reserve areas, the most populated being Tallcree #173A. These reserves cover approximately 8160 ha. The total registered population is approximately 983 people. The native language of these people is Algonquian Cree.

The communities have water and sewer systems, a fire truck, and garbage collection. Facilities available on the reserves include recreation buildings, offices, a band office, a water plant, various public works buildings, a fire hall, schools, and teacherages.

2.3.2 PADDLE PRAIRIE METIS SETTLEMENT

Paddle Prairie Metis Settlement was established pursuant to the Metis Settlements Act. The Settlement is approximately 77 km south of High Level and covers 163 168 ha. There are approximately 1028 people living on the Settlement. The main languages are English and Algonquian Cree.

The community has a number of services, including water and sewer systems, fire protection, and garbage collection. Facilities include a gymnasium, arena/hall, public works buildings, settlement office, school and teacherages. Footner Forest Products Ltd. has a fibre supply agreement and TOLKO Industries Ltd. has a purchase agreement with the Settlement.

2.3.3 METIS IN THE REGION

The Metis Nation of Alberta Association (MNAA) Zone 6 and a portion of Zone 5 (primarily local 74) represent the Metis community. A large Metis population lives in and around the community of Fort Vermilion. The Metis use the FMA areas for hunting, trapping, gathering and other traditional pursuits. The overall Metis population for the region is estimated at 1500 to 2000. Metis are involved in many businesses including several aspects of forestry, guiding, farming, hunting, trapping and fishing.

2.3.4 MUNICIPAL DISTRICT OF MACKENZIE

Alberta's largest rural municipality, the Municipal District of Mackenzie No. 23, has experienced significant growth since 1998, and the trend is continuing as many businesses and newcomers recognize that the municipality provides a unique lifestyle and employment opportunities.

Located in the extreme northwestern corner of the province, 800 km from Edmonton, the municipality has municipal offices in Fort Vermilion, High Level, La Crete and Zama. Overall, it comprises 12% of Alberta's entire landmass, or about 50 000 km^2.

The municipality offers a mix of flat, arable land and boreal forest, thus supporting active agriculture, forestry, and tourism industries. It holds 36% of the Peace Region's natural gas reserves, and 80% of its light-medium crude oil reserves, both of which play a significant role in the area's economy. The energy industry is largely responsible for the establishment and growth of three of the area's five main communities–High Level, Zama, and Rainbow Lake. The economies of Fort Vermilion and La Crete are more driven by forestry and agriculture.

There are many active grain farmers in the area, with the two main grain buyers being P & H Grain in La Crete and Agricore in High Level. La Crete boasts the largest United Farmers of Alberta retail outlet in Alberta, which gives an indication of how active the local agriculture industry is.

The rich natural resource base in the municipality provides a stable work environment for the area. For example, many Aboriginals and farmers work in the local sawmills during the winter months to supplement their income. There are several mills within the MD, the largest being La Crete Sawmills in La Crete, Footner Forest Products south of High Level and TOLKO Industries in High Level.

2.4 REGIONAL INFORMATION AND INITIATIVES

2.4.1 REGIONAL TRAINING INITIATIVES

Currently there are a number of training and development programs in the oil and gas and forestry fields. These initiatives are funded through both federal and provincial agencies with support from local industries and First Nations. Of note are the training programs underway or completed in the Dene Tha' and Little Red/Tallcree First Nations.

2.4.2 EMPLOYMENT AND OPPORTUNITY DEVELOPMENT

There is considerable potential for employment and business opportunities in the region, and there is an intensive movement to identify these opportunities for the people of the region. Business, employment and training opportunities are being recommended to Alberta Aboriginal Affairs and Northern Development, as well as to the Aboriginal community. The North Peace Tribal Council, local Aboriginal communities, government and industry are pursuing these initiatives, with a focus on the following aspects:

- Identify business development, employment and training opportunities/needs;
- Identify partnership priorities;
- Obtain commitments to develop and implement partnership initiatives;
- Develop strategic regional planning;
- Assess human resources and skills training needs;
- Conduct business planning and market analysis of forest-based economic opportunities and resource partnership initiatives; and
- Identify joint venture opportunities.

2.5 GOVERNMENT AGENCIES

2.5.1 FEDERAL GOVERNMENT AGENCIES

- **Indian and Northern Affairs Canada (INAC)** – responsible for the *Indian Act*. The *Indian Act* was enacted pursuant to Parliament's authority arising from *s. 91(24)* of the *Constitution Act*, *1867*. Primarily INAC is responsible for meeting most of the federal government's constitutional, treaty, and political and legal responsibilities for First Nations, Inuit and Northerners. INAC must work collaboratively with First Nations, other federal government departments, provinces and territories. Increasingly, INAC's role has become one of facilitating change and bringing together the partners and interests needed to implement "Gathering Strength – Canada's Aboriginal Action Plan".

- **Canadian Environmental Assessment Agency (CEAA)** – provides Canadians with high-quality environmental assessments that contribute to informed decision-making in support of sustainable development.
- **Environment Canada** – responsible for the *Canadian Environmental Protection Act, Canada Water Act, Canada Wildlife Act*, and *Migratory Birds Convention Act*. The department's mandate is, in part, to preserve and enhance the quality of the natural environment, including water, air and soil quality; conserve Canada's renewable resources including migratory birds and other non-domestic flora and fauna, and conserve and protect Canada's water resources.
- **Fisheries and Oceans (DFO)** – protects and conserves fish habitat in support of Canada's coastal and inland fisheries resources, and conducts environmental assessments under the *Canadian Environmental Assessment Act*. The Department of Fisheries and Oceans makes regulatory decisions under certain provisions of the *Fisheries Act*, the *Navigable Waters Protection Act* and the *National Energy Board Act*.
- **Human Resources Development Canada – Aboriginal Peoples** – the Aboriginal Relations Office is committed to working in partnership with Aboriginal people and their communities to increase their members' employability and create job opportunities.
- **Intergovernmental Affairs** – part of the Privy Council Office. Directed by a deputy minister, it supports the Minister of Intergovernmental Affairs and, through the Clerk of the Privy Council and Secretary to the Cabinet, the Prime Minister and Cabinet. It provides policy and communications in such areas as federal-provincial-territorial relations, Aboriginal affairs, and the evolution of the federation and Canadian unity.
- **National Energy Board** – promotes safety, environmental protection and economic efficiency in the Canadian public interest, while respecting individuals' rights within the mandate set by Parliament in the regulation of pipelines, energy development and trade.
- **Natural Resources Canada (NRCan)** – specializes in the sustainable development and use of natural resources, energy, minerals and metals, forests and earth sciences. NRCan deals with natural resource issues from both a national and international perspective, using its expertise in science and technology, policy and programs.
- **Canadian Forest Service – First Nations Forestry Program** – The First Nations Forestry Program is a partnership program between the Government of Canada and Canada's First Nation peoples to improve economic conditions in status Indian communities with full consideration of the principles of sustainable forest management.
- **Western Economic Diversification Canada** – known as WD, its mandate is to promote the development and diversification of the economy of western Canada, and to advance the interests of the West in national economic policy. WD fulfils its mandate through programs and activities, innovation, economic development and business development.

2.5.2 PROVINCIAL GOVERNMENT AGENCIES

Alberta Aboriginal Affairs and Northern Development

- Co-ordinates Alberta's Aboriginal relations strategies;
- Provides information, strategic advice, and policy analysis to Alberta ministries and other clients;
- Facilitates partnerships to enhance the well-being and self-reliance of Aboriginal governments, communities, and organizations;
- Administers Metis Settlements legislation; and
- Assist in the settlement of Indian land claims for which Alberta is responsible.

Alberta Community Development

- Promotes community development;
- Protects human rights and promotes fairness and access;
- Ensures inclusion and participation for Albertans with disabilities; and
- Preserves, protects, and presents Alberta's history, culture, provincial parks, and protected areas.

Alberta Economic Development

- Provides leadership for Alberta's economic development;
- Promotes increased trade of Alberta's goods and services;
- Attracts investment to Alberta; and
- Stimulates the growth of Alberta's tourism industry.

Alberta Energy

- Secures Albertans' share of benefits from energy and mineral resource development;
- Ensures the competitiveness of Alberta's energy and mineral resources;
- Develops and communicates energy and mineral resource policies; and
- Ensures Alberta consumers have a choice of reliable and affordable energy.

Alberta Environment

- Establishes policies, legislation, plans, guidelines, and standards for environmental management and protection as they relate to the Environmental Protection and Enhancement Act;
- Allocates resources (water, coal and oil sands only) through approvals, dispositions, and licenses, and enforces those decisions;
- Ensures water infrastructure and equipment are maintained and operated effectively; and
- Prevents, reduces, and mitigates floods, droughts, emergency spills, and other pollution-related incidents.

Alberta Human Resources and Employment

- Provides information about careers, workplaces, the labour market, and department services;
- Helps Albertans prepare for, obtain, and maintain employment;
- Promotes positive work environments and the establishment of professional and workplace standards; and
- Provides individual and financial supports.

Alberta Infrastructure

- Supports the provision of infrastructure for health care, learning, community, and seniors' facilities;
- Plans, designs, constructs, rehabilitates, operates, maintains, and manages government-owned and supported infrastructure;
- Manages central services to all government departments including supply purchasing, surplus sales, accommodation requirements, property acquisition and sale, air transportation, and vehicle fleet operations; and
- Represents Alberta's interests in national and international trade agreements as they impact government procurement.

Alberta Municipal Affairs

- Provides support services, develops policies, and administers legislation to ensure Albertans benefit from sustainable and accountable local governments;
- Administers a safety system that uniformly applies safety codes and standards and promotes fire protection throughout the province;
- Manages provincial disaster planning and recovery programs; and
- Supports municipalities to ensure they are prepared to deal with major emergencies and disasters.

Alberta Sustainable Resource Development

- Forest protection – Protects Alberta's forests by preventing and suppressing wildfire in the Forest Protection Zone;
- Forest land and timber resource development – Enhances the economic, environmental, and social contributions of Alberta's public forests and forest lands to Albertans;
- Fish and wildlife management – Enhances the economic, environmental, and social contributions of Alberta's fish and wildlife resources to Albertans;
- Rangeland management – Enhances the economic, environmental, and social contributions of Alberta's public land rangelands to Albertans; and
- Land Use management – Allocates surface materials (e.g., sand and gravel, peat) and forage (grazing) resources on public land. Optimizes the benefits (environmental, social and economic)

that Albertans receive from public lands through effective, efficient planning and management.

Alberta Transportation

- Provides driver education, licensing standards, and safety programs;
- Manages driver records and problem drivers;
- Implements impaired driving programs;
- Monitors the handling and transport of dangerous goods;
- Oversees the operation of provincial railways;
- Plans, designs, constructs, rehabilitates, operates, and maintains provincial highways;
- Designs, constructs and rehabilitates major water-management infrastructure;
- Supports the provision of municipal transportation and water/wastewater infrastructure;
- Influences national and international policy on roads, busing, trucking, rail, air, passenger, accessibility, ports/marine, and border crossing service facilities; and
- Represents Alberta's transportation interests in national and international trade agreements.

2.6 OTHER RESOURCE INDUSTRIES

2.6.1 OIL AND GAS

The oil and gas sector within the FMA has been very active in the last several years. Traditionally, activity has been focused near the town of Rainbow Lake and Zama City; however, an increasing amount of concentrated activity has been occurring in the northern portion of the FMA, mainly in the Steen River area and stretching north to Indian Cabins. Minimal oil and gas activity has taken place around the communities of Fort Vermilion and LaCrete in the eastern sections of the FMA.

Approximately 30 oil and gas companies operate within the FMA. Some of the major players include Husky Oil Operations Limited, EnCana Corporation (formerly AEC Oil & Gas Ltd. and PanCanadian Petroleum Limited), Paramount Resources Ltd., Apache Canada Ltd., ExxonMobil Canada Energy, Penn West Petroleum Ltd., and Samson Canada Ltd. In addition, there has been a steady amount of activity from ATCO Electric, AltaGas Utilities, and NOVA Gas Transmission Ltd.

TOLKO Industries–High Level Lumber Division has been co-ordinating land use activities within the FMA since November 1999. The amount of oil and gas activity in the FMA fluctuates depending on the market price. The past few years of generally high oil and gas prices has resulted in a significant amount of seismic exploration being undertaken in the area. Depending on the results of the exploration programs, it is expected the energy activity will continue to grow. A limiting factor for new oil and gas activity in the area is the lack of infrastructure and all-weather roads to access remote locations, resulting in high costs for new activity.

Any merchantable timber removed from the FMA by the energy companies is generally salvaged by those companies and delivered either to TOLKO Industries–High Level Lumber Division or Footner Forest Products Ltd., depending on the species of trees.

Since December 1996, High Level Lumber Division has dealt directly with oil and gas representatives in the area. During this time, many positive working relationships have been established. Integrated use of the land is becoming a greater focus between the oil and gas sector and TOLKO, which has resulted in TOLKO being able to solicit opinions from oil and gas representatives in the area on many issues. In addition, there is a greater commitment from both industries to work together to minimize the overall impact on the landbase.

2.6.2 REGISTERED TRAPPERS ON THE FMA

Fur trapping has been a traditional pursuit in western Canada since the mid-1600s. It helped open the country to exploration and started the commerce that built Canada.

Trapping continues today in Alberta, with approximately 2300 trappers in the province. Of those, about 1600 conduct their trapping on 1700 Registered Fur Management Areas (RFMAs). An RFMA is a parcel of public land allocated to the holder of a Registered Fur Management Licence by Sustainable Resource Development. These registered trappers may form partnerships with other trappers to trap their RFMAs.

About 650 holders of Resident Fur Trapping Licences trap on privately owned land and public lands not included in RFMAs. The remaining trappers in the province hold Métis and Indian Licences to trap on Métis settlements and Indian reserves.

During the 2000-2001 fur trapping season, over $2.1 million worth of wild fur was produced by trappers in Alberta. This total is up from the $1.8 million worth of fur that was produced during the 1999-2000 season.

Furbearing species commercially harvested in Alberta include[8]:

- Beaver
- Muskrat
- Red Squirrel
- Badger
- Fisher
- Marten
- Mink
- Otter
- Weasels
- Wolverine
- Coyote
- Red Fox

[8] *Trapping in Alberta. See website at: http://www3.gov.ab.ca/srd/fw/trapping/index.html.*

- Lynx
- Wolf

Commercial and traditional fur trapping occurs throughout and surrounding the FMA. Trapping has a strong history in the area as Fort Vermilion, the oldest settlement in the province, was established for the fur trade. Many individuals still depend on the fur trade for supplemental income and a link to their traditional way of life, although fur prices tend to be volatile. The Companies contact registered trappers on a regular basis to inform them of forest management activities within their trap line area. There are over 150 registered trappers operating on numbered trap lines within the FMA.

2.6.3 GUIDES AND OUTFITTERS

Many guides and outfitters work on and/or around the FMA, although few of them live in the region. The primary focus of the guides and outfitters is on hunting and fishing. Legally, all outfitters must be registered with the Alberta Professional Outfitter Society. Each year, the Government of Alberta auctions a predetermined number of allocations for big game species for hunts that will occur at different times of the year. These allocations are sometimes resold to other parties, making it difficult to determine which guides and outfitters have big game allocations in the region. Attempts have been made by the Companies to contact guides and outfitters listed as operating in the area.

Commercial recreational and aesthetic opportunities involving guides and outfitters are not well developed in the region, although there are an abundance of opportunities.

SECTION 3:
DESCRIPTION OF THE FMA AREA

Ref: H-065

3.0 DESCRIPTION OF THE FMA AREA

3.1 LANDSCAPE PLANNING BOUNDARIES

The FMA encompasses a gross area of 3 560 311 ha, and is the second largest FMA in the Province of Alberta. The FMA is currently managed using landscape principles over two distinct management compartments, F24 and F25. However, because of the dissolved landbase, the companies are seeking ratification from ASRD to manage the FMA as a single FMU (F26).

F24 includes FMUs 2, 5 and 7, and encompasses a total gross area of 960 894 ha. F25, the larger of the two compartments, encompasses a total gross area of 2 599 417 ha, and includes FMUs 12, 13, 15, 21 and 22.

During development of the DFMP, the Companies decided to change from the old system of forest management units and licences and adopt operating areas and planning compartments. The operating areas and compartments are found in Map 6-3 (full size map can be found in Appendix E, Map E-1).

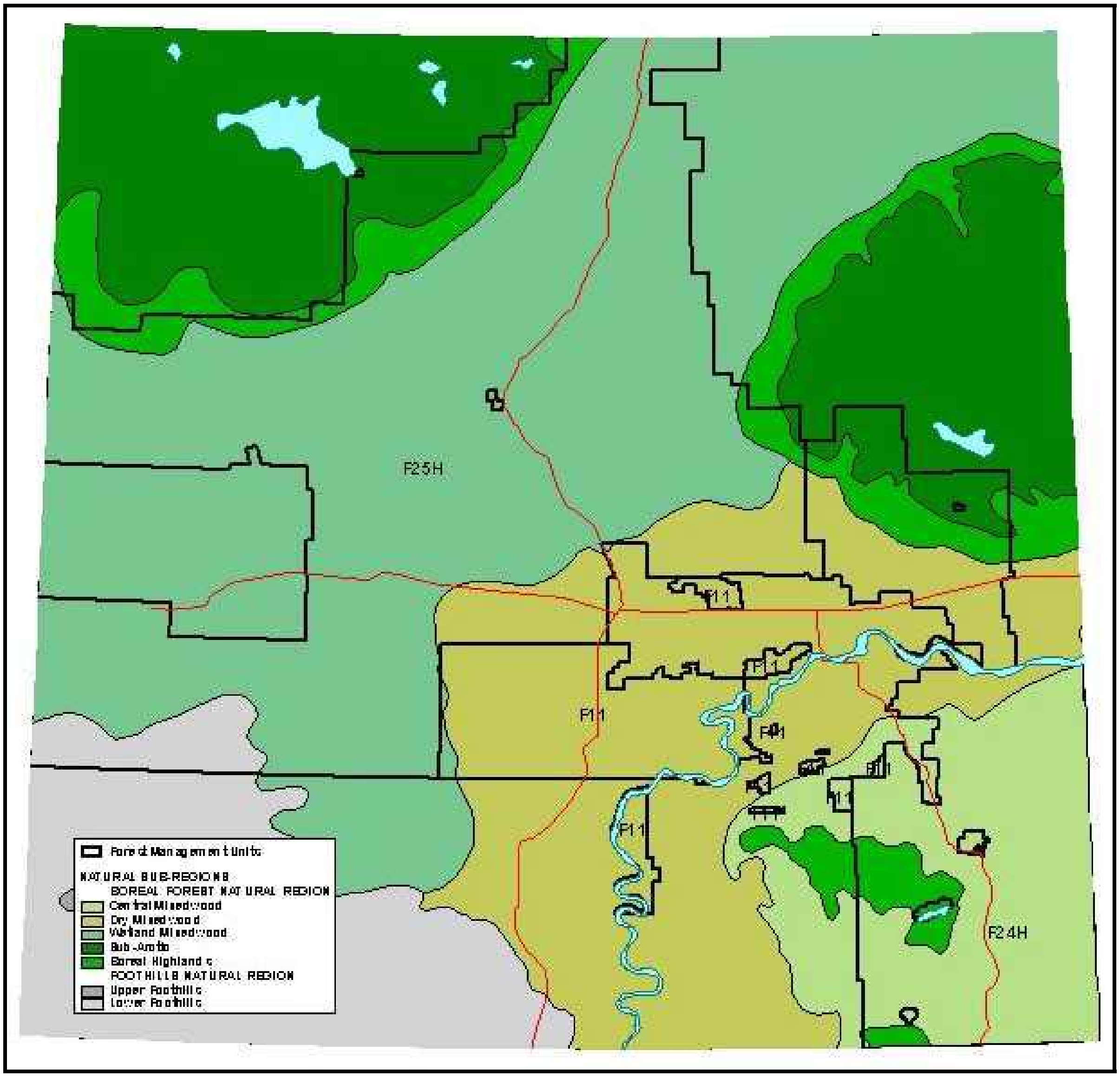
3.2 BIOPHYSICAL DESCRIPTION

3.2.1 ECOLOGICAL CLASSIFICATION

The landscape of Alberta is divided into six natural regions: Grassland, Parkland, Foothills, Boreal Forest, Rocky Mountains, and the Canadian Shield. These natural regions provide the “large picture” of the province’s landscape. The landscape patterns of each region contain a combination of similar vegetation, soils, and landform features. Within each natural region, there are characteristics that further differentiate themselves into subregions. Subregions are areas with similar landscape patterns that have characteristics different from other subregions.

The Companies’ area falls predominately within the Boreal Forest Natural Region, with the exception of the Rainbow operating area, which also includes the Foothills Natural Region. The Boreal Forest Region is divided into six subregions: Central Mixedwood. Dry Mixedwood, Wetland Mixedwood, Subarctic, Peace River Lowlands, and the Boreal Highlands. All but the Peace River Lowlands fall within the FMA. The Foothills Forest Region is divided into two subregions: the Lower Foothills and the Upper Foothills. The Lower Foothills Subregion is the only part of the Foothills Natural Region found within the Companies’ operating area.

FIGURE 3-1: NATURAL SUBREGION DESCRIPTION



The Mixedwood and Peace River Lowlands subregions are similar in that they have overstories dominated by white spruce, balsam fir, aspen, balsam poplar, and white birch, with admixtures being common. Understory vegetation consists of an assortment of shrubs and forbs. Wild rose, low bush cranberry, Saskatoon, Canadian buffalo berry, twinflower, and green alder are the most common understory shrubs with bunchberry, wild sarsaparilla, and dewberry being the most common forbs.

Dry and sandy sites tend to be dominated by jack pine in all ecological areas except the Subarctic where both jack pine and lodgepole pine predominate. Large proportions of ericaceous species such as blueberry and bog cranberry exist in the understory of these two pine overstories. Black spruce and tamarack dominate the forested wetland areas.

The Boreal Highlands are found on hillsides, plateaus, and hilly moraines. Examples of the Boreal Highlands Subregion found within the High Level surrounding area are the Cameron Hills, Caribou Mountains, Birch Mountains, and Buffalo Head Hills. Generally, the Boreal Highlands are transitional areas between the Mixedwood and Subarctic subregions.

The Boreal Highlands are ecologically similar to the Mixedwood subregions, except that jack pine hybridize with lodgepole pine and these hybrids are found intermixed with white spruce, aspen, and balsam poplar. Black spruce stands occur frequently on upland sites and pure conifer forests occur at higher elevations.

The Subarctic Subregion is found on the top of the Cameron Hills, Caribou Mountains, and Birch Mountains. Forests of black spruce with an understory of Labrador tea and lichen on peatlands represent the most common stand type. Lodgepole pine, jack pine, white spruce, and aspen occur on well-drained sites. Poorly drained black spruce bogs with permafrost within 50 cm of the soil surface dominate the majority of this subregion.

The Lower Foothills Subregion is representative of areas found in the Hawk Hills. This subregion is characterized by the co-dominant occurrence of aspen, poplar, lodgepole pine, and white spruce. The Lower Foothills occurs from elevations of less than 500 m up to 1150 m.

The Lower Foothills represents a transition from the aspen–white spruce-dominated Boreal Mixedwood subregions to the lodgepole pine-dominated upper foothills. Balsam poplar is a common tree species found in these forests, especially on moist-to-wet sites. Black spruce and tamarack are common on wet, low-lying sites. Understory species in this subregion are similar to those in the Boreal Forest Region. Low bush cranberry, prickly rose, green alder, and Canada buffalo berry are common shrubs on mesic sites. Wild sarsaparilla, dewberry, marsh reed grass, and hairy wild rye are the common forb and grass species. The topography is generally rolling with sporadic ridges.

3.2.2 CLIMATE

The operating area lies mainly within a continental climatic regime; the Central, Wetland, and Dry Mixedwood subregions occupy much of the area, and these lower elevation subregions are characterized by short, cool, moist summers and long, cold winters. These three subregions represent a gradient of conditions. The Wetland Mixedwood Subregion has the wettest summers and coldest winters, the Dry Mixedwood has the driest summers and warmest winters, and the Central Mixedwood exhibits intermediate conditions.

The Lower Foothill, Boreal Highlands and Boreal Sub-Arctic subregions all occur at higher elevations. The Lower Foothills Subregion has cooler summers and warmer winters than the lower elevation Mixedwood subregions, and is influenced to some degree by both continental and mountain climates. The Boreal Highlands and Subarctic subregions have cooler summers and winters than any of the other subregions, with permafrost being a feature of both.

Table 2 summarizes the major climatic characteristics of all subregions within the area that may be of importance to forest management.

TABLE 3-1: CLIMATIC DATA SUMMARY FOR THE PROPOSED FOOTNER FMA AREA (STRONG ET. AL., 1992)

NATURAL REGION	SUBREGION	MEAN ANNUAL TEMPERA-TURE (°C)	AVERAGE SUMMER TEMPERA-TURE (°C)	AVERAGE WINTER TEMPERA-TURE (°C)	MEAN ANNUAL PRECIPIT-ATION (mm)	MOISTURE DEFICIT	GROWING DEGREE DAYS
Foothills	Lower Foothills	3.0	12.0	-7.8	464	-80	1008
Mixedwood	Boreal Highlands	0.5	12.0	-17.0	400	-70	883
	Boreal Subarctic	0.0	11.0	-17.0	400	-70	500
	Central Mixedwood	0.8	13.5	-13.2	397	-213	1143
	Dry Mixedwood	0.8	13.8	-10.5	380	-265	1150
	Wet Mixedwood	0.5	13.0	-15.0	400	-200	1000

Moisture deficit = 0.5(P-PE [May])+1.5(P-PE [June])+2.0(P-PE [July])+1.0(P-PE [August]); P = total monthly precipitation (mm), PE = potential evapotranspiration (mm)

Growing degree days = relative amount of solar energy available for plant growth

3.2.3 SOILS

The terrain of the area reflects the influence of several glacial advances and retreats, smoothing areas of higher elevation and depositing material in lower lying areas. Large glaciolacustrine lakes dominated the area after the last glacial retreat and fine textured lakebed sediments are common across the landscape. There is very little topographic relief and the water table is close to the soil surface in many areas. Somewhat more topographic relief occurs in the eroded remnant hills that survived glaciation–the Caribou Mountains, the Cameron Hills, and the small outliner of Foothills terrain in the extreme southwest.

The proportion of soil types in the area varies widely across natural subregions, and differs greatly between low and upland sites on different parent materials. The occurrence and distribution of low-lying wet terrain control the proportions of soil type. Poorly drained Organic and Gleysolic soils are associated with level glaciolacustrine plains that characterize much of the Wetland Mixedwood Subregion. On slightly higher terrain in this and other subregions, Luvisolic soils have developed on fine-textured morainal and glaciolacustrine materials; Brunisols are typical of eolian or glaciofluvial deposits. Within the river valley walls and on fluvial terraces, Regosolic soils may be found. Cryosolic soils also occur, usually in association with wetlands within the Boreal Subarctic, Wetland Mixedwood and Boreal Highland subregions. (For more information on soils in the FMA refer to Appendix C.)

3.2.4 HYDROLOGY

The two major river drainage basins in the area are the Hay and Peace River basins. The Hay River drains the north, west and central portions of the FMA, while the Peace River drains the south and east portions.

Glaciation is the most important determinant of landscape patterns throughout the operating area. This is particularly true of the low-relief terrain that characterizes the Wetland, Central and Dry Mixedwood subregions. The Boreal Highlands and Subarctic subregions are located on and around the Caribou Mountains and Cameron Hills. Numerous creeks and streams drain these areas and the local water table is less influential. Bedrock groundwater seepage on the slopes and high local water table levels in valley bottoms and depressions characterize the hydrology of the Lower Foothills Subregion.

3.2.5 WILDLIFE

The Central and Dry Mixedwood subregions provide the most diverse array of wildlife species and suitable habitat. This is due to the large degree of habitat variability and high proportion of mixedwood and shrub land, as observed by Beckingham and Archibald (1996).

Characteristic species of deciduous forests in the Dry Mixedwood Subregion include least flycatcher, house wren, ovenbird, red-eyed and warbling vireos, Baltimore oriole and rose-breasted grosbeak. Species in mixedwood forests include yellow-bellied sapsucker, Swainson’s thrush, solitary vireo, magnolia warbler, white-throated sparrow, pileated woodpecker and northern goshawk. Typical mammals include beaver, moose, varying hare, black bear, wolf, lynx and ermine.

The wildlife of the Central Mixedwood Subregion is the most diverse and varied of the Boreal Forest Natural Region. The species characteristic of coniferous forests are wide-ranging and include western wood peewee, gray jay, red-breasted nuthatch, golden and ruby-crowned kinglets, yellow-rumped warbler, pine siskin, red and white-winged crossbills, dark-eyed junco, boreal chickadee, and red squirrel. Three warblers, the bay-breasted, Cape May and black-throated green, are confined largely to mature conifer-dominated mixedwood stands in the central and eastern portions of the subregion. Balsam fir stands have a particularly diverse assemblage of coniferous forest birds.

Characteristic species of deciduous forests are similar to those in the Dry Mixedwood Subregion and include least flycatcher, house wren, ovenbird, red-eyed and warbling vireos, Baltimore oriole and rose-breasted grosbeak. Species of mixedwood forests include yellow-bellied sapsucker, Swainson's thrush, solitary vireo, magnolia warbler, white-throated sparrow, pileated woodpecker and northern goshawk.

The Wetland Mixedwood is less diverse due to large expanses of wetland with minimal plant species diversity and suitable habitat, but provides important habitat for migrating waterfowl, including the sandhill crane and whooping crane (Alberta Natural Heritage Information Centre, 1998). The wildlife of this subregion is relatively impoverished, both in species and numbers compared with the Central Mixedwood Subregion. The scarcity of deciduous and mixedwood communities is largely responsible for this. The extensive wetlands that characterize this subregion provide important habitat for nesting and migrating waterfowl, including the sandhill crane and rare whooping crane.

Boreal Highland and Sub-Arctic subregions also have relatively low vegetation and wildlife species diversity due to the harsh environments of these subregions. While the overall species diversity is lower, unique populations of woodland caribou occur in the Caribou Mountains and the largest concentration of nesting bald eagles occur around Bistcho Lake in the Cameron Hills (Alberta Natural Heritage Information Centre, 1998).

Riparian areas in all subregions provide important habitat for large mammals. Some Boreal Forest species are either local or absent, while other species more typical of Subarctic habitats further north are present. The latter includes red-throated loon, arctic loon, surf scoter, tree sparrow and northern phalarope. Species common to black spruce forests include gray jay, common raven, yellow-rumped warbler, blackpoll warbler, dark-eyed junco, chipping sparrow, red squirrel, snowshoe hare and black bear. Wetland species include lesser yellowlegs, palm warbler, rusty blackbird, Lincoln's sparrow, and moose. On lakes and ponds, the common loon, bald eagle, osprey, spotted sandpiper, swamp sparrow and beaver are generally found.

Many of the animal species of the Lower Foothills Subregion that inhabit coniferous forests are wide-ranging species that are common to spruce and pine forests of the Boreal Forest, Foothills, and Rocky Mountain natural regions. However, for those species that have Rocky Mountain and Boreal Forest subspecies, the Boreal Forest subspecies is characteristic of the Lower Foothills. Species of coniferous forests include boreal chickadee, spruce grouse, ruby-crowned kinglet, white-winged crossbill, and red squirrel.

Areas with deciduous forests have diverse animal communities including ruffed grouse, warbling vireo, black-capped chickadee and Tennessee warbler. Along the boundary with the Central Mixedwood Subregion, species more typical of the boreal forest occur including moose, yellow-bellied sapsucker (northern race), rose-breasted grosbeak and purple finch.

The most species-rich habitats are the mixedwoods and shrublands associated with swamps, ponds, streams and lakes. Some species, such as yellow and black-and-white warblers, American redstart, song sparrow, northern water thrush, fox sparrow and Philadelphia vireo are mostly restricted to these sites. Barred owl occurs occasionally in mature mixedwoods along lakeshores and river valleys.

Typical, widespread mammals include beaver, moose, varying hare, black bear, wolf, lynx, Gapper's red-backed vole, cinereous shrew, deer mouse, least chipmunk, moose and ermine. Others, such as fisher, wolverine, river otter, and woodland caribou, are less common and locally distributed[9] (For more information on wildlife in the FMA refer to Appendix D).

3.2.6 VEGETATION

Beckingham and Archibald (1996) describe 73 distinct plant communities for the Wetland, Central and Dry Mixedwood subregions (in aggregate), 29 types for the Boreal Highlands, and 27 types for the Boreal Subarctic. These community types are the result of climatic, topographic and historical influences. Table 3-2 summarizes the major overstory and understory vegetation that is associated with different moisture conditions within each of the subregions.

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[9] *See website at: http://www.cdtest.gov.ab.ca/preserving/parks/anhic/borcenmx.asp.*

TABLE 3-2: MAJOR VEGETATION TRENDS DUE TO MOISTURE AND CLIMATE WITHIN THE PROPOSED FOOTNER FMA (ALL COMMON NAMES FOLLOW THOSE GIVEN IN BECKINGHAM AND ARCHIBALD (1996))

NATURAL SUBREGION	MOISTURE	CHARACTERISTIC TREES SPECIES	CHARACTERISTIC SHRUB SPECIES	CHARACTERISTIC FORBES AND NON-VASCULAR PLANTS
Dry, Central, and Wetland Mixedwood	Dry	Jack pine, aspen, white birch, and white spruce	Bearberry, blueberry, green alder, rose, and Labrador tea	Hairy wild rye and lichens
	Average	Aspen, white spruce, balsam fir, and black spruce	Green alder, rose, low-bush cranberry, and Labrador tea	Marsh reed grass, fireweed, dewberry, coltsfoot, sarsaparilla, and feather moss
	Moist	Aspen, balsam poplar, white spruce, balsam fir, and black spruce	River alder, dogwood, honeysuckle, rose, low-bush cranberry, and Labrador tea	Horsetails, ferns, tall lungwort, bishops cap, marsh reed grass, feather moss
	Wet	Black spruce, tamarack	Labrador tea, bog birch, and willow	Sedges, rushes, peat mosses, and other mosses
Subarctic and Boreal Highlands	Dry	Lodgepole pine (Subarctic), jack pine (Boreal Highlands), aspen, and white spruce	Bearberry, blueberry, and Canadian buffalo-berry	Hairy wild rye and lichens
	Average	Lodgepole pine (Subarctic), aspen, white spruce, and black spruce	Rose, Canadian buffalo-berry, Labrador tea, low-bush cranberry, and bog cranberry	Fireweed and feather mosses
	Moist	White spruce, balsam poplar, aspen, white birch, Lodgepole pine (Subarctic), and black spruce	river alder, low-bush cranberry, currant, and Labrador tea	Horsetails, tall lungwort, marsh reed grass, feather moss, and other mosses
	Wet	Black spruce and tamarack	Labrador tea, northern Labrador tea, bog cranberry, dwarf birch, willow, and bog billberry	Cloudberry, dwarf raspberry, sedges, peat mosses, and marsh reed grass
Lower Foothills	Dry	Lodgepole pine, aspen, and white spruce	Bearberry, Canadian buffalo-berry, juniper, shrubby cinquefoil, rose, blueberry, bog cranberry, and green alder	Hairy wild rye, feather moss, and ground cedar
	Average	Lodgepole pine, aspen, balsam fir, and black spruce	Labrador tea, bog cranberry, green alder, blueberry, rose, twin-flower, Saskatoon, willow, and wild red raspberry	Bunchberry, fireweed, wild sarsaparilla, stiff club-moss, dewberry, feather mosses, marsh reed grass, and hairy wild rye
	Moist	Lodgepole pine, aspen, white spruce, balsam poplar, balsam fir, and black spruce	Green alder, bracted honeysuckle, low-bush cranberry, currants, and Labrador tea	Dewberry, wild sarsaparilla, stiff club-moss, twisted stalk, horsetails, ferns, marsh reed grass, and feather moss
	Wet	Black spruce and tamarack	Labrador tea, bog birch, and willow	Sedges, rushes, cloudberry, peat mosses, other mosses, and buck-bean

3.3 FIRE HISTORY

Map 3-1 shows the location, size and period in 10-year classes of the Class E fires on and around the FMA (full size map can be found in Appendix E, Map E-2). The areas shown on the map indicates that major fires during the past 20 years of data have continued despite increased suppression capabilities.

3.4 SILVICS AND MANAGEMENT IMPLICATIONS OF THE BOREAL COMMERCIAL TREE SPECIES

Theoretical and practical knowledge of the silvics, (biologic and ecologic characteristics) of commercial tree species is necessary to properly understand, plan and implement "objective-driven" forest management. This review of the commercial tree species contains only the tree and stand-level attributes of each species that are considered sufficiently important to the practical management of the species to be stated in this abbreviated silvics review.

3.4.1 THE BOREAL PINES: JACK PINE/LODGEPOLE PINE

The distribution of the boreal pine species is shown in the landscape assessment. Hybridization of the two named species, pinus contorta and pinus banksiana is known to occur in the FMA. Both species commonly occur in relatively pure, even-aged stands, particularly on dry, nutritionally impoverished sites, on coarse-to-loam textured soils. They are particularly evident following the burning or clear-cutting of a pre-existing pine stand.

The vegetation climax on pine sites is rarely experienced since the boreal fire interval is much less than the 200 plus years the specie can survive. However, these pines have a very wide ecological amplitude and often occur in pure stands on poor, wet sites as well. This is likely more a matter of their ability to survive on these sites, rather than being a favored ecological niche in a botanical sense where the specie would otherwise tend to thrive.

Better soils and climate bring with them better growth performance, but are also accompanied by competition from other species, including the spruces. The latter will occupy a lower canopy position for the first 50 to 100 years, then succeed as the dominant species if fire does not intervene.

Boreal pines are considered shade "intolerant". Of the common boreal tree species, only aspen and birch are more shade intolerant than jack and lodgepole pine. In managed forests, clearcutting is a silvicultural requirement to perpetuate the pine species.

In general, it can be said that with the exception of tree form, (lodgepole has preferred lumber manufacturing characteristics) the silvics, and autecology of jack and lodgepole are so similar that for practical purposes, the two species are herein considered as one.

3.4.1.1 STAND RE–ESTABLISHMENT FROM SEED OR PLANTINGS

The fire ecology of the boreal has stimulated a great deal of adaptation in the pines. Over millennia, nature's selection process has evolved both species to the point where they compete quite favourably against other tree, shrub and grass vegetation that might otherwise dominate the cold, exposed, burned-over landscapes of the boreal forest.

MAP 3-1: HISTORY OF "E" CLASS FIRES BY DECADE

For map, please see:

APPENDIX E

MAP E-2

The most obvious example is the habit of both species to produce non-serotinous cones and viable seed very early in their lifecycle. This results in an annual seeding-in, or ingress of additional trees, often beginning before the stand is 10 years old. This habit then reverses itself as the regeneration progresses into the sapling stage. From that point on, virtually no seeding-in occurs, as the seeds are now contained and protected in tough cones in the aerial portions of the plant, where their new-found serotinity prevents them from being scattered annually. Instead, all the seed is reserved, in many more new serotinous cones, for potential reproduction after fire or logging.

The seed is heavy and does not readily move laterally for opportunistic regeneration. The serotinous cone opens well only after an extreme heat event has broken the natural wax bond between the scales. Then the seeds drop down, either from the aerial portions of burned snags, or from cones in logging slash heated by the strong radiant energy of summer sun in exposed cutblocks.

3.4.1.2 GROWTH CHARACTERISTICS OF BOREAL PINES

In the pines, the size and shape of an individual tree's crown, and the size and shape of that same tree's stem or bole, is controlled predominately by density. In fact, research suggests that if a biological limit (expressed in same aged stems per hectare) is exceeded, the entire stand will be adversely affected by "height repression". This means that every year, each stem will fail to achieve not only its full biological diameter growth (which is common when intolerant trees are shaded), but also its annual height growth. This is a biological extreme within plants that occurs only when "intraspecific" competition between individuals is excessive. In fact, it is the second last biologically induced reaction; mortality of individuals within the stand is the last natural reaction to alleviate the problem. Mortality will continue within the stand until the shading subsides, and only the strongest and tallest individuals will survive.

This process is known as self-thinning and takes place over a very long period in pines–perhaps 50 to 100 years depending on site productivity. Therefore, it has a much more dramatic effect on the yields of pine stands than it does on yields in the poplar family, where self-thinning is effectively achieved with 10 years. With the predominance of dense, fire-origin pine stands on the FMA, the likelihood is high that most of these stands took this prolonged path in their stand dynamics. It is generally accepted, therefore, that the site index (the slope of the growth curve) for these stands is systematically underestimated and will increase dramatically under managed scenarios.

3.4.1.3 YIELD CHARACTERISTICS OF BOREAL PINES

The most prevalent condition affecting mature pine on the FMA is the impact of very high regeneration densities in naturally occurring fire-origin stands. Since the recoverable net yield of stands is a reflection of the total number of stems that get used times the size of the bole of each tree, the volume effect of more trees is generally larger than the volume effect of taller, shorter, skinny or fatter trees. The value, however, may be quite different, depending upon what product is produced, as the size and taper of each individual stem accounts for great efficiencies (or inefficiencies) in the manufacturing process. This is not of great concern to pulpwood manufacturers, but certainly is to sawmills.

There are many efficient ways to improve volume recovery from overly dense stands. The two most common examples are precommercial thinning and planting at controlled densities (rather than using natural seedcast that would often over-stock the site). Objective-driven silviculture is the key to realizing these potential gains. This can be done without diminishing the ecological character of stands within the forest.

The management of post-harvest, regeneration densities of pine presents a tremendous opportunity to increase stand yield or to reduce the rotation age of many of these stands. In managed forest scenarios, the rotation age is the age when the stand can sustainably and economically be harvested, because its average stem size fits the design of the manufacturing plant. Both improved stand yields and reduced rotation ages have significant impact on the allowable cut effect (ACE), which can help meet company and societal needs from the forest.

3.4.2 THE BOREAL SPRUCES: BLACK SPRUCE/WHITE SPRUCE AND THE HYBRIDS

Black spruce also has very wide ecological amplitude and is most prevalent on the poorer sites, occurring at all elevations across the FMA. Hybridization occurs between black and white spruce, but the management implications of the crosses are routinely accounted for. Seed crops are quite periodic for white and Engelmann spruce, with poor crops always following bumper crops. Seed pests, both insect and disease, as well as the timing of cone maturity, are large considerations in cone collection programs. Black spruce seeds, on the other hand, are easy to collect because of the relative absence of pathogens, its habit of annual seed production, and the many years of cones maintained by the trees.

Both white spruce and black spruce can survive in a somewhat "light competitive" environment, and may in fact thrive under some naturally occurring circumstances, such as a light nurse crop of aspen. Under perfect site conditions, however, full exposure to sunlight is always preferred and results in the best possible site index for all three of these species. Therefore, planting is the most common management technique to put spruce back on a site, or put them onto a site where they were not present in the last rotation. By planting, the slow ingress of spruce is reduced to full site occupancy in one year, something that may have taken up to 50 years in the last rotation.

All species of spruce can occur in pure stands as well. In fact they thrive in dominant canopy positions. Individuals living the rotation period in dominant canopy positions will express very high site indexes; however, these circumstances are relatively uncommon in the boreal because shade-intolerant species generally take over in disturbance scenarios. Even when other species are not present, natural factors such as spring and fall frosts, and insect shoot damage, often slow down early height growth to where other species may overtake white spruce in the developing canopy.

3.4.2.1 BLACK SPRUCE

Black spruce silvics resemble pine, with the exception of its shade tolerance. Unlike white spruce, the ecological amplitude of black spruce is quite extreme, commonly occurring on very wet to very dry sites that are usually nutritionally poor and have light competition. Pine and black spruce commonly occur together, and are often of similar ages, with black spruce almost always in the understory position due to its slower initial growth rate. If not pre-empted by disturbance, black spruce can become the successional climax species.

3.4.2.2 WHITE AND HYBRID SPRUCE

The reproductive strategy for white and white crosses is to slowly invade across newly burned or logged areas, "from the side" rather than "from above", as is the case with pine. This means the species does not necessarily have to pre-exist on the site. Small, light seed with a good wing and an ability to scatter laterally on the wind, or across snow pack, are the keys to the success of this species in the boreal.

Seeding-in from the side may take up to 50 years before sufficient stocking exists to affect the species composition of the regenerated stand. The happenstance of wind-disseminated seed dispersal, and the fact that cone crops in the white and white crosses are very unpredictable and almost certainly not annual, most easily explains the slow ingress. This explains the very common age class difference between the shade-intolerant species that first occupy disturbed sites, and the much younger spruce found in the understory where only shade-tolerant species could survive.

3.4.2.3 GROWTH CHARACTERISTICS OF BOREAL SPRUCES

Generally, overtopping and overcrowding, at least within density moderation, does not impact the juvenile height growth of all species of spruce. Diameter growth is somewhat curtailed because the shaded tree's crown is not fully exposed to sunlight. But evolved shade tolerance keeps diameter losses minimal in the early sapling stages. Sunlight exposure later in the rotation, when understory individuals become dominants, results in exceptional diameter increments, but does not change the annual height increment as that is controlled by the inherent productivity of the site.

In mixedwood stands, mid-rotational disturbances such as epidemic tent caterpillar populations or severe droughts, may knock out the aspen overstory of entire stands or forests, allowing the white spruce subdominants to take over. This situation is analogous to logging the aspen overstory from an aspen-over-spruce mixedwood stand. The effect is that of a commercial thinning rather than a true harvest. This is because the residual spruce understory is undisturbed and fully occupies the site. Hence from a technical or sustainability perspective, a new crop does not need to be re-established.

3.4.2.4 YIELD CHARACTERISTICS OF BOREAL SPRUCES

Perhaps the biggest management opportunity with spruce on the FMA is the opportunity to do commercial thinnings as part of an EFM program. The two essential ingredients required for success are present–an opportunity in the stand structure and the ability of the specie to respond to the treatment. For the manager, the challenge is to do the commercial thinning properly. The key to success is removing the overstory aspen or black poplar mechanically, while protecting the advance spruce understory. The presumption, of course, is that the poplar overstory is sufficient to make it economically feasible to remove, and the understory spruce content is sufficient to make it biologically possible.

Where this management technique is possible to administer, the total volume recovery from the stand is substantial when considering the volume of both hardwood and softwood. Current volume tables do not show the full potential of the volume that can be derived from such management. The Companies' intent is to establish trials under this management scenario and measure the potential for volume gains under these types of stands. This has an ACE, either as additional volume gained from two entries or as a reduced rotation age for the second coniferous crop on the site.

3.4.3 THE BOREAL FIRS: BALSAM FIR/SUB-ALPINE FIR

The distribution of balsam fir on the FMA is shown in the landscape assessment. Another boreal specie, Douglas fir, is not a true fir nor has it been recorded on the FMA. Balsam fir and subalpine fir are hard to distinguish visually by anything more than their cones and elevation position. They probably hybridize but not much is known locally about their biology.

Balsam fir is not a principal target of commercial management for a variety of reasons, perhaps the most important being its susceptibility to spruce budworm. In the understory position, both species commonly occur in sufficient numbers and stocking to nullify the need for regeneration after cutting. However, experience shows that when overstories are removed by commercial thinning, the shade-tolerant needles of firs are unable to cope with full exposure to sunlight and large-scale mortality is common.

As a result, commercial thinnings of this nature can be practised only on well-stocked, north-facing exposures. Theoretically, the specie would lend itself to uneven-aged management and partial cutting, but the risk of budworm devastation is far too great in a commercially managed forest.

Balsam fir is very shade tolerant and considering the fire history of the region is rarely found in pure stands since the stand's origin would have had to greatly exceed the average fire interval. This scenario occurs only in high elevations. The specie commonly exists, however, as a minor understory component of most stands within the FMA, and is certainly part of the stand structure and ecological diversity that adds value to the non-timber aspects of the forest.

3.4.4 THE BOREAL POPLARS: TREMBLING ASPEN/BALSAM POPLAR

The distribution of trembling aspen and balsam poplar on the FMA is shown in the landscape assessment. Aspen has the widest distribution of any native North American tree species. Sexual hybridization between the two species occurs, expressed as hybrid seed, but the proliferation of clonal origin stands is so extensive that the hybrids are of no biologic nor economic significance. Both species commonly occur in relatively pure, even-aged stands, and clones may even intertwine their root systems but still remain separate clones. On average, aspen clones are generally larger than poplar owning to balsam's better tolerance of wetter, colder soils.

Individual aspen and poplar trees are relatively short lived. At most, only 60 to 120 years pass before they are replaced in stands by shade-tolerant species. Once a clone establishes on a site, however, it will be there for generations to come. In fact, aspen clones are known to outlive the oldest giant sequoia, perhaps thousands of years old, and provide genetic diversity and possibly some measure of "old growth traits" to stands whose individual trees are rarely more than 100 years old.

3.4.4.1 STAND RE-ESTABLISHMENT

Two factors contribute to the very wide distribution of the poplars–their ability to seed-in to great distances, and their tremendous persistence in the root zone once they have become established.

Both species have good annual seed crops and are very prolific seeders. Windborne seed may disseminate tens of kilometres from the stand, but the viability of the seed is very short lived. Seeds must find a very humid, non-competitive microsite, such as a flood plain, in order to germinate and survive to the point of establishment.

Most re-establishment of the species is by vegetative propagation. Both species sucker when the hormonal balance within the tree is disrupted by lethal disturbance to the aboveground parts of the plant, such as by fire or logging. The growth hormone from the root tips is no longer kept in check by growth inhibitors from the aerial shoot tips, and dormant root buds are stimulated to elongate, break the soil surface, and establish leaves. The success of this regeneration strategy is significantly affected by the season of treatment. Early summer cuttings have a lower success rate than late fall or winter cuttings because the root system's carbohydrate reserves are depleted after the leaf flush and shoot elongation period.

Aspen is much more prolific at suckering than is poplar, since the total number of root system buds far exceed the number of basal buds. Many more basal and stump sprouts occur in balsam clones, as the dormant buds on the root system appear less impacted by hormonal changes than buds on the stump itself. This results in denser restocking and a spatially wider reoccupation of the regenerated site in aspen. High soil temperatures are very important to their success.

Under optimal conditions, seeding-in occurs in newly established cutblocks, which helps to explain the "salt and pepper" occurrence of aspen and balsam trees and small clones in otherwise pure stands of pine. Aspen will invade new cutblocks or floodplains by seeding-in, particularly if the timing is right and the vegetative competition is minimal.

3.4.4.2 GROWTH AND YIELD CHARACTERISTICS OF BOREAL POPLARS

Both species are very shade intolerant, with aspen being the least tolerant. In addition, both have a pronounced ability to express dominance. Trees not present as co-dominants quickly die and disappear, as do most of the lower branches on the bole. Overstocking to stagnation, as discussed in the pine section, is extremely rare.

Significant fibre yields are lost to self-thinning before they can be economically used. These contribute to natural nutrient recycling. Thinning entries would have to be made every 10 years to capture most of this productivity. The difficulty in not damaging the remaining stems, the low economic value of the product, and the abundance of mature stands all collectively contribute to its "non use" as a current management alternative.

SECTION 4:
MANAGEMENT GOALS

Ref: H-065

TOLKO
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HIGH LEVEL LUMBER DIVISION

4.0 MANAGEMENT GOALS

"The concept of humanity as part of the ecosystem, not separate from it, is a vital underlying principle of the ecosystem approach."[10]

The Management Goals of the DFMP describe the framework used by the Companies to achieve the management philosophy. The Companies use various management activities to achieve the desired future forest necessary to attain the balance of ecological, social and economic values. Each section is set up to show Goals, Objectives, Strategies, and Targets.

In many cases, opportunities for research exist for improving the knowledge base. In recognition of this fact, the Companies will continue to be actively involved in a number of research projects and associations to improve their management activities. Opportunities for research projects will be identified and prioritized during production of the DFMP. The Companies will incorporate results from research where applicable as part of their adaptive management.

4.1 ECOLOGICAL STEWARDSHIP

Goal:

Responsible ecological stewardship incorporating natural disturbance and landscape management techniques that affect timber, wildlife, and water within the range of natural variability across the landbase.

Responsible ecological stewardship involves the maintenance of biological diversity and conservation of soil and water resources. Biological diversity is measured on three levels: genetic diversity, species diversity and ecosystem diversity. Ecological stewardship objectives should maintain biodiversity on all three levels through a combination of coarse and fine filter approaches. Soil and water conservation objectives involve the productivity of the soil, maintenance of water quality and minimal fluctuation of water quantity resulting from the Companies' operations.

The Companies understand that ecosystems are affected in ways that are often beyond human control. The Companies intend to address the areas of ecological stewardship that are affected by their forest management activities, and use adaptive management techniques to modify operations to reflect the changes to the landbase and increased knowledge over time (Canadian Council of Forest Ministers, 1995).

4.1.1 NATURAL DISTURBANCE PATTERNS

Objective:

Manage to emulate natural disturbance patterns.

The current age class and cover type distribution across the landscape is the result of many ecological processes occurring over time. Although natural disturbances and succession will create changes to the existing patterns of age classes and cover types across the landscape, the Companies will manage the FMA such that their activities do not result in changes to age class and cover type distribution beyond natural variability.

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[10] *Northern River Basin Study. See website at: http://www3.gov.ab.ca/env/water/nrbs/ sect3/sect311.html.*

Strategy 1:

Reforest areas to maintain the proportion of existing cover types.

The success of reforestation will be measured by establishment and performance surveys. These surveys will measure cutblock regeneration as compared to the regeneration standard of the pre-harvest declaration identified in the Annual Operating Plan.

Target: The Companies will ensure that the area harvested will return to the pre-harvest declaration within a target range of +/- 5%. As the Companies are operating on a dissolved landbase, success will be measured at the FMA level allowing better forest management by maintaining successional transition.

Strategy 2:

Reforest areas to meet regeneration standards.

Currently, the Government of Alberta determines the standard at which a harvest area is said to have regenerated successfully. As the relationship between the two companies becomes better established, they will move toward producing "management by objective" regeneration standards that will then require ratification by the government. Establishment and performance surveys will measure harvest area regeneration as compared to stocking and growth standards.

Target: The Companies are committed to meeting the applicable regeneration targets on all harvested areas. The Companies are also committed to developing a Model II before the next DFMP.

Strategy 3:

Schedule harvest activities to maintain older age classes.

Under a sustained-yield approach to forest management, the strategy is to move toward a "regulated forest state" that attempts to maintain an equal area of productive forest under each yield class up to the determined harvest age. However, sustainability requires that older age classes be maintained beyond optimal harvest age.

Through the Preferred Forest Management Strategy (PFMS), the Companies will implement a spatial scheduling of harvesting activities that will ensure that older age classes (120 +) are maintained across the landscape (Figure 8-4).

Target: The Companies will ensure that the amount of area in older age classes (120+) is not reduced more than 37% from current levels over the 200 year planning horizon. Deviations from current levels will be included in the Stewardship Report.

Strategy 4:

Participate in research activities to better understand the natural range of variability.

Although the Preferred Forest Management Strategy (PFMS) outlines a spatial scheduling of harvesting activities that ensures the maintenance of older age classes, age class distribution, including the amount of area within older age classes, is historically highly variable over time (Bonar *et. al.* 2003).

Although the Companies have completed an analysis on the current age-class, patch size, and covertype distribution and its fluctuation over time (8.3), the natural range of variability at various scales needs to be understood and incorporated into future planning to ensure these variables are managed within this historic range.

Target: Through research initiatives or future analyses, the Companies will determine the historic range of natural variability and incorporate the results of the analyses into the next DFMP.

4.1.2 SPECIES DIVERSITY

Objective:

Incorporate wildlife and plant species into harvest planning and operations.

Ensuring that habitat and special ecological features associated with native species within the FMA is maintained over time should ensure that species diversity is conserved. Since exclusive use of either the coarse or fine filter approach will not achieve the guiding principle (Alberta Research Council, 1998), the Companies will use a combination of coarse and fine filter techniques to ensure that broad ecosystem functions and patterns are maintained while incorporating specific species for management.

Strategy 1:

Assess the availability of habitat for a variety of species on the FMA

The Companies assessed habitat availability across the FMA, or where applicable, within identified wildlife zones, for a variety of species including the American marten (*Martes americana*), Moose (*Alces alces*), Pileated Woodpecker (*Dryocopus pileatus*), Wood Bison (*Bison bison*), and Woodland Caribou (*Rangerifer tarandus*). Species were selected based on provincial status, association with specific stands and/or condition, and social importance.

In a prior analysis, the Companies summarized life requisites for selected terrestrial vertebrates on the FMA (Appendix H). The Companies used the information collected in this analysis to identify the critical habitat attributes for each of the species outlined above (Table 8-37) and monitored these attributes over the first 100 years in the planning horizon (8.5).

Target(s):

- Maintain or increase the availability of habitat and foraging areas for the American Marten with an acceptable threshold for reduction of no greater than 10% from current levels.
- Maintain or increase the availability of habitat for Woodland Caribou in identified caribou zones with an acceptable threshold for reduction of no greater than 10% from current levels.
- Maintain or increase the total availability of habitat for the moose with an acceptable threshold for reduction of no greater than 10% from the current levels. The Companies will also maintain or increase the availability of foraging habitat across the landscape.
- Maintain or increase the availability of non-forested mesic sites, the preferred habitat of the Wood Bison. Since the species has been identified as being at risk by the Alberta Wildlife Act, the acceptable threshold for reduction in preferred habitat is only 5% from current levels. Since the Wood Bison also utilize mixedwood stands that lie adjacent to the non-forested mesic sites for thermal cover, the companies will also target to maintain adequate levels of these stands. These areas are currently low (551 ha) and continue to be reduced over the planing period before stabilizing at 411 ha. This will be the target for future projections with an acceptable threshold of +/- 5%.

- Maintain or increase the availability of preferred habitat for the Pileated Woodpecker with an acceptable threshold for reduction of no greater than 30% from current levels. Although the analysis shows a 30% reduction in habitat availability in Year 50, it does increase in the following period.
  The Companies recognize the decrease in habitat for the Pileated Woodpecker at Year 50, however additional habitat will be available to the species through retention within harvest areas. The Companies' commitment to adaptive management will also allow plans to be altered to incorporate unique finds such as a Pileated Woodpecker nest.
- The companies will also work with SRD over the planning period to identify other species to be included in the next DFMP.

Strategy 2:

Develop strategies to identify the location and maintain habitat for rare, threatened, and endangered species.

There are a number of species within the FMA area that are listed as being at risk or may be at risk, and require specific attention. (Canadian Council of Forest Ministers, 1997). All levels of plans will show where critical habitat has been identified and outline measures for maintaining habitat for rare, threatened and endangered species.

Of particular importance on the FMA, is the woodland caribou (*Rangerifer tarandus*) which is a species that has been classified as threatened under Alberta's Wildlife Act since 1984. During the Timber Supply Analysis (TSA), all black spruce stands with a timber productivity rating "fair" were removed from the net landbase. These stands are generally classified as overmature in age and will provide large tracts of critical habitat required by the woodland caribou.

Target(s):

- Train employees and contractors on identification of rare, threatened, and endangered species on the FMA.
- Involve the public in identifying the location of habitat for rare, threatened, and/or endangered species.
- Develop operational plans with Alberta Sustainable Resource Development in caribou areas that will consider the impact of harvest operations on caribou. The Companies will also continue to participate in the Boreal Caribou Committee.

Strategy 3:

Participate in research activities to better identify and understand the habitat needs of rare, threatened, and endangered species on the FMA.

The use of adaptive management will change management practices on the FMA as knowledge of rare, threatened and endangered species increases. The government's list of species at risk is updated regularly and will be monitored to assist the Companies in modifying their management practices.

Target: The Companies will continue to have active membership and/or sponsorship in research projects relating to rare, threatened, and endangered species associated with the FMA.

Strategy 4:

Develop strategies to identify the location and maintain rare plants during harvesting and silvicultural operations

The Companies recognize the lack of data regarding the location(s) of rare plant species within the FMA. However, using adaptive management strategies during the planning process will allow the companies to alter plans to incorporate unique discoveries, rare habitats, and ecological features.

Target(s):

- Involve the public in identifying the location of rare plant species or areas of ecological interest.
- Annual Operating Plans (AOP's) will outline specific strategies that have been implemented to protect or mitigate impacts to rare plant species or other ecological features.

4.1.3 SPATIAL DIVERSITY

Objective:

Manage to maintain spatial diversity

Spatial diversity is the size, distribution, and frequency of past natural disturbances on the landscape and the vertical structure or layers found within a forest stand. Since information regarding forest inventory is limited to current stand structure, the information may not provide the detailed information required to model previous disturbance patterns.

While an historic patch size distribution will be derived from natural disturbance history, economic values will be used to set minimum patch/block sizes. A balance of ecological, social, and economic values will set the block sizes for any one planning period.

During harvest, single trees and clumps of live trees will be left to emulate the patches that occur naturally after fire. Snags that are found in mature and older seral stands provide important habitat for cavity-nesting birds and mammals. Most cavity nesters require mature trees with some decay. Coarse woody debris in the form of brush debris piles and single downed stems will also provide habitat structure. Fibre utilization, fire prevention and habitat requirements will be balanced to achieve the objective.

Strategy 1:

Schedule harvest areas to maintain spatial diversity, patch size and connectivity.

The Alberta Forest Legacy calls for activities in the forest to be managed in such a way as to allow the forest landscape to continue to evolve under the influence of disturbances that are, in scale at least, similar to those disturbances that shaped the landscape in the past[11]. The Preferred Forest Management Strategy will be used to spatially schedule and determine harvest areas.

Although cutblocks will be planned to be less than the size limitations as outlined in the Alberta Timber Harvest Planning & Operating Ground Rules (ATHP&OGR), there may be instances where cutblock size will exceed these thresholds.

Target: The Companies will identify patch size by age class and cover type at both the Natural Sub-Region and FMA level(s) and incorporate patch size targets into the next Detailed Forest Management Plan (DFMP).

[11] *Government of Alberta. (2002). The Alberta Forest Legacy – Implementation Framework for Sustainable Forest Management. Alberta Environmental Protection. (See website at: http://www3.gov.ab.ca/srd/forests/fmd/legacy/legacy.html).*

Strategy 2:

Conduct harvest and reforestation activities to maintain vertical and horizontal spatial diversity within harvest areas.

Maintaining spatial diversity within harvest areas and across the landscape is meant to mimic the residual structure that occurs naturally following disturbances such as fire, wind, and insect and/or disease. Since maintaining various types, amounts, and distribution of residual structure is important in maintaining ecosystem function and biological diversity (Beese et al., 2003), the Companies will incorporate a variety of operational strategies to ensure that vertical and horizontal diversity is maintained within harvest areas.

In addition to the structure retained at the landscape-level through the determination of the net productive landbase (Table 6-1), the Companies will exceed the current retention targets as outlined in the ATHP&OGR by establishing merchantable and non-merchantable retention targets in both "patches" and "single-stems" at the cutblock-level. Merchantable volume retained during operations will average 1% across the landscape and will be focused on cutblocks exceeding the size and/or distance to hiding cover requirements as outlined in the ATHP&OGR. Variability in the amount and species retained at both the compartment and cutblock level (0-3%) will exist to allow flexibility during plan development to incorporate other values and objectives such as forest health. In areas infested by spruce budworm for example, retention will be focussed on deciduous species or coniferous species that are least preferred by the insect (i.e. jack pine, black spruce, etc.).

In addition to merchantable retention, the Companies will retain other residual material during operations. Residual material, which can include lesser vegetation associated with lower-order streams, standing dead, broken, or decaying trees, trees identified as having dens or nests, or other unique flora and/or terrain features, will average 5% of the area harvested and be distributed evenly where within harvest areas where it exists. Viable understory will also be retained where it exists on the landscape through a number of protection strategies.

To increase the value of residual material to wildlife, merchantable stem retention will be emphasized in areas where multiple canopy layers and a range of tree sizes and species exists. Combining retention of residual material and merchantable stems during operations as well as ensuring that structure is retained near the cutblock edge will enhance the value to wildlife by creating a gradual ecotone between the cutblock and the adjacent forest.

Operationally, merchantable and non-merchantable patches larger than 0.25 hectares will be identified and tracked digitally through GPS technology and/or aerial photography with volume estimations based on composition and block yield. Volume estimations for single-tree retention will incorporate average tree-size and information gathered through field assessments.

In addition to considering ecological values in evaluating the type, amount, and composition of residual material to be implemented at the cutblock-level, the Companies will also incorporate safety, silviculture, and economics into the process.

<u>Target(s):</u>

- Vertical diversity in the form of merchantable structure retention will be maintained at the landscape-level (1% of coniferous and deciduous volume). Other residual material will be retained within harvest areas to maintain horizontal diversity and will average 5% of the area harvested across the landscape.

- Over the planning period, the Companies will develop strategies to quantify the amount of merchantable volume retained as single-trees.
- The deciduous and coniferous volume retained across the landscape will be charged against the respective AAC's and will be reported annually in the General Development Plan (GDP).
- Over the planning period, the Companies will evaluate spatial and horizontal diversity and implement a more scientific and ecologically based target for the next DFMP while balancing the economical, ecological, and social objectives.
- The Companies will also work with ASRD in establishing targets for brush pile retention within cutblocks, recognizing fibre utilization and forest protection objectives.

Literature Cited

Beese, W.J., Dunsworth, B.G., Zielke, K., and Bancroft, B. 2003. Maintaining attributes of old-growth forest in coastal B.C. through variable retention. Forestry Chronicle. Volume 79. No. 3, May-June

4.1.4 PRODUCTIVE CAPACITY

Objective:

Maintain the productive capacity of the forest for the production of timber.

There are a number of pressures on the landbase that affect the amount of area available for timber production. Maintaining the productive capacity of the forest will not only ensure that the social, ecological, and economic values that the forest provides are sustained over time, maintaining productive capacity will also minimize the effects of industrial activity and reduce the potential for a reduction in landbase.

Strategy 1:

Reforest productive lands, previously removed from the net landbase, to return to the net landbase.

Deductions for unsalvageable burns and oil and gas dispositions have occurred within the net landbase. These areas do not currently contribute to calculation of the annual allowable cut (AAC), although they may or may not be available to be reforested for inclusion in the net landbase. To maintain or increase the net productive area, previously removed areas will be surveyed to determine their status as forested. If these areas are satisfactorily forested, they will be scheduled for inclusion in the net landbase. If they are not forested, they may be scheduled for reforestation activities in co-ordination with the Companies' tree planting program.

Through the Companies' involvement in the Alberta Forest Products Association (AFPA) land use subcommittee, the Companies will promote changes to existing policy that will encourage oil and gas companies to reforest rather than re-vegetate reclaimed dispositions.

Through working with the Oil & Gas industry, the Companies will move toward achieving a zero net loss of productive forested land.

Target(s):

- The Companies will be active in reforesting in-block seismic lines as part of the reforestation program, unless they are to remain open to maintain traditional access routes or to incorporate into future access development.

- Depending on the availability of oil & gas dispositions, the Companies will strive to reforest an average of 5 dispositions per year over the planning period. Areas added to the net productive landbase will be outlined in the Stewardship Report.

Strategy 2:

Conduct harvest activities in such a way as to minimize the loss of the productive capacity of the forest.

Through the Companies' harvest activities, there is potential for soil degradation that could cause a loss of productive capacity of the forest. The Companies will follow the soil conservation guidelines prepared by the Alberta Government and AFPA to reduce the risk of soil degradation from in-block roads. To ensure the guidelines are being followed, post harvest and reforestation inspections of blocks will be completed and summarized over the FMA.

An advantage of the dissolved landbase is the opportunity for the Companies to combine harvest operations. This will prevent the likelihood of multiple entries over a short period of time, or the need to open more operating areas than necessary to satisfy the annual mill requirements. This minimizes the loss of productive capacity of the forest by reducing the amount of road required during any particular period, and reduces the number of operating areas harvested.

Target: To minimize the loss of productive capacity within harvest areas, the Companies are committed to ensuring that soil disturbance in cutblocks is <5% of the cutblock area as outlined in the Soil Conservation Guidelines. Success will be measured based on the total amount of in-block road area over a five-year period.

Strategy 3:

Where possible, conduct activities with other stakeholders to minimize the cumulative impacts and loss of the productive capacity of the forest.

During the approval of dispositions, the Land Use Co-ordinator reviews survey plans for a variety of activities. In many cases, there are opportunities to modify the plan to reduce the impact on the landbase. Rather than constructing temporary or permanent campsite(s), access routes, or a wellsite on productive land, proposed development may be moved to an existing access route/linear corridor or in the case of a camp or wellsite, moved to non-productive land. Such actions reduce the need for other companies to salvage the timber and prevent the loss of productive capacity of the landbase.

Target: The Companies will record the number of proposed access routes amended to use utilize existing routes or linear corridor, as well as the number of proposed campsites and/or wellsites moved off productive land.

4.1.5 GROWTH AND YIELD

Objective:

Enhance the existing growth and yield information for timber production.

The Companies are committed to continue contributing to an ongoing growth-and-yield program as a way to model the growth of the forest to assist in the determination of the Annual Allowable Cut (AAC). This will be completed through a number of sample plots distributed throughout the FMA.

Strategy 1:

Model yield from management activities on managed stands on the FMA.

Over the period of the DFMP, a number of permanent sample plots will be established to contribute to the growth-and-yield data, as they measure the growth of stands over time. They are established and re-measured at pre-determined intervals to accurately describe the growth resulting from the combinations of treatments and sites, thereby helping to determine the best combination for enhancing yield.

Target: The Companies are committed to establishing a minimum of 50 Sample Plots prior to the submission of the next DFMP. The Companies are also committed to following an approved Growth & Yield Program.

4.1.6 TIMBER YIELD

Objective:

Manage to improve timber yield.

Although the Companies are not currently using enhanced or managed stand yield curves, they know their current actions affect the amount of timber available in the future. The Companies must emphasize managing with the objective of increasing the amount of timber available for the future to accommodate an expected increase in the demand for wood products resulting from a growing world population. In addition, there may be reductions in the area available for harvesting timber owing to the need to accommodate other resource users, and from changes of societal values. Without increasing the yield on the available landbase, this could result in reduced productivity of the existing mills.

Strategy 1:

Conduct harvest and reforestation activities to reduce time to meet adjacency requirements.

According to the current provincial ground rules, the second pass of a two-pass operation cannot be harvested until the first pass regeneration has reached 3 m in height on conifer and 3 m in height and 10 years have passed for deciduous. This is a constraint on the AAC. Opportunities exist for the Companies to examine ways to reduce the time required to meet current adjacency requirements. This may involve planting superior stock or larger stock for quicker seedling establishment, improved retention of understory to reduce the need for reforestation, and/or partial cutting techniques. Establishment surveys measure cutblock regeneration to compare height and age relationships. Successful strategy implementation will lead to a reduction in the time required to meet adjacency requirements.

Strategy 2:

Conduct harvest and reforestation activities to increase the growing stock density of the site.

As mentioned in the silvics of species, the requirements differ between poplar and spruce in terms of light level, root response to disturbance, and timing of natural regeneration. As such, the Companies must use different approaches for meeting regeneration requirements and strategy success. In general terms, the Companies will regenerate lower density (AB) stands to a higher density (CD) level, and maintain higher density stands at that level, following harvest.

Target: Establishment and Performance surveys, as well as the Companies Growth & Yield

Program, will measure performance.

Strategy 3:

Schedule multiple entry harvest activities to improve timber yields from mixedwood stands.

There are a number of existing trials that measure the increase in yield realized by multiple entry into mixedwood stands. Reasons for this increase can be attributed to the difference in the peak mean annual increment between poplar and spruce, and the positive response to thinning shown by spruce through to the late stages of maturity. With a multiple entry harvest system, the aspen/poplar is harvested prior to its natural death or "falling out of the stand". Owing to the removal of light competition, the remaining spruce trees can exhibit a positive growth response if they have not been damaged during harvest. This silviculture method creates a higher overall volume per hectare for both species as compared to the current practice of not harvesting the poplar in the stand until the spruce has reached maturity.

Target: The Companies are committed to developing an Enhanced Forest Management (EFM) Plan prior to the next DFMP.

4.1.7 RIPARIAN AREA MANAGEMENT

Objective:

Manage riparian areas for water quality.

The Companies realize the importance of water quality for all life forms. If caution is not exercised, some forestry practices could have negative impacts on the environment. Extensive tree cutting in an area may not only remove habitat, but also increase natural water runoff and accelerate soil erosion. This can lead to increased flow and sediment loads in nearby streams. It can also result in naturally occurring chemical substances being released from the forest soils and migrating into rivers or lakes. Both the chemicals and the additional sediment can harm fish and other organisms[12].

Alberta is known to have large fluctuations in water quantity, which is associated with annual spring melt and run-off and the relatively hot and dry summers. Non-point source pollution also contributes to water quality degradation. Currently, there is no formal process or protocol in place in Canada for monitoring water quality, flow rates, and aquatic biota in relation to forest practices (Canadian Council of Forest Ministers, 1997). "Care must be exercised in separating the impacts of forest practices from those of other industrial, recreational, agricultural and urban activities".

There are a number of hydrological stations in northwestern Alberta that the Companies can access information for water monitoring.

Strategy 1:

Schedule harvest activities to harvest less than 50% of a gross watershed area prior to meeting adjacency requirements.

The immediate effects of harvesting in a watershed lead to an increase in nutrient loading, organic chemicals and water quantity in stream water. This is a result of removing the organisms that previously absorbed the water nutrients and organic chemicals in their growth processes. The levels

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[12] *Environment Canada. See website at: http://www.ec.gc.ca/water/en/nature/sedim/e_forest.htm.*

of nutrients return to pre-disturbance levels after three to five years as new growth restores the demand. Stream flows take a longer period of time to return to pre-disturbance levels.

Target: The Preferred Forest Management Strategy will identify critical watersheds and outline a spatial harvest sequence that will harvest less than 50% of the gross watershed area to minimize the effects of harvesting on a watershed.

Strategy 2:

Conduct operations for waterbodies as they are on the landbase.

During the landbase determination netdown, buffer widths consistent with the Alberta Ground Rules were applied to lakes, rivers and streams. The assignment of classification was based on the best and most reasonable information available at the time. One of the principles guiding development of the DFMP has been to manage for what is on the landscape.

Target: The location, classification, and associated buffer of a particular watercourse within a compartment or harvest area will be identified and outlined in the Annual Operating Plan.

Strategy 3:

Conduct harvest and reforestation activities as per the AOPs, to maintain the integrity of riparian areas.

The DFMP is a higher order plan that must have a strong link to operations to ensure that policies are implemented on the ground. Annual Operating Plans (AOPs) determine the most appropriate treatment and harvest design for operational application at the stand level. In terms of water quality, this strategy is a check to ensure that plans to achieve the objective are applied.

Through the Companies' Environmental Management System (EMS), post-harvest and reforestation inspections of riparian areas will determine whether expectations stated in the AOP are followed.

Target(s):

- The Companies standard is that all harvesting and/or silvicultural operations over a 5-year period adhere to the expectations outlined in an approved AOP.
- To minimize impact to water quality due to watercourse crossings, the Companies have implemented Standard Operating Procedures (SOP's) for crossing installation(s) and removal(s).

Strategy 4:

Conduct harvesting activities to minimize impacts to watersheds in the FMA.

As part of the development of the DFMP, the Companies completed a preliminary watershed analysis to assess the potential impacts of implementing the Preferred Forest Management Strategy (PFMS) on stream flow yield within the FMA.

Through information collected from hydrological stations throughout northwestern Alberta, the Companies were able to assess water yield over time (See Section 8.6).

Target: The Companies will strive to limit increases in water yield within a watershed to 34% of current levels with an acceptable tolerance of +/- 12%.

Strategy 5:

Participate in research activities to better understand riparian ecology.

The Companies will continue to have active membership and/or sponsorship in riparian research for projects relating to the forests on the FMA. Over time, the results of this research will be incorporated in the DFMP, and the Companies' practices adapted to reflect the most current research.

Target: The companies will continue to have active membership and/or sponsorship in research projects relating to riparian ecology.

4.1.8 WASTE MANAGEMENT

Objective:

Manage waste during woodlands operations.

Proper management of waste is a priority of the Companies and their contractors. Training in spill response for contractors and staff has taken place and will continue in the future. Methods to minimize the risk of a spill reaching riparian areas and the proper materials for use are demonstrated during training.

Strategy 1:

Conduct operations as per company storage, handling and waste disposal standards.

Through the implementation of an Environmental Management System, the Companies have developed standards for the proper storage and handling of fuels and oils and the proper disposal of wastes. The Companies and contractors maintain up-to-date copies of the company standards manual and the Alberta Waste Minimization Guide at their camps.

In addition to meeting company standards, TOLKO Industries–High Level, Footner Forest Products Ltd. and their contractors must demonstrate they have managed their waste properly. A balance sheet that tracks by invoice the amount of material brought into the operation is compared to the receipts from approved waste disposal sites for these items.

Target: The Companies and their contractors will be periodically monitored over the life of the DFMP. Since waste management is an important aspect to the Companies EMS, the Companies require all staff and contractors to be compliant with the expectations set by the Companies.

4.1.9 FIRE, INSECT, DISEASE AND NOXIOUS WEEDS

Objective:

Minimize the loss of fibre due to fire, insects, disease and noxious weeds on the FMA.

While fire has been the dominant force behind the current size, age and distribution of stands across the landbase, insects and disease have also contributed to its current structure. While natural processes will continue to determine the future landscape, societal and economic considerations must also take an active role in shaping the future forest condition. Fireproofing objectives around communities and managing to minimize the effects of damaging insect outbreaks need to take precedence over natural processes.

Strategy 1:

Plan and adapt activities to minimize fibre loss to insects and disease on the FMA.

The Companies will plan activities to reduce the effect or likelihood of fibre loss due to insect and disease on the FMA.

Compartment selection for the first 5-year period incorporates areas of high-risk or those showing increased damage as a result of spruce budworm infestation. Further analysis (8.4) indicates that the harvest sequence outlined in the Preferred Forest Management Strategy (PFMS) continues to address spruce budworm beyond the first 5-year period through increased harvesting activity in these areas.

Target(s):

- Annual Operating Plans (AOP's) will outline specific strategies that will be implemented to minimize the loss of fibre due to insects and disease. Annual Operating Plans will also adapt to include potential salvage opportunities.
- The Companies are committed to working with SRD to develop a Spruce Budworm Management Plan that outlines shared responsibilities, implementation strategies, and monitoring programs. The plan will be completed and submitted by December 31st 2004.

Strategy 2:

Plan and adapt activities to minimize fibre loss to fire on the FMA.

Although the companies will plan activities to reduce the effect or likelihood of fibre loss due to fire, there will be situations where the Companies can only react.

The Companies, with assistance from Alberta Sustainable Resource Development (ASRD), also incorporated fire protection areas during compartment selection. Although the Companies strategy regarding fire will primarily be reactive, the Companies will work with ASRD to develop FireSmart landscapes around selected communities in the region.

Target(s):

- Annual Operating Plans (AOP's) will outline specific strategies that will be implemented to minimize the loss of fibre due to fire on the FMA. Plans will also adapt to include salvage opportunities.
- Annual Operating Plans (AOP's) for Bistcho-2 and Chinchaga-1 will incorporate FireSmart landscapes and will be developed by September 11th 2007.

Strategy 3:

Plan and adapt activities to minimize fibre loss to noxious weeds on the FMA.

The Companies will develop a Weed Control Plan over the planning period for submission to Alberta Sustainable Resource Development (ASRD).

Target: The Companies will develop a Weed Control Plan by September 11th 2007.

Strategy 4:

Participate in activities to better identify and understand the fibre impacts of fire, insects, disease and noxious weeds on the FMA.

The Companies will work with the Government and the scientific community on gathering information to determine the impact of fires, insects, disease, and noxious weeds on the FMA. Our joint Growth & Yield program, which will include both permanent and temporary sample plots, will be used to assess the impact of these agents on growth and yield over time. From this information, the Companies will be able to develop an adaptive management approach to deal with damage to stands across the FMA.

Target: The Companies will continue to have active membership in associations and/or sponsorship in research projects relating to the effects of fire, insect, disease, and noxious weeds on the FMA.

Strategy 5:

Conduct operations as outlined in the Fire Control Plan.

The Companies will provide a fire control plan to Alberta Sustainable Resource Development on an annual basis. The contents of this plan are outlined in the *Forest and Prairie Protection Act* and discussed in Section 5.9 of the DFMP.

Target: The Companies and their contractors will be periodically monitored over the life of the DFMP. Staff and contractors are expected to be compliant will all regulations and standards.

4.2 COMMUNITY INTERESTS

Goal:

To support local and Aboriginal community interests.

As an important part of the community, the Companies contribute to the functions and success of the region. A symbiotic relationship exists between the Companies and the communities. The region needs the Companies to provide a source of revenue and employment for its citizens, and the Companies need a good community for their employees to live in that provides them with services, schools, recreation and other activities which contribute to their overall well being.

4.2.1 HERITAGE SITES

Objective:

Protect regional heritage sites.

The Alberta Historical Heritage Act provides for the protection of heritage sites in Alberta. Alberta Community Development has recently requested that all forest companies begin a process of meeting this requirement of this Act.

To meet the requirements of Alberta Community Development, the Companies, through Alberta Western Heritage, are currently in the process of developing a Heritage Potential Model that will be incorporated in the development of future Annual Operating Plans on the FMA. The model, which will be operational prior to the 2002-2003 harvest season, incorporates known areas of historical importance and evaluates the heritage potential of a defined area based on topographical features, watercourses, and existing access and covertypes.

Strategy 1:

Plan activities to identify and protect heritage sites on the FMA.

The region has a rich history and heritage. Included in this history is the community of Fort Vermilion, which is said to be the oldest in Alberta. In addition, the fur trade established many posts and forts along the Peace River. Several other rivers in the area are also important to the First Nations people of the area. The Companies are sensitive to the importance of these and other sites for their historical and cultural value.

To protect and preserve these sites, plans will be developed to identify and outline protective measures for known heritage sites. Where possible, all plans will identify heritage sites; however, due to the sensitive nature of these sites, their exact locations will not be publicly displayed.

Target(s):

- The Companies are committed to providing Alberta Community Development (ACD) with details regarding their assessments of heritage potential.
- Through the Public Involvement Plan (Appendix B), the Companies will involve the public in identifying the location(s) of historical sites to incorporate into operational plan development.
- The Companies will develop Standard Operating Procedures (SOP's) over the planning period to be used by staff and contractors to deal with unique finds. All identified sites having historical significance will be recorded.

Strategy 2:

Explore initiatives to better identify and protect heritage sites on the FMA.

The Companies are aware there is a lack of data associated with heritage sites on the FMA. Although the Companies intend on participating in programs to identify heritage sites on the FMA, the Companies will be utilizing the Heritage Potential Model to identify potential sites and apply the appropriate prescription as required.

Target: The Companies will develop adaptive management strategies based on research conclusions.

4.2.2 PUBLIC INTERESTS

Objective:

Support public interests of local and Aboriginal stakeholders.

The Companies are supportive and accommodating to pubic interests in the region by providing funding or in-kind contributions to a variety of community functions and projects. Staff members volunteer a large amount of time to community projects. Some examples of community involvement by Woodlands staff include volleyball coaching, Scouts Canada Beavers leader, Dene Tha' traditional dancers, Machesis Lake Spring Clean–up, and as members of the High Level Volunteer Fire Department. The Companies are represented on and provide financing for the High Level Forests Public Advisory Committee, Mackenzie Economic Development Corporation and Fort Vermilion School Board.

Strategy 1:

Contribute to activities identified as public interests.

The Companies will track activities for which financial contributions are annually. One example of this is the donation of money collected from overweight fines from the log haul. The truck drivers vote on how to distribute the money to various local charities. This not only provides funding for local charities, but also gives the Companies an insight into the social priorities of the community.

Target: The Companies will report on the number of activities promoted annually.

4.2.3 BUSINESS RELATIONSHIPS

Objective:

Support local and Aboriginal businesses where economically feasible.

Just as the Companies hope their products would be requested and used in local projects and by local businesses, the Companies also acknowledge the need to establish positive business relationships with local and Aboriginal businesses to contribute to the success of these establishments. All businesses, however, must remain cost-competitive in order to survive in today's economy.

Strategy 1:

Inform stakeholders of economic and employment opportunities related to the Companies.

Part of creating positive business relationships is making local and Aboriginal businesses aware of the opportunities. Where possible, these businesses will have the opportunity to bid on work related to the Companies' business. The demand for employment tends to fluctuate at the two operations. Both companies have policies related to hiring people from the local communities, since this is advantageous for both the employee and employer, particularly with High Level having a somewhat transient workforce.

Target: The Companies will develop a tracking system which will record business and employment opportunities and be reported on an annual basis.

Strategy 2:

Promote requirements needed to obtain employment in the forest sector.

There is a lot of pride in both companies regarding the quality and professionalism of their companies and industry. As such, the Companies actively promote their industry as being a satisfying career or employment path. Local services, such as the Rising Star Employment Centre, provide opportunities for the Companies to publicise their requirements for employment, both within the Companies and throughout the industry in general.

Target: The Companies will track the number of promotional activities used to increase awareness of career opportunities in the field of forestry. Success will be measured based on the number of activities.

4.3 CONSULTATION

Goal:

Continue an open consultative environment for the resolution of significant issues.

The Companies will use all available methods of consultation. Employees meet on an ongoing basis with members of the public, government and each other. All communications and consultations will continue to be professional, open and honest. Both companies place high value on integrity in the public.

4.3.1 STAKEHOLDER INVOLVEMENT

Objective:

Encourage Stakeholder involvement during the development of forest management plans.

Albertans are increasingly participating in forest management planning and operations. This participation is a result of the public placing social values on the forest. As these values are prioritized, forest management practices evolve and are modified through adaptive management.

Stakeholders and interest groups traditionally not involved in forest management planning are now participating more frequently in forestry related issues. Through forest management planning and communication, the Companies will educate and make stakeholders more aware of their operations.

The Companies will work with the public and the Government of Alberta towards sustainable development of the FMA. The Companies believe that by working together with stakeholders and interest groups that our forest management will accommodate a wide range of public interests.

Strategy 1:

Incorporate and continue a public involvement plan.

The Companies developed and implemented a Public Involvement Plan during the development of this DFMP (Appendix B) to encourage public input into the future management of the forest. Following the submission and approval of this DFMP, this public involvement plan will continue as the Companies seek additional input regarding Woodlands operations and the development of future forest management plans.

Target: The Companies will track stakeholder involvement in the development of forest management plans and summarize in an annual report. Success will be measured based on the number of opportunities stakeholders have for involvement.

4.3.2 INFRASTRUCTURE AND TRANSPORTATION

Objective:

Develop infrastructure and programs that promote public safety and maintain efficient transportation.

Currently, the Companies have several programs that address public safety relating to the transportation of logs. These include the school bus warning program, contractor dropped log schedule and Public Input Hotline.

As the operations grow, there will be continuous improvement programs in place to improve the safety of the public, which may include the development of additional infrastructure within the FMA to reduce the number of trucks travelling on public highways in the region. Stakeholders will be involved in this initiative.

Strategy 1:

Minimize access and infrastructure development through the utilization of existing routes while maintaining public safety and cost-efficient transportation.

The Companies will predominately utilize permanent (primary and secondary highways, M.D. roads, etc.) and existing (License of Occupations, historical haul routes, etc.) access routes during operations. However, where the use of permanent or existing access is infeasible, not available, or conflicts log haul safety, additional access routes may be required and developed. Although this planned access will be composed primarily of seismic lines or clearings, new access may be developed where seismic activity is limited.

Operationally, access will be developed to mitigate impacts on other resource values, including wildlife. Development into critical wildlife zones will be planned to avoid key habitat types and will be coordinated with other industrial users wherever possible to minimize the amount of access required to complete operations.

In addition, the Companies will develop access management strategies on roads in conjunction with other stakeholders and government representatives.

Specifics regarding access development, management, and abandonment will be outlined in the General Development Plan and Annual Operating Plan.

Target(s):

- The Companies will make every reasonable effort to utilize the permanent, existing, or planned access routes identified in Map 4-1 and promote their use by other industrial stakeholders.
- Through integrating operations between Companies and encouraging integration with other industrial users, the amount of new access and infrastructure development will be kept at a minimum. In addition to the access corridor development identified in Map 4-1, the Companies will strive to develop less than 50 kilometres/year of all-weather access over the planning horizon.
  New access development or deviations from this threshold will be tracked annually and submitted as part of the Stewardship Report.

Strategy 2:

Involve stakeholders in the development of infrastructure.

As part of the Companies public involvement plan, a number of methods will be used to involve stakeholders during infrastructure development. This stakeholder involvement will be tracked and the number of opportunities stakeholders have to contribute during development of infrastructure projects will determine success.

To date, stakeholder involvement has been received and a social aspect regarding safety on public highways has been identified. This concern has been especially evident on Highway 58 (West) which has resulted in the Companies proposal for a road corridor that parallels the highway through the Watt, Bassett, and Rainbow Operating Areas (See Map 4-1). Developing this access corridor will keep log traffic on this highway to a minimum.

Target: As part of the Companies Public Involvement Plan (Appendix B), the Companies will track stakeholder involvement in the development of infrastructure and summarize in an annual report. Success will be measured based on the number of opportunities stakeholders have for involvement.

Strategy 3:

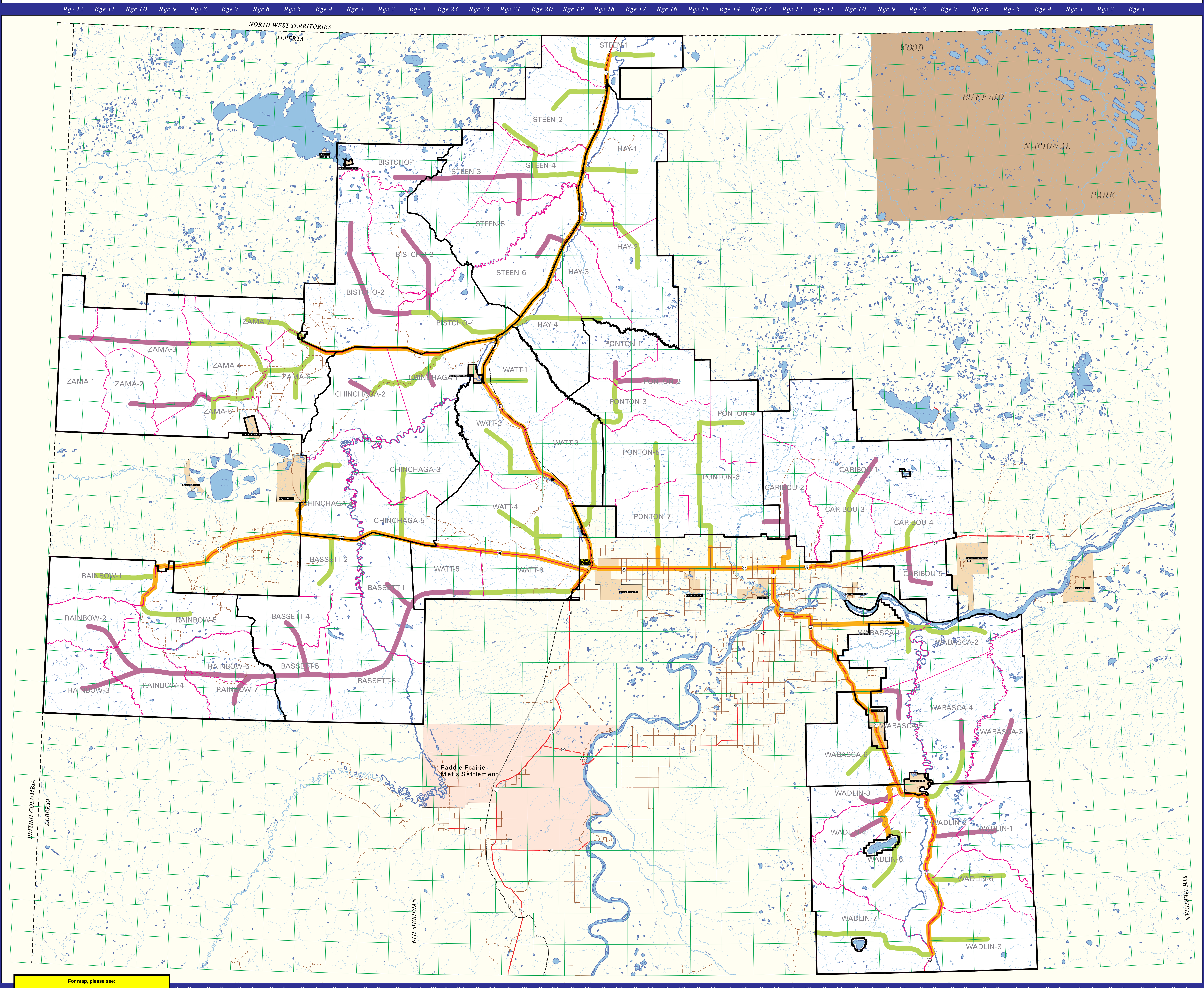
Continue Log Haul Safety Program.

Forest companies in the region all contribute to the volume of logging trucks on public roads. TOLKO Industries–High Level, Footner Forest Products and LaCrete Sawmills Ltd. have developed a joint trucking program to assist in keeping the roads as safe as possible. These three companies are very active in improving the safety of the roads by carrying out truck safety inspections, placing school bus stop warning signs along haul routes, providing and posting the log haul frequency for other users, and building safe roadside turnouts along the highways.

Target: The Companies will track adherence to the standards as outlined in the Log Haul Safety Program. The Companies expect conformance to those standards as well as continuous improvement in meeting those standards.

TOLKO INDUSTRIES LTD.
HIGH LEVEL LUMBER DIVISION

COMPARTMENT ACCESS PLAN

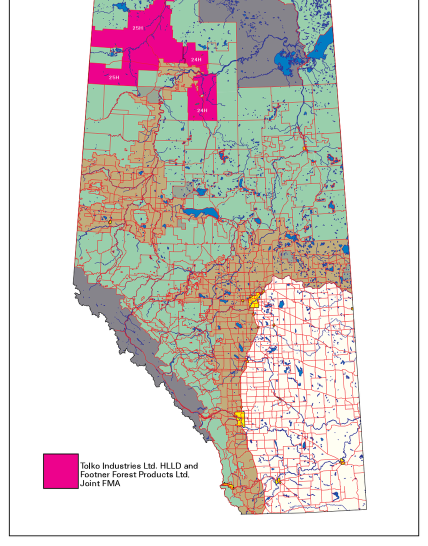


For map, please see:

APPENDIX ***

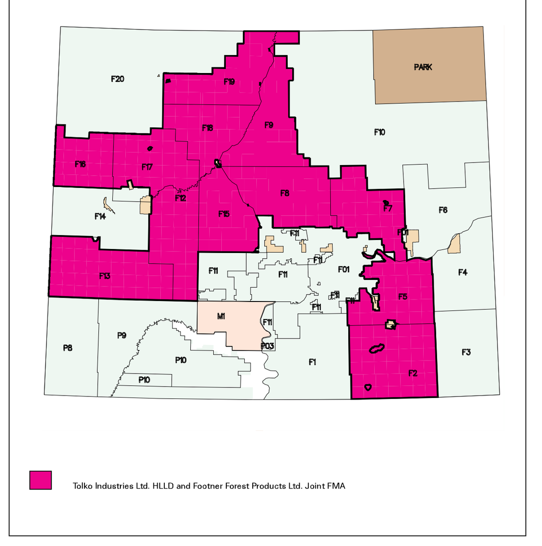
MAP ***

PROVINCIAL INDEX



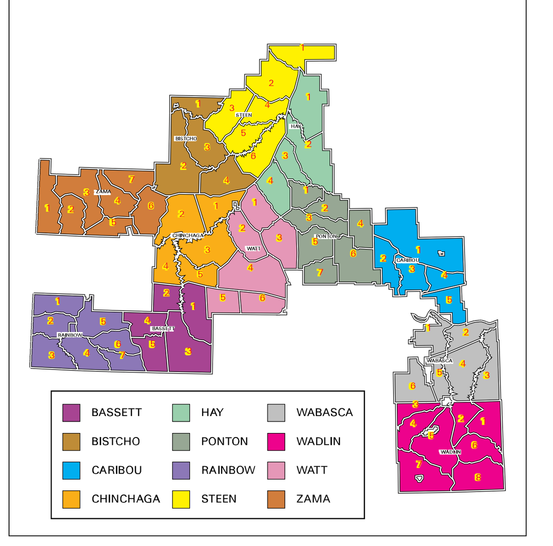
Tolko Industries Ltd. HLLD and Footner Forest Products Ltd. Joint FMA

OLD FOREST MANAGEMENT UNITS



Tolko Industries Ltd. HLLD and Footner Forest Products Ltd. Joint FMA

OPERATING AREA INDEX



PLANIMETRIC LEGEND

- Divided Primary Highway
- Paved Primary Highway
- Gravel Primary Road
- Paved Secondary Road
- Gravel Secondary Road
- Improved Road
- Unimproved Road
- Railway
- Truck Trail
- Indian Reserve
- Metis Settlement
- Water Features

FEATURES OF INTEREST

- Permanent Access
- Existing Access
- Planned Access

0 10 20 30

KILOMETRES

Map version 2.00
Map date: April 25, 2003
Original map scale: 1:300000
Map production: Silvacom Ltd.
Silvacom Ref: H-065
Map File: .h-065/haul_rds/maps
haulrds_map.amlhaulrds_map2.aml

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4.3.3 STAKEHOLDER EDUCATION

Objective:

Encourage education of stakeholders on the subject of forestry.

The Companies know the concepts of sustainable forest management and a dissolved landbase are fairly new, and therefore require a mutual exchange of information between forestry professionals and stakeholders. It is acknowledged that obtaining input from a variety of sources, including stakeholders, is useful in improving management of the forested landbase. Providing stakeholders with a better understanding of what the Companies do regarding forest management is necessary to reduce the number of stakeholder concerns.

Strategy 1:

Contribute to forest education.

The Companies plan to continue to use a variety of methods to increase public knowledge of forestry. Recently, the Northern Lights Forest Education Society was established, and both companies are represented. All requests from schools within the region for a speaker to discuss forestry issues with students are honoured. TOLKO Industries and Footner Forest Products parent companies maintain Internet websites that provide forestry information and provide links to useful sites. Both companies attend regional trade fairs and host open houses at which they distribute general forestry or company-specific information.

Target: The Companies will track the contributions, activities and initiatives undertaken to contribute to forest education. The number of educational opportunities made available to stakeholders will determine success.

4.4 STAKEHOLDER INVESTMENTS

Goal:

Manage the timber resource on the FMA to allow for the continued operations of timber processing facilities.

The Companies have invested large amounts of money in building, maintaining and improving their operations. Their contractors have also invested large amounts of money and rely on the continued operations of the mills to maintain their businesses. Since the Companies are managing a public resource, it is essential that the Companies manage the timber resource properly to provide the public with confidence in their management skills and abilities, and allow company operations to continue.

4.4.1 COST CONTROL

Objective:

Supply sustainable volumes of fibre to the coniferous and deciduous tenure holders as well as those other parties having contractual agreements for fibre through Wood Supply or Volume Supply Agreements.

While the Companies will continually assess how to become more competitive in the global economy, the initiatives undertaken will not be at the expense of future competitiveness. The

Companies will strive to maintain an average haul distance over the planning period even though the number and location of active compartments fluctuates over time.

Strategy 1:

Schedule harvest activities to sustain volumes of fibre to meet contractual obligations.

The Preferred Forest Management Strategy provides a spatial representation of where the stands are located to provide the volume of fibre required for harvesting the AAC. The Companies will schedule harvest activities to ensure the necessary volumes of fibre are sustained to meet contractual obligations.

<u>Target:</u> The Preferred Forest Management Strategy will include a harvest sequence which will best meet the Companies contractual obligations while balancing costs. Success will be measured based on adherence to the harvest sequence within an acceptable variance of +/- 20% of the area identified in the approved sequence.

4.5 COMMERCIAL USER CO-OPERATION

Goal:

Co-operate with other commercial users of the FMA.

The Companies contribute significantly to the economy, employment and business opportunities of the region, and as the operations grow the contributions will increase. There are a number of other commercial ventures on the FMA that contribute to the economic diversity of the area. The Companies do not want to be viewed as a constraint to other commercial ventures that already exist or will be established on the FMA. Co-operation on use of the FMA contributes to the success of all users.

4.5.1 COMMERCIAL CO-EXISTENCE

Objective:

Plan and operate in co-existence with other commercial stakeholders.

Commercial and traditional fur trapping occurs throughout the FMA, with many individuals making their livelihood through the fur trade.

Sport hunting and fishing is an important recreational activity for many individuals, and contributes significantly to the region’s economy. Overall, the shift to guided fishing and hunting has become an industry that has changed from supplemental earnings to a full-time business.

The oil and gas industry is of great importance to northern Alberta. Oil and gas production is widely dispersed throughout the FMA. Market price and current technology determine the level of resource extraction.

The forest resource provides economic opportunities for various forest industries in the region. The Companies are aware that the regional forest industries must work together in order to be economically viable and to achieve a sustainable forest.

The Companies are committed to working with all groups outlined above as plans are developed and carried out.

Strategy 1:

Schedule and conduct harvest activities to co-exist with other commercial stakeholders.

The Companies have procedures in place within the annual operating plans that address other commercial stakeholders' concerns.

Target: The Companies will track issues and concerns and will measure success based on the number of such concerns that are addressed in operating plans. Since the Companies work closely with the other commercial stakeholders, the number of concerns is expected to decrease over time.

4.5.2 COMPANY INTEGRATION

Objective:

Develop integration between forest companies.

The dissolved landbase allows the Companies along with other forestry-based operations in the area to integrate operations, providing better, more consistent and cost-competitive forest management. There are a number of initiatives already under way to take advantage of the synergies of the two companies.

Strategy 1:

Schedule integrated operations on the dissolved landbase.

During development of the DFMP, the landbase was divided into planning compartments. The Companies intend to develop these compartments as integrated harvest areas. Annual operating plans will address integration by determining the volume by species, rather than separating the areas into conifer or deciduous.

Target: Success will be measured based on the number of Annual Operating Plans requiring ASRD approval on an annual basis. Through integration, the amount of plans required for harvest by the Companies will be reduced over time.

SECTION 5:
FOREST MANAGEMENT PROGRAMS & RESEARCH

Ref: H-065

5.0 FOREST MANAGEMENT PROGRAMS AND RESEARCH

5.1 GENERAL DEVELOPMENT PLAN

The harvest levels for F25 and F24, as well as additional timber quotas, are managed on five-year periods (also referred to as cut control periods) to ensure compliance with the approved AAC's that are identified in the DFMP.

To ensure the annual harvest levels are compliant with the AAC and cut control period, all FMA holders in the province must submit an annual General Development Plan (GDP). The GDP is based on a rolling five-year time period outlining future harvest locations, expected wood supply forecast, road requirements, as well as general silviculture and reforestation activities.

In addition to future harvest and silviculture operations, the GDP includes fire management or fire hazard reduction programs, and strategies to address possible insect and disease epidemics that may occur within the planning area.

Fish and wildlife issues, as well as issues surrounding significant non-timber values, are also identified in the document. Company policies and initiatives including inventory, research, and monitoring programs are also included within the plan.

Similar to the DFMP, the GDP also incorporates a Public Involvement Plan (PIP). Company representatives display the plan in the surrounding communities to get input obtain input on all aspects of company operations–past, present, and future.

5.2 ANNUAL OPERATING PLAN

To follow the harvest plan identified in the GDP, Annual Operating Plans are developed for each individual area scheduled for harvest. Unlike the DFMP and GDP, which include forest and landscape-level goals and objectives, the AOP addresses specific stand-level objectives for the harvest area for that year. Although the scope at the AOP level focuses on stand-level goals and objectives, these goals and objectives must remain consistent with the landscape-level goals and objectives identified in both the DFMP and GDP.

The AOP includes an integrated harvest design, which identifies all merchantable coniferous and deciduous stands. Cutblock design, road and creek crossing locations, as well as a detailed reforestation plan specific to the harvest area, are key components of the AOP. In addition, monitoring, access management, and reclamation strategies are also included.

All watersheds and other sensitive areas within the harvest area must be identified in the harvest plan. Strategies are implemented to ensure that timber operations do not jeopardize the integrity of the area while ensuring compliance with the Alberta Timber Harvest Planning and Operating Ground Rules.

During development of the Annual Operating Plans, all trappers, guides and/or outfitters, as well as other area specific industrial and non-industrial stakeholders are contacted to identify potential issues or concerns. Since the DFMP incorporates a harvest sequence that must be adhered to by the Companies, more time is available for stakeholders to identify potential issues or concerns prior to the commencement of future operations.

5.3 G.I.S. LIBRARY

The ArcInfo base data library and the ArcInfo workspace were built from provincial government raw base data originally collected in the early 1980s. Some coverage layers have been enhanced over time to create a greater geographical and spatial representation of the areas within and surrounding the FMA. The coverage includes the Alberta Township Survey, as well as hydrology, contours, utilities and transportation.

In 1994, an Alberta Vegetation Inventory (AVI) project for the FMA commenced. Data collected and built from this project included spatial and aspatial information for each stand's polygon. The AVI data provide various types of information such as species, age, height and density. The data play a key role in a variety of woodlands operations, which include the AOP processes, land use activities and mapping operations.

5.4 ROAD REPORT

As part of the Companies' commitment to ensuring compliance with the Alberta Timber Harvest Planning and Operating Ground Rules and the Soil Conservation Guidelines, a detailed road report is submitted to the Land and Forest Division (LFD) for each year of operations. This report measures FMA operations against the Soil Conservation Guidelines, and assists in future efforts to minimize the impact of forestry operations on the environment. Within the report, all blocks are examined and the disturbance impacts are calculated based on the percentage of the block that has been disturbed. In some instances, where the maximum disturbance percentage was exceeded, a justification is submitted to LFD.

This process is used as a field verification to ensure that soil disturbance is minimized at the operational level. Some of the reasons for exceeding the Soil Conservation Guidelines are:

- Operating in a narrow, small or patchy block. In these types of blocks, the opening size is very small but the required roads often exceed the limits.
- In blocks with rugged terrain or severe slope, the guidelines may be exceeded in order to prevent unsafe or inoperable conditions for hauling logs.
- Block roads are often planned and used for accessing adjacent blocks; this may create a situation in which more roads than normal are constructed. It may be necessary to exceed the guidelines in an effort to keep disturbance "within" blocks as opposed to creating new access roads outside the block.

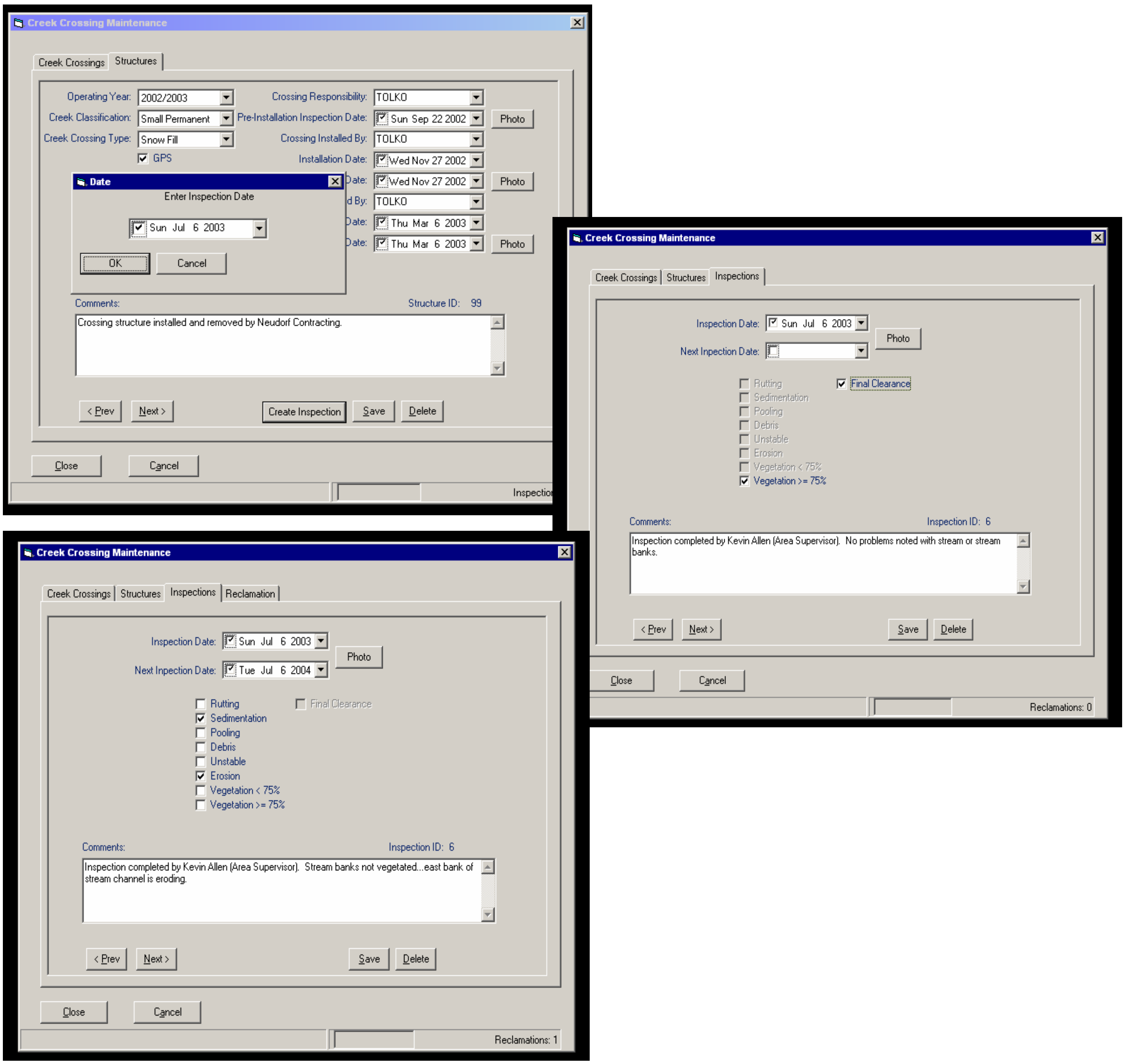
5.5 CREEK CROSSING DATABASE

The Companies are committed to ensuring their operations are conducted in a manner that mitigates impacts on aquatic habitat and watershed quality. To help monitor activities near watersheds, a creek crossing database has been developed that includes information such as legal location, creek and crossing type, installation and removal dates, and initial and follow-up inspection dates for all crossings installed on the FMA.

Watercourse crossings are first identified during the development of Preliminary Annual Operating Plans based on a preliminary road design. Watercourse type and preliminary crossing structure is also identified however crossing structure may change depending on the season of operations and/or the ground conditions at the time of entry.

Watercourse crossings are monitored by the Companies during and following the completion of harvesting and/or silvicultural operations and recorded by operating year to incorporate other industrial users and reflect changes in responsibility from year to year.

All crossings are monitored until the crossing is given a Final Clearance.



5.6 SILVICULTURE PROGRAM

5.6.1 SITE PREP PROGRAM

To ensure prompt regeneration of the harvested areas, various methods of mechanical site preparation are used to prepare the ground for subsequent reforestation activities. Site preparation creates a favorable growing area for seedlings, good germination spots for seeds, and can encourage suckering of deciduous species. This is accomplished by physically altering slash, duff and soil layers by a variety of methods including mounding, ploughing and screefing.

The particular type of mechanical site preparation to be applied is generally selected prior to harvest during frost-free conditions. During the Pre-harvest assessment, the Companies evaluate soil temperature, moisture levels, light availability, and other factors that may inhibit seedling survival and growth.

The following is a brief summary of each site preparation method and the sites where such methods may be applied.

Ripper Tooth Plough

This method used of site preparation can provide effective control of competing vegetation, warm the soil, and provide a favorable planting site. A crawler tractor pulling a specially designed low plough creates a double furrow of mineral soil. The operation occurs immediately following harvest operations.

The ripper is suited to well-to-imperfectly drained sites that are usually subject to high vegetation competition from grass and other species following harvest. The furrows also aid in the planting operation by allowing increased access to the microsites for planting. The seedlings are planted on the raised microsites along the edge of the furrow.

To minimize erosion potential and subsequent sedimentation, ploughing is typically applied perpendicular to the slope and/or parallel to a watercourse(s).

Hoe Mounding

Mounding is typically applied to low-lying wet areas where the possibility of flooding is a concern. Increased soil temperature, loose and oxygen-rich mineral soil, and good drainage promote rapid root growth, seedling establishment, and early seedling performance. Mounds can control competing vegetation, retain nutrients found in the surface organic layers, increase light available to the crop seedlings, and reduce the hazard of snow press and frost damage. The operation is generally completed immediately following harvest operations.

Mounding is also used to re-treat areas where reforestation failed, as the mounds offer a competition-free area for a short time to aid regeneration establishment. Hoe mounding is less damaging to the site due to more mobile machines and a lower overall level of disturbance to the area. The operation is also better able to avoid established immature growing stock, which will aid in future reforestation.

Hoe Screefing

Hoe screefing or scalping is used on sensitive sites such as potential erosion areas, operational buffers and in areas where avoidance of residual stems/understory requires a method that can be used in confined areas. The screefing operation is also used on harvested areas where there is a large amount of slash that would restrict the availability of planting sites.

This method is also employed on sites that are visually sensitive, since the final result does not appear as serious as linear scarification by a ripper plough. The screef produces a long, slash-free zone with the majority of the litter layer removed to create plantable areas. The scalped area must be large enough to reduce the influence of competing vegetation.

To minimize the effects of mechanical site preparation on water yield and/or flow, watercourse buffers are applied as outlined in the General Development Plan (GDP) unless otherwise approved by ASRD.

5.6.2 TREE PLANTING OPERATIONS

As part of the reforestation program to ensure successful establishment of the next generation of conifer trees, blocks are replanted using coniferous seedlings. These seedlings are grown in several nurseries throughout Alberta, and are planted in the spring and summer after harvest whenever possible. The rapid establishment of regeneration in a harvested area is important, as the competition level is lower immediately following harvest rather than if planting was delayed to a later time.

Deciduous seed collection on the FMA will commence this spring, with the goal of building a seed bank that can be used to grow seedlings. These seedlings would be planted in deciduous-based blocks where re-treatment is necessary. Handling, timing, and other nursery knowledge gathered from other deciduous holders will help in the success of a deciduous planting program.

For conifer seedlings, the spring planting operations usually take place with seedlings that were cached in the harvest areas during the late winter. These seedlings are cached in the winter by burying them in large piles of snow and covering the pile with an insulating material to provide an insulation layer.

The snow caching operation allows the seedlings to be located closer to the final destination for planting by using the winter access that is available on frozen ground, and reducing the amount of transportation stress placed on the seedlings. The caches are dug out in the spring and the trees are allowed to thaw for a five-day period. The trees are planted immediately after they have thawed and while they are still in a dormant state. Once planted, the buds will flush and the tree will grow for the full summer season.

Conifer seedlings that are planted in the summer (after summer solstice) are lifted from the nursery, shipped and planted within a few days. The summer planting operation commences in late June, since by this time the nurseries have grown the seedlings and placed them into a partially dormant state. The trees have been conditioned at the nursery so they will have set, established buds. When planted, these seedlings will not grow above ground that year, although the roots are still actively growing and will establish a good base for the tree to grow the following year.

Specialized tree planting contractors are selected based on their ability to ensure the trees are planted in the best possible manner. The planting contractors are responsible for all materials required for conducting the planting operation. Individual areas may have a different planting density prescription based upon the objectives for the site.

The planters select the best spot or microsite for the seedling prior to planting each tree. The use of site preparation increases the amount of microsites available for the seedling. The best microsite is one that provides enough moisture, light and growing space for the tree to establish and grow to maturity. The Companies supervise the field operations and conduct quality checks on planting contractor personnel. If quality issues are discovered during checking, the appropriate actions are taken to allow for a successful plant.

5.6.3 TREE IMPROVEMENT PROGRAM

The Companies are committed to conserving biodiversity and sustainable use of biological resources within the FMA and associated quota operations. In an effort to ensure sustainability, the Companies are committed to maintaining a healthy forest. Owing to the increased demand on the forest resource by other users, a reduction in the net landbase available for fibre removal is a constant threat. One option for maintaining the wood supply over the long term is to plant genetically superior planting stock through a tree improvement program.

The Companies' objectives for a tree improvement program are:

1. Develop an improved variety of deciduous and coniferous seedlings through selection and breeding to enhance growth, yield, timber quality and climatic hardiness, while ensuring stability of wood quality.
2. Use genetically improved seedlings to enhance or maintain fibre supply.
3. Develop the breeding program in a manner that maintains the option for more advanced breeding in the future.
4. Conserve the genetic integrity, adaptability, diversity and health of the regional forest.

Footner Forest Products is exploring membership in the Western Boreal Aspen Corporation (WBAC). Footner recognizes aspen genetics is still in its infancy, and will contribute to the work and research to gain further knowledge on genetically improved aspen. WBAC is a corporation with the objective of developing genetically superior planting stock. WBAC consists of Ainsworth Lumber Company, Daishowa Marubeni International, Millar Western Forest Products, Slave Lake Pulp, and Weyerhaeuser Company.

TOLKO Industries–High Level tree improvement program is a continuous cycle of selection, testing and breeding. In this cycle, the genetic quality of a species is improved and those improvements are delivered to the forest as seedlings from seed orchard seeds. The first step is to select parent trees from natural stands. Selections are based on physical characteristics such as superior growth, form, wood quality, and resistance to insects and disease. Scions (branch samples) are collected from selected trees, grafted to root stock material, and out-planted to form the seed orchard. Seed produced from the seed orchard is then available for use in the reforestation program.

Testing is required to determine the ability of each parent to pass on its superior qualities to its progeny. Progeny tests will be conducted to select the best parents and families for future breeding purposes. Breeding begins with the best performers from the progeny tests. Pollination is strictly controlled and the offspring produced are put through a new set of progeny tests. Through this cycle of selection, testing and breeding, genetic gain is slowly enhanced. Genetic gains of about 5% can be expected from the first round of selections. The second and third rounds of selection and breeding can deliver genetic gains of up to 30%.

Potential alteration of the natural genetic and species diversity is a major consideration when using genetically improved planting stock on the FMA. To help conserve genetic diversity of conifer species, TOLKO Industries - High Level plans to implement the safeguards described below.

1. TOLKO will not exceed 30% genetically improved conifer seedlings planted on an annual basis.;
2. A two-part gene conservation plan will be implemented:
   - Ex-Situ gene conservation involves placing a portion of the grafted parent tree selections in a clone bank, along with a portion of the seed collected being placed in protected seed storage.
   - In-Situ gene conservation requires protection of forest populations and their gene pools in their natural habitat. Special Places 2000, Ecological Reserves, Natural Areas, provincial and federal parks, and protected riparian areas represent in-situ conservation. In addition to in-situ gene conservation, TOLKO is committed to setting aside stands of exceptional timber quality and uniqueness. The rare and exceptional stand survey program could be implemented to survey the FMA and find representative stands.

Currently, TOLKO is in partnership with other companies/agencies in two tree improvement programs, and is working toward a third tree improvement program for the FMA, as described below.

Region G2

The white spruce tree improvement program covers the quota interests in Management Unit P10. Current partners are Manning Diversified Forest Products Ltd. (MDFP), HLLD and Alberta Sustainable Resource Development. TOLKO has a 4% share in this program, which will cover 30% of its planting program based on an AAC of 31 647 m^3.

Region J

Lodgepole pine covers TOLKO's quota interests in management unit P10 and FMA interests in F13 and portions of F12 above 550 m elevation. Current partners are MDFP, HLLD, and Alberta Sustainable Resource Development. TOLKO has a 10% share with an anticipated seedling production of 50 000 seedlings per year.

Region H

The white spruce program covers the entire FMA for all areas below 600 m elevation. Alberta Sustainable Resource Development started this project in 1997 and has been the only proponent since inception.

5.7 PRE-HARVEST ASSESSMENTS

Pre Harvest Assessment (PHA) is a site evaluation based on a specific set of procedures, to accomplish certain forest management objectives. These assessments are completed prior to harvest during frost-free conditions. The data gathered from the PHA can then be stored in a database for analysis of reforestation successes or failures.

PHAs create a link between the harvesting and reforestation systems, and are used to determine whether to log. Other purposes include matching the site preparation technique to the site, flagging potential hazard areas, and identifying possible intensive forest management areas. Intensive forest management may include planting genetically improved stock or fertilizing.

Forests are complex ecosystems and successful management comes from understanding how the specific ecosystem functions. The forest provides clues in the understory vegetation, the forest floor and the soils, which can promote or inhibit the re-establishment of a healthy forest. Factors that promote rapid re-establishment include adequate moisture and nutrient availability. Inhibiting factors may be competing vegetation, such as grasses, or damaging agents such as insects or disease. By gathering this information, the forests can be studied and the successful management activities can be identified. Since similar forest ecosystems have similar site conditions, the successes in one area should be attainable in a similar area if the same management activities are undertaken.

General location information such as the operating license, block number, legal land location and stand number are used to track information. The site classification information is used to help catalogue the site according to the rest of the assessment results. This classification is done using the government-based system of ecological assessment to allow for data sharing between companies separated by administrative boundaries but with similar forest conditions.

The general condition of the timber in the block is assessed to determine if any timber is potentially endangered by disease, windfall, etc. The condition of the understory is assessed to determine the feasibility of an understory protection harvest operation to retain that understory. The soils are assessed for the moisture and nutrients available to the trees, and information on the soil texture and the rooting depth of the existing trees is also gathered. Understory vegetation is assessed to determine any possible vegetation competition concerns that may arise after harvest. The shrub, herb, grasses and moss layers are assessed for the percentage of ground cover they provide.

There are different "indicator" species that are used to identify possible post harvest concerns, such as the amount of moisture and availability of nutrients. Any special operating or planning concerns are also assessed, such as insect and disease damage agents, unique wildlife concerns, and recreation or visually sensitive areas.

These assorted pieces of information are gathered to form a silviculture prescription. Since the stands within a particular block may change significantly, each different stand condition should be assessed to refine the plans so they are relevant to unit that is even smaller than the block. Depending on the results of the assessment, different techniques for site preparation or harvesting may be used to achieve reforestation objectives.

5.8 REFORESTATION MONITORING PROGRAM

In 1991, the legislative requirements for forest regeneration were amended to reflect an improved understanding of forest management and increased industry accountability for reforestation. The Province of Alberta has reforestation standards in place as measurement criteria for assessing whether the forest establishment and performance objectives are being met. The regeneration standards and subsequent survey methods are set practices and procedures that are carried out on all harvested lands to determine levels of regrowth and performance of desirable tree species.

The current standards in place were revised as of May 1, 2000. The standards incorporate density, height, and "free-to-grow status (performance standard), as well as a minimum stocking standard. Under these standards, all forest operators are expected to reforest harvested lands to one of four "strata standards"–Coniferous (C), Coniferous-Deciduous (CD), Deciduous-Conifer (DC), and Deciduous (D). Two independent surveys are mandated, as described below.

The Establishment Survey is completed four to eight years after harvest in C, CD and DC cutblocks, and three to five years after harvest in D cutblocks, with the following objectives:

- Determines if a new forest stand has been initiated successfully.
- Guides treatments needed to ensure the stand continues to grow in a manner that will meet performance survey requirements.
- Shows stocking amounts (percent), density (stems/ha) and early growth (height and diameter) of regenerated trees.
- Spatially displays approximate locations of satisfactorily restocked (SR) and/or not satisfactorily restocked (NSR) areas larger than 4 ha in size.

The Performance Survey is completed 8 to 14 years after harvesting in C, CD, and DC cutblocks, and 10 to 14 years after harvesting in conditionally stocked D cutblocks (those blocks that do not pass an establishment survey), with the following objectives:

- Assesses whether established stands have continued to grow and are in a condition to reach maturity.
- Shows stocking amounts (percent), density (stems/ha) and early growth (height and diameter) of regenerated trees. The same variables apply as for the establishment survey but with different standards.
- Determines whether seedlings are free-to-grow. There is a "Free-to-Grow" qualifier on all acceptable coniferous seedlings, meaning that a seedling must be located at least 1.5 to 2 m from any deciduous tree or shrub that is taller than two-thirds its height.
- Spatially displays approximate locations of satisfactorily restocked (SR) and/or not satisfactorily restocked (NSR) areas larger than 4 ha in size.

In addition to the legislated surveys, TOLKO Industries incorporates a third survey on harvested areas. The Post-treatment Survey is a reduced density survey that is conducted during the second growing season after a planting treatment, with the following objectives:

- Used to assess if the planting treatment was effective and the cutblock is on track for meeting the establishment survey.
- Shows stocking amounts (percent), density (stems/ha) and early growth (height and diameter) of regenerated trees.

5.9 FIRE CONTROL PLAN

The Companies submit an integrated Fire Control Plan to LFD each spring, as per the *Forest and Prairie Protection Act*. This plan outlines the following:

- Company staff and related fire training;
- Weekend-standby duty person;
- Fire fighting equipment available;
- Radio frequencies; and
- Location of summer projects/operations and the respective area supervisor(s).

The TOLKO plan also covers LaCrete Sawmills' sphere of operations.

In addition to submitting a fire plan each spring, the Companies are committed to working with LFD in developing fire management strategies and fire hazard reduction programs that will be reflected in future AOPs.

5.10 UNDERSTORY RETENTION POLICY

The Companies define conifer understory as unmerchantable and immature coniferous stems that are growing under the existing overstory. Understory can be present as single stems or clumps, and can be found in dispersed patches or with even distribution throughout the block.

"Understory Avoidance" is the practice of retaining immature coniferous stems without modifying normal operations. (Example: skidding around a pocket of understory.) Understory avoidance is done in all blocks with less than 2400 stems/ha of understory.

"Understory Protection" is the required practice of retaining immature coniferous understory with the need to modify operations. (Example: using designated skid trails that have been flagged.) Understory protection is undertaken when a block has greater than 2400 stems/ha of coniferous understory.

The Companies will attempt to remain within areas that require understory avoidance over protection until operational strategies are developed and agreed to by both companies. In the interim, the companies will incorporate the strategy outlined below.

General Information

- Woodlands Field Supervisors will forward information to the contractor on blocks containing heavy understory.

- Pre-harvest assessments, timber cruising, layout or any other field assessments that are completed should capture information on understory components and location within the blocks.
- If pockets of understory are encountered but missed during field visits, the contractor will notify the Companies' supervisor and will attempt to avoid the understory.
- Understory that is 7 m or less will best withstand the wind.
- Understory that is 7 m or more will be more susceptible to blowdown.
- Wind firmness is determined using the tree's slenderness coefficient (ratio of height to diameter at breast height [dbh]).
- Seedlings can be deemed unhealthy if there is damage to the seedling, poor leader development, nutrient-poor site, poor stem or root form, or extreme slenderness (tall trees with small diameter are less wind firm).
- During harvesting and silviculture operations, single trees and clumps will be avoided.
- Clumps of understory are flagged out of the block as internal deletions, when identified.
- Clumps stand up to the wind better than single trees.
- Efforts will be made to minimize disturbance in blocks with high concentrations of understory (minimize roads, minimize landings, minimize skid trails, not to be used as camp block, etc.).
- Scarification equipment operators will be instructed to work in a pattern that minimizes understory disturbance.
- The benefit to avoiding understory is that the trees are already established and already have several years of growth.
- Protected understory may have a chance to outperform planted seedlings.
- Stands may regenerate back to a healthy forest sooner than by planting.
- The understory patches provide wildlife habitat and break the line-of-sight.
- Trees will be avoided based on order of importance by species: white spruce, black spruce, jack pine, lodgepole pine and balsam fir.
- The Companies' target to avoid/protect a minimum of 50-60% of the understory that existed prior to harvest.
- If understory protection is required, operations will have to be modified. This may involve using designated skid trails that would otherwise be flagged out prior to harvest.

5.11 PERMANENT SAMPLE PLOT PROGRAM

TOLKO Industries-High Level established a Permanent Sample Plot (PSP) program on the FMA in 2002. Plot establishment will continue over the next 10 years. The intent is to establish 20 plots each year, and located at random. Established plots will be remeasured every five years.

The FMA area occupies portions of the Central Mixedwood, Dry Mixedwood and Wetland Mixedwood natural regions. Small portions of the Lower Foothills and Boreal Highlands natural regions are also represented. Sample plots will be allocated approximately in proportion to area representation to capture site differences within and between these natural regions. Sample intensity and plot distribution will also be influenced by the availability and location of any existing PSPs, as well as the importance and contribution of individual site types to the coniferous wood supply.

PSPs are allocated to individual conifer and mixedwood stands sampled from the following eight combinations of AVI v2.1 crown closures and overstory height:

Crown closure (2)	AB
	CD
Height Class (4)	1-6 m
	7-12 m
	13-18 m
	19-24 m

In terms of plot configuration and measurement protocols, the intent is to maintain consistency with SRD procedures. HLLD proposes to establish circular, fixed-area plots of 0.10 ha with a nested sapling plot comparable in size to LFD standards. The LFD definition of minimum diameter will be followed (9.1 cm on the tree plot, 1.1 cm on the sapling plot), and LFD condition codes will be used. All trees 9.1 cm or larger will be uniquely numbered, stem mapped (azimuth, distance from plot centre) and measured for dbh, total height and height to live crown. Sapling-sized trees (1.1 cm to 9.0 cm) will not be numbered or stem mapped, but will be measured for dbh and total height.

5.11.1 NIVMA

Northern Interior Vegetation Management Association (NIVMA) is a British Columbia and Alberta forest industry co-operative for exchanging information and developing silviculture and stand management decision-making tools with a common monitoring protocol and database.

The purpose of the Association is to provide leadership and direction to its members within the disciplines of silviculture and forest vegetation management by:

1. Providing a system of silviculture monitoring that will provide members with information needed to:

    - Monitor years to breast height for timber supply planning purposes.
    - Monitor years to free-to-grow status for silviculture policy purposes.

- ♦ Monitor tree performance in relation to the height of competing vegetation as a basis for reviewing the free growing targets.
- ♦ Monitor years to breast height at various levels of site disturbance as a basis for reviewing soil conservation guidelines.
- ♦ Monitor years to green-up height.
- ♦ Monitor tree performance from various silviculture regimes to assist in identifying trends in outcomes.
- ♦ Describe changes in plant species communities following disturbances.
- ♦ Monitor forest health in managed stands.

2. Facilitating information exchange among members by:
   - ♦ Collating and disseminating information on the silvicultural benefits of vegetation management.
   - ♦ Exchanging information on the efficacy of a variety of chemical, mechanical and other forest vegetation management tools.
3. Advising members, agencies and the public with respect to silviculture and forest management tools.

Association membership is voluntary and comes into effect through the acceptance of the firm or organization by the Association's advisory council, and the payment of annual dues. The calculation of dues is a set levy per cubic meter of AAC. Members are also required to participate in monitoring activities at the required levels, and to contribute to the Association's database by establishing a minimum number of installations based on AAC. The Association controls the monitoring protocol and database management.

5.12 INDUSTRIAL SALVAGE PROGRAM

The forest industry in the High Level region relies on a multitude of different timber sources to supply its mill with sufficient annual fibre volumes. One of these sources is timber originating from industrial land user activities–salvage.

The requirement for timber salvage on public lands occurs under the direction of the Land and Forest Division field office. The authority for such a requirement is contained within the regulations under the *Forests Act*.

Timber salvage occurs in accordance with the guidelines established in the Forest Stand Damage Appraisal Table for timber damages in Alberta. A basic principle of these provincial guidelines is that a forest company will reimburse any standing wood value assessed, and pay an amount equivalent to the forest company's average cost of delivering the wood to the mill, including felling, decking, and hauling costs.

Also providing direction to the timber salvage program is the Master Agreement for Withdrawal of Lands, which is a standard provincial consent agreement that other parties enter into to gain entry onto the FMA. In this agreement, the parties agree that any timber salvaged will be offered to the FMA holder. Upon acceptance, the FMA holder will reimburse the provider with an amount consistent with the Forest Stand Damage Appraisal Table and Associated Guidelines. It is important to note that under this agreement, ownership of the timber remains with the FMA holder if it is salvaged, and the provider is not free to sell the salvaged timber on the open market.

Salvage generally occurs with a minimum of 25 merchantable trees per hectare, which forms the basis for determining whether or not timber salvage will be required. The provincial government may (and frequently does) require salvage down to a single load, irrespective of distance.

5.13 AFPA

The Companies are committed to acquiring a better understanding of the ecosystem to ensure that our planning, harvesting, and silvicultural operations are conducted in a manner that mitigates environmental concerns. As a result, the Companies actively participate in a number of committees and partnerships that are dedicated to sustainable forest management, health and safety, and the communities in our region.

5.13.1 SILVICULTURE SUB-COMMITTEE

The Silviculture Sub-Committee (SSC) is composed of a group of AFPA member companies that meet on a regular basis to address a number of initiatives with respect to silviculture, including:

- Co-ordination of industry safety activities relating to silviculture.
- Working with the government and public to achieve fair and effective policies and legislation.
- Liaison with government agencies on silvicultural issues.
- Information sharing with member companies on silvicultural issues/research.

The SSC is a subcommittee of the Forest Management Committee (FMC). Direction is received from the FMC and it is given feedback on a regular basis.

Current member companies that sit on the SSC are:

- TOLKO Industries Ltd.
- Footner Forest Products Ltd.
- Sundance Forest Industries
- Weldwood of Canada
- Sunpine Forest Products
- Spray Lakes Sawmills (1980) Ltd.
- Alberta Plywood
- Vanderwell Contractors (1971) Ltd.

- Alberta Newsprint Company
- Weyerhaeuser Canada Ltd.
- Ainsworth Lumber Co. Ltd
- Blue Ridge Lumber (1981) Ltd.
- Daishowa-Marubeni International Ltd.
- Manning Diversified Forest Products Ltd.
- Millar Western Forest Products Ltd.
- Northland Forest Products Ltd.
- Canadian Forest Products Ltd.

5.13.2 LAND USE SUB-COMMITTEE

The Alberta Forest Products Association established a Land Use Subcommittee (LUSC) under the mandate of the Forest Management Committee several years ago. The value of forming the LUSC was recognised when issues relating to land use continued to surface within the Forest Management Committee.

The subcommittee meets quarterly and the current members include representatives from the AFPA, several FMA holders in the province, and a quota holder. The meetings are an excellent opportunity for forestry professionals working in land use to share ideas, policies, and potential improvements in the field. It also encourages consistency in dealing with the oil and gas sector operating within FMAs. This allows oil and gas companies to operate in the same manner within the province, regardless of the FMA holder, with a solid understanding and commitment to working together with the forest industry.

Another committee, formed in part from members of the LUSC, is the Joint Management Committee. This committee includes representatives from Alberta Sustainable Resource Development, KPMG, and the oil and gas sector. The focus of the Joint Management Committee is primarily the creation and yearly update of the Forest Stand Damage Appraisal Tables. All Alberta FMA holders who need to determine timber damages resulting from oil and gas activities use these tables.

The LUSC was instrumental in developing the Master Consent for the Withdrawal of Lands and Master Road Use documents. Both documents are widely used by FMA holders in the province.

Members of the LUSC recognize that although it is difficult to directly influence the amount of oil and gas activity taking place within the province, they are often able to be involved in the consultation and planning stages and have input on the activities and their effects on the landbase. By working together with the oil and gas sector, the overall impact of both industries has the potential to be reduced. The LUSC offers an excellent environment in which to discuss methods for improving the relationship between the oil and gas sector and the forest industry, and minimizing the cumulative impacts of the two industries.

5.13.3 LOG HAUL SUB-COMMITTEE

The AFPA Log Haul Subcommittee has been formed from the Forest Management Committee. The Log Haul Subcommittee is a group of forestry companies that discuss transportation rules and regulations, operational health and general safety, and policies. After the Log Haul Subcommittee has discussed issues of importance, the AFPA representative will submit a letter or recommendations to the government or parties who are responsible for the areas of concern.

The main goal of the Log Haul Subcommittee is to work with the public, other associations and governments to achieve a fair and effective policy and legislation. Some of the recent examples of involvement by the Log Haul Subcommittee are the Winter Weights Program, Annual Safe Log Haul radio advertising campaign, and roadside pullouts concerns.

5.13.4 PARTNERS FOR INJURY REDUCTION

The Companies are committed to a Health and Safety program that protects the employees and contractors.

As part of the Health and Safety Program, the Companies have enrolled as a participant in the Partners for Injury Reduction (PIR) program through the AFPA. The partnership that has been formed is between Alberta Human Resources and Employment and the Alberta Forest Products Association. The Companies are committed to attaining a "Certificate of Recognition" as an accredited member of the program.

By participating in this program, the Companies are committed to the extensive auditing process and reporting the results within the organization as a way to ensure future improvement. As members of the program, the Company participates in yearly audits of the Health and Safety Program. An external audit is required every three years to ensure Alberta health and safety legislation is adhered to and understood by the employees.

The audits consist of reviewing all internal documentation in relation to health and safety, as well as conducting interviews with employees to ensure all aspects of the safety program are being conveyed throughout the organization.

Contractors are encouraged to participate in the program and can register through the Companies' membership with the AFPA. With a focus on performance, it is important to maintain a strong commitment to health and safety in the workplace.

5.14 MIXEDWOOD MANAGEMENT COMMITTEE

The Mixedwood Management Association (MWMA) is a group of eight Alberta forest companies that have joined forces to cooperatively advance the science and application of mixedwood management of boreal white spruce–aspen mixedwood forests. The MWMA is committed to provide funding in support of the creation of new knowledge through research and to apply this knowledge to day-to-day mixedwood forest management planning and practices. This is an industry-driven group that collectively sets priorities in areas they feel require additional information and/or tools for them to effectively use mixedwood management.

Forest industry members include:

- TOLKO Industries Ltd.

- ♦ Ainsworth Lumber Co. Ltd.
- ♦ Alberta-Pacific Forest Industries Inc.
- ♦ Daishowa-Marubeni International Ltd.
- ♦ Millar Western Forest Products Ltd.
- ♦ Vanderwell Contractors (1971) Ltd.
- ♦ Slave Lake Pulp/Alberta Plywood Ltd.
- ♦ Weyerhaeuser Company Ltd.
- ♦ Footner Forest Products Ltd.

The Alberta government and the Alberta Research Council are supporting partners in the Association. The Land and Forest Division of Alberta Sustainable Resource Development supports the association with advice and information in an effort to promote the scientific basis for developing forest management plans. Alberta Research Council's Forest Resources business unit acts as a co-ordinating body for MWMA, providing administrative, accounting, facilities, and project management to support the association in carrying out its day-to-day activities.

The MWMA was founded on the basis of collectively agreeing to six areas the association will focus on. These are:

1. To forecast and validate managed and natural stand growth and yield, of boreal mixedwood forest white spruce and *Populus* species mixes;
2. To establish research needs and priorities, facilitate the completion of research projects, and ensure that results of the research are disseminated;
3. To co-ordinate with other research groups and, where priorities cannot be addressed by existing research groups, initiate research;
4. To facilitate discussions to increase understanding within the forestry community of mixedwood management issues;
5. To develop and use standardized data collection protocols primarily for, but not limited to, research trials for the purpose of developing data sets that are reputable and able to be amalgamated, recognizing the needs of forest management decision making; and
6. To develop a data sharing agreement.

From these initial goals, the MWMA has drafted a five-year business plan that seeks to deliver on these points. These goals include:

1. Development of defendable, ecologically based (e.g., account for the effects of succession), site-specific yield curves:
   a) naturally regenerated stands with or without treatments; and
   b) post-harvest regenerated stands across the range of potential management treatments.
2. Development of defensible site-specific crop plans that lead to mixedwood stands in:
   a) naturally regenerated stands with or without treatments; and

   b) post-harvest regenerated stands across the range of potential management treatments.

3. Development and use of a standardized monitoring protocol. Define the characteristics to measure, optimal timing of these measurements, and how to measure them:
   a) monitoring to judge conformity of predicted and realized stand trajectories; and
   b) monitoring to assess accuracy of yield projections.
4. Development of stand assessment tools (attributes needed to be quantified) to:
   a) enable assignment of naturally occurring understory spruce to appropriate yield trajectories;
   b) assist in the selection of specific understory spruce protection treatments and the determination of associated probabilities of success for mixedwood stands; and
   c) select hardwood stands that will allow the successful establishment and growth of understory spruce.
5. Development of a decision support tool (model) that will estimate cost versus yield (m^3) for a wide range of silvicultural regimes that will aid in the selection of crop plans to be developed (with the understanding of the models limitations with respect to accuracy.
6. Documentation of the effects of mixedwood management on non-fibre values:
   a) soil nutrient changes from existing and proposed stand trajectories;
   b) biodiversity implications from practicing mixedwood management;
   c) potential to aid in "fire proofing" the forest; and
   d) aid in inter-company cooperation

5.15 FRIAA

The Forest Resource Improvement Association of Alberta (FRIAA) was established to promote and initiate projects that enhance Alberta's forest resources. This association was set up to administer and deliver the Forest Resource Improvement Program (FRIP) created by the Government of Alberta. Since formation of FRIAA, two additional programs–Wildfire Reclamation and the Community Reforestation–have come under stewardship of FRIAA.

FRIAA is committed to the following objectives:

- Establishing programs and initiatives for the enhancement of forest resources within Alberta.
- Promoting the enhanced management and improved sustained yield of the forest resource of Alberta.
- Promoting improved integrated resource management.

Forest Resource Improvement Program (FRIP)

This program is funded through the collection of dues from individuals and firms that harvest Crown timber in the Province of Alberta. Members submit project proposals based on four categories:

- Field Operation

- Inventory and Planning
- Applied Research
- Other forestry projects

All proposals must indicate that the project does not represent work required by the company under legislation, tenure or other binding agreement, and that the project meets the FRIAA's objectives.

Wildfire Reclamation Program (WRP)

This program was developed in conjunction with the Department of Sustainable Resource Development to mitigate the impacts resulting from the 1998 wildfire season. Funded by grants from the province, this program focused on re-establishing forest plantations that were damaged or destroyed by wildfires in 1998.

Community Reforestation Program (CRP)

This program was created May 1, 2000, by Order in Council, giving FRIAA the responsibility to carry out reforestation programs on public land cut under the authority of timber licenses and permits on or after May 1, 1994. FRIAA manages all aspects of the reforestation process on Crown land where the timber operator has the option of paying a fee in lieu of conducting the work.

5.16 MANAGEMENT ENHANCEMENT FUND

A management enhancement fund will be established by Footner Forest Products, and has already been established by TOLKO Industries–High Level, to enhance management activities and the level of understanding of the forest resource and forest products. For every cubic meter cut from the FMA, $0.25 will be put toward the fund.

5.17 FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

The Forest Engineering Research Institute of Canada (FERIC) is a private, non-profit research and development organization whose goal is to improve Canadian forestry operations related to harvesting and transporting wood, and growing trees, within a framework of sustainable development.

FERIC is funded by a growing partnership between leading forestry companies, the Government of Canada, some provinces and the Northwest Territories. Their mission is to provide these partners with the knowledge and technology to conduct cost-competitive, quality operations that respect the forest environment.

FERIC's affairs are administered by a board of directors that represents the forest industry, the federal and provincial governments, and universities with forestry programs. Their research program is developed with the guidance of national and regional advisory committees, and includes representatives from all their partners. Ongoing feedback helps to address the broad spectrum of technical problems encountered during the planning and implementation of forestry operations.

FERIC's head office and Eastern Division are located near Montreal, and their Western Division operates out of Vancouver. Between the two locations, FERIC employs more than 80 forestry and engineering professionals, technicians and support staff.

Research and Development Programs

FERIC's research and development programs cover the engineering, human, operational and environmental aspects of harvesting, processing and transportation of forest products; silvicultural operations; the specific problems encountered in small-scale operations; and the management and suppression of wildfire. In addition, they conduct contract research on projects selected for their value to their partners. FERIC's research is field-oriented, and is carried out in close co-operation with woodlands personnel. Their research focuses on the areas described below.

Wood Harvesting

A major part of FERIC's resources is directed at improving Canadian forest harvesting operations (felling, processing, and extraction to roadside). Key projects are aimed at increasing the efficiency of current equipment and reducing costs; improving fibre quality and utilization; minimizing environmental impacts (e.g., investigating alternatives to clearcutting, protecting soils and advance regeneration); developing resource management tools (e.g., computer models, decision-support systems); and evaluating current and innovative harvesting technologies.

Transportation and Roads

The transportation research program addresses one of the largest aspects of the total production cost of wood products–the delivery of wood from roadside to the mill or sortyard. Their priorities include maximizing payload to minimize cost; improving truck performance; improving road and bridge design, construction and maintenance; traffic flow and system optimization; and improving the efficiency of loading and unloading operations.

Silvicultural Operations

FERIC's silvicultural research program assists their members in implementing intensified forest renewal and management programs, which are essential for sustained yield and environmental protection. Their priorities include evaluating site preparation implements and their prime movers; testing alternatives to herbicide use; improving the efficiency and efficacy of reforestation, especially the link between harvesting and silviculture; mechanization of stand-tending activities; and treating woody residues after harvesting.

Small-scale Operations

Much of eastern Canada's wood supply comes from smaller operations that produce significant quantities of commercial wood. These operations are usually conducted on private woodlots, but environmental concerns (e.g., reductions in clearcut size) are increasing the importance of these woodlots on freehold and public land. The program focuses on many of the same activities as in the other work areas, but is applied on a smaller scale.

Engineering Design/Specialized Technologies

FERIC has developed considerable expertise in applying engineering design skills and specialized technologies to solve problems in their major areas of research. They pursue research on leading-edge technological developments of potential interest to the forest sector, such as GPS tracking and navigation, central tire inflation, applied robotics, laser-based scaling and wood chip classification, and equipment-monitoring systems.

Technology Transfer

FERIC's research and development results are distributed to their members through publications, videos, slide presentations, seminars, electronic media, special meetings, and personal contacts. Since FERIC was founded in 1975, more than 1000 reports have been published for distribution to a mailing list of over 1000 Canadian forestry practitioners and to interested parties around the world. Their Information Services Group has also assembled an impressive collection of periodicals and monographs on forestry, forest engineering, environmental issues, and related patents to fulfill the needs of their members.

Wildland Fire Operations Research Centre

Wildland Fire Operations Research Centre (WFORC) was established in 2000 through the support of Alberta Sustainable Resource Development, and is located in Hinton, Alberta. Its objectives are to develop and commercialize new technologies and knowledge for the suppression and management of wildfire in the Province of Alberta. Research is in three areas:

1. planning (examining the integration of management, suppression, and protection against wildland fires within forest development planning);
2. operations (evaluating existing equipment and systems for managing, suppressing, and protecting against wildland fires); and
3. design (improving or developing more effective equipment).

5.18 SFM NETWORK

The Sustainable Forest Management (SFM) Network is located at the University of Alberta and has been in existence since 1996. Through strong partnerships and enhanced networking, the SFM Network is dedicated to providing integrated, multidisciplinary research and training to ensure the sustainability of Canada's boreal forests in all their physical, biological, ecological and economic dimensions for future generations.

The Network's research team comprises natural scientists in forestry, soil science and biological sciences; social scientists in economics, sociology, anthropology, health sciences and political science; and environmental, civil, and chemical engineers.

5.19 NORTHERN LIGHTS FOREST EDUCATION SOCIETY

The Northern Lights Forest Education Society has been established in the High Level area with the mandate of informing the public about the many benefits of the forest to the communities. The Companies are represented on the Board of Directors. Administration of funds is conducted by the Society. Once funding is secure, the Society plans to recruit and hire a Forest Educator to help deliver the program.

The Forest Educator's primary role will be to provide information on forestry-related topics to schools and community groups in the following manner:

- Co-ordinate field trips.
- Arrange for professional speakers to conduct classroom presentation, field trips mill tours, forest walks, workshops, etc.

- Co-ordinate professional development opportunities for teachers that relate to the forest curriculum.
- Act as the liaison with industry, community organizations, other forest educators and the Society's board of directors.
- Assist in creating program lesson plans and resource information for teachers.
- Assist in obtaining educational materials and programs for schools.

The Northern Lights Forest Education Society plans to implement their program with Fort Vermilion School Division #52, Northlands School Division, and private schools organization within the following communities; High Level, Paddle Prairie, Rainbow Lake, Fort Vermilion, La Crete and Rocky Lane.

Current organizations represented on the board of directors are:

- TOLKO Industries–High Level
- Footner Forest Products
- Fort Vermilion School Division #52
- Town of High Level
- Youth Connections
- Mackenzie Economic Development Council
- High Level Public School
- Rocky Lane School
- High Level Chamber of Commerce
- GSR Management Group Inc.

5.20 BOREAL CARIBOU COMMITTEE

The Boreal Caribou Committee consists of industry and government members working together to ensure the continued existence of boreal caribou in Alberta (Boreal Caribou Committee, 2001). Industry members represent the forestry, oil and gas, and peat moss industries. Through the committee, a strategic plan and best management practices have been developed. The following principles describe the basis for commitment to caribou conservation:

- Caribou conservation is an integral part of allowing industrial activity on caribou range. Industrial activity can occur on caribou range provided caribou conservation is not compromised by those activities.
- Innovative techniques, planning, and co-ordination among operators and regulators are necessary to ensure caribou protection.
- Government and industry will take a flexible but conservative approach to industrial development.

- Government and industry will use adaptive management to ensure the guidelines are effective and reflect best knowledge.
- Cumulative effects will be addressed in the development, application and evaluation of the guidelines to ensure that habitat and industry activity targets are met.
- Research results, initiatives, guidelines, and experience will be communicated to stakeholders (industry, regulators, communities, interest groups, governments).
- It is important to maximize caribou conservation for the time and money invested.
- In the absence of precise data, conservative limits will be established.
- Where data deficiencies are identified, research needs should be identified and the required data should be gathered.

The Companies have agreed to adopt the strategic plan and best management practices produced by the Boreal Caribou Committee as they relate to their activities.

5.21 ALBERTA WESTERN HERITAGE MODEL

The Companies are currently in the preliminary stages of developing a Heritage Resources Management Program for the FMA to ensure that its operations will be in compliance with the provisions of the Alberta *Historical Resources Act*.

Through existing inventories of known archaeological sites, historical trails and locations, as well as by analyzing the current forest cover, topography, and hydrology throughout the landscape, planners may be able to anticipate and predict potential heritage resources when developing the AOPs.

The approach involves predicting where heritage resources are located, determining what forestry practices could damage them, and devising a solution to prevent or minimize the chances of damaging those resources. This may prevent potential conflicts associated with proposed developments, allowing planners to formulate avoidance or reduce impacts at the planning stage.

SECTION 6:
TIMBER SUPPLY ANALYSIS

Ref: H-065

TOLKO
INDUSTRIES LTD.
HIGH LEVEL LUMBER DIVISION

FFP

6.0 TIMBER SUPPLY ANALYSIS

The following section outlines the timber supply analysis procedures and proposed harvest levels for the joint FMA area.

6.1 VEGETATION INVENTORY

The vegetation inventory covering the joint FMA area was derived from medium scale (1:20 000) black and white infrared photography. The majority of this photography was obtained in 1994, with the following exceptions:

- ♦ Photography for FMU's F8 and F9 was obtained in 1992;
- ♦ Photography for FMU F13 was obtained in 1999.

This "leaf-on" photography was the basis for stratification of forested and non-forested lands. The stratification was completed in accordance with Alberta Vegetation Inventory (AVI) standards version 2.1.

6.1.1 INVENTORY UPDATES

To ensure the vegetation inventory captured harvesting activity, fire history, and oil and gas development, the following updates were incorporated:

- ♦ Cutblock update boundaries were acquired to reflect recent harvesting activities from the stakeholders listed below:
    - ♦ Tolko photography updates from blocks harvested in the 94/95 to 98/99 timber years;
    - ♦ Tolko GPS updates for blocks harvested in the 99/00 and 00/01 timber years;
    - ♦ FFP GPS updates for blocks harvested in the 00/01 timber year;
    - ♦ Tallcree GPS updates for blocks harvested in the 00/01 timber year.
- ♦ Boundaries of recent fires (post-inventory) to March 2001 were acquired from the Land and Forest Division of Alberta Sustainable Resource Development (LFD).
- ♦ Land use dispositions from the timber damage assessment (TDA) area coverage were incorporated to reflect land use disturbances to July 2001.

6.2 NET LANDBASE DETERMINATION

This section briefly describes the process used to netdown the joint FMA area. A more detailed description of the netdown process can be found in the accompanying "Net Landbase Determination" (May 31, 2002) document.

6.2.1 GROSS LANDBASE

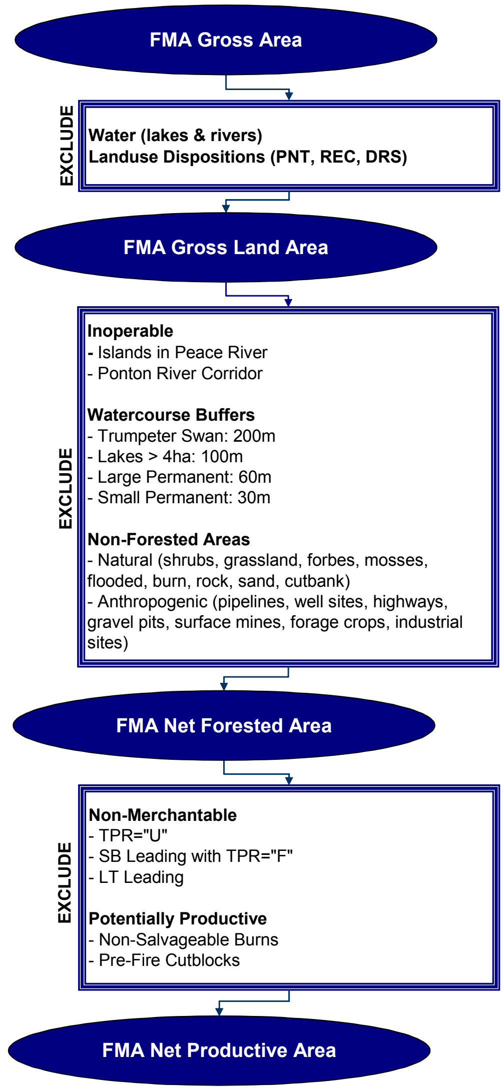
The joint FMA area encompasses a gross area of 3 560 311 ha and includes two amalgamated FMU's; F24H and F25H. F25H, the larger of the two management units, is 2 599 417 ha in size while F24H has a total gross area of 960 894 ha.

In terms of biological diversity, the joint FMA area falls within six natural subregions. It is dominated by the Wetland Mixedwood natural subregion, which comprises 57.8% of the area. The Central Mixedwood natural subregion makes up 15.9% of the area while the Dry Mixedwood natural subregion makes up 10.9%. The Sub-Arctic, Boreal Highlands and Lower Foothills make up 4.6%, 7.9% and 2.9% of the area, respectively.

6.2.2 LANDBASE DETERMINATION

The gross landbase was examined and assigned to one of a number of categories based on the netdown procedure illustrated in below. The joint FMA area landbase categories are illustrated on Map 6-1 (full size map can be found in Appendix E, Map E-3), and the species group and age distribution of the net productive area is presented on Map 6-2 (full size map can be found in Appendix E, Map E-4).

FIGURE 6-1: NETDOWN PROCEDURES



MAP 6-1: LANDBASE CATEGORIES

For map, please see:

APPENDIX E

MAP E-3

MAP 6-2: SPECIES GROUP AGE DISTRIBUTION OF THE NET PRODUCTIVE AREA

For map, please see:

APPENDIX E

MAP E-4

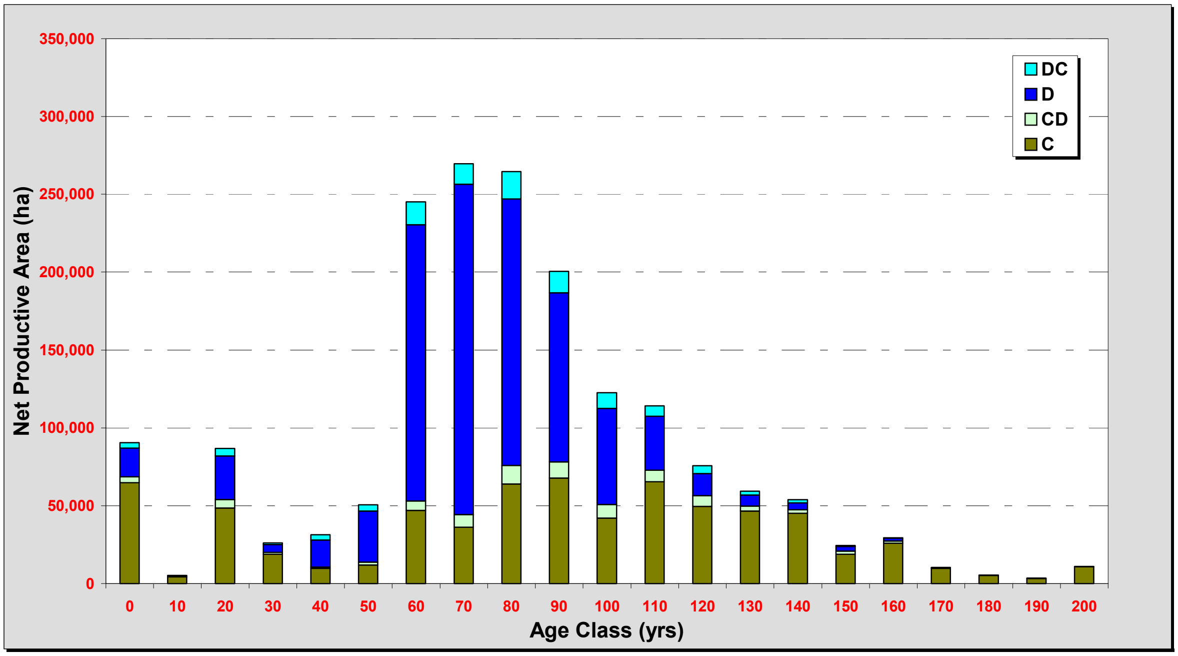
6.2.3 NET LANDBASE ESTIMATES

The following table summarizes the area within each landbase category by FMU and the joint FMA. Figure 6-2 illustrates the age class distribution by overstory species group for the net productive landbase.

TABLE 6-1: LANDBASE SUMMARY

Landbase Category	F24H Area (ha)	F25H Area (ha)	FMA Area (ha)
Gross Area	**960,894**	**2,599,417**	**3,560,311**
♦ Water	14,378	20,760	35,138
♦ Land use dispositions (REC, DRS, PNT)	611	17,206	17,817
Gross FMA Land Area	**945,905**	**2,561,451**	**3,507,356**
Inoperable			
♦ Islands in Peace River	3,127		3,127
♦ Ponton River Corridor	3,700	1,989	5,689
Subtotal	*6,827*	*1,989*	*8,816*
Watercourse Buffers			
♦ Trumpeter Swan Buffers (200 m)	0	875	875
♦ Lake Buffers (100 m)	6,025	11,847	17,871
♦ River Buffers (60 m)	21,384	55,526	76,911
♦ Stream Buffers (30 m)	13,879	31,876	45,755
Subtotal	*41,288*	*100,125*	*141,412*
Non-Forested			
♦ Natural	227,393	422,530	649,923
♦ Anthropogenic	934	16,007	16,941
Subtotal	*228,327*	*438,537*	*666,864*
Net Forested Area	**669,463**	**2,020,800**	**2,690,263**
Non-merchantable			
♦ TPR = “U”	142,246	548,144	690,389
♦ Black Spruce with TPR = “F”	24,105	125,779	149,885
♦ Larch Leading	8,444	26,539	34,984
Subtotal	*174,795*	*700,462*	*875,258*
Potentially Productive			
♦ Non-salvageable Burns	19,039	12,524	31,563
♦ Pre-fire Cutblocks	1,432	2,506	3,937
Subtotal	*20,471*	*15,030*	*35,500*
Net Productive Area	**474,197**	**1,305,308**	**1,779,504**

FIGURE 6-2: NET LANDBASE AGE CLASS DISTRIBUTION BY OVERSTORY SPECIES GROUP–ENTIRE FMA



6.3 GROWTH AND YIELD

The following section provides an overview of the growth and yield analyses for the joint FMA area. A more detailed description of the methods used in predicting volume estimates can be found in the accompanying "Growth and Yield Information" (May 31, 2002) document.

6.3.1 VOLUME SAMPLING

The volume sampling program for the joint FMA area included the collection of detailed field information describing the density and volume by species for individual sampling strata. The objective was to acquire sufficient data to calculate conifer and deciduous volume estimates, at various utilization standards, for specific sub-populations of the productive forest landbase. The field program was also intended to provide temporary plot information to be used in the construction of empirical yield curves.

The volume sampling program collected data from across FMUs F23, F24H and F25H, and ran from 1995 to 2000. The data was collected using procedures established in the "Volume Sampling Field Manual – Footner Lake Inventory" (The Forestry Corp., 1997), which can be found in Appendix A of the accompanying "Growth and Yield Information" document.

6.3.2 YIELD CURVE STRATIFICATION

Detailed descriptions of the yield strata assignments to the landbase are provided in the accompanying net landbase documentation. The number of plots and net landbase areas are provided for each stratum class in Figure 6-3.

Figure 6-4 and Figure 6-5 contain the final proposed yield curves for the conifer and deciduous strata.

FIGURE 6-3: YIELD CURVE DEVELOPMENT

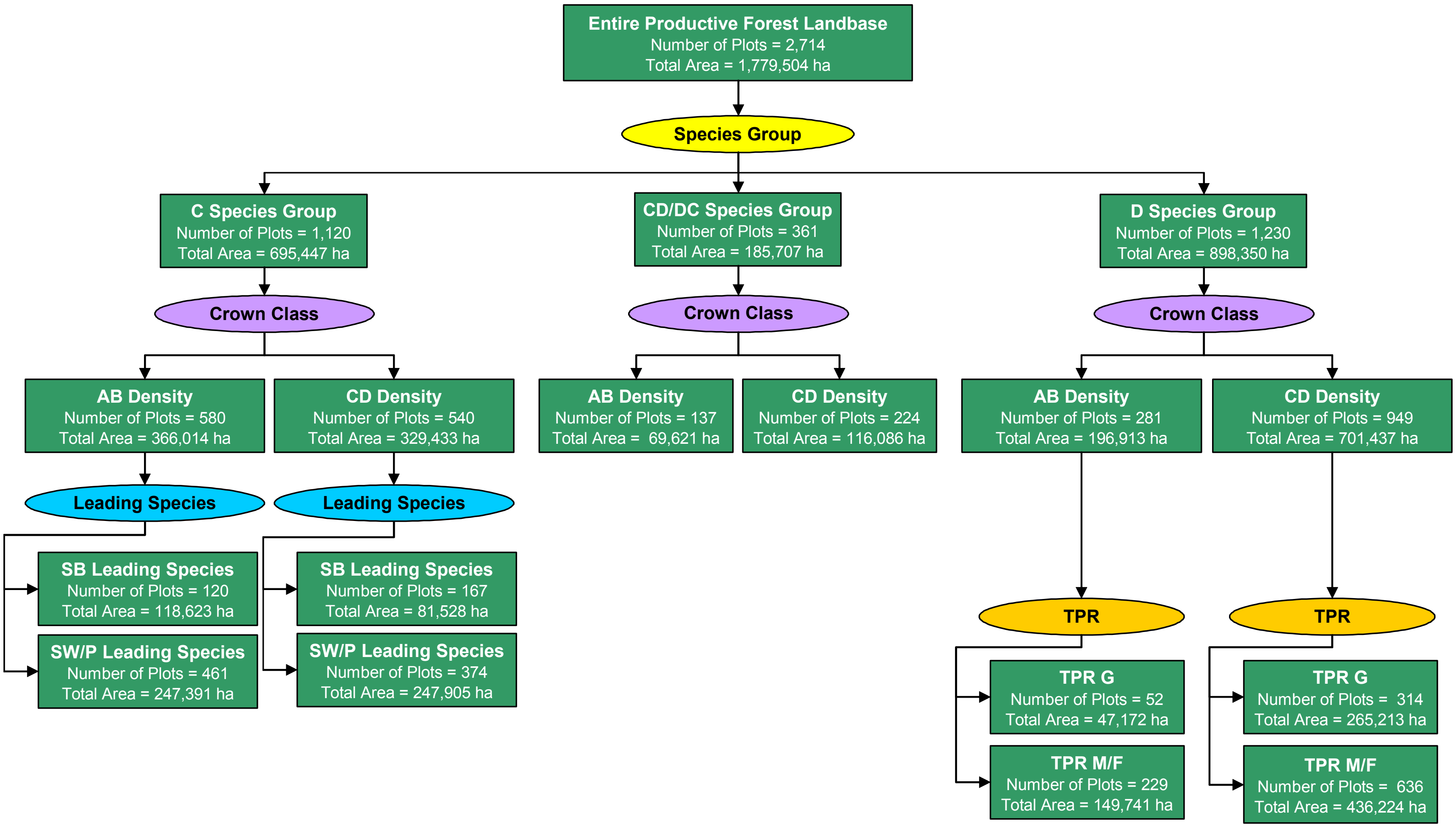
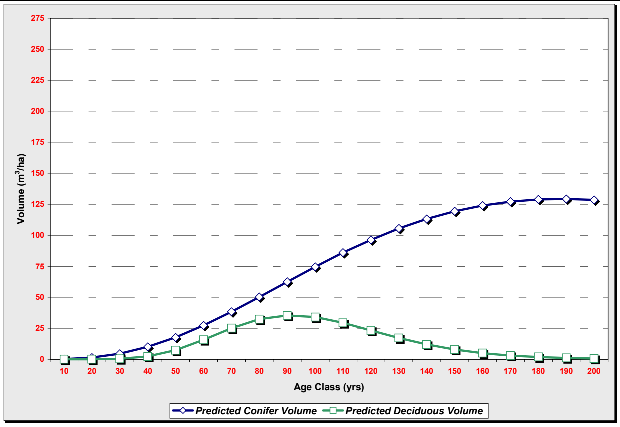
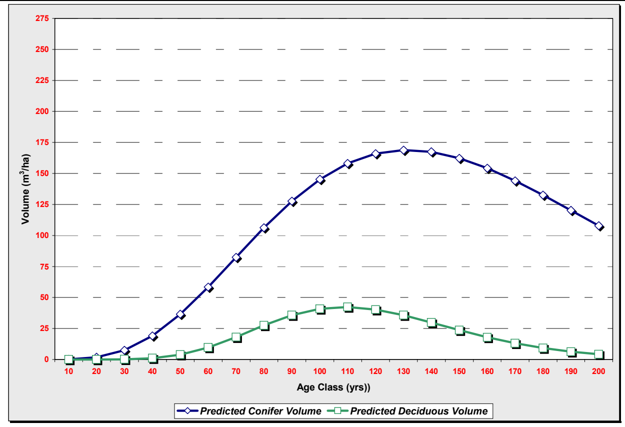


FIGURE 6-4: YIELD CURVES – AB CROWN CLOSURE

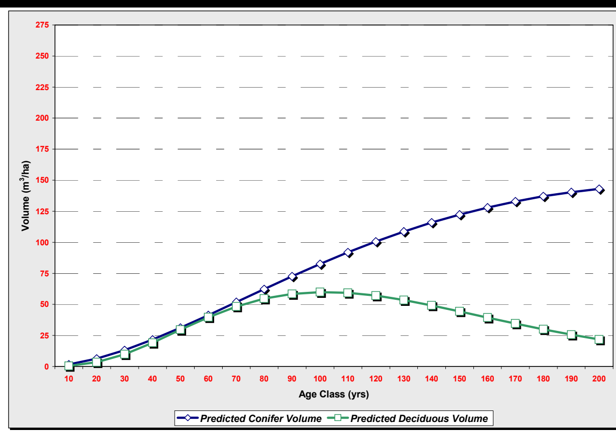
AB-C-SB-A



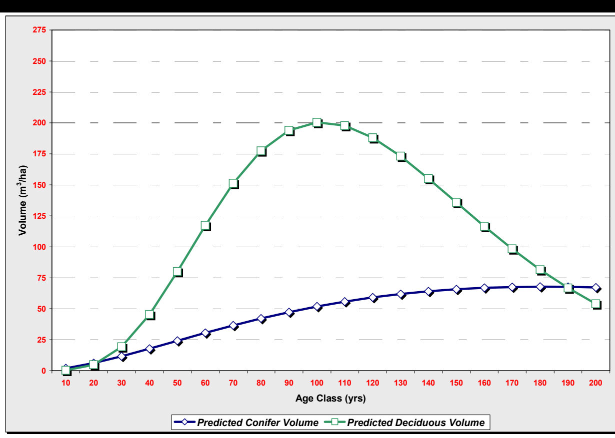
AB-C-SW-A



AB-MX-A-A



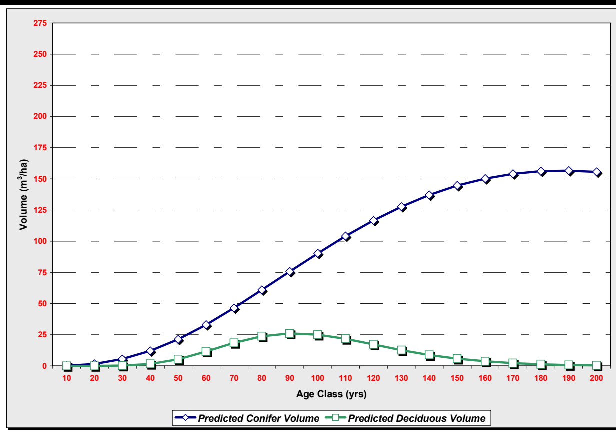
AB-D-A-G



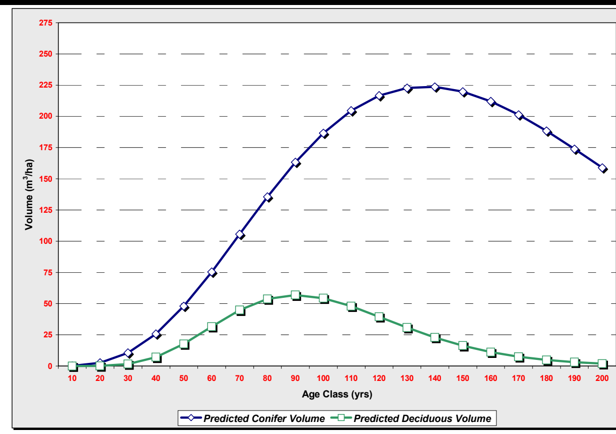
AB-D-A-MF

FIGURE 6-5: YIELD CURVES – CD CROWN CLOSURE

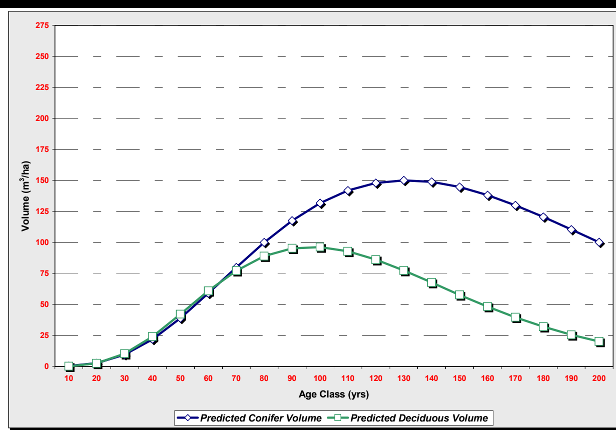
CD-C-SB-A



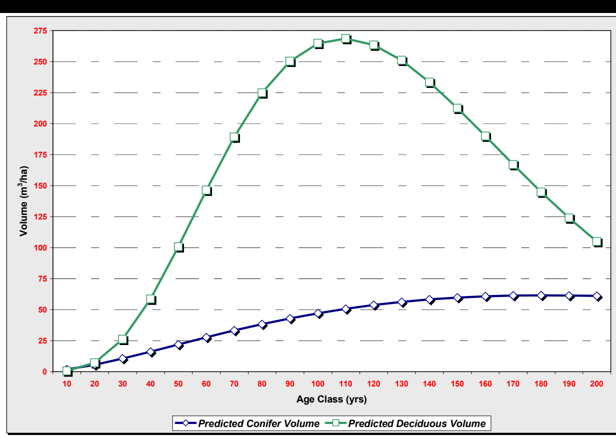
CD-C-SW-A



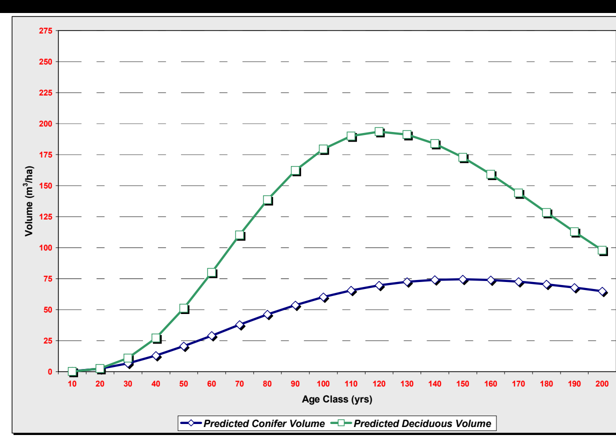
CD-MX-A-A



CD-D-A-G



CD-D-A-MF



6.3.2.1 CULL DEDUCTION

Cull deductions were not applied during yield curve development. The following cull deductions were applied to the yield curves during the timber supply analysis:

- 2% conifer cull deduction;
- 9% deciduous cull deduction.

6.3.2.2 YIELD STRATA TRANSITION

Stands were assumed to regenerate on the fully stocked yield curve (i.e., AB density regenerates to CD density) with the same species composition and TPR (see Table 6-2).

TABLE 6-2: YIELD CURVE TRANSITION

CROWN CLOSURE	SPECIES GROUP	LEADING SPECIES	TPR	YIELD CURVE STRATA	TRANSITION CURVE STRATA
A or B	C	SB	ALL	AB-C-SB-A	CD-C-SB-A
A or B	C	SW, PL, PJ, P or FB	ALL	AB-C-SW-A	CD-C-SW-A
A or B	CD\DC	ALL	ALL	AB-MX-A-A	CD-MX-A-A
A or B	D	ALL	G	AB-D-A-G	CD-D-A-G
A or B	D	ALL	M\F	AB-D-A-MF	CD-D-A-MF
C or D	C	SB	ALL	CD-C-SB-A	CD-C-SB-A
C or D	C	SW, PL, PJ, P or FB	ALL	CD-C-SW-A	CD-C-SW-A
C or D	CD\DC	ALL	ALL	CD-MX-A-A	CD-MX-A-A
C or D	D	ALL	G	CD-D-A-G	CD-D-A-G
C or D	D	ALL	M\F	CD-D-A-MF	CD-D-A-MF

6.4 TIMBER SUPPLY ANALYSIS PROCEDURES

6.4.1 MODELS USED

This section summarizes the procedures, results and assumptions applied in determining the annual allowable harvest level for the joint FMA area.

6.4.1.1 LRSYA

Long-run sustained-yield average (LRSYA) is a measure of forest productivity that is calculated as the sum of growth per year of regenerated stands at a selected rotation age. It is derived from the theoretical concept of a regulated forest with static and uniform age class distribution, a single rotation age and a single yield function operating across equally productive sites. Under this assumption, the annual harvest equates the annual growth in the oldest age class. LRSYA is calculated using the following formula:

$$LRSYA = \sum_{1}^{i} MAI_i \bullet A_i$$

Where:

LRSYA = long-run sustained-yield average (m^3/yr)

MAI_i = mean annual increment (m^3/ha/yr) for yield class "i"

A_i = net area (ha) for yield class "i"

The LRSYA estimates are provided in the following tables:

TABLE 6-3: LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – FMA

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	118,623	0.73	0.31	86,595	36,773
AB-C-SW-A	247,391	1.42	0.37	351,295	91,535
AB-MX-A-A	69,621	0.81	0.55	56,393	38,292
AB-D-A-G	47,173	0.51	1.82	24,058	85,854
AB-D-A-MF	149,741	0.67	1.03	100,326	154,233
CD-C-SB-A	81,527	0.88	0.23	71,744	18,751
CD-C-SW-A	247,905	1.83	0.49	453,667	121,474
CD-MX-A-A	116,086	1.29	0.88	149,750	102,155
CD-D-A-G	265,213	0.46	2.41	121,998	639,163
CD-D-A-MF	436,224	0.59	1.63	257,372	711,046
Total	**1,779,504**			**1,673,200**	**1,999,276**

TABLE 6-4: LRSYA ESTIMATES: FULLY STOCKED REGENERATION TRANSITION – FMA

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	118,623	0.88	0.23	104,388	27,283
AB-C-SW-A	247,391	1.83	0.49	452,726	121,222
AB-MX-A-A	69,621	1.29	0.88	89,812	61,267
AB-D-A-G	47,173	0.46	2.41	21,699	113,686
AB-D-A-MF	149,741	0.59	1.63	88,347	244,077
CD-C-SB-A	81,527	0.88	0.23	71,744	18,751
CD-C-SW-A	247,905	1.83	0.49	453,667	121,474
CD-MX-A-A	116,086	1.29	0.88	149,750	102,155
CD-D-A-G	265,213	0.46	2.41	121,998	639,163
CD-D-A-MF	436,224	0.59	1.63	257,372	711,046
Total	**1,779,504**			**1,811,504**	**2,160,124**

TABLE 6-5: LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – FMA EXCLUDING FMU F2

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	114,655	0.73	0.31	83,698	35,543
AB-C-SW-A	190,219	1.42	0.37	270,111	70,381
AB-MX-A-A	58,757	0.81	0.55	47,593	32,316
AB-D-A-G	35,083	0.51	1.82	17,893	63,852
AB-D-A-MF	134,774	0.67	1.03	90,299	138,818
CD-C-SB-A	76,123	0.88	0.23	66,988	17,508
CD-C-SW-A	212,913	1.83	0.49	389,630	104,327
CD-MX-A-A	104,586	1.29	0.88	134,916	92,035
CD-D-A-G	241,459	0.46	2.41	111,071	581,915
CD-D-A-MF	408,443	0.59	1.63	240,981	665,762
Total	**1,577,012**			**1,453,181**	**1,802,458**

TABLE 6-6: LRSYA ESTIMATES: FULLY STOCKED REGENERATION TRANSITION – FMA EXCLUDING FMU F2

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	114,655	0.88	0.23	100,897	26,371
AB-C-SW-A	190,219	1.83	0.49	348,101	93,207
AB-MX-A-A	58,757	1.29	0.88	75,797	51,706
AB-D-A-G	35,083	0.46	2.41	16,138	84,551
AB-D-A-MF	134,774	0.59	1.63	79,517	219,682
CD-C-SB-A	76,123	0.88	0.23	66,988	17,508
CD-C-SW-A	212,913	1.83	0.49	389,630	104,327
CD-MX-A-A	104,586	1.29	0.88	134,916	92,035
CD-D-A-G	241,459	0.46	2.41	111,071	581,915
CD-D-A-MF	408,443	0.59	1.63	240,981	665,762
Total	**1,577,012**			**1,564,036**	**1,937,066**

TABLE 6-7: LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – FMU F25H

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	107,458	0.73	0.31	78,445	33,312
AB-C-SW-A	165,670	1.42	0.37	235,251	61,298
AB-MX-A-A	53,499	0.81	0.55	43,334	29,424
AB-D-A-G	27,727	0.51	1.82	14,141	50,464
AB-D-A-MF	116,795	0.67	1.03	78,252	120,298
CD-C-SB-A	70,510	0.88	0.23	62,049	16,217
CD-C-SW-A	176,881	1.83	0.49	323,692	86,672
CD-MX-A-A	91,700	1.29	0.88	118,293	80,696
CD-D-A-G	159,231	0.46	2.41	73,246	383,746
CD-D-A-MF	335,838	0.59	1.63	198,144	547,415
Total	**1,305,308**			**1,224,847**	**1,409,542**

TABLE 6-8: LRSYA ESTIMATES: FULLY STOCKED REGENERATION TRANSITION – FMU F25H

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	107,458	0.88	0.23	94,563	24,715
AB-C-SW-A	165,670	1.83	0.49	303,175	81,178
AB-MX-A-A	53,499	1.29	0.88	69,014	47,079
AB-D-A-G	27,727	0.46	2.41	12,755	66,823
AB-D-A-MF	116,795	0.59	1.63	68,909	190,375
CD-C-SB-A	70,510	0.88	0.23	62,049	16,217
CD-C-SW-A	176,881	1.83	0.49	323,692	86,672
CD-MX-A-A	91,700	1.29	0.88	118,293	80,696
CD-D-A-G	159,231	0.46	2.41	73,246	383,746
CD-D-A-MF	335,838	0.59	1.63	198,144	547,415
Total	**1,305,308**			**1,323,840**	**1,524,917**

TABLE 6-9: LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – FMU F24H

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	11,165	0.73	0.31	8,150	3,461
AB-C-SW-A	81,722	1.42	0.37	116,045	30,237
AB-MX-A-A	16,122	0.81	0.55	13,059	8,867
AB-D-A-G	19,445	0.51	1.82	9,917	35,390
AB-D-A-MF	32,946	0.67	1.03	22,074	33,934
CD-C-SB-A	11,018	0.88	0.23	9,695	2,534
CD-C-SW-A	71,025	1.83	0.49	129,975	34,802
CD-MX-A-A	24,385	1.29	0.88	31,457	21,459
CD-D-A-G	105,982	0.46	2.41	48,752	255,417
CD-D-A-MF	100,387	0.59	1.63	59,228	163,631
Total	**474,197**			**448,353**	**589,732**

TABLE 6-10: LRSYA ESTIMATES: FULLY STOCKED REGENERATION TRANSITION – FMU F24H

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	11,165	0.88	0.23	9,825	2,568
AB-C-SW-A	81,722	1.83	0.49	149,551	40,044
AB-MX-A-A	16,122	1.29	0.88	20,797	14,187
AB-D-A-G	19,445	0.46	2.41	8,945	46,862
AB-D-A-MF	32,946	0.59	1.63	19,438	53,702
CD-C-SB-A	11,018	0.88	0.23	9,696	2,534
CD-C-SW-A	71,025	1.83	0.49	129,976	34,802
CD-MX-A-A	24,385	1.29	0.88	31,457	21,459
CD-D-A-G	105,982	0.46	2.41	48,752	255,417
CD-D-A-MF	100,387	0.59	1.63	59,228	163,631
Total	**474,197**			**487,665**	**635,206**

TABLE 6-11: LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – FMU F2

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	3,968	0.73	0.31	2,896	1,230
AB-C-SW-A	57,172	1.42	0.37	81,185	21,154
AB-MX-A-A	10,864	0.81	0.55	8,800	5,975
AB-D-A-G	12,089	0.51	1.82	6,165	22,002
AB-D-A-MF	14,966	0.67	1.03	10,027	15,415
CD-C-SB-A	5,404	0.88	0.23	4,756	1,243
CD-C-SW-A	34,993	1.83	0.49	64,036	17,146
CD-MX-A-A	11,500	1.29	0.88	14,835	10,120
CD-D-A-G	23,754	0.46	2.41	10,927	57,247
CD-D-A-MF	27,782	0.59	1.63	16,391	45,284
Total	**202,492**			**220,019**	**196,817**

TABLE 6-12: LRSYA ESTIMATES: FULLY STOCKED REGENERATION TRANSITION – FMU F2

YIELD CURVE	NET AREA (HA)	MAI (M^3/HA/YR) @ 100 YEARS		LRSYA (M^3/YR)	
		CONIFER	DECIDUOUS	CONIFER	DECIDUOUS
AB-C-SB-A	3,968	0.88	0.23	3,491	913
AB-C-SW-A	57,172	1.83	0.49	104,625	28,014
AB-MX-A-A	10,864	1.29	0.88	14,015	9,561
AB-D-A-G	12,089	0.46	2.41	5,561	29,135
AB-D-A-MF	14,966	0.59	1.63	8,830	24,395
CD-C-SB-A	5,404	0.88	0.23	4,756	1,243
CD-C-SW-A	34,993	1.83	0.49	64,036	17,146
CD-MX-A-A	11,500	1.29	0.88	14,835	10,120
CD-D-A-G	23,754	0.46	2.41	10,927	57,247
CD-D-A-MF	27,782	0.59	1.63	16,391	45,284
Total	**202,492**			**247,468**	**223,058**

6.4.1.2 HARVEST SIMULATION

SILVASYM is Silvacom's proprietary timber supply simulation model. The model simulates the effect of management strategies on sustainable harvest levels over a specified planning horizon. In its most basic form, SILVASYM is a model that cuts and grows each stand in the forest according to user-defined yield functions and forest policy constraints. SILVASYM maintains a full spatial link to the net landbase GIS coverage and attribute file over the entire planning horizon. Compartment sequencing can also be introduced to reflect "real-world" limitations, such as accessibility and multi-pass harvesting rules. Adjacency constraints can be applied on a stand-by-stand basis to control the distribution (or concentration) of the harvest and mimic operational planning strategies.

A number of sorting rules are available that define the harvest priorities assigned to each stand (e.g., cut oldest first). The simulation model uses binary search methods to assess harvest levels. Average harvest age and post-harvest forest conditions are evaluated at the end of each simulation to determine whether the even-flow harvest levels are too low or too high. Reports and GIS map products can be produced for each scenario to evaluate the condition of the forest throughout, and also at the end of the planning horizon. The table below provides a definition of the harvest simulation control parameters used in the analysis.

TABLE 6-13: HARVEST SIMULATION CONTROL PARAMETER DEFINITIONS USED IN ANALYSIS

CONSTRAINT	DEFINITION
FMA/FMU	Description of the administrative area under analysis
Planning horizon	Total time period for the analysis scenario (years)
Targeted average harvest age at the end of the planning horizon	Average age (years) of stands scheduled for harvest in the last twenty years of the planning horizon, typically with a specified tolerance
Minimum harvest age	Minimum age of stands that are eligible for harvest scheduling; may vary by yield stratum (years)
Landbase	Landbase available for analysis (e.g., discrete, single)
Sorting rules	Factors used to prioritize stands for harvest sequencing (e.g., oldest first)
Harvest flow constraint	Scheduled harvest level of the primary species between harvest periods (may have tolerances applied)
Yield curve sets	Predicted yields for individual strata
Cull deductions	Percent reduction of predicted yields to account for losses from defects
Regeneration transition	Assumptions applied for the regeneration of stands scheduled for harvest
Introduce harvest plans	Incorporation of existing harvest plans into the harvest sequence
Spatial stand adjacency	The process of protecting other resource values by spatially identifying and scheduling inventory polygons (stands) that share a boundary, or are within a specified distance to that polygon
Adjacency: Time horizon	Total time period that stand adjacency is incorporated into the analysis (years)
Adjacency: Green-up	The time period applied restricting the harvest of adjacent polygons (years)
Adjacency: Accumulate adjacent stands	Maximum total area of adjacent stands scheduled for harvest in the same harvest period
Modulation	Reduces the annual variability in the harvest of the secondary species by distributing the "peaks" in secondary harvest flow to periods with little or no secondary harvest
Compartment sequencing	Prioritization of administrative planning units for harvest scheduling
Number of compartments open simultaneously	Number of compartments available for harvest scheduling at any given time

6.4.2 TIMBER SUPPLY ASSUMPTIONS

The following assumptions were used to formulate the preferred management strategy.

6.4.2.1 ADJACENCY/GREEN-UP

Adjacency is the process of protecting other resource values by spatially identifying and scheduling inventory polygons (stands) that share a boundary or are within a specified distance to that polygon. Thus "real-world" decision rules can be introduced into the TSA. Two different decision rules are typically analysed, which are:

- Allowing the accumulation of adjacent stands into larger harvest units (cutblocks); and
- Applying a delay factor (green-up) which restricts the harvest of adjacent polygons.

Green-up is defined as the time required to re-establish vegetation after a disturbance (Interim Forest Management Planning Manual, April 1998). A 20-year green-up constraint has been applied to stands adjacent to harvested blocks.

6.4.2.2 COMPARTMENT AND CUT SEQUENCING[13]

Compartments have been defined for the entire joint FMA area. Map 6-3 depicts the units used for operational harvest planning (full size map can be found in Appendix E, Map E-1). The compartment sequence was determined based on a combination of operational considerations and scheduling constraints. The compartment sequencing used in the timber supply analyses is outlined in Table 6-19 at the end of this section.

6.4.2.3 CUTBLOCK SIZE LIMITATIONS

A block size limitation of 300 ha was applied in the two pass even flow over two rotations harvest simulations.

6.4.2.4 MERCHANTABILITY/ECONOMIC LIMITATIONS

The current utilization standard for the joint FMA is 15/11 conifer and 15/10 deciduous utilization.

[13] *The compartment and cut sequencing does not include currently planned areas.*

MAP 6-3: COMPARTMENT AND OPERATING AREA BOUNDARIES

For map, please see:

APPENDIX E

MAP E-1

6.4.3 SUMMARY OF RESULTS

A summary of the required timber supply analyses is presented in the following tables, which includes the harvest simulation control parameters, detailed profiles of simulated harvest flows and post-harvest forest conditions, and 20 year harvest sequence maps[14] (full size maps can be found in Appendix E). The required runs include:

- One pass even flow over two rotations
  - With "status quo" regeneration strategy – (run no. 5F),
  - With fully stocked regeneration strategy – (run no. 10F);
- Two pass even flow over two rotations (fully stocked regeneration strategy) – (run no. 30C) ;
- Two pass even flow for one rotation; step up/down to LRSYA (fully stocked regeneration strategy) – (run no. 61C); and
- Two pass even flow over two rotations with harvest constraints (fully stocked regeneration strategy) – (run no. 60C).

[14] *The 20 year harvest sequence map has not been provided for run no. 61C. The 60C first 20-year harvest sequence map is identical to the 61C run because the same harvest simulation control parameters were applied for the first rotation (100 years).*

6.4.3.1 ONE PASS EVEN FLOW OVER TWO ROTATIONS (“STATUS QUO” REGENERATION STRATEGY) – RUN NO. 5F

TABLE 6-14: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. 5F

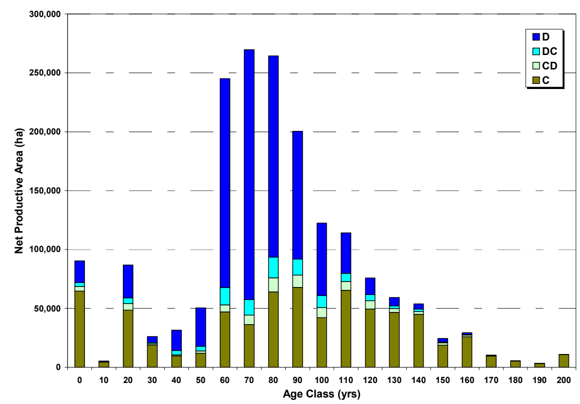
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Oldest first; 2) Modulate deciduous flow; 3) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Status quo
Introduce harvest plans	Not applied
Spatial stand adjacency	Not applied
Adjacency: Time horizon	N/A
Adjacency: Green-up	N/A
Adjacency: Accumulate adjacent stands	N/A
Modulation	Applied
Compartment sequencing	Not applied
Number of compartments open simultaneously	N/A

FIGURE 6-6: HARVEST SIMULATION RESULTS – RUN NO. 5F

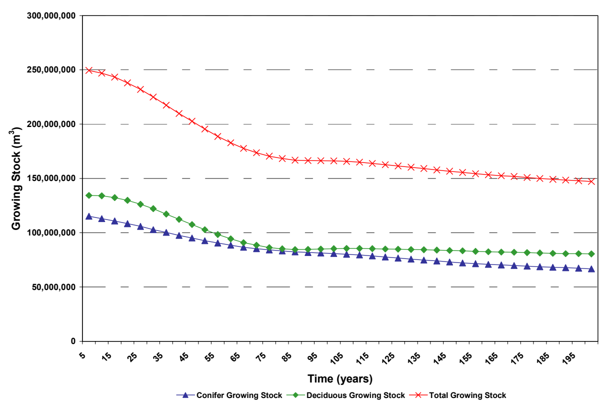
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1,775,000
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	1,921,000

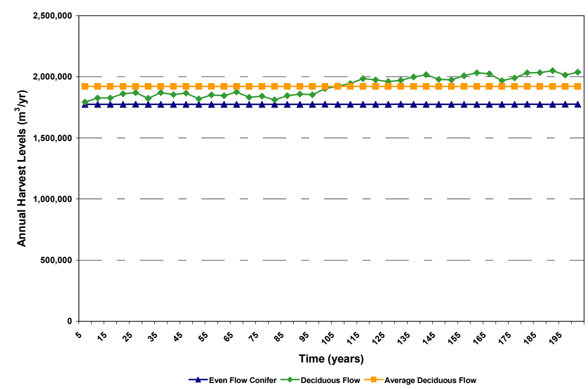
INITIAL AGE CLASS DISTRIBUTION



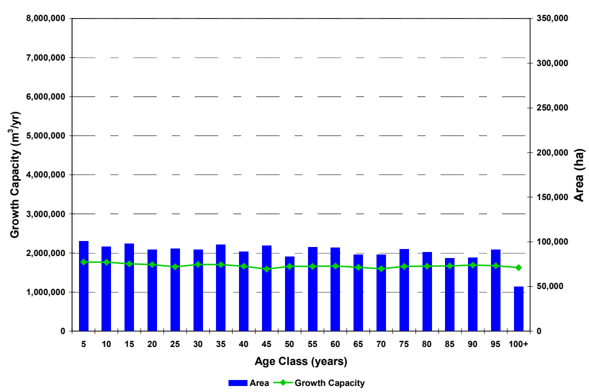
GROWING STOCK



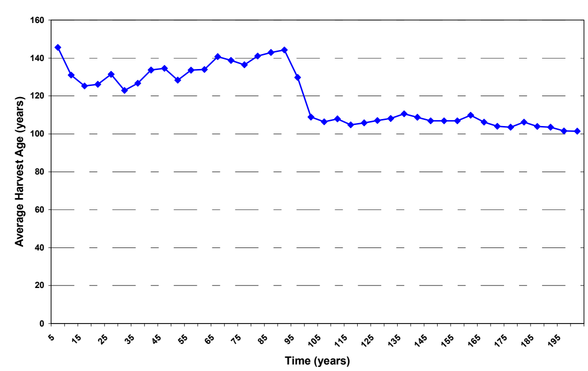
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



MAP 6-4: 20 YEAR HARVEST SEQUENCE – ONE PASS EVEN FLOW OVER TWO ROTATIONS – RUN NO. 5F

For map, please see:

APPENDIX E

MAP E-5

6.4.3.2 ONE PASS EVEN FLOW OVER TWO ROTATIONS (FULLY STOCKED REGENERATION STRATEGY) – RUN NO. 10F

TABLE 6-15: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. 10F

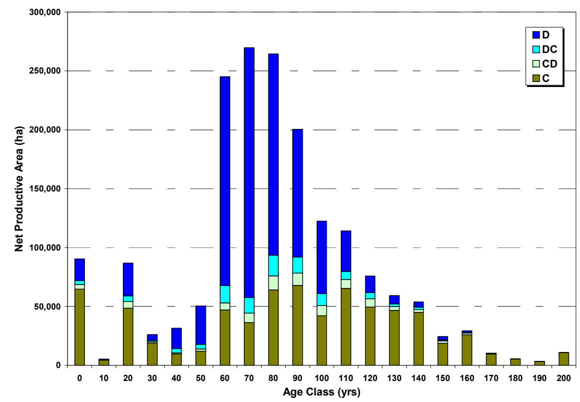
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Oldest first; 2) Modulate deciduous flow; 3) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Fully stocked
Introduce harvest plans	Not applied
Spatial stand adjacency	Not applied
Adjacency: Time horizon	N/A
Adjacency: Green-up	N/A
Adjacency: Accumulate adjacent stands	N/A
Modulation	Applied
Compartment sequencing	Not applied
Number of compartments open simultaneously	N/A

FIGURE 6-7: HARVEST SIMULATION RESULTS – RUN NO. 10F

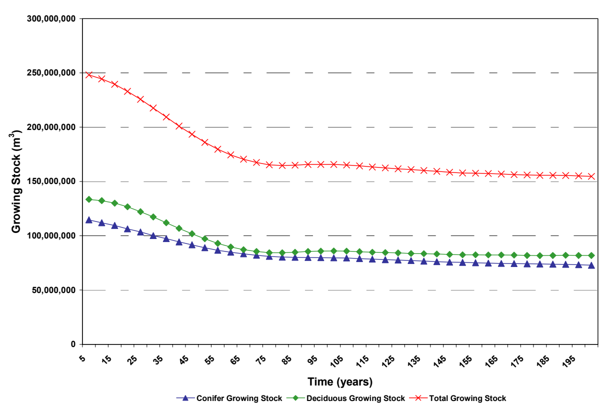
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1,862,000
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	2,092,000

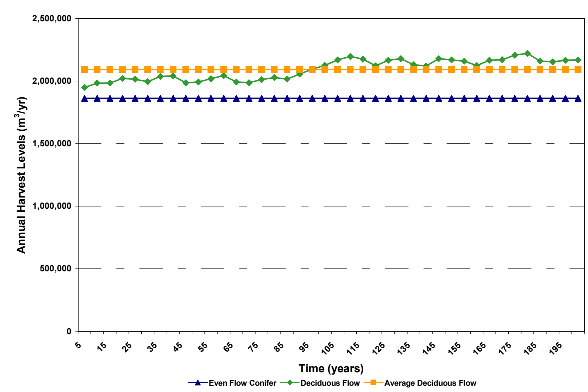
INITIAL AGE CLASS DISTRIBUTION



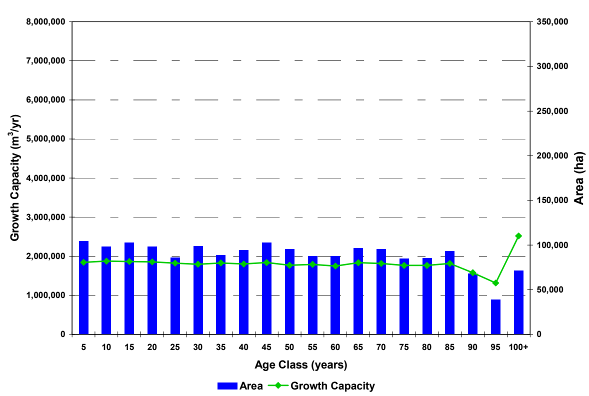
GROWING STOCK



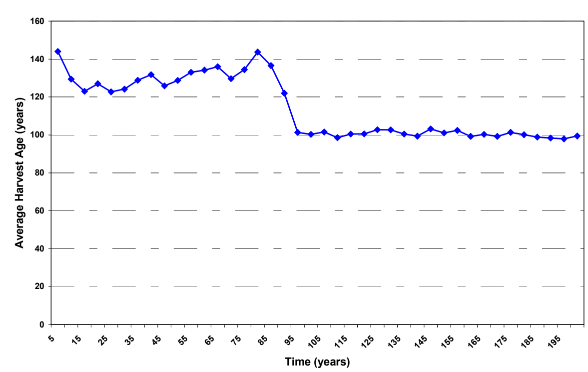
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



MAP 6-5: 20 YEAR HARVEST SEQUENCE – ONE PASS EVEN FLOW OVER TWO ROTATIONS – RUN NO. 10F

For map, please see:

APPENDIX E

MAP E-6

6.4.3.3 TWO PASS EVEN FLOW OVER TWO ROTATIONS (FULLY STOCKED REGENERATION STRATEGY) – RUN NO. 30C

TABLE 6-16: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. 30C

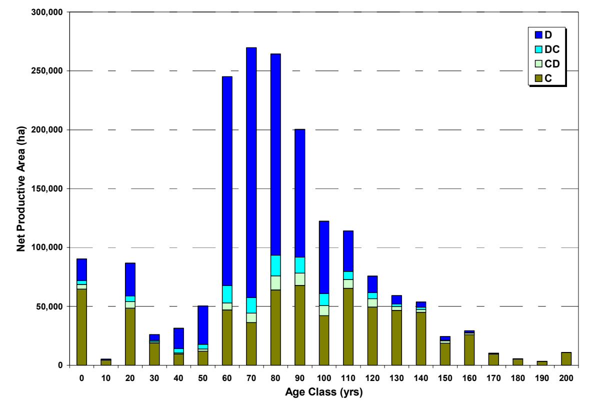
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Oldest first; 2) Modulate deciduous flow; 3) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Fully stocked
Introduce harvest plans	Not applied
Spatial stand adjacency	Not applied
Adjacency: Time horizon	N/A
Adjacency: Green-up	N/A
Adjacency: Accumulate adjacent stands	N/A
Modulation	Applied
Compartment sequencing	Applied
Number of compartments open simultaneously	23

FIGURE 6-8: HARVEST SIMULATION RESULTS – RUN NO. 30C

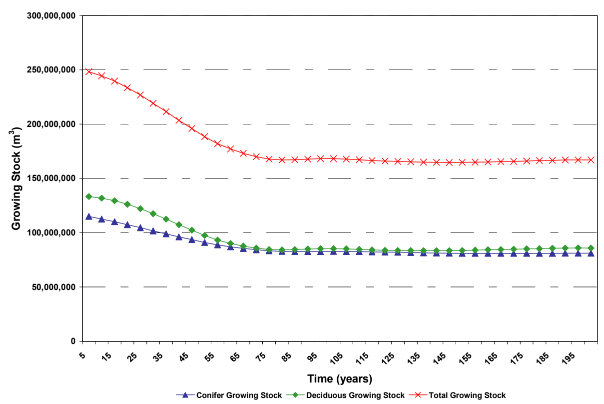
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1,810,000
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	2,051,000

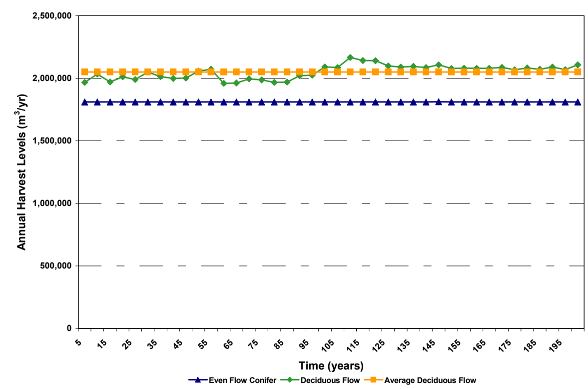
INITIAL AGE CLASS DISTRIBUTION



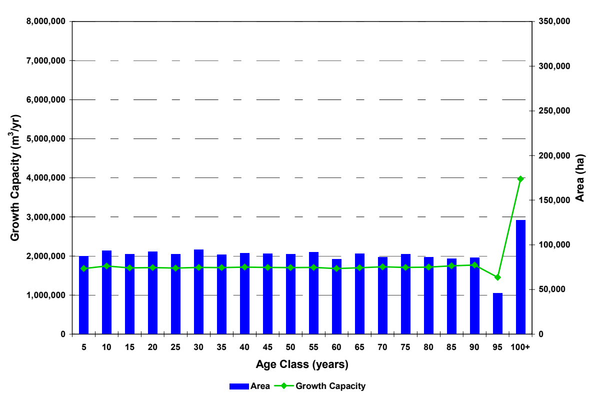
GROWING STOCK



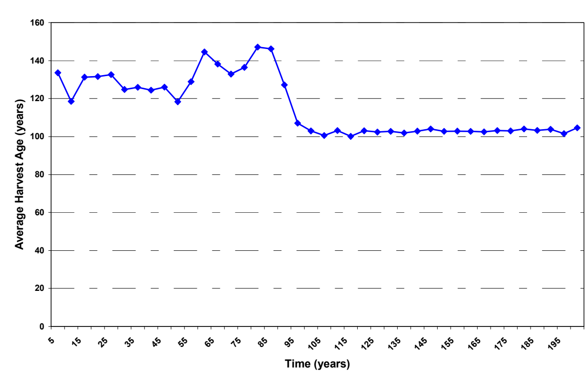
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



MAP 6-6: 20 YEAR HARVEST SEQUENCE – TWO PASS EVEN FLOW OVER TWO ROTATIONS – RUN NO. 30C

For map, please see:

APPENDIX E

MAP E-7

6.4.3.4 TWO PASS EVEN FLOW FOR ONE ROTATION; STEP UP/DOWN TO LRSYA (FULLY STOCKED REGENERATION STRATEGY) – RUN NO. 61C

TABLE 6-17: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. 61C

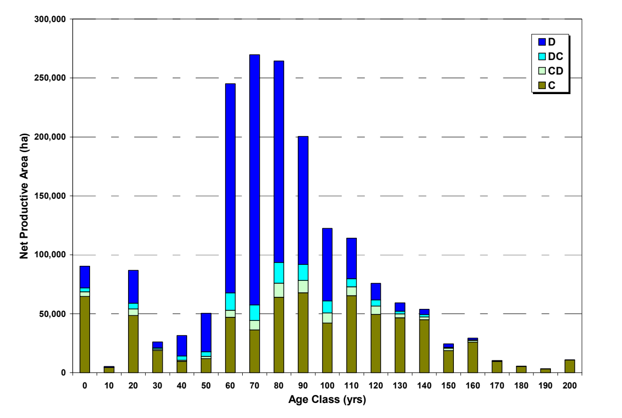
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Oldest first; 2) Modulate deciduous flow; 3) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Fully stocked
Introduce harvest plans	Not applied
Spatial stand adjacency	Applied
Adjacency: Time horizon	65 years
Adjacency: Green-up	20 years
Adjacency: Accumulate adjacent stands	Applied (max. 300 ha)
Modulation	Applied
Compartment sequencing	Applied
Number of compartments open simultaneously	26

FIGURE 6-9: HARVEST SIMULATION RESULTS – RUN NO. 61C

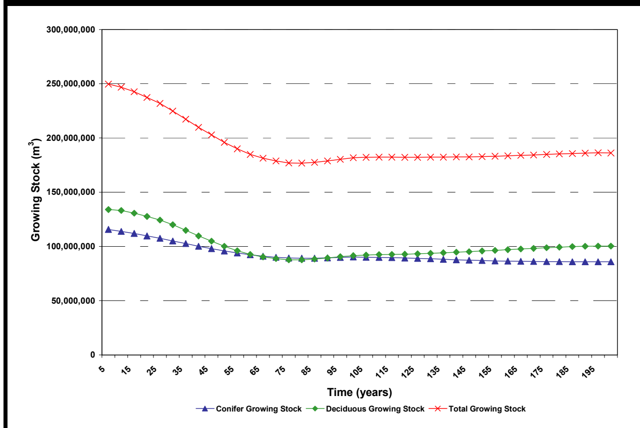
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1,680,000
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	1,911,000

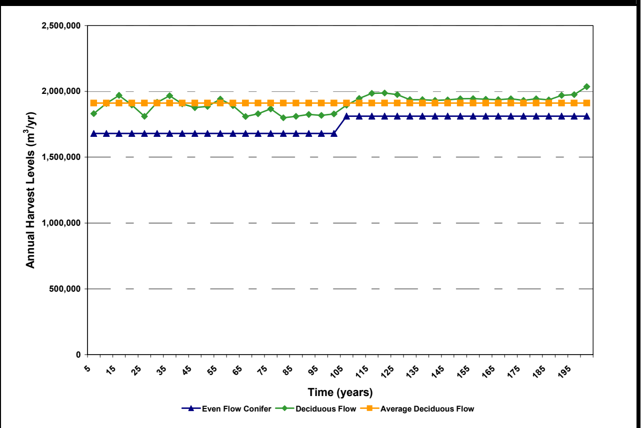
INITIAL AGE CLASS DISTRIBUTION



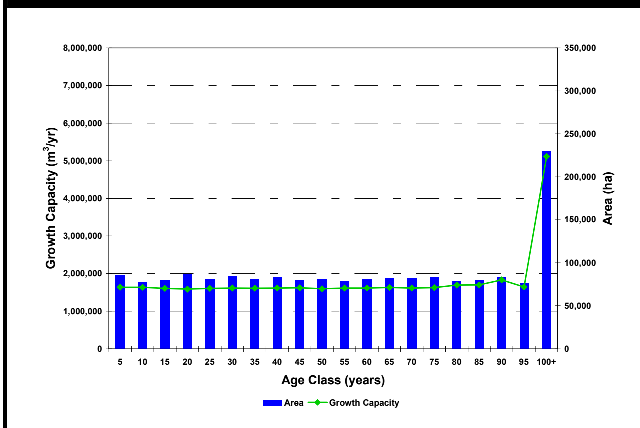
GROWING STOCK



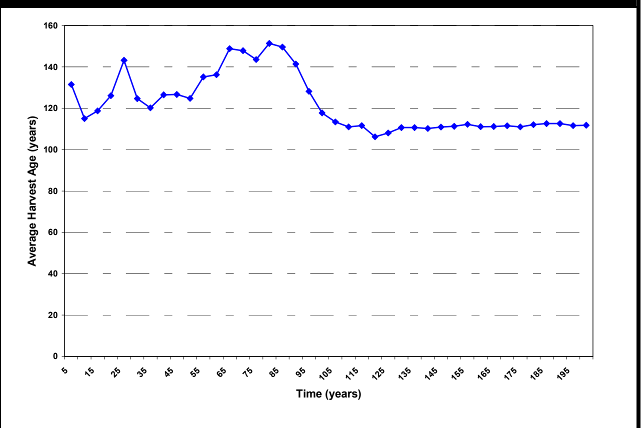
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



6.4.3.5 TWO PASS EVEN FLOW OVER TWO ROTATIONS WITH HARVEST CONSTRAINTS (FULLY STOCKED REGENERATION STRATEGY) – RUN NO. 60C

TABLE 6-18: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. 60C

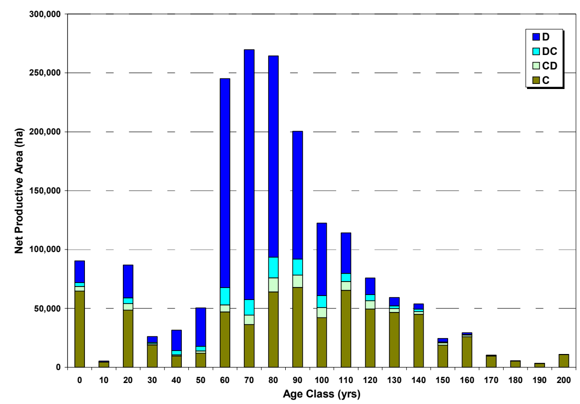
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Oldest first; 2) Modulate deciduous flow; 3) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Fully stocked
Introduce harvest plans	Not applied
Spatial stand adjacency	Applied
Adjacency: Time horizon	65 years
Adjacency: Green-up	20 years
Adjacency: Accumulate adjacent stands	Applied (max. 300 ha)
Modulation	Applied
Compartment sequencing	Applied (See Table 6-19 for summary of area harvested by compartment by 20 year period)
Number of compartments open simultaneously	26

FIGURE 6-10: HARVEST SIMULATION RESULTS – RUN NO. 60C

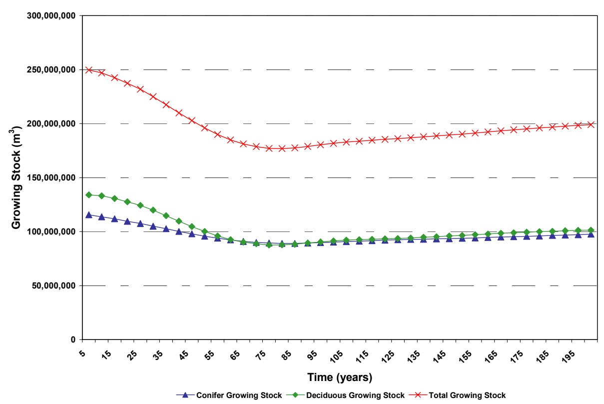
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1,680,000
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	1,884,000

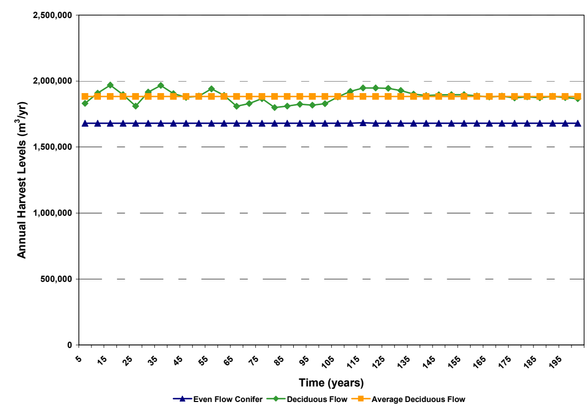
INITIAL AGE CLASS DISTRIBUTION



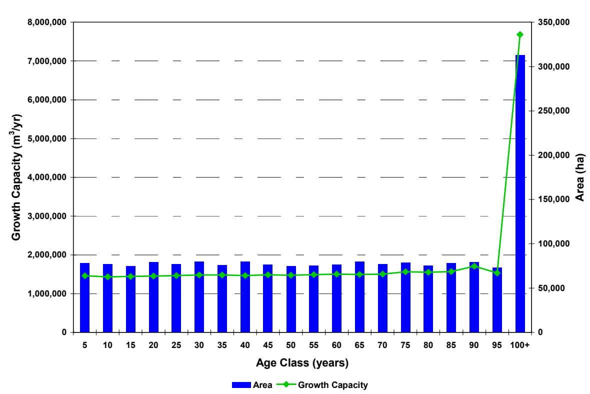
GROWING STOCK



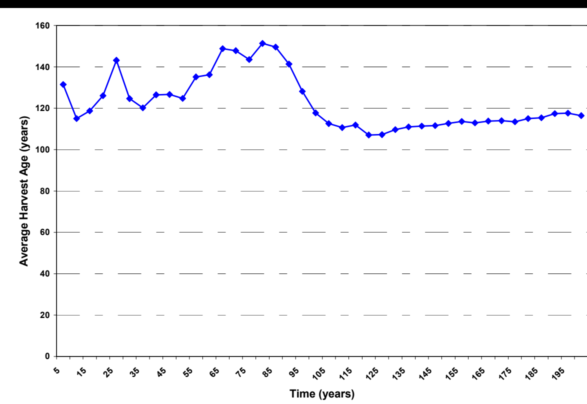
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



MAP 6-7: 20 YEAR HARVEST SEQUENCE – TWO PASS EVEN FLOW OVER TWO ROTATIONS WITH HARVEST CONSTRAINTS – RUN NO. 60C

For map, please see:

APPENDIX E

MAP E-8

TABLE 6-19: AREA HARVESTED BY COMPARTMENT BY 20 YEAR PERIOD – RUN NO. 60C

COMPARTMENT	AREA(HA) HARVESTED BY 20 YEAR PERIOD					TOTAL AREA(ha)
	1-20	21-40	41-60	61-80	81-100	
BASSETT-1	8,419	3,289		11,521	2,460	25,690
BASSETT-2	6,832	5,100	1,185	1,338	1,826	16,281
BASSETT-3	14,757		27,882	6,202	13,596	62,437
BASSETT-4	9,723		12,803	1,090	4,866	28,483
BASSETT-5		11,594		13,419	7,126	32,139
BISTCHO-1		1,656	185		6,711	8,552
BISTCHO-2	10,722	4,206		17,059	5,922	37,910
BISTCHO-3		9,070			18,463	27,533
BISTCHO-4		7,002		7,131	2,320	16,454
CARIBOU-1		2,257	1,154		4,990	8,402
CARIBOU-2		8,500	669		14,869	24,039
CARIBOU-3	9,635	2,204		14,050	2,045	27,934
CARIBOU-4		7,117		12,234	2,981	22,332
CARIBOU-5		8,811	691		17,525	27,027
CHINCHAGA-1	6,610	5,964	4,603	567	3,994	21,738
CHINCHAGA-2	3,416	7,886		11,399	1,062	23,763
CHINCHAGA-3	15,880		23,017	2,140	4,655	45,692
CHINCHAGA-4	3,905	8,595		12,974	1,482	26,955
CHINCHAGA-5	8,429		8,019	1,581	2,185	20,214
HAY-1	8,328		10,971	139	813	20,250
HAY-2	6,928	7,093	1,767	554	1,741	18,084
HAY-3	4,616		8,533	96	165	13,411
HAY-4	8,341		10,355	1,000	5,224	24,919
PONTON-1	2,047	1,674	3,626	89	1,300	8,735
PONTON-2		967		861	396	2,224
PONTON-3		4,278		3,491	1,428	9,197
PONTON-4		2,472	147		4,138	6,757
PONTON-5	9,004	138	9,181	1,249	147	19,718
PONTON-6		18,853		27,427	2,057	48,337
PONTON-7	7,621	1,781		13,395	1,006	23,803
RAINBOW-1	12,861		10,731	2,637	3,445	29,674
RAINBOW-2	7,051	3,057	6,898	2,275	6,303	25,584
RAINBOW-3	5,255		15,952	2,964	2,730	26,900
RAINBOW-4		11,644		7,207	12,874	31,725
RAINBOW-5	9,839	7,425	2,882	1,973	2,214	24,332
RAINBOW-6		9,054		8,747	6,495	24,296
RAINBOW-7		4,295	5,347		9,766	19,408
STEEN-1	6,639	3,858	3,862	1,059	3,318	18,736
STEEN-2	7,987		14,501	1,450	4,386	28,324
STEEN-3		5,548	2,874		13,671	22,094
STEEN-4	4,367	4,229	1,204	753	980	11,533
STEEN-5		4,506	778	5,980	2,467	13,731
STEEN-6		6,228		7,457	3,991	17,676
WABASCA-1	5,847		15,993	1,958	322	24,121
WABASCA-2	6,620		14,902	2,326	413	24,261
WABASCA-3	5,770	2,905		11,221	1,715	21,611
WABASCA-4		14,516		17,775	4,716	37,007
WABASCA-5		7,397			8,551	15,948
WABASCA-6	5,343		13,842	3,533	2,806	25,524
WADLIN-1		6,182		6,696	3,933	16,811
WADLIN-2	6,730	573	7,235	650	1,454	16,643
WADLIN-3		1,780			5,824	7,604
WADLIN-4		3,348			9,208	12,556
WADLIN-5	15,426	8,767	8,170	4,066	16,501	52,930
WADLIN-6	1,843	2,383		4,409	6,094	14,730
WADLIN-7		13,356		13,646	6,982	33,984
WADLIN-8		6,780		7,745	3,208	17,734
WATT-1	7,740	7,782	1,814	450	4,927	22,712
WATT-2		14,546		14,129	4,133	32,807
WATT-3	6,053	1,727	9,513	356	462	18,111
WATT-4	19,992		30,589	7,495	8,625	66,701
WATT-5	5,095	2,360		7,065	1,946	16,466
WATT-6	6,363		10,855	1,114	3,395	21,727
ZAMA-1	10,881		14,487	967	4,739	31,075
ZAMA-2	8,450	6,413	2,018	1,388	1,447	19,717
ZAMA-3	14,550	14,171	3,322	2,411	12,513	46,967
ZAMA-4	9,501	12,001	2,652	493	7,316	31,962
ZAMA-5		6,235		6,919	1,249	14,404
ZAMA-6		8,603		8,909	2,251	19,763
ZAMA-7	8,360	7,482	5,229	1,459	6,637	29,167
TotalArea(ha)	343,777	339,659	330,438	330,690	341,503	1,686,066

SECTION 7:
PREFERRED FOREST MANAGEMENT STRATEGY

Ref: H-065

7.0 PREFERRED FOREST MANAGEMENT STRATEGY

The preferred forest management strategy (PFMS) selected by the Companies provides for the achievement of the goals and objectives outlined in section 4. The Companies have chosen to model the AAC from forest management strategy run 60C at a substantially lower harvest level for the first 5 years of the planning horizon. The Companies' intention is to ramp-up the volume over time while maintaining sustainability. The reasons for this are explained in the following sub-sections.

7.1 RAMP-UP STRATEGY

The harvest level in forest management strategy run 60C is the basis for the preferred forest management strategy. This strategy assumes a dissolved landbase where all species are managed together. This allows for "incidental fibre" to be included and managed, since the Companies' share the landbase rather than divide it. As a result, the conifer and deciduous AAC's depend on each other to the extent that if one company is not harvesting at their AAC level then the harvest level for the other company will not be available. The reason for this is that the volume requirements for each company are directly related to harvesting activities of the other company. The Companies have a number of operational issues to resolve before they can realize the full benefits provided by a dissolved landbase that allows harvesting at that cut level.

The Companies are developing their respective facilities to accommodate the increased volume and maintain their other purchase commitments. They believe it is important to maintain the purchase agreements in place with the First Nations and Metis, accommodate salvage volume from oil and gas operations, and continue external quotas. The total volume from the FMA will not be accessed until additional capacity is realized at both facilities. This will allow all parties to continue their previous commitments.

The harvest sequence chosen provides a volume that meets the current volume capacities of the mills, while balancing the haul distance and addressing the most immediate concerns that can be resolved through harvesting. The harvest sequence assumes that all current volume supply arrangements will be maintained over the next five years. More volume may be required from the FMA if this situation changes. The volumes the Companies intend to harvest over the first five year period are as follows:

	FMS Run No. 60C First 5yr Period	**PFMS Run No. Ramp6 First 5yr Period**
	m^3/yr	**m^3/yr**
Conifer	1.68 million	**1.20 million**
Deciduous	1.88 million	**1.00 million**
TOTAL	3.56 million	**2.20 million**

A summary of the PFMS timber supply analyses is presented in the following tables, which includes the harvest simulation control parameters, detailed profiles of simulated harvest flows and post-harvest forest conditions. Refer to Map 7-1 for the 20 year harvest sequence, (full size map can be found in Appendix F, Map F-1).

7.1.1 PREFERRED FOREST MANAGEMENT STRATEGY: TWO PASS EVEN FLOW OVER TWO ROTATIONS WITH HARVEST CONSTRAINTS (FULLY STOCKED REGENERATION STRATEGY) – RUN NO. RAMP6

TABLE 7-1: HARVEST SIMULATION CONTROL PARAMETERS – RUN NO. RAMP6

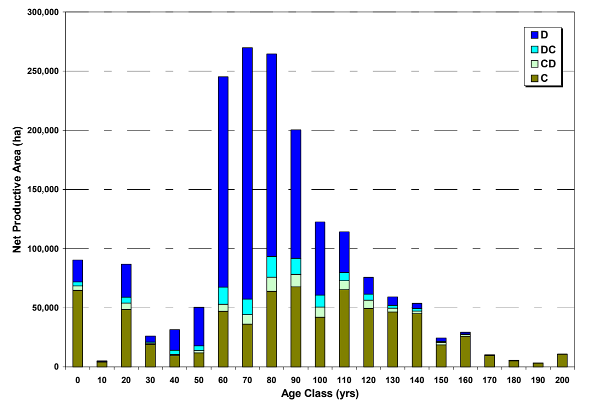
CONSTRAINT	SIMULATION PARAMETER
FMA/FMU	FMA
Planning horizon	200 years
Targeted average harvest age at the end of the planning horizon	100 ± 5
Minimum harvest age	90 conifer and 70 deciduous
Landbase	Single landbase
Sorting rules	1) Ramp-up sequence (5 year compartment volume requirements); 2) Oldest first; 3) Modulate deciduous flow; 4) Maximize conifer harvest.
Harvest flow constraint	Dual even flow
Yield curve sets	Nonlinear plot based – 15/11 conifer, 15/10 deciduous utilization
Cull deductions	Applied 2% conifer and 9% deciduous
Regeneration transition	Fully stocked
Introduce harvest plans	Applied
Spatial stand adjacency	Applied
Adjacency: Time horizon	65 years
Adjacency: Green-up	20 years
Adjacency: Accumulate adjacent stands	Applied (max. 300 ha)
Modulation	Applied
Compartment sequencing	Applied (See Table 7-2 for summary of area harvested by compartment by 20 year period)
Number of compartments open simultaneously	26

FIGURE 7-1: HARVEST SIMULATION RESULTS – RUN NO. RAMP6

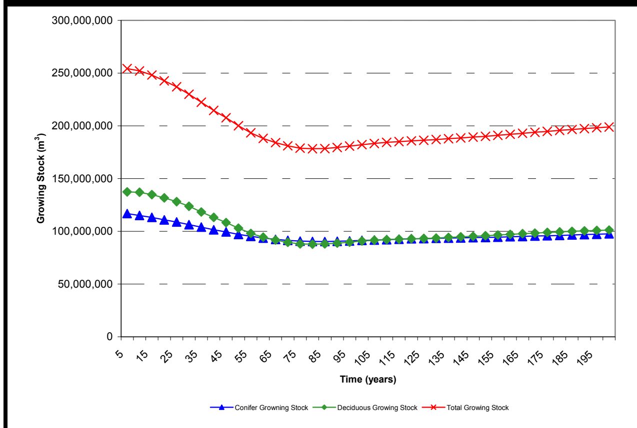
TIMBER SUPPLY SUMMARY

Net Productive Area (ha):	1,779,504
Conifer Harvest Level (m^3/yr) – 15/11 Utilization:	1.20 (first 5 years) → 1.68 million
Deciduous Harvest Level (m^3/yr) – 15/10 Utilization:	1.00 (first 5 years) → 1.88 million

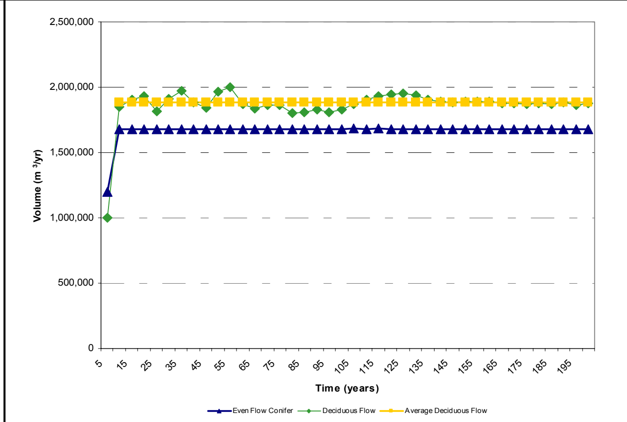
INITIAL AGE CLASS DISTRIBUTION



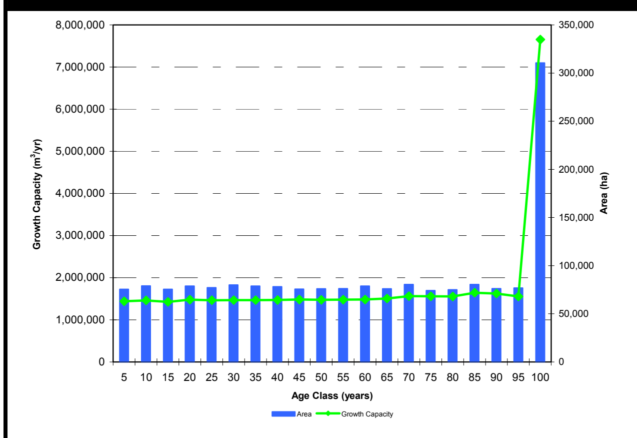
GROWING STOCK



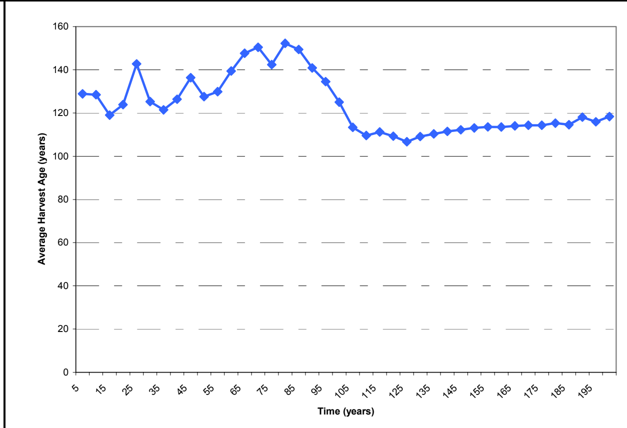
HARVEST FLOW SUMMARY



POST HARVEST FOREST CONDITIONS



AVERAGE HARVEST AGE BY 5 YEAR ITERATION



MAP 7-1: PFMS 20 YEAR HARVEST SEQUENCE – TWO PASS EVEN FLOW OVER TWO ROTATIONS WITH HARVEST CONSTRAINTS – RUN NO. RAMP6

For map, please see:

APPENDIX F

MAP F-1

TABLE 7-2: AREA HARVESTED BY COMPARTMENT BY 20 YEAR PERIOD – RUN NO. RAMP6

COMPARTMENT	AREA(HA) HARVESTED BY 20 YEAR PERIOD					TOTAL AREA(ha)
	1-20	21-40	41-60	61-80	81-100	
BASSETT-1	9,036	2,755		12,257	1,521	25,568
BASSETT-2	7,261	2,445	2,840	2,025	1,634	16,205
BASSETT-3	15,619		22,976	10,196	11,303	60,094
BASSETT-4	9,060		10,617	4,361	1,036	25,073
BASSETT-5		10,757		14,257	7,126	32,140
BISTCHO-1		1,839			6,713	8,552
BISTCHO-2	4,983	16,047	5,459	2,730	8,880	38,100
BISTCHO-3		9,461			17,079	26,540
BISTCHO-4		7,017		7,206	2,232	16,454
CARIBOU-1		2,821	627		4,854	8,301
CARIBOU-2		7,465	221		16,349	24,035
CARIBOU-3	2,997	12,186	3,075	1,763	7,411	27,432
CARIBOU-4		7,061		12,290	2,777	22,129
CARIBOU-5		9,423	551		15,578	25,553
CHINCHAGA-1	6,614		11,910	282	2,730	21,536
CHINCHAGA-2	3,154	8,151		11,831	627	23,763
CHINCHAGA-3	14,767		20,896	618	6,602	43,170
CHINCHAGA-4	3,582	8,957		12,832	864	25,948
CHINCHAGA-5	7,633		9,518	417	2,264	19,833
HAY-1	8,347	7,491	1,538	481	2,316	20,173
HAY-2	7,905	381	8,754	155	876	18,071
HAY-3	4,952		5,661	687	1,919	13,218
HAY-4	8,104		13,199	639	778	22,671
PONTON-1	2,045	1,467	2,515	329	2,350	8,706
PONTON-2		961		866	396	2,223
PONTON-3	1,962	1,899		3,908	1,423	9,192
PONTON-4		2,495	754		3,506	6,755
PONTON-5	6,788	964		11,169	798	19,718
PONTON-6	39	18,845		27,409	2,057	48,312
PONTON-7	1,766	11,192	3,989	2,665	5,247	24,897
RAINBOW-1	2,885	9,978		14,767	1,953	29,582
RAINBOW-2	6,991		12,369	1,663	4,183	25,206
RAINBOW-3	4,790		11,354	2,545	6,215	24,904
RAINBOW-4		9,705		9,202	15,773	34,680
RAINBOW-5	9,840	3,751	5,483	2,472	4,255	25,801
RAINBOW-6		9,044		8,758	6,494	24,295
RAINBOW-7		2,151	7,486		9,771	19,408
STEEN-1	6,641	3,755	3,797	1,161	3,343	18,696
STEEN-2	8,948		12,942	1,770	5,436	29,655
STEEN-3	230	5,141	3,272		13,133	21,547
STEEN-4	4,191	2,072	2,077	1,460	1,215	10,685
STEEN-5		4,008		7,217	2,572	13,798
STEEN-6		6,135		7,367	3,995	17,496
WABASCA-1	6,280		14,347	2,865	1,561	25,124
WABASCA-2	6,818		14,759	2,030	508	24,115
WABASCA-3	6,011	2,521		11,890	1,174	21,597
WABASCA-4		13,877		18,415	4,714	37,006
WABASCA-5	70	7,356			8,423	15,779
WABASCA-6	4,936		15,111	2,476	2,558	25,081
WADLIN-1		6,185		6,693	3,933	16,811
WADLIN-2	5,833	1,469		7,813	1,469	16,584
WADLIN-3		1,762			5,816	7,578
WADLIN-4		3,210			9,143	12,352
WADLIN-5	13,441		19,405	3,070	10,688	46,640
WADLIN-6	4,227			4,479	5,956	14,661
WADLIN-7	37	12,859		13,163	7,191	33,212
WADLIN-8		6,783		7,743	3,208	17,734
WATT-1	7,562	5,646	1,912	817	3,353	19,173
WATT-2	913	13,766		13,350	4,188	31,304
WATT-3	6,406	1,375	8,159	347	1,825	18,111
WATT-4	18,658		32,257	3,717	11,661	67,372
WATT-5	1,390	5,689		7,602	1,515	16,196
WATT-6	5,933		10,677	240	3,783	20,633
ZAMA-1	10,078		13,615	1,775	5,334	30,803
ZAMA-2	9,203	5,586	1,585	1,563	1,776	19,712
ZAMA-3	14,550	14,356	3,013	1,967	5,899	39,786
ZAMA-4	9,503	8,381	3,784	2,021	4,106	27,794
ZAMA-5		6,234		6,921	1,248	14,404
ZAMA-6		8,604		8,910	2,239	19,753
ZAMA-7	8,360	3,170	9,343	1,913	6,248	29,035
Total Area(ha)	**311,337**	**336,646**	**331,847**	**331,535**	**337,100**	**1,648,465**

SECTION 8:
PFMS ADDITIONAL ANALYSES

Ref: H-065

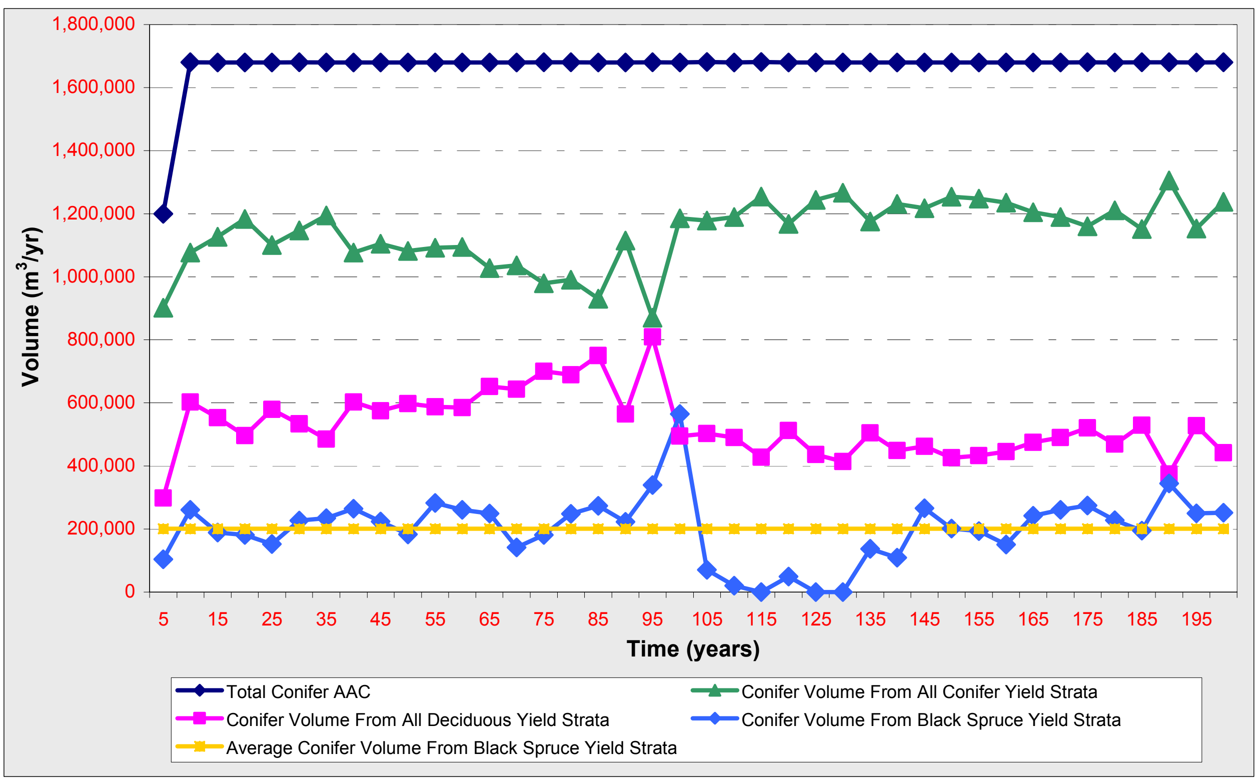
8.0 PFMS ADDITIONAL ANALYSES

The PFMS the Companies have chosen was selected on the ability to achieve specific goals and objectives. In order to determine the effectiveness of attaining these goals and objectives, detailed analysis on the PFMS was carried out. The following sub-sections outline the analysis used to help choose the forest management strategy which best fits the Companies requirements.

8.1 BLACK SPRUCE CONTRIBUTION TO AAC

The Companies have committed to include good and medium site black spruce stands in their harvest profile. Analysis was completed on the PFMS to illustrate the contribution black spruce stands have towards the AAC. Figure 8-1 shows the conifer volume flow, including an average volume of 200,000m^3/yr from the black spruce yield strata over the entire planning horizon. For a spatial representation of the 10 year harvest sequence by cover type see Map 8-1 (full size map can be found in Appendix F, Map F-2).

FIGURE 8-1: PFMS CONIFER VOLUME FLOW



MAP 8-1: 10 YEAR HARVEST SEQUENCE BY COVER TYPE

For map, please see:

APPENDIX F

MAP F-2

8.2 FUTURE FOREST CONDITION

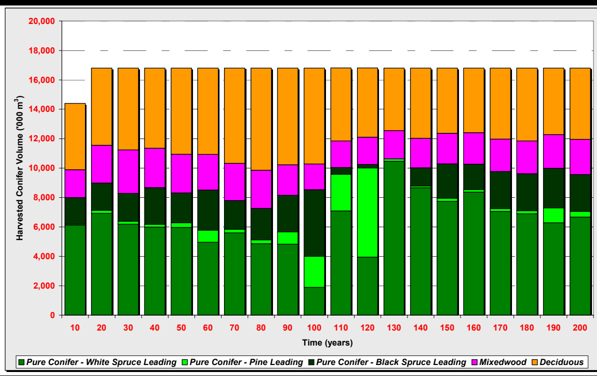
Future forest condition based on the PFMS is given in Figure 8-2 through Figure 8-4. The harvest summary tables indicate a relatively even amount of area and volume being harvested over the entire 200 year planning horizon for both conifer and deciduous. Due to the constraints applied to the PFMS the average harvest age and piece size graphs show the forest increasing in age and tree size after the first rotation.

The future forest summary in Figure 8-3, showing cover type change over time for both the gross and net landbase indicates there is no shift in area from one forest class to another. This is as expected, for a fully stocked yield transition is assumed for the PFMS. Once a stand is harvested it will regenerate on the same yield strata with a fully stocked density class.

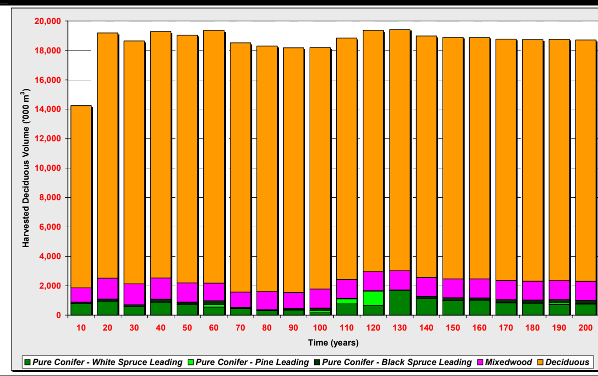
The cover type age class summary in Figure 8-4 shows how the age class distribution of the forest changes over time. The age class graphs for the gross landbase indicates significant area remaining in the older ages well into the projected future. This occurs due to the aging of a large amount of treed area netted out of the landbase, and therefore, not eligible for harvest. The age class graphs for the net productive landbase show how the forest moves towards a "regulated forest state" by maintaining a relatively equal area of productive forest in each age class. Map 8-2 through Map 8-13 depicts the current forest, 10, 50, 100, 150, and 200 year projection of age class by cover type distribution for the gross and net landbase (full size maps can be found in Appendix F, Maps F-3).

FIGURE 8-2: FUTURE FOREST HARVEST SUMMARIES

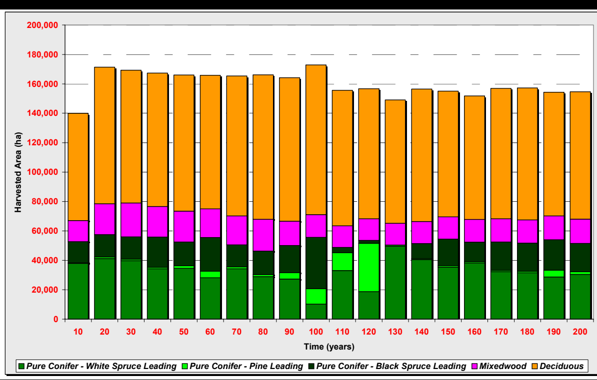
CONIFER VOLUME FLOW



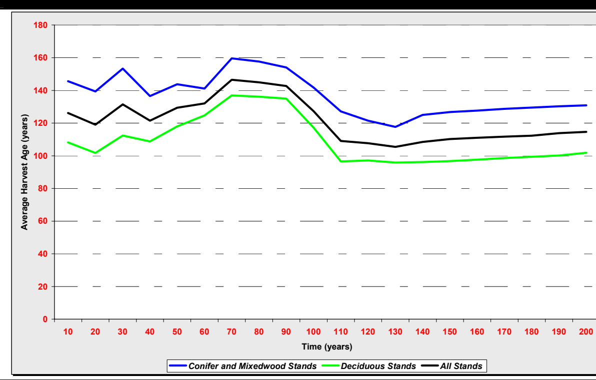
DECIDUOUS VOLUME FLOW



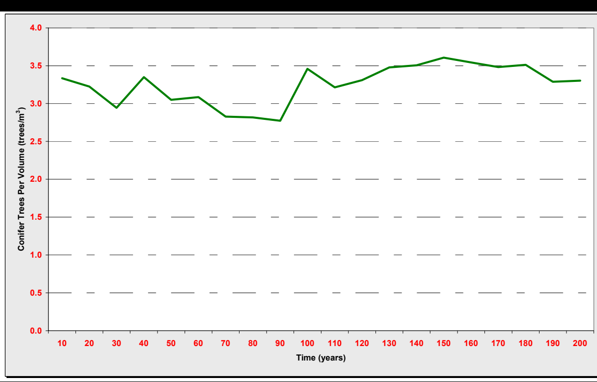
HARVESTED AREA



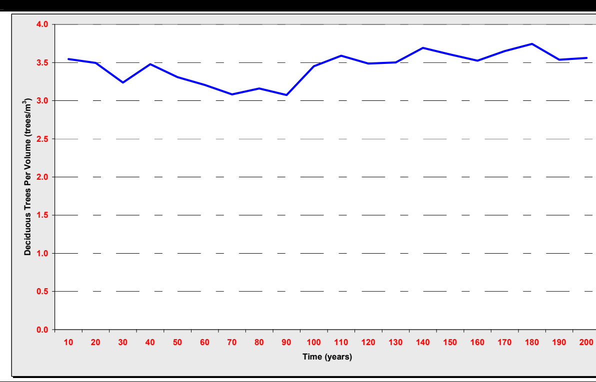
AVERAGE HARVEST AGE



CONIFER PIECE SIZE SUMMARY[15]



DECIDUOUS PIECE SIZE SUMMARY[15]



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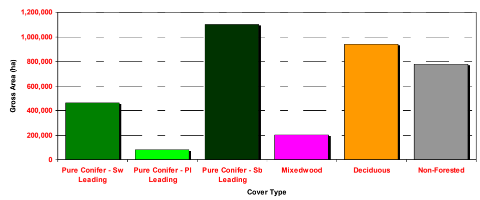
15 *Piece size summaries were determined using a projected height for each time period that was calculated using the projected age in the site index equation given in the Alberta Vegetation Inventory Standards Manual Version 2.2 (1997), Alberta Environmental Protection. This projected height was then used to assign a sampling stratum for each stand in each time period. Stratum volume and density tables were matched to the sampling strata to determine an average piece size in each time period.*

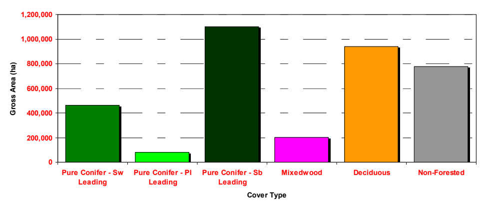
FIGURE 8-3: FUTURE FOREST COVER TYPE

GROSS LANDBASE

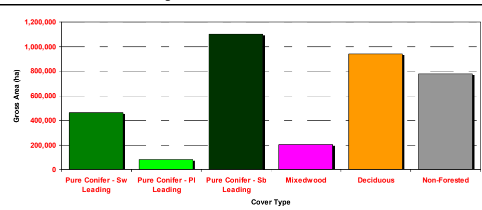
Current



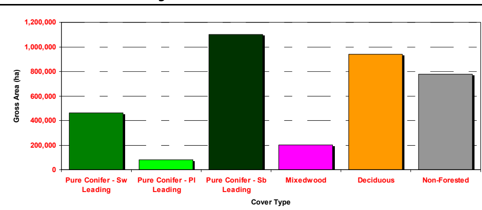
Projection at Year 10



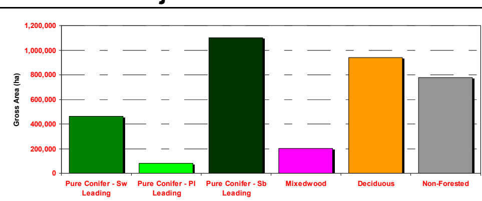
Projection at Year 50



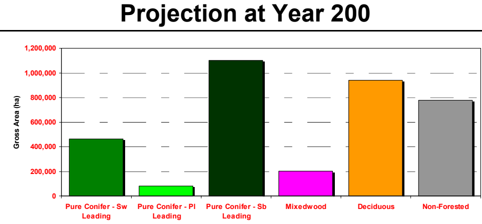
Projection at Year 100



Projection at Year 150

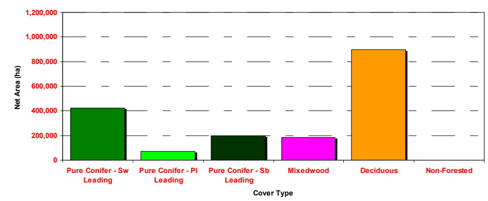


Projection at Year 200

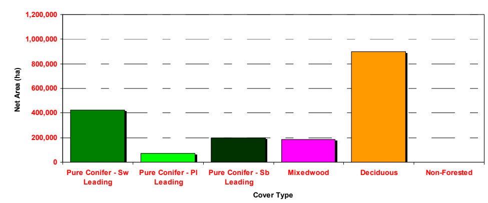


NET PRODUCTIVE LANDBASE

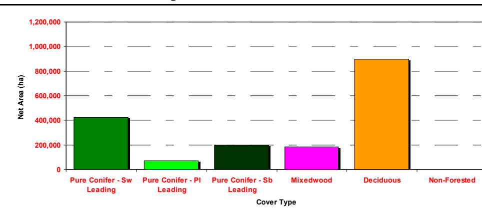
Current



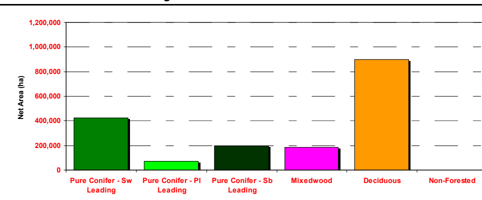
Projection at Year 10



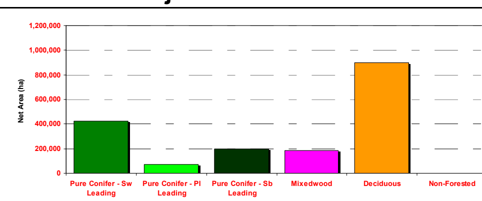
Projection at Year 50



Projection at Year 100



Projection at Year 150



Projection at Year 200

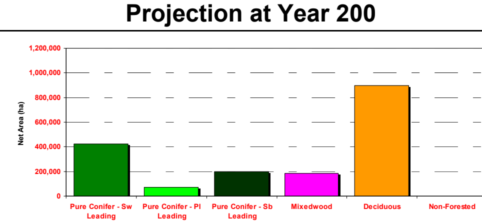
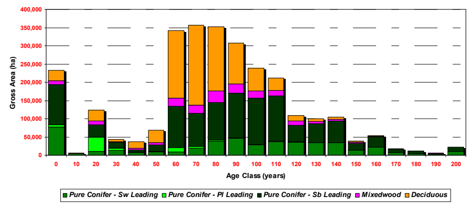


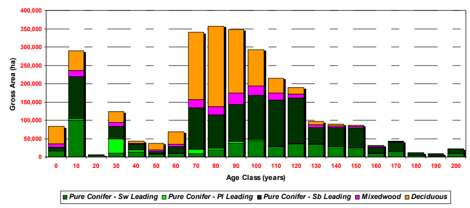
FIGURE 8-4: FUTURE FOREST AGE CLASS COVER TYPE

GROSS LANDBASE

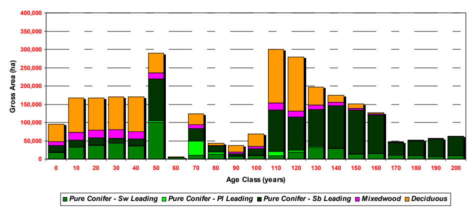
Current



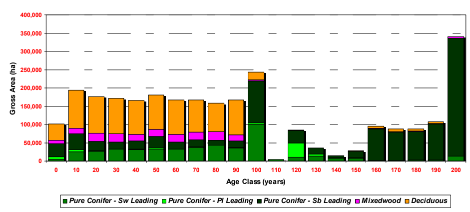
Projection at Year 10



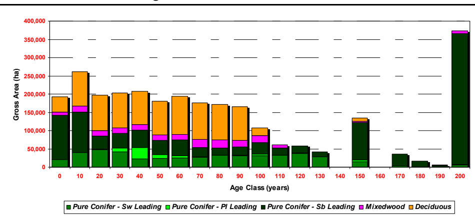
Projection at Year 50



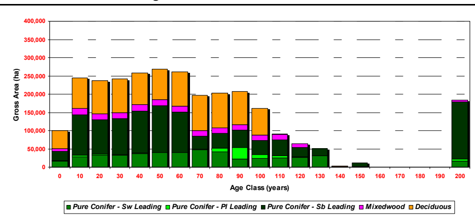
Projection at Year 100



Projection at Year 150

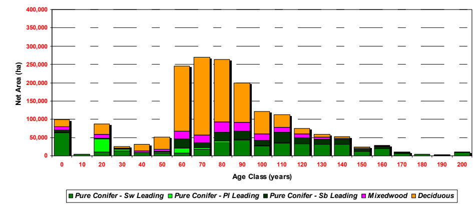


Projection at Year 200

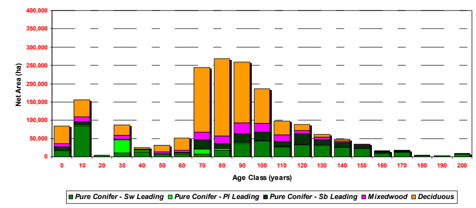


NET PRODUCTIVE LANDBASE

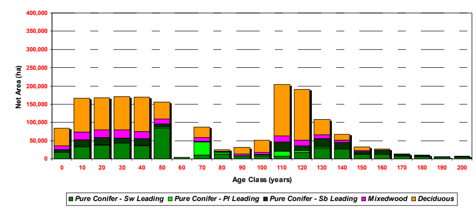
Current



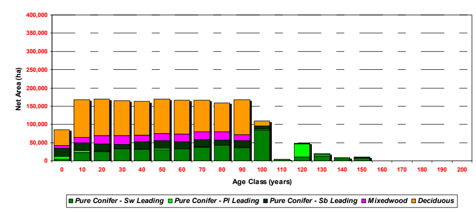
Projection at Year 10



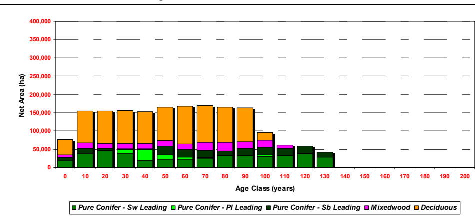
Projection at Year 50



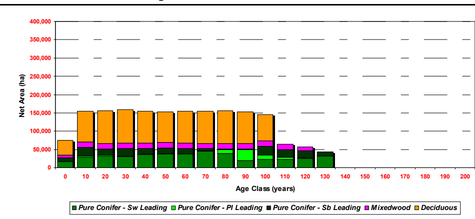
Projection at Year 100



Projection at Year 150



Projection at Year 200



MAP 8-2 CURRENT – GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-3 10 YEAR PROJECTION– GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-4 50 YEAR PROJECTION – GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-5 100 YEAR PROJECTION – GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-6 150 YEAR PROJECTION – GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-7 200 YEAR PROJECTION – GROSS AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-8 CURRENT – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-9: 10 YEAR PROJECTION – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-10: 50 YEAR PROJECTION – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-11: 100 YEAR PROJECTION – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-12: 150 YEAR PROJECTION – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

MAP 8-13: 200 YEAR PROJECTION – NET AGE CLASS DISTRIBUTION

For map, please see:

APPENDIX F

MAPS F-3

8.3 PATCH SIZE ANALYSIS

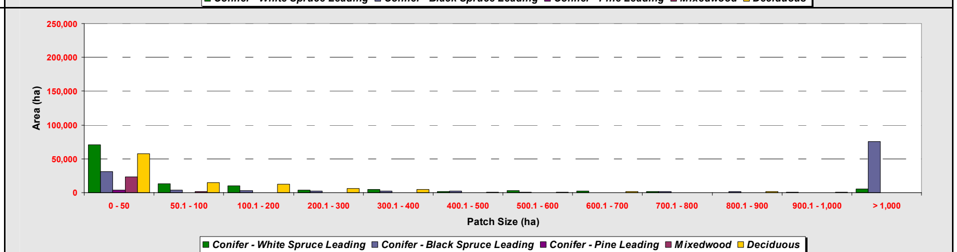
The patch size analysis is presented in Figure 8-5 through Figure 8-46 and Table 8-1 through Table 8-35. The forest class patches were developed by dissolving boundaries based on six age class groupings (0-20, 21-40, 41-80, 81-120, 121-160, 160+) and five cover types (C-SW, C-PL, C-SB, Mixedwood, Deciduous). Patch sizes of these groups were determined for the current forest, 10, 50, 100, 150, and 200 years into the future on the gross treed landbase for the entire FMA and by each of the six natural sub-regions that fall within the FMA. The results of this analysis show small patches with marginal change over time. This trend can be explained due to the buffers applied to seismic lines during the net landbase determination process, which greatly fragments the forest.

FIGURE 8-5: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

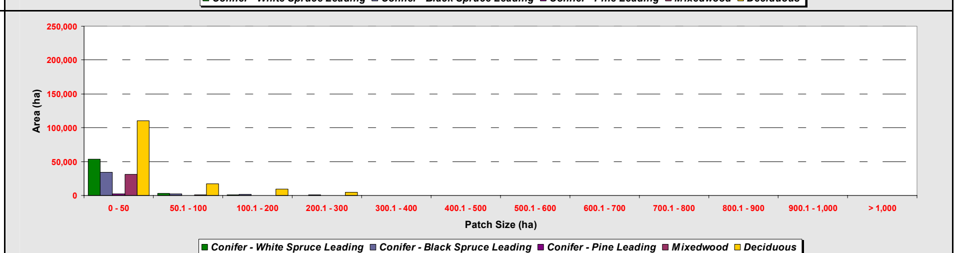
0 – 20 YEARS

Current

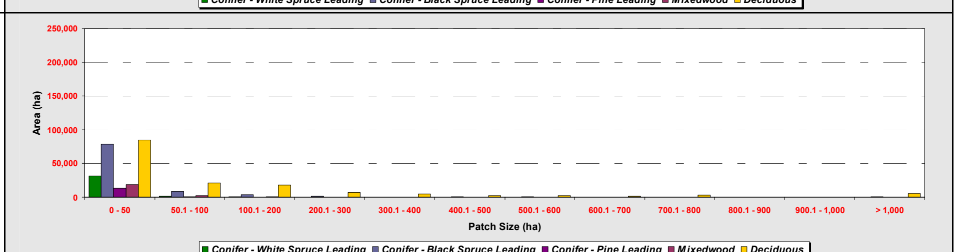
Projection at Year 10



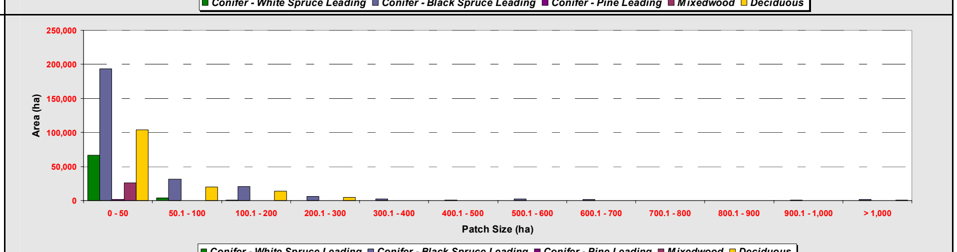
Projection at Year 50



Projection at Year 100



Projection at Year 150



Projection at Year 200

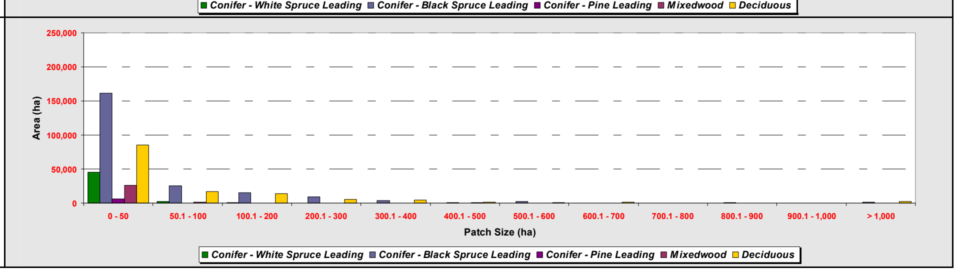


FIGURE 8-6: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

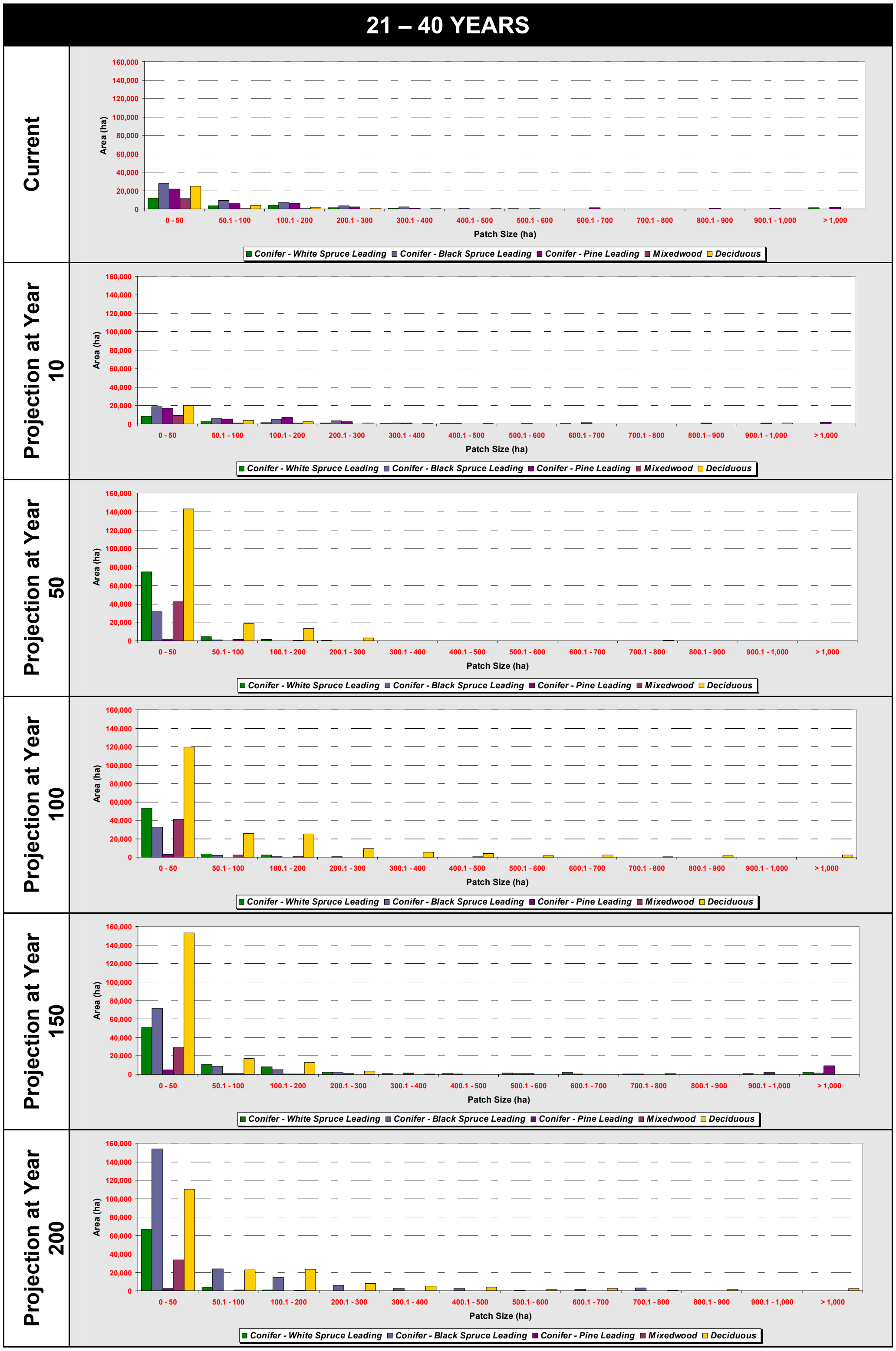


FIGURE 8-7: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

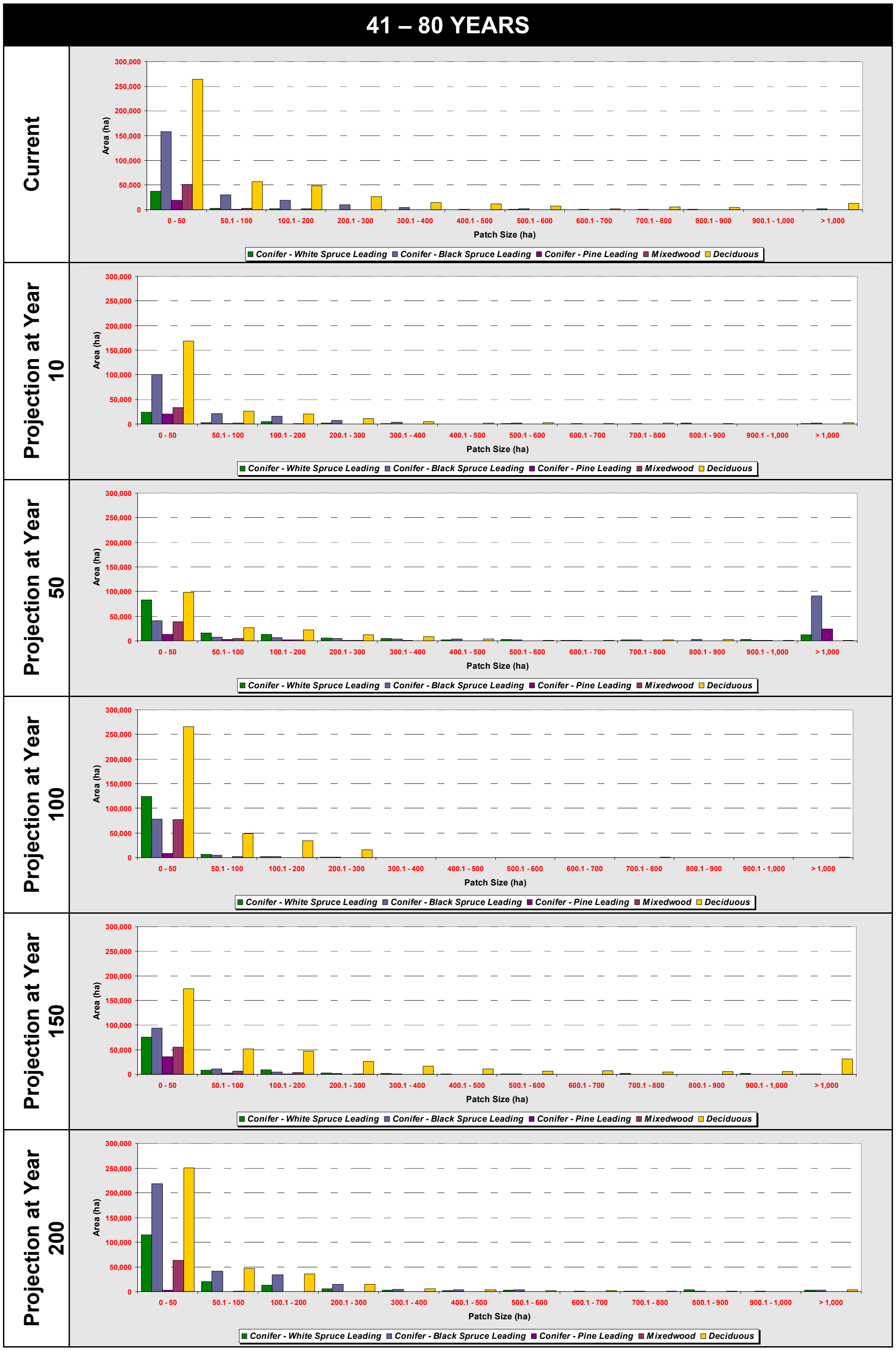


FIGURE 8-8: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

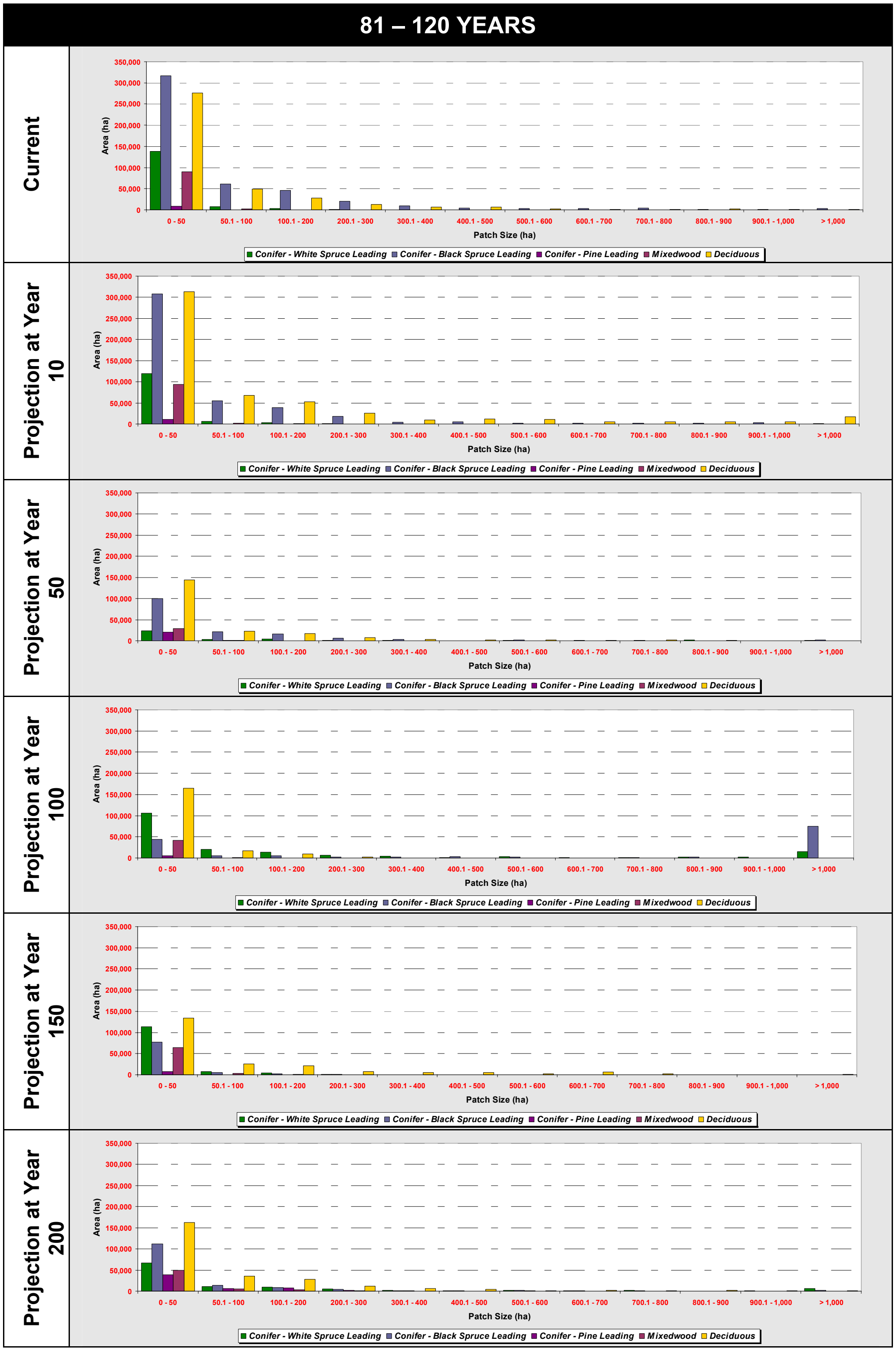


FIGURE 8-9: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

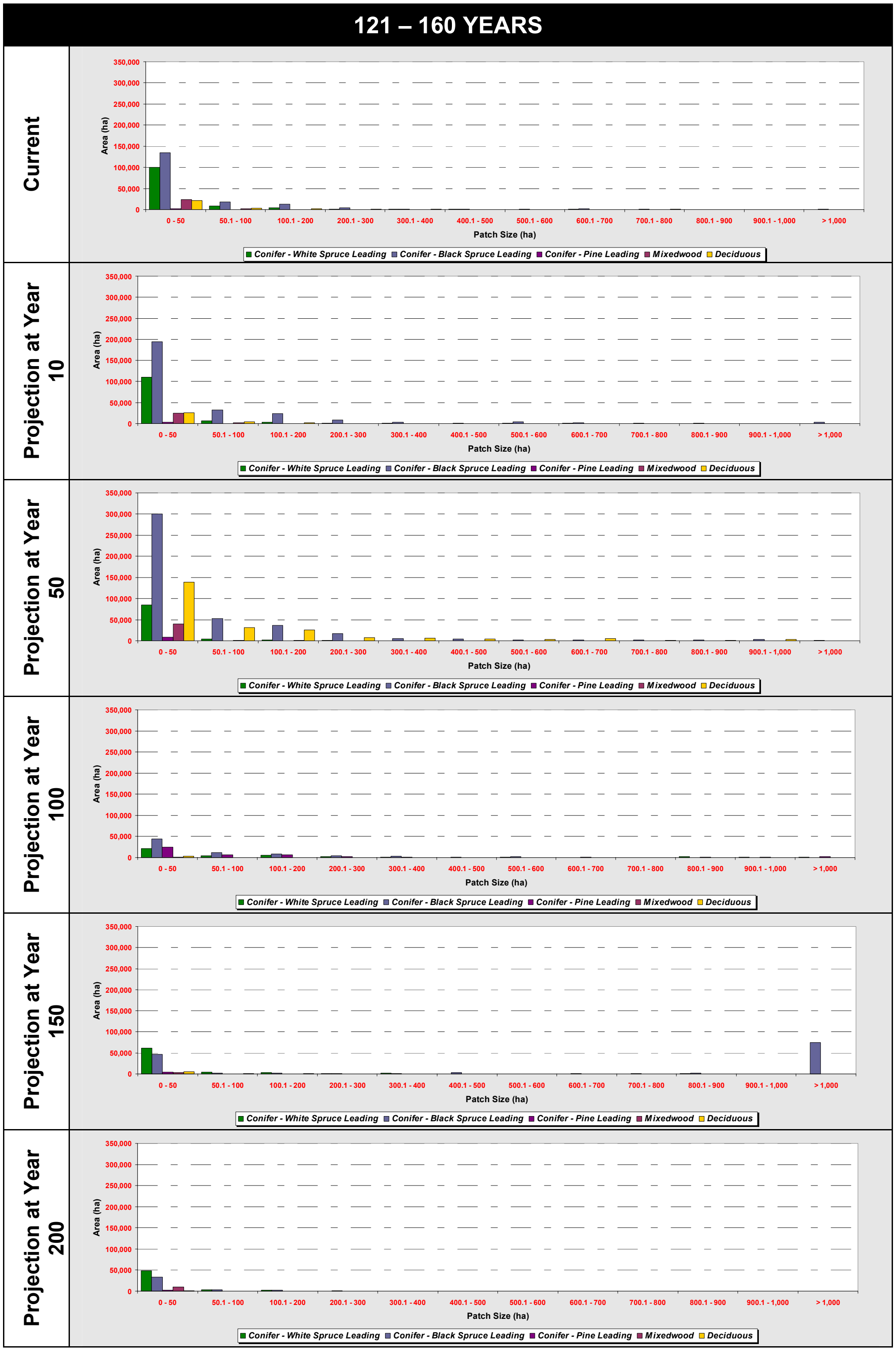


FIGURE 8-10: FMA – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

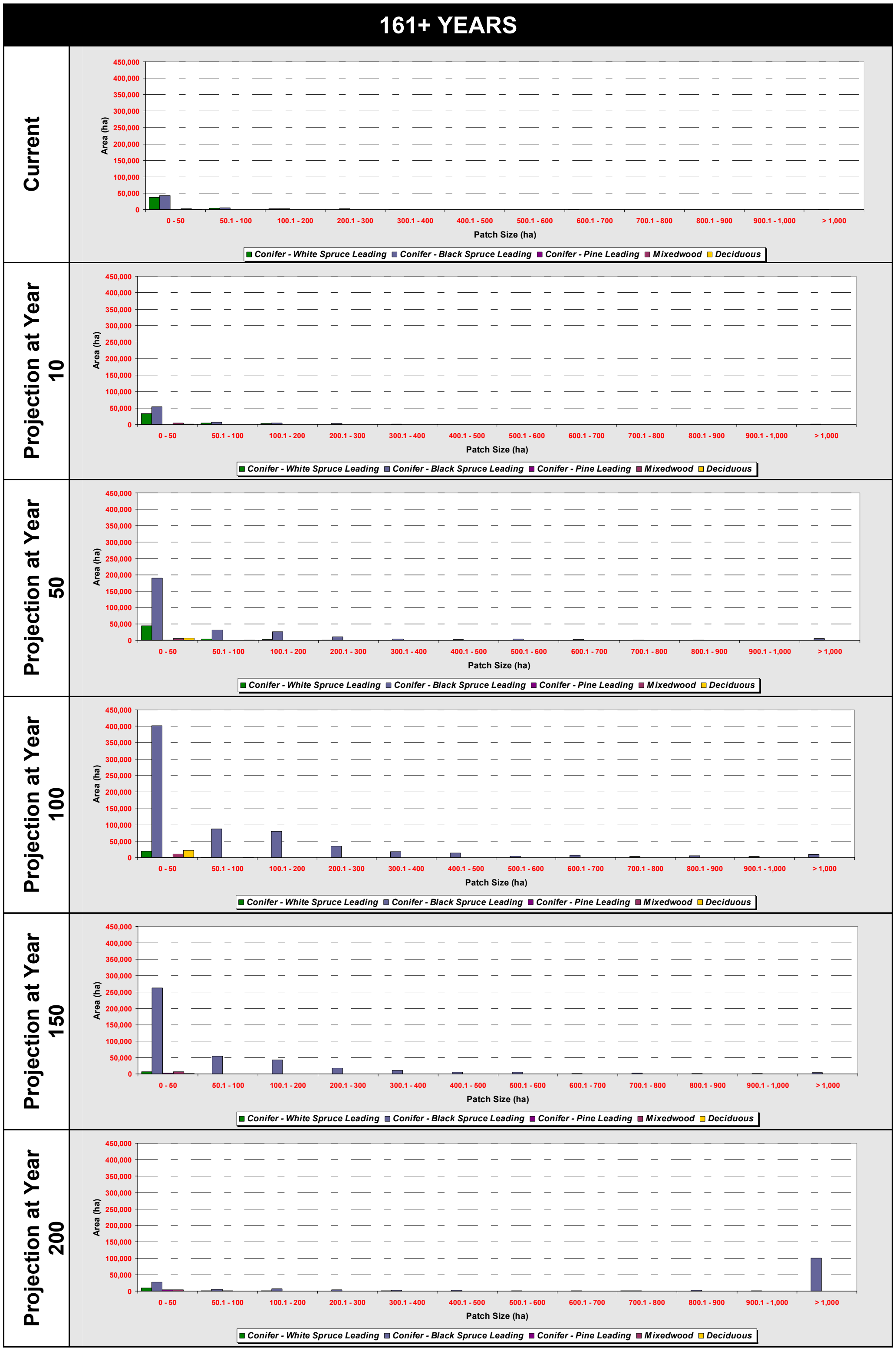


TABLE 8-1: FMA PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	84,114	23,754	43,397	149,723	116,945	46,325
	Average Patch Size (ha)	1.68	20.08	3.32	2.57	2.90	3.20
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	117,126	15,043	37,683	130,493	123,455	40,457
	Average Patch Size (ha)	2.24	15.49	5.60	2.47	2.35	2.71
	Difference from Current Average Patch Size (ha)	0.56	-4.59	2.28	-0.09	-0.55	-0.50
PROJECTION AT YEAR 50	Total Gross Area (ha)	57,757	80,979	144,095	37,683	92,735	51,010
	Average Patch Size (ha)	1.46	2.08	2.76	5.60	2.78	2.69
	Difference from Current Average Patch Size (ha)	-0.22	-18.00	-0.55	3.03	-0.13	-0.52
PROJECTION AT YEAR 100	Total Gross Area (ha)	34,029	59,718	134,623	177,773	38,371	19,745
	Average Patch Size (ha)	2.50	3.02	1.79	3.35	9.96	1.27
	Difference from Current Average Patch Size (ha)	0.82	-17.06	-1.53	0.78	7.05	-1.94
PROJECTION AT YEAR 150	Total Gross Area (ha)	71,138	82,556	102,905	126,293	74,140	7,226
	Average Patch Size (ha)	1.90	1.55	3.88	2.01	1.99	0.96
	Difference from Current Average Patch Size (ha)	0.22	-18.53	0.56	-0.56	-0.91	-2.24
PROJECTION AT YEAR 200	Total Gross Area (ha)	48,521	71,891	166,860	106,626	53,960	16,400
	Average Patch Size (ha)	2.44	1.52	3.10	3.77	3.00	1.87
	Difference from Current Average Patch Size (ha)	0.76	-18.56	-0.22	1.20	0.09	-1.33

TABLE 8-2: FMA PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	110,454	51,294	228,570	474,012	176,902	59,054
	Average Patch Size (ha)	1.59	8.40	4.43	4.02	3.20	3.23
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	124,953	34,808	153,397	442,332	274,024	70,772
	Average Patch Size (ha)	1.72	9.02	4.67	3.95	3.62	3.07
	Difference from Current Average Patch Size (ha)	0.14	0.62	0.25	-0.07	0.43	-0.16
PROJECTION AT YEAR 50	Total Gross Area (ha)	39,134	32,151	165,548	153,397	429,792	280,264
	Average Patch Size (ha)	2.10	2.09	2.33	4.67	3.95	3.74
	Difference from Current Average Patch Size (ha)	0.51	-6.31	-2.10	0.65	0.75	0.51
PROJECTION AT YEAR 100	Total Gross Area (ha)	94,535	36,964	86,146	143,067	74,111	665,463
	Average Patch Size (ha)	3.14	2.76	2.19	1.96	6.08	4.66
	Difference from Current Average Patch Size (ha)	1.56	-5.64	-2.24	-2.06	2.88	1.43
PROJECTION AT YEAR 150	Total Gross Area (ha)	260,253	92,620	115,051	86,057	134,773	411,531
	Average Patch Size (ha)	3.26	1.36	3.34	2.23	1.73	4.61
	Difference from Current Average Patch Size (ha)	1.67	-7.04	-1.09	-1.80	-1.46	1.38
PROJECTION AT YEAR 200	Total Gross Area (ha)	220,426	207,285	326,862	146,590	39,901	159,221
	Average Patch Size (ha)	3.83	3.42	3.04	3.53	3.01	2.60
	Difference from Current Average Patch Size (ha)	2.24	-4.98	-1.39	-0.49	-0.19	-0.63

TABLE 8-3: FMA PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	4,402	43,051	20,554	8,672	2,298	91
	Average Patch Size (ha)	0.52	8.75	2.87	2.82	2.61	3.50
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	4,717	38,377	21,571	10,889	3,241	272
	Average Patch Size (ha)	0.56	9.79	3.11	2.62	3.02	5.04
	Difference from Current Average Patch Size (ha)	0.04	1.04	0.25	-0.19	0.40	1.54
PROJECTION AT YEAR 50	Total Gross Area (ha)	2,296	1,871	43,606	21,571	8,727	996
	Average Patch Size (ha)	1.89	2.27	6.14	3.11	2.79	3.27
	Difference from Current Average Patch Size (ha)	1.37	-6.48	3.27	0.30	0.18	-0.24
PROJECTION AT YEAR 100	Total Gross Area (ha)	14,179	2,936	8,474	5,835	46,872	772
	Average Patch Size (ha)	3.02	3.66	1.91	0.68	7.69	0.69
	Difference from Current Average Patch Size (ha)	2.50	-5.09	-0.96	-2.13	5.07	-2.82
PROJECTION AT YEAR 150	Total Gross Area (ha)	1,343	21,355	40,066	8,168	4,856	3,279
	Average Patch Size (ha)	2.41	2.81	3.68	1.98	2.37	1.01
	Difference from Current Average Patch Size (ha)	1.89	-5.94	0.81	-0.83	-0.24	-2.50
PROJECTION AT YEAR 200	Total Gross Area (ha)	6,247	2,519	3,141	58,668	2,494	5,999
	Average Patch Size (ha)	1.75	1.81	0.44	5.55	3.89	2.50
	Difference from Current Average Patch Size (ha)	1.23	-6.93	-2.43	2.74	1.28	-1.00

TABLE 8-4: FMA PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	11,546	12,864	56,078	92,055	26,156	2,667
	Average Patch Size (ha)	0.35	4.53	2.42	2.11	3.33	5.31
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	25,585	10,955	35,489	98,033	27,378	3,925
	Average Patch Size (ha)	0.72	4.96	2.19	2.15	2.35	4.96
	Difference from Current Average Patch Size (ha)	0.37	0.43	-0.23	0.04	-0.98	-0.36
PROJECTION AT YEAR 50	Total Gross Area (ha)	32,263	44,232	45,799	31,216	41,386	6,470
	Average Patch Size (ha)	1.37	2.29	1.32	2.50	2.46	1.80
	Difference from Current Average Patch Size (ha)	1.02	-2.24	-1.10	0.39	-0.87	-3.51
PROJECTION AT YEAR 100	Total Gross Area (ha)	21,866	44,525	79,748	43,175	1,044	11,008
	Average Patch Size (ha)	0.63	2.87	1.76	1.95	0.73	1.04
	Difference from Current Average Patch Size (ha)	0.29	-1.66	-0.66	-0.16	-2.61	-4.28
PROJECTION AT YEAR 150	Total Gross Area (ha)	26,207	30,606	65,857	68,073	2,972	7,651
	Average Patch Size (ha)	1.50	2.25	1.97	2.09	0.64	0.97
	Difference from Current Average Patch Size (ha)	1.15	-2.28	-0.45	-0.03	-2.69	-4.35
PROJECTION AT YEAR 200	Total Gross Area (ha)	28,439	34,827	64,818	59,243	10,379	3,659
	Average Patch Size (ha)	2.29	2.40	1.60	1.78	4.33	0.70
	Difference from Current Average Patch Size (ha)	1.94	-2.13	-0.82	-0.33	1.00	-4.62

TABLE 8-5: FMA PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	30,706	32,586	454,947	386,926	30,104	2,239
	Average Patch Size (ha)	0.40	5.16	4.76	3.82	5.27	8.14
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	101,453	29,535	240,575	530,088	33,171	2,685
	Average Patch Size (ha)	1.31	6.21	3.44	4.52	3.61	7.52
	Difference from Current Average Patch Size (ha)	0.91	1.06	-1.32	0.70	-1.66	-0.62
PROJECTION AT YEAR 50	Total Gross Area (ha)	140,954	178,143	178,569	203,492	227,422	8,927
	Average Patch Size (ha)	2.57	3.03	2.38	3.56	4.54	2.49
	Difference from Current Average Patch Size (ha)	2.16	-2.13	-2.39	-0.26	-0.73	-5.65
PROJECTION AT YEAR 100	Total Gross Area (ha)	151,050	198,114	366,714	194,560	2,843	24,226
	Average Patch Size (ha)	1.96	4.87	3.29	2.47	0.73	1.01
	Difference from Current Average Patch Size (ha)	1.56	-0.28	-1.47	-1.35	-4.54	-7.14
PROJECTION AT YEAR 150	Total Gross Area (ha)	143,900	187,525	385,940	210,621	7,709	1,814
	Average Patch Size (ha)	2.47	2.64	5.58	4.47	0.76	0.73
	Difference from Current Average Patch Size (ha)	2.06	-2.52	0.82	0.65	-4.51	-7.41
PROJECTION AT YEAR 200	Total Gross Area (ha)	132,732	181,796	366,233	255,642	1,059	45
	Average Patch Size (ha)	2.21	4.78	3.50	3.90	1.41	1.94
	Difference from Current Average Patch Size (ha)	1.81	-0.37	-1.26	0.08	-3.86	-6.20

FIGURE 8-11: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

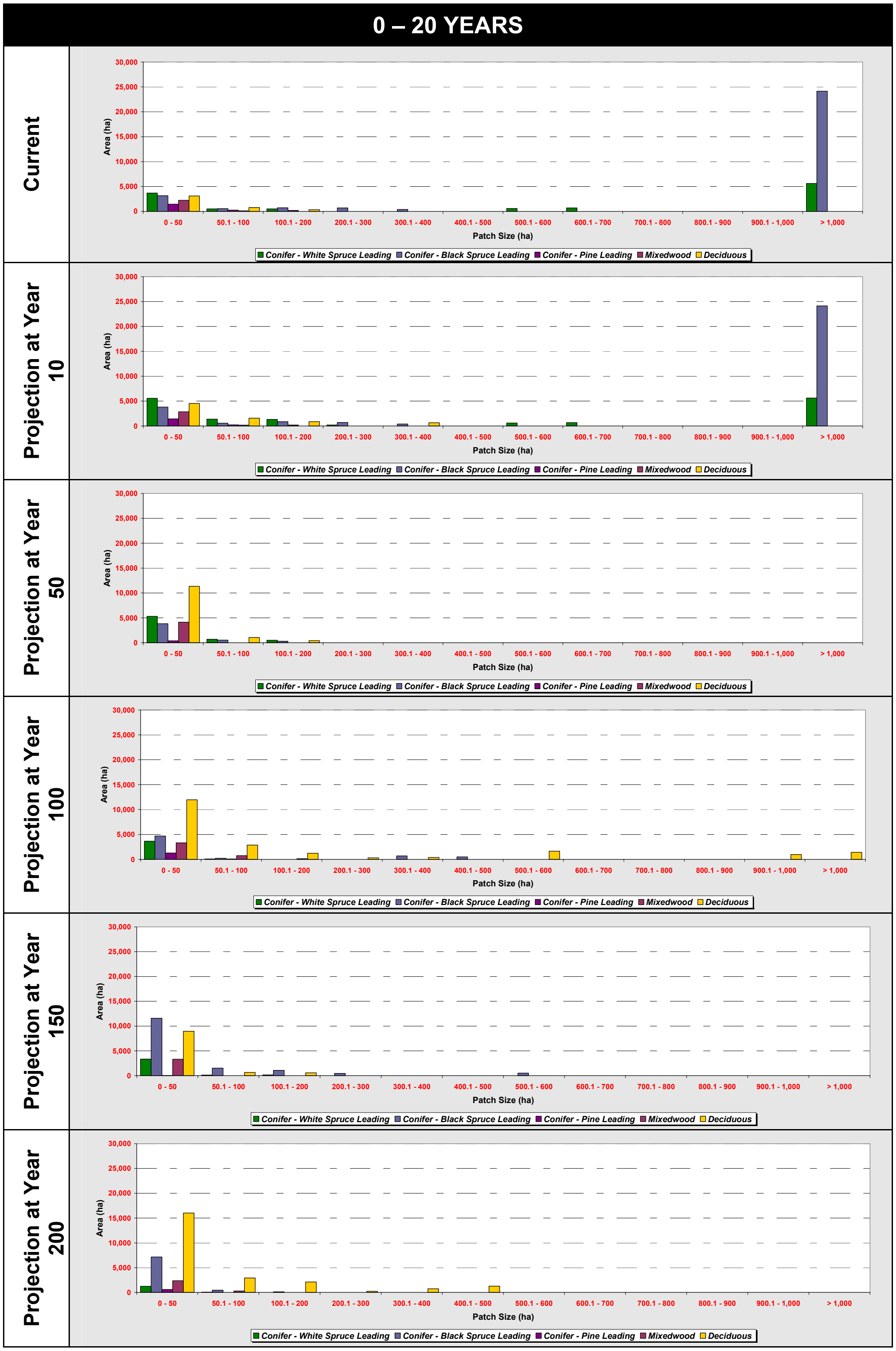


FIGURE 8-12: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

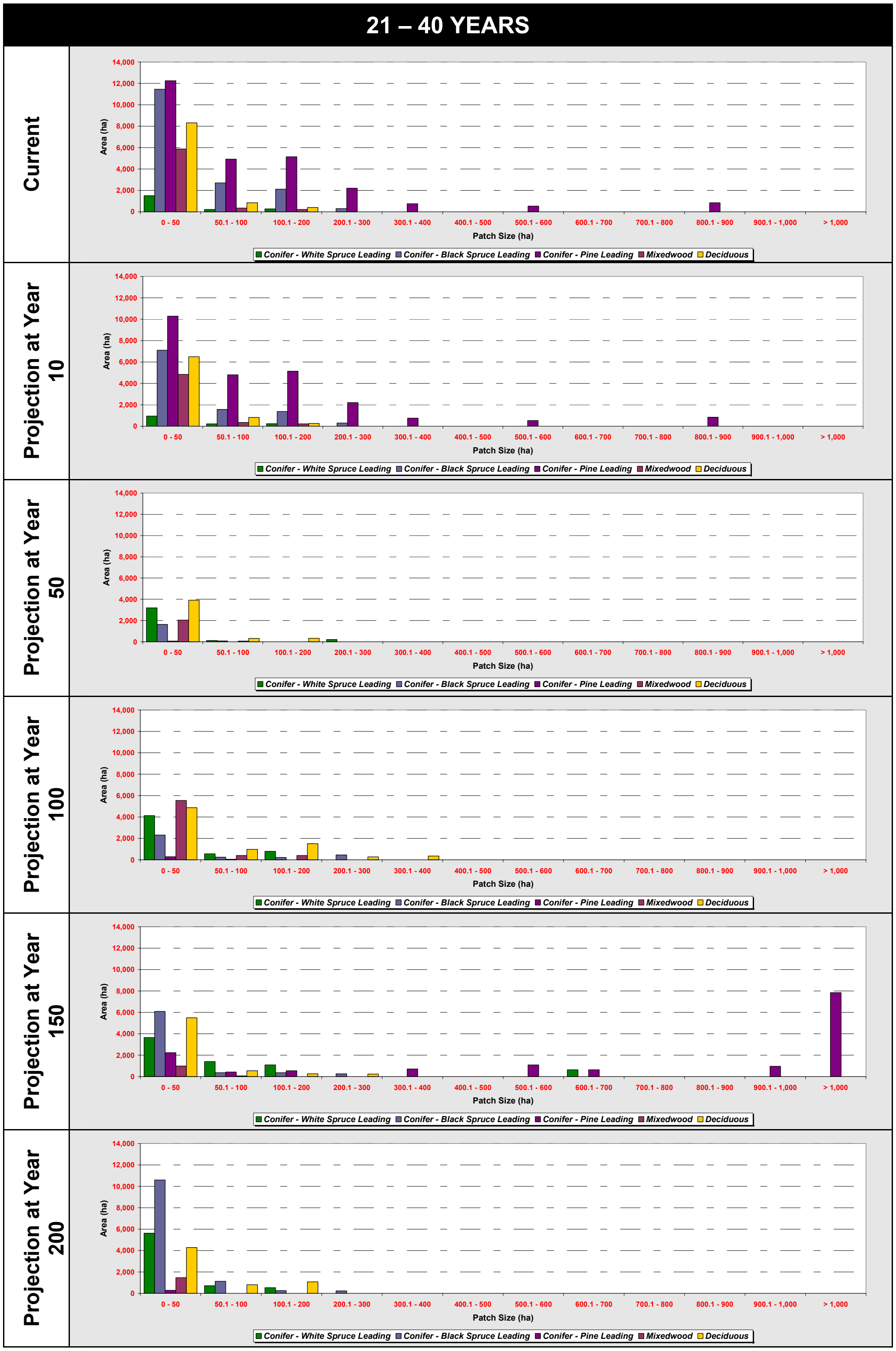


FIGURE 8-13: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

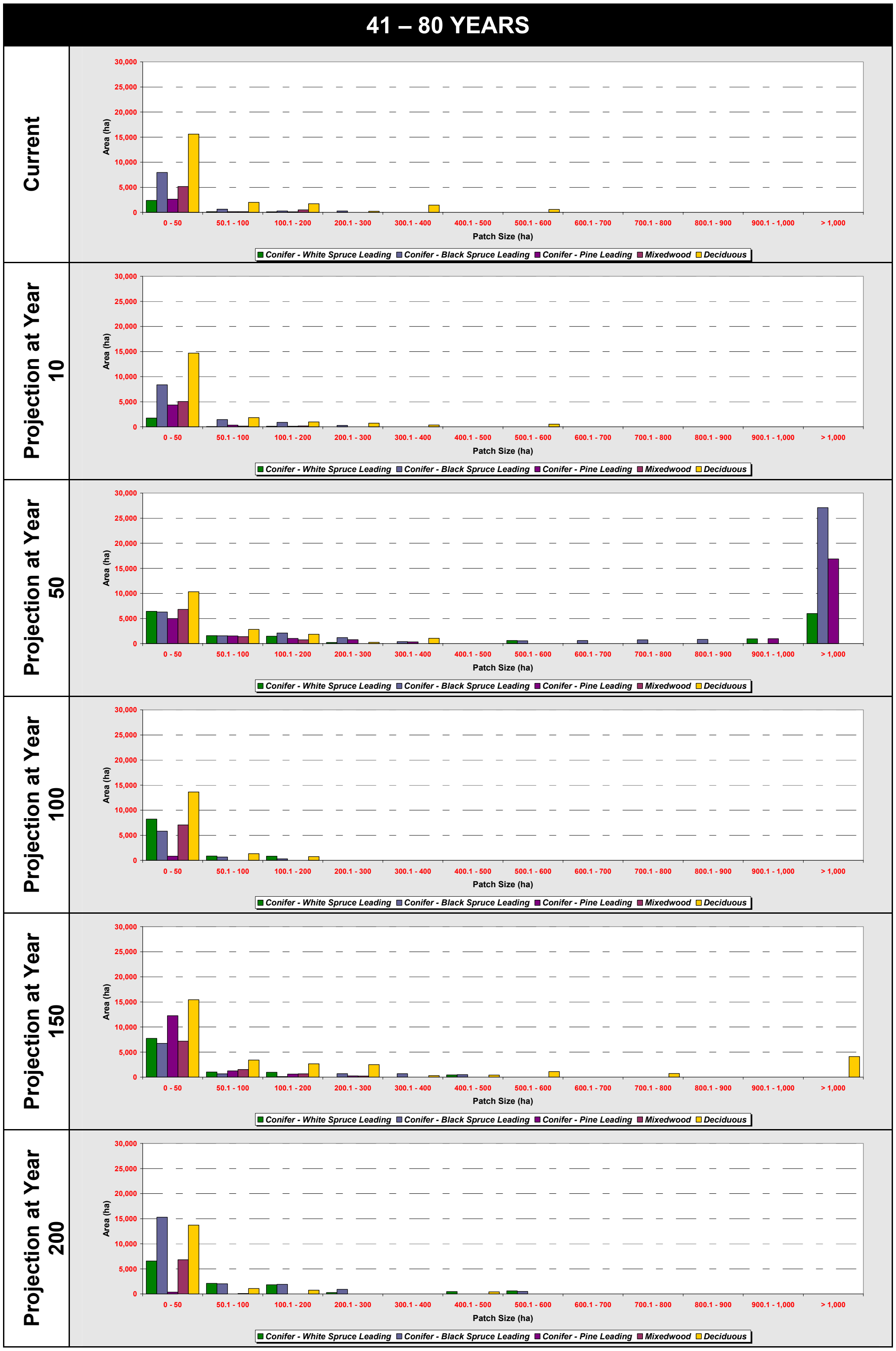


FIGURE 8-14: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

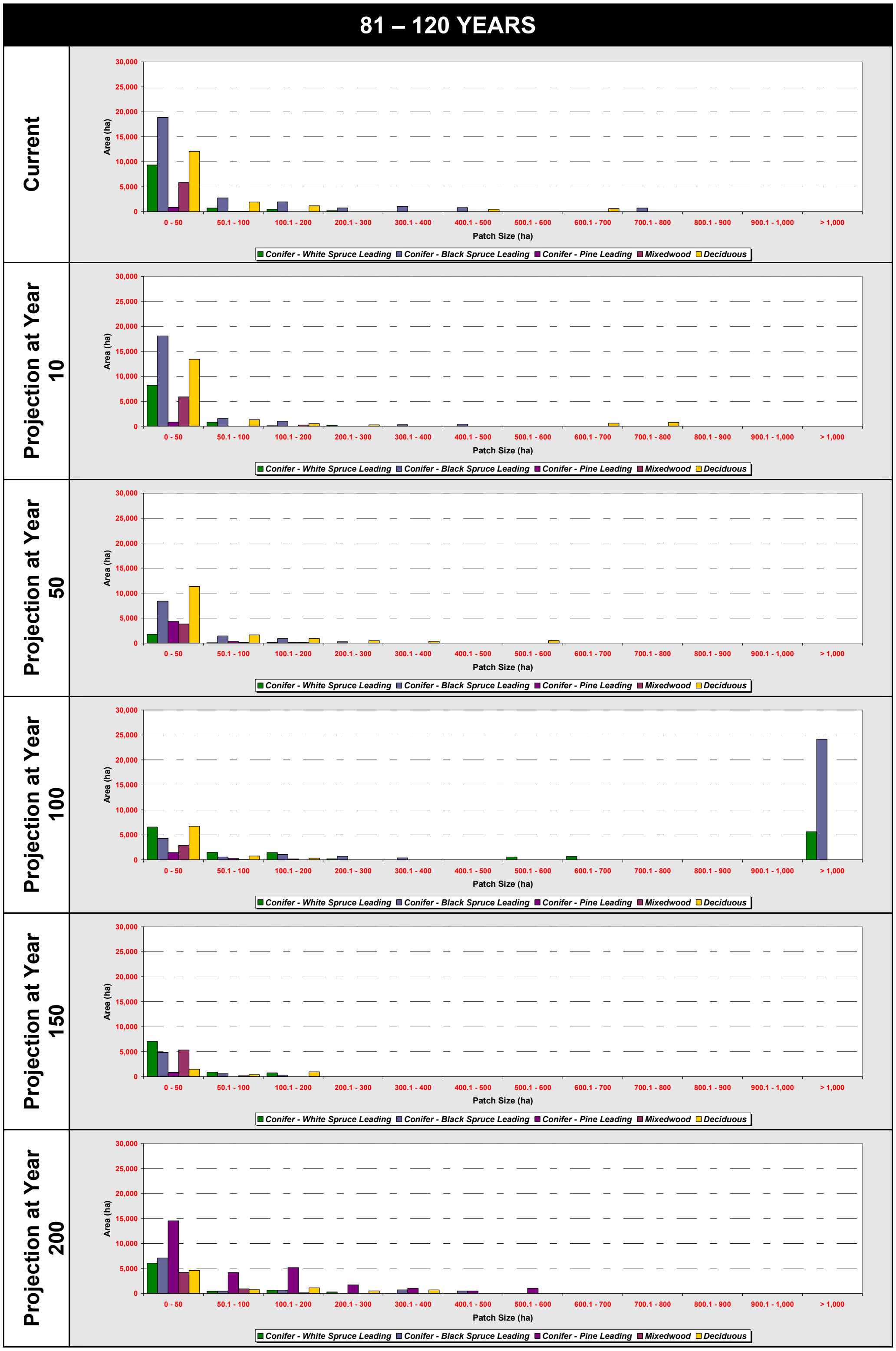


FIGURE 8-15: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

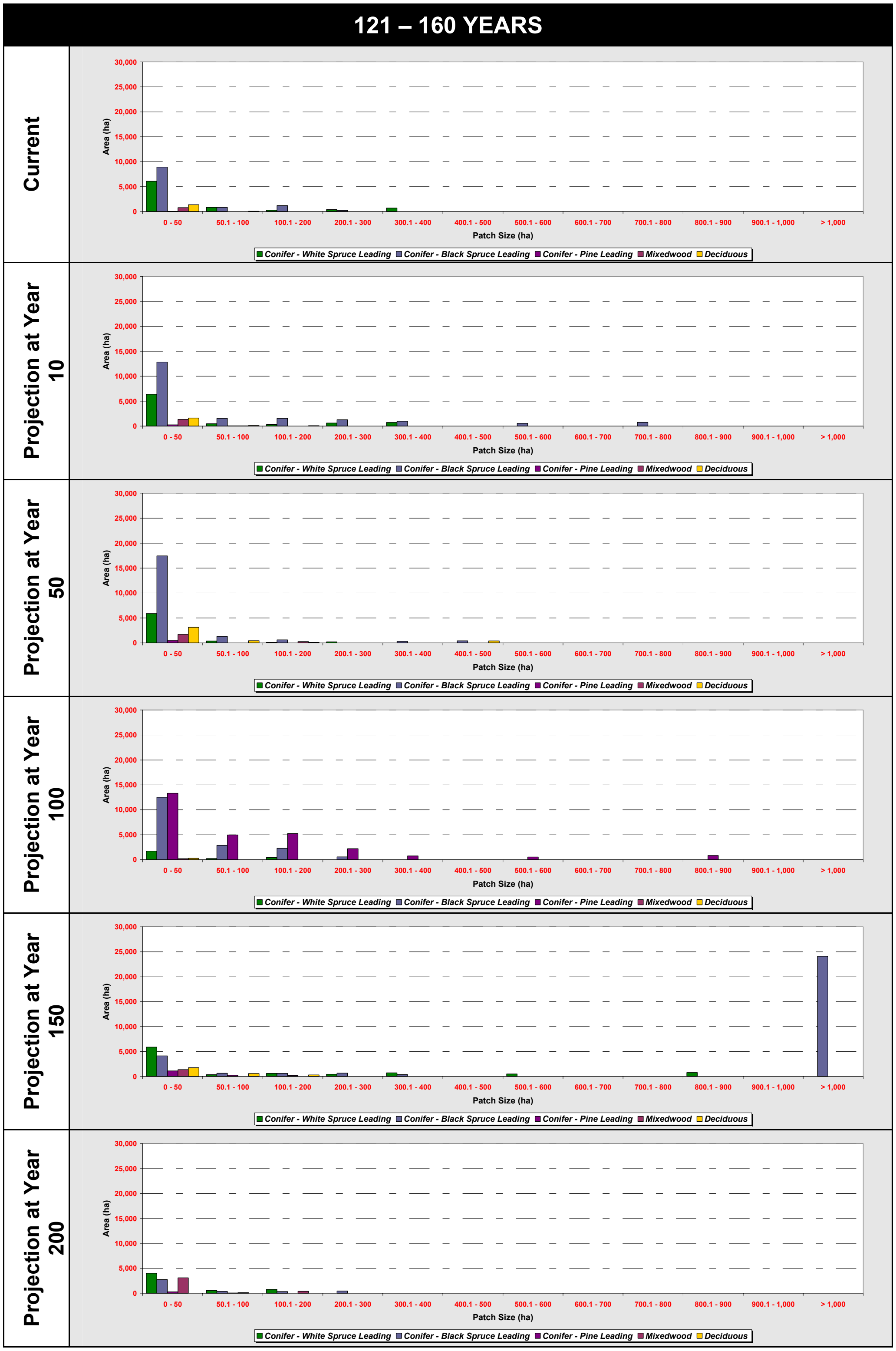


FIGURE 8-16: BOREAL HIGHLANDS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

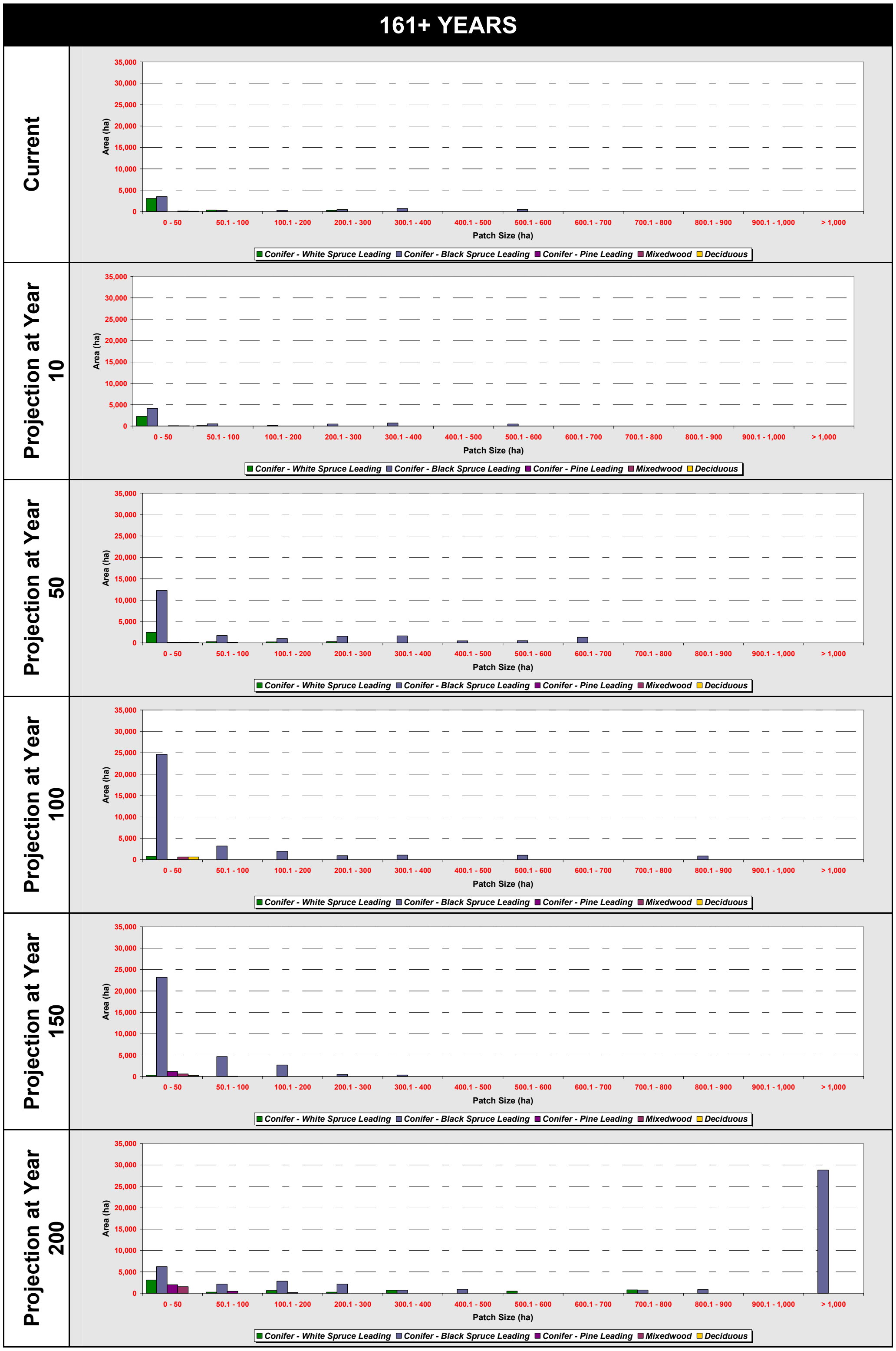


TABLE 8-6: BOREAL HIGHLANDS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	11,524	1,988	2,597	10,772	8,321	3,714
	Average Patch Size (ha)	3.19	16.17	2.17	2.39	2.70	2.60
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	15,338	1,390	1,887	9,380	8,500	2,420
	Average Patch Size (ha)	4.36	14.48	3.02	2.31	2.06	2.17
	Difference from Current Average Patch Size (ha)	1.17	-1.68	0.85	-0.07	-0.64	-0.43
PROJECTION AT YEAR 50	Total Gross Area (ha)	6,526	3,505	17,145	1,887	6,590	3,262
	Average Patch Size (ha)	1.42	2.01	5.07	3.02	2.97	2.94
	Difference from Current Average Patch Size (ha)	-1.77	-14.16	2.91	0.63	0.27	0.34
PROJECTION AT YEAR 100	Total Gross Area (ha)	3,729	5,492	9,897	16,588	2,427	782
	Average Patch Size (ha)	2.31	4.08	1.55	4.75	10.28	0.93
	Difference from Current Average Patch Size (ha)	-0.88	-12.09	-0.62	2.37	7.58	-1.67
PROJECTION AT YEAR 150	Total Gross Area (ha)	3,655	6,768	10,120	8,706	9,366	300
	Average Patch Size (ha)	1.38	1.81	3.81	1.66	3.64	0.71
	Difference from Current Average Patch Size (ha)	-1.81	-14.35	1.64	-0.72	0.94	-1.89
PROJECTION AT YEAR 200	Total Gross Area (ha)	1,295	6,851	11,766	7,389	5,381	6,234
	Average Patch Size (ha)	1.51	1.42	3.16	2.98	4.08	5.56
	Difference from Current Average Patch Size (ha)	-1.68	-14.74	0.99	0.59	1.38	2.96

TABLE 8-7: BOREAL HIGHLANDS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	29,678	16,585	9,119	26,965	11,166	5,735
	Average Patch Size (ha)	4.52	6.48	1.76	2.78	2.28	2.95
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	30,470	10,352	10,967	21,362	19,550	6,547
	Average Patch Size (ha)	4.46	7.09	2.67	2.24	2.98	3.13
	Difference from Current Average Patch Size (ha)	-0.06	0.61	0.91	-0.54	0.70	0.18
PROJECTION AT YEAR 50	Total Gross Area (ha)	4,678	1,708	41,252	10,967	20,118	20,526
	Average Patch Size (ha)	1.81	1.68	6.50	2.67	2.20	3.55
	Difference from Current Average Patch Size (ha)	-2.70	-4.79	4.74	-0.11	-0.08	0.60
PROJECTION AT YEAR 100	Total Gross Area (ha)	6,072	3,219	6,744	31,188	18,238	33,788
	Average Patch Size (ha)	2.17	4.60	1.55	4.57	5.92	2.73
	Difference from Current Average Patch Size (ha)	-2.35	-1.88	-0.20	1.79	3.64	-0.21
PROJECTION AT YEAR 150	Total Gross Area (ha)	15,145	7,070	9,383	5,744	30,569	31,337
	Average Patch Size (ha)	2.28	1.22	2.74	1.57	4.49	3.32
	Difference from Current Average Patch Size (ha)	-2.24	-5.25	0.98	-1.21	2.21	0.38
PROJECTION AT YEAR 200	Total Gross Area (ha)	7,746	12,209	20,604	9,376	3,911	45,402
	Average Patch Size (ha)	1.56	2.14	2.26	2.57	4.75	8.94
	Difference from Current Average Patch Size (ha)	-2.96	-4.34	0.50	-0.21	2.47	6.00

TABLE 8-8: BOREAL HIGHLANDS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	1,877	26,621	2,875	928	43	2
	Average Patch Size (ha)	0.73	9.74	2.96	2.86	1.55	1.64
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	1,877	24,553	4,754	836	325	2
	Average Patch Size (ha)	0.73	11.04	3.40	2.39	4.45	1.64
	Difference from Current Average Patch Size (ha)	0.00	1.30	0.45	-0.48	2.90	0.00
PROJECTION AT YEAR 50	Total Gross Area (ha)	381	68	26,431	4,754	498	215
	Average Patch Size (ha)	1.91	3.09	16.52	3.40	2.55	5.66
	Difference from Current Average Patch Size (ha)	1.19	-6.65	13.56	0.54	1.00	4.02
PROJECTION AT YEAR 100	Total Gross Area (ha)	1,354	333	818	1,892	27,879	70
	Average Patch Size (ha)	2.94	3.70	1.68	0.73	8.98	0.62
	Difference from Current Average Patch Size (ha)	2.21	-6.04	-1.28	-2.14	7.43	-1.02
PROJECTION AT YEAR 150	Total Gross Area (ha)	23	14,435	14,311	807	1,560	1,210
	Average Patch Size (ha)	0.59	7.23	4.15	1.66	2.88	1.00
	Difference from Current Average Patch Size (ha)	-0.13	-2.52	1.20	-1.20	1.33	-0.64
PROJECTION AT YEAR 200	Total Gross Area (ha)	599	289	340	28,156	329	2,634
	Average Patch Size (ha)	1.42	1.83	0.17	8.79	3.83	2.70
	Difference from Current Average Patch Size (ha)	0.70	-7.92	-2.78	5.93	2.28	1.05

TABLE 8-9: BOREAL HIGHLANDS PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	2,339	6,444	5,754	5,910	785	159
	Average Patch Size (ha)	0.60	4.32	1.44	1.63	1.89	4.08
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	3,004	5,421	5,315	6,144	1,407	101
	Average Patch Size (ha)	0.75	4.66	1.50	1.58	1.84	3.90
	Difference from Current Average Patch Size (ha)	0.15	0.34	0.06	-0.05	-0.04	-0.19
PROJECTION AT YEAR 50	Total Gross Area (ha)	4,146	2,108	8,949	4,096	1,971	121
	Average Patch Size (ha)	0.96	2.37	2.38	2.01	1.89	1.24
	Difference from Current Average Patch Size (ha)	0.36	-1.95	0.94	0.38	0.00	-2.85
PROJECTION AT YEAR 100	Total Gross Area (ha)	4,198	6,343	7,063	2,959	200	629
	Average Patch Size (ha)	1.11	3.32	1.16	1.75	0.49	0.71
	Difference from Current Average Patch Size (ha)	0.51	-1.00	-0.27	0.12	-1.40	-3.37
PROJECTION AT YEAR 150	Total Gross Area (ha)	3,308	1,053	9,545	5,529	1,368	589
	Average Patch Size (ha)	1.41	2.37	2.66	1.25	1.95	0.63
	Difference from Current Average Patch Size (ha)	0.81	-1.95	1.23	-0.38	0.06	-3.46
PROJECTION AT YEAR 200	Total Gross Area (ha)	2,657	1,465	6,874	5,245	3,615	1,536
	Average Patch Size (ha)	2.25	1.17	1.21	1.43	4.16	1.71
	Difference from Current Average Patch Size (ha)	1.65	-3.15	-0.22	-0.21	2.27	-2.37

TABLE 8-10: BOREAL HIGHLANDS PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	4,215	9,536	21,505	16,290	1,428	72
	Average Patch Size (ha)	0.73	4.09	2.49	2.51	2.62	2.79
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	7,598	7,574	19,015	16,924	1,860	75
	Average Patch Size (ha)	1.31	4.30	2.54	2.47	3.84	2.90
	Difference from Current Average Patch Size (ha)	0.59	0.21	0.06	-0.04	1.22	0.11
PROJECTION AT YEAR 50	Total Gross Area (ha)	12,825	4,540	16,297	15,238	4,104	41
	Average Patch Size (ha)	1.67	2.24	2.98	3.07	3.36	0.64
	Difference from Current Average Patch Size (ha)	0.94	-1.85	0.49	0.55	0.74	-2.15
PROJECTION AT YEAR 100	Total Gross Area (ha)	20,709	7,958	15,671	7,808	280	619
	Average Patch Size (ha)	4.03	6.19	1.81	1.62	0.55	0.80
	Difference from Current Average Patch Size (ha)	3.31	2.10	-0.67	-0.89	-2.07	-1.99
PROJECTION AT YEAR 150	Total Gross Area (ha)	10,189	6,517	30,584	2,832	2,682	242
	Average Patch Size (ha)	1.53	2.06	6.82	4.04	3.70	0.56
	Difference from Current Average Patch Size (ha)	0.80	-2.03	4.33	1.53	1.08	-2.22
PROJECTION AT YEAR 200	Total Gross Area (ha)	23,271	6,171	15,936	7,667	1	0
	Average Patch Size (ha)	3.97	5.02	1.81	2.34	0.23	
	Difference from Current Average Patch Size (ha)	3.24	0.93	-0.67	-0.18	-2.39	

FIGURE 8-17: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

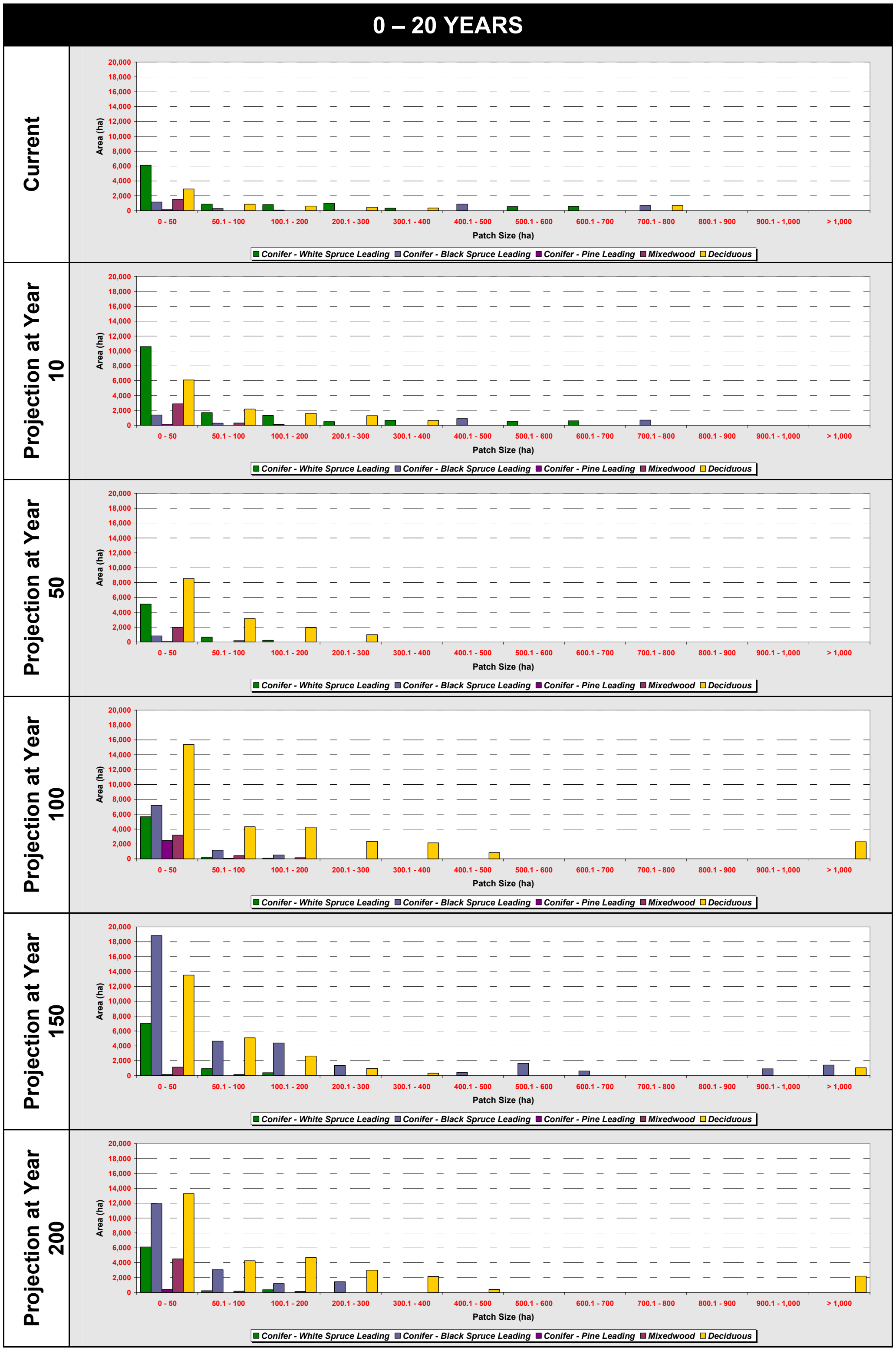


FIGURE 8-18: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

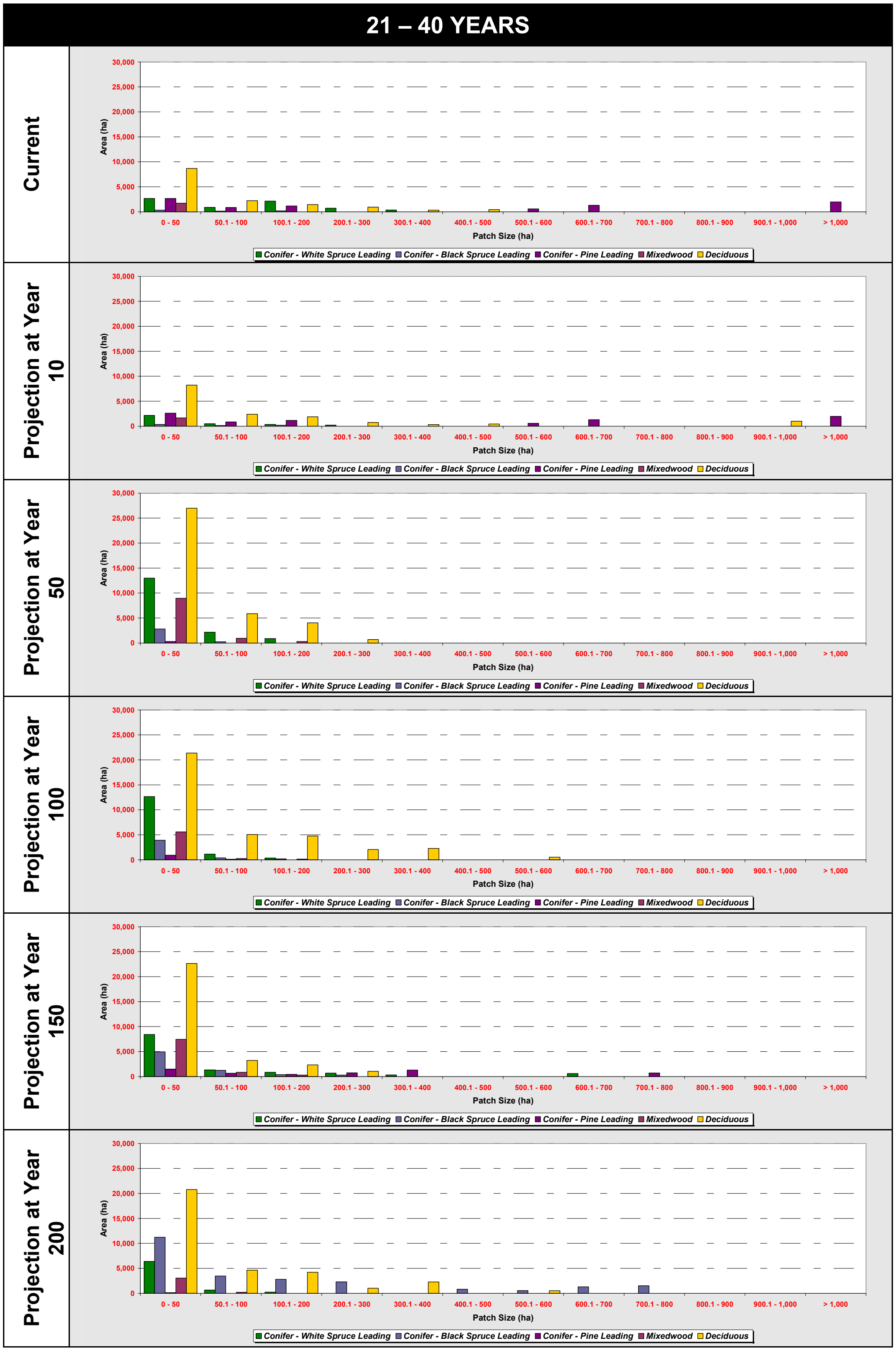


FIGURE 8-19: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

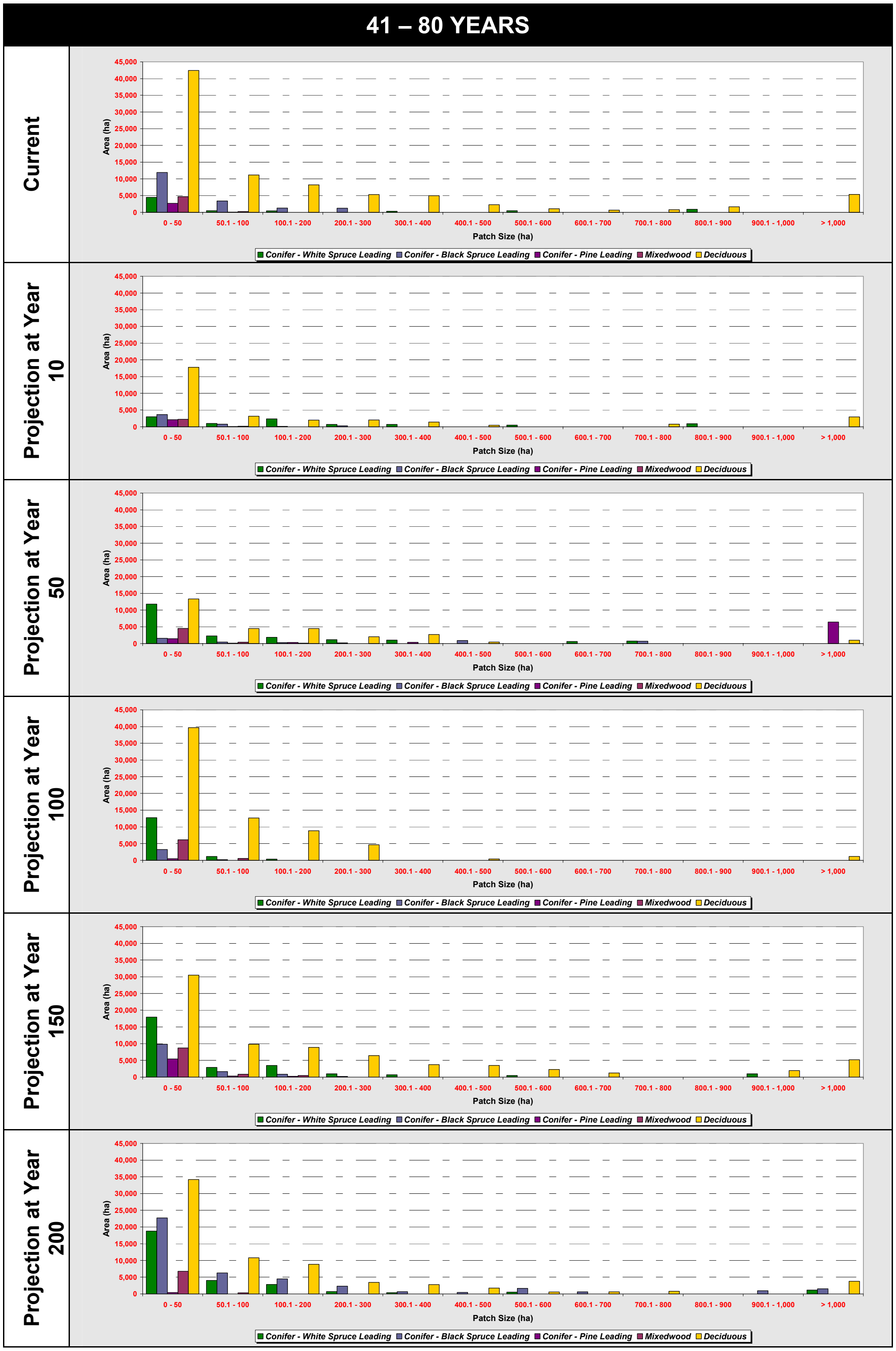
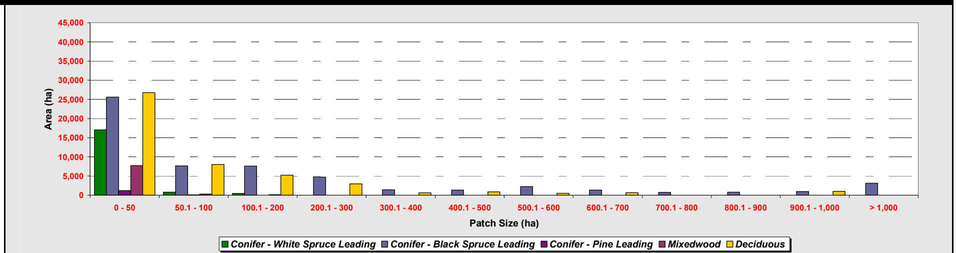


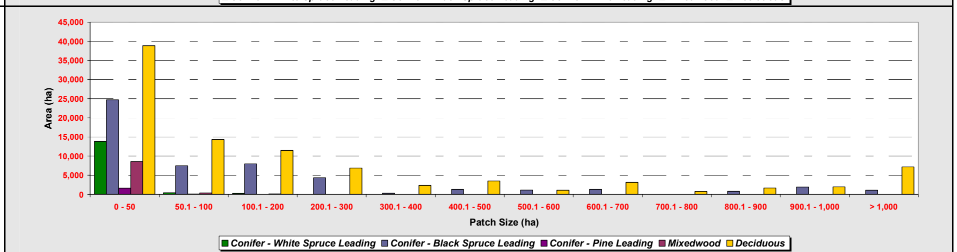
FIGURE 8-20: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

81 – 120 YEARS

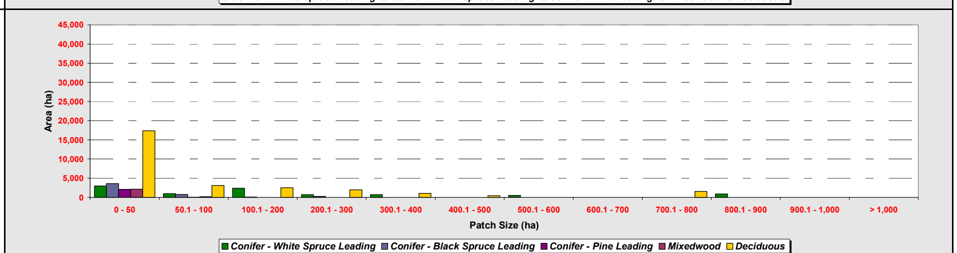
Current



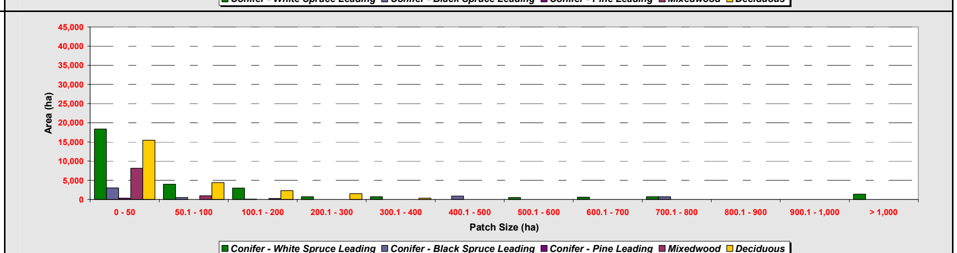
Projection at Year 10



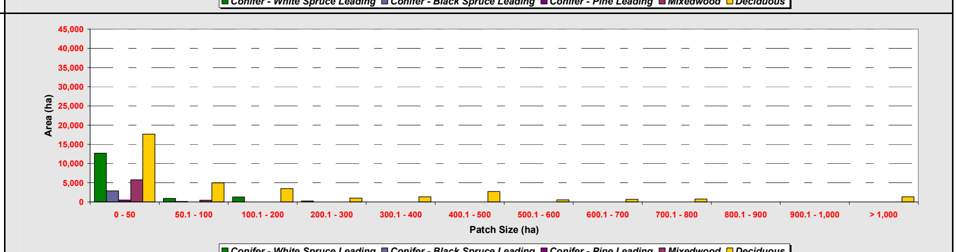
Projection at Year 50



Projection at Year 100



Projection at Year 150



Projection at Year 200

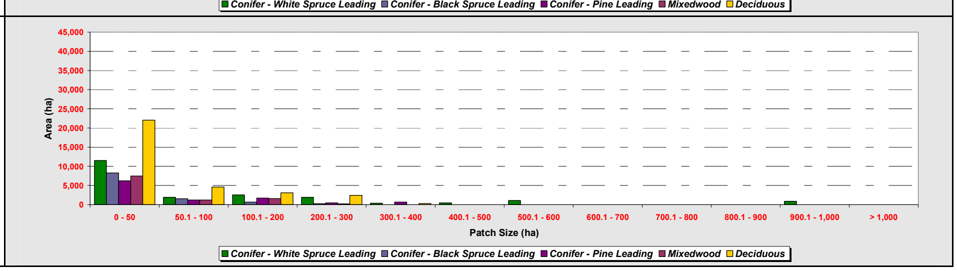


FIGURE 8-21: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

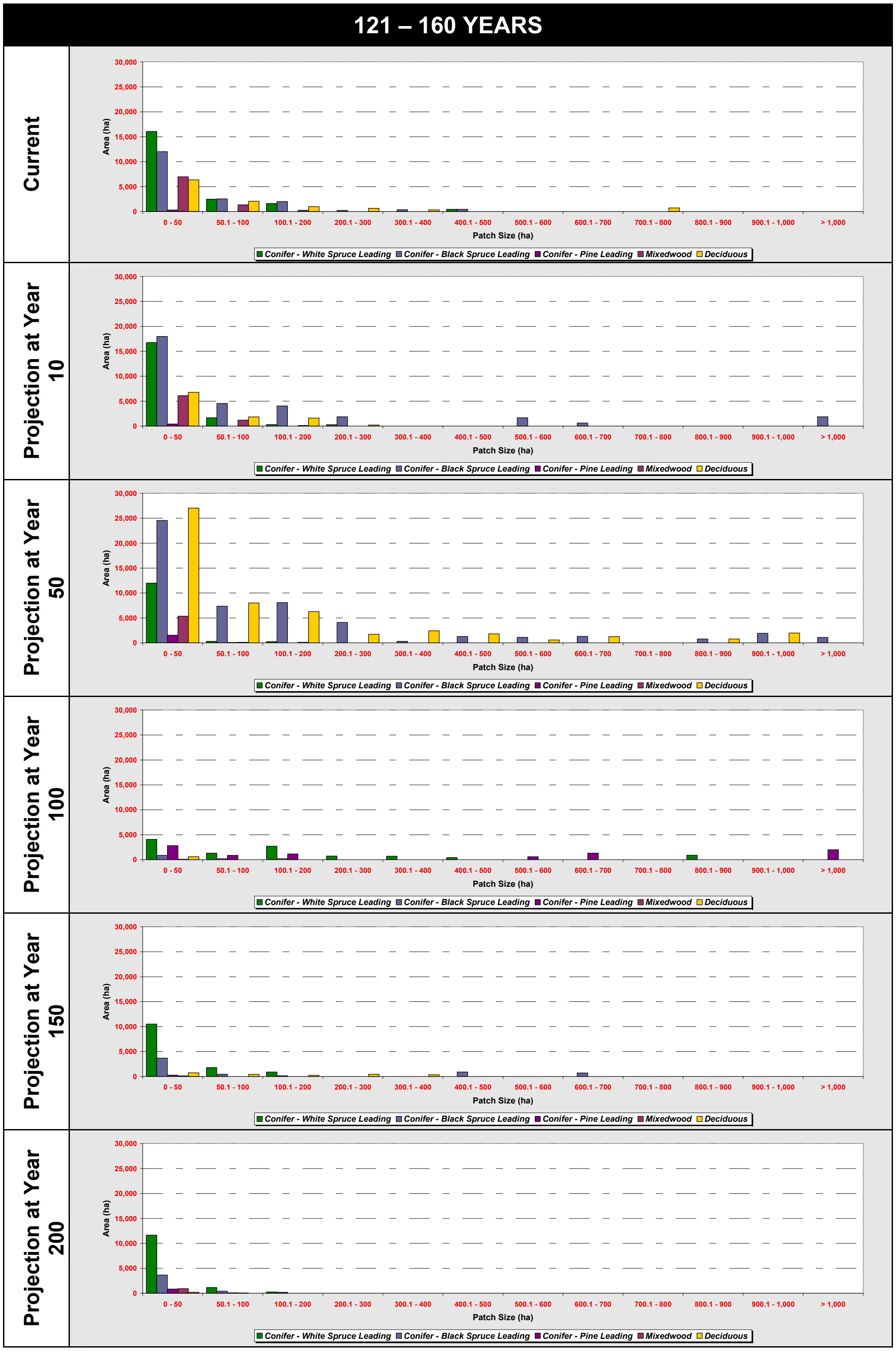


FIGURE 8-22: CENTRAL MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

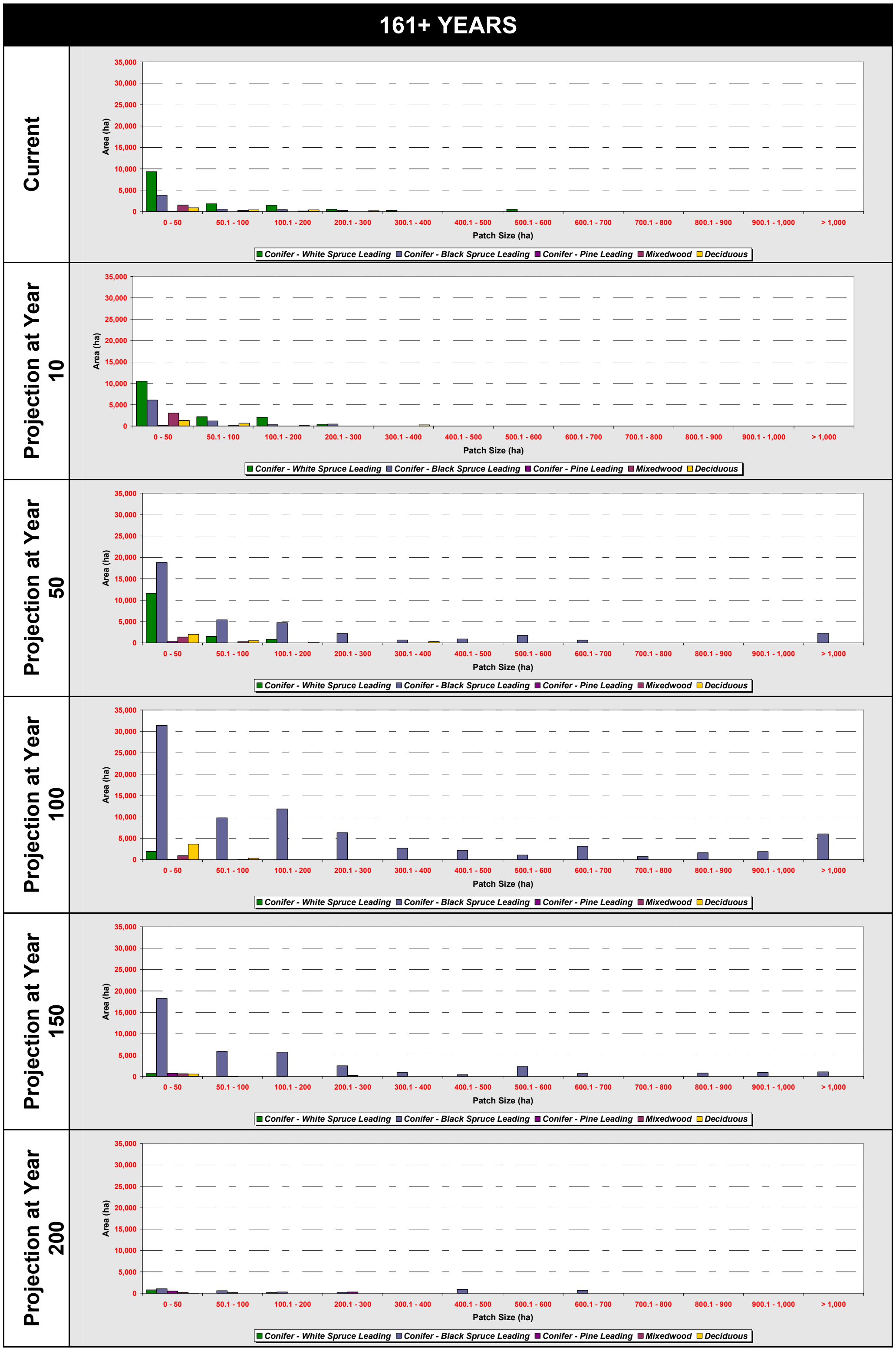


TABLE 8-11: CENTRAL MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	10,367	6,774	7,153	18,330	20,646	13,943
	Average Patch Size (ha)	2.57	24.91	6.01	3.59	5.44	6.55
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	15,951	3,261	9,152	14,580	19,026	15,244
	Average Patch Size (ha)	3.59	10.76	16.58	3.38	4.36	6.05
	Difference from Current Average Patch Size (ha)	1.02	-14.14	10.57	-0.22	-1.08	-0.49
PROJECTION AT YEAR 50	Total Gross Area (ha)	5,997	16,033	19,524	9,152	12,544	13,963
	Average Patch Size (ha)	4.56	4.08	4.21	16.58	3.42	3.82
	Difference from Current Average Patch Size (ha)	1.98	-20.83	-1.81	12.99	-2.02	-2.72
PROJECTION AT YEAR 100	Total Gross Area (ha)	6,013	14,174	14,269	30,006	10,828	1,922
	Average Patch Size (ha)	2.54	4.04	3.41	5.41	25.07	1.15
	Difference from Current Average Patch Size (ha)	-0.03	-20.87	-2.60	1.82	19.63	-5.40
PROJECTION AT YEAR 150	Total Gross Area (ha)	8,356	12,247	27,496	15,246	13,176	692
	Average Patch Size (ha)	3.45	2.66	5.22	4.22	3.76	1.11
	Difference from Current Average Patch Size (ha)	0.88	-22.25	-0.79	0.63	-1.68	-5.44
PROJECTION AT YEAR 200	Total Gross Area (ha)	6,719	7,308	28,345	20,876	13,045	920
	Average Patch Size (ha)	3.02	3.48	4.79	6.09	4.11	1.39
	Difference from Current Average Patch Size (ha)	0.45	-21.43	-1.22	2.50	-1.33	-5.16

TABLE 8-12: CENTRAL MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	3,156	655	17,828	57,710	17,619	5,070
	Average Patch Size (ha)	0.85	14.23	7.76	11.06	7.59	6.40
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	3,394	696	4,767	52,397	32,638	8,145
	Average Patch Size (ha)	0.92	7.57	6.14	11.35	8.83	6.46
	Difference from Current Average Patch Size (ha)	0.07	-6.66	-1.62	0.30	1.24	0.06
PROJECTION AT YEAR 50	Total Gross Area (ha)	828	3,042	4,127	4,767	51,964	37,309
	Average Patch Size (ha)	4.14	3.90	1.11	6.14	11.35	9.33
	Difference from Current Average Patch Size (ha)	3.29	-10.33	-6.65	-4.92	3.77	2.93
PROJECTION AT YEAR 100	Total Gross Area (ha)	8,888	4,482	3,411	5,237	1,242	78,778
	Average Patch Size (ha)	5.09	4.87	3.91	1.33	9.13	12.55
	Difference from Current Average Patch Size (ha)	4.23	-9.36	-3.85	-9.72	1.54	6.15
PROJECTION AT YEAR 150	Total Gross Area (ha)	34,276	6,835	12,518	3,010	5,882	39,518
	Average Patch Size (ha)	8.74	2.89	5.34	4.28	1.60	11.16
	Difference from Current Average Patch Size (ha)	7.89	-11.34	-2.42	-6.78	-5.99	4.76
PROJECTION AT YEAR 200	Total Gross Area (ha)	17,603	23,993	41,609	10,804	4,275	3,754
	Average Patch Size (ha)	7.63	11.06	7.47	5.42	5.23	1.29
	Difference from Current Average Patch Size (ha)	6.77	-3.17	-0.29	-5.63	-2.36	-5.11

TABLE 8-13: CENTRAL MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	137	8,567	2,747	1,335	306	73
	Average Patch Size (ha)	0.18	12.24	4.18	4.53	3.78	4.86
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	162	8,498	2,165	1,741	419	180
	Average Patch Size (ha)	0.22	12.67	4.16	4.42	3.61	3.75
	Difference from Current Average Patch Size (ha)	0.03	0.43	-0.03	-0.11	-0.17	-1.12
PROJECTION AT YEAR 50	Total Gross Area (ha)	73	300	8,680	2,165	1,643	305
	Average Patch Size (ha)	4.04	3.65	14.30	4.16	4.48	2.91
	Difference from Current Average Patch Size (ha)	3.86	-8.58	10.12	-0.37	0.70	-1.96
PROJECTION AT YEAR 100	Total Gross Area (ha)	2,522	1,020	488	340	8,734	61
	Average Patch Size (ha)	4.15	4.55	3.64	0.43	11.63	0.73
	Difference from Current Average Patch Size (ha)	3.97	-7.69	-0.54	-4.09	7.85	-4.13
PROJECTION AT YEAR 150	Total Gross Area (ha)	126	5,348	5,948	492	262	989
	Average Patch Size (ha)	2.80	6.38	4.00	3.94	1.16	2.66
	Difference from Current Average Patch Size (ha)	2.62	-5.86	-0.18	-0.59	-2.62	-2.20
PROJECTION AT YEAR 200	Total Gross Area (ha)	376	126	399	10,330	944	990
	Average Patch Size (ha)	2.54	2.80	0.47	6.48	4.72	4.27
	Difference from Current Average Patch Size (ha)	2.36	-9.44	-3.71	1.95	0.94	-0.59

TABLE 8-14: CENTRAL MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	1,533	1,773	4,952	8,150	8,560	1,931
	Average Patch Size (ha)	0.74	4.33	3.50	3.79	6.29	7.76
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	3,185	1,663	2,387	9,050	7,439	3,174
	Average Patch Size (ha)	1.44	4.35	3.73	3.66	5.39	6.15
	Difference from Current Average Patch Size (ha)	0.70	0.02	0.23	-0.13	-0.91	-1.60
PROJECTION AT YEAR 50	Total Gross Area (ha)	2,168	10,182	5,013	2,296	5,602	1,637
	Average Patch Size (ha)	3.96	4.74	2.21	3.70	3.45	2.91
	Difference from Current Average Patch Size (ha)	3.22	0.40	-1.29	-0.09	-2.84	-4.85
PROJECTION AT YEAR 100	Total Gross Area (ha)	3,784	5,936	6,695	9,387	81	1,017
	Average Patch Size (ha)	1.75	3.71	3.40	4.59	0.47	1.36
	Difference from Current Average Patch Size (ha)	1.00	-0.62	-0.10	0.80	-5.82	-6.40
PROJECTION AT YEAR 150	Total Gross Area (ha)	1,263	8,613	10,036	6,231	128	628
	Average Patch Size (ha)	2.36	4.92	3.82	3.97	0.61	1.06
	Difference from Current Average Patch Size (ha)	1.61	0.59	0.32	0.18	-5.69	-6.70
PROJECTION AT YEAR 200	Total Gross Area (ha)	4,820	3,263	7,071	10,572	968	206
	Average Patch Size (ha)	3.82	3.28	3.71	4.33	2.79	0.62
	Difference from Current Average Patch Size (ha)	3.08	-1.05	0.21	0.54	-3.50	-7.13

TABLE 8-15: CENTRAL MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	5,973	14,037	83,857	46,775	11,114	1,912
	Average Patch Size (ha)	0.89	8.11	9.10	8.48	9.04	12.41
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	11,872	15,045	30,436	93,397	10,480	2,438
	Average Patch Size (ha)	1.70	9.98	7.49	10.50	6.86	8.83
	Difference from Current Average Patch Size (ha)	0.81	1.86	-1.60	2.03	-2.18	-3.58
PROJECTION AT YEAR 50	Total Gross Area (ha)	14,649	37,610	28,428	28,021	51,954	3,004
	Average Patch Size (ha)	5.87	5.93	3.98	7.05	7.44	4.49
	Difference from Current Average Patch Size (ha)	4.98	-2.18	-5.11	-1.43	-1.60	-7.92
PROJECTION AT YEAR 100	Total Gross Area (ha)	31,620	36,003	67,428	24,005	574	4,036
	Average Patch Size (ha)	4.24	7.47	6.61	5.81	0.77	1.54
	Difference from Current Average Patch Size (ha)	3.34	-0.64	-2.48	-2.67	-8.27	-10.88
PROJECTION AT YEAR 150	Total Gross Area (ha)	23,617	29,251	73,471	34,554	2,216	558
	Average Patch Size (ha)	5.26	4.62	8.96	8.07	2.82	0.79
	Difference from Current Average Patch Size (ha)	4.37	-3.49	-0.13	-0.41	-6.23	-11.63
PROJECTION AT YEAR 200	Total Gross Area (ha)	29,959	33,500	67,477	32,521	196	13
	Average Patch Size (ha)	4.75	7.15	7.18	5.51	0.94	1.30
	Difference from Current Average Patch Size (ha)	3.86	-0.96	-1.92	-2.97	-8.10	-11.11

FIGURE 8-23: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

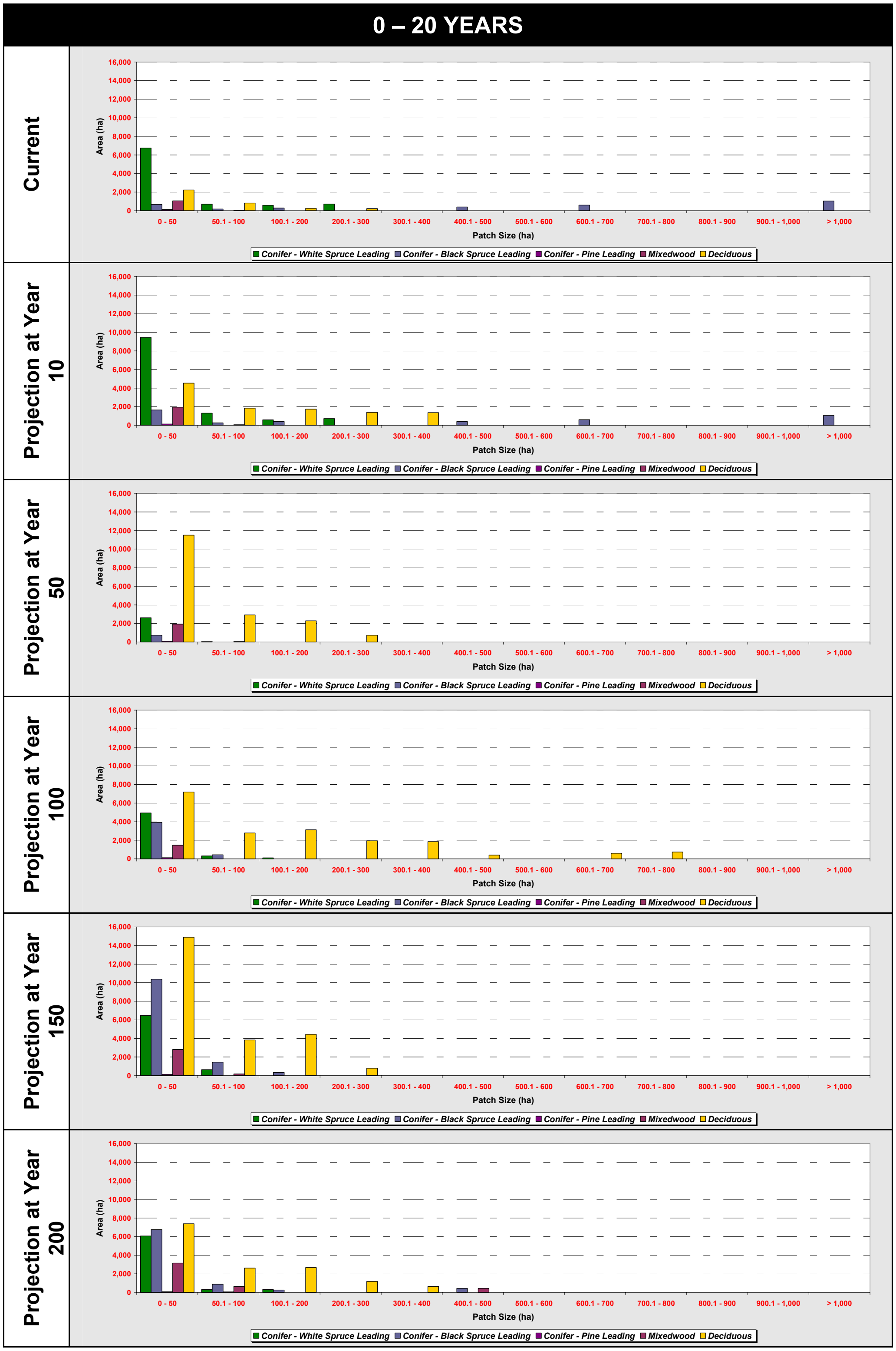


FIGURE 8-24: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

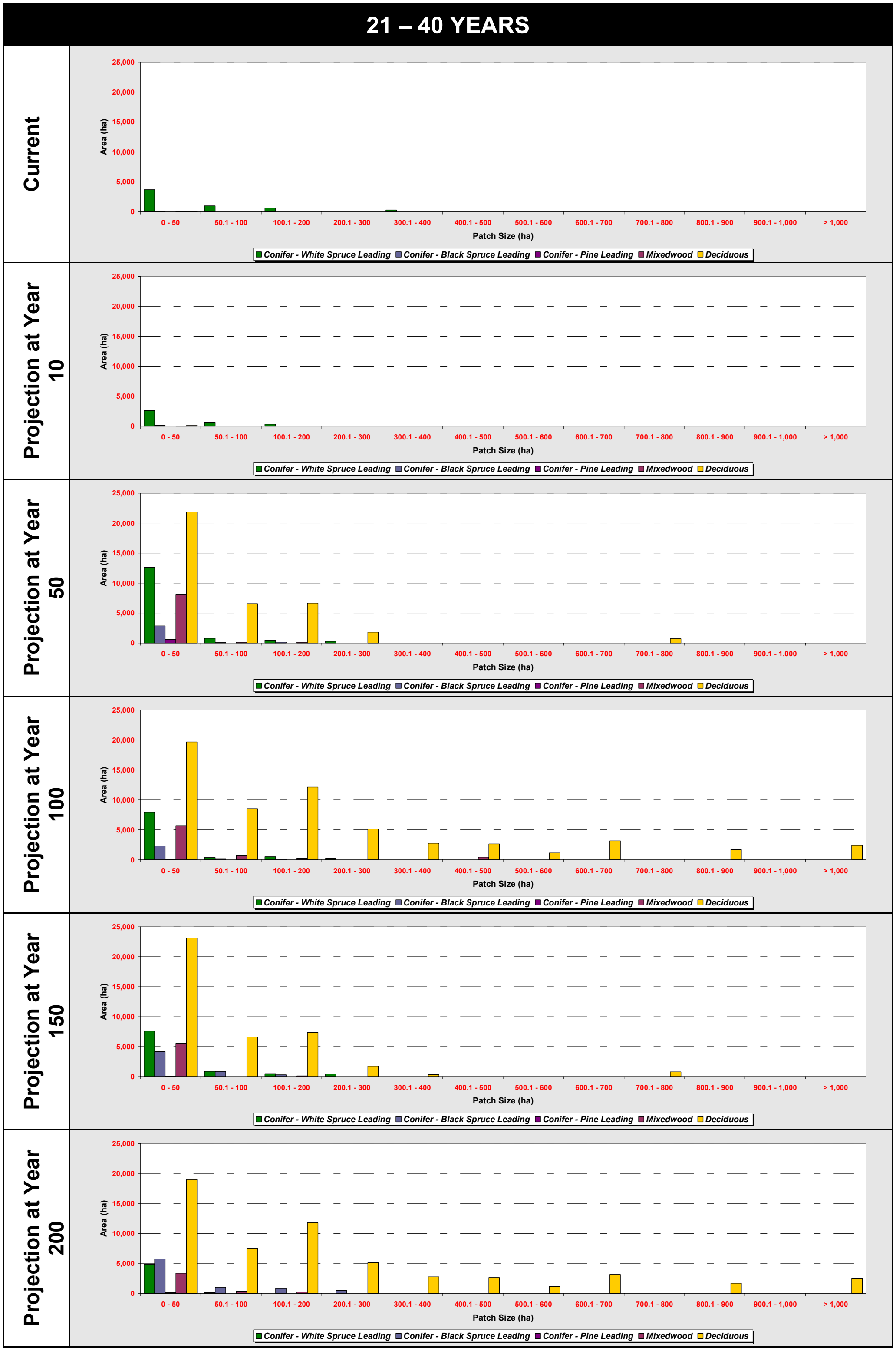


FIGURE 8-25: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

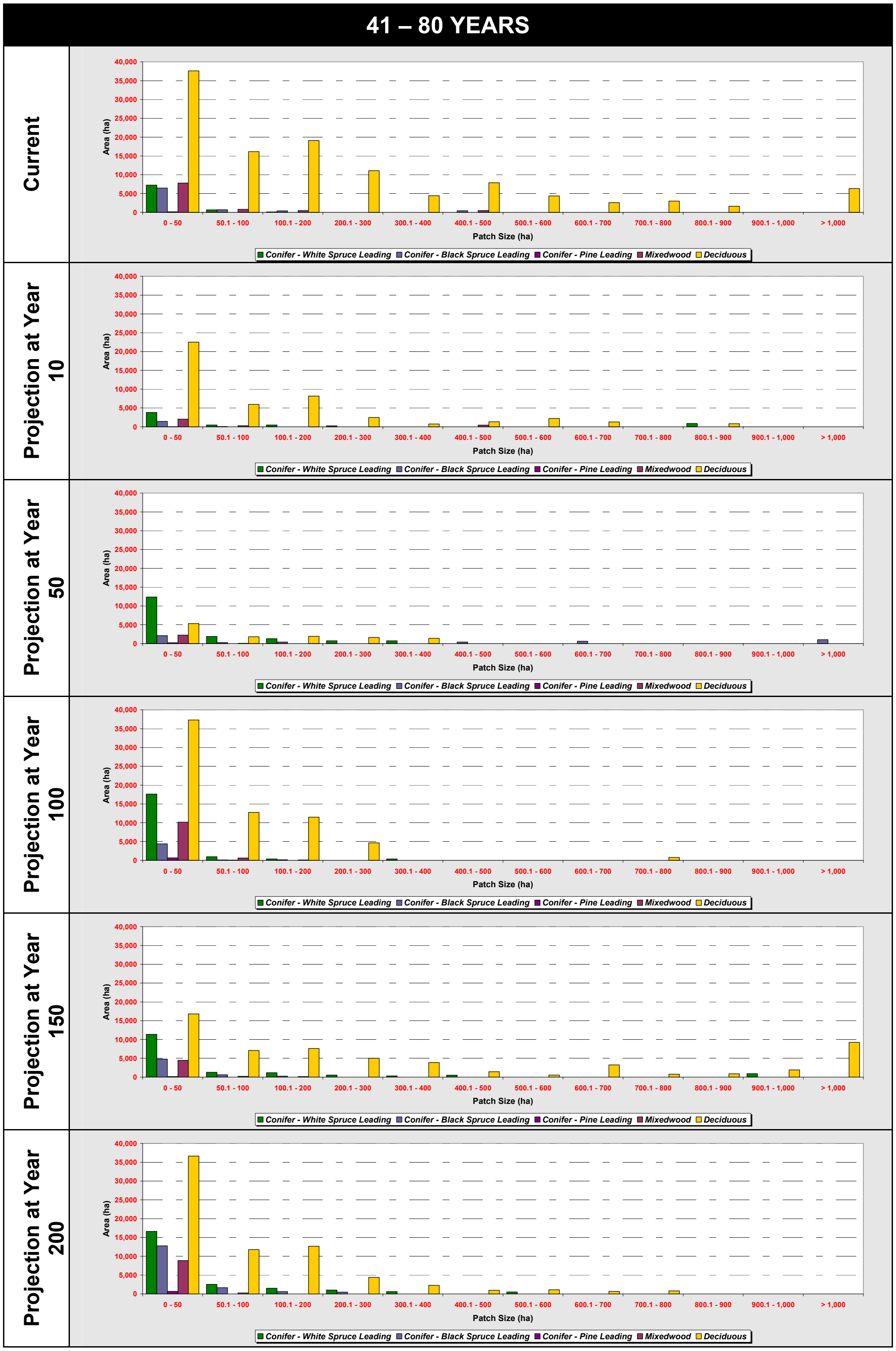


FIGURE 8-26: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

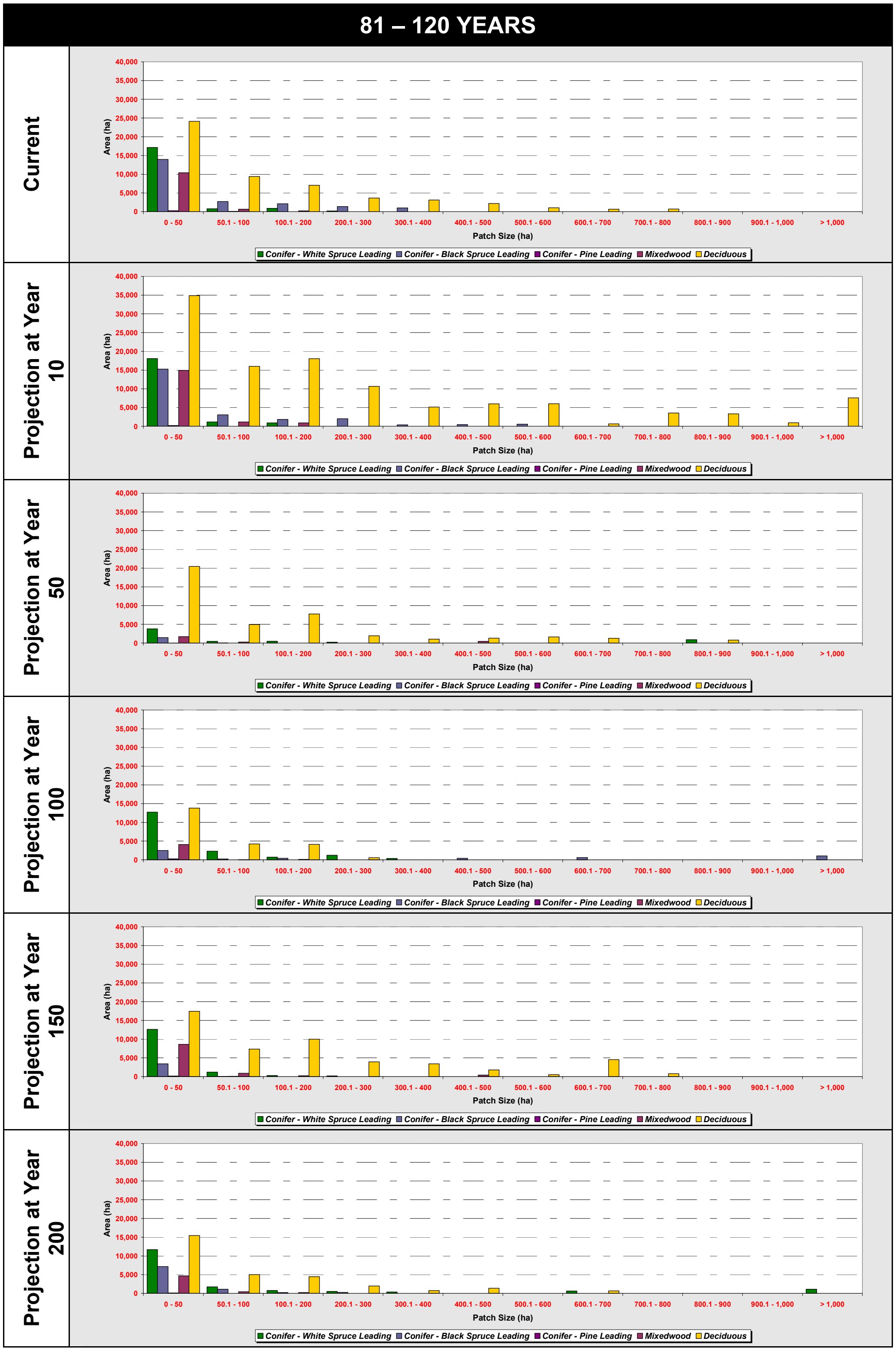


FIGURE 8-27: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

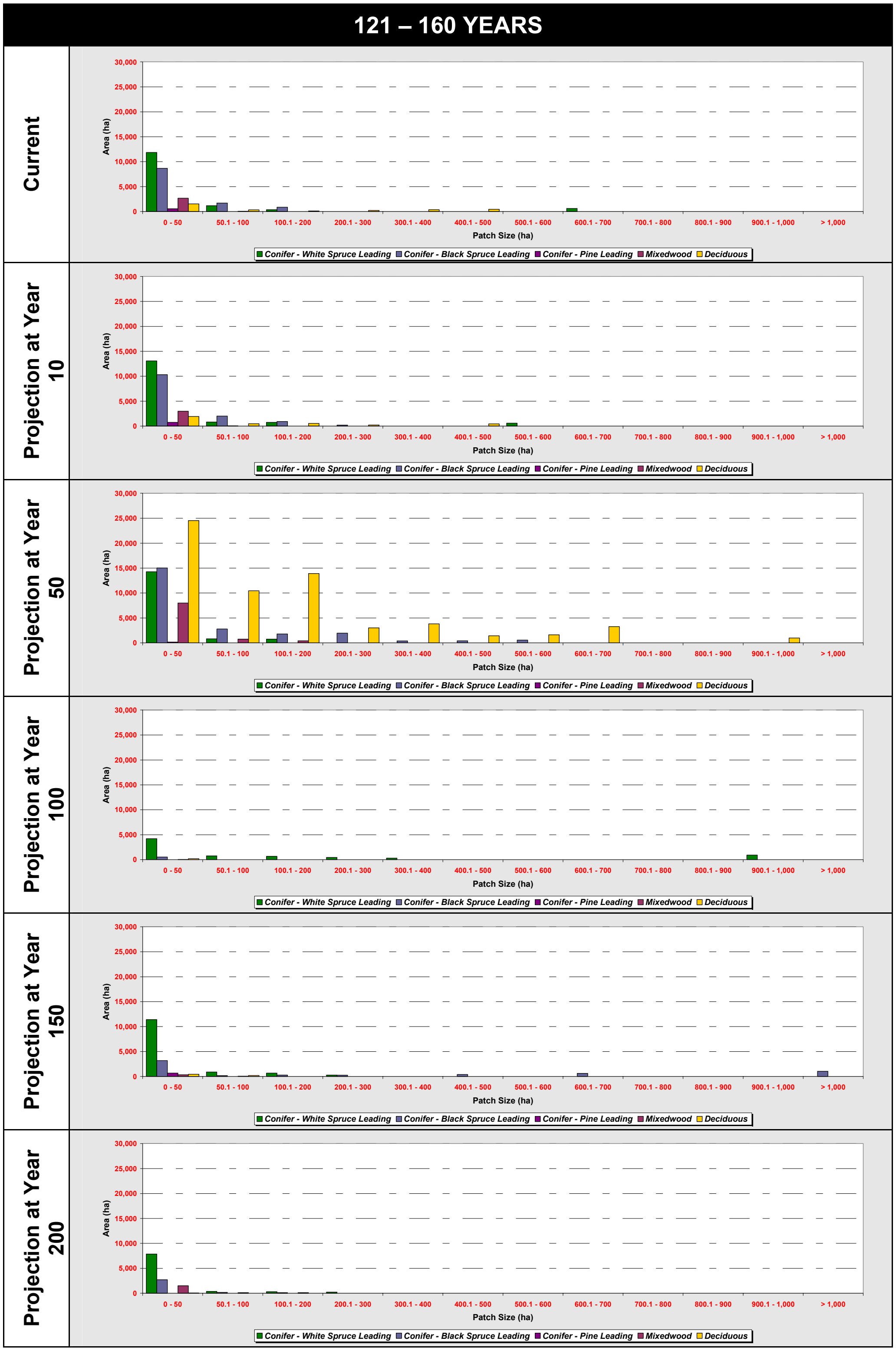


FIGURE 8-28: DRY MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

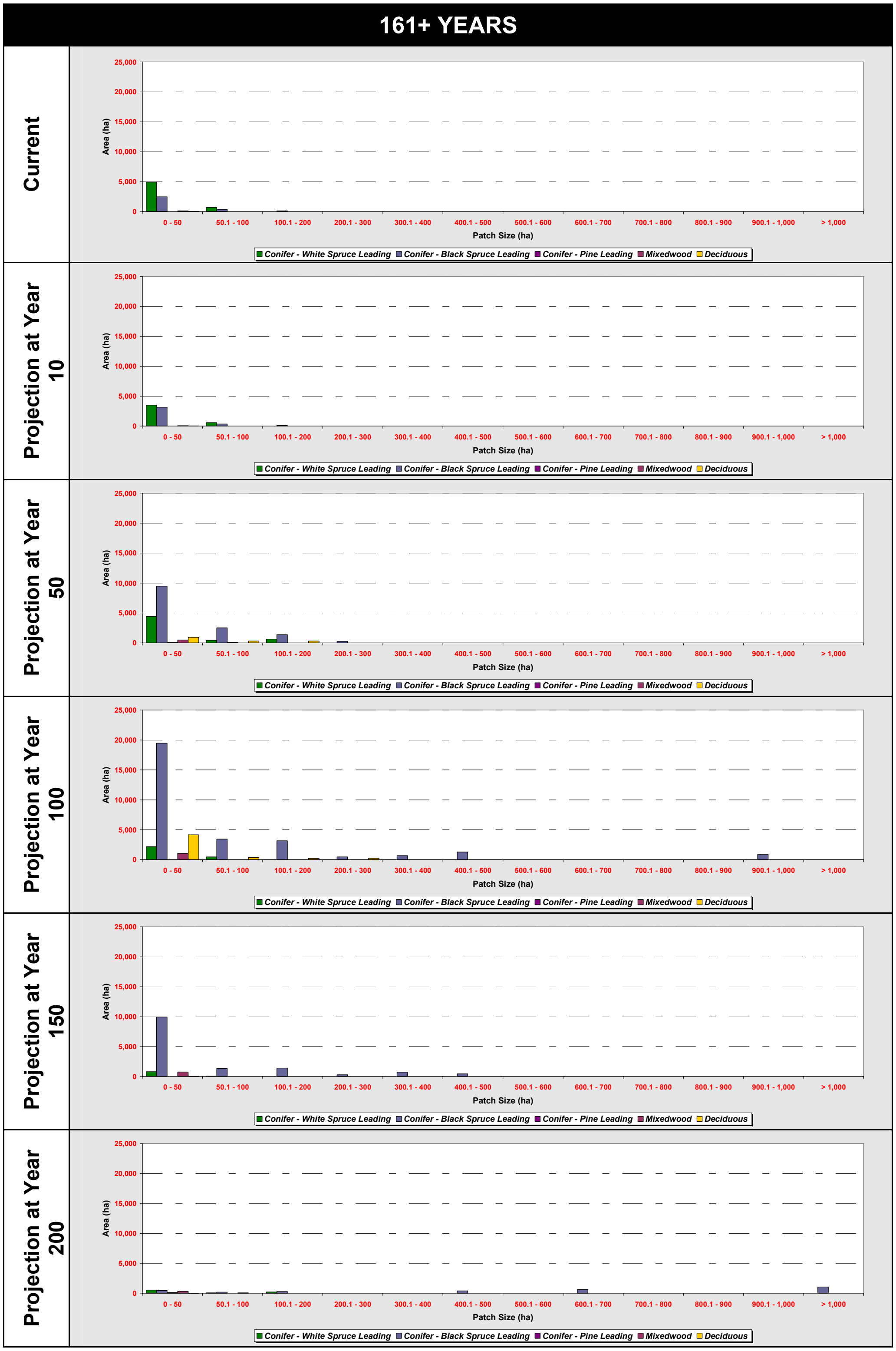


TABLE 8-16: DRY MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	8,754	5,585	7,995	19,085	14,003	5,616
	Average Patch Size (ha)	2.85	12.75	5.23	5.01	4.35	3.78
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	12,052	3,618	5,886	20,137	15,255	4,091
	Average Patch Size (ha)	3.49	10.49	8.20	4.83	3.82	3.43
	Difference from Current Average Patch Size (ha)	0.63	-2.26	2.97	-0.17	-0.53	-0.35
PROJECTION AT YEAR 50	Total Gross Area (ha)	2,673	14,124	16,991	5,886	15,849	5,515
	Average Patch Size (ha)	3.49	2.71	4.56	8.20	5.11	3.52
	Difference from Current Average Patch Size (ha)	0.64	-10.04	-0.67	3.19	0.76	-0.26
PROJECTION AT YEAR 100	Total Gross Area (ha)	5,366	9,065	19,242	17,396	7,341	2,628
	Average Patch Size (ha)	4.13	5.98	3.09	4.28	13.09	2.06
	Difference from Current Average Patch Size (ha)	1.28	-6.77	-2.14	-0.72	8.74	-1.73
PROJECTION AT YEAR 150	Total Gross Area (ha)	7,112	9,374	16,060	14,371	13,235	886
	Average Patch Size (ha)	2.73	2.71	7.03	4.35	2.85	1.55
	Difference from Current Average Patch Size (ha)	-0.13	-10.04	1.80	-0.66	-1.50	-2.24
PROJECTION AT YEAR 200	Total Gross Area (ha)	6,709	4,966	22,822	16,958	8,779	805
	Average Patch Size (ha)	3.32	3.22	4.48	6.25	5.66	2.63
	Difference from Current Average Patch Size (ha)	0.47	-9.53	-0.75	1.24	1.31	-1.15

TABLE 8-17: DRY MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	3,209	134	7,990	21,155	11,258	2,945
	Average Patch Size (ha)	1.35	1.32	6.22	7.91	6.58	5.99
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	4,361	142	1,503	23,576	13,455	3,655
	Average Patch Size (ha)	1.69	4.06	3.54	8.02	6.85	4.87
	Difference from Current Average Patch Size (ha)	0.34	2.74	-2.68	0.11	0.27	-1.11
PROJECTION AT YEAR 50	Total Gross Area (ha)	742	3,058	4,796	1,503	22,972	13,621
	Average Patch Size (ha)	4.14	3.42	1.82	3.54	7.96	7.04
	Difference from Current Average Patch Size (ha)	2.79	2.10	-4.40	-4.36	1.39	1.05
PROJECTION AT YEAR 100	Total Gross Area (ha)	4,358	2,563	4,631	5,201	535	29,403
	Average Patch Size (ha)	5.09	5.96	3.79	1.92	3.07	7.55
	Difference from Current Average Patch Size (ha)	3.74	4.64	-2.44	-5.99	-3.50	1.57
PROJECTION AT YEAR 150	Total Gross Area (ha)	12,179	5,329	5,650	3,459	5,951	14,124
	Average Patch Size (ha)	5.70	2.77	5.12	4.74	2.36	6.84
	Difference from Current Average Patch Size (ha)	4.35	1.45	-1.10	-3.16	-4.21	0.86
PROJECTION AT YEAR 200	Total Gross Area (ha)	8,348	8,019	15,549	8,809	2,979	2,987
	Average Patch Size (ha)	5.73	6.56	5.31	5.77	5.61	1.82
	Difference from Current Average Patch Size (ha)	4.38	5.24	-0.91	-2.14	-0.96	-4.17

TABLE 8-18: DRY MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	138	0	134	352	569	2
	Average Patch Size (ha)	1.97		3.96	8.79	2.83	2.05
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	140	0	14	214	827	0
	Average Patch Size (ha)	1.94		3.52	5.36	3.58	
	Difference from Current Average Patch Size (ha)	-0.03		-0.44	-3.43	0.75	
PROJECTION AT YEAR 50	Total Gross Area (ha)	90	607	207	14	176	101
	Average Patch Size (ha)	6.44	2.89	2.68	3.52	5.18	7.23
	Difference from Current Average Patch Size (ha)	4.47		-1.27	-5.28	2.35	5.18
PROJECTION AT YEAR 100	Total Gross Area (ha)	125	52	724	281	6	7
	Average Patch Size (ha)	3.67	26.00	3.32	3.52	5.64	0.34
	Difference from Current Average Patch Size (ha)	1.70		-0.63	-5.28	2.81	-1.71
PROJECTION AT YEAR 150	Total Gross Area (ha)	145	6	130	245	665	4
	Average Patch Size (ha)	4.14	0.12	3.72	9.78	3.07	0.31
	Difference from Current Average Patch Size (ha)	2.17		-0.23	0.99	0.24	-1.74
PROJECTION AT YEAR 200	Total Gross Area (ha)	158	108	661	134	0	134
	Average Patch Size (ha)	6.87	7.20	2.99	1.68		6.07
	Difference from Current Average Patch Size (ha)	4.91		-0.96	-7.12		4.03

TABLE 8-19: DRY MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	1,126	22	9,499	11,308	2,722	123
	Average Patch Size (ha)	0.60	1.68	6.10	5.48	5.29	3.00
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	2,021	10	2,737	16,964	2,991	77
	Average Patch Size (ha)	0.98	1.27	6.19	5.59	4.00	2.13
	Difference from Current Average Patch Size (ha)	0.38	-0.40	0.09	0.11	-1.28	-0.87
PROJECTION AT YEAR 50	Total Gross Area (ha)	2,004	8,356	2,294	2,448	9,205	494
	Average Patch Size (ha)	3.82	4.49	1.10	6.46	5.17	1.55
	Difference from Current Average Patch Size (ha)	3.22	2.82	-5.00	0.97	-0.12	-1.45
PROJECTION AT YEAR 100	Total Gross Area (ha)	1,466	7,094	10,909	4,267	38	1,026
	Average Patch Size (ha)	0.74	6.73	4.10	4.31	2.56	1.31
	Difference from Current Average Patch Size (ha)	0.14	5.05	-2.00	-1.17	-2.72	-1.69
PROJECTION AT YEAR 150	Total Gross Area (ha)	2,994	5,662	4,805	10,190	399	750
	Average Patch Size (ha)	3.47	4.71	2.16	4.99	2.39	1.38
	Difference from Current Average Patch Size (ha)	2.87	3.03	-3.93	-0.49	-2.90	-1.62
PROJECTION AT YEAR 200	Total Gross Area (ha)	4,250	3,936	9,077	5,394	1,742	401
	Average Patch Size (ha)	5.64	5.00	3.71	2.44	5.25	2.39
	Difference from Current Average Patch Size (ha)	5.04	3.32	-2.38	-3.05	-0.04	-0.62

TABLE 8-20: DRY MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	3,548	126	114,022	51,982	3,053	30
	Average Patch Size (ha)	0.69	2.18	16.18	10.91	10.87	3.79
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	10,879	124	45,376	112,740	3,620	24
	Average Patch Size (ha)	1.98	3.75	10.93	15.82	6.50	3.41
	Difference from Current Average Patch Size (ha)	1.28	1.57	-5.25	4.91	-4.37	-0.37
PROJECTION AT YEAR 50	Total Gross Area (ha)	17,458	37,617	11,989	41,183	62,971	1,544
	Average Patch Size (ha)	5.21	8.90	2.14	10.88	11.63	3.99
	Difference from Current Average Patch Size (ha)	4.51	6.72	-14.03	-0.03	0.76	0.20
PROJECTION AT YEAR 100	Total Gross Area (ha)	18,681	59,248	66,919	22,749	189	4,976
	Average Patch Size (ha)	3.39	19.00	7.29	6.15	1.04	1.64
	Difference from Current Average Patch Size (ha)	2.70	16.82	-8.89	-4.76	-9.82	-2.15
PROJECTION AT YEAR 150	Total Gross Area (ha)	23,981	39,957	58,333	49,797	665	29
	Average Patch Size (ha)	4.50	8.00	10.62	12.66	1.10	0.92
	Difference from Current Average Patch Size (ha)	3.80	5.83	-5.55	1.75	-9.76	-2.87
PROJECTION AT YEAR 200	Total Gross Area (ha)	14,522	57,225	71,251	29,692	55	18
	Average Patch Size (ha)	3.29	18.75	7.50	5.64	4.24	3.65
	Difference from Current Average Patch Size (ha)	2.60	16.57	-8.67	-5.26	-6.63	-0.13

FIGURE 8-29: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

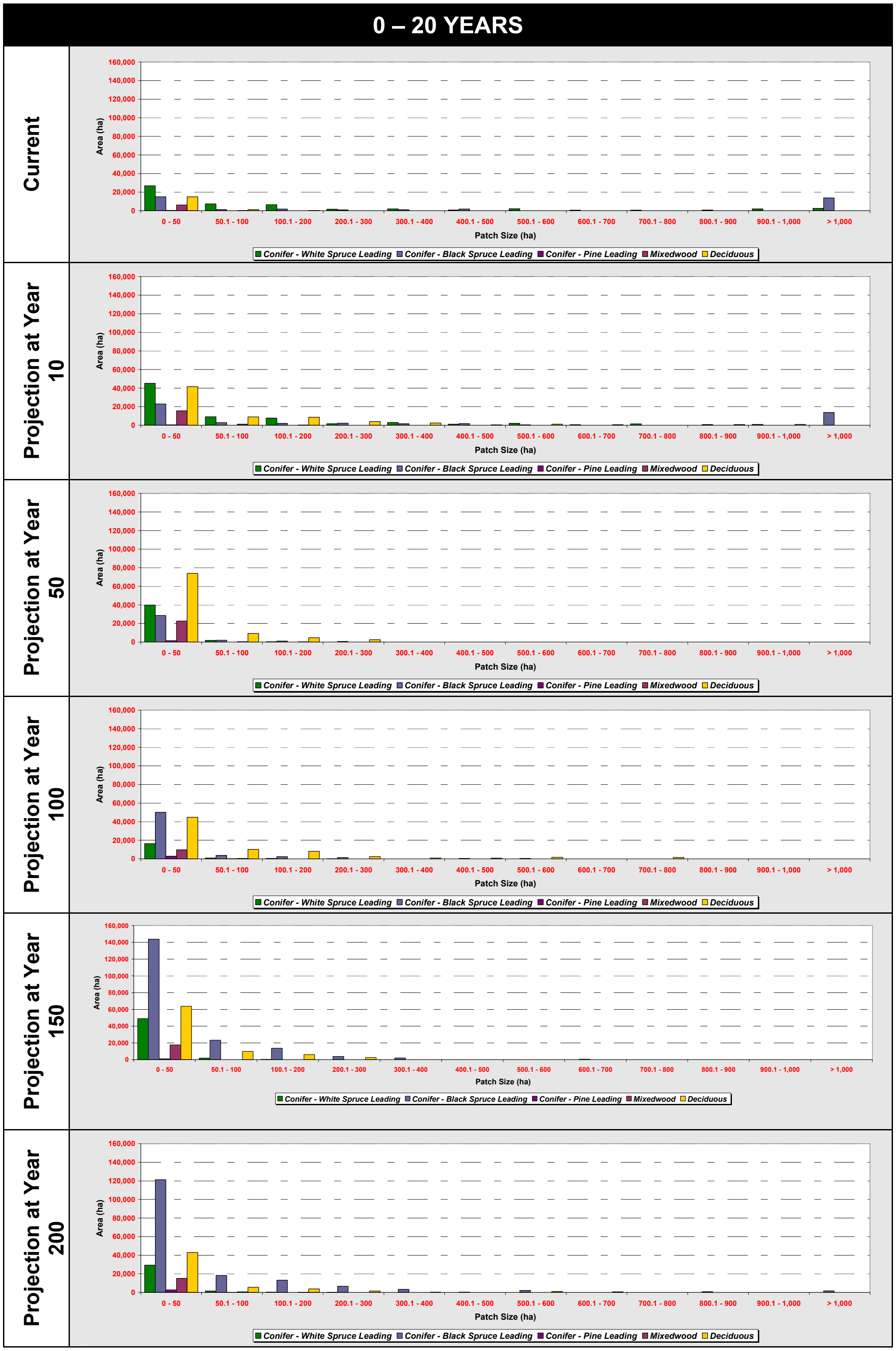


FIGURE 8-30: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

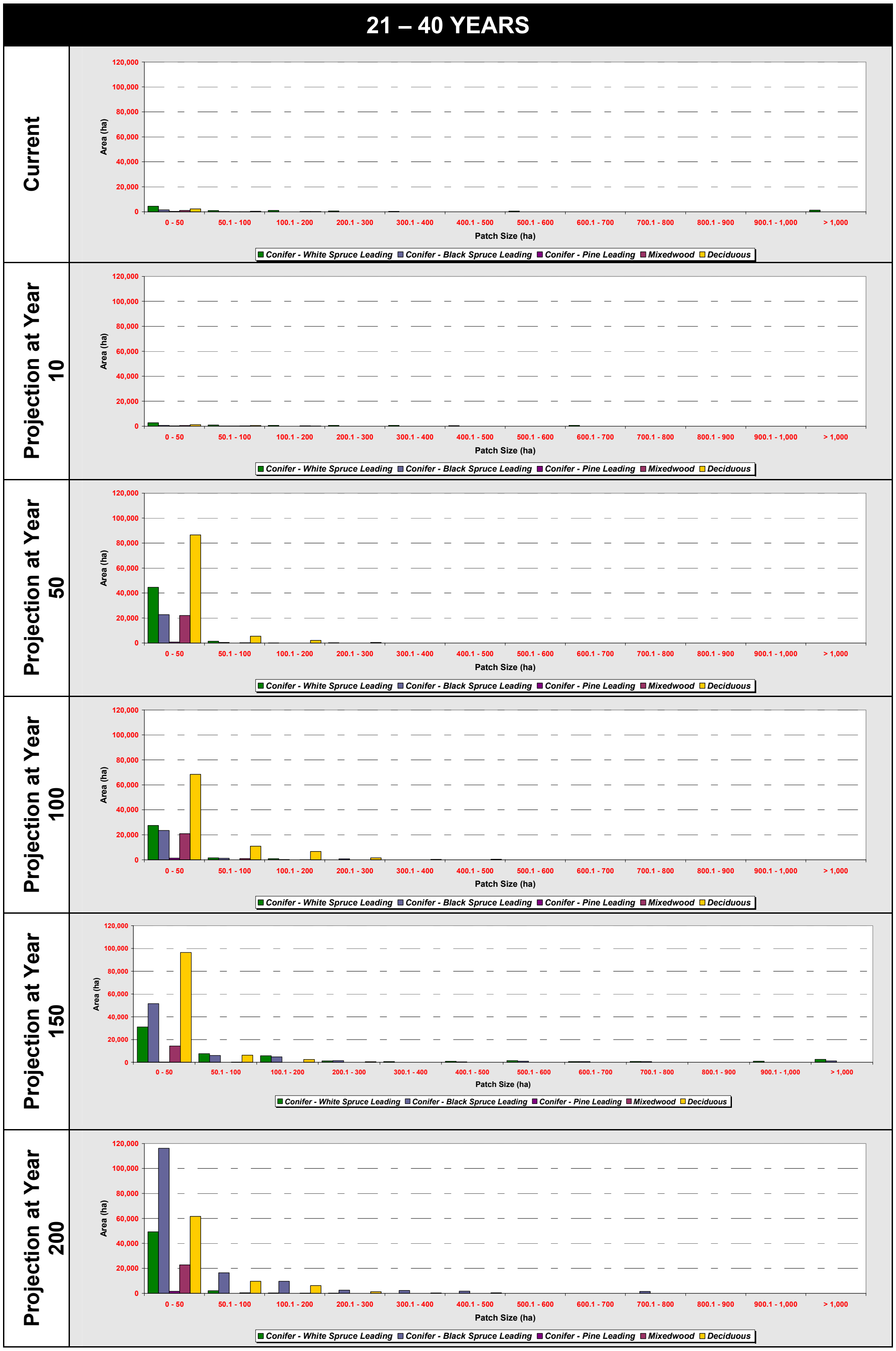


FIGURE 8-31: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

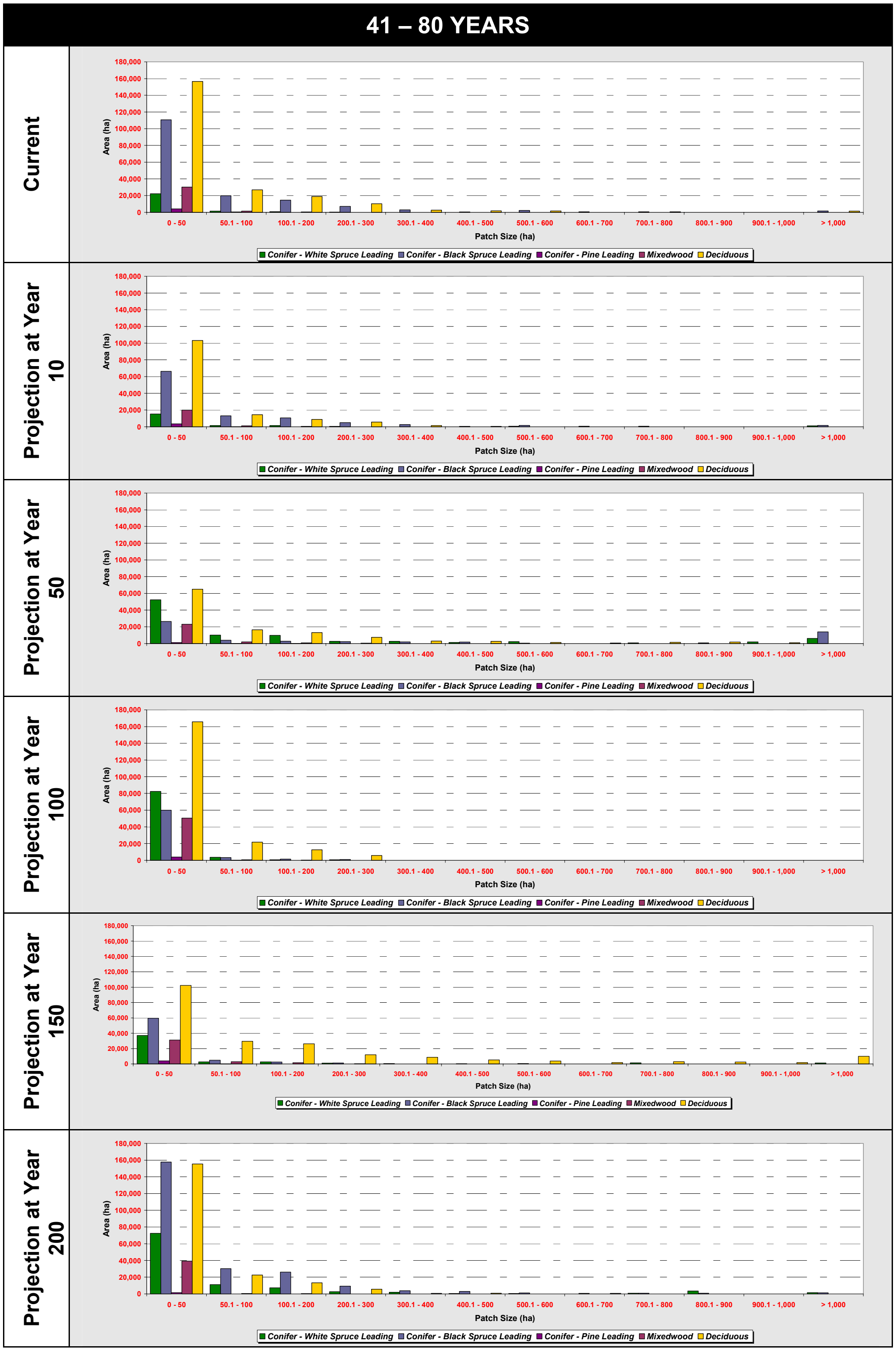


FIGURE 8-32: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

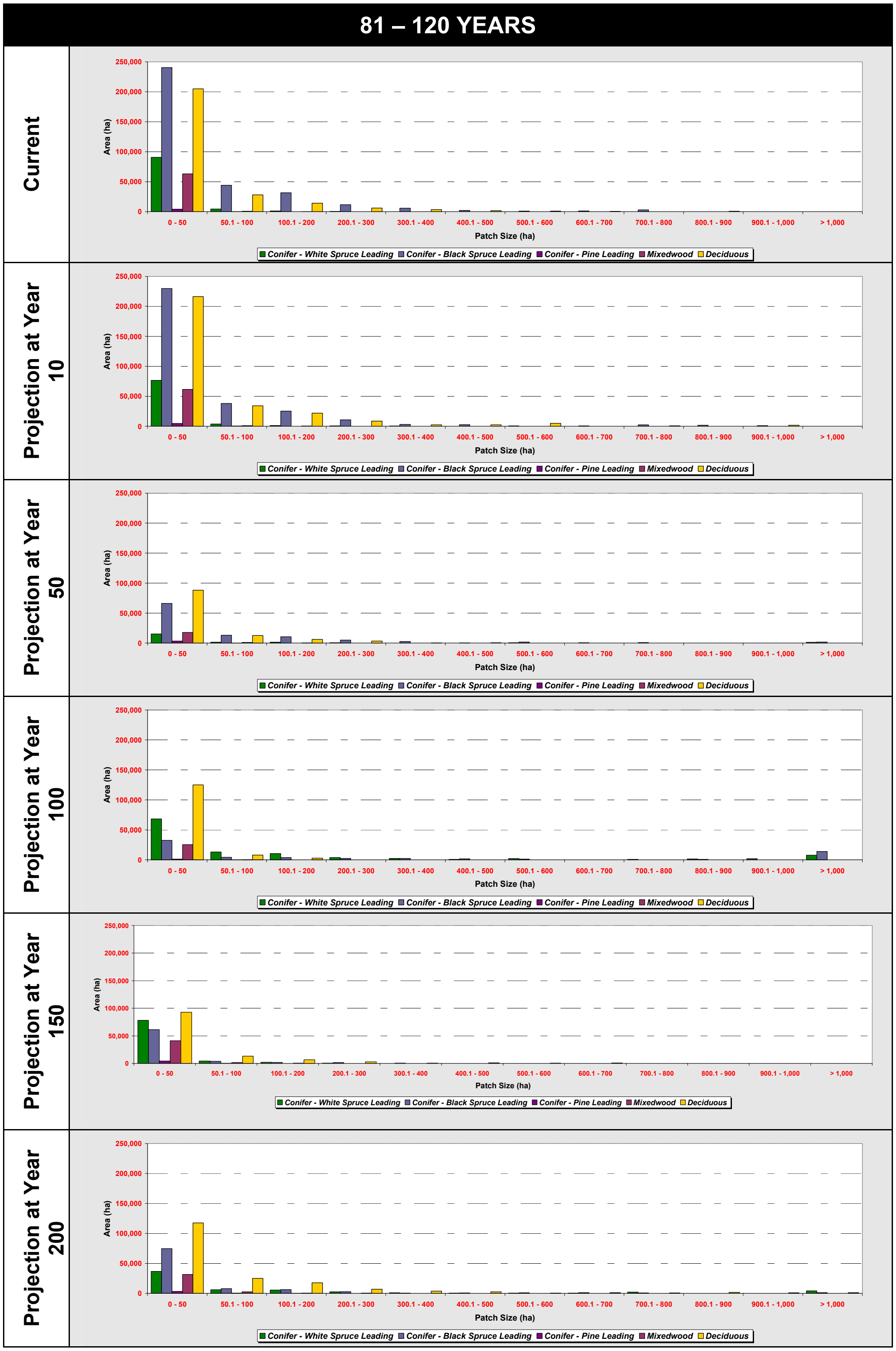


FIGURE 8-33: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

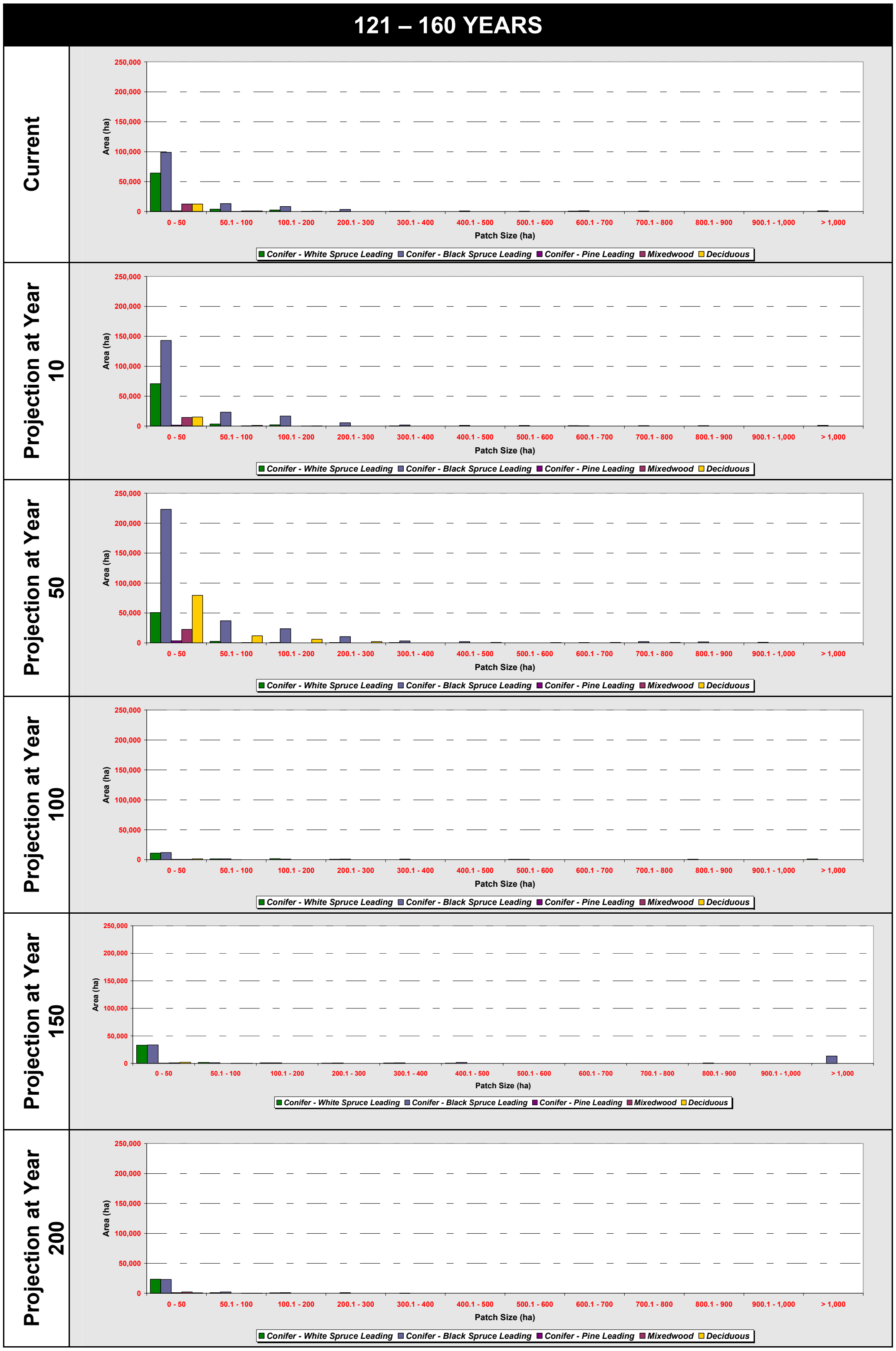


FIGURE 8-34: WET MIXEDWOOD – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

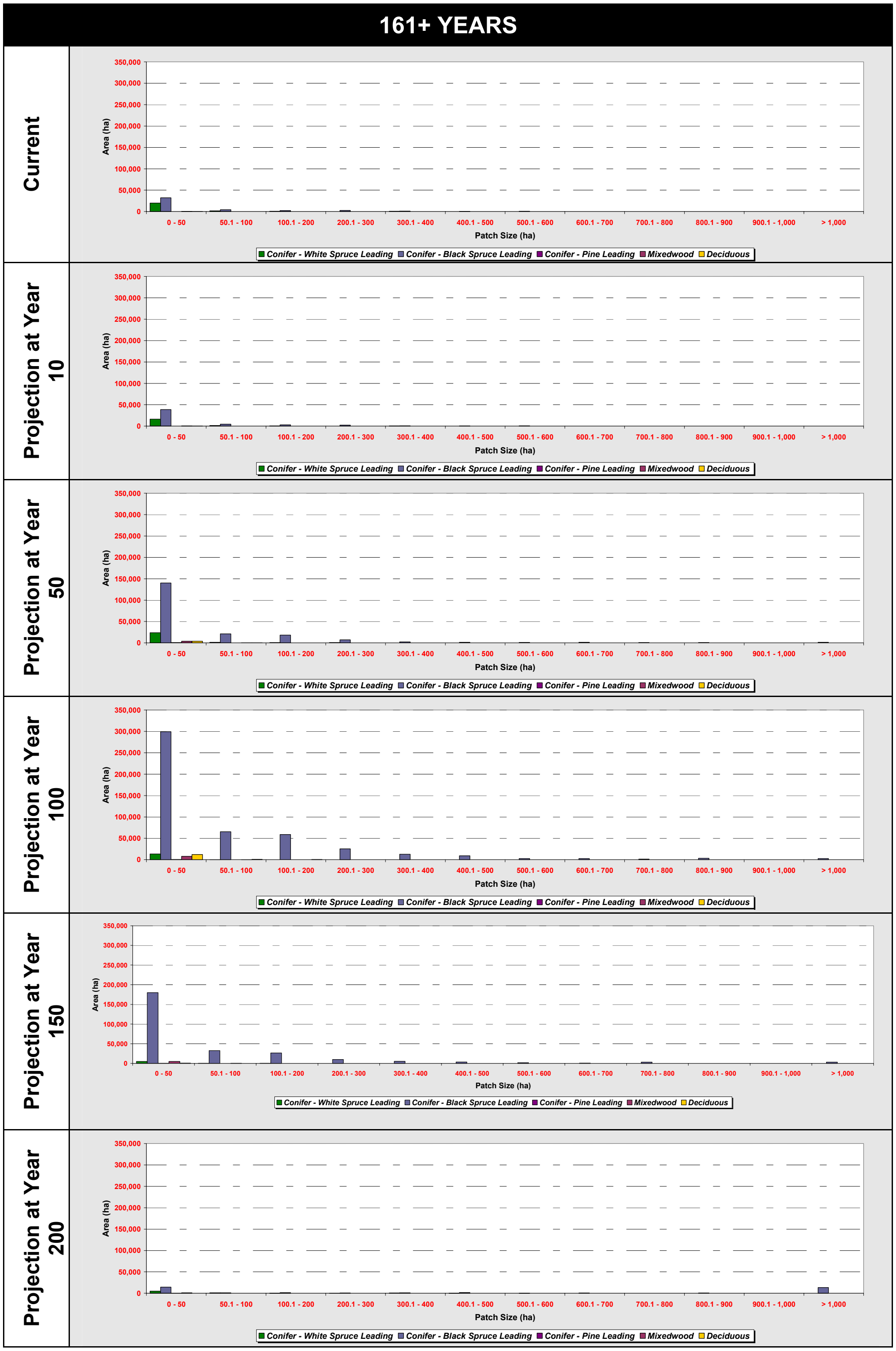


TABLE 8-21: WET MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	53,196	9,406	24,665	96,888	72,451	22,987
	Average Patch Size (ha)	1.38	23.87	2.77	2.23	2.41	2.40
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	73,360	6,774	20,197	83,011	77,638	18,614
	Average Patch Size (ha)	1.83	25.37	4.30	2.12	1.97	1.83
	Difference from Current Average Patch Size (ha)	0.45	1.50	1.53	-0.10	-0.44	-0.57
PROJECTION AT YEAR 50	Total Gross Area (ha)	42,068	46,269	89,690	20,197	54,872	26,499
	Average Patch Size (ha)	1.28	1.67	2.27	4.30	2.34	2.18
	Difference from Current Average Patch Size (ha)	-0.10	-22.20	-0.50	2.08	-0.07	-0.21
PROJECTION AT YEAR 100	Total Gross Area (ha)	18,098	29,855	87,515	112,902	17,404	13,820
	Average Patch Size (ha)	2.27	2.29	1.53	2.88	6.86	1.21
	Difference from Current Average Patch Size (ha)	0.88	-21.59	-1.24	0.66	4.45	-1.19
PROJECTION AT YEAR 150	Total Gross Area (ha)	51,236	53,841	47,449	84,706	37,296	5,067
	Average Patch Size (ha)	1.73	1.33	3.02	1.71	1.44	0.91
	Difference from Current Average Patch Size (ha)	0.34	-22.54	0.25	-0.52	-0.97	-1.49
PROJECTION AT YEAR 200	Total Gross Area (ha)	31,416	51,931	102,192	60,191	25,624	8,240
	Average Patch Size (ha)	2.25	1.35	2.66	3.13	2.21	1.27
	Difference from Current Average Patch Size (ha)	0.87	-22.52	-0.11	0.90	-0.20	-1.13

TABLE 8-22: WET MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	36,569	1,763	160,938	341,306	129,665	43,433
	Average Patch Size (ha)	0.71	3.77	4.22	3.56	2.89	2.96
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	48,767	813	102,455	315,371	196,369	49,899
	Average Patch Size (ha)	0.90	4.17	4.51	3.50	3.23	2.70
	Difference from Current Average Patch Size (ha)	0.20	0.40	0.29	-0.07	0.33	-0.26
PROJECTION AT YEAR 50	Total Gross Area (ha)	32,367	23,144	54,554	102,455	305,608	195,546
	Average Patch Size (ha)	2.08	1.90	1.01	4.51	3.49	3.23
	Difference from Current Average Patch Size (ha)	1.37	-1.87	-3.21	0.95	0.60	0.27
PROJECTION AT YEAR 100	Total Gross Area (ha)	58,573	25,634	65,602	63,339	17,017	483,510
	Average Patch Size (ha)	2.68	2.33	2.11	1.17	3.43	4.27
	Difference from Current Average Patch Size (ha)	1.98	-1.44	-2.12	-2.39	0.53	1.31
PROJECTION AT YEAR 150	Total Gross Area (ha)	187,368	68,279	69,422	68,577	53,694	266,335
	Average Patch Size (ha)	2.90	1.26	2.83	2.14	0.91	3.99
	Difference from Current Average Patch Size (ha)	2.19	-2.51	-1.39	-1.43	-1.99	1.03
PROJECTION AT YEAR 200	Total Gross Area (ha)	168,014	150,352	234,544	97,354	27,606	35,806
	Average Patch Size (ha)	3.75	3.08	2.77	3.16	2.58	0.75
	Difference from Current Average Patch Size (ha)	3.04	-0.69	-1.46	-0.41	-0.32	-2.21

TABLE 8-23: WET MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	297	458	4,582	4,290	1,366	13
	Average Patch Size (ha)	0.15	5.20	2.13	2.30	2.46	1.62
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	584	275	3,540	4,989	1,529	89
	Average Patch Size (ha)	0.30	5.09	2.08	2.14	2.45	22.34
	Difference from Current Average Patch Size (ha)	0.14	-0.11	-0.04	-0.17	0.00	20.72
PROJECTION AT YEAR 50	Total Gross Area (ha)	1,491	753	1,283	3,540	3,582	355
	Average Patch Size (ha)	1.67	1.78	0.65	2.08	2.26	2.42
	Difference from Current Average Patch Size (ha)	1.52	-3.43	-1.48	-0.22	-0.20	0.80
PROJECTION AT YEAR 100	Total Gross Area (ha)	3,113	1,274	4,120	1,346	739	413
	Average Patch Size (ha)	2.33	3.09	1.64	0.66	3.00	0.97
	Difference from Current Average Patch Size (ha)	2.18	-2.12	-0.49	-1.64	0.55	-0.65
PROJECTION AT YEAR 150	Total Gross Area (ha)	1,024	302	4,331	4,418	543	388
	Average Patch Size (ha)	2.42	0.16	2.54	1.79	1.09	1.00
	Difference from Current Average Patch Size (ha)	2.27	-5.05	0.41	-0.52	-1.37	-0.62
PROJECTION AT YEAR 200	Total Gross Area (ha)	2,875	1,672	1,475	3,914	965	104
	Average Patch Size (ha)	1.68	1.69	0.95	2.51	3.43	0.58
	Difference from Current Average Patch Size (ha)	1.53	-3.51	-1.18	0.21	0.98	-1.03

TABLE 8-24: WET MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	6,373	1,315	31,966	63,940	13,815	444
	Average Patch Size (ha)	0.27	4.31	2.15	1.83	2.50	2.46
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	17,079	1,007	21,337	62,714	15,161	554
	Average Patch Size (ha)	0.66	6.49	2.06	1.79	1.74	2.53
	Difference from Current Average Patch Size (ha)	0.40	2.18	-0.09	-0.04	-0.75	0.08
PROJECTION AT YEAR 50	Total Gross Area (ha)	23,115	22,258	26,317	19,025	22,991	4,147
	Average Patch Size (ha)	1.29	1.60	1.04	2.28	1.95	1.60
	Difference from Current Average Patch Size (ha)	1.02	-2.71	-1.10	0.45	-0.55	-0.86
PROJECTION AT YEAR 100	Total Gross Area (ha)	10,289	21,944	51,424	25,731	534	7,930
	Average Patch Size (ha)	0.41	2.18	1.55	1.51	1.12	1.01
	Difference from Current Average Patch Size (ha)	0.14	-2.13	-0.60	-0.32	-1.38	-1.45
PROJECTION AT YEAR 150	Total Gross Area (ha)	17,755	14,539	36,297	42,991	1,030	5,240
	Average Patch Size (ha)	1.32	1.47	1.53	1.83	0.31	1.01
	Difference from Current Average Patch Size (ha)	1.05	-2.84	-0.61	0.00	-2.19	-1.44
PROJECTION AT YEAR 200	Total Gross Area (ha)	15,918	23,432	39,930	35,160	2,110	1,302
	Average Patch Size (ha)	1.79	2.25	1.34	1.49	4.69	0.38
	Difference from Current Average Patch Size (ha)	1.53	-2.06	-0.81	-0.34	2.19	-2.08

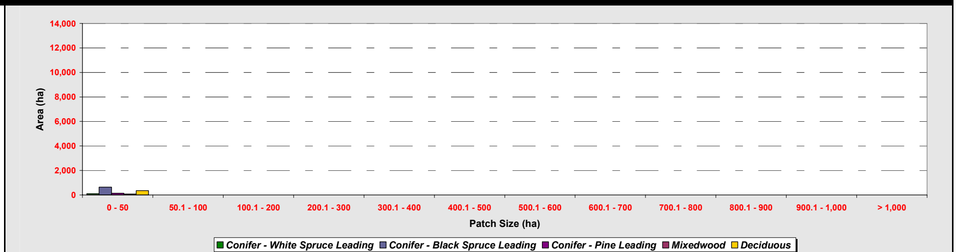
TABLE 8-25: WET MIXEDWOOD PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	16,410	2,906	220,606	261,298	14,321	225
	Average Patch Size (ha)	0.30	3.26	3.26	3.16	3.89	2.55
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	69,816	1,901	133,896	293,155	16,850	148
	Average Patch Size (ha)	1.24	4.69	2.60	3.18	2.57	3.03
	Difference from Current Average Patch Size (ha)	0.95	1.43	-0.66	0.02	-1.32	0.48
PROJECTION AT YEAR 50	Total Gross Area (ha)	90,468	94,532	113,485	110,726	102,292	4,263
	Average Patch Size (ha)	2.26	2.09	2.10	2.61	2.92	1.75
	Difference from Current Average Patch Size (ha)	1.96	-1.17	-1.16	-0.55	-0.97	-0.80
PROJECTION AT YEAR 100	Total Gross Area (ha)	70,707	88,460	205,692	135,898	1,512	13,498
	Average Patch Size (ha)	1.26	2.97	2.55	2.09	0.87	0.80
	Difference from Current Average Patch Size (ha)	0.96	-0.29	-0.71	-1.07	-3.02	-1.75
PROJECTION AT YEAR 150	Total Gross Area (ha)	82,150	105,753	207,475	117,584	2,067	740
	Average Patch Size (ha)	2.02	1.93	4.28	3.18	0.27	1.04
	Difference from Current Average Patch Size (ha)	1.72	-1.33	1.02	0.03	-3.62	-1.51
PROJECTION AT YEAR 200	Total Gross Area (ha)	55,959	79,647	199,078	180,264	807	13
	Average Patch Size (ha)	1.37	2.90	2.69	3.59	1.54	1.67
	Difference from Current Average Patch Size (ha)	1.07	-0.36	-0.57	0.43	-2.35	-0.88

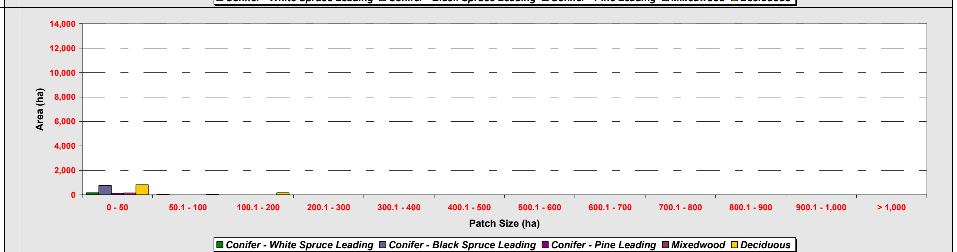
FIGURE 8-35: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

0 – 20 YEARS

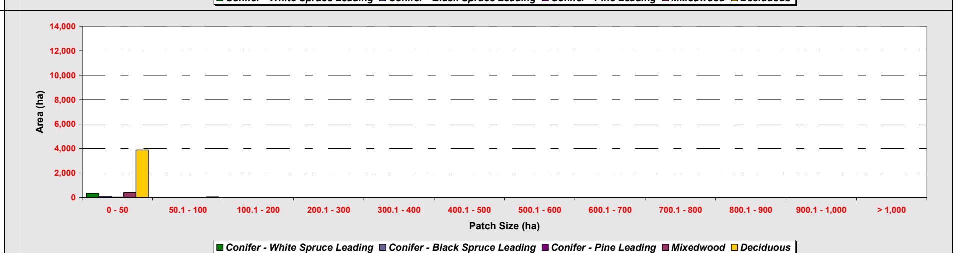
Current



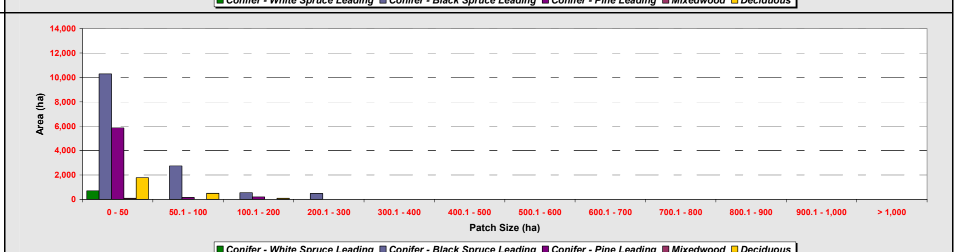
Projection at Year 10



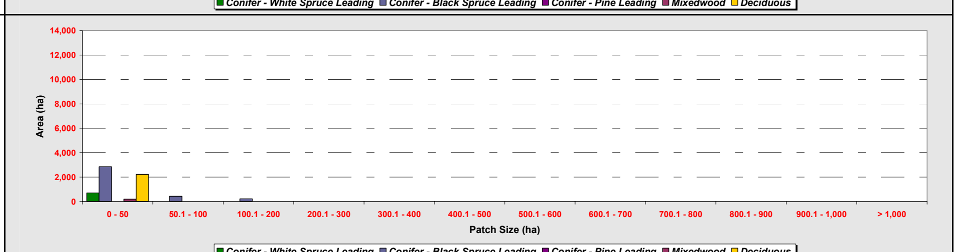
Projection at Year 50



Projection at Year 100



Projection at Year 150



Projection at Year 200

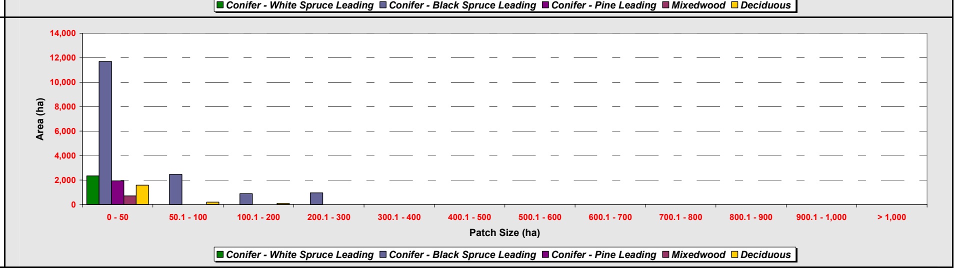
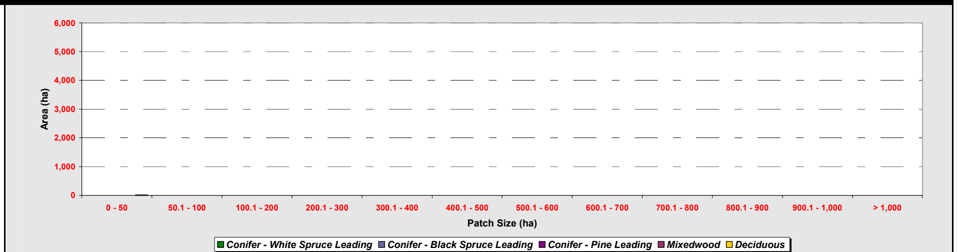


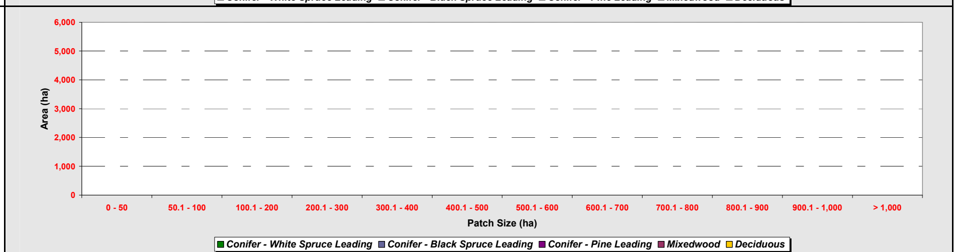
FIGURE 8-36: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

21 – 40 YEARS

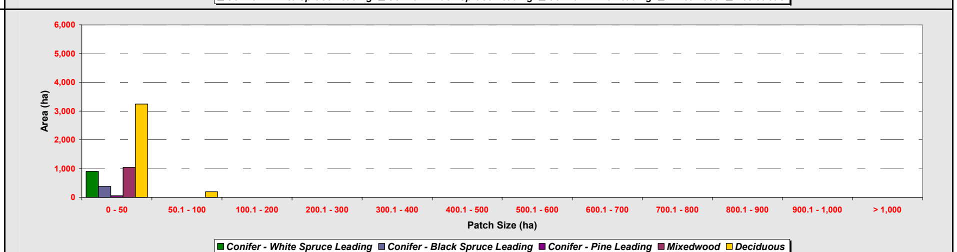
Current



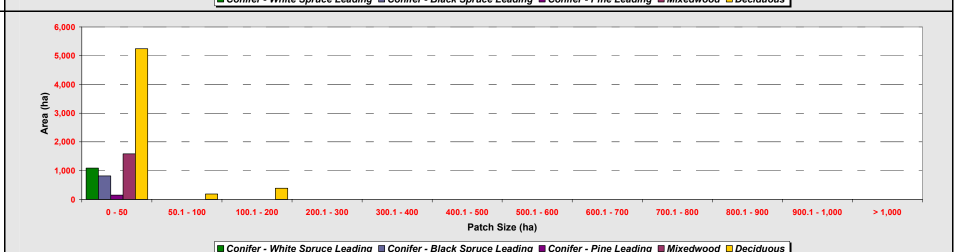
Projection at Year 10



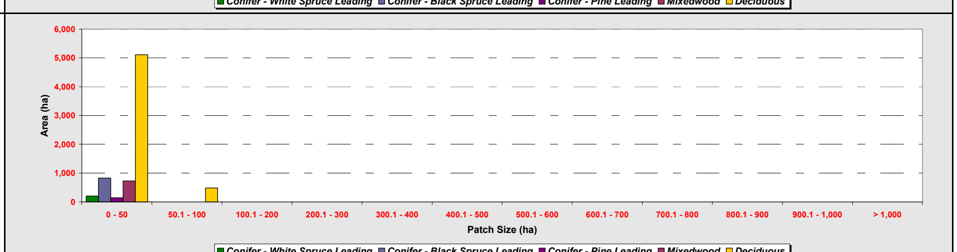
Projection at Year 50



Projection at Year 100



Projection at Year 150



Projection at Year 200

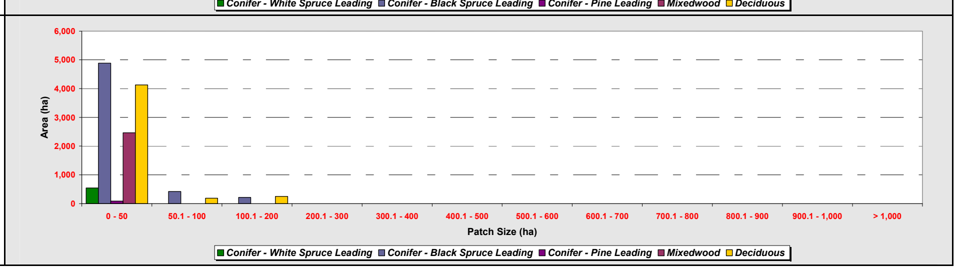


FIGURE 8-37: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

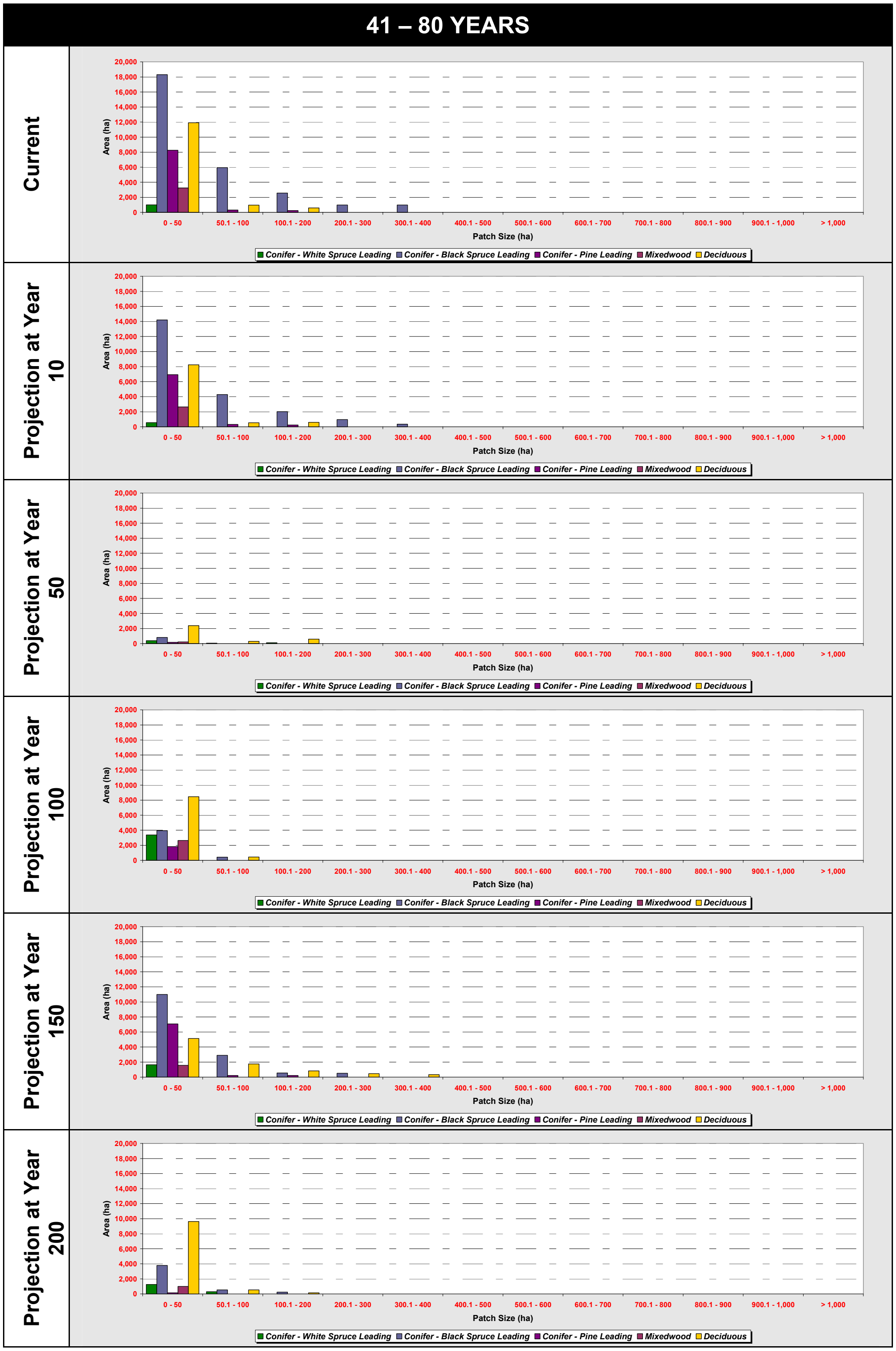


FIGURE 8-38: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

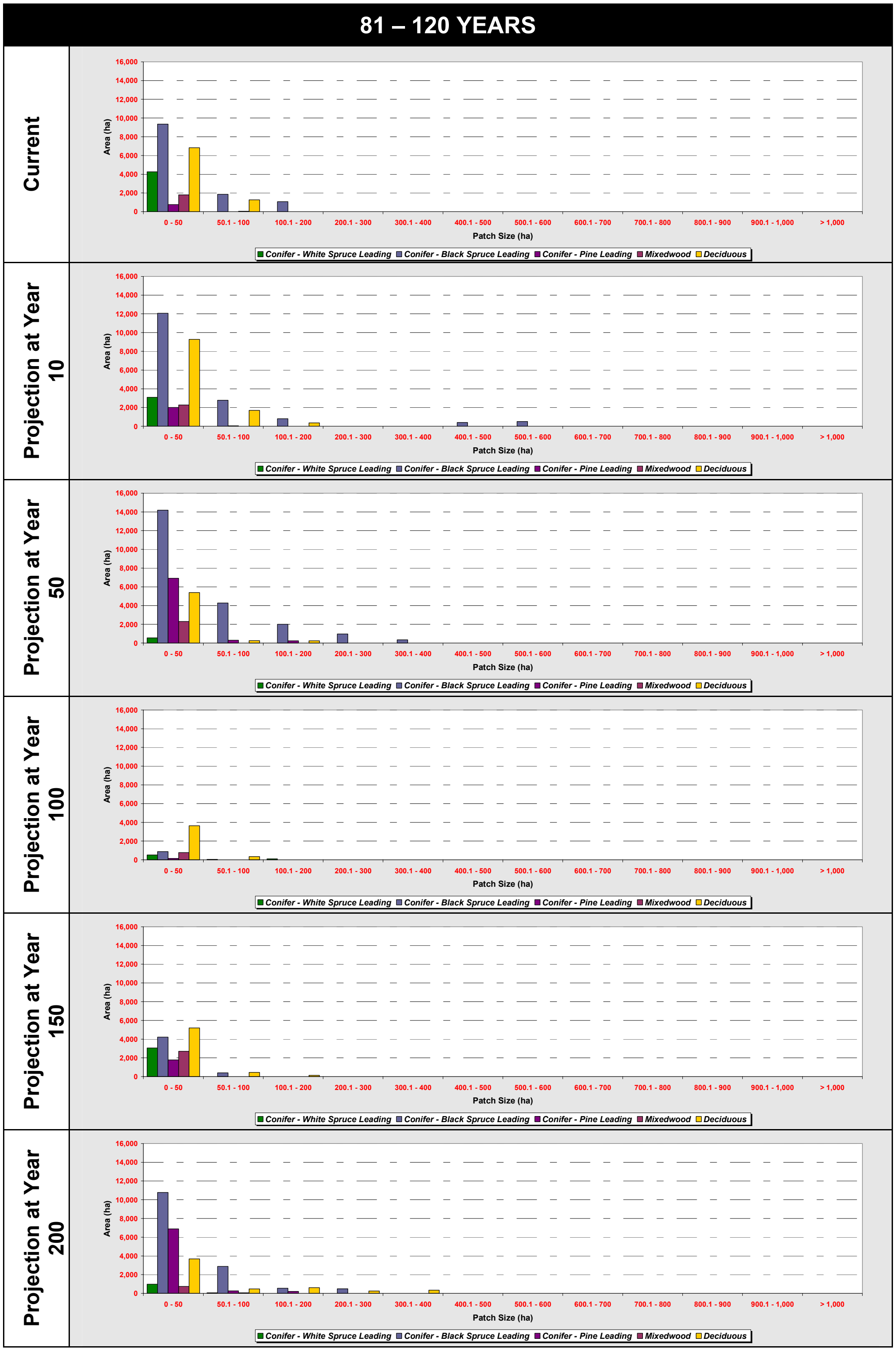


FIGURE 8-39: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

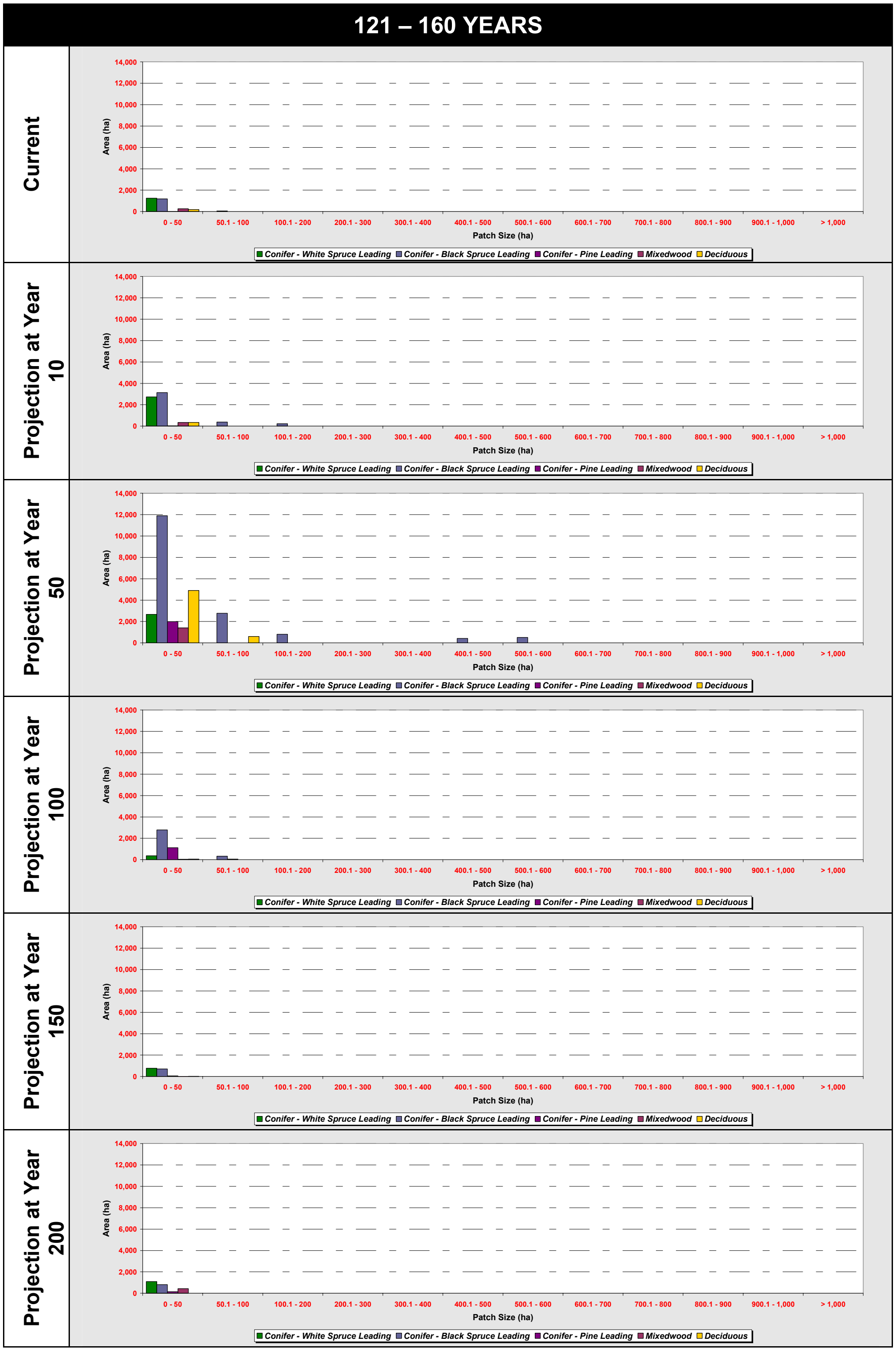


FIGURE 8-40: LOWER FOOTHILLS – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

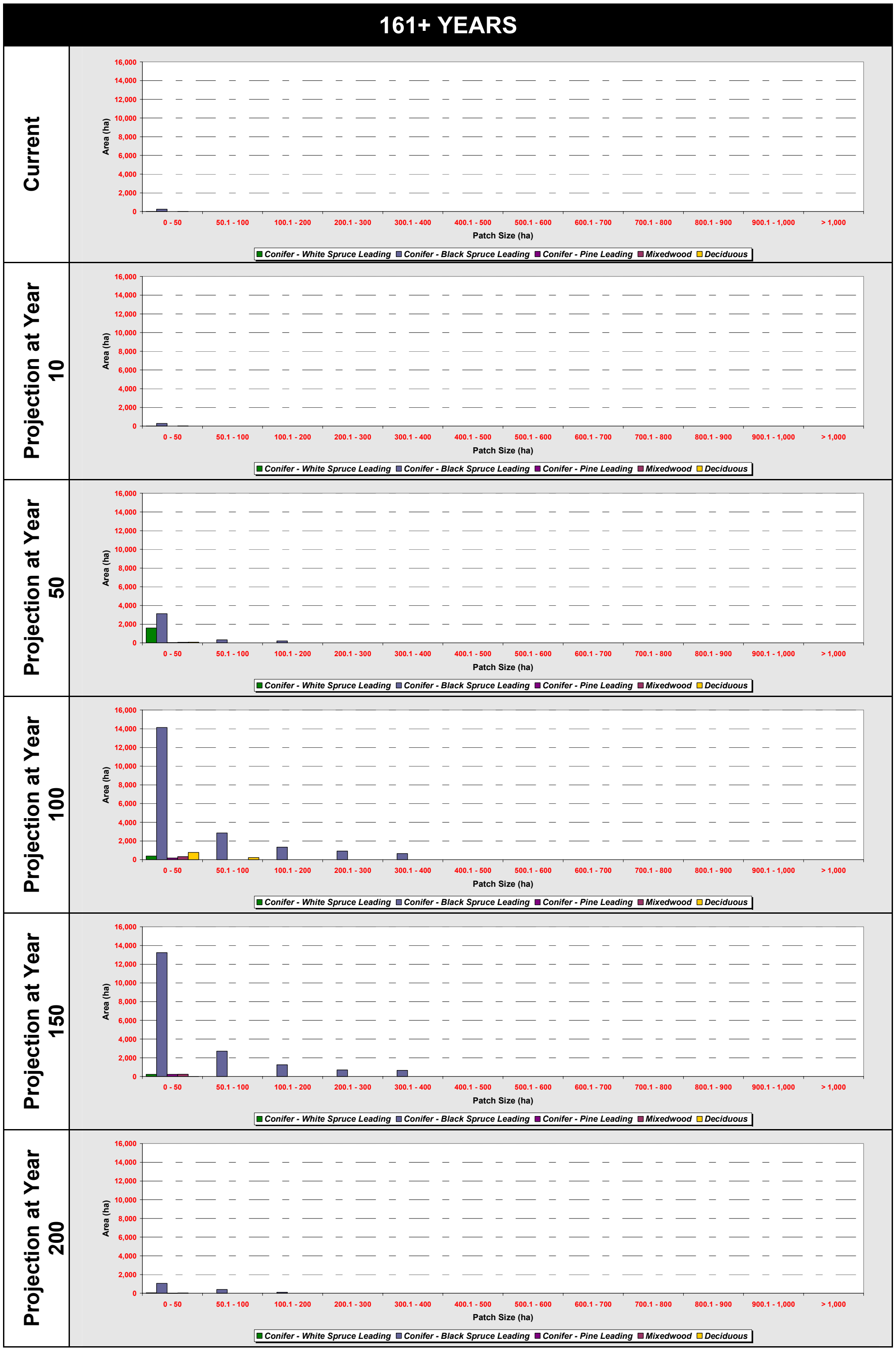


TABLE 8-26: LOWER FOOTHILLS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	108	0	984	4,270	1,248	5
	Average Patch Size (ha)	0.10		2.50	2.79	3.63	0.96
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	233	0	557	3,090	2,729	6
	Average Patch Size (ha)	0.21		2.68	2.36	3.26	0.89
	Difference from Current Average Patch Size (ha)	0.11		0.18	-0.43	-0.37	-0.07
PROJECTION AT YEAR 50	Total Gross Area (ha)	338	901	553	557	2,671	1,594
	Average Patch Size (ha)	1.67	1.93	0.49	2.68	2.43	2.91
	Difference from Current Average Patch Size (ha)	1.57		-2.01	-0.11	-1.20	1.95
PROJECTION AT YEAR 100	Total Gross Area (ha)	706	1,093	3,364	689	367	397
	Average Patch Size (ha)	2.00	2.24	2.40	0.60	2.43	1.20
	Difference from Current Average Patch Size (ha)	1.90		-0.10	-2.19	-1.20	0.24
PROJECTION AT YEAR 150	Total Gross Area (ha)	711	208	1,627	3,068	774	227
	Average Patch Size (ha)	2.21	0.18	2.08	2.48	1.42	0.87
	Difference from Current Average Patch Size (ha)	2.12		-0.41	-0.31	-2.20	-0.09
PROJECTION AT YEAR 200	Total Gross Area (ha)	2,345	545	1,541	1,035	1,093	56
	Average Patch Size (ha)	2.65	1.29	1.54	1.93	2.24	0.38
	Difference from Current Average Patch Size (ha)	2.55		-0.96	-0.86	-1.39	-0.58

TABLE 8-27: LOWER FOOTHILLS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	**21 – 40**	**41 – 80**	**81 – 120**	**121 – 160**	**161+**
CURRENT	**Total Gross Area (ha)**	648	0	28,735	12,288	1,244	260
	Average Patch Size (ha)	0.21		6.98	5.34	3.47	4.91
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	**Total Gross Area (ha)**	761	0	21,800	16,584	3,740	289
	Average Patch Size (ha)	0.25		6.58	5.75	4.62	4.45
	Difference from Current Average Patch Size (ha)	0.04		-0.40	0.40	1.15	-0.46
PROJECTION AT YEAR 50	**Total Gross Area (ha)**	106	378	805	21,800	16,416	3,668
	Average Patch Size (ha)	2.17	1.90	0.27	6.58	5.78	4.84
	Difference from Current Average Patch Size (ha)	1.95		-6.71	1.23	2.30	-0.07
PROJECTION AT YEAR 100	**Total Gross Area (ha)**	14,077	814	4,361	889	3,119	19,915
	Average Patch Size (ha)	6.30	2.21	3.40	0.29	4.33	5.07
	Difference from Current Average Patch Size (ha)	6.09		-3.58	-5.05	0.86	0.16
PROJECTION AT YEAR 150	**Total Gross Area (ha)**	3,517	827	14,959	4,627	707	18,537
	Average Patch Size (ha)	4.07	0.35	6.22	3.31	0.28	4.89
	Difference from Current Average Patch Size (ha)	3.86		-0.76	-2.04	-3.19	-0.02
PROJECTION AT YEAR 200	**Total Gross Area (ha)**	16,013	5,523	4,544	14,718	812	1,564
	Average Patch Size (ha)	4.64	4.03	1.48	6.18	2.24	0.68
	Difference from Current Average Patch Size (ha)	4.43		-5.50	0.83	-1.24	-4.23

TABLE 8-28: LOWER FOOTHILLS PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	149	0	8,803	766	10	0
	Average Patch Size (ha)	0.09		3.00	2.56	0.56	
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	149	0	7,477	2,066	36	0
	Average Patch Size (ha)	0.09		3.01	2.82	1.20	
	Difference from Current Average Patch Size (ha)	0.00		0.01	0.26	0.64	
PROJECTION AT YEAR 50	Total Gross Area (ha)	39	53	149	7,477	1,992	17
	Average Patch Size (ha)	1.87	1.02	0.09	3.01	2.83	2.49
	Difference from Current Average Patch Size (ha)	1.79		-2.91	0.44	2.27	
PROJECTION AT YEAR 100	Total Gross Area (ha)	6,239	148	1,836	149	1,169	187
	Average Patch Size (ha)	3.11	2.21	2.04	0.09	3.00	0.47
	Difference from Current Average Patch Size (ha)	3.02		-0.96	-2.48	2.44	
PROJECTION AT YEAR 150	Total Gross Area (ha)	0	146	7,506	1,787	57	233
	Average Patch Size (ha)	0.14	0.08	3.05	2.09	0.30	0.49
	Difference from Current Average Patch Size (ha)	0.05		0.05	-0.47	-0.26	
PROJECTION AT YEAR 200	Total Gross Area (ha)	1,943	88	146	7,380	148	23
	Average Patch Size (ha)	1.76	1.34	0.10	3.28	2.21	0.15
	Difference from Current Average Patch Size (ha)	1.67		-2.90	0.71	1.65	

TABLE 8-29: LOWER FOOTHILLS PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	85	0	3,240	1,850	261	9
	Average Patch Size (ha)	0.08		2.60	2.58	4.42	4.46
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	164	0	2,635	2,281	347	18
	Average Patch Size (ha)	0.16		2.58	2.51	3.99	5.95
	Difference from Current Average Patch Size (ha)	0.08		-0.02	-0.07	-0.43	1.49
PROJECTION AT YEAR 50	Total Gross Area (ha)	410	1,036	219	2,304	1,412	65
	Average Patch Size (ha)	1.90	2.10	0.21	2.60	2.65	3.24
	Difference from Current Average Patch Size (ha)	1.81		-2.39	0.02	-1.77	-1.22
PROJECTION AT YEAR 100	Total Gross Area (ha)	87	1,584	2,633	771	45	326
	Average Patch Size (ha)	0.09	2.50	2.36	2.06	0.67	1.31
	Difference from Current Average Patch Size (ha)	0.01		-0.24	-0.52	-3.75	-3.15
PROJECTION AT YEAR 150	Total Gross Area (ha)	203	725	1,570	2,703	7	238
	Average Patch Size (ha)	3.45	2.01	1.60	2.41	0.06	0.84
	Difference from Current Average Patch Size (ha)	3.36		-1.00	-0.17	-4.36	-3.62
PROJECTION AT YEAR 200	Total Gross Area (ha)	716	2,465	991	809	434	31
	Average Patch Size (ha)	1.99	2.45	1.91	0.85	3.68	0.25
	Difference from Current Average Patch Size (ha)	1.90		-0.69	-1.73	-0.74	-4.21

TABLE 8-30: LOWER FOOTHILLS PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	362	13	13,444	8,098	188	0
	Average Patch Size (ha)	0.15	1.02	4.11	4.67	4.94	
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	1,064	1	9,369	11,331	340	0
	Average Patch Size (ha)	0.44	0.75	3.73	4.82	3.06	
	Difference from Current Average Patch Size (ha)	0.29	-0.26	-0.38	0.14	-1.88	
PROJECTION AT YEAR 50	Total Gross Area (ha)	3,945	3,437	3,256	5,896	5,497	74
	Average Patch Size (ha)	3.14	2.70	1.37	3.46	3.92	2.55
	Difference from Current Average Patch Size (ha)	2.99	1.69	-2.74	-1.21	-1.02	
PROJECTION AT YEAR 100	Total Gross Area (ha)	2,378	5,813	8,879	3,985	52	998
	Average Patch Size (ha)	0.98	3.46	3.29	2.84	0.35	1.38
	Difference from Current Average Patch Size (ha)	0.83	2.45	-0.82	-1.83	-4.59	
PROJECTION AT YEAR 150	Total Gross Area (ha)	2,231	5,588	8,476	5,786	14	10
	Average Patch Size (ha)	2.07	2.80	3.93	3.82	0.05	0.26
	Difference from Current Average Patch Size (ha)	1.92	1.79	-0.19	-0.85	-4.89	
PROJECTION AT YEAR 200	Total Gross Area (ha)	1,889	4,563	10,277	5,376	0	0
	Average Patch Size (ha)	0.96	3.26	3.46	4.38		
	Difference from Current Average Patch Size (ha)	0.81	2.25	-0.65	-0.30		

FIGURE 8-41: SUB-ARCTIC– COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (0-20 YEARS)

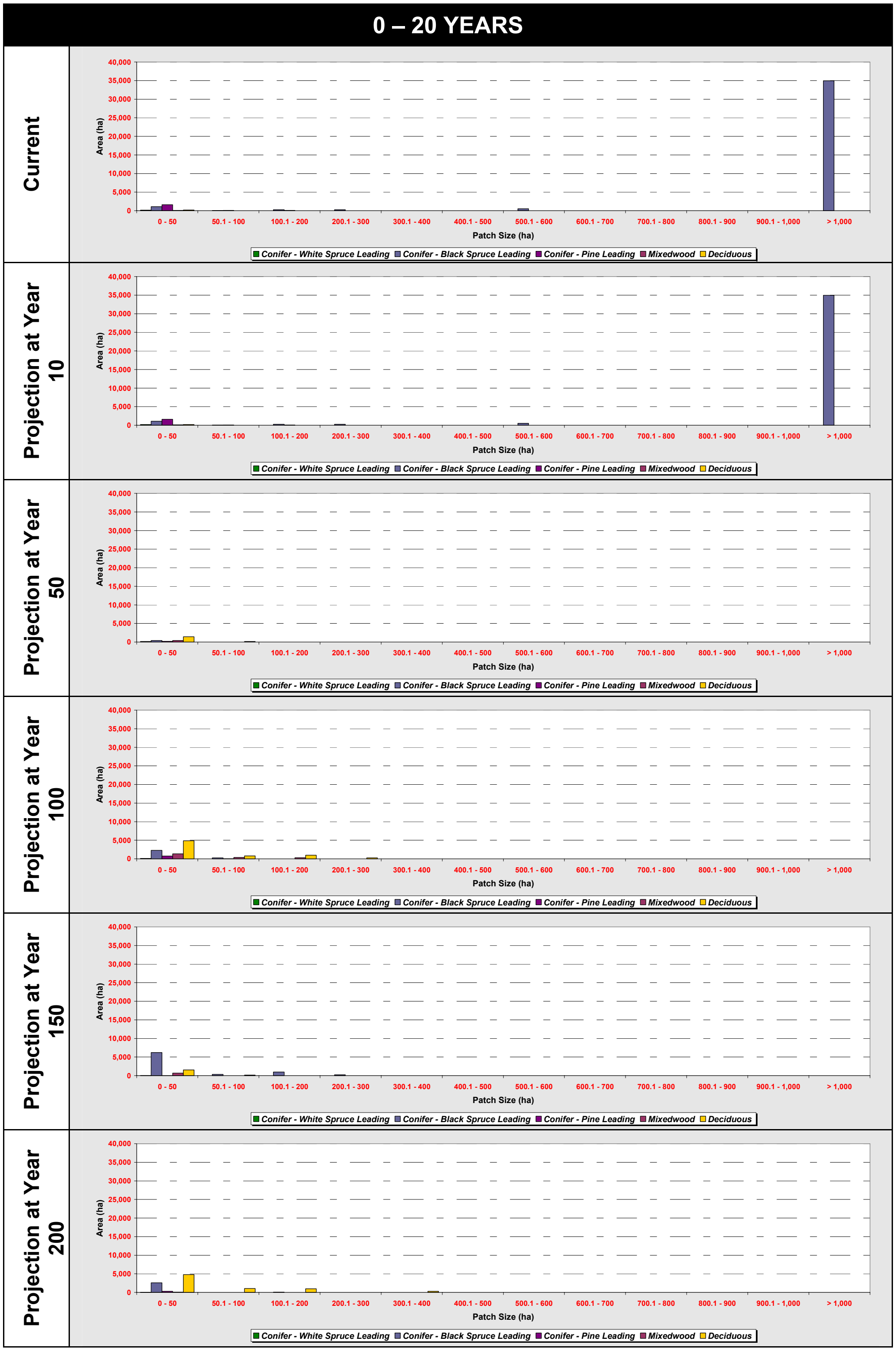


FIGURE 8-42: SUB-ARCTIC – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (21-40 YEARS)

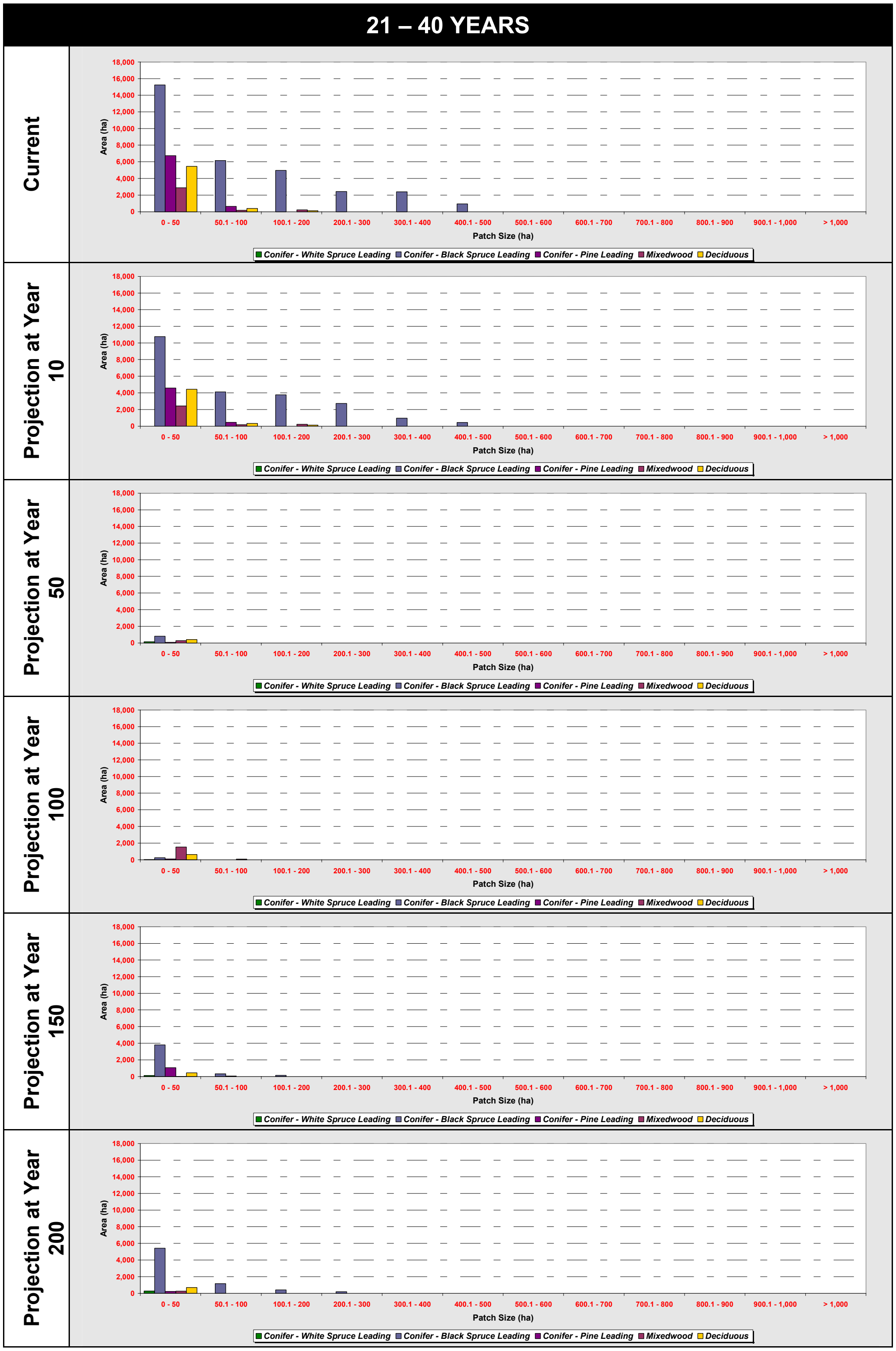


FIGURE 8-43: SUB-ARCTIC – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (41-80 YEARS)

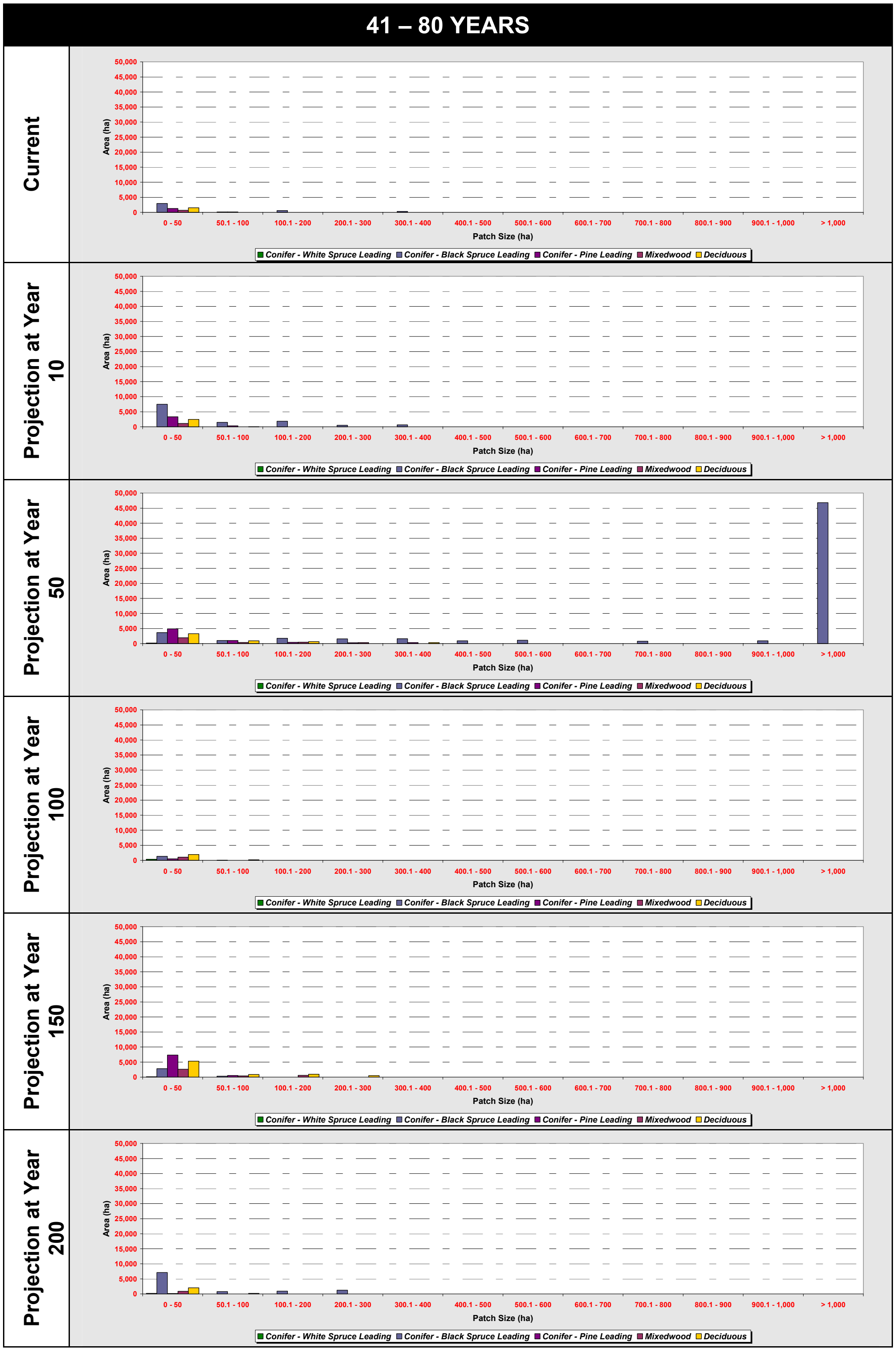


FIGURE 8-44: SUB-ARCTIC – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (81-120 YEARS)

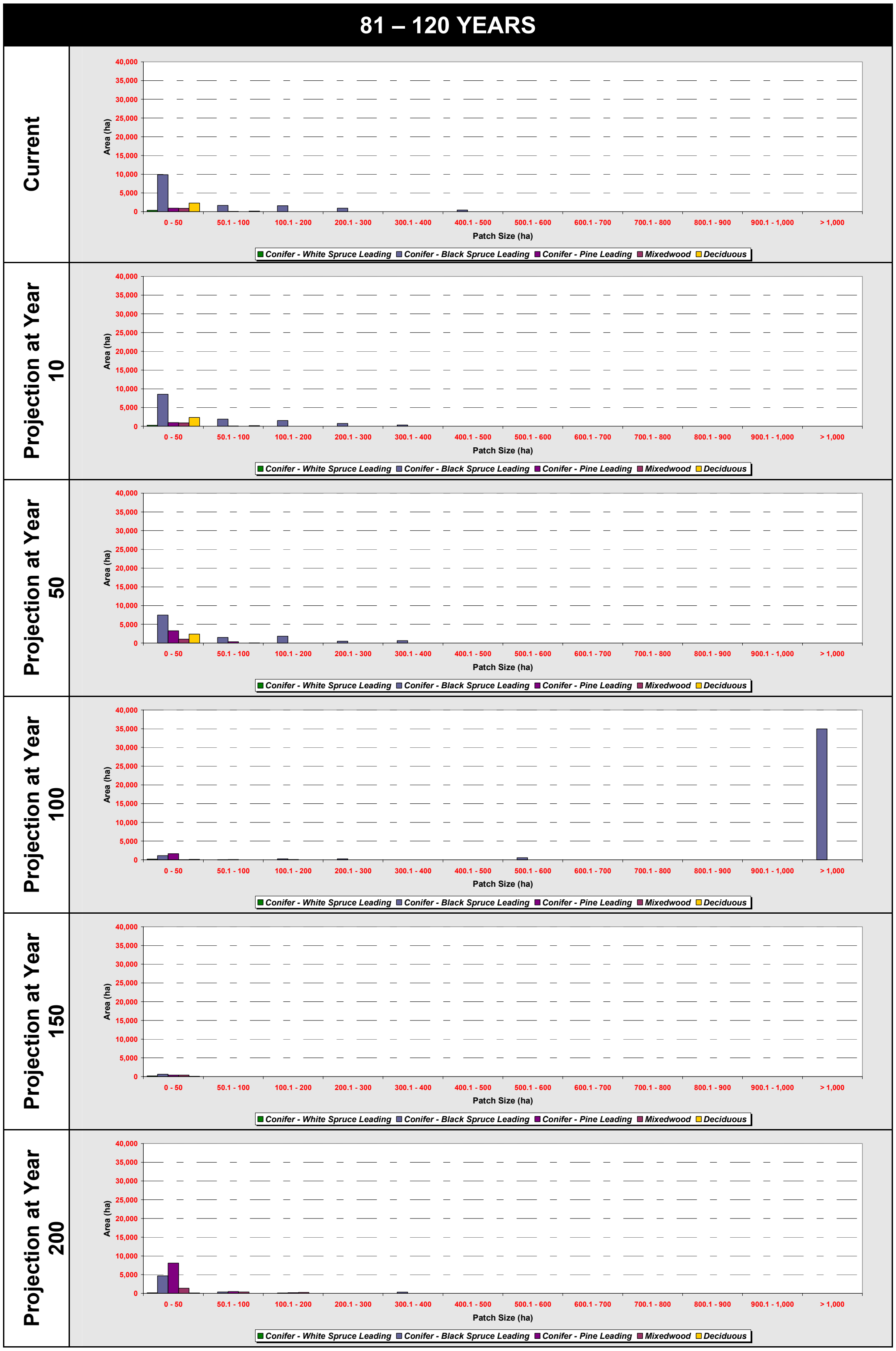


FIGURE 8-45: SUB-ARCTIC – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (121-160 YEARS)

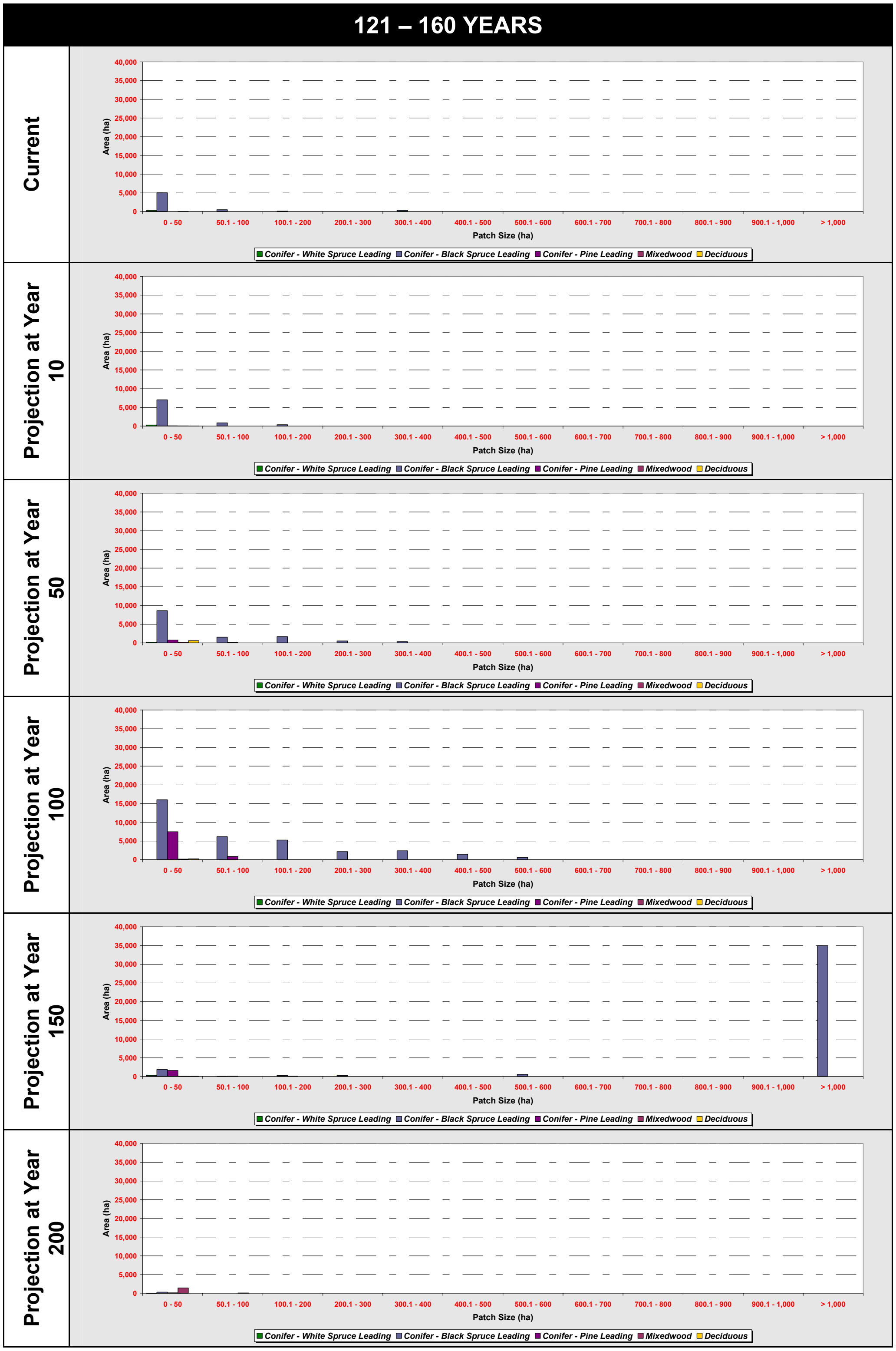


FIGURE 8-46: SUB-ARCTIC – COVER TYPE AND AGE CLASS PATCH SIZE DISTRIBUTION (160+ YEARS)

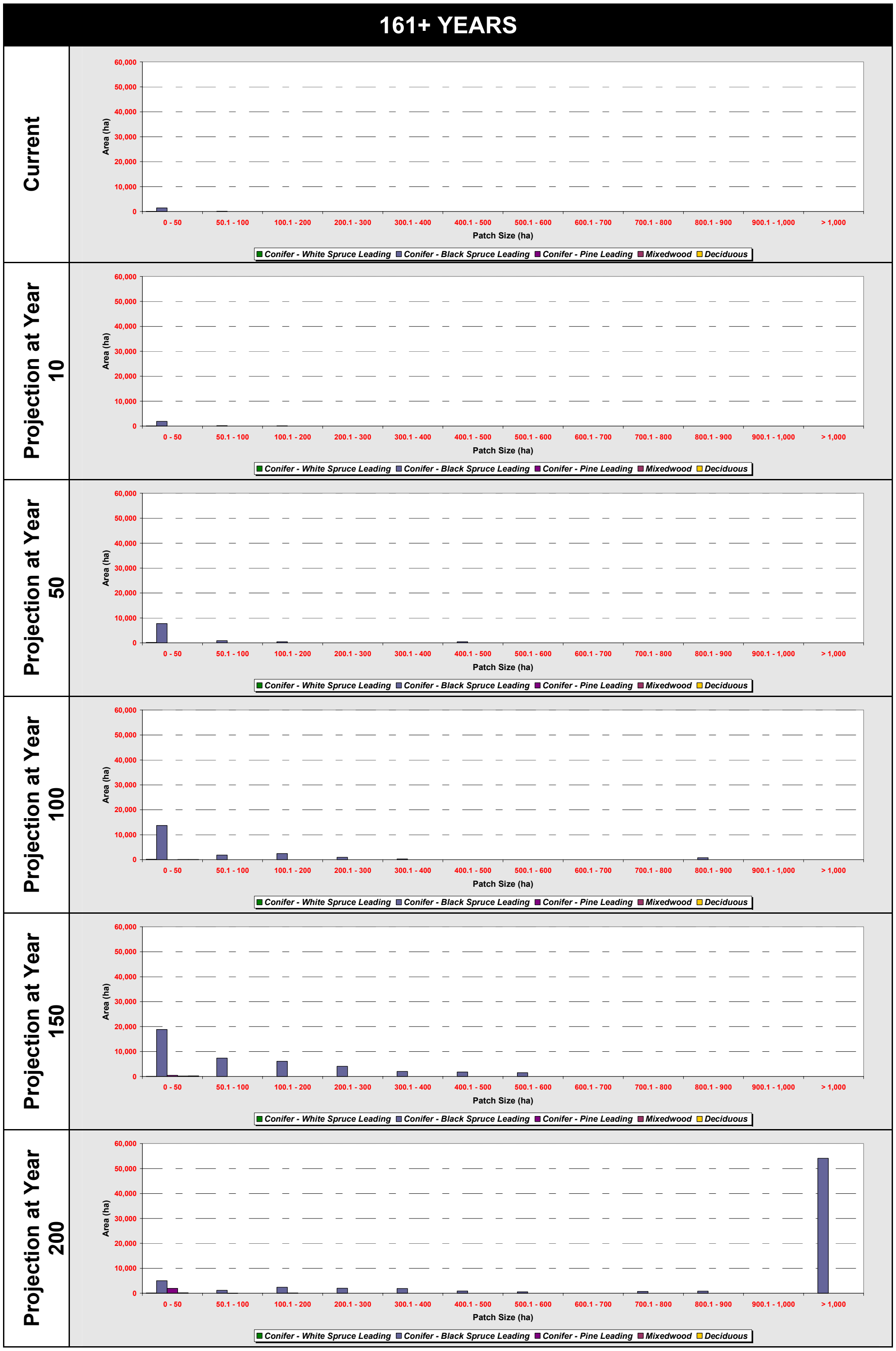


TABLE 8-31: SUB-ARCTIC PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER WHITE SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	165	0	3	378	276	60
	Average Patch Size (ha)	0.85		1.69	1.70	2.65	2.08
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	193	0	3	296	308	83
	Average Patch Size (ha)	0.98		1.69	1.65	2.35	2.50
	Difference from Current Average Patch Size (ha)	0.13		0.00	-0.06	-0.30	0.42
PROJECTION AT YEAR 50	Total Gross Area (ha)	155	147	193	3	208	176
	Average Patch Size (ha)	1.13	1.52	0.98	1.69	1.62	1.70
	Difference from Current Average Patch Size (ha)	0.28		-0.71	-0.01	-1.03	-0.38
PROJECTION AT YEAR 100	Total Gross Area (ha)	116	39	337	193	3	195
	Average Patch Size (ha)	1.17	2.29	1.32	0.98	1.69	1.33
	Difference from Current Average Patch Size (ha)	0.32		-0.37	-0.72	-0.96	-0.75
PROJECTION AT YEAR 150	Total Gross Area (ha)	68	118	152	196	292	56
	Average Patch Size (ha)	1.14	0.70	1.30	1.17	1.51	0.91
	Difference from Current Average Patch Size (ha)	0.28		-0.39	-0.53	-1.14	-1.17
PROJECTION AT YEAR 200	Total Gross Area (ha)	38	290	194	177	39	145
	Average Patch Size (ha)	1.21	1.29	1.13	1.33	2.16	1.51
	Difference from Current Average Patch Size (ha)	0.36		-0.57	-0.37	-0.49	-0.57

TABLE 8-32: SUB-ARCTIC PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER BLACK SPRUCE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	37,194	32,157	3,960	14,588	5,949	1,609
	Average Patch Size (ha)	13.14	10.29	4.53	5.06	3.82	3.82
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	37,200	22,804	11,905	13,043	8,271	2,236
	Average Patch Size (ha)	13.13	10.38	7.06	5.20	3.87	4.06
	Difference from Current Average Patch Size (ha)	-0.01	0.09	2.53	0.14	0.05	0.24
PROJECTION AT YEAR 50	Total Gross Area (ha)	413	820	60,014	11,905	12,713	9,593
	Average Patch Size (ha)	2.25	2.27	29.03	7.06	5.09	4.21
	Difference from Current Average Patch Size (ha)	-10.89	-8.02	24.50	2.00	1.27	0.39
PROJECTION AT YEAR 100	Total Gross Area (ha)	2,566	252	1,397	37,213	33,962	20,067
	Average Patch Size (ha)	3.22	2.90	2.33	13.12	10.17	5.34
	Difference from Current Average Patch Size (ha)	-9.91	-7.39	-2.21	8.07	6.35	1.52
PROJECTION AT YEAR 150	Total Gross Area (ha)	7,769	4,280	3,119	639	37,971	41,680
	Average Patch Size (ha)	3.92	2.64	3.34	2.34	11.45	9.74
	Difference from Current Average Patch Size (ha)	-9.22	-7.65	-1.19	-2.71	7.64	5.92
PROJECTION AT YEAR 200	Total Gross Area (ha)	2,703	7,190	10,013	5,528	317	69,708
	Average Patch Size (ha)	3.19	4.31	3.84	3.91	2.99	36.40
	Difference from Current Average Patch Size (ha)	-9.94	-5.98	-0.69	-1.15	-0.83	32.58

TABLE 8-33: SUB-ARCTIC PATCH SIZE SUMMARIES BY AGE CLASS – PURE CONIFER PINE LEADING COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	1,805	7,404	1,411	1,001	4	2
	Average Patch Size (ha)	1.30	4.81	2.81	3.46	2.13	1.51
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	1,805	5,051	3,621	1,042	106	2
	Average Patch Size (ha)	1.30	4.62	3.94	3.23	5.31	1.51
	Difference from Current Average Patch Size (ha)	0	-0.19	1.14	-0.24	3.18	0
PROJECTION AT YEAR 50	Total Gross Area (ha)	223	90	6,856	3,621	836	2
	Average Patch Size (ha)	2.78	2.05	5.54	3.94	3.41	1.51
	Difference from Current Average Patch Size (ha)	1.48	-2.76	2.74	0.48	1.28	0.00
PROJECTION AT YEAR 100	Total Gross Area (ha)	827	108	487	1,826	8,345	33
	Average Patch Size (ha)	2.88	7.22	2.25	1.32	4.70	0.39
	Difference from Current Average Patch Size (ha)	1.58	2.42	-0.55	-2.14	2.57	-1.11
PROJECTION AT YEAR 150	Total Gross Area (ha)	25	1,118	7,839	420	1,770	456
	Average Patch Size (ha)	1.53	0.97	4.03	2.29	4.27	0.54
	Difference from Current Average Patch Size (ha)	0.23	-3.84	1.22	-1.17	2.14	-0.96
PROJECTION AT YEAR 200	Total Gross Area (ha)	296	235	119	8,755	108	2,113
	Average Patch Size (ha)	1.74	1.96	0.11	4.21	7.22	2.36
	Difference from Current Average Patch Size (ha)	0.44	-2.85	-2.69	0.74	5.09	0.86

TABLE 8-34: SUB-ARCTIC PATCH SIZE SUMMARIES BY AGE CLASS – MIXEDWOOD COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	90	3,311	667	896	13	0
	Average Patch Size (ha)	0.15	4.93	2.47	2.72	1.58	
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	132	2,854	1,078	879	33	0
	Average Patch Size (ha)	0.21	5.27	2.82	2.69	2.05	
	Difference from Current Average Patch Size (ha)	0.07	0.33	0.35	-0.03	0.47	
PROJECTION AT YEAR 50	Total Gross Area (ha)	420	290	3,006	1,047	206	7
	Average Patch Size (ha)	2.41	1.95	5.44	2.91	1.49	0.85
	Difference from Current Average Patch Size (ha)	2.27	-2.99	2.97	0.19	-0.09	
PROJECTION AT YEAR 100	Total Gross Area (ha)	2,042	1,624	1,025	60	146	80
	Average Patch Size (ha)	3.73	4.60	2.13	0.66	0.48	0.68
	Difference from Current Average Patch Size (ha)	3.58	-0.33	-0.34	-2.06	-1.10	
PROJECTION AT YEAR 150	Total Gross Area (ha)	683	15	3,604	429	39	206
	Average Patch Size (ha)	2.25	1.46	6.26	2.10	0.45	0.52
	Difference from Current Average Patch Size (ha)	2.10	-3.47	3.79	-0.62	-1.13	
PROJECTION AT YEAR 200	Total Gross Area (ha)	79	267	874	2,063	1,510	184
	Average Patch Size (ha)	1.44	1.82	2.02	3.74	4.79	0.60
	Difference from Current Average Patch Size (ha)	1.29	-3.12	-0.45	1.02	3.21	

TABLE 8-35: SUB-ARCTIC PATCH SIZE SUMMARIES BY AGE CLASS – PURE DECIDUOUS COVER TYPE

		AGE CLASS (YEARS)					
		0 – 20	21 – 40	41 – 80	81 – 120	121 – 160	161+
CURRENT	Total Gross Area (ha)	197	5,967	1,512	2,483	0	0
	Average Patch Size (ha)	0.17	4.22	3.16	3.71		
	Difference from Current Average Patch Size (ha)						
PROJECTION AT YEAR 10	Total Gross Area (ha)	223	4,891	2,482	2,541	22	0
	Average Patch Size (ha)	0.19	4.32	3.31	3.64	7.19	
	Difference from Current Average Patch Size (ha)	0.02	0.11	0.15	-0.07		
PROJECTION AT YEAR 50	Total Gross Area (ha)	1,609	407	5,114	2,427	603	0
	Average Patch Size (ha)	3.64	2.66	5.07	3.40	2.18	
	Difference from Current Average Patch Size (ha)	3.47	-1.56	1.91	-0.31		
PROJECTION AT YEAR 100	Total Gross Area (ha)	6,954	632	2,124	115	236	99
	Average Patch Size (ha)	7.00	3.36	3.38	0.60	0.41	0.57
	Difference from Current Average Patch Size (ha)	6.83	-0.86	0.22	-3.11		
PROJECTION AT YEAR 150	Total Gross Area (ha)	1,731	458	7,601	68	67	235
	Average Patch Size (ha)	3.44	1.81	7.77	4.00	0.38	0.41
	Difference from Current Average Patch Size (ha)	3.26	-2.41	4.62	0.29		
PROJECTION AT YEAR 200	Total Gross Area (ha)	7,132	691	2,215	123	0	0
	Average Patch Size (ha)	7.45	1.90	3.23	0.54		
	Difference from Current Average Patch Size (ha)	7.28	-2.32	0.08	-3.17		

8.4 SPRUCE BUDWORM

Spruce budworm analysis for the DFMP was done to further understand the magnitude of impact currently occurring across the FMA. For this analysis impact is assessed based on years of consecutive defoliation, since tree health is directly related to the consecutive number of years of budworm attack. Stands attacked 1-3 years in a row have no visible damage while stands affected 4-7 years often begin showing top kill, and stands having budworm damage more then 7 consecutive years begin to die back. Table 8-36 shows area by consecutive years of defoliation class for the FMA. This area is compared to the amount of existing cutblocks to assess how much of the area has currently been addressed through previous harvest activity. A comparison is also made against the amount of area sequenced for harvest in the first 10 years. The results show that 25 percent of the net productive landbase affected by spruce budworm is being addressed by existing or proposed harvesting activities. Refer to Map 8-14 for the distribution of Spruce Budworm defoliation areas in relation to existing and planned harvest stands (full size map can be found in Appendix F, Map F-4).

TABLE 8-36: FMA WIDE SPRUCE BUDWORM DEFOLIATION SUMMARY

Consecutive Years of Defoliation[16]	Gross Landbase		Landbase Deletions		Net Productive Landbase		Existing Cutblocks[17]		Proposed Harvesting (1-10yrs)	
	Area (ha)	% of Gross Area	Area (ha)	% of Deleted Area	Area (ha)	% of Net Area	Area (ha)	% of Net Area	Area (ha)	% of Net Area
1-3 Non Visible Impact	384,493	10.8[18]	156,483	8.8[19]	228,011	12.8[20]	21,228	6.9[21]	32,206	10.5[21]
4-7 Top Kill Occurs	124,583	3.5[18]	44,807	2.5[19]	79,776	4.5[20]	10,818	3.5[21]	11,021	3.6[21]
8+ Tree Mortality Occurs	378	0.0[18]	106	0.0[19]	272	0.0[20]	160	0.1[21]	0	0.0[21]
Defoliation Sub-Total	**509,455**	**14.3**[18]	**201,396**	**11.3**[19]	**308,059**	**17.3**[20]	**32,207**	**10.5**[21]	**43,226**	**14.0**[21]
No Defoliation	**3,050,856**	**85.7**[18]	**1,579,410**	**88.7**[19]	**1,471,445**	**82.7**[20]	**79,107**	**5.4**[22]	**96,719**	**6.6**[22]
Total FMA	**3,560,311**	**100.0**[18]	**1,780,806**	**100.0**[19]	**1,779,504**	**100.0**[20]	**111,314**	**6.3**[20]	**139,945**	**7.9**[20]

16 Data used for determining consecutive years of budworm defoliation include both severity classes moderate and severe.
17 Existing cutblocks only include blocks within the net productive landbase and blocks harvested since the time of landbase determination.
18 Percent calculation based on gross landbase Total FMA area.
19 Percent calculation based on landbase deletions Total FMA area.
20 Percent calculation based on net productive landbase Total FMA area.
21 Percent calculation based on net productive landbase Defoliation area.
22 Percent calculation based on net productive landbase No Defoliation area.

MAP 8-14: CONSECUTIVE YEARS OF SPRUCE BUDWORM DEFOLIATION

For map, please see:

APPENDIX F

MAP F-4

8.5 WILDLIFE

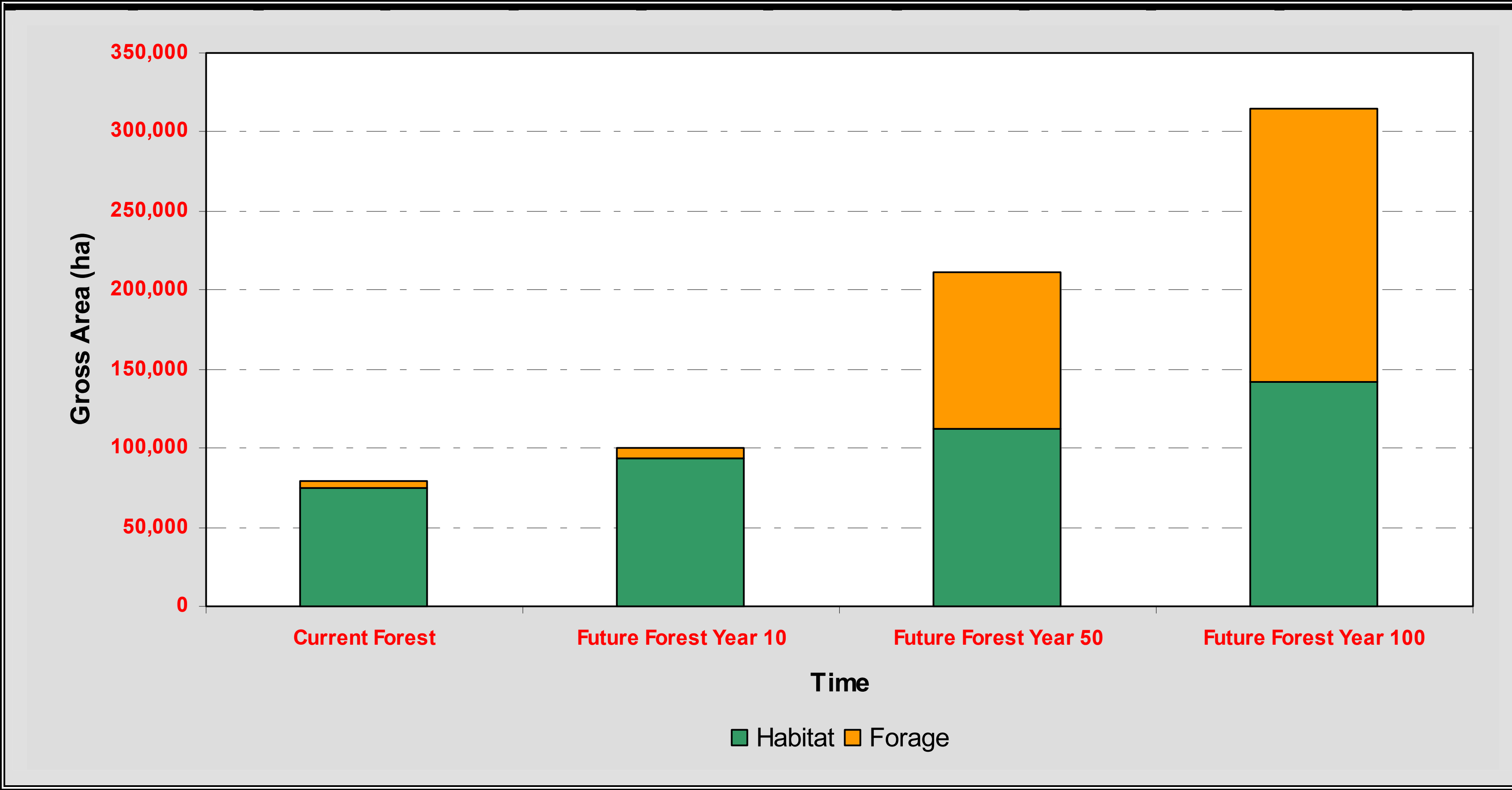
The PFMS is used to carry out a fine filter approach analysis by forecasting current and future habitat for five key wildlife species. The outcome of the analysis is used to determine how the PFMS affects the amount and distribution of habitat over the long term. The results show a general trend of increasing habitat for all species except the Pileated Woodpecker which drops during the first 50 years and increases 100 years in the future. The wildlife habitat analysis is presented in Table 8-38 through Table 8-42. For a spatial distribution of habitat for each species over time, refer to Map 8-15 through Map 8-34 (full size maps can be found in Appendix G). The following table identifies the key species and habitat requirements used for the analysis.

TABLE 8-37: WILDLIFE HABITAT CRITERIA

SPECIES	HABITAT CRITERIA
American Marten (*Martes americana*)	• Canopy closure of C or D density • Canopy composition of Sb, Sw, Fb greater than 50% • Tree height greater than 15m • Stand age greater than 90 years **OR** • Deciduous overstory with an understory meeting the same specifications as above • **Forage criteria**: cutblocks greater than or equal to 30 years and less then or equal to 90 years old adjacent to stands meeting the above habitat criteria
Moose (*Alces alces*)	• Canopy closure of B, C or D density • Leading species of Sw, Sb, Pj or Pl • Tree height greater than 10m **OR** • Deciduous overstory with an understory meeting the same specifications as above **OR** • Mixedwood stand with a C or D density and a tree height greater than 10m • **Forage criteria**: cutblocks less than 20 years
Woodland Caribou (*Rangerifer tarandus*)	• Canopy closure of C or D density • Leading species of Sw, Sb, Pj, or Pl • Tree height greater than 10m • Stand age greater than or equal to 100 years **OR** • Fair site Sb leading **OR** • Lt leading
Wood Bison (*Bison bison*)	• Naturally non-forested mesic sites • **Themal cover criteria:** C or D density mixedwood stands greater then or equal to 10m adjacent to naturally non-forested mesic sites
Pileated Woodpecker (*Dryocopus pileatus*)	• Canopy closure of C or D density • Canopy composition of Aw or Pb greater than 50% • Stand age greater than 40 years

TABLE 8-38: AMERICAN MARTEN HABITAT SUMMARY

Current Forest Gross Area (ha)			Future Forest Year 10 Gross Area (ha)			Future Forest Year 50 Gross Area (ha)			Future Forest Year 100 Gross Area (ha)		
Habitat	Forage	Total	Habitat	Forage	Total	Habitat	Forage	Total	Habitat	Forage	Total
75,274	3,884	79,157	93,240	6,493	99,733	112,810	98,846	211,656	141,757	172,842	314,600



MAP 8-15: CURRENT – AMERICAN MARTEN HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-16: 10 YEAR PROJECTION – AMERICAN MARTEN HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-17: 50 YEAR PROJECTION – AMERICAN MARTEN HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

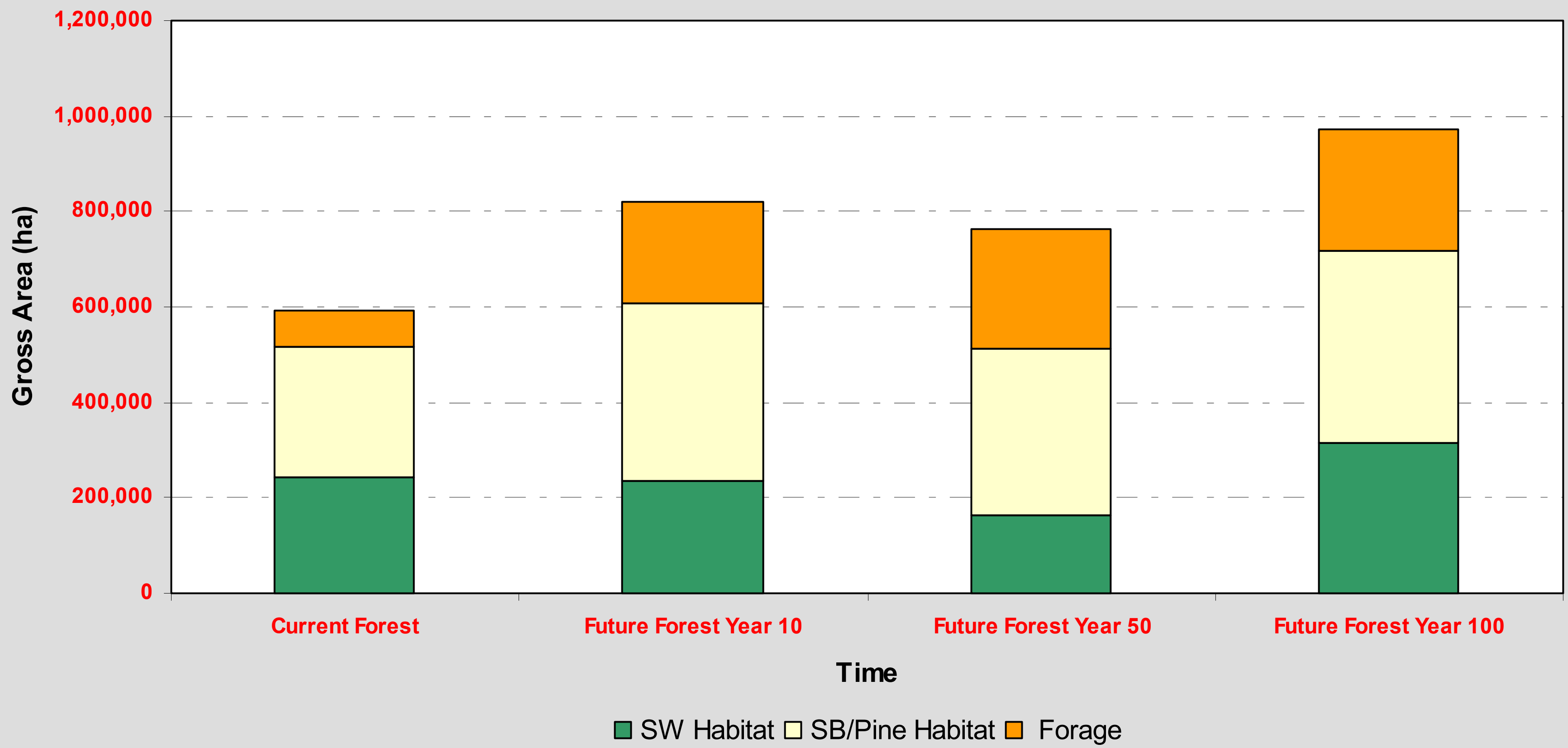
MAP 8-18: 100 YEAR PROJECTION – AMERICAN MARTEN HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

TABLE 8-39: MOOSE HABITAT SUMMARY

Current Forest Gross Area (ha)				Future Forest Year 10 Gross Area (ha)				Future Forest Year 50 Gross Area (ha)				Future Forest Year 100 Gross Area (ha)			
SW Habitat	SB/Pine Habitat	Forage	Total Habitat	SW Habitat	SB/Pine Habitat	Forage	Total Habitat	SW Habitat	SB/Pine Habitat	Forage	Total Habitat	SW Habitat	SB/Pine Habitat	Forage	Total Habitat
241,442	274,047	78,326	593,815	234,022	374,529	213,055	821,607	164,049	348,298	251,007	763,355	313,611	405,160	253,163	971,934



MAP 8-19: CURRENT – MOOSE HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-20: 10 YEAR PROJECTION – MOOSE HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-21: 50 YEAR PROJECTION – MOOSE HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

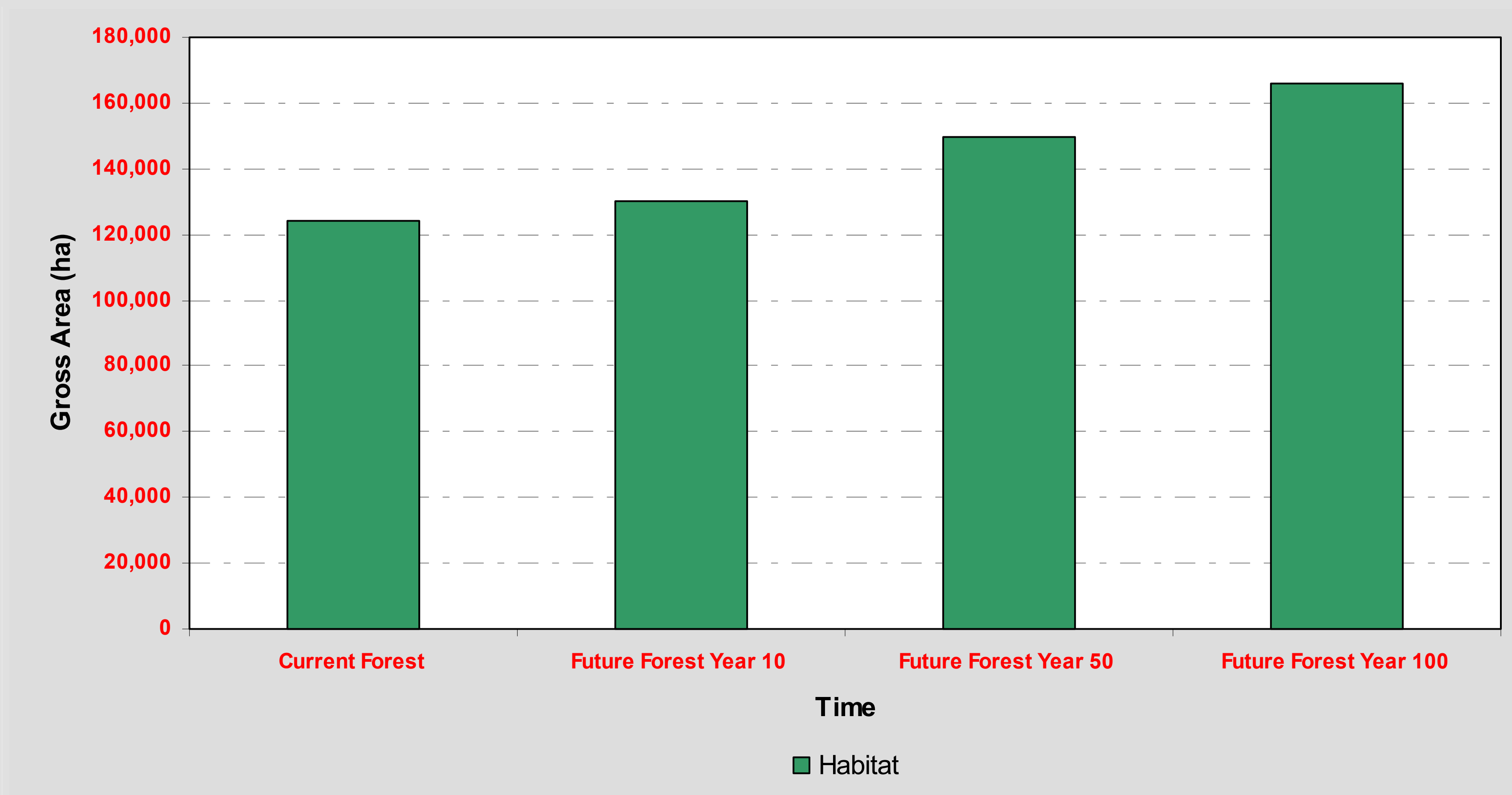
MAP 8-22: 100 YEAR PROJECTION – MOOSE HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

TABLE 8-40: WOODLAND CARIBOU HABITAT SUMMARY

Current Forest Gross Area (ha)	Future Forest Year 10 Gross Area (ha)	Future Forest Year 50 Gross Area (ha)	Future Forest Year 100 Gross Area (ha)
123,998	130,321	149,630	166,049



* Summarized Caribou habitat only represents area within the Caribou range as identified from the Caribou wildlife referral shapefile provided by Tolko.

MAP 8-23: CURRENT – WOODLAND CARIBOU HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-24: 10 YEAR PROJECTION – WOODLAND CARIBOU HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-25: 50 YEAR PROJECTION – WOODLAND CARIBOU HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

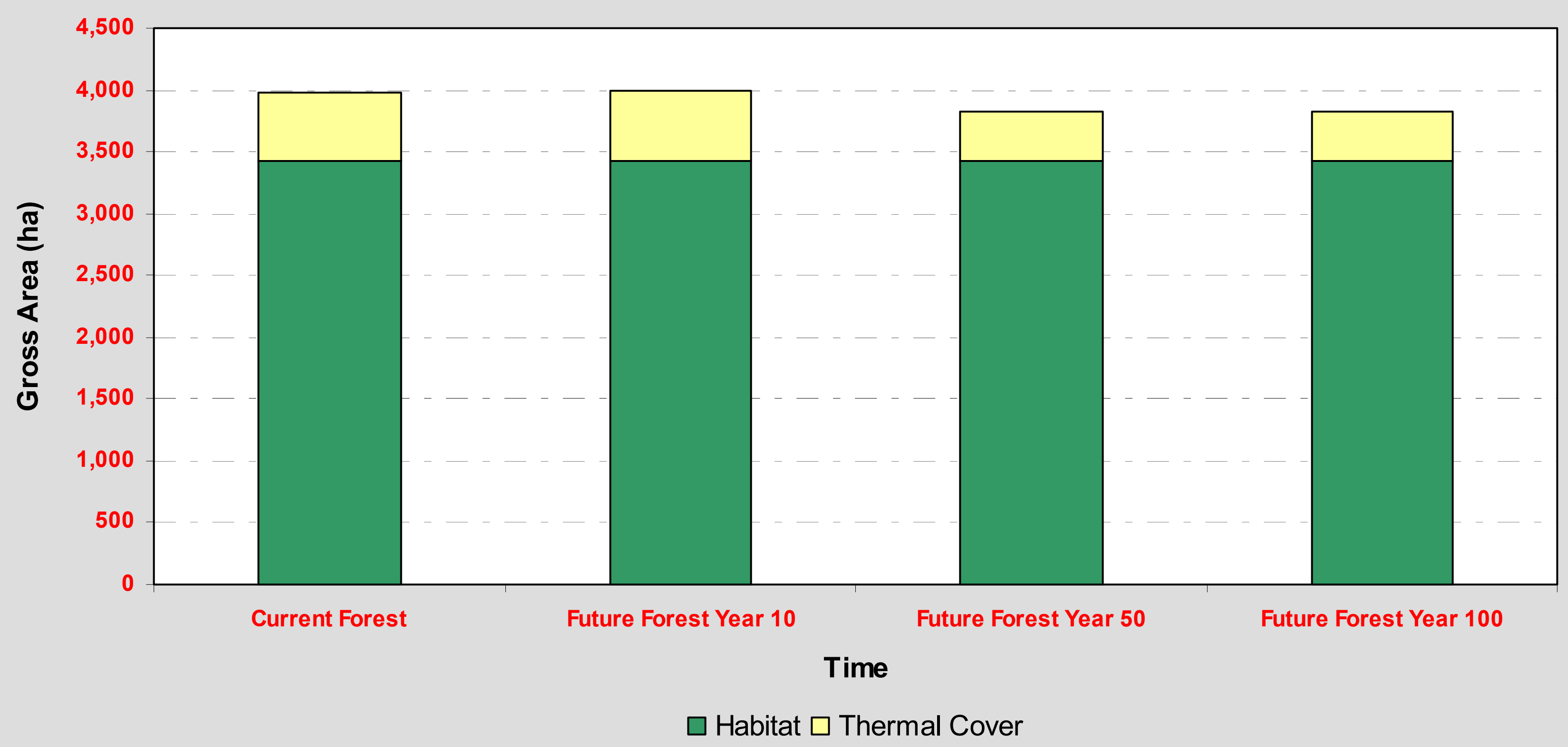
MAP 8-26: 100 YEAR PROJECTION – WOODLAND CARIBOU HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

TABLE 8-41: WOOD BISON HABITAT SUMMARY

Current Forest Gross Area (ha)			Future Forest Year 10 Gross Area (ha)			Future Forest Year 50 Gross Area (ha)			Future Forest Year 100 Gross Area (ha)		
Habitat	Thermal Cover	Total	Habitat	Thermal Cover	Total	Habitat	Thermal Cover	Total	Habitat	Thermal Cover	Total
3,419	551	3,971	3,419	567	3,986	3,419	411	3,830	3,419	411	3,830



* Summarized Bison habitat only represents area within the Bison range and Bison protected area as identified by Tolko and ASRD.

MAP 8-27: CURRENT – WOOD BISON HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-28: 10 YEAR PROJECTION – WOOD BISON HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-29: 50 YEAR PROJECTION – WOOD BISON HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

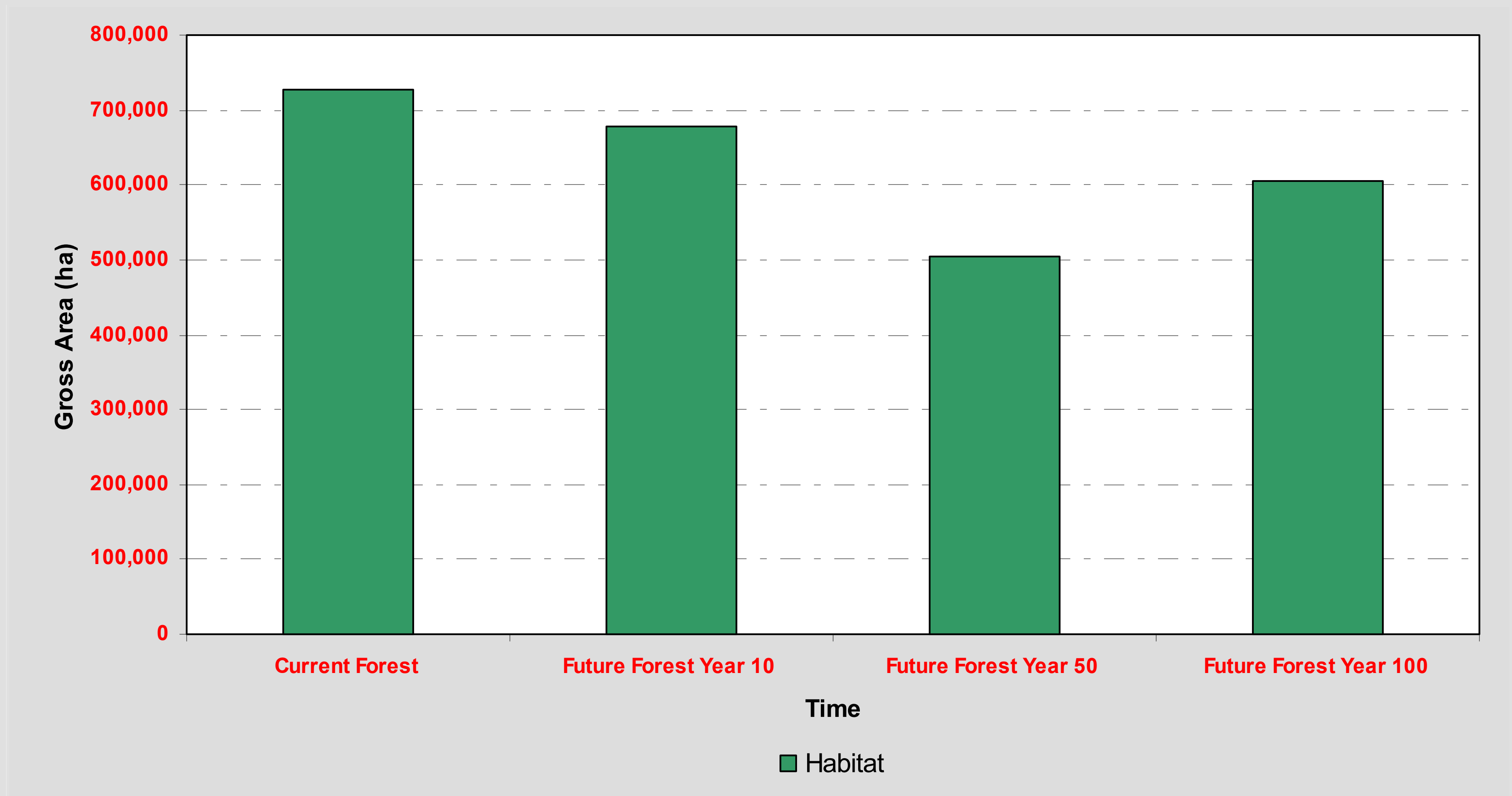
MAP 8-30: 100 YEAR PROJECTION – WOOD BISON HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

TABLE 8-42: PILEATED WOODPECKER HABITAT SUMMARY

Current Forest Gross Area (ha)	Future Forest Year 10 Gross Area (ha)	Future Forest Year 50 Gross Area (ha)	Future Forest Year 100 Gross Area (ha)
726,491	678,126	504,468	604,226



MAP 8-31: CURRENT – PILEATED WOODPECKER HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-32: 10 YEAR PROJECTION – PILEATED WOODPECKER HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-33: 50 YEAR PROJECTION – PILEATED WOODPECKER HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

MAP 8-34: 100 YEAR PROJECTION – PILEATED WOODPECKER HABITAT DISTRIBUTION

For map, please see:

APPENDIX G

8.6 WATERSHED ANALYSIS

Using the Cumulative Watershed Disturbance and Hydrologic Recovery Simulator (ECA-Alberta) developed by Dr. Uldis Silins, and the PFMS harvest sequence as input into the model, a watershed analysis was undertaken for 24 watersheds on the FMA. ECA stands for "equivalent clearcut area" which describes the "effective" area that a recovering historic disturbance currently represents in terms of its ecological effects. The main application of the model is to evaluate the effect of past disturbance on streamflow in a watershed, and to project the cumulative effect of both past and proposed future forest harvesting and/or natural disturbances on streamflow.

To accomplish this, the model requires an aggregated data set of past and future areas disturbed by species and timber productivity rating. Using this information, along with regional long term average precipitation and streamflow data and provincial average growth/yield data (to predict rate of hydrologic recovery), the model will calculate the equivalent clearcut area and resulting change in annual streamflow.

The results of the watershed analysis showing percent of total gross forested watershed area harvested, percent equivalent clearcut area, and percent change in long term average annual yield over time are presented in Table 8-43 through Table 8-66. For maps showing the percent equivalent clearcut area by watershed at current, 10, 50 and 100 years in the future, refer to Map 8-35 through Map 8-38 (full size maps can be found in Appendix G). Much of the material in this section is referenced from the ECA-Alberta Model.

NOTE:

- Long term streamflow and precipitation data was gathered from measuring stations within 20km of the FMA boundary. An average of 64mm/yr for streamflow and 426mm/yr for precipitation was determined for the FMA and used as input in the model;
- Most streamflow gauging stations are shut down during certain times of the year and therefore, the gaps in data must be estimated to determine a year round average;
- Model accuracy depends primarily on accurate hydrologic recovery information of forest stands after disturbance, as well as representative regional streamflow and precipitation data;
- Hydrologic recovery of mixedwood stands is not simulated by this model;
- Minimum harvest age (90 years conifer, 70 years deciduous) was used to represent full hydrologic recovery;
- Model calculations reflect provincial averages for unmanaged (primarily fire origin) stands;
- Deviation of regional forest growth from provincial averages may produce unreliable results for some regions;
- This analysis only represents the incremental cumulative effect of harvesting;
- Watersheds having only small fractions within the FMA may be inaccurately represented and therefore not included in this analysis;
- The objective of this model is not to produce a detailed, highly accurate simulation of streamflow, but rather a projection of streamflow changes over time assuming average climatic conditions in the region;
- ECA-Alberta describes how disturbance will affect streamflow based on long-term climatic conditions and may not represent actual changes in any given year.

TABLE 8-43: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #3

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	1	10	15	15	21	31	33	34	35	38	43
ECA (%)	1	10	13	12	15	22	19	16	13	13	13
Yield Increase Above Long Term Average (%)	3	17	21	13	17	27	19	13	8	10	12

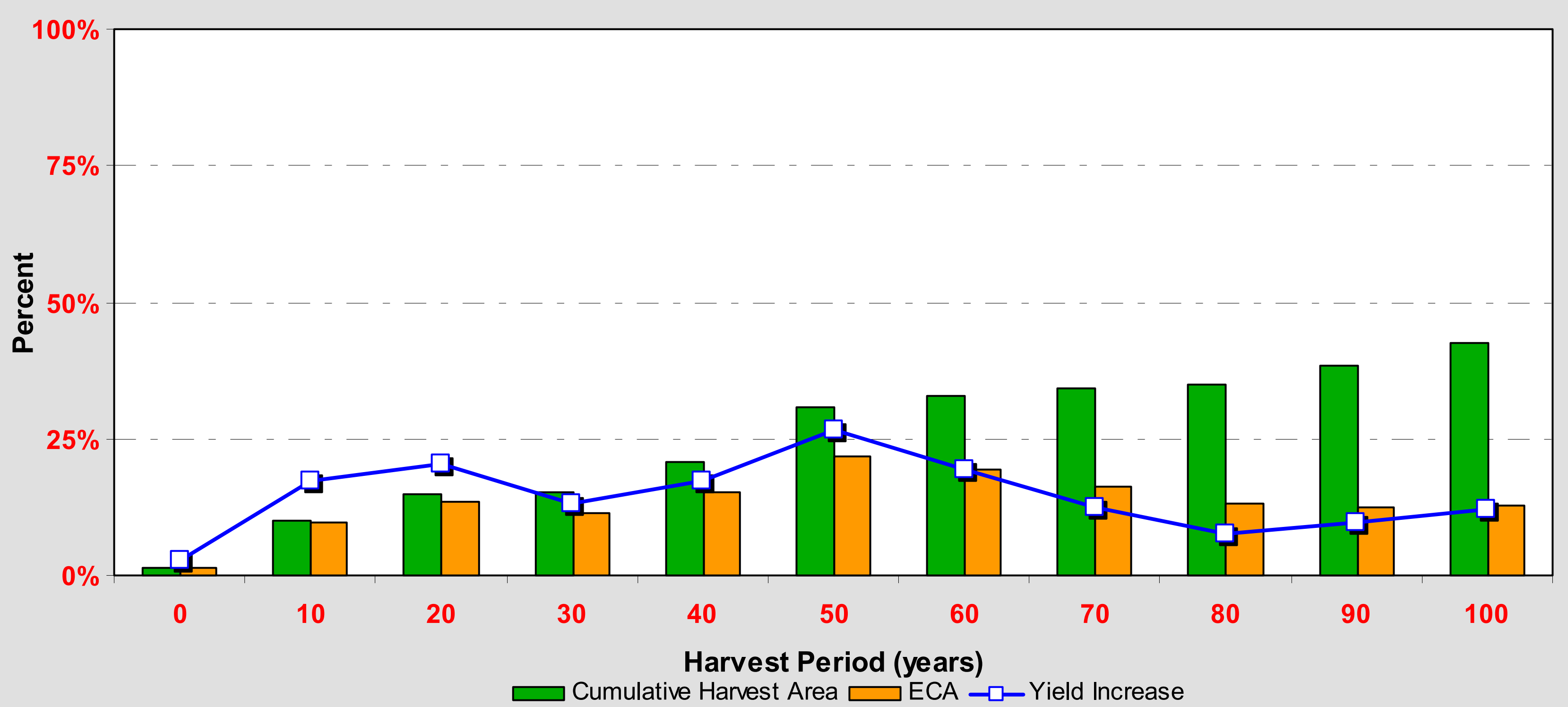


TABLE 8-44: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #4

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	0	0	0	0	6	7	7	7	7	26	27
ECA (%)	0	0	0	0	6	6	5	4	3	20	17
Yield Increase Above Long Term Average (%)	0	0	0	1	11	7	4	2	1	33	19

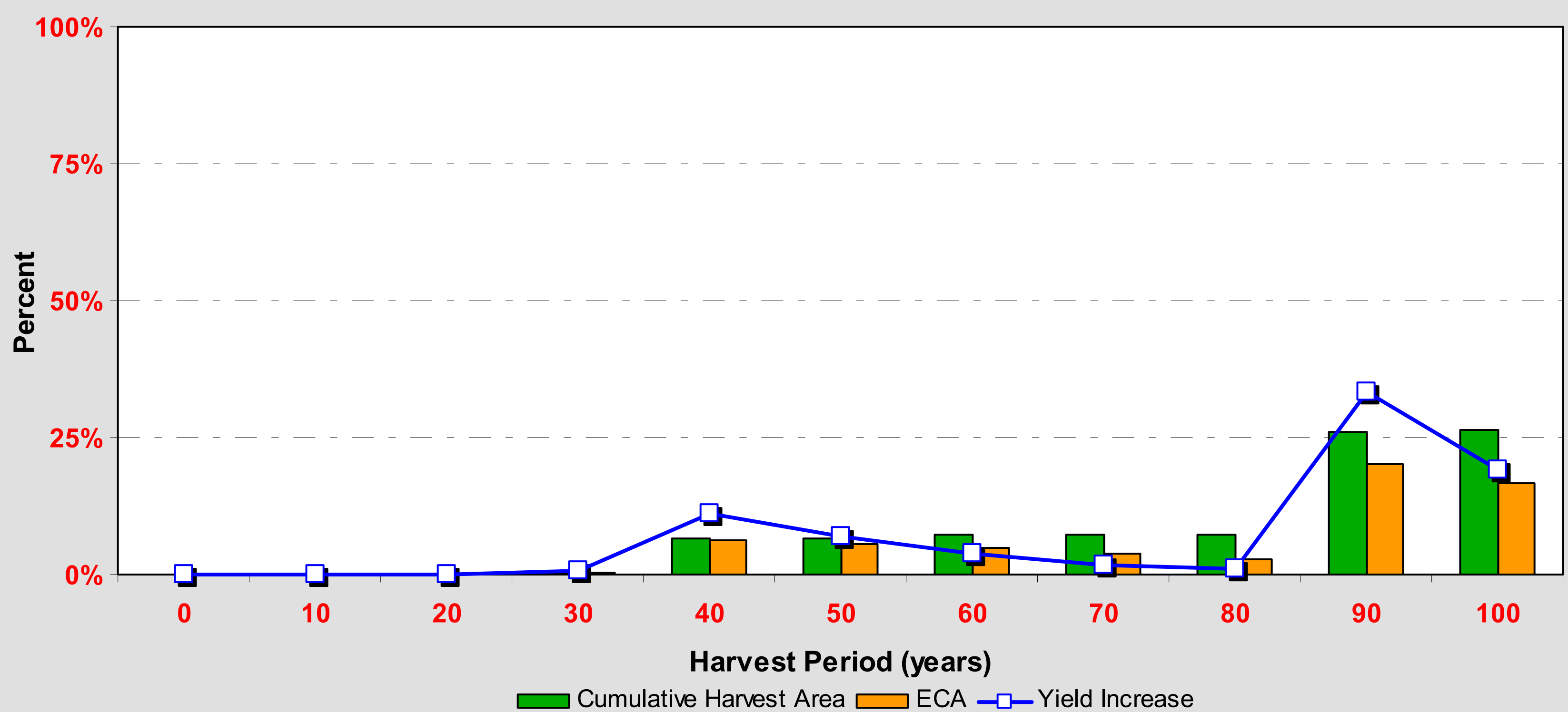


TABLE 8-45: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #5

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	1	2	3	8	16	17	18	19	24	36	40
ECA (%)	1	2	3	7	14	13	12	10	12	21	19
Yield Increase Above Long Term Average (%)	2	4	4	11	21	16	11	6	11	25	19

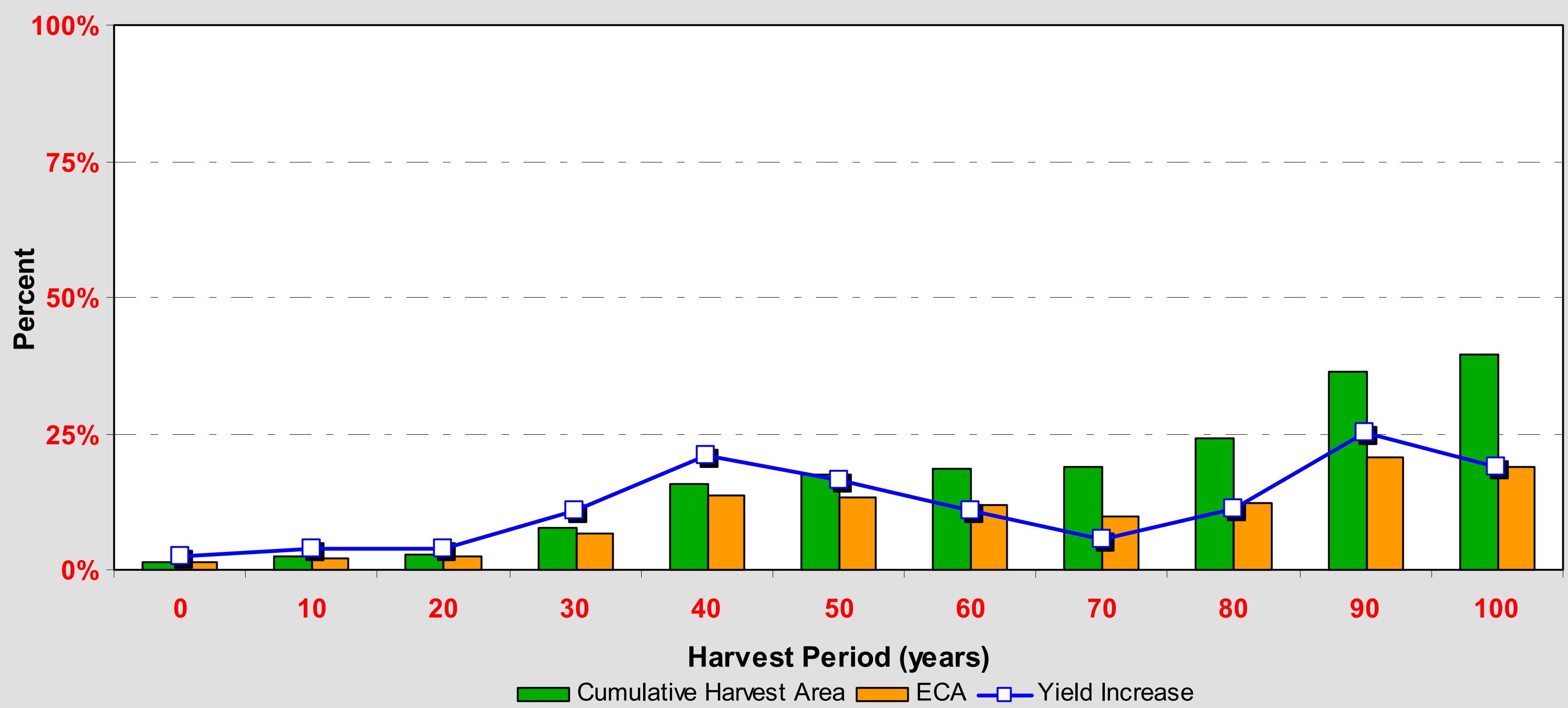


TABLE 8-46: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #6

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	1	6	11	24	30	36	37	51	54	56	63
ECA (%)	1	5	10	21	24	25	21	29	24	19	20
Yield Increase Above Long Term Average (%)	2	9	17	33	31	26	15	29	20	12	16

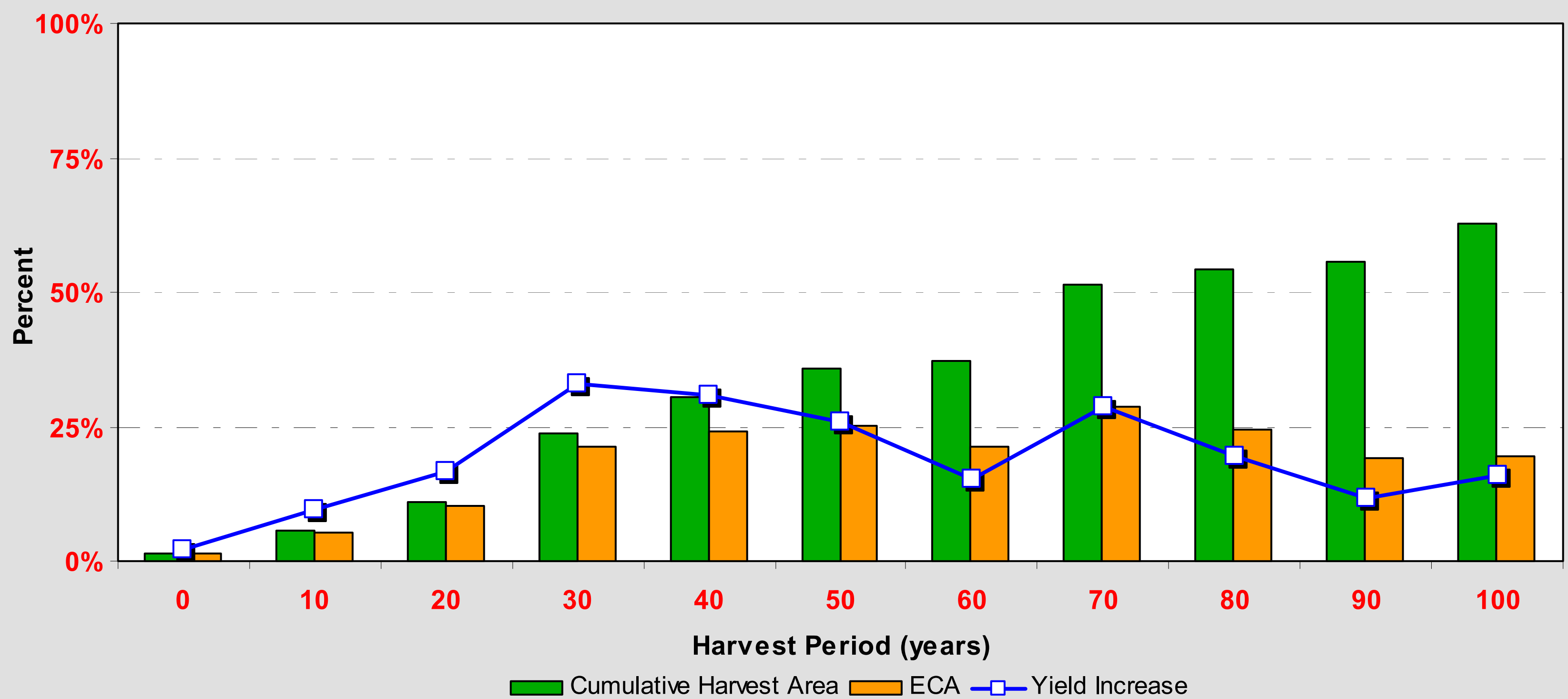


TABLE 8-47: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #7

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	0	10	18	25	39	44	46	54	57	59	66
ECA (%)	0	10	16	20	30	29	25	26	22	18	19
Yield Increase Above Long Term Average (%)	0	17	23	24	37	32	21	24	17	11	17

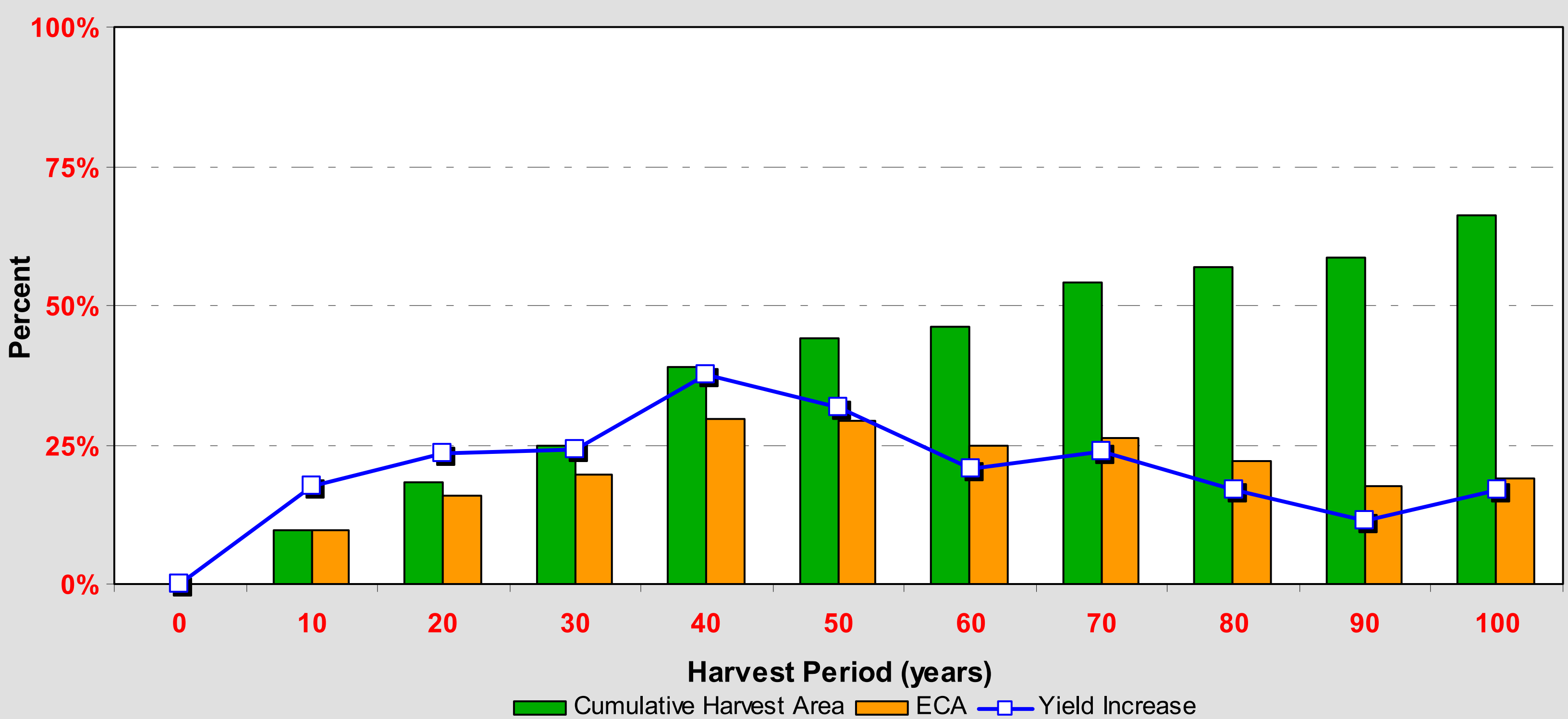


TABLE 8-48: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #8

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	0	5	23	23	37	45	47	51	52	53	61
ECA (%)	0	5	20	17	27	29	25	22	17	13	16
Yield Increase Above Long Term Average (%)	0	9	30	16	31	32	23	17	11	8	16

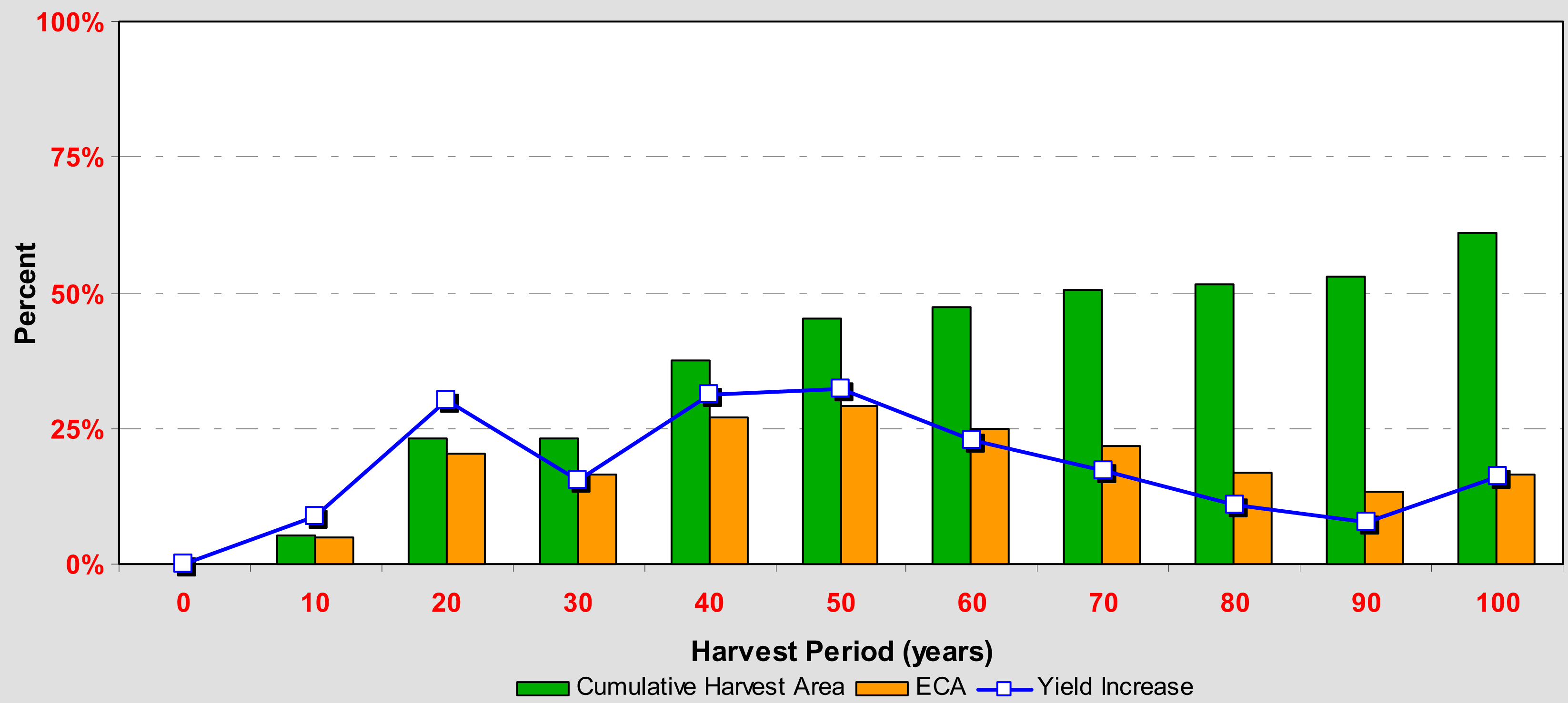


TABLE 8-49: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #10

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	4	10	16	19	28	28	40	42	48	51	56
ECA (%)	3	8	13	14	19	16	23	20	20	17	17
Yield Increase Above Long Term Average (%)	4	13	18	17	22	13	23	16	19	14	15

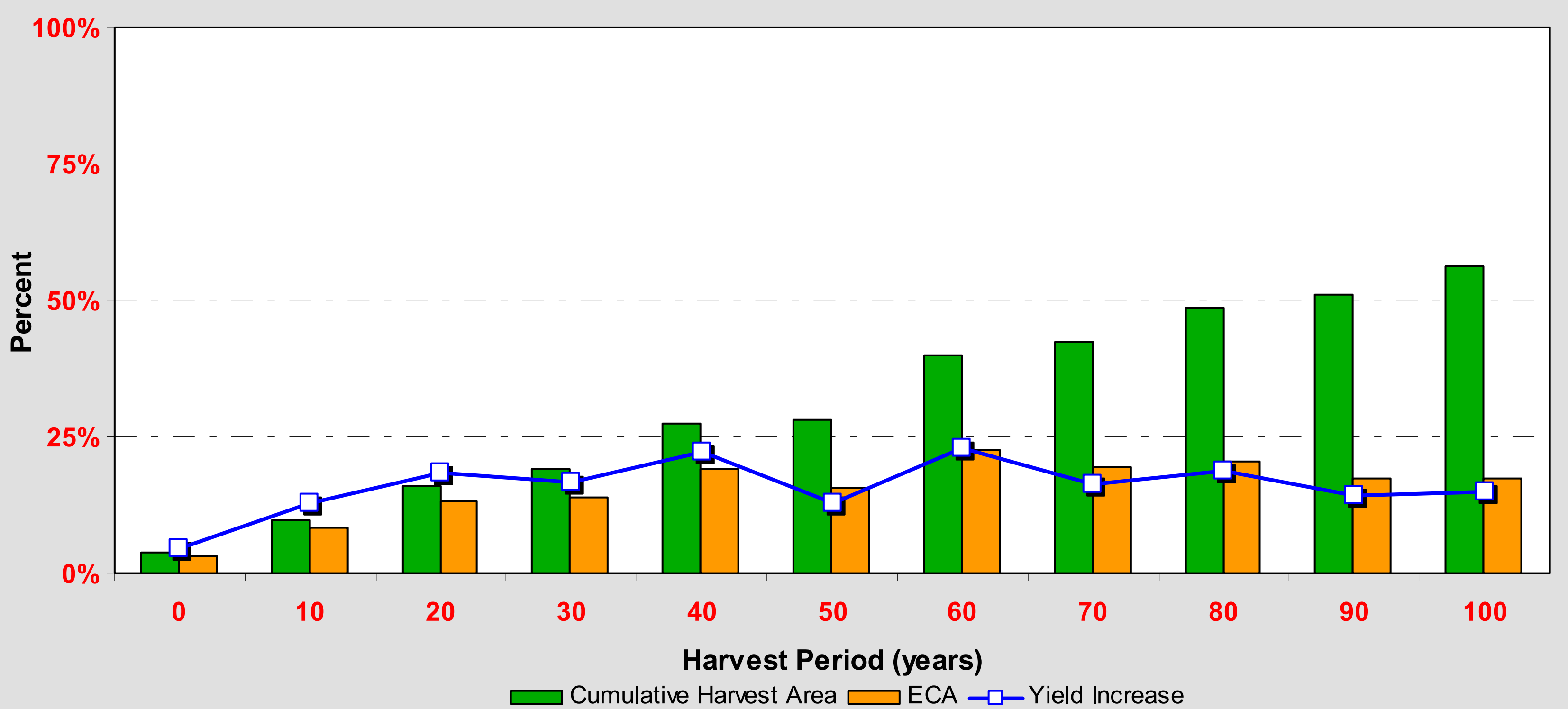


TABLE 8-50: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #11

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	2	7	12	15	17	21	30	30	35	37	40
ECA (%)	2	6	11	12	11	13	19	15	16	13	13
Yield Increase Above Long Term Average (%)	3	12	16	15	11	12	23	15	15	10	11

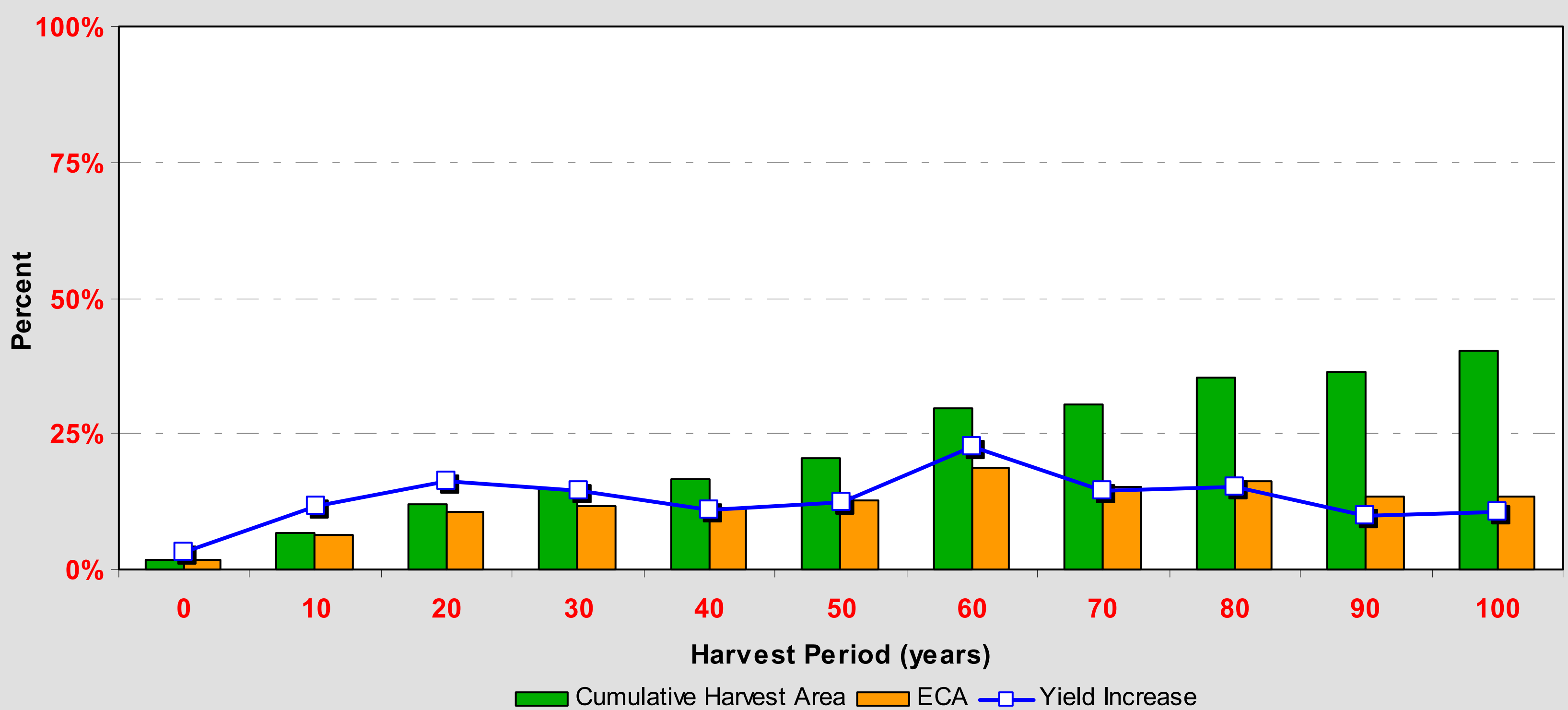


TABLE 8-51: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #12

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	8	9	14	16	23	24	26	32	37	40	44
ECA (%)	8	8	12	13	17	15	14	16	16	15	15
Yield Increase Above Long Term Average (%)	14	14	19	17	22	14	11	15	16	15	14

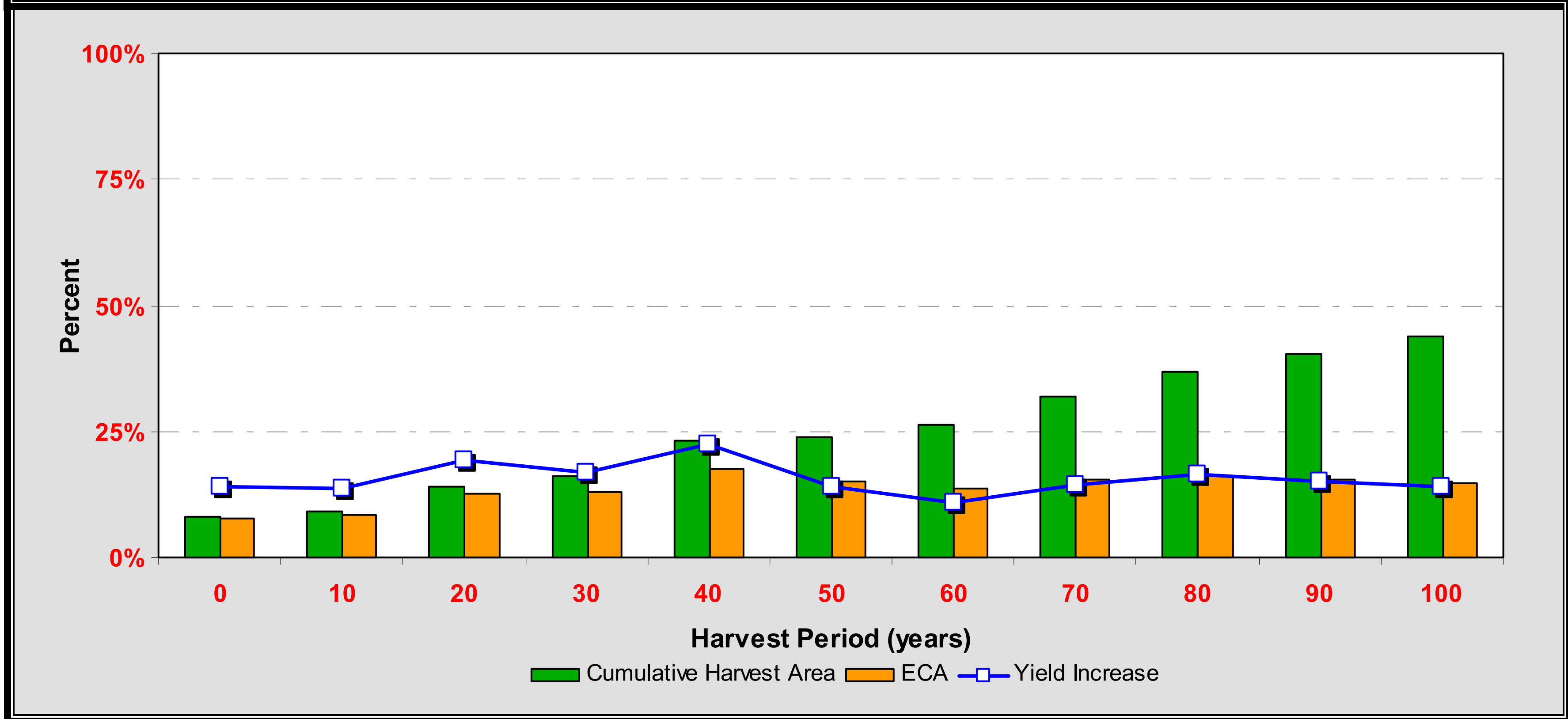


TABLE 8-52: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #13

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	14	19	27	36	37	41	48	59	60	63	66
ECA (%)	13	17	23	28	25	24	26	29	24	21	18
Yield Increase Above Long Term Average (%)	21	27	35	39	26	21	24	32	22	17	14

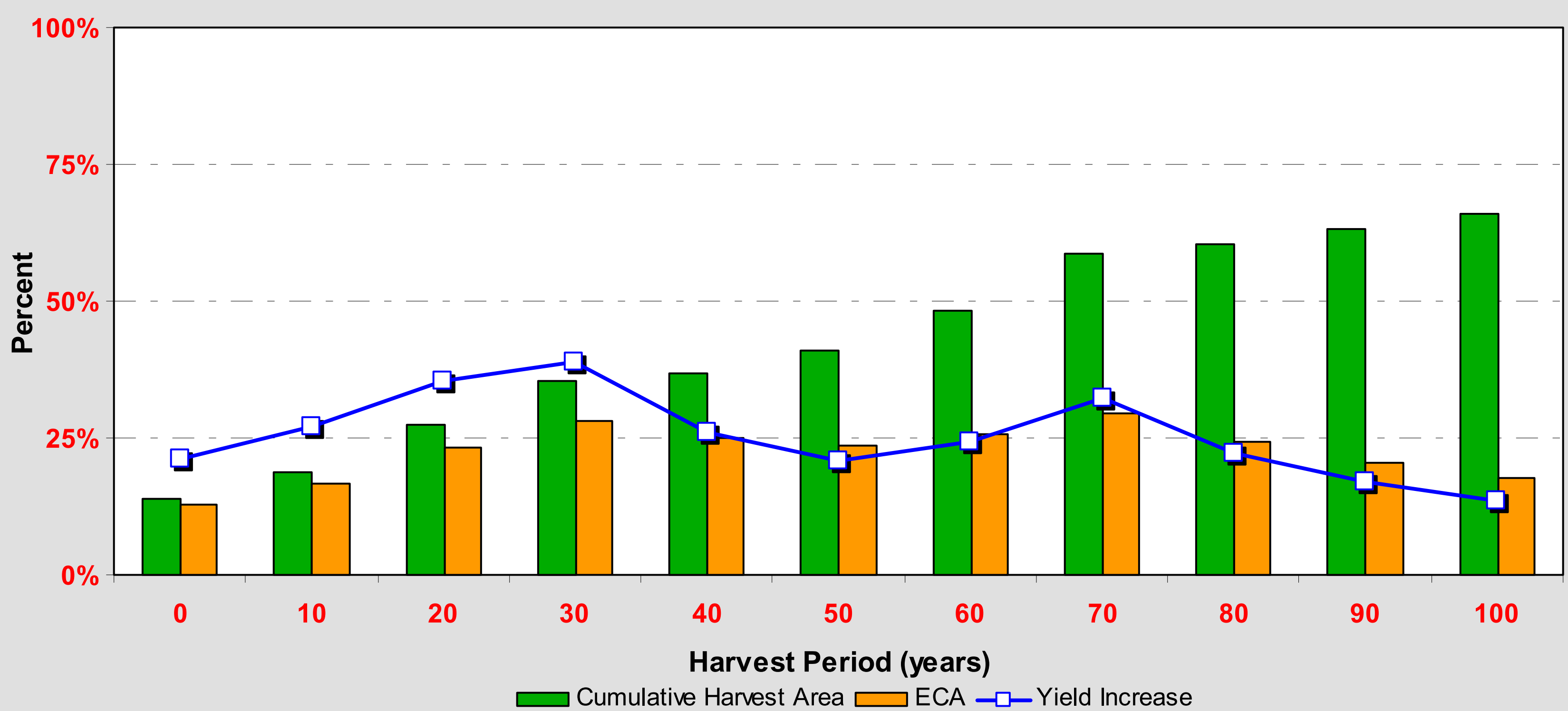


TABLE 8-53: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #14

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	7	16	29	35	36	61	64	74	75	79	85
ECA (%)	7	15	25	27	23	40	34	35	26	22	21
Yield Increase Above Long Term Average (%)	12	25	36	32	18	46	30	30	18	15	18

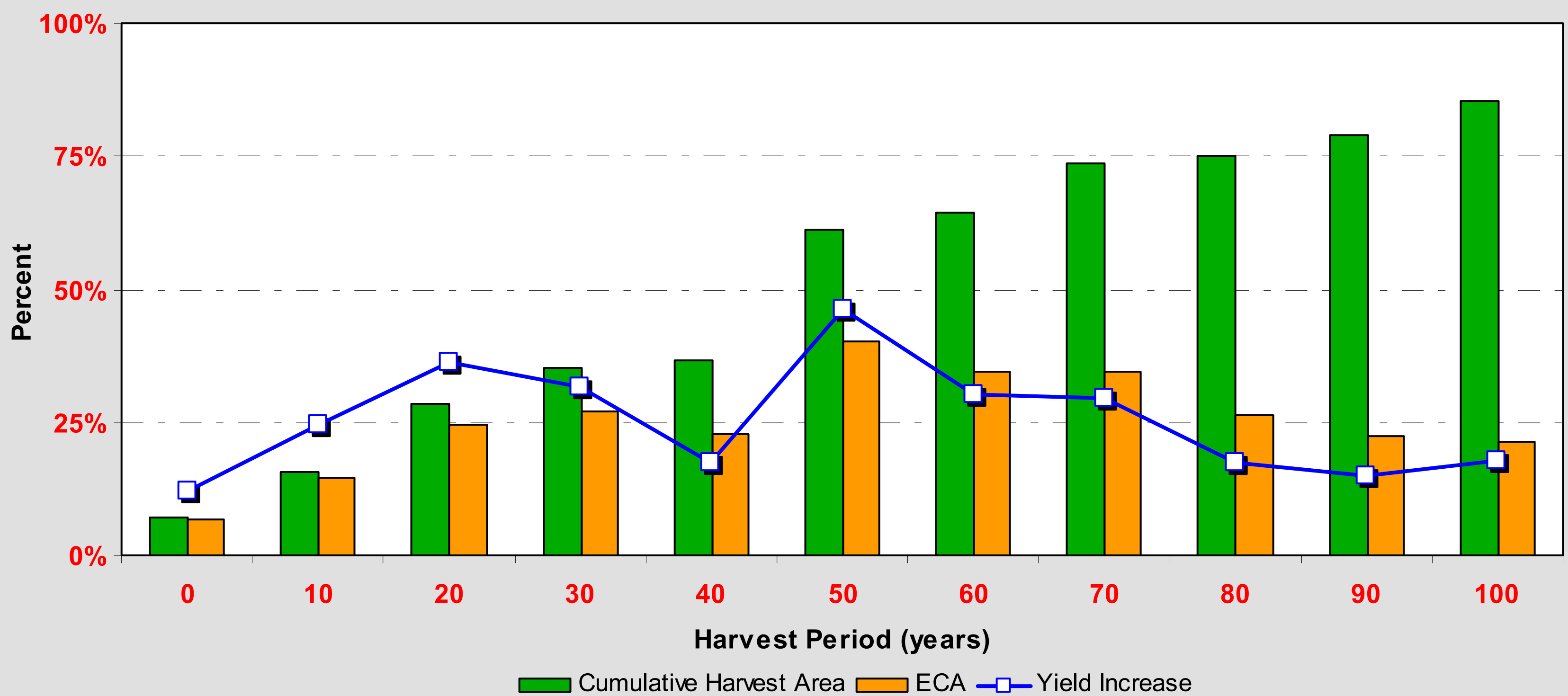


TABLE 8-54: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #15

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	2	10	23	31	35	40	51	62	67	70	75
ECA (%)	1	9	21	25	24	24	29	32	30	25	23
Yield Increase Above Long Term Average (%)	2	16	33	33	24	22	30	34	29	19	18

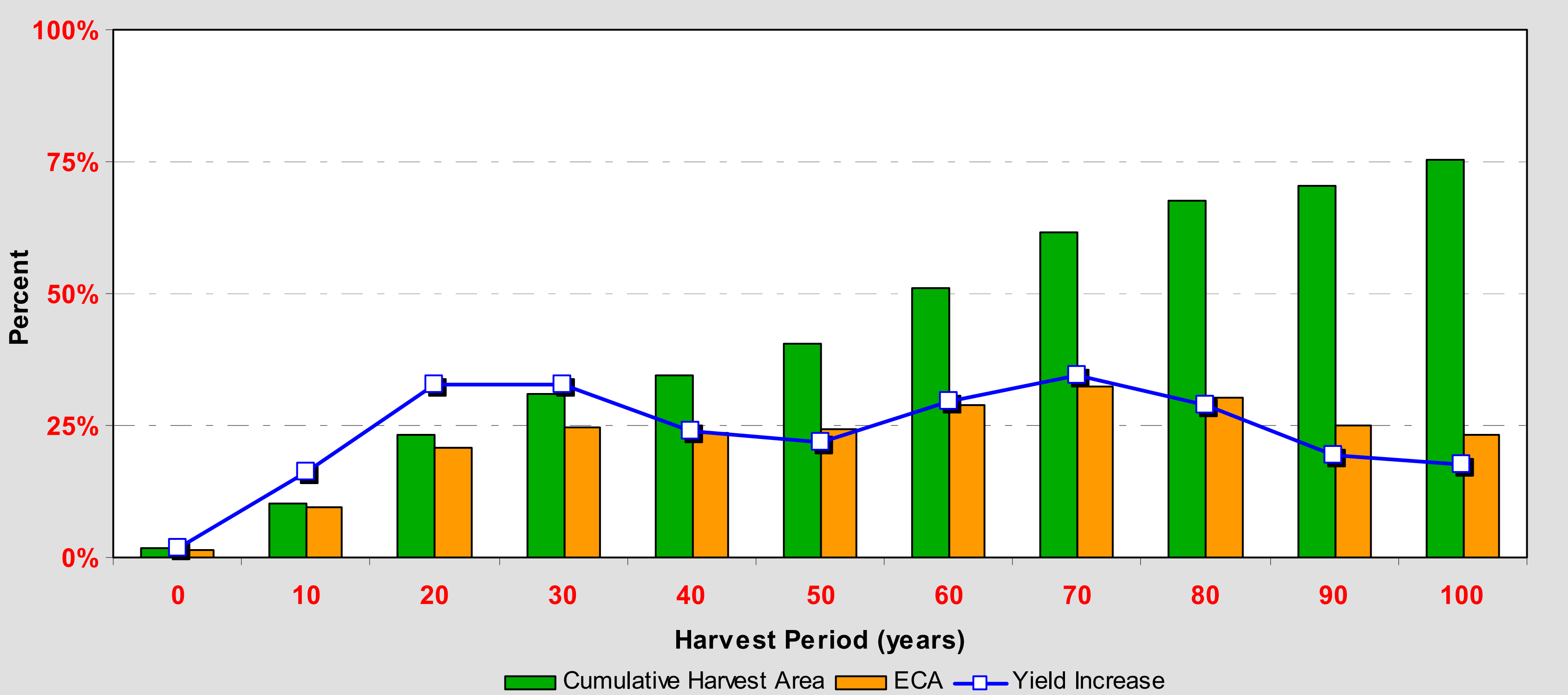


TABLE 8-55: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #17

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	0	1	11	11	11	11	35	36	40	42	54
ECA (%)	0	1	10	8	7	5	27	23	22	19	25
Yield Increase Above Long Term Average (%)	0	2	16	9	3	1	43	29	21	13	23

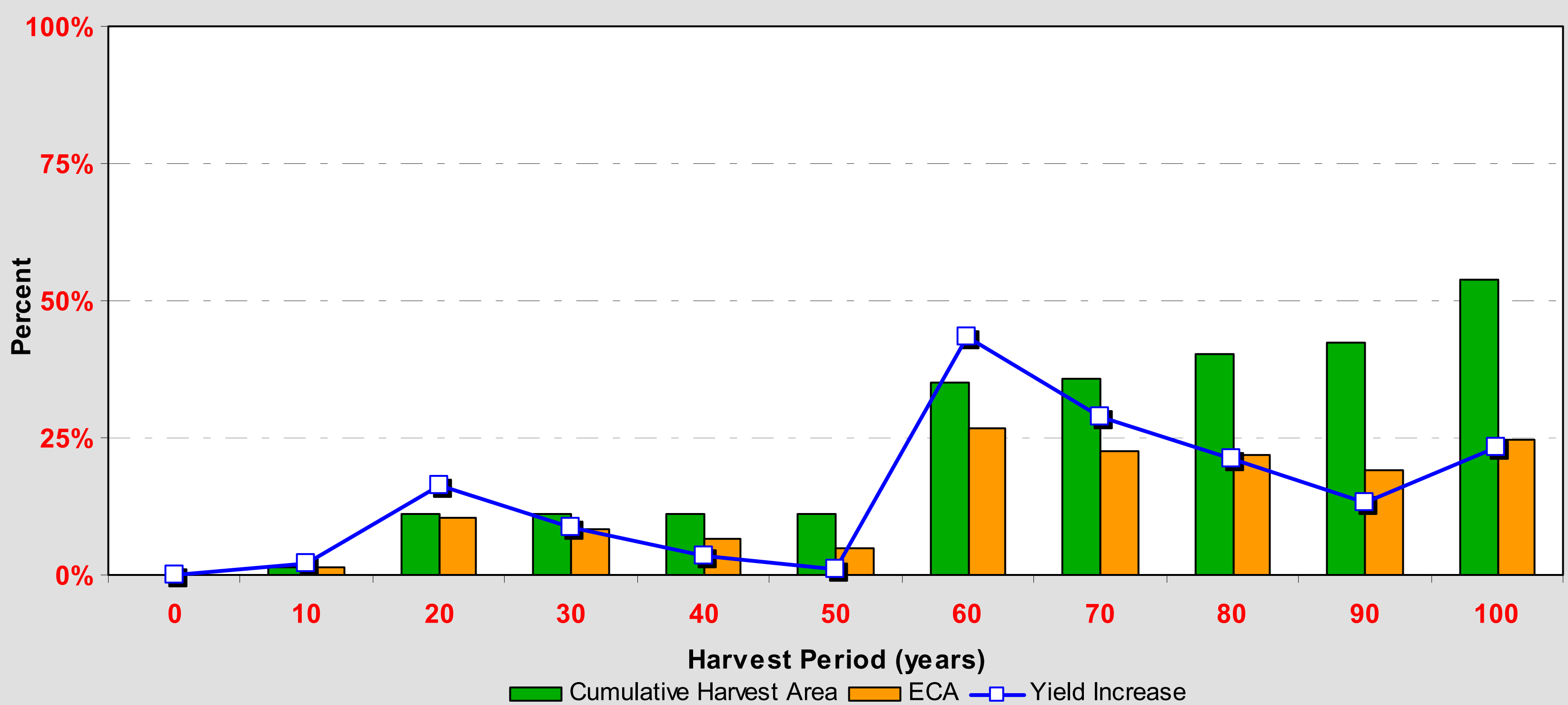


TABLE 8-56: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #18

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	1	5	10	20	25	28	39	47	55	60	76
ECA (%)	1	4	8	17	18	17	24	27	28	26	35
Yield Increase Above Long Term Average (%)	1	7	12	23	20	16	27	30	31	24	40

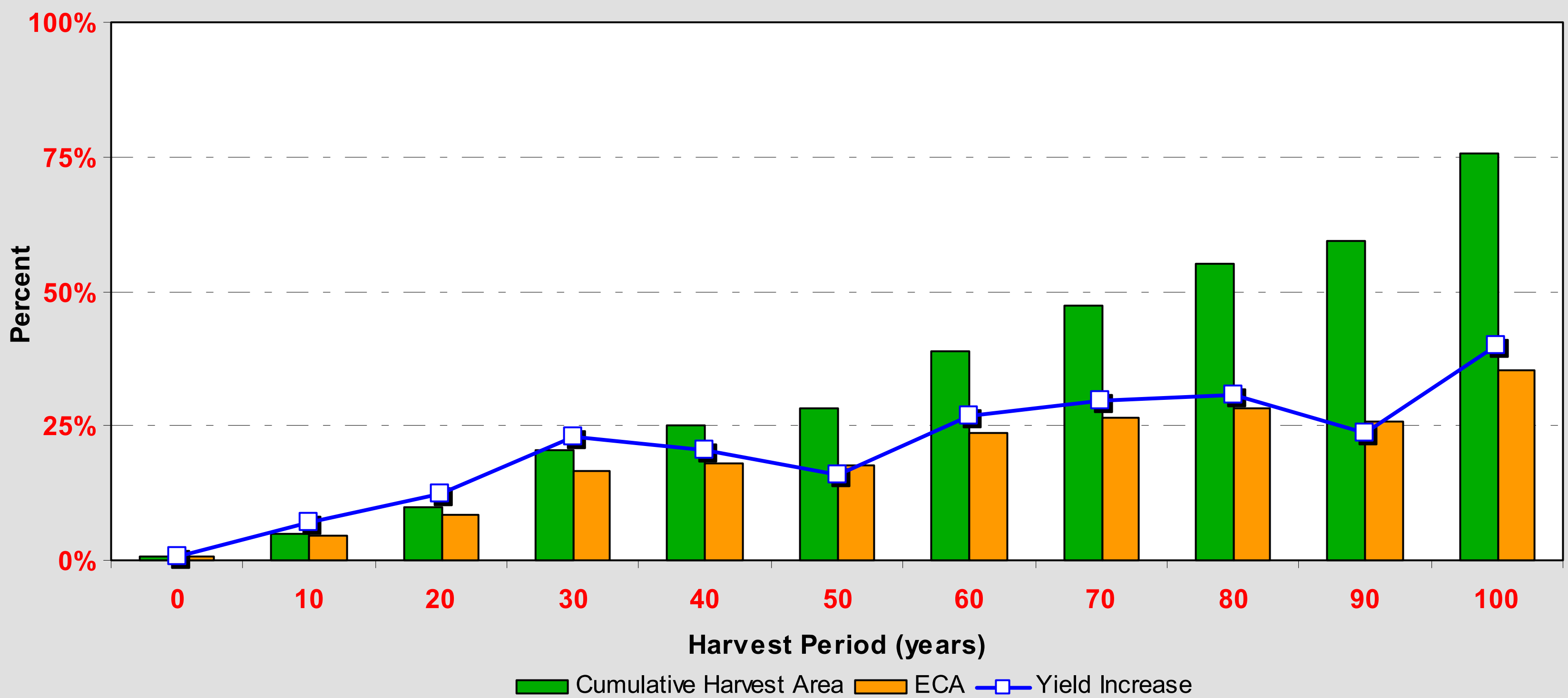


TABLE 8-57: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #19

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	2	4	5	10	20	26	34	36	57	64	81
ECA (%)	2	4	4	8	17	19	22	19	35	34	41
Yield Increase Above Long Term Average (%)	4	6	5	11	25	22	23	14	44	34	43

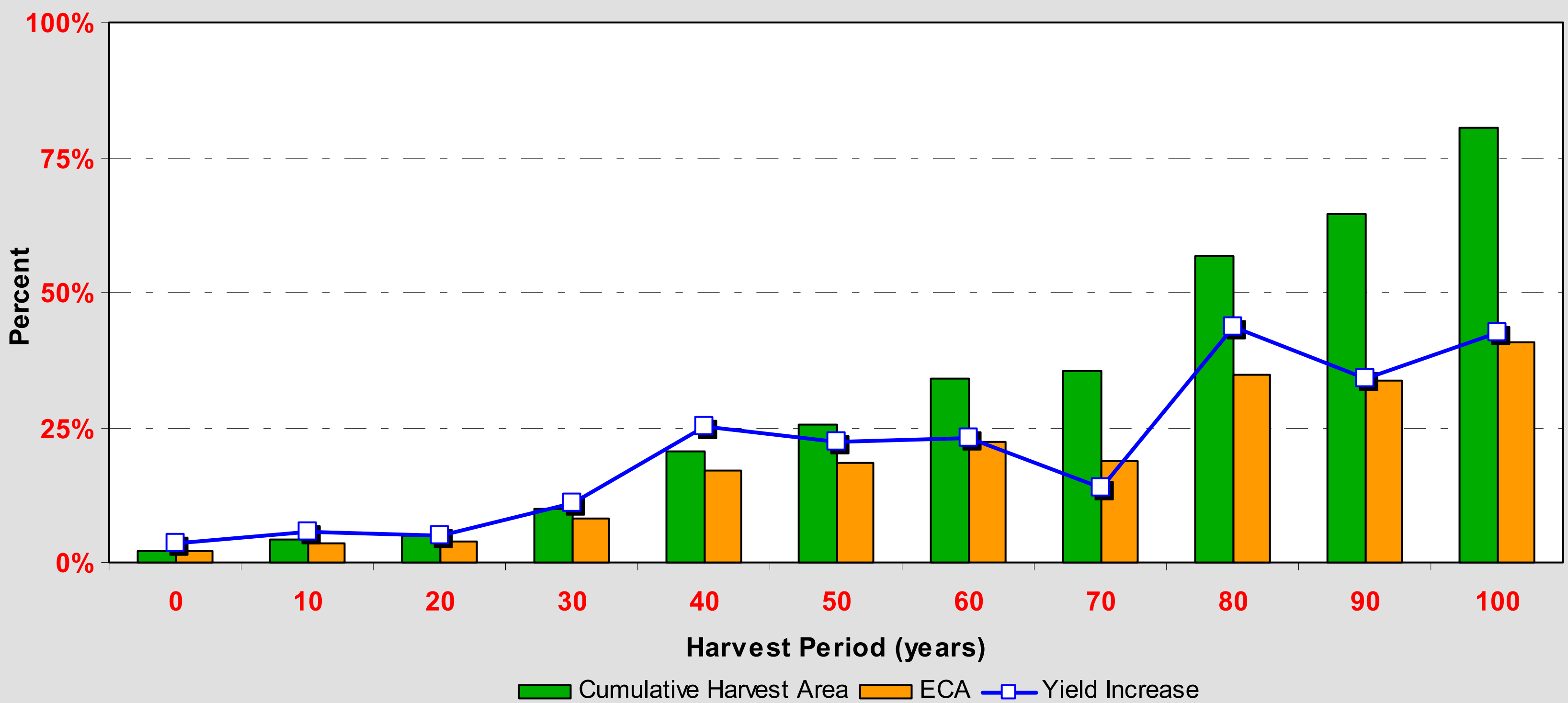


TABLE 8-58: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #20

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	11	20	30	33	34	48	53	71	72	74	81
ECA (%)	10	18	25	23	20	29	28	37	30	24	24
Yield Increase Above Long Term Average (%)	16	28	37	26	16	31	28	43	25	14	19

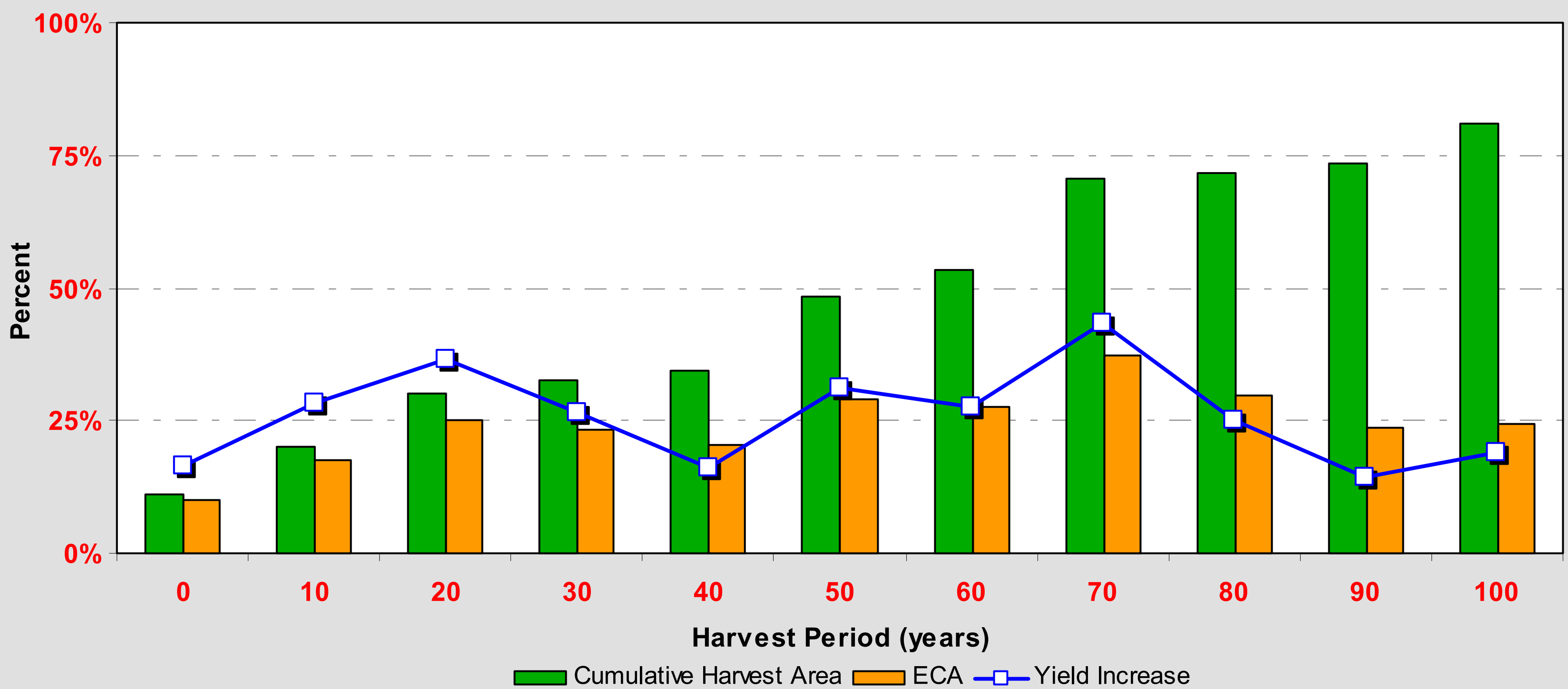


TABLE 8-59: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #22

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	13	27	32	38	39	48	66	74	76	79	89
ECA (%)	11	23	24	25	21	24	35	35	29	24	27
Yield Increase Above Long Term Average (%)	17	35	31	26	15	23	41	37	26	18	26

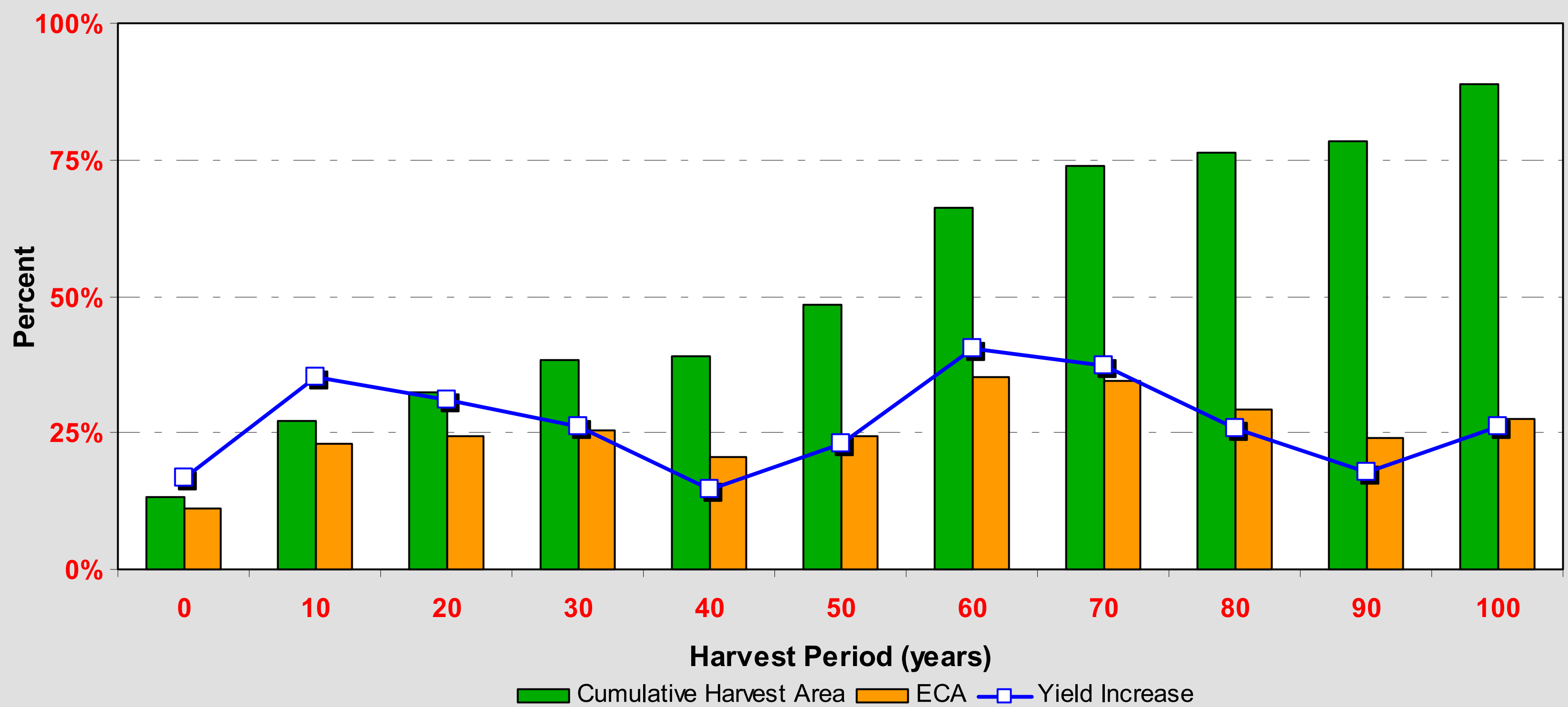


TABLE 8-60: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #24

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	6	8	14	31	43	43	49	61	78	84	87
ECA (%)	6	7	12	26	33	27	27	31	38	34	28
Yield Increase Above Long Term Average (%)	10	11	17	38	42	23	20	28	39	29	19

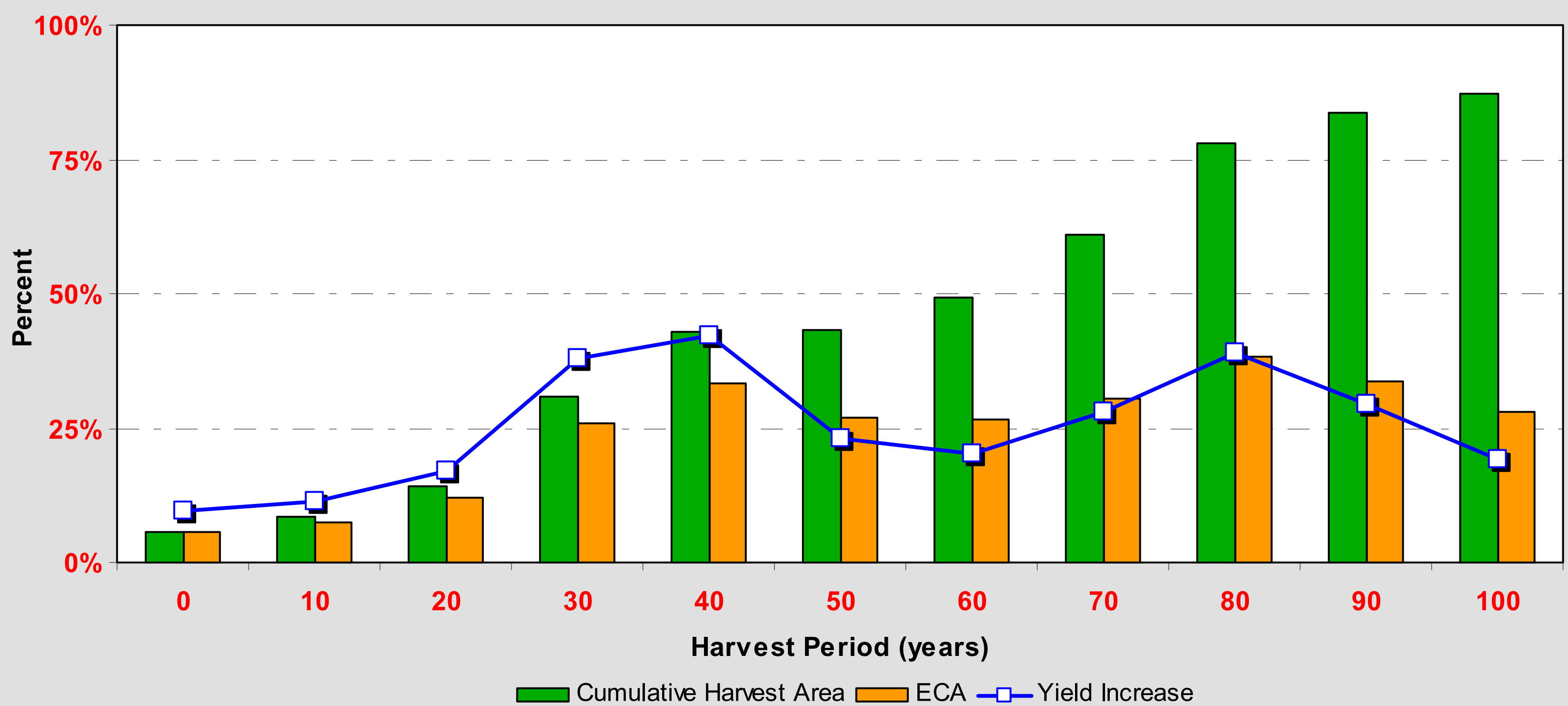


TABLE 8-61: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #26

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	1	1	1	9	17	18	18	18	27	40	41
ECA (%)	1	1	1	8	15	13	10	7	13	21	18
Yield Increase Above Long Term Average (%)	3	2	2	13	23	13	6	2	14	26	16

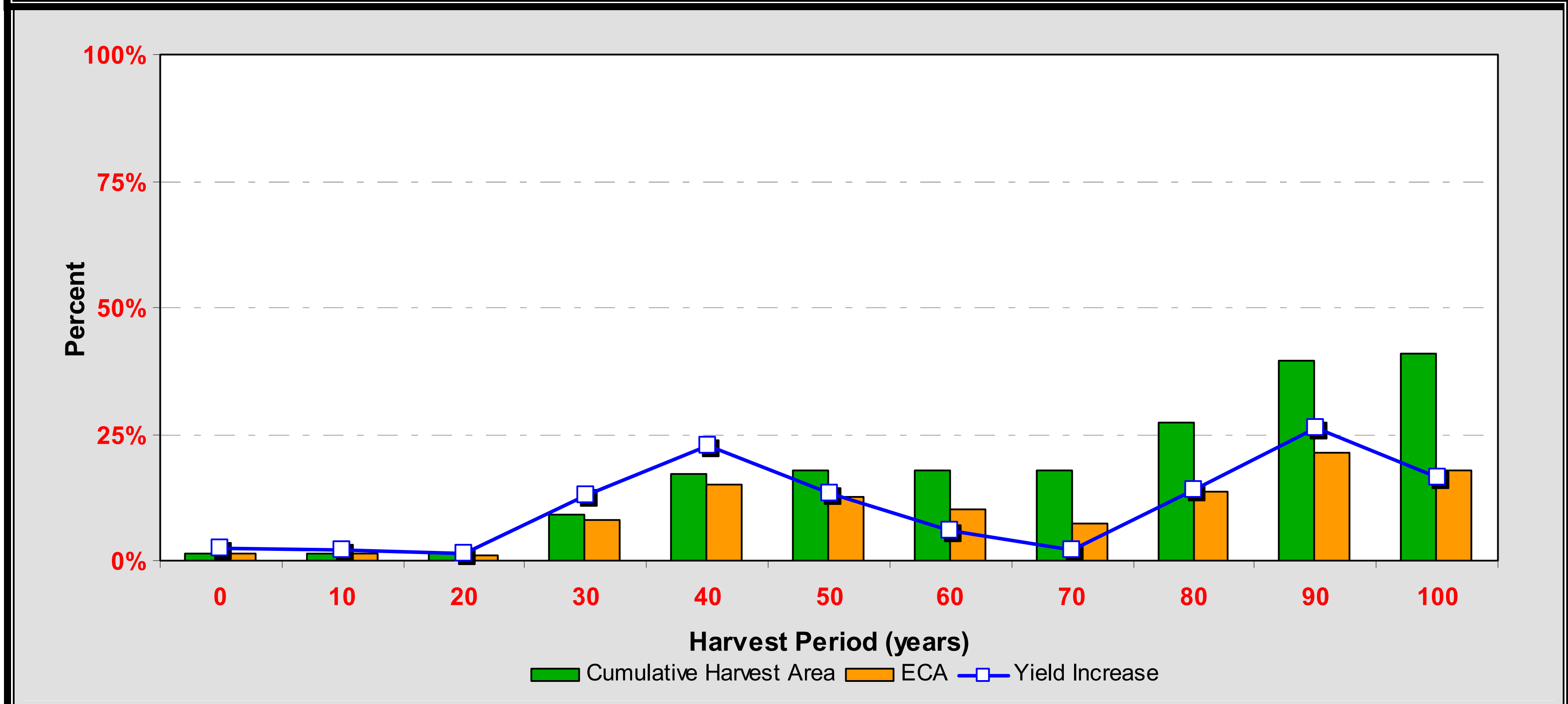


TABLE 8-62: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #28

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	5	7	7	14	27	28	32	33	40	58	62
ECA (%)	4	6	5	11	21	19	18	15	17	29	25
Yield Increase Above Long Term Average (%)	6	8	7	17	31	19	15	10	14	33	24

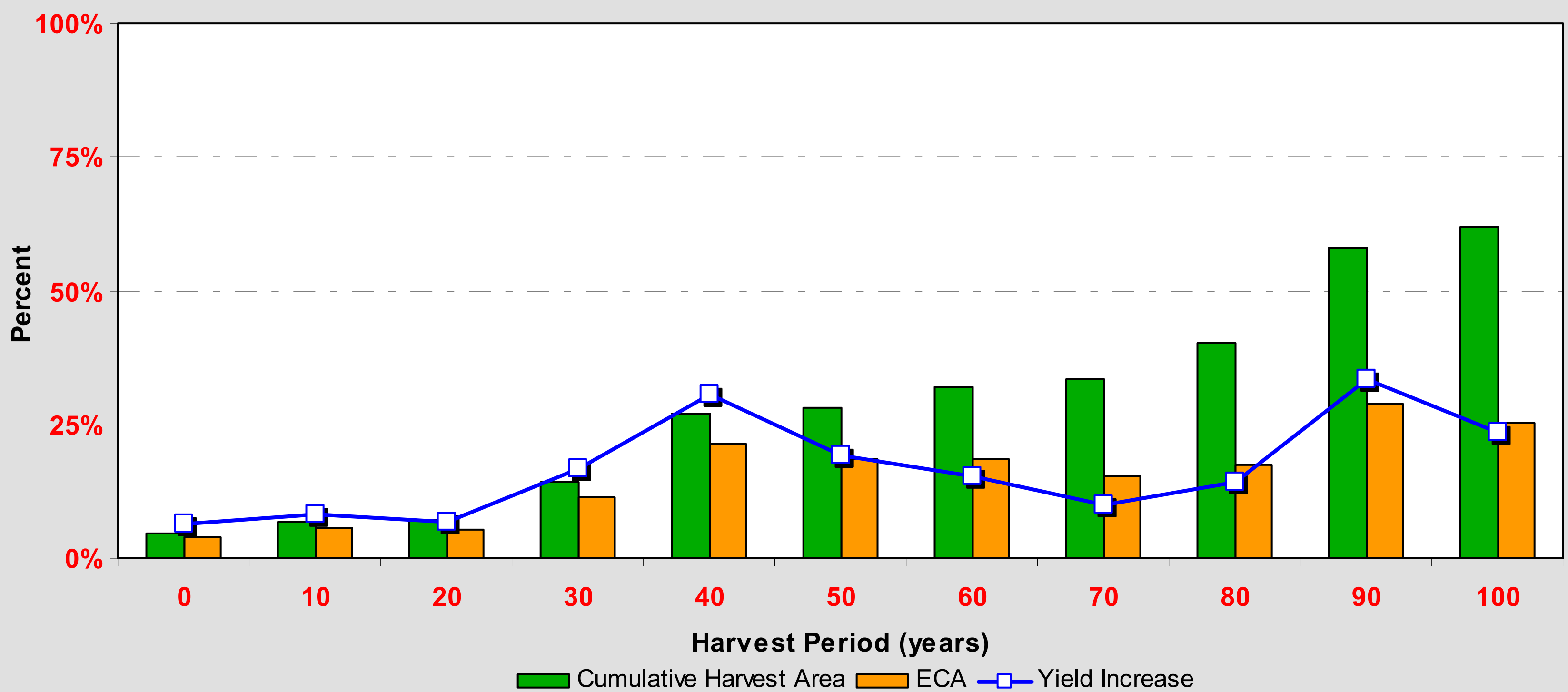


TABLE 8-63: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #30

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	3	4	9	15	23	23	36	38	51	59	62
ECA (%)	3	3	7	12	17	14	24	20	27	28	23
Yield Increase Above Long Term Average (%)	4	3	11	17	21	12	30	19	29	27	17

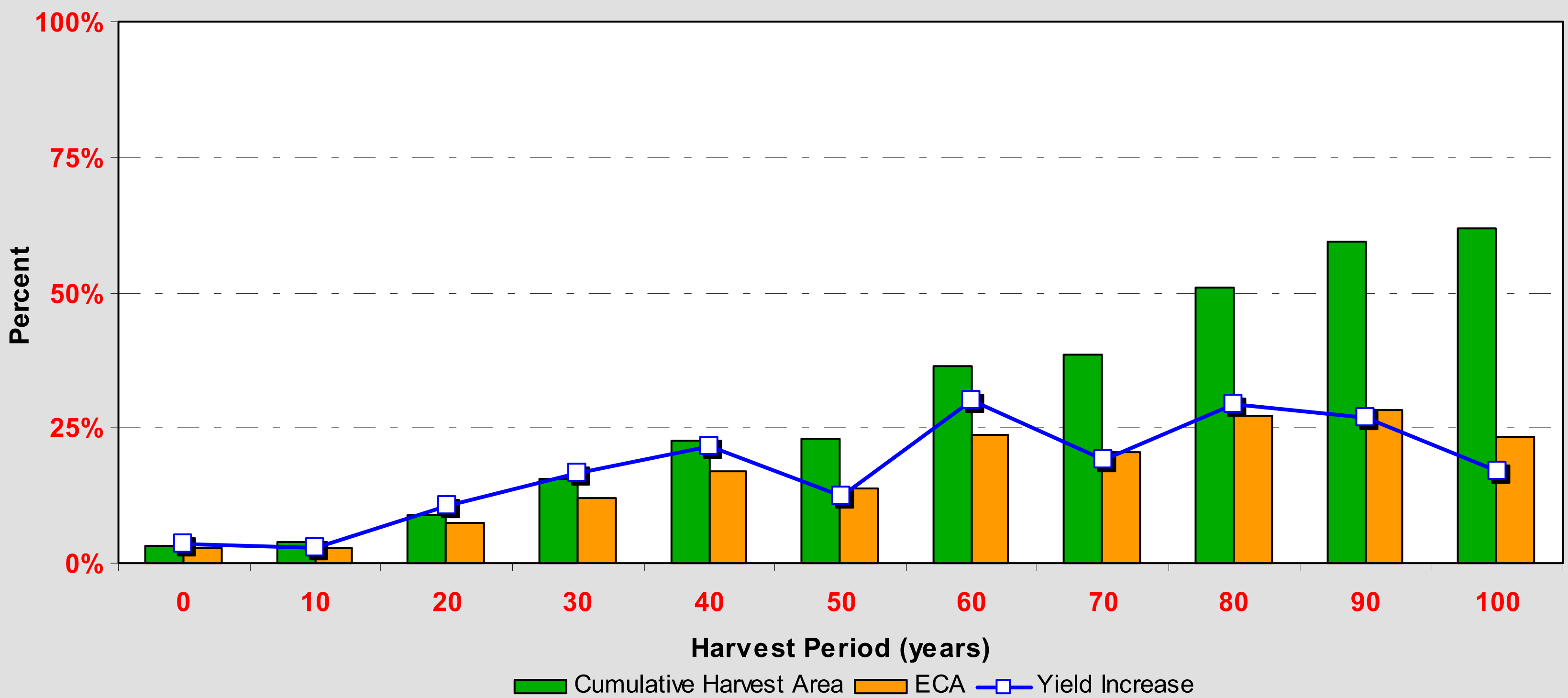


TABLE 8-64: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #32

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	3	4	16	24	26	27	28	44	56	60	66
ECA (%)	3	3	14	20	19	16	13	25	30	27	25
Yield Increase Above Long Term Average (%)	4	3	24	30	22	13	7	27	34	24	22

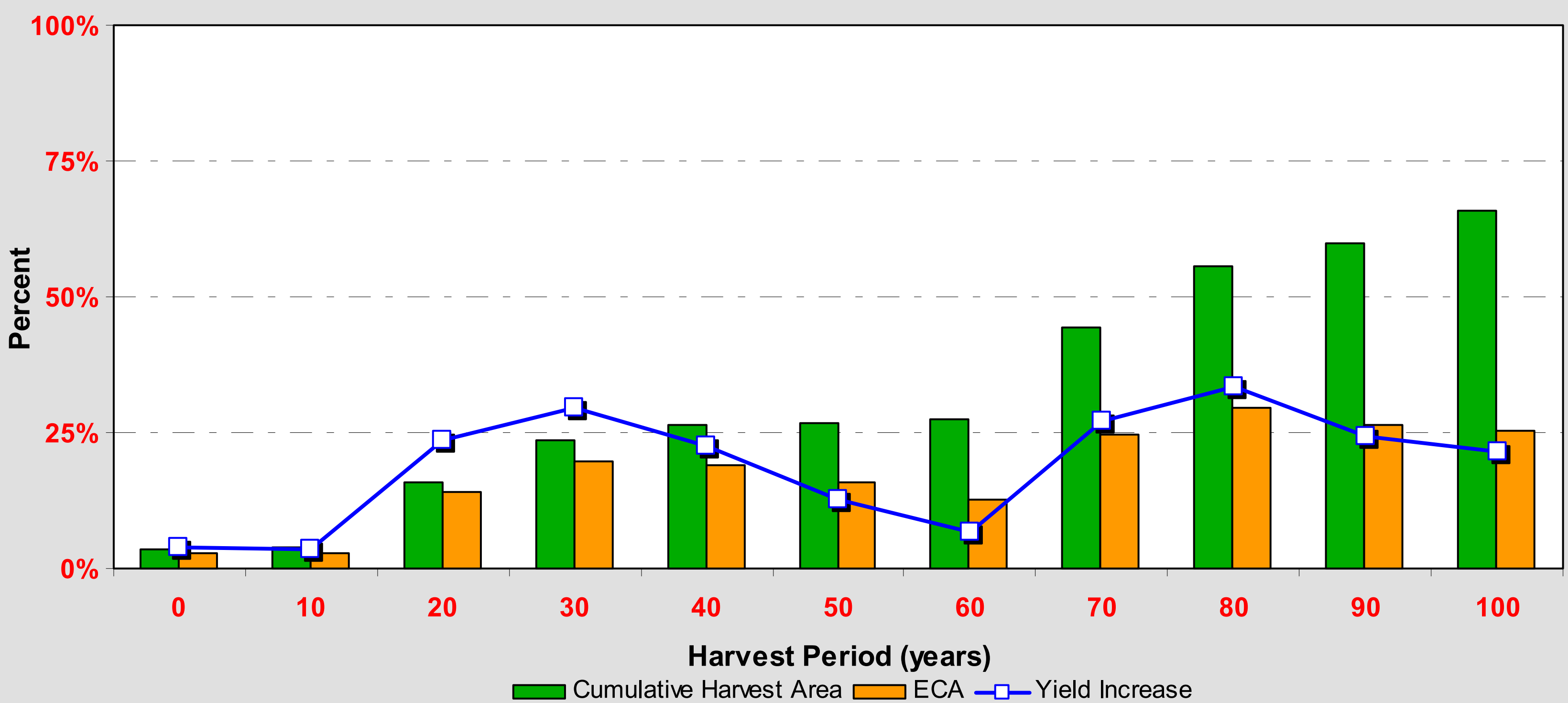


TABLE 8-65: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #33

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	7	13	16	24	29	36	40	43	53	62	69
ECA (%)	6	10	12	17	18	22	21	18	23	26	27
Yield Increase Above Long Term Average (%)	7	15	16	23	21	23	19	13	24	31	29

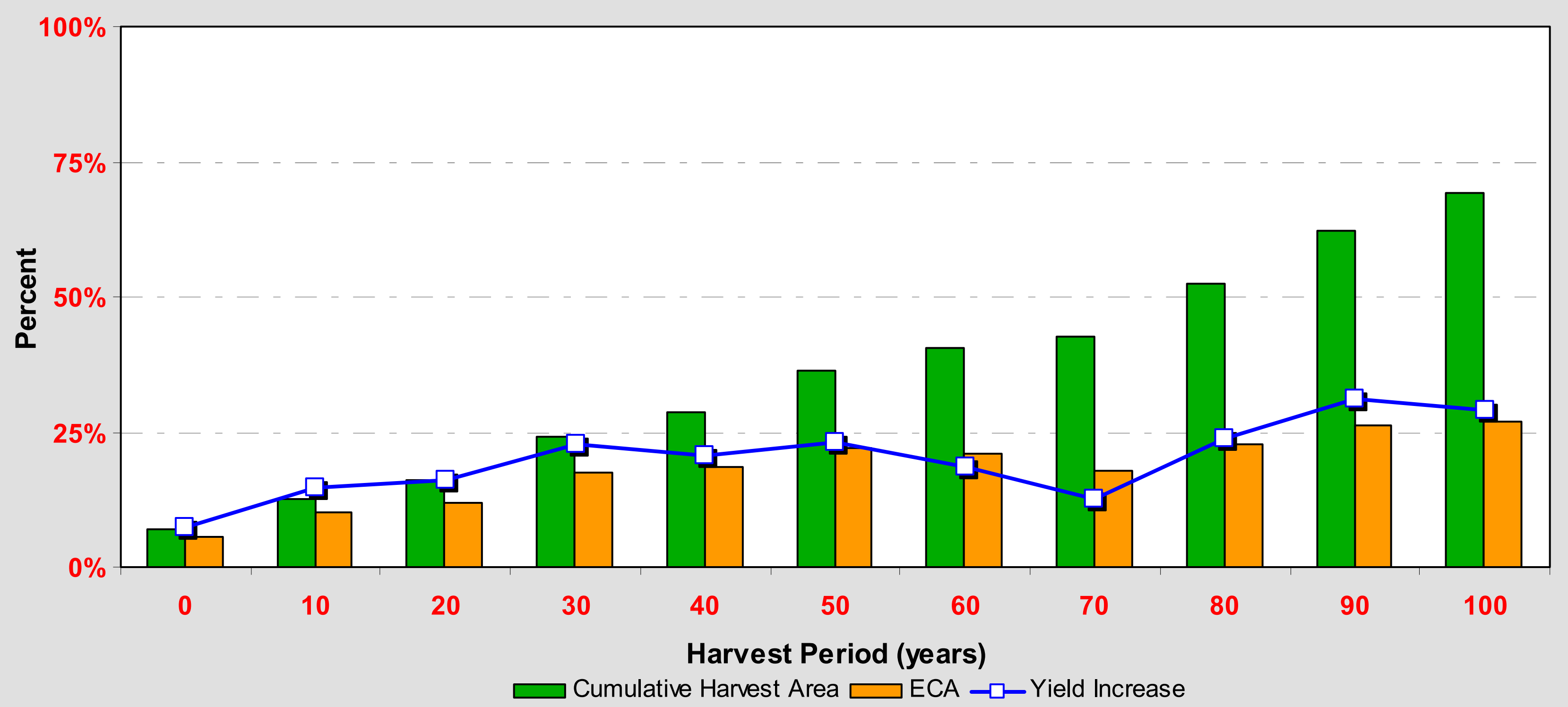
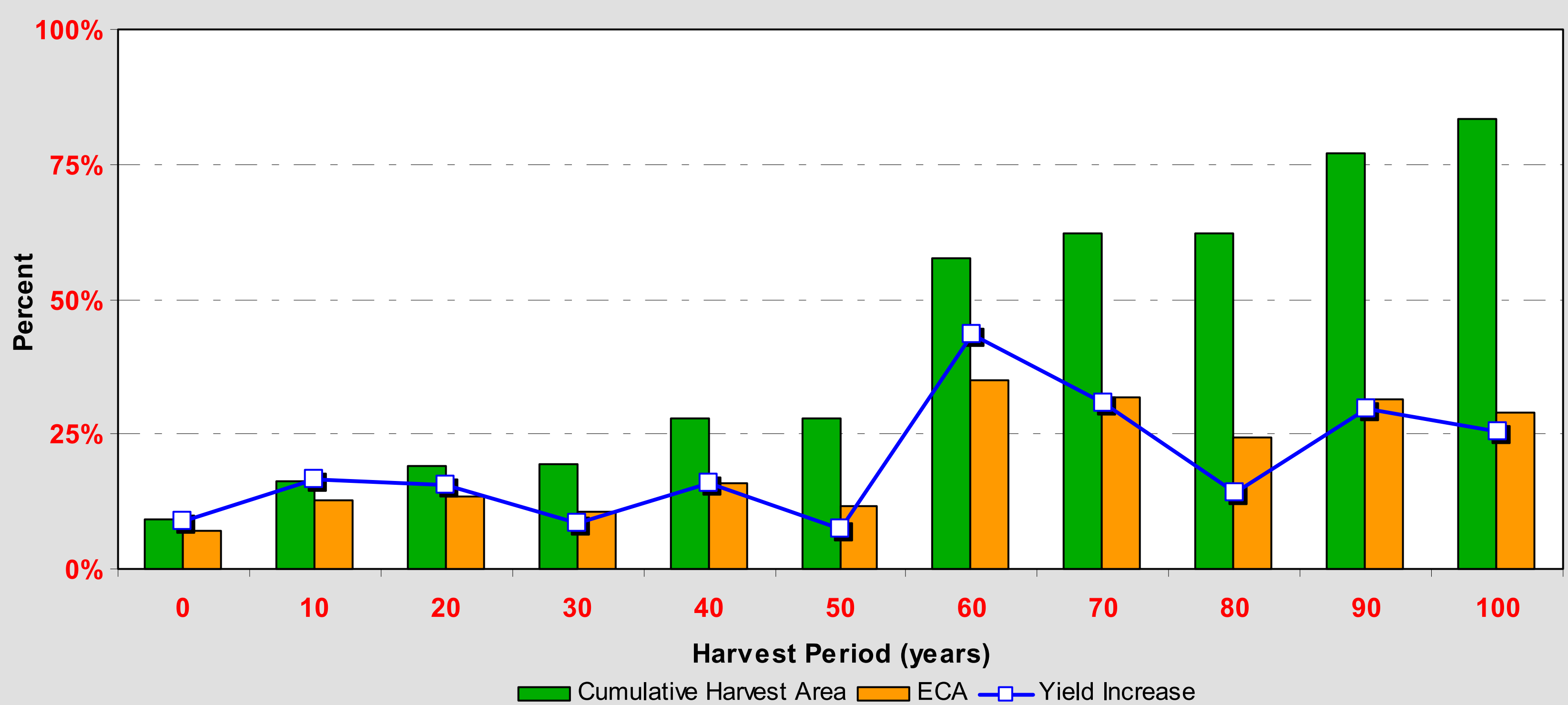


TABLE 8-66: CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS WATERSHED #34

Harvest Period (years)	0	10	20	30	40	50	60	70	80	90	100
Cumulative Harvest Area (%)	9	16	19	19	28	28	57	62	62	77	83
ECA (%)	7	13	13	11	16	12	35	32	24	31	29
Yield Increase Above Long Term Average (%)	9	17	15	8	16	7	44	31	14	30	26



MAP 8-35: CURRENT – CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS

For map, please see:

APPENDIX G

MAP 8-36: 10 YEAR PROJECTION – CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS

For map, please see:

APPENDIX G

MAP 8-37: 50 YEAR PROJECTION – CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS

For map, please see:

APPENDIX G

MAP 8-38: 100 YEAR PROJECTION – CUMULATIVE WATERSHED DISTURBANCE AND HYDROLOGIC RECOVERY ANALYSIS

For map, please see:

APPENDIX G

SECTION 9:
PRINCIPLES OF THE PLAN

Ref: H-065

9.0 PRINCIPLES OF THE PLAN

9.1 ADHERENCE TO PRINCIPLES OF THE PLAN

The preferred management strategy adheres to the principles established by the Companies in preparing the DFMP to achieve the desired future forest. The principles are:

1. Maintain and/or improve the health and productivity of forest ecosystems and biological diversity.
2. Agreement to manage for what is on the landscape.
3. Share in gains and losses.
4. Actively promote stakeholder and public participation through open communication.
5. Comply with applicable legislation.
6. Evaluate resource management performance through internal and external audits.
7. Practise adaptive management by enhancing employee knowledge and expertise.

The following subsections address principles that have been met by the selection of the preferred management strategy. The Companies continue to comply with existing applicable legislation regardless of the preferred management strategy selection.

9.1.1 HEALTH AND PRODUCTIVITY OF THE FOREST

Following 200 years of operating at the volume levels of the preferred management strategy, the forest is somewhat regulated in appearance with the exception of the 100+ age class, which occupies over 300 000 ha of the net landbase. This compares to the average of 70 000 ha in each of the other five-year age classes. The average harvest age at the beginning of the two-rotation simulation is approximately 130 years; at the end of the simulation, the average is just below 120 years.

The growth capacity of the forest is also somewhat regulated following two rotations. Again the exception is in the 100+ age class, which exceeds 8 000 000 m^3 per year–approximately four times the growth capacity of the next lower age class. The growing stock is on an upward trend following 70 years of reduction. The upward trend continues beyond 200 years.

The priority of compartment selection for the first five-year period involved removal of timber due to spruce budworm or fire protection requirements around the communities of Zama City and Meander River. The spruce budworm areas are compartments Zama-1 and Steen-2. These compartments were selected as a result of the continuation of L2 surveys that indicate these are areas of high risk for infestation or increasing infestation damage. The spruce budworm, if allowed to continue infesting an area, will eventually cause tree mortality and lead to a high wildfire risk due to fuel accumulation. Fire protection areas were identified with the assistance of the Forest Protection Division of Sustainable Resources Development. Compartments that match their priority objectives are Chinchaga-1 for the Meander River Reserve and Bistcho-3 for Zama City.

Yield curves are based on the growth of natural stands. No enhancement to the yield has been assumed despite enhanced forest management initiatives; therefore, no ACE has been determined.

9.1.2 BIOLOGICAL DIVERSITY

The long-term desired future forest to be achieved by following the preferred management strategy and goals outlined in this DFMP is realized on a net landbase that operates on less than 50% of the gross landbase area. This provides both large contiguous tracts and small patches of forested land that contribute to the ecological functions of the forest, but do not contribute to the harvestable production of timber. In particular, timber productivity rating "fair" black spruce sites, which provide key habitat requirements for woodland caribou, have been removed from production. This resulted in a reduction of nearly 150 000 ha from the net landbase.

Watercourse buffers along the Ponton River valley have been increased to the banks of the slope, well beyond the requirements of the Alberta Ground Rules, to maintain the integrity of the river valley and stability of the slopes along the banks. All other watercourses have had a watercourse assignment that will be field checked to ensure proper buffer assignments are in place prior to harvesting. Current watercourse buffers occupy over 140 000 ha. The islands found within the Peace River have also been removed from the net landbase.

As natural processes regulate these areas, there is no reliable method to determine the amount of area that will be found in older age classes outside the net landbase. Within the net landbase, older age classes will be maintained at an average age of 120 years through harvesting. As the majority of deciduous stands are harvested at an earlier age than conifer stands, this indicates that a number of stands must be older than 120 years to maintain the average age.

The combination of coarse and fine filter techniques and monitoring programs established for the DFMP will determine the effects of harvesting according to the levels set out in the preferred management strategy. However, the ramp up strategy outlines that harvest levels will not be at the preferred management strategy level until the next DFMP submission.

9.1.3 MANAGE FOR WHAT IS ON THE LANDBASE

The Companies have agreed to base their management decisions on what is actually on the ground. In order to do this, the Companies are working toward standard operating procedures that outline when and what field measurements will be taken to incorporate into the appropriate plan. Managing for what exists on the landscape is one of the advantages to the dissolved landbase concept, since it prevents inappropriate forest management decisions made to maintain a percentage of landbase. The adaptive management section and field modification protocols developed for the DFMP are examples of how the Companies will modify their operations to incorporate this principle.

9.1.4 SHARE IN GAINS AND LOSSES

Although there are a number of benefits of operating under a dissolved landbase, the Companies and other tenure holders on the FMA recognize that there are also costs associated with its implementation.

The benefits extend beyond the proposed uplift in coniferous and deciduous Annual Allowable Cuts (AAC's) for each of the facilities. The local contractor workforce will also benefit through the implementation of a Preferred Forest Management Strategy, which includes a ramp up strategy. This will give local contractors time to purchase additional equipment (if necessary) to accommodate the gradual increase in volume harvested. In addition, compartment selection in the PFMS should allow the Companies to balance the haul distances over time, thus promoting a relatively stable number of log trucks required for transportation.

These gains go beyond the FMA boundaries, and extend to purchase wood agreements. The ramp up strategy included in the PFMS outlines a reduction in volume harvested during the first 5-year period to allow for the continuation of wood purchases from other sources. This allows for timber harvested in the area to remain in the area for processing, and to continue the relationships that existed prior to the submission of the DFMP.

Although there are many benefits associated with operating under the dissolved landbase, the Companies must undertake an updated forest inventory program, develop and implement a Growth & Yield program, as well as adhere to the spatial harvest sequence outlined in the DFMP.

The implementation of the PFMS, which includes a commitment to forest health, forest protection, and ecological stewardship, will also mean that the Companies must continue sponsorship and have active participation in a number of research initiatives in these areas.

9.1.5 STAKEHOLDER AND PUBLIC PARTICIPATION

A different approach to public and stakeholder participation was established with development of this DFMP. Many members of the public dedicated much of their free time to assist the Companies in developing a direction to follow that involves the public's concerns. The Companies appreciate this effort and wish to continue public and stakeholder involvement in an advisory capacity. To this end, the Companies have prepared a public involvement plan that deals with implementation of the DFMP. Strategies to achieve the goals outline when and how the public will be involved in planning.

Following approval of the DFMP, a committee involving members of the public and stakeholders will be asked to provide assistance in developing the next DFMP. The Companies have also spent considerable time and effort in educating the public on their activities. This investment will continue in the future.

9.1.6 EVALUATE RESOURCE MANAGEMENT PERFORMANCE

The monitoring and reporting strategy outlined in the following sections indicates what the Companies will be measuring, and how and when it will be reported. In addition both Companies are pursuing an Environmental Management System (EMS) that will involve mutual standard operating procedures (SOPs). These SOPs will be developed over the period of this DFMP. The Companies fully expect to have external and internal audits of their performance several times during the period of this DFMP.

9.2 ADAPTIVE MANAGEMENT

The Albert Forest Legacy recognizes that sustainable forest management is a "continuation of a 60 year process of incremental change, driven by advancements in knowledge and changes in public demands on the forest landscape."[23] Adaptive management is defined as "a systematic process for continually improving management policies and practices by learning from outcomes of operational

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[23] *The Alberta Forest Legacy – Implementation Framework for Sustainable Forest Management. Alberta Environmental Protection. (See website at: http://www3.gov.ab.ca/srd/forests/fmd/legacy/legacy.html)*

programs." Adaptive management is a key component to the successful implementation of this DFMP. Managing to achieve the desired future forest will demand flexibility and incorporation of the best available information.

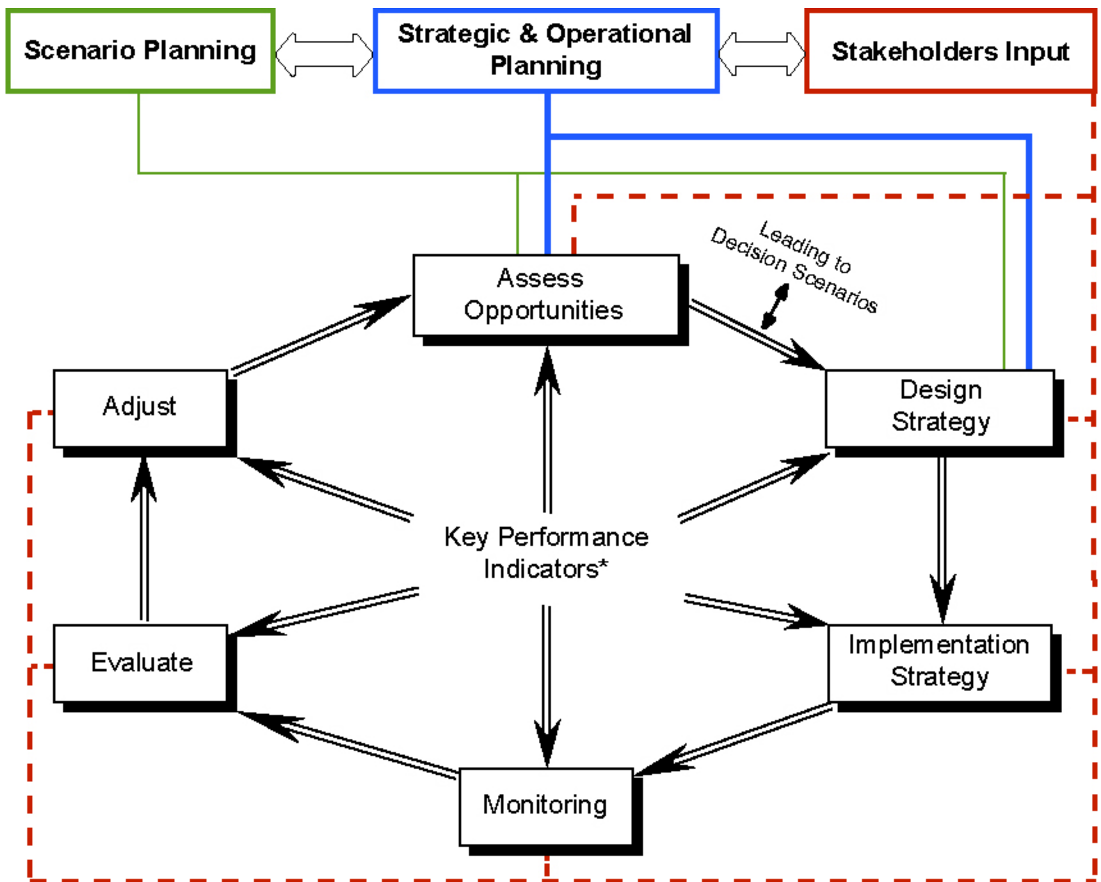
When choosing the preferred management strategy, the Companies made decisions on balancing ecological, social and economic values using the best information possible. The Companies will move forward, continuing to make informed decisions while monitoring actions and implementing improvements (PLAN, DO, CHECK, and ACT). The process of Adaptive Management (Fig. 7-1) will be used in all levels of forest management planning.

9.2.1 ADAPTIVE MANAGEMENT PROCESS

Maintaining an adaptive and flexible approach to resource management is critical to long-term goal achievement. Throughout the document, deficiencies in information or understanding of natural processes have been identified. As this information becomes available, the effect it has on implementation strategies will be assessed and the strategies revised as required.

Monitoring will be conducted within an adaptive management framework, and the results applied to modify planning and operational activities. Monitoring programs will be developed to test whether the modifications to planning and operations are meeting the objectives. As new information becomes available, it will be assessed and may be incorporated into planning and operations.

FIGURE 9-1: ADAPTIVE MANAGEMENT[24]



*Key performance indicators

1. Scenario Planning
2. Strategic and Operational Planning
3. Stakeholder Input
4. Future Forest Conditions
5. Design Strategy
6. Implementation Strategy
7. Monitoring
8. Evaluate
9. Adjust
10. Assess Opportunities

[24] *Draft Forest Management Planning Manual, April 2001. Alberta Sustainable Resource Development – Forest Management Division.*

9.2.2 FIELD MODIFICATION PROTOCOLS

The Companies have agreed to "manage for what is there", meaning that regardless of the inventory call, stands planned for harvest will be field-checked, and prescriptions will be made based on this information. Field modification protocols were developed to deal with the changing inputs so that the final harvest sequence can be implemented as closely as possible. Development of these protocols will be incorporated into the FMA ground rules.

The field modification protocols are explicit and measurable. They describe thresholds to drop or add stands, the process to replace stands that have been dropped, and briefly describe a way of monitoring the changes and the effect of the changes. Summaries will stratify why changes were needed, track the changes made, and measure their effects on the goals and objectives. These changes are also incorporated in the adaptive management philosophy, and work towards continual improvement of information for timber modelling.

Protocols were developed for:

1. AVI mistyping
2. Ground conditions
3. Unique discoveries, rare habitats and ecological features.
4. Major events
5. Economics
6. Yields and quadrant production

1. **AVI Mistyping**

The photography used to inventory the FMA was taken between 1991 and 1999. The protocol deals with AVI stand calls that are not accurate, or calls that have changed since the time of photography. The categories for changing the sequence of stands or portions of stands harvested are:

a. Overstory change/piece size

If the deciduous and/or coniferous species in a stand is not of merchantable size due to an error or change in the AVI, stands or portions of stands will be dropped. The dropped portions will be used to meet wildlife and structural goals. If the deciduous is typed correctly and is still merchantable, but the conifer is incorrectly recorded and is unmerchantable, the stand may be moved to the understory category and its sequencing and harvest strategy re-evaluated by both companies.

Stands or portions of stands may be added to the harvest sequence (i.e., a portion of an unproductive stand is productive and merchantable). In this situation, the Companies will be cautious that the change to the harvest design does not create future adjacency problems, and/or affect the goals and objectives for wildlife habitat or age class structure.

b. Species/stand classification

Timing of volume flow to both facilities is very important. The ability to achieve both facilities' volume control needs may delay stands sequenced for harvesting from the current period to the next period. Alternatively, a stand in the next period, with an acceptable species mix, could meet volume control needs.

c. Understory

The Companies' commitment to understory involves different strategies to allow the predicted yields expected from stands (i.e., double entry tactics) to occur. Regardless of the inventory, the Companies will manage for what exists on the landbase. Therefore, if there are inaccuracies in the understory inventory, the Companies will make the necessary changes, implement the harvesting strategy required, and evaluate potential effects to the TSA. Again, with changes to the design, there will have to be a heightened awareness of the possible effects on future adjacency, and/or effects on wildlife habitat or age class structure.

d. Age

Mistyping of age on either species may necessitate an evaluation of whether a stand is harvested. If a significant error on age results in changes to stand merchantability, the stand or portion of the stand would be dropped.

2. **Ground Conditions**

a. **Weather**

Where the general development plan forecasts harvesting and/or deliveries during non-frozen conditions, and extended periods of wet weather occur, change in sequencing may be required. Stands meeting the proper criteria, which are closest to the mill temporally, would be used as replacement stands.

b. Slope

Where slopes are too steep to efficiently or safely operate, stands or portions of stands will be dropped from the final harvest sequence and added to the inoperable areas removed from the net landbase.

3. **Economics**

a. **Market Conditions**

If market conditions increase the rate of mill consumption, block harvesting may be accelerated. Blocks in the adjacent period would be scheduled. The Companies would evaluate the effects on even flow of both species to their respective facilities.

Alternately, if market conditions determined that less volume is needed, harvest areas will be deferred to the next period.

Market conditions may necessitate a closer average haul distance, and sequencing of close by operating areas would be necessary.

b. **Mill Production Conditions**

Should a mill shut down for some unforeseen reason, the volume harvested would be reduced. If one facility requires less volume, the Companies may re-sequence blocks to minimize volume to the company requiring the lower volume.

c. Product

If conditions exist that require more of one profile log type than originally needed, cutblock sequencing may change. For example, more Best Quality Sawlog (BQS) volume may be needed; therefore, cutblocks with higher BQS percentages would be sequenced differently.

4. **Land Use**

a. **Shared Areas of Interest**

To reduce the amount of industrial impact on an area, it may be in the Companies' best interest to co-ordinate harvesting with oil and gas activities. This may change the sequence of harvest, but should reduce potential conflicts.

5. **Unique Discoveries**

a. **Archaeological**

Whether identified through the heritage modelling, public involvement plans or pre-harvest fieldwork, archaeological sites require some form of protection. Therefore, stands or parts of stands containing unique discoveries may need to be removed from the net landbase. Areas scheduled for harvesting in the future may be used to replace the volume lost if required to maintain volume commitments.

6. **Rare Habitats or Ecological Features (Fine Filter)**

The Companies will work diligently on gathering information throughout the FMA to identify rare habitats of flora and/or fauna, and unique ecological features. As more information is gathered and research conducted, the Companies may have to drop areas to allow for the natural continuation of these features.

7. Public Concerns

Resolution of public concerns may require changing harvest designs for entire stands or portions of stands. As well, new information and/or social values may put demands on areas to not be harvested. Areas may need to be delayed. Harvesting an area in the same period or adjacent period would make up the volume, if required.

8. **Fibre Loss due to Fire, Insects, and/or Disease.**

The occurrence of fire, insects, and disease in the boreal forest will continue. Even though tools are available to minimize the effects, a certain percentage of forest fibre loss will always occur. Mills recognize the short utilization windows to salvage wood from areas affected by fire, insects, and disease. The ability to modify plans quickly to respond to the unpredictability of these three factors is necessary to ensure as much fibre as possible is used.

9. **Quadrant Production/Yields**

Monitoring the annual allowable cut is a crucial part of sustainability. Production records will be measured against yield curve information used in the TSA. This will assist in generally determining if the yield curves accurately reflect the yield from those strata of forest.

The current TSA periods are measure in five-year intervals. The Joint Forest Management Agreement requires a Detailed Forest Management Plan due on the 5th anniversary of signing the joint FMA. Yield curves will be redone before submitting the next DFMP.

9.3 PERFORMANCE MONITORING

Stewardship reporting will normally be submitted to the public every five years, and include statements of intent for correcting performance not consistent with the DFMP. However, in this case the stewardship report will become part of the next DFMP submission.

To consolidate tracking of indicators and performance of the objectives at all planning levels, performance is reported annually and/or periodically, when required. The following tables outline the contents for each report.

TABLE 9-1: THE ANNUAL PERFORMANCE REPORT

OBJECTIVE	STRATEGY	REPORT CONTENTS
4.1.1 & 4.1.5 4.1.3	Strategy 2 Strategy 2	Regeneration survey summary.
	Strategy 2	Annual road and creek crossing summary that addresses activities under the Soil Conservation Guidelines.
	Strategy 3	Summary of activities where there has been shared development with other stakeholders.
4.1.4	Strategy 1	Summary of annual growth-and-yield program activities.
4.1.5 4.1.6	Strategy 1	Summary of existing obligations and reforestation activities to be performed over the next year.
	Strategy 2	Summary of activities within, adjacent, or crossing lakes, rivers, streams as built. Summary (audit) will verify water body classification and buffer used.
	Strategy 3	Summary of reforestation or reclamation activities undertaken in riparian areas.
	Strategy 4	Summary of research activities undertaken to better understand riparian ecology.
4.1.7 4.1.8	Strategy 1	Summary of audit findings and incidents with regards to waste management.
	Strategy 1	Summary of annual activities that involve the identification and incorporation of rare, threatened, and endangered species into planning and forest management activities.
4.1.9	Strategy 2	Summary of research activities undertaken to better understand the needs of rare, threatened, and endangered species on the FMA.
	Strategy 1	Summary of activities taken to minimize the impacts of insects, fire, disease and noxious weeds.
	Strategy 2	Summary of training and initiatives taken to better identify and understand impacts of fire, insects, disease and noxious weeds.
4.2.1	Strategy 3	Summary of any issues with regards to not operating within the forest protection plan.
	Strategy 1	Identify the number of plans that address heritage sites.
	Strategy 2	Summary of research of heritage site identification in which the Companies are participating.
4.2.2	Strategy 1	Summary of number of activities promoted.
4.3.1	Strategy 1	Summary of the number of opportunities stakeholders have had in developing forest management and operating plans.
4.3.2	Strategy 2	Summary of log haul program (over-weights, safety audits, incidents).
4.3.3	Strategy 1	Summary of educational activities promoted by the Companies.

Other items for inclusion in the reports include:

- Report by leading species for each yield strata.
- Report volumes harvested by leading species for each yield strata on a cutblock basis.
- Report on treatments completed by silvicultural regime.

- Report treatments completed using genetically improved stock.
- Submit raw regeneration survey plot data to ARIS.
- Report annually AVI programs completed.
- Report number of crossings by crossing type.
- A summary of all research initiatives completed or ongoing.

TABLE 9-2: THE STEWARDSHIP REPORT

OBJECTIVE	STRATEGY	REPORT CONTENTS
4.1.1	Strategy 1	Regeneration summary of the pre-harvest declaration in hectares to certain cover types.
	Strategy 3	An age class range report that compares actual to the predicted from the preferred management strategy.
4.1.2	Strategy 1	Summary of landscape assessment of patch size and connectivity in compartments operated in.
	Strategy 2	Summary of audit findings of snag retention and coarse woody debris left in cutblocks. Also report on any initiatives taken to better understand the role and needs for snags and coarse woody debris.
4.1.3	Strategy 1	Report on any lands added into the net productive landbase.
4.1.5	Strategy 3	Summary of research and growth-and-yield results that predict values from mixedwood stands and activities undertaken over the last five years in mixedwood stands on the FMA.
4.1.6	Strategy 1	For active and recently closed operating compartments, report the amount of hectares harvested, the amount of hectares known to have other recent disturbance (land use, fire), and the gross amount of hectares in the compartment.
4.2.3	Strategy 1	Summary of the employment opportunities communicated to the community.
	Strategy 2	Summary of the activities undertaken to promote employment in the forest sector.
4.3.2	Strategy 1	Summary of any initiatives undertaken with the municipal district and/or the Department of Transportation.
4.4.1	Strategy 1	Summary of the quadrant production harvest and other tenure holders' harvest volumes.
4.5.1	Strategy 1	Summary of commercial stakeholders' concerns that were addressed.
4.5.2	Strategy 1	Progress status on issues identified in the "Rub points of a dissolved landbase" survey, and a summary of progress that has been achieved and/or where improvements are needed.

Other items for inclusion in the reports include:

- Land Use Disposition Summary.
- Any amendments to the operating plans (field modification protocols).
- Any enhanced forest management activities undertaken.

- Any inventory initiatives undertaken.
- Any other forest value activities.
- Any significant disturbance events.
- Any changes due to adaptive management.
- Any shortcomings or problems that may be beyond the FMA holders' control.
- Any warnings, penalties issued, and corrective actions taken.
- A summary of commercial and public involvement.
- An overall comparison of the progress on the goals and objectives, the performance indicators, and any adaptations that need to be re-evaluated.
- Any development and/or changes to key performance indicators.
- A summary of whether planned activities were achieved.
- A summary of all research initiatives completed or ongoing.
- Silviculture treatments over the 5-Year period.
- Compare regeneration survey results vs. DFMP regenerated yield assumptions.
- Results from Permanent Sample Plot Re-measurement
- Report deviations from OGR's for buffer zones.
- Report number of crossings by crossing type.

9.3.1 MONITORING PROGRAM RESULTS REPORT

The feedback from the monitoring program may result in changes to operating plans and activities as well as to the next DFMP. The monitoring process will:

1. Track actual activities in comparison with forecasted activities.
2. Track biological responses to management activities and compare them to forecasted responses.
3. Assist the manager in detecting and assessing impacts arising from change.
4. Trigger appropriate actions to correct or mitigate any negative impacts resulting from the change.

9.4 FUTURE DATA ANALYSIS

Some of the commitments identified by the Companies for research include:

- Heritage modeling information
- Understory inventory
- Rare, threatened and endangered species
- Ecological stewardship

- Reforestation (management by objective)
- Mixedwood management
- Managing on a dissolved landbase
- Ground rules
- Growth and yield
- Public involvement

9.5 THRESHOLDS FOR AAC RECALCULATION

Due to the relatively short time period of this DFMP, the thresholds for AAC recalculation under the Joint Forest Management Agreement will be followed.

SECTION 10:
REFERENCES AND BACKGROUND LITERATURE

Ref: H-065

10.0 REFERENCES AND BACKGROUND LITERATURE

10.1 REFERENCES

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