The Sustainable Forest Management Plan

for

Canfor, Alberta Region,

Grande Prairie Operations

July 2000

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CONTENTS

APPENDICES

FIGURES

TABLES


FMA 9900037
FIGURE 1
FMA Area
Location Map
ALBERTA
Slave River
Lake
Athabasca
Lake Claire
Peace River
FMU G8C
(Peace Block)
Grande
Prairie
Lesser Slave Lake
Lesser Slave River
FMU G2C
(Puskwaskau Block)
FMU G5C
(Main Block)
Athabasca River
N. Saskatchewan River
FMU E8C
(Main Block)
Edmonton
Red Deer River
Calgary
Bow River
Oldman River
S. Saskatchewan River
N
W
E
S
Map Projection: Universal
Transverse Mercator,
Zone 11, NAD 27,
Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
FMA Area
(649 000 Hectares)
100 0 100 200 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

1 Introduction

In July of 1999, Canadian Forest Products Ltd. (Canfor) formally announced its commitment to seek sustainable forest management certification of the Company's forestry operations under the Canadian Standards Association (CSA) Sustainable Forest Management System standard CAN/CSA-Z809-96 (CSAI 1996a). The Sustainable Forest Management Plan (SFMP) presented here, and its implementation, is intended to fulfil that commitment for Canfor's Alberta Region, Grande Prairie Operations' Forest Management Agreement area (FMA area).

1.1 CSA Requirement

As a preparatory step to certification, Canfor developed an environmental management system (EMS) for the company's woodlands operations. In December 1999 this environmental management system was certified to the ISO 14001 standard developed by the International Organization for Standardization. The Company's EMS provides a platform on which to build the sustainable forest management system required to meet the CSA standard.

Canfor's Environment Policy includes a commitment to "*create opportunities for interested parties to have input to our forest planning activities*" (Appendix 1). The CSA standard requires that sustainable forest management planning be carried out in consultation with those directly affected by or interested in forest management. Our Environment Policy commitment has been interpreted and extended to include the involvement of the public in the setting of local values, goals, indicators, and objectives for the purpose of developing a sustainable forest management plan to fulfil this standard. The Forest Management Advisory Committee (FMAC) is the body that has provided this input and the Terms of Reference for this group is included in Appendix 4. Our Environment Policy commitment has also been interpreted and extended to include the Aboriginal peoples with respect to their rights and interests. Our Forestry Principles also commit us to "…pursue business partnerships and co-operative working arrangements with aboriginal people to provide mutual social, cultural and economic benefits and to address mutual interest" (Canfor 1999a: p. 17).

For the purpose of this SFMP, Grande Prairie Operations has chosen to adopt their FMA area as the Defined Forest Area (DFA), as shown in Figure 1. Under the CSA standard, the DFA is "a specified area of forest, land, and water delineated for the purposes of registration of the Sustainable Forest Management System" (CSAI 1996a: p. 2).

It is recognized that Canfor is not the only operator with management responsibility within the FMA area. The Alberta Environment has the overall authority for approvals and ensuring that all objectives laid out in the Detailed Forest Management Plan (DFMP) are met. Guiding Principles have been, or are being, developed with Tolko Industries Ltd. and Ainsworth Lumber Company Ltd. that detail how the companies will co-operatively work together to meet the objectives as laid out in the SFMP and DFMP. Canfor will monitor the activities of other timber resource users to determine if their operations significantly impact the SFMP/DFMP objectives. Significant differences that are found will be reported to Alberta Environment and the companies involved. Canfor will co-operatively work with Alberta Environment and the other timber users to determine if remedial actions are required.

Alberta Environment has the responsibility for managing and approving the energy sector activities. The energy sector does not have forest management responsibilities on the FMA area; however, their activities do affect the forest landscape of the FMA area. Canfor has the opportunity to review all energy sector applications and give consent for withdrawal of the lands from the FMA area. The activities are monitored and the impacts upon the SFMP and DFMP objectives will be assessed during the linear update process (which includes all industrial dispositions).

1.2 Forest Ecosystem Model

The management of Canfor has established a number of documents that define our commitments. These include Canfor's Environment Policy (Appendix 1), Canfor's Mission Statement (Appendix 2), and Canfor's Forestry Principles (Appendix 3).

Canfor's Forestry Principles ("the forestry principles") is the corporate initiative that sets the direction for all Canfor operations. It establishes the direction for future strategic and operational plans. In particular, Canfor Grande Prairie Operations is using the forestry principles to help direct the development of its DFMP. The development of an SFMP to meet the requirements of the CSA standard occurs from the direction provided by the forestry principles and the DFMP. Although they are separate documents at this point, due to the sequence of planning events, they will be one document in the future.

The forestry principles outline a broad approach to the sustainability of the forests in which Canfor operates. The forest management systems, including certification standards, that result from the forestry principles will maintain the long-term health of forest ecosystems, while providing ecological, economic and social opportunities for the benefit of present and future generations.

The forestry principles serve as the basis for a forest ecosystem model that incorporates a coarse filter approach to natural variability. Forest ecosystem management addresses natural variability at a variety of levels: stand structure (e.g, snags and coarse woody material), landscape pattern/structure, and forest processes (e.g., successional pathways) across a variety of scales. In order to move toward sustainable forest management, an ecological model must identify the ecosystem framework in which the ecological, economic, and social components can operate. The forest management system uses an ecological site classification hierarchy to apply silviculture planning, growth and yield components, and to establish wildlife/habitat relationships by combining ecosite data at a variety of scales.

Successional stages of forest development are based on stand level ecosystem classification (i.e., ecosites) as well as disturbance types and severity. Thus, an ecological foundation will allow prediction of the current and future forest condition. Growth and yield, biodiversity operations, management strategies, and silviculture planning can be tied to the same spatial and temporal ecological units. In this way, a full range of silviculture procedures, stocking levels, age class proportions, and ecological components (e.g., patch size, slope, and disturbance severity) can be managed and balanced over time. In order to achieve this wide range of growth and yield to biodiversity goals, ecological units can be organized at a variety of scales, in order to identify and implement ecological relationships.

The development of ecologically based successional models will provide the framework to describe, document, and define measurable targets of forest conditions at both the stand and landscape level. While ecosite classification systems provide opportunities to identify and implement a wide range of ecological relationships, landscape structure (e.g., seral stage distributions, patch size, shape, and distribution and disturbance severity) allows the opportunity to implement ecological process at a higher scale.

With measurable ecological targets, management regimes can be defined and monitored, allowing tradeoffs among components to make efficient use of forest net downs. If measurable targets begin to diverge from the predicted outcomes, we will use adaptive management to adjust our management practices.

> "Adaptive management is a learning approach to management that incorporates the experience gained from the results of previous actions into decisions. It is a continuous process requiring constant monitoring and analysis of the results of past actions which are used to update current and planned strategies" (Canfor 1999a: p. 20).

The SFMP is a foundation for addressing Canfor's commitment to implement the forestry principles. The specific critical elements in the SFMP can be directly

linked to the forestry principles. The sustainability of these elements is measured through a series of indicators and objectives. However, the criteria and critical elements may be interchangeable. This is demonstrated by the first criteria (Conservation of Biological Diversity) and its three critical elements (CSAI 1996b: p. 9):

"Ecosystem diversity is conserved if the variety and landscape level patterns of communities and ecosystems that naturally occur on the DFA are maintained through time.

Species diversity is conserved if all native species found on the DFA prosper through time.

Genetic diversity is conserved if the variation of genes within species is maintained."

These three levels of diversity are, in fact, outcomes of dynamic ecological processes, which include the components of landscape structure. The forest ecosystem model incorporates the natural parameters of fire return internal (e.g., rotation age and seral stage distribution), fire (patch) size, residuals, shape and distribution, and severity (structure). Canfor has termed these attributes as landscape structure in the Canfor Grande Prairie Operations CSA Matrix (Appendix 6). These landscape parameters, including stand level attributes, determine the variety and landscape level patterns of communities and ecosystems, the habitat of native species and variation in genetic material. Thus, ecological processes and landscape structures are the driving elements, while scale of diversity is the indicator, of successful achievement of the forest ecosystem model.

The use of a forest ecosystem model allows correctly formulated anthropogenic disturbances to replace natural disturbance processes. Although it is important to reduce natural disturbance effects (see "Critical Element 2a, Objective 1.1a.1") to a point where harvesting can replace it, it is important that harvesting incorporate the necessary ecological components to allow the system to function as normally as possible. Thus, harvesting will incorporate a range of landscape structure attributes (e.g., patch size, frequency, shape, and variable retention), which will be evaluated using genetic, species and ecosystem indicators.

Canfor commits to the following important technical parameters of the forest ecosystem model:

1. An assessment of mixedwood management, utilizing a range of successional pathways, determined from the ecological classification system;
2. Inclusion of a broad silviculture system that could incorporate a range of practices from natural regeneration to planting. The silviculture systems form the basis for mixedwood management, variable successional pathways, and biodiversity (biological richness);
3. Identification of historic variability baselines for fire-return interval (minimum harvest age), fire patch size frequency distribution, fire residual description, snag production and turnover, coarse woody debris, etc.;
4. An evaluation of utilization levels in relation to coarse and fine woody material requirements;
5. An assessment of contributions to old growth and habitat structure that may come from buffers, caribou constraints, natural fire, and lands that are inoperable lands, non-harvested, and unproductive, variable retention, anthropogenic, and non-forested vegetated, etc.;
6. An assessment of net downs, especially buffers (approximately 40 000 ha, or 6.2% of the forested landbase), to assess their relationship to natural disturbance processes in order to determine their efficient application;
7. A biodiversity (biological richness) program, including monitoring, that is based on coarse filter principles, natural disturbance variability and landscape and species indicators; and
8. Initiation of a program that will utilize the spatially based, ecological site classification system to describe species/habitat relationships.

Additional initiatives, as listed below, will be evaluated for future incorporation into the forest ecosystem model:

- An assessment of stocking standards and free-to-grow requirements in relation to successional pathways and early successional biodiversity requirements;
- An assessment of the contribution of natural fire to variable retention management of green material as well as the contribution of snags as non-salvageable losses; and
- An assessment of cumulative effects from natural fire and oil and gas, as both a negative (volume) and a positive (snag production, early seral) component.

The performance of the SFMP will be evaluated, in part, to the extent to which the stated commitments have been attained.

We will continually strive for improvement. If the SFMP does not completely address all of the model parameters (above), adjustments will be made through the annual review process. The FMAC, as well, will be involved with the annual review process to provide feedback regarding effectiveness and continued relevancy of the plan's objectives.

2 Description of the Defined Forest Area

The FMA area (Figure 2) comprises three separate blocks of forested land with four forest management units (FMU) with a total area of 649 160 hectares: FMU G8C (Peace Block), FMU G2C (Puskwaskau Block), and FMU G5C (contained in the Main Block) and FMU E8C (contained in the Main Block). Table 1 lists the components of the timber harvesting landbase.

2.1 Other Timber Resource Users in the FMA Area

On May 26, 1964, Canadian Forest Products Ltd. (formerly North Canadian Forest Industries Ltd.) entered into a twenty-year Forest Management Agreement with the Province of Alberta that was renewed in 1978. The current Forest Management Agreement 9900037 (Canfor 1999j) commenced on May 5,1999 and expires in May of 2019, unless renewed under the provisions contained in the agreement. Canfor has been granted the rights to manage, grow, harvest, and reforest coniferous timber and to maintain and/or increase the coniferous annual allowable cut, within a 649 160 hectare FMA area. The approved Annual Allowable Cut (AAC) in the 1991 Detailed Forest Management Plan (DFMP) is 730 000 m^3 per year. The amount of timber harvested in 1999 from the FMA area was 526 377 m^3.

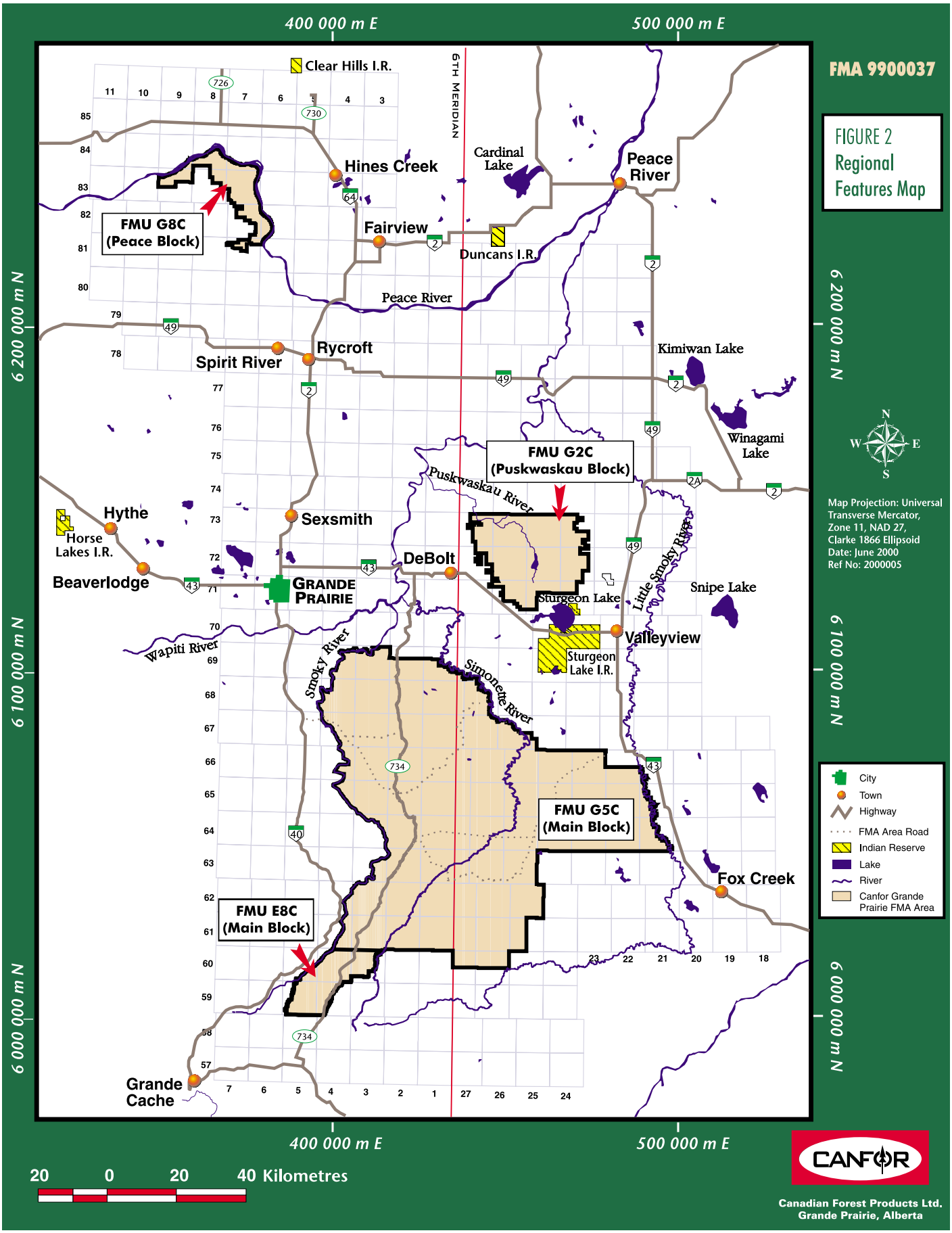
Three other forest companies (Tolko Industries Ltd., Ainsworth Lumber Company Ltd. and Grande Alberta Paper Ltd.) have been allocated rights to deciduous timber within the FMA area.

Tolko Industries Ltd. (Tolko) has been issued deciduous timber allocation certificates in FMU G2C and FMU G5C as part of the timber supply for their OSB Mill located near High Prairie. They have exclusive rights to the deciduous timber in FMU G2C, with an annual allowable cut of 60 500 m^3 per year (DTAG2C001, in force between May 1, 1997 and April 30, 2017), and an annual allowable cut of 54 212 m^3 per year in FMU G5C (DTAG50001, in force between May 1, 1996 to April 30, 2016). Tolko representatives act in an advisory capacity to the Forest Management Advisory Committee (FMAC) and provide technical input regarding strategic and operational plans, growth and yield projections, and operational and harvest sequence plans for the DFMP.

Ainsworth Lumber Company Ltd. (ALC) has recently been awarded rights to 170 000 m^3 per year of deciduous timber within FMU G5C as a result of the North-Central Re-allocation Program process, initiated by the Alberta Government in February 1999. Ainsworth is an advisory member of FMAC. As a new stakeholder within the FMA area, their representatives have met with Canfor several times to discuss their role and requirements in development of Canfor's DFMP.

In 1996, Grande Alberta Paper Ltd. (GAP) reached an agreement in principle with the Province of Alberta to build a single-line lightweight paper mill near Grande Prairie. In accordance with environmental regulations, GAP must complete a comprehensive Environmental Impact Assessment and undergo a Natural Resource Conservation Board review before final approval. The Crown has made provision for GAP's timber requirements by planning for a deciduous allocation of 169 000 m^3 per year within FMU G5C. Final approval of the GAP project has not been announced to date. GAP has not played a role in development of Canfor's Detailed Forest Management Plan to the present time. However, if their proposal is successful, Canfor will extend an invitation to GAP to become involved in the planning process.

The primary regulatory environment under which Canfor Grande Prairie Operations conducts its forest operations is the Forest Management Agreement 9900037. The DFMP defines activities in a specific geographic area and time period and provides detailed justification and environmental planning to support the allowable annual cut from the area defined in the Forest Management Agreement 9900037. Canfor voluntarily formed the Forest Ecosystem Management Task Force to assist in the development of an ecologically responsible DFMP. The task force, comprising scientists, academics, and government representatives, functions as an independent check on aspects of forest management planning. This task force developed a vision statement for their efforts,


400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 2
Regional
Features Map
6TH MERIDIAN
Clear Hills I.R.
Hines Creek
Cardinal Lake
Peace River
FMU G8C
(Peace Block)
Fairview
Duncans I.R.
Peace River
Rycroft
Spirit River
Kimiwan Lake
Winagami Lake
FMU G2C
(Puskwaskau Block)
Puskwaskau River
Hythe
Horse Lakes I.R.
Sexsmith
Beaverlodge
GRANDE PRAIRIE
DeBolt
Sturgeon Lake
Little Smoky River
Snipe Lake
Valleyview
Sturgeon Lake I.R.
Wapiti River
Smoky River
Simonette River
FMU G5C
(Main Block)
Fox Creek
FMU E8C
(Main Block)
Grande Cache
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
City
Town
Highway
FMA Area Road
Indian Reserve
Lake
River
Canfor Grande Prairie FMA Area
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

since adopted by Canfor Grande Prairie Operations: "To provide a forest management plan framework for crown lands under Canfor's tenure in Alberta, that maintains the ecological integrity and biological diversity of forests and is socially acceptable and economically viable" (Canfor 1997: p. 2).

TABLE 1
Landbase Components of the FMA Area

Classification	Area (ha)	Area (ha)	% of Total Area	% of Forested Area
Total landbase		**649 160**	**100.0**	
Reductions for non-forest				
♦ natural, non-vegetated	12 959.92		2.00	
♦ anthropogenic, non-vegetated	4 939.38		0.76	
♦ anthropogenic, vegetated	4 946.45		0.76	
♦ non-forested, vegetated	32 884.38		5.05	
♦ AVI attribute MODCON1 = "cl"	0.68		0.00	
♦ Roads not included in AVI	1 132.93		0.17	
♦ Total non-forest reductions	56 863.74	56.863.74	8.76	
Total forested landbase		**592 296.24**	**91.24**	**100.00**
Reductions to forested landbase				
♦ steep slopes (from AVI)	10 522.06		1.62	1.78
♦ slumps (from AVI)	42.51		0.01	0.01
♦ gravesites	5.15		0.00	0.00
♦ DRS	320.47		0.05	0.05
♦ Fourth Creek special area of interest	303.82		0.05	0.05
♦ Cactus Creek special area of interest	8.00		0.00	0.00
♦ Peace River Dunvegan special area of interest	374.33		0.06	0.06
♦ Sand Dunes special area of interest	5 480.31		0.84	0.92
♦ swan buffers	2 247.53		0.35	0.38
♦ Lake >16-ha buffers	248.41		0.04	0.04
♦ Lake 4–16-ha buffers	506.87		0.08	0.09
♦ major river buffers	4 694.36		0.72	0.79
♦ perennial river buffers	1 202.23		0.18	0.20
♦ intermittent river buffers	31 061.26		4.78	5.24
♦ unproductive (Yield Group 13)*	25 816.15		3.98	4.36
♦ river buffers (Beaver)	3.79		0.00	0.00
♦ AVI Attribute MODCON2 = "sc"	0.18		0.00	0.00
♦ Total reductions to forested landbase	82 838.43	82 838.43	12.76	13.99
Timber harvesting landbase		**509 459.83**	**78.47**	**86.0**

Source: based on Canfor 2000

3 Forest Management Planning and Operational Activities

3.1 Relationship between the SFMP and the DFMP

The relationship between the DFMP and the SFMP is strong. In particular, many of the quantitative objectives that comprise the SFMP shall be derived from the DFMP:

- Detailed discussions about the interplay of technical and social parameters;
- Technical calculations and justification for the proposed annual allowable cut; and
- Community input about larger social issues of forest management.

The DFMP is a flexible, "living" document that allows for change. In the context of adaptive management, the DFMP will be revised, as additional information becomes available through a process of scientific evaluation, monitoring, assessment, and feedback. The SFMP also will be revised, as required. There will be an annual review (surveillance audits) by a third party of Canfor's SFM System documentation. The initial certification will remain in effect for three years, with subsequent audits performed every five years. These audits will include field inspections to measure performance and ensure that the system is producing the intended results for the DFA. The FMAC, as well, will be involved with the annual review of the SFMP with the purpose of providing feedback regarding its effectiveness.

The DFMP is scheduled for submission for approval by the Minister no later than April 30, 2001 as per Forest Management Agreement 9900037. This means that some of the detailed quantitative objectives for the SFMP must wait until the DFMP is approved. There is an important legal reason for this. The SFMP cannot contain statements or commitments that are in conflict with the DFMP. The detailed discussion of the SFM performance framework in Section 5 will occasionally refer to the DFMP for some quantitative details.

The SFMP will be an important component of the DFMP. Both documents will guide the strategic and operational decisions made by the Company. Harvest operations and planning adhere to the DFMP and are conducted in accordance to the local ground rules. An Annual Operating Plan (AOP)/5-year General Development Plan (GDP) is submitted to Alberta Environment for approval May of each year.

3.2 Forest Management Activities

Canfor conducts a variety of activities to manage, grow, harvest, reforest and stand-tend coniferous timber on the FMA area.

Planning

Planning has both a strategic and operational component. The strategic level is discussed in Section 2 and Section 5. Operational planning involves a more detailed look at the specific areas that will be harvested. Areas are assessed through aerial photos, aerial and/or ground reconnaissance, timber cruising, and/or ecological site classification. The Annual Operating Plan contains the details regarding operational planning activities.

Many activities are being implemented operationally, to various degrees, to provide a transition from the old to the new plans:

- The current harvest level has been reduced to reflect the anticipated cut levels for the new DFMP;
- The new AOP did not propose any new harvest areas, in order to reduce the pre-planning horizon; and
- Harvest plans incorporated some of the AAC constraints such as cut block sizes and configuration in the Caribou Area.

Harvesting

The Annual Operating Plan 2000 - 2005 (Canfor 2000i) describes the harvesting systems used on the FMA area. A brief discussion follows.

The current cutting system is species type clearcutting in patches, normally in two passes, where the second cut is approximately equal to the first in area, volume, operability and quality. This does not preclude the modification of the basic cutting system to accommodate specific timber management concerns (i.e., variable patch retention). Approximately 50 percent of the merchantable volume covering approximately 50 percent of the merchantable area may be harvested in the first cut (unless approved otherwise). The balance is taken in the second cut.

Second cuts may be harvested, after 20 years, when regeneration on the first cut attains a height of 2 meters. At the time of removal, any stands that have become merchantable since the first cut will be addressed operationally by including them in the cut – leave pattern. This procedure will continue with each subsequent pass.

The harvesting method employed on all sites is conventional ground based (wheel skid to roadside), with logs being processed as either tree length or cut-to-length.

Silviculture

As discussed in the Silviculture AOP (Canfor 2000j), Canfor uses a variety of silviculture techniques to treat, regenerate, and tend harvested areas.

Reforestation treatments are based upon preharvest silviculture prescriptions that are based on ecological site classification data. There are a variety of different treatments used to prepare the site for seedling establishment: ripper plow, disc trenching, mounding, drag scarification, mulching, pile and burn, and raw plant. All harvested sites are reforested. The majority of the sites are planted after treatment; however, a minor amount of area is aerial seeded.

Once the stands are established, stand tending treatments for controlling competition are applied to maintain growth. A variety of vegetation management tools, as discussed in the Vegetation Management Plan and Herbicide Use Proposal (Canfor 2000g), are utilized for stand tending including brushsaw and a variety of herbicide application methods. Although there are a number of tools available, the majority of sites are treated with brushsaw.

Monitoring

Canfor has implemented an Environmental Management System (EMS). An EMS provides the framework to describe our activities (policies, plans and objectives), to conduct our activities as planned, and to monitor those activities to ensure compliance to stated plans and objectives. Monitoring involves validation of observed results against model forecasts (leading to corrective measures and continual improvement), ensuring that we meet performance standards (in relation to projected yields), and determining conformance of activities and prescriptions with stated objectives (inspections and surveys).

4 Public Participation

An essential element to the success of sustainable forestry management is the inclusion of systematic and formal public input into the management of the forested landbase in the defined forest area. According to the CSAI (1996b: p. xiii): "the registration of an SFM System applied to the DFA will follow a successful independent third-party registration audit, which will assess that an SFM System including quantified objectives for meeting sustainable forest management criteria has been established through a process of public participation…"

Public participation processes are characterized by accommodating (CSA 1996b: p. 15) "the public's varied knowledge of sustainable forest management, its different interests, levels of involvement, and differing cultural and economic ties with the forest."

The purpose of the CSA standard is to describe the components and performance objectives of a sustainable forest management system. When applied to a specific DFA, this system will ensure that management objectives are set for the 21 critical elements of the 6 CCFM criteria for sustainable forest management. Through a process of public participation, the CSA performance framework attains a local relevance in the form of locally determined values, goals, indicators, and objectives being developed for the 21 critical elements.

4.1 The Forest Management Advisory Committee (FMAC) and Canfor

Canfor has adopted public participation as an essential element in its forest management strategy. The development of a new DFMP for the FMA area commenced in 1995. The first step taken was to form the Forest Management Advisory Committee (FMAC), comprised of local stakeholder groups who are directly affected by or have an interest in the management of the forest resources. The Committee, which first met in September, 1995 has been providing valuable input into the development of the DFMP by reviewing various documents and identifying issues of concern. These issues and concerns have been documented in an "issues list" for consideration into the DFMP.

Canfor decided in July, 1999 to actively pursue CSA certification. On October 13, 1999, the FMAC was approached and requested to consider acting also as the public consultation committee for the development of values, goals, indicators and objectives of the CSA criteria and critical elements for the SFMP. At the December 1, 1999 meeting, the Committee agreed (via consensus) to take on the CSA process. At the January 19, 2000 meeting, work began on a Terms of Reference for the committee. On February 23, 2000, the FMAC gave final approval to the Terms of Reference (Appendix 4). The Terms of Reference clearly state the goals, operating rules, methodology of making decisions, and dispute resolution mechanisms by which the Committee is able to provide input to Canfor on an objective and fair basis. When the mandate of the FMAC was expanded to include CSA certification, additional organizations were invited to participate. The members of the FMAC, as of March 4, 2000, are listed in Appendix 5 (together with a more detailed history of the FMAC meetings).

4.2 The FMAC's Role in Certification

The primary task of the FMAC was to provide local values, goals, indicators and objectives (as per the definitions below) to Canfor for the criteria and critical elements as defined in CSA (1996b: p. 9):

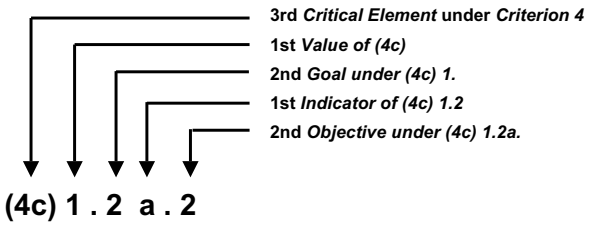
- "Values: principles, standards, or qualities considered worthwhile or desirable;
- Goals: broad, general statements that describe a desired state or condition related to one or more forest values;
- Indicators: measurable variables used to report progress toward the achievement of a goal; and

- Objectives: clear, specific statements of expected quantifiable results to be achieved within a defined period of time related to one or more goals; an objective is commonly stated as a desired level of an indicator."

Appendix 6 contains the CSA Matrix that was developed by the FMAC during five meetings between January, 2000 and March, 2000. The content of the CSA Matrix was the creative result of the FMAC members working together to arrive at a consensus. Canfor provided the rewording and rephrasing of the technical content, with the approval of the FMAC. Final approval of the content of the CSA Matrix was received on April 12, 2000. Section 5 of this document lists and discusses in detail the contents of the matrix.

5 CSA Performance Framework

We have adopted a numbering system for the subheadings in this part of the SFMP that is different from the earlier sections. This has been done in order to assist the reader in being able to directly tie the detailed discussion found here to the CSA Matrix in Appendix 6. The text under each of Criterion, Critical Element, Value, Goal, Indicator, and Objective have been given a unique alphanumeric identifier as follows (choosing one of the more complex examples):



In this section, we refer to the text that this code points to as "Critical Element (4c), Objective 1.2a.2." In total, there are 6 Criteria, 21 Critical Elements, 25 Values, 39 Goals, 76 Indicators, and 89 Objectives. However, some of these components are duplicated, for example:

- "Critical Element (4b), Value 1" and "Critical Element (5a), Value 1";
- "Critical Element (1a), Indicator 1.2a" and "Critical Element (1b), Indicator 1.2a"; and
- "Critical Element (1a), Objective 1.1a.1" and "Critical Element (3a), Objective 2.1a.1".

This duplication results from the inherently integrated nature of ecosystem functioning and forest condition.

The text for the Criteria and Critical Elements was taken as given from the CSA standards. The FMAC, by consensus, decided upon the content for all values and goals. Canfor and its consultants then worked on the technical wording required for the indicators and objectives, which were subsequently approved by the FMAC.

1. Criterion

Conservation of Biological Diversity

Biological diversity is conserved by maintaining the variability of living organisms and the complexes of which they are part.

(1a) Critical Element

Ecosystem Diversity

Ecosystem diversity is conserved if the variety and landscape-level patterns of communities and ecosystems that naturally occur on the DFA (Defined Forest Area) are maintained through time.

(1a) 1. Value

Landscape level ecosystem diversity

(1a) 1.1 Goal

Provide support to areas of rare physical environments

The desired condition or management strategy is to provide a degree of protection by not harvesting fibre in areas that are officially classified as rare physical environments.

(1a) 1.1a Indicator

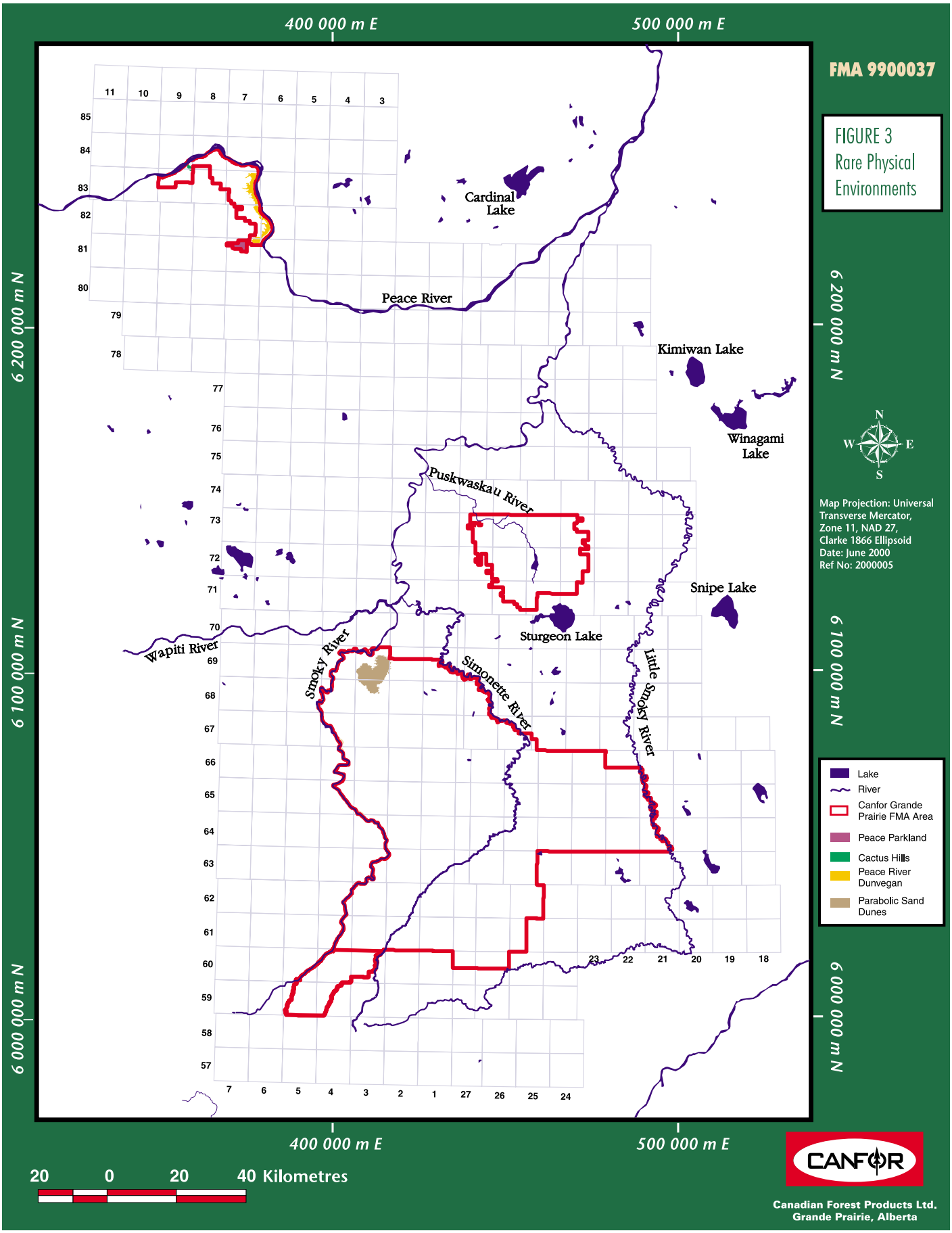
The amount of area of lands excluded from harvest, in the DFMP

The areas protected from harvest (Figure 3) are the Parabolic Sand Dunes (contained in the Main Block) and Cactus Hills, Peace Parkland, and Peace River Dunvegan (contained in the Peace Block). These areas, also referred to as rare physical environments, have been excluded from the landbase in the net down process before the calculation of annual allowable cut (AAC) for the DFMP (Table 1).

(1a) 1.1a.1 Objective

One hundred percent (100%) of identified and validated rare physical environments will not be harvested

- **Acceptable variance**
  The acceptable level of variance is zero because 100% of the identified and validated rare physical environments will not be harvested.
- **Current status**
  The areas that have been identified as rare physical environments were not included in the calculation of AAC and will not be harvested.
- **Forecasting assumptions and analytical methods**
  These rare physical environments, although not harvested, contribute to other ecological values on the landbase (e.g., seral stages).
- **Forest management activities**
  There are no harvesting activities for these rare physical environments. There are Permanent Sample Plots (PSP) located in some of the rare physical environments. These plots will continue to be measured in the future.
- **Implementation schedule**
  Maintain current status.


400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 3
Rare Physical Environments
Cardinal Lake
Peace River
Kimiwan Lake
Winagami Lake
Puskwaskau River
Snipe Lake
Sturgeon Lake
Wapiti River
Smoky River
Simonette River
Little Smoky River
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
Lake
River
Canfor Grande Prairie FMA Area
Peace Parkland
Cactus Hills
Peace River Dunvegan
Parabolic Sand Dunes
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

- **Monitoring procedure**
  Ensure no harvesting occurs in these rare physical environments. These areas will be evaluated in the future as to their importance to the ecological attributes of the FMA area. New rare physical environments will be reviewed and considered in the future. The impact of any changes in the rare physical environments will be evaluated.
- **Linkages between strategic and operational plans**
  Harvest restrictions for the rare physical environments will be identified in the DFMP and incorporated into the operational plans.

(1a) 1.1b. Indicator

Cactus Hills (84-9-W6M) and Peace Parkland (81-7-W6M)

The Cactus Hills and Peace Parkland will be nominated as special places under the Alberta Special Places Program. The Special Places Program aims to complete a network of protected areas to preserve the environmental diversity of the province's six natural regions and twenty subregions. The program balances the preservation of Alberta's natural heritage with three other cornerstone goals: heritage appreciation, outdoor recreation, and tourism/economic development.

(1a) 1.1b.1 Objective

Nominate Cactus Hills and Peace Parkland areas as candidate sites for the Alberta Special Places Program

- **Acceptable variance**
  These areas have already been nominated.
- **Current status**
  The Cactus Hills and Peace Parkland areas have been nominated under the Alberta Special Places Program. A local committee has been formed to review all nominated sites in the area. Results are pending.
- **Forecasting assumptions and analytical methods**
  These areas will be maintained as no harvest areas.
- **Forest management activities**
  There are no harvesting activities for these nominated sites.
- **Implementation schedule**
  Pending results from the local committee.
- **Monitoring procedure**
  Supply information as needed and monitor progress of local committee and keep current as to status of nominated sites.
- **Linkages between strategic and operational plans**
  If the sites receive designation under the Alberta Special Places Program, the final boundaries will be incorporated into the future planning process.

(1a) 1.2 Goal

Maintain range of seral stages

Ensure that each seral stage is represented on the landscape at key points in time.

(1a) 1.2a. Indicator

The amount of area in old seral stage at present and key points in time

For the purposes of this document, the term old growth has been replaced with old seral stage to be consistent with the DFMP seral stage terminology. The characteristics of older forests provide important habitat for a number of species. Old seral stage is defined by the age of the stand at breast height for different yield groups (Canfor 2000). The breast height age ranges used to define seral stages are presented in Table 2.

TABLE 2
Breast Height Age Ranges for Seral Stages

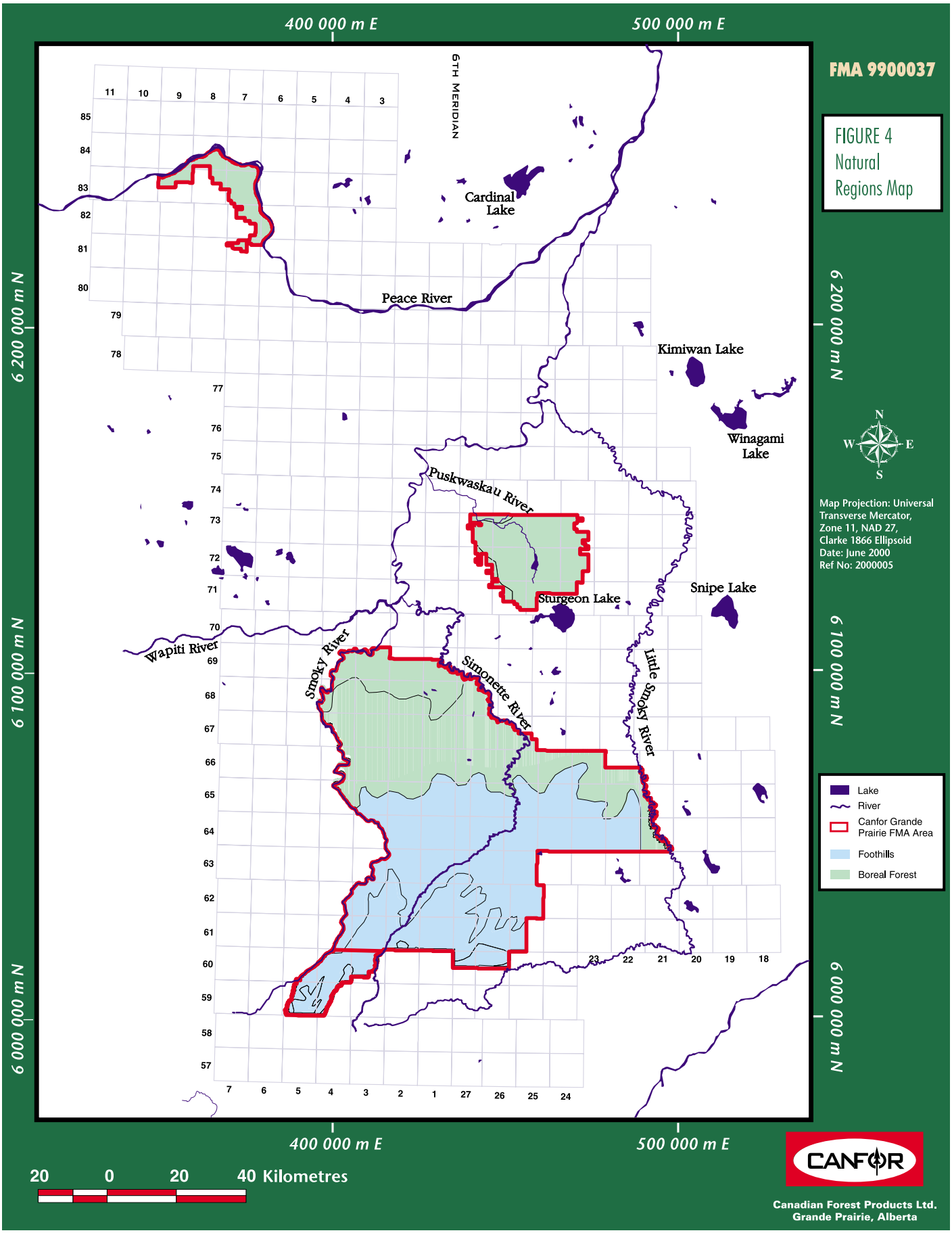
Yield Group	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	Species	Years to BH
1	0	1–20	21–70	71–110	110+	AW	6
2	0	1–20	21–70	71–110	110+	AW	6
3	0	1–40	41–80	81–120	120+	SW	15
4	0	1–20	21–70	71–110	110+	BW	6
5	0	1–40	41–100	101–120	120+	FB	15
6	0	1–40	41–80	81–120	120+	SW	15
7	0	1–20	21–80	81–110	110+	PB	6
8	0	1–40	41–80	81–120	120+	PL	10
9	0	1–30	31–70	71–120	120+	PL	10
10	0	1–40	41–90	91–120	120+	PL	10
11	0	1–40	41–90	91–120	120+	PL	10
12	0	1–50	51–130	131–150	150+	SB	20
13	0	1–50	51–140	141–160	160+	SB	20
14	0	1–40	41–100	101–130	130+	SB	20
15	0	1–40	41–90	91–120	120+	SW	15
16	0	1–40	41–90	91–120	120+	SW	15
17	0	1–40	41–90	91–120	120+	SW	15

Note: Ages are breast height age
Source: Canfor 2000

(1a) 1.2a.1 Objective

Maintain old seral stages within the natural disturbance regimes at present and key points in time

The target (natural) seral stage distribution is one that approximates the expected distribution created by natural disturbance regimes within the two natural regions, Foothills and Boreal Forest (Figure 4). The natural disturbance regime has been modeled by using a theoretical fire-return interval.



FMA 9900037

FIGURE 4
Natural Regions Map

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Canadian Forest Products Ltd.
Grande Prairie, Alberta

- **Acceptable variance**

  The acceptable variance is to not fall below the range of the natural disturbance regimes for the old seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) as indicated in Figures 5-8, respectively. The acceptable variance represents a combination of both natural regions where they occur.

  Figures 9 and 10, Foothills and Boreal Forest natural regions, are provided only as supplementary information.

  The range of natural disturbance is represented by the "red" line in Figures 5-10, whereas the "yellow" bar represents the current or projected distributions.

- **Current status**

  Currently, the old seral stage is within 1-3% of achieving the acceptable variance in 3 of the 4 area summaries (location) as indicated in Table 3. The observed differences are caused primarily by anthropogenic disturbances. Figures 5-8 demonstrate that the acceptable variance is achieved in all locations in the future.

TABLE 3
Percent of Current Forested Landbase in Old Seral Stage

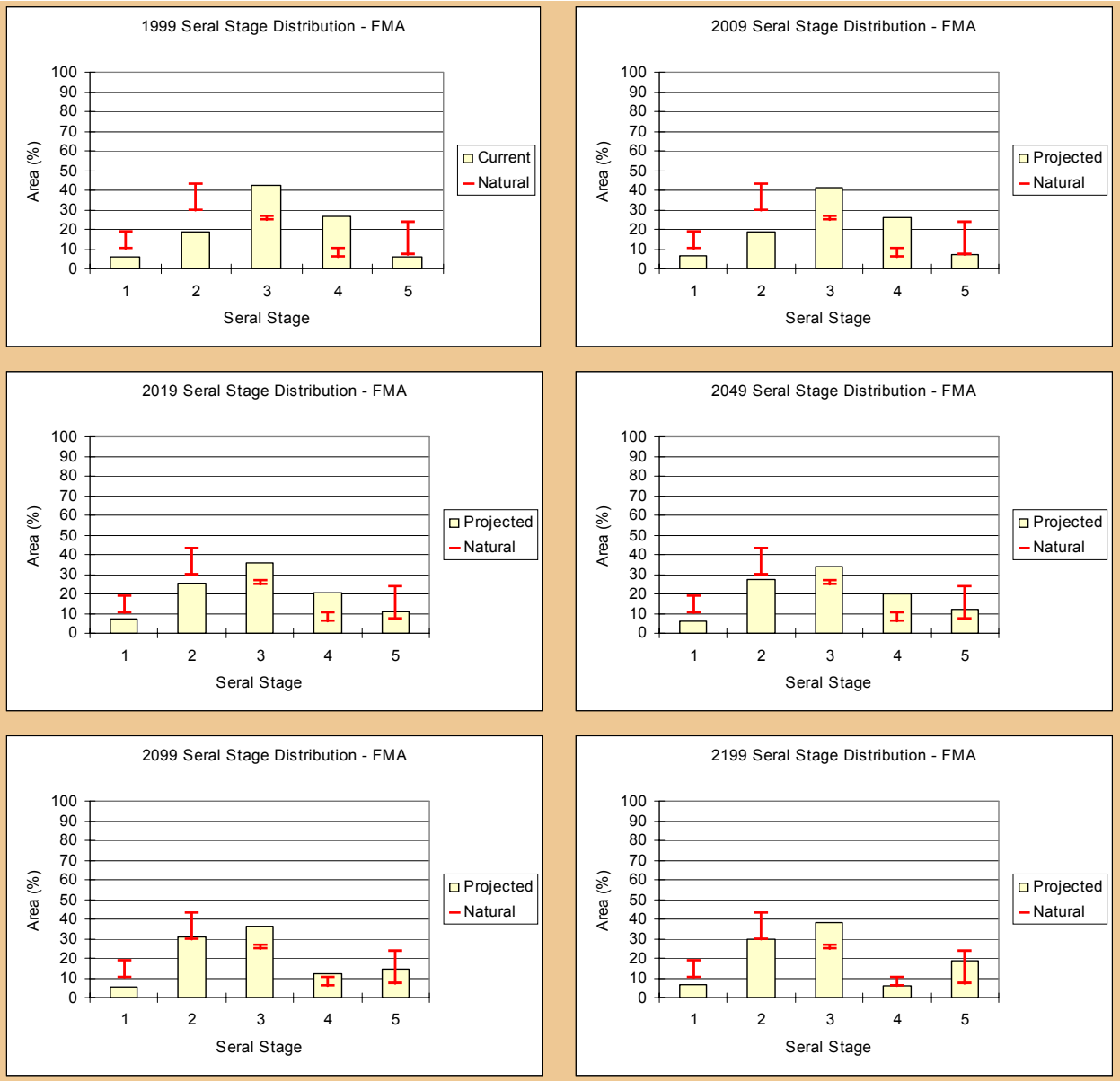
Location	Area in Old Seral Stage	Total Forested Area	% of Area in Old Seral Stage	% Natural Disturbance Range
FMA	35 151	592 296	5.9	7.0–23.4
FMU G8C	391	25 936	1.5	3.8–21.4
FMU G2C	5 179	63 667	8.1	3.8–21.4
FMU G5C E8C	29 581	502 693	5.9	7.6–23.7

Source: ORM compiled data

Tables 4-9 represent the area of seral stages by year for the FMA, FMUs (G8C, G2C, and G5C E8C) and the natural regions (Foothills and Boreal Forest).

- **Forecasting assumptions and analytical methods**

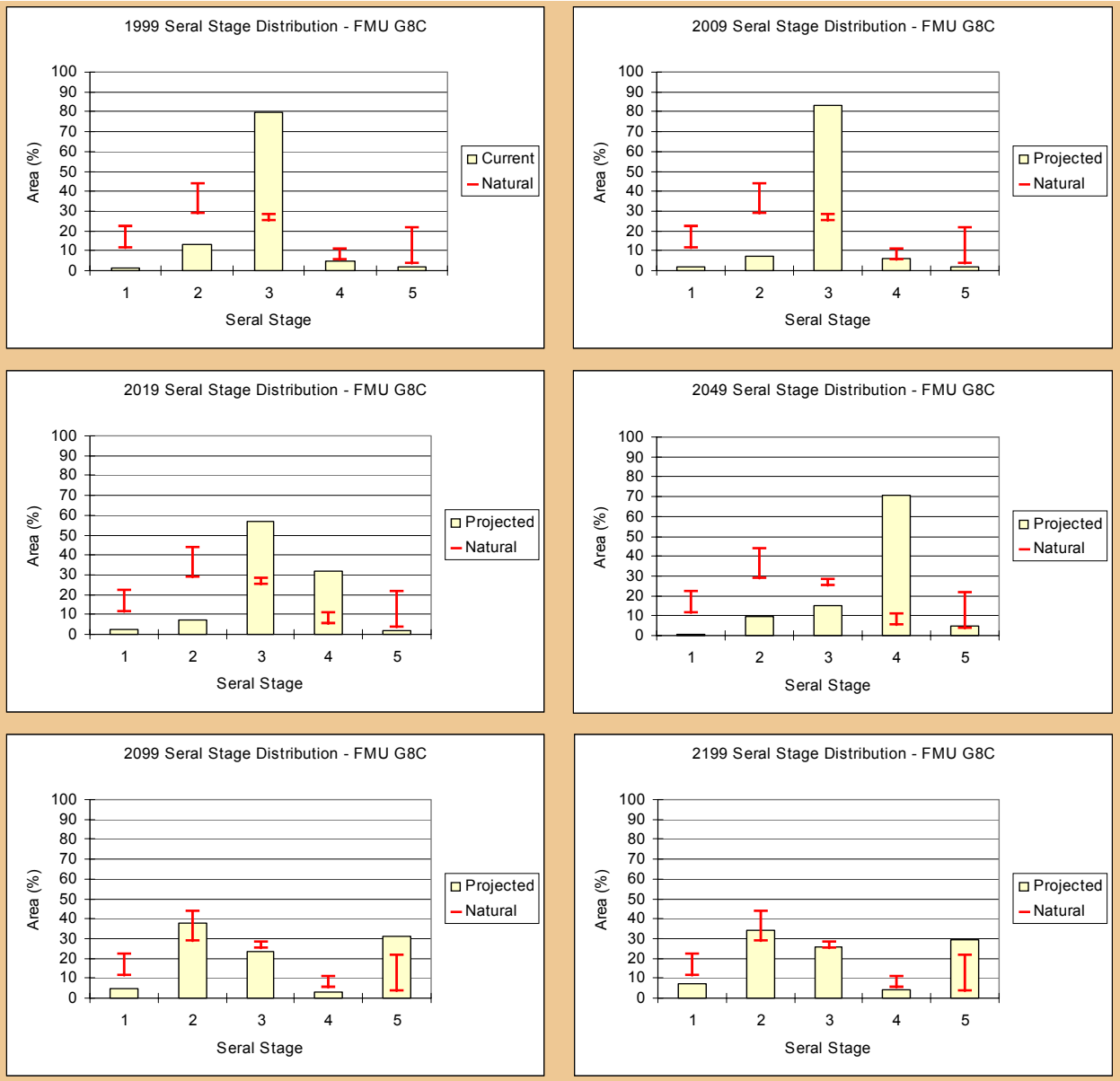
  Seral stage distributions under a natural fire regime were modeled by using a theoretical fire-return interval (Olympic Resource Management 2000). The amount of old seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) has been forecasted on the landbase at each key point in time (Figures 5-8). The key points in time are at years 0, 10, 20, 50, 100, and 200, where 1999 represents year 0. It is assumed that these time periods provide a reasonable picture of the variability of old seral stage over time. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

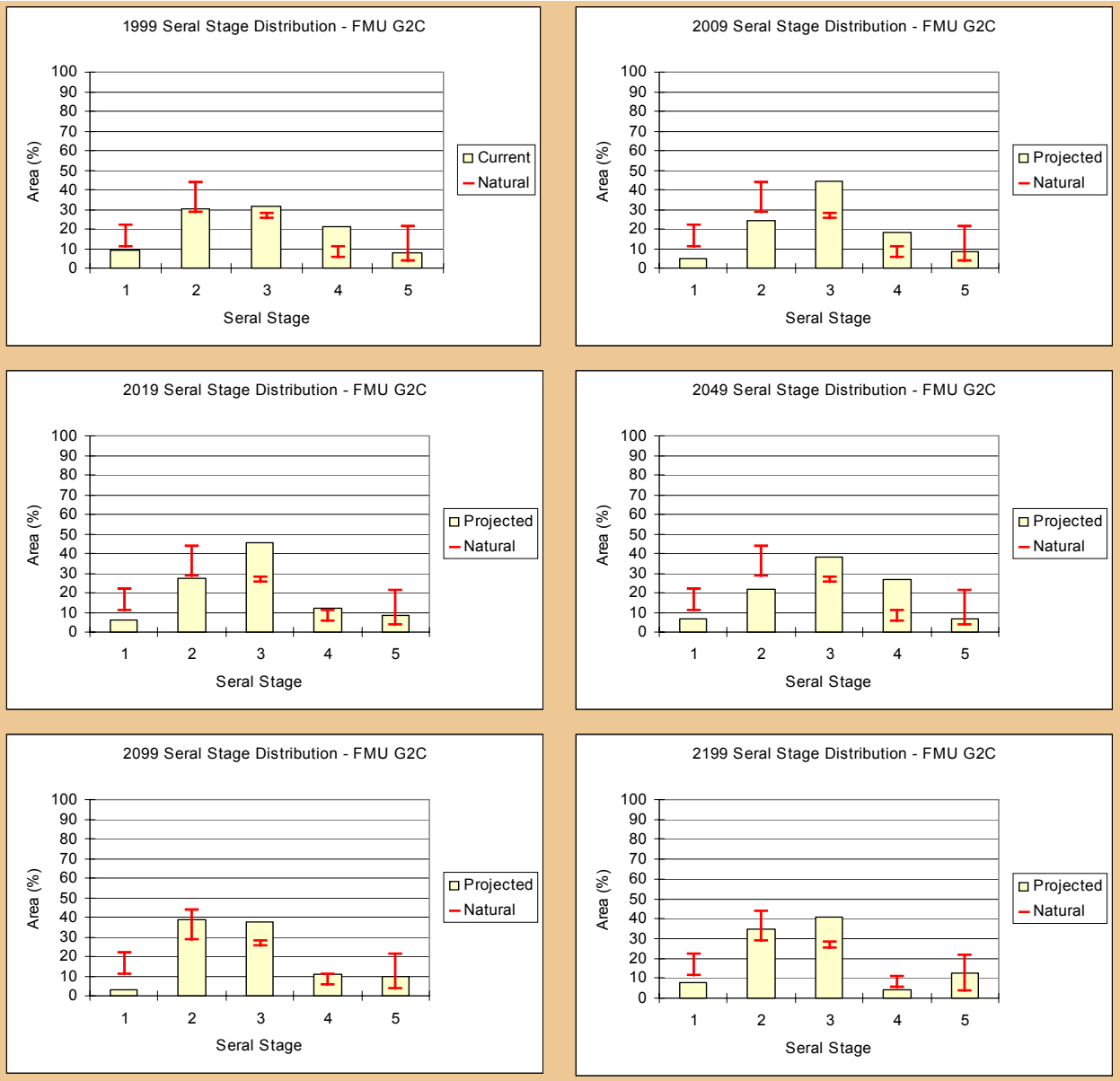
FIGURE 5
Seral Stage Distribution for the FMA



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

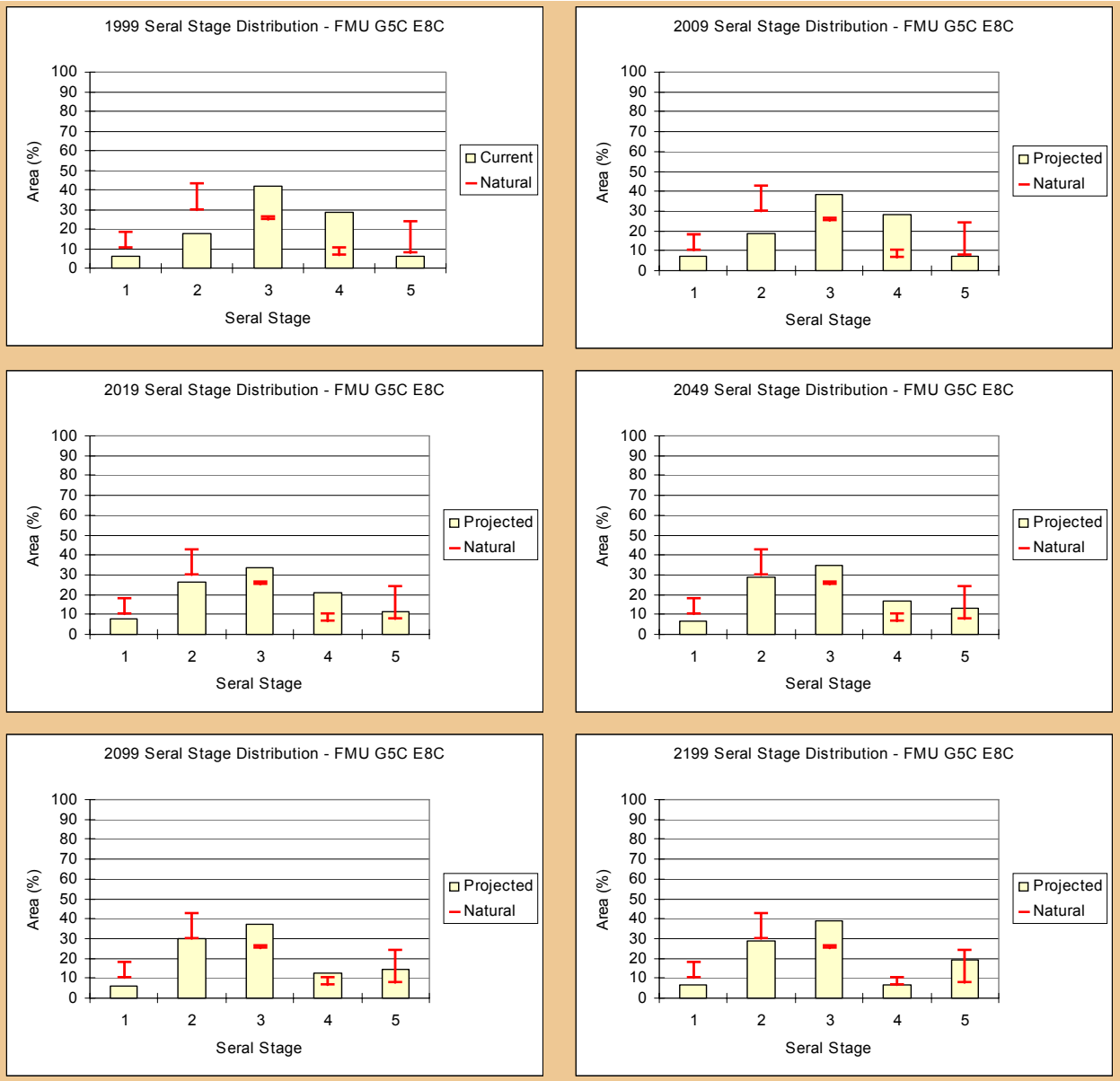
FIGURE 6
Seral Stage Distribution for FMU G8C



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

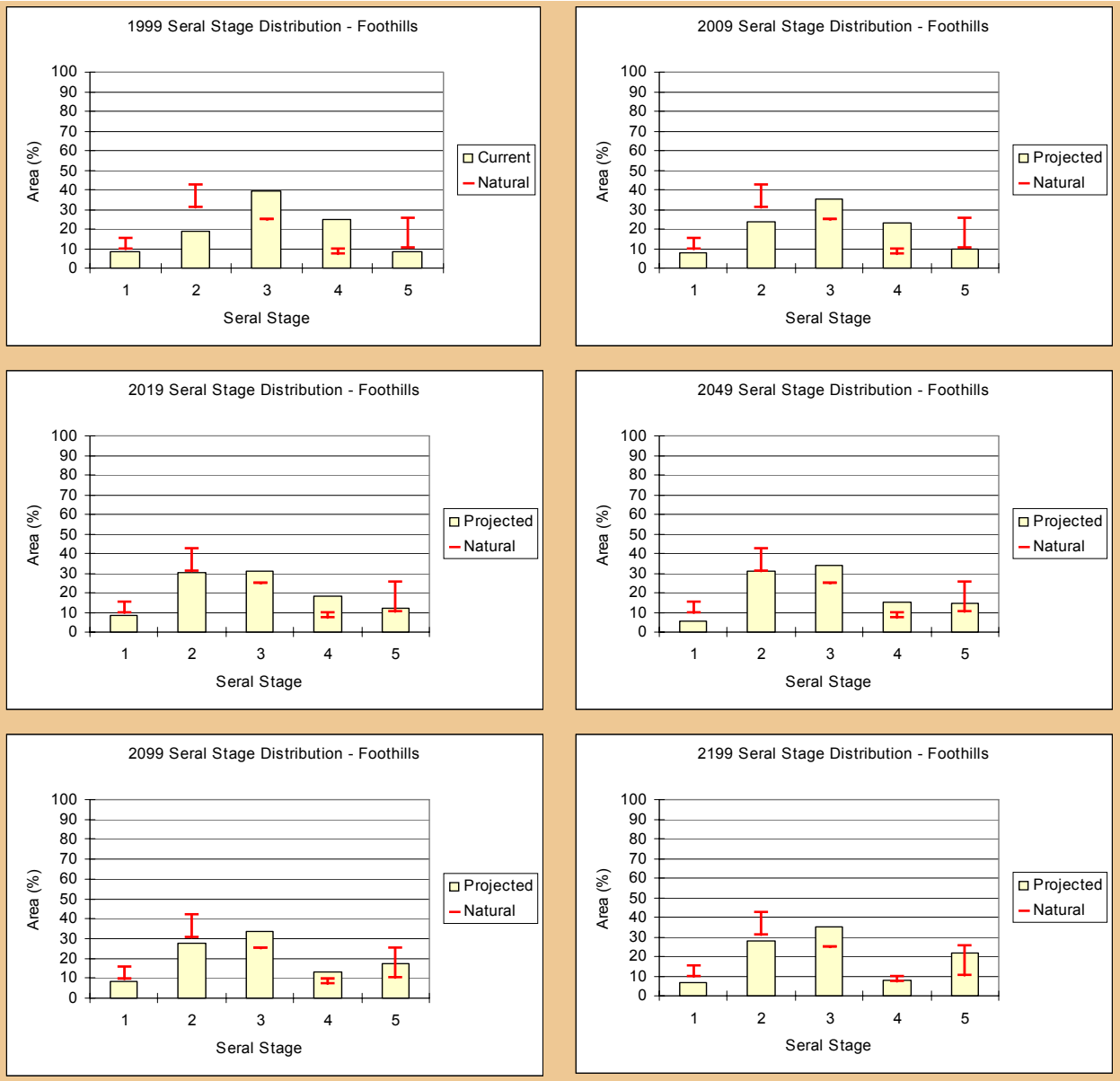
FIGURE 7
Seral Stage Distribution for FMU G2C



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

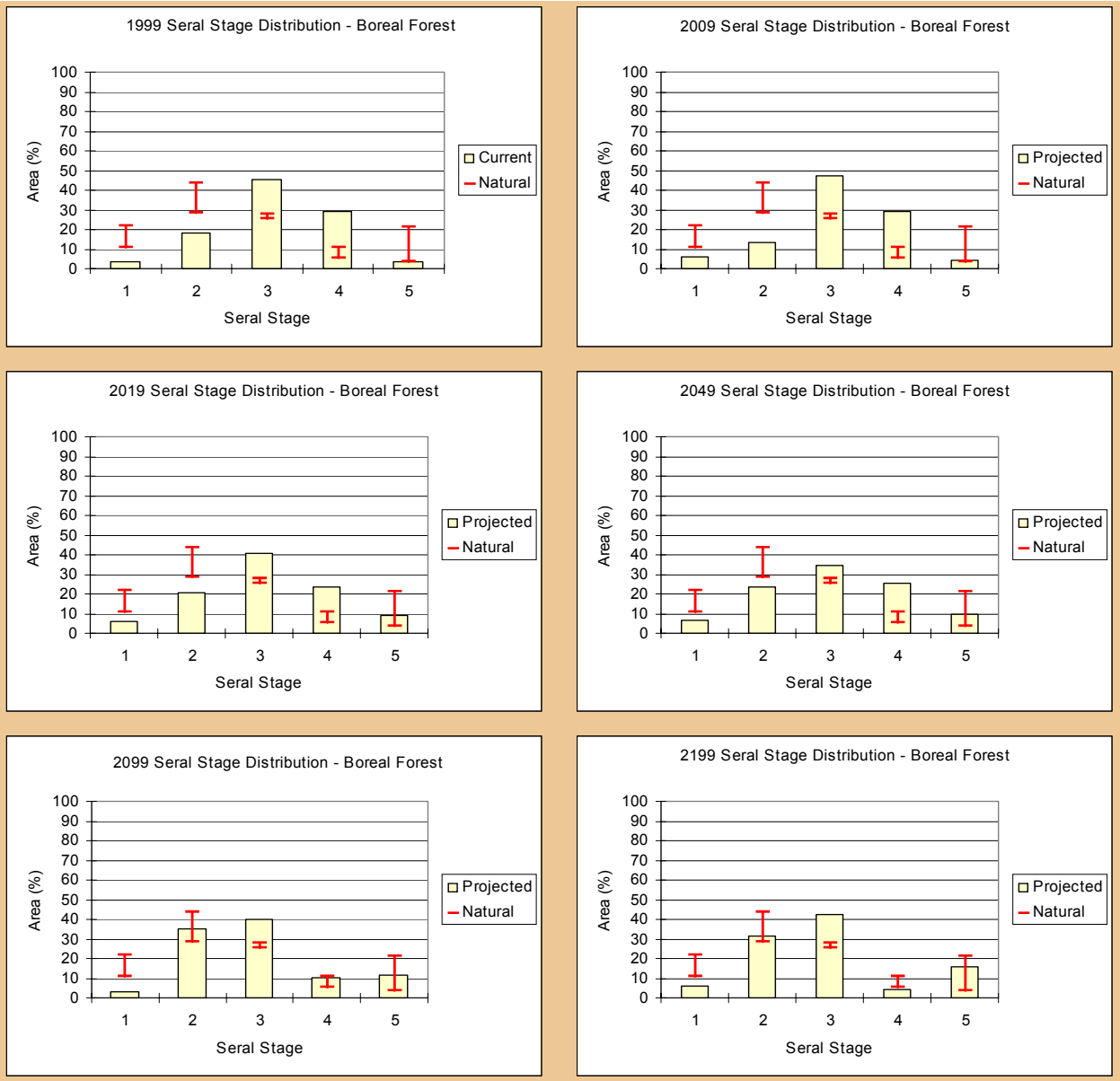
FIGURE 8
Seral Stage Distribution for FMU G5C E8C



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

FIGURE 9
Seral Stage Distribution for the Foothills Natural Region



Source: ORM compiled data

LEGEND: 1 – pioneer
2 – young
3 – mature
4 – over mature
5 – old

FIGURE 10
Seral Stage Distribution for the Boreal Forest Natural Region

TABLE 4
Seral Stage Distribution for the FMA Total

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	36 929	110 476	250 761	158 979	35 151	592 296
2009	41 026	111 712	242 782	153 461	43 316	592 296
2019	43 337	150 668	211 468	122 544	64 280	592 296
2049	36 717	162 161	201 272	118 894	73 252	592 296
2099	33 528	184 815	216 473	70 014	87 466	592 296
2199	39 214	176 428	227 489	36 835	112 329	592 296

Source: ORM compiled data

TABLE 5
Seral Stage Distribution for the FMU G8C

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	243	3 489	20 579	1 234	391	25 936
2009	479	1 937	21 567	1 482	472	25 936
2019	613	1 808	14 723	8 287	505	25 936
2049	161	2 418	3 823	18 297	1 237	25 936
2099	1 273	9 817	5 980	766	8 099	25 936
2199	1 796	8 812	6 721	1 071	7 534	25 936

Source: ORM compiled data

TABLE 6
Seral Stage Distribution for the FMU G2C

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	5 611	19 289	20 082	13 506	5 179	63 667
2009	3 241	15 331	28 274	11 410	5 411	63 667
2019	3 902	17 262	29 073	7 837	5 593	63 667
2049	4 275	13 881	24 127	17 022	4 363	63 667
2099	1 782	24 837	23 788	6 930	6 330	63 667
2199	4 884	22 128	25 891	2 682	8 083	63 667

Source: ORM compiled data

TABLE 7
Seral Stage Distribution for the FMU G5C E8C

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	31 076	87 697	210 099	144 240	29 581	502 693
2009	37 306	94 445	192 941	140 569	37 433	502 693
2019	38 821	131 598	167 672	106 420	58 182	502 693
2049	32 281	145 863	173 322	83 575	67 652	502 693
2099	30 473	150 161	186 704	62 318	73 037	502 693
2199	32 533	145 488	194 877	33 082	96 712	502 693

Source: ORM compiled data

TABLE 8
Seral Stage Distribution for the Foothills Natural Region

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	26 156	58 518	121 529	77 517	25 608	309 329
2009	24 194	74 005	108 684	71 603	30 841	309 329
2019	26 117	93 156	95 990	55 642	38 424	309 329
2049	17 506	94 875	104 192	47 109	45 647	309 329
2099	25 041	85 864	103 947	40 447	54 029	309 329
2199	21 425	86 703	107 916	25 294	67 990	309 329

Source: ORM compiled data

TABLE 9
Seral Stage Distribution for the Boreal Forest Natural Region

Year	Area (ha) in each Seral Stage					Grand Total
	Pioneer [1]	Young [2]	Mature [3]	Over mature [4]	Old [5]	
1999	10 774	51 957	129 231	81 463	9 543	282 967
2009	16 831	37 707	134 097	81 857	12 474	282 967
2019	17 220	57 512	115 478	66 901	25 856	282 967
2049	19 211	67 287	97 079	71 785	27 605	282 967
2099	8 487	98 951	112 526	29 567	33 437	282 967
2199	17 789	89 725	119 573	11 541	44 339	282 967

Source: ORM compiled data

- **Forest management activities**
  The management strategy is to work towards meeting the acceptable variance for those areas not currently achieving the target. This could be accomplished, for example, by deferring harvest of old and over mature seral stages until sufficient areas of old seral stage is available to achieve the acceptable variance.
- **Implementation schedule**
  Preliminary comparisons between current status and the target old seral stage have been completed. All future harvesting plans will follow the strategic direction as outlined in the DFMP and be adjusted as required to meet the desired old seral stage at key points in time.
- **Monitoring procedure**
  The amount of area of old seral stage that is on the landscape will be compared to the expected natural distributions at key points in time.
- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1a) 1.2b. Indicator

The amount of area in each seral stage at present and key points in time

Seral stage distribution "is important for the conservation of biodiversity because it enables timber harvests to be planned so as to maintain a full range of successional habitats for wildlife and ecosystem types over the long-term" (CCFM 1997: p. 2). Seral stages are defined by the age of the stand at breast height for different yield groups (Canfor 2000). The breast height age ranges used to define seral stages are presented in Table 2.

(1a) 1.2b.1 Objective

Maintain seral stages within the natural disturbance regimes at present and key points in time

The target (natural) seral stage distribution is one that approximates the expected distribution created by natural disturbance regimes within the two natural regions, Foothills and Boreal Forest (Figure 4). The natural disturbance regime has been modeled by using a theoretical fire-return interval.

- **Acceptable variance**
  For this planning horizon (200 years), the acceptable variance is to be within the range of the natural disturbance regimes for seral stages in the FMA and FMUs (G8C, G2C, and G5C E8C) as indicated in Figures 5-8, respectively. The acceptable variance represents a combination of both natural regions where they occur.

  Figures 9 and 10, Foothills and Boreal Forest natural regions, are provided only as supplementary information.

The range of natural disturbance is represented by the "red" line in Figures 5-10, whereas the "yellow" bar represents the current or projected distributions.

- **Current status**
  The area of each seral stage by year in the FMA, FMUs (G8C, G2C, and G5C E8C) and natural regions (Foothills and Boreal Forest) is provided in Tables 4-9, respectively.

  Figures 5-8 indicate the present and forecasted distributions for the FMA and FMUs as compared to expected natural distributions. The observed differences are caused primarily by fire prevention and control and by anthropogenic disturbances.

- **Forecasting assumptions and analytical methods**
  Seral stage distributions under a natural fire regime were modeled by using a theoretical fire-return interval (Olympic Resource Management 2000). The amount of area in each seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) has been forecasted on the landbase at each key point in time (see Figures 5-8). The key points in time are at years 0, 10, 20, 50, 100, and 200, where 1999 represents year 0. It is assumed these time periods provide a reasonable picture of the variability of seral stage over time. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

- **Forest management activities**
  The amount of each seral stage and its distribution will be compared to the amount of seral stage expected from a theoretical fire-return interval. Adjustments will be made to the harvest schedule as required to ensure the desired seral stage distribution is obtained over time.

- **Implementation schedule**
  Preliminary comparisons between current status and the target seral stages have been completed. All future harvesting plans will follow the strategic direction as outlined in the DFMP and be adjusted as required to meet the desired seral stages over time.

- **Monitoring procedure**
  The amount of area of each seral stage that is on the landscape will be compared to the expected natural distributions at key points in time.

- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1b) Critical Element	**Species Diversity** Species diversity is conserved if all native species found on the DFA prosper through time.
(1b) 1. Value	**Landscape level species diversity and abundance**
(1b) 1.1 Goal	**Minimize impacts on wildlife species population abundance** Impacts of Canfor operations on wildlife species populations can be minimized by controlling access, maintaining wildlife habitat, and protecting significant wildlife mineral licks.
(1b) 1.1a. Indicator	**Amount of Canfor LOC access into the Caribou Area that is gated** This indicator discusses access control into the Caribou Area. Other access management issues are discussed in "Critical Element 3a, Objective 1.1a.1", which deals with the amount of new Canfor LOC (License of Occupation) access constructed on the FMA area and "Critical Element 3b, Objective 1.1c.1", which deals with minimizing the amount of roads in harvested areas. Under Alberta legislation, any roads that are constructed on public lands are automatically open to the public. Gates cannot be erected without the approval of the government and, then, only for wildlife management purposes.
(1b) 1.1a.1 Objective	**100% of Canfor's LOC roads into the Caribou Area will be gated or other appropriate control measures, as approved by the government, will be implemented** ♦ **Acceptable variance** Zero variance, as directed by the province. ♦ **Current status** Canfor has three main LOC roads that access the Caribou Area and all have gates on them to restrict access for wildlife management purposes: ➢ Norton Creek Road (LOC 910567, Township 62-01-W6M); ➢ Boulder Road (LOC 920512, Township 62-01-W6M); and ➢ Camp 9 Road (LOC 890636, Township 62-01-W6M). ♦ **Forecasting assumptions and analytical methods** No forecasting or analysis is required. ♦ **Forest management activities** Gates are currently in place into the Caribou Area and will be documented in the forest road maintenance system. Gates on new roads that are planned for the Caribou Area will be discussed with Alberta Environment.

- **Implementation schedule**
  Canfor access into the Caribou Area is already gated.
- **Monitoring procedure**
  If future roads are proposed into the Caribou Area, the need for gates will be discussed with the government.
- **Linkages between strategic and operational plans**
  The DFMP and operating ground rules identify access management strategies that will be implemented operationally.

(1b) 1.1b. Indicator

Level of suitable habitat for species of special management concern

Consultation with members from the Forest Ecosystem Management Task Force, Canfor, and the FMAC resulted in the selection of the following seven (7) species of special management concern: moose (*Alces alces*), pine marten (*Martes americana*), pileated woodpecker (*Dryocopus pileatus*), barred owl (*Strix varia*), woodland caribou (*Rangifer tarandus caribou*), bull trout (*Salvelinus fontinalis*), and trumpeter swan (*Cygnus buccinator*). Out of this group, the first four were selected for HSI modeling and the last three are to be managed by means of habitat constraint modeling.

These seven species were selected because they represent a broad and variable range of habitat characteristics. Thus, if the habitat is maintained and available for these species, it is assumed that the FMA area will contain a wide range of habitat conditions suitable for all other species in the planning area.

(1b) 1.1b.1 Objective

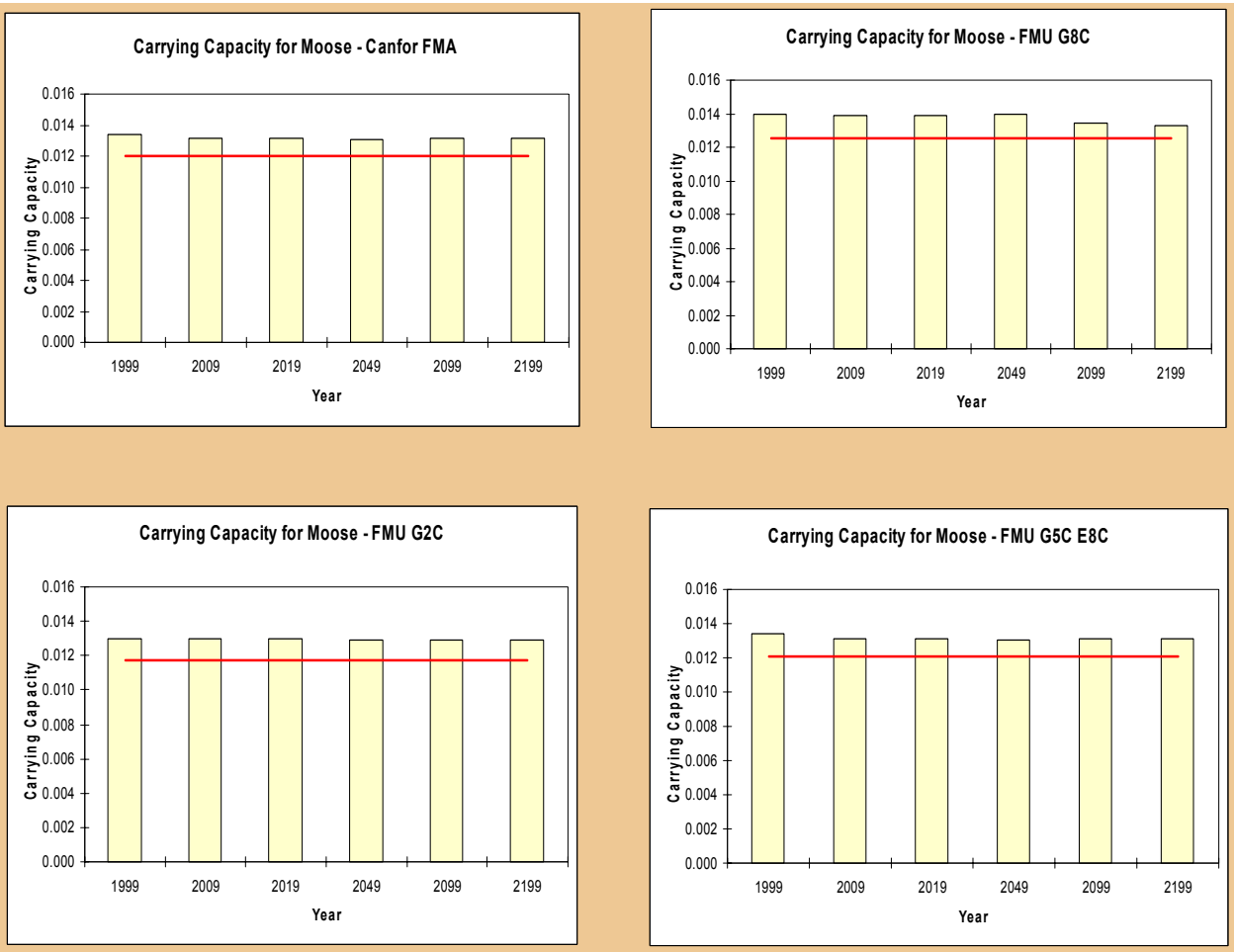
Maintain habitat conditions required by identified species of special management concern utilizing HSI models

The techniques used to evaluate the suitability of habitat for specific species are called habitat suitability index (HSI) models. They are able to predict the value of a habitat to a specific species, based on life variables related to food, availability of cover, and the physical size of the potential habitat. A HSI value of 0 indicates the lowest habitat and a value of 1 indicates the optimum habitat. HSI can be categorized into a scale of habitat quality as nil, low, medium, and high.

Carrying capacity, the potential number of animals that would occur in a perfect unit of habitat (HSI = 1.0), can be estimated by multiplying the predicted number of animals by the total available habitat (De La Mare 1998).

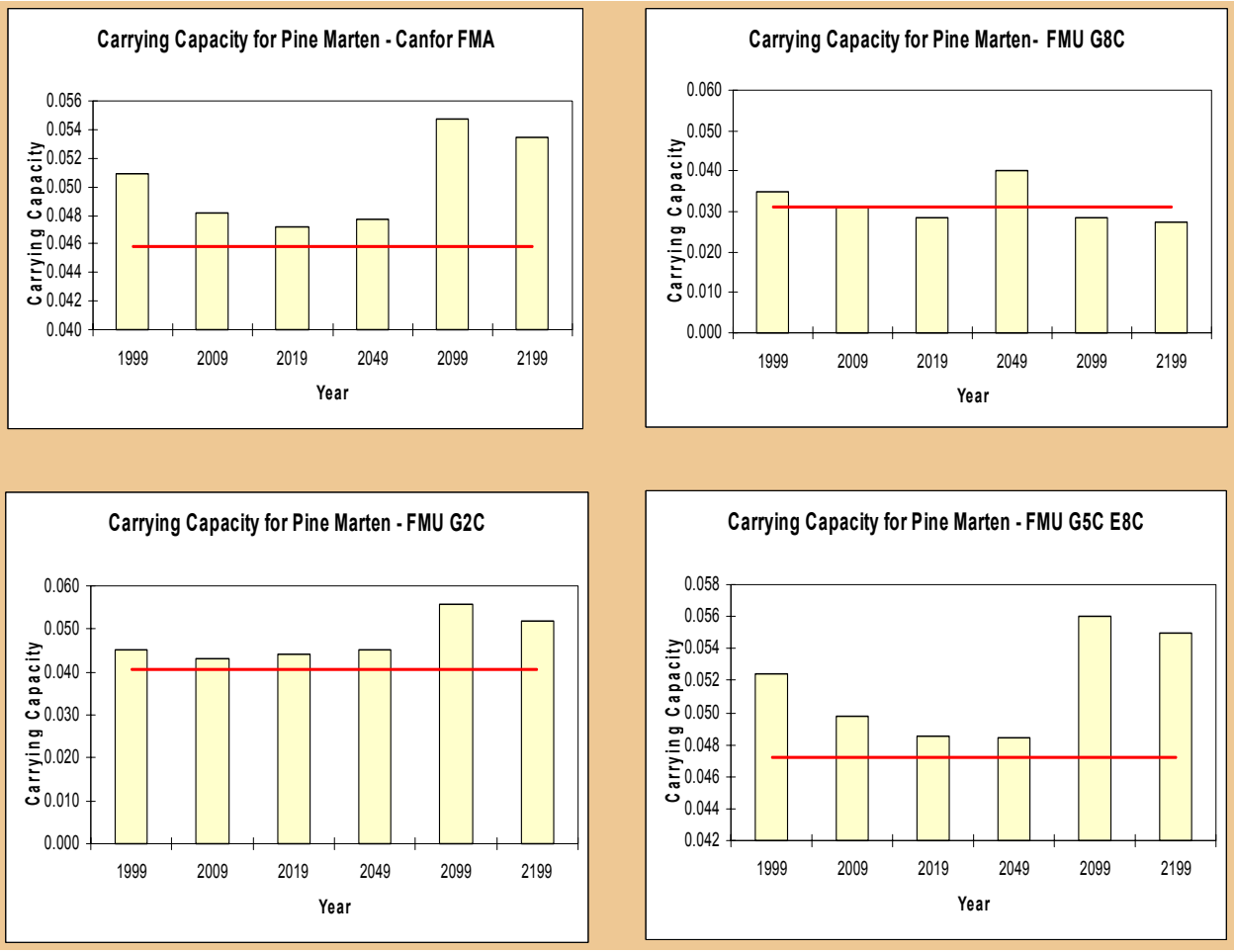
- **Acceptable variance**
  The acceptable variance for the four selected species is to maintain the carrying capacity within -10% of the current status at key points in time (0, 10, 20, 50, 100, and 200 years).

  The solid "red" line in Figures 11, 12, and 13 represents the acceptable variance for 3 of the 4 selected species (barred owl is currently



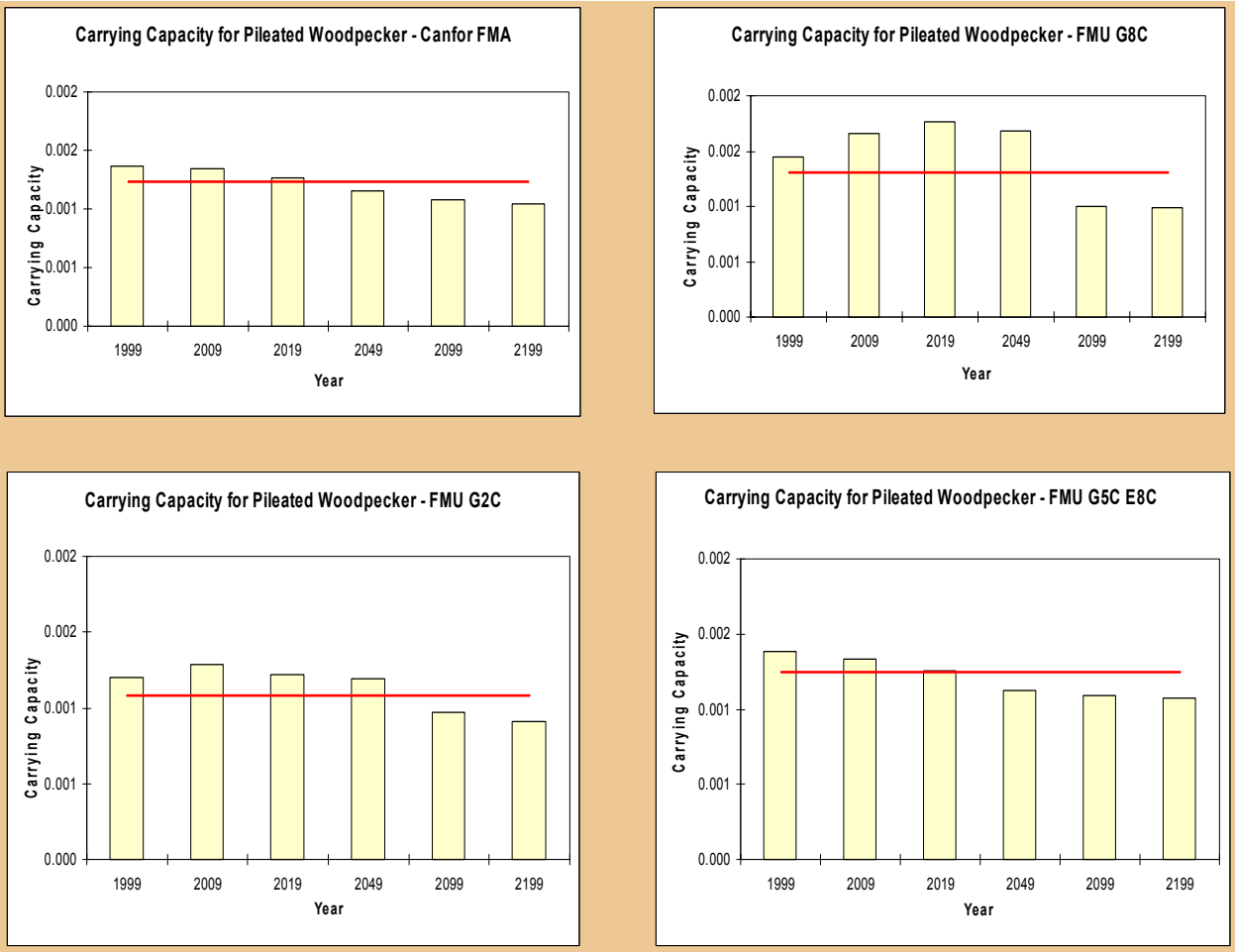
Source: ORM compiled data

FIGURE 11
Carrying Capacity Forecasts for Moose



Source: ORM compiled data

FIGURE 12
Carrying Capacity Forecasts for Pine Marten



Source: ORM compiled data

FIGURE 13
Carrying Capacity Forecasts for Pileated Woodpecker

unavailable). The bars represent the current and projected carrying capacities.

- **Current status**

  Available habitat was assessed from data obtained from the most recent AAC analysis, with the harvest sequencing applied; therefore, changes may arise as additional analyses are completed.

  The current (year 1999) HSI-Class percentages (nil, low, medium, and high) and carrying capacity per hectare for the species moose, pine marten and pileated woodpecker are shown in Figure 14, 15, and 16, respectively. The data is shown for the entire FMA and FMUs (G8C, G2C, and G5C E8C).

  An existing HSI model for barred owl will be used to calculate the carrying capacity for the species; however, the preliminary results are not yet available.

- **Forecasting assumptions and analytical methods**

  The assumptions of the HSI models themselves are described in Beck et al. (1996) and De La Mare (1998). The key assumptions of the HSI models being used are:

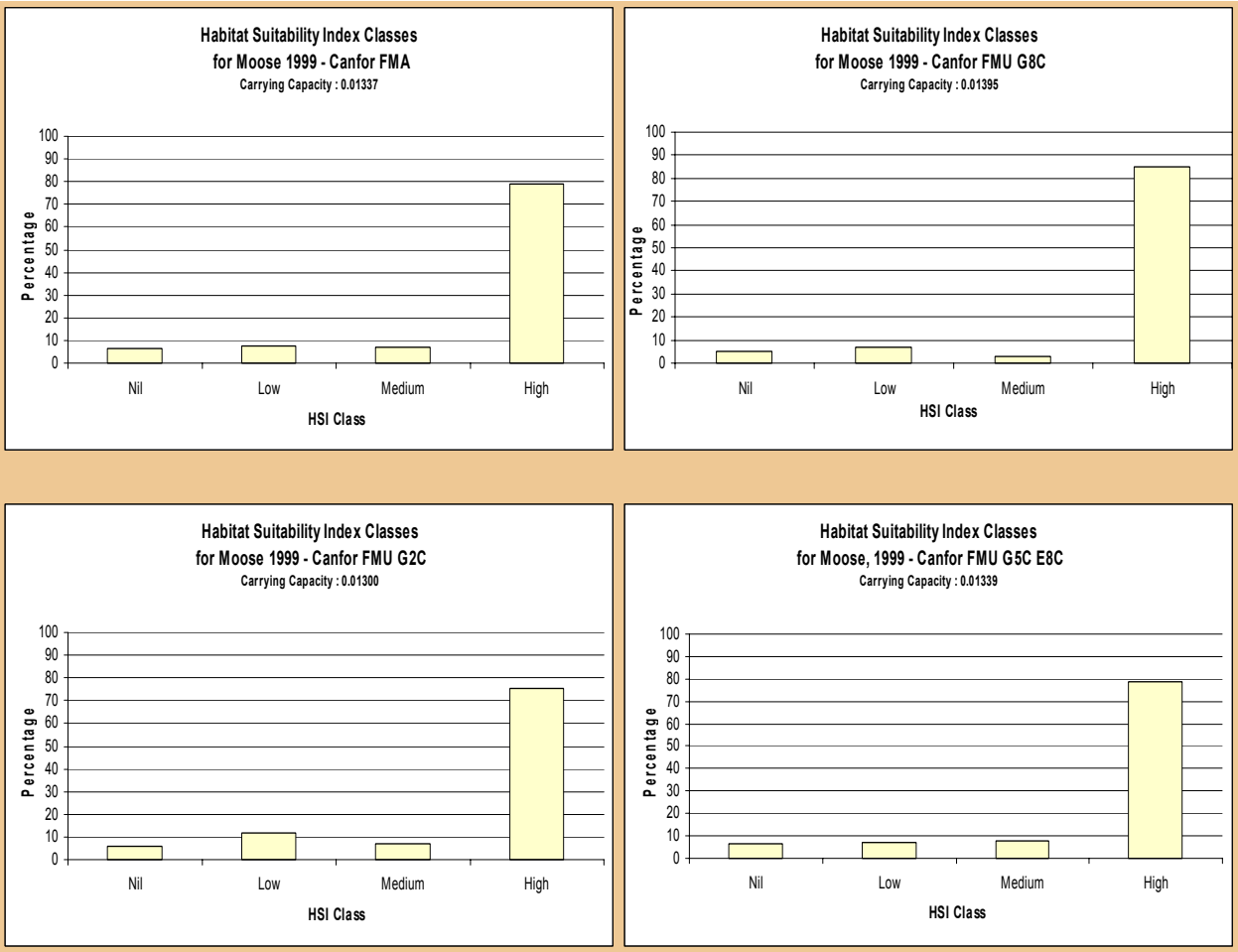
  - A larger area of poorer habitat is equivalent to a smaller area of higher quality habitat;
  - The quantity and quality of habitat can be used to estimate the maximum potential number of animals that it is able to support; and
  - The data available to drive the model is representative of the actual conditions.

- **Forest management activities**

  In order to apply the HSI models, the relationship between important habitat characteristics and stand variables was evaluated and habitat values determined for each 20 year breast height age class for each yield group (Canfor 1999c). The habitat models have been applied to the landscape at key points in time (0, 10, 20, 50, 100, and 200 years) to determine the amount of potential habitat available (carrying capacity) for the selected species.

  The change in carrying capacity over time for moose, pine marten and pileated woodpecker is demonstrated in Figures 11, 12 and 13. The data is shown for the entire FMA and by FMUs (G8C, G2C, and G5C E8C).

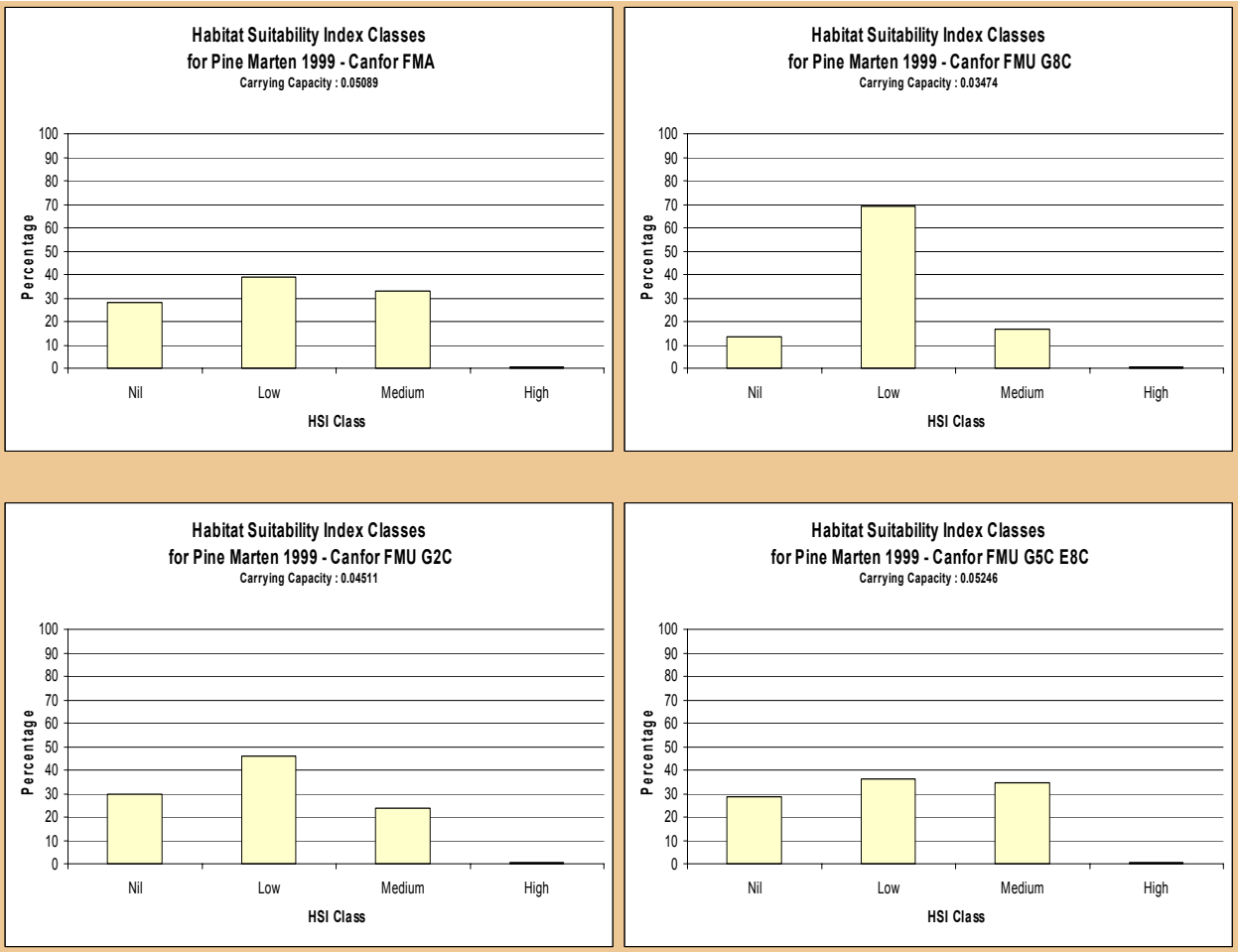
  On an FMA level, carrying capacities do not fall below the acceptable variance with the exception of the pileated woodpecker which occurs in year 2049 (a variance of 16% as opposed to the 10% acceptable) and beyond. On an FMU level, the carrying capacities for moose do not fall below the acceptable variance. On the other hand, pine marten and



Source: ORM compiled data

FIGURE 14

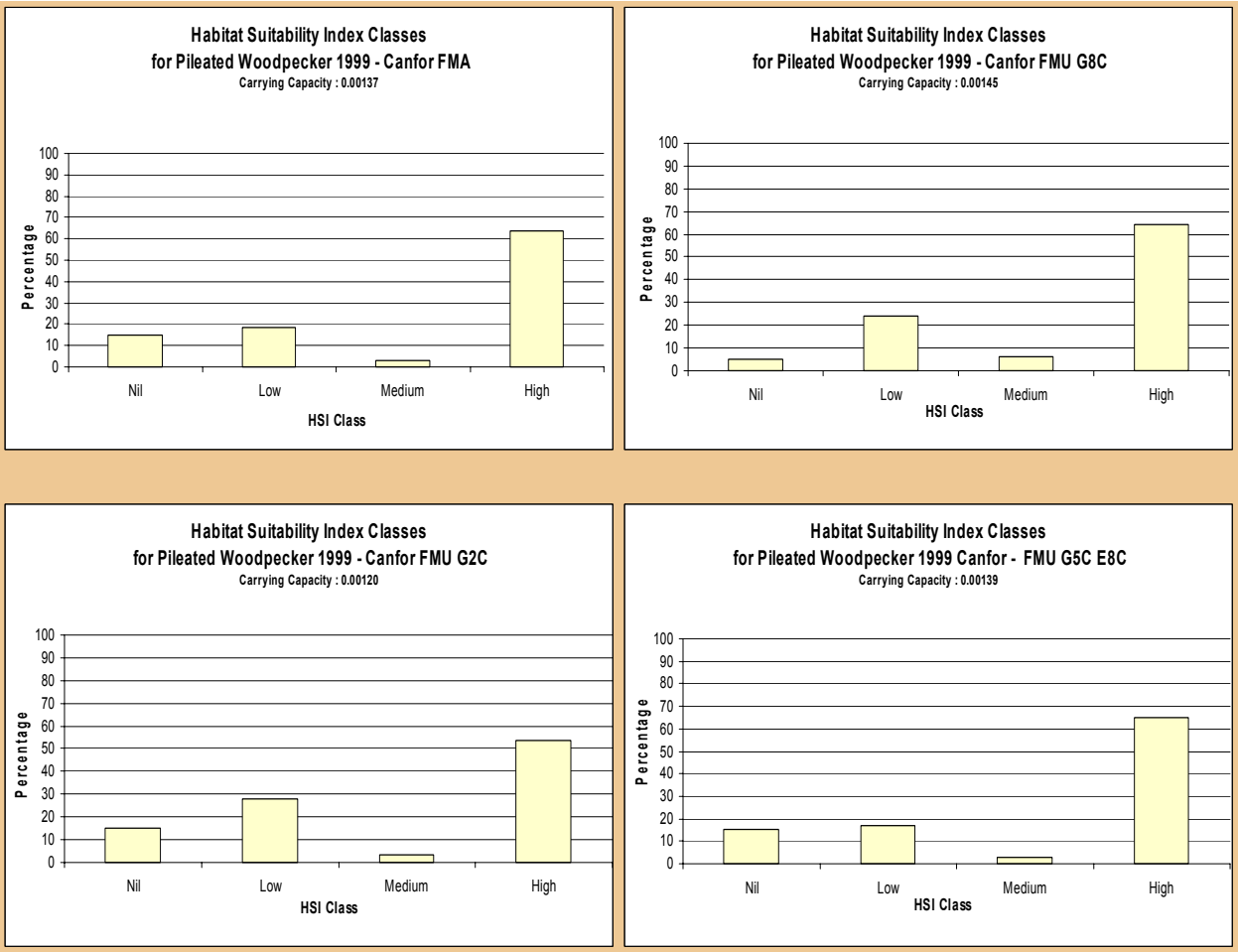
Current HSI-Class Percentages and Carrying Capacity for Moose



Source: ORM compiled data

FIGURE 15

Current HSI-Class Percentages and Carrying Capacity for Pine Marten



Source: ORM compiled data

FIGURE 16

Current HSI-Class Percentages and Carrying Capacity for Pileated Woodpecker

pileated woodpecker fall below the acceptable variance in specific FMUs over certain periods of time (Figures 12 and 13).

Further evaluation of carrying capacities that fall below the acceptable variance will be conducted and the results considered in current or future plan submissions.

Canfor will work closely with the Alberta Environment, Land and Forest Service (LFS) and Natural Resources Service (NRS) and the Forest Management Advisory Committee (FMAC) to avoid management practices that place species of special management concern at risk (Canfor 1997).

Canfor is also working on models that utilize a HSI type approach to evaluate wildlife habitat at the landscape level (1:100 000 scale). These models represent a variety of indicator wildlife species grouped into guilds (Canfor 1998b) and will then be applied at key points in time. If potential problems are identified, information from this new landscape level habitat evaluation project will provide insight into the development of preventative and mitigative strategies.

- **Implementation schedule**
  The HSI models are currently being used in the evaluation of results from the timber supply analysis for the DFMP. This wildlife habitat evaluation (using HSI) will be completed by March 31, 2001.

  The new landscape level habitat evaluation project will be completed by March 31, 2001; however, validation and testing of the model results and development of operational strategies will be completed by May, 2003.

- **Monitoring procedure**
  Harvesting activities will be monitored (as per the forest management activity above) to ensure that they follow the management strategies defined in the DFMP.

- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1b) 1.1b.2 Objective

Maintain habitat conditions required by identified species of special management concern, using habitat constraint modeling

- **Acceptable variance**
  Woodland Caribou
  The target for woodland caribou is to have no more than 20% of the area in pioneer or young seral condition and at least 20% of the area must be in old seral condition (Table 10). The acceptable variance for the pioneer/young seral condition is no more than 25% of the area. The acceptable variance for the old seral condition is to be no less than 15% of the area.

TABLE 10
Percentage of Pioneer/Young and Old Seral Stages in the Woodland Caribou Area

Year	Pioneer/Young (%)	Old (%)
1999	14	10
2009	20	11
2019	23	17
2049	25	32
2099	22	41
2199	17	56

Source: ORM compiled data

Bull Trout

Within a defined watershed, total vegetated cover removal will not exceed 40% ECA above the H60. Total vegetated area includes the forested and non-forested vegetated covers (refer to "Critical Element 3c, Objective 2.1a.1" for further information regarding the H60 and ECA).

Trumpeter Swan

Zero variance with respect to harvesting within the no harvest buffers unless approved by Alberta Environment.

- **Current status**

Woodland Caribou

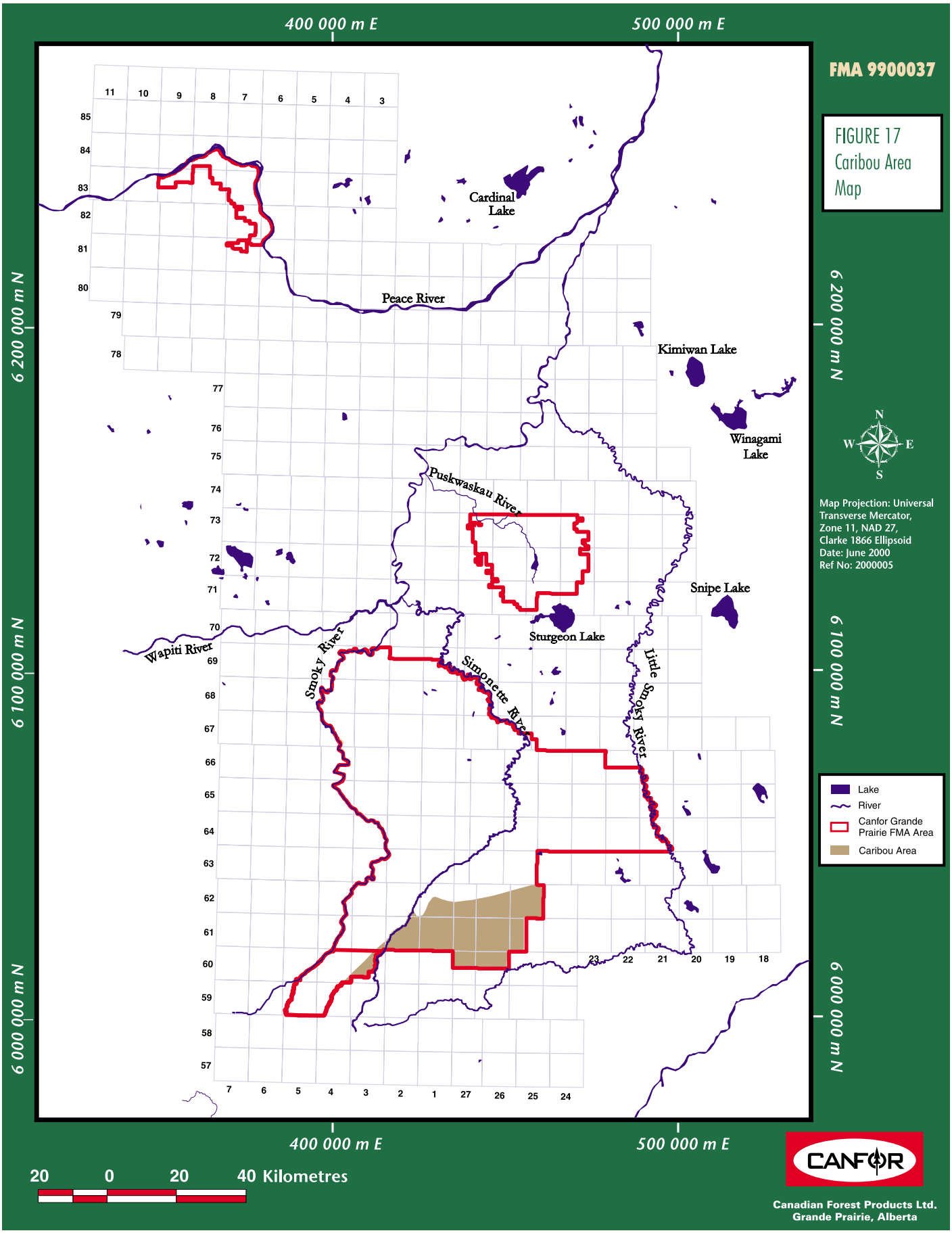
There are two woodland caribou herds within and adjacent to the FMA area: La Le Pech and the Little Smoky. Their total range is 466 127 hectares. The total amount of woodland caribou area within the FMA area is 70 228 hectares as depicted in Figure 17 (representing 15% of the total area and 10.8% of the total FMA area of 649 160 hectares).

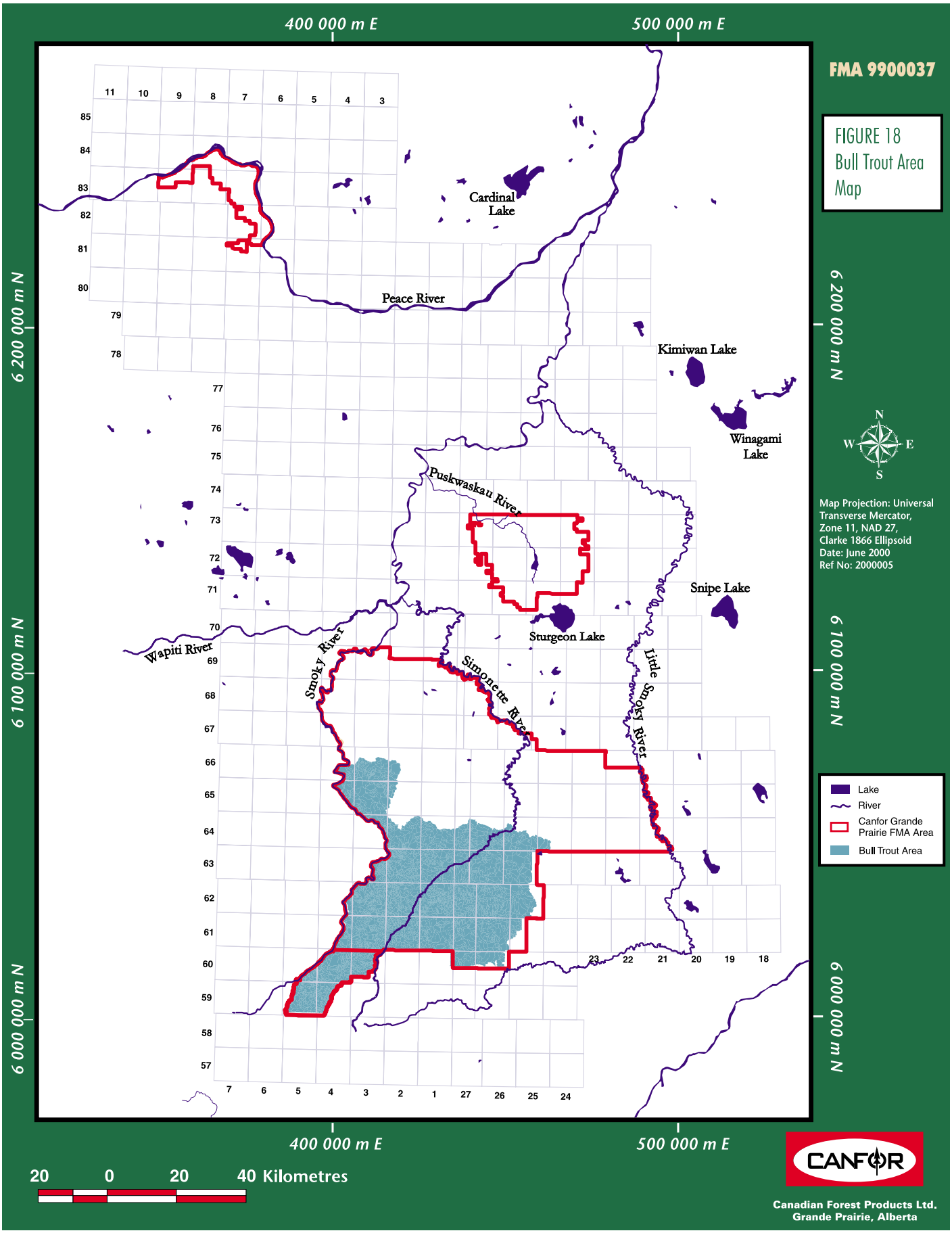
Table 10 represents the current status (1999) and projected status for pioneer/young and old seral stage distribution. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

Bull Trout

The total bull trout area identified within the FMA area is 242 828 hectares as indicated in Figure 18. This represents 37% of the total FMA area.

The H60 line has been determined for all watersheds aggregated up to a minimum of 500 ha in the bull trout area (Figure 19). There are a total of 163 watersheds in the bull trout area. More detailed description of the data is in Appendix 7, Tables 1-3. A summary of watersheds above the ECA of 35% flagged for concern is presented in Table 11. Further information regarding the flagging (concern areas), refer to the section on Forecasting assumptions and analytical methods below.


400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 17
Caribou Area
Map
Cardinal Lake
Peace River
Kimiwan Lake
Winagami Lake
Puskwaskau River
Snipe Lake
Sturgeon Lake
Wapiti River
Smoky River
Simonette River
Little Smoky River
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
Lake
River
Canfor Grande Prairie FMA Area
Caribou Area
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta


400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 18
Bull Trout Area
Map
Cardinal Lake
Peace River
Kimiwan Lake
Winagami Lake
Puskwaskau River
Snipe Lake
Sturgeon Lake
Wapiti River
Smoky River
Simonette River
Little Smoky River
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
Lake
River
Canfor Grande Prairie FMA Area
Bull Trout Area
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

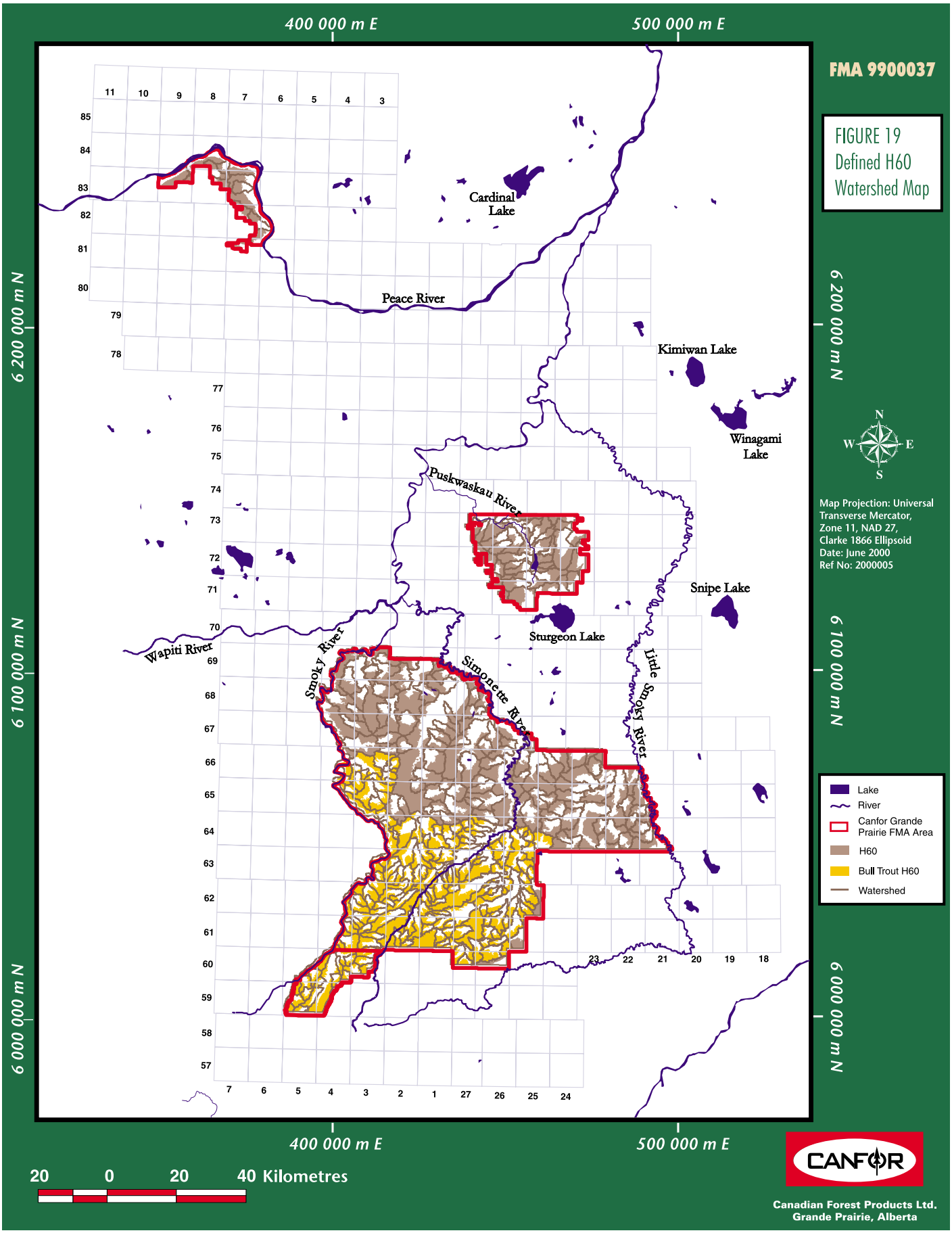

400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 19
Defined H60
Watershed Map
Cardinal Lake
Peace River
Kimiwan Lake
Winagami Lake
Puskwaskau River
Snipe Lake
Sturgeon Lake
Wapiti River
Smoky River
Simonette River
Little Smoky River
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
Lake
River
Canfor Grande Prairie FMA Area
H60
Bull Trout H60
Watershed
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

TABLE 11
Watershed Above the ECA of 35% Flagged for Concern

Watershed ID	1999 ECA %	2009 ECA %	2019 ECA %
2057	44.0	–	–
4257	36.3	–	–
1775	–	35.7	–
7443	–	35.2	–
583	–	–	35.9
595	–	–	36.3
670	–	–	35.0
1466	–	–	36.0
Combined ECA (ha)	**292.9**	**245.9**	**864.0**

Source: ORM compiled data

Trumpeter Swan

There are 45 areas that have been identified by Alberta Environment, Natural Resource Services (NRS) which have been buffered to protect nesting sites in the FMA area (Figure 20).

Forecasting assumptions and analytical methods

Woodland Caribou

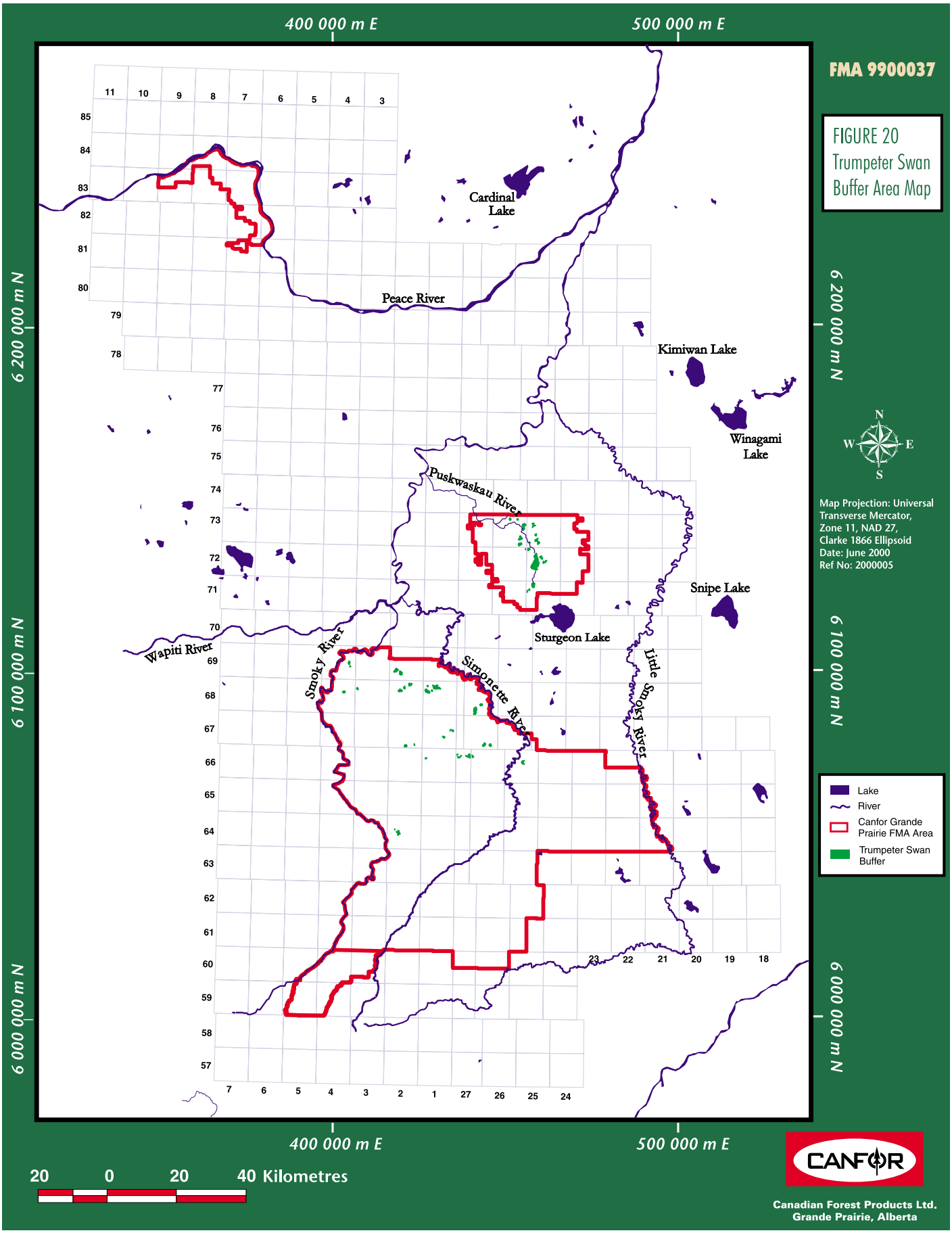
The constraints, defined under the forest management activities, used in the timber supply modeling for the DFMP will ensure woodland caribou are not adversely impacted by Canfor's operations.

Bull Trout

It is assumed that streamflow maximums will not adversely impact the ecosystem if no more than 20-40% of the total vegetated cover is removed within the area above the H60 within a defined watershed.

The following will be used to evaluate potential watersheds that may require further adjustments:

- A base 0 (Equivalent Clearcut Area (ECA) value) has been calculated (Appendix 7, Table 1) which includes the 1999 Annual Operating Plan proposed areas as part of the harvested areas. The need to do this is to demonstrate present ECA values that will not change;
- ECA percentage report (Appendix 7, Tables 2 and 3) for year 10 (2009) and year 20 (2019) was based on the most recent AAC analysis; and
- The following criteria will be used to flag areas of concern:
  - ECA >35% in bull trout area; and
  - Visual representation.


400 000 m E
500 000 m E
6 200 000 m N
6 100 000 m N
6 000 000 m N
FMA 9900037
FIGURE 20
Trumpeter Swan
Buffer Area Map
Cardinal Lake
Peace River
Kimiwan Lake
Winagami Lake
Puskwaskau River
Snipe Lake
Sturgeon Lake
Wapiti River
Smoky River
Simonette River
Little Smoky River
N
W
E
S
Map Projection: Universal Transverse Mercator, Zone 11, NAD 27, Clarke 1866 Ellipsoid
Date: June 2000
Ref No: 2000005
Lake
River
Canfor Grande Prairie FMA Area
Trumpeter Swan Buffer
20 0 20 40 Kilometres
CANFOR
Canadian Forest Products Ltd.
Grande Prairie, Alberta

For a more detailed discussion around ECAs and H60, see "Critical Element 3c, Objective 2.1a.1" or "Critical Element 4a, Objective 1.2a.1".

Trumpeter Swan
Buffer areas will be maintained, unless changes are recommended or approved by the LFS.

- **Forest management activities**

Woodland Caribou
Cover constraints are being applied to forested stands identified within the Caribou Area (Figure 17) as follows:

- No more than 20% of the area can be in pioneer or young seral condition;
- At least 20% of the area must be in old seral condition;
- Maximum opening size of 1 000 ha; and
- 2 m green-up.

In addition, Canfor, as a member of the West Central Alberta Caribou Standing Committee (WCACSC), is participating in a three to five year research program which began in April 1998 (Rohner 1999). There are three components of this program:

- Predation;
- Forest renewal; and
- Responses to human infrastructure.

Bull Trout
Bull trout habitat is dependent on the amount of vegetated cover within a watershed. Vegetated cover removal must be controlled to maintain adequate habitat. The absolute amount of Equivalent Clearcut Area (ECA) that can be supported without adverse impacts to bull trout is not well understood; it differs depending upon watershed sensitivity. Given this lack of understanding, it is important to monitor the amount of ECAs.

Trumpeter Swan
Two hundred (200) metres of no harvest buffers are maintained around identified trumpeter swan areas to protect nesting sites, unless changes are recommended or approved by the LFS.

- **Implementation schedule**

Woodland Caribou
The cover constraints are currently being implemented in the Annual Operating Plan (AOP).

Bull Trout
ECA values have been calculated and data utilized in the 2001 AOP.

Trumpeter Swan

Protection of identified nesting sites has been implemented and will be maintained.

- **Monitoring procedure**

Woodland Caribou

- Canfor will monitor the DFMP cover constraints as stated in the Forest management activities; and
- The status of the WCACSC research program will be monitored. Data coming from this research program will be used to enhance forest management within the Caribou Area (Figure 17).

Bull Trout

The Equivalent Clearcut Area (ECA) within the defined watersheds will be tracked.

Trumpeter Swan

Verify the presence of nest sites as identified in the active AOP planning areas and incorporate any new nest sites into future plans.

- **Linkages between strategic and operational plans**

All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1b) 1.1c. Indicator

Amount of significant wildlife mineral licks

Significant wildlife mineral licks are areas that tend to be relatively wet and have a concentration of mineral salts that provide nutrition to various wildlife species. In order to be significant, licks must be used by wildlife on a regular basis.

(1b) 1.1c.1 Objective

Protect 100% of identified significant wildlife mineral licks

- **Acceptable variance**

The acceptable variance is zero.

- **Current status**

Currently, there are approximately 159 wildlife mineral licks protected on the FMA area, representing an area of 480 hectares (0.07% of the entire FMA area).

Significant wildlife mineral licks are identified operationally during pre-harvest assessments and block layout. Licks are protected with a 100 m no harvest buffer. The licks are identified on the Annual Operating Plan (AOP) maps as WLZ (wildlife zones). Approximately 85% of identified WLZ are wildlife mineral licks. The AOP documents each WLZ in the current operating area and describes in more detail the purpose of the WLZ designation.

- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  Management activities include identification, verification, and buffering of significant wildlife mineral licks. New field staff will require training in the identification of wildlife mineral licks.
- **Implementation schedule**
  Protecting wildlife mineral licks is part of our current practice. Starting in May, 2001, a monitoring procedure will be implemented to verify that the objective is being met.
- **Monitoring procedure**
  A minimum of 10% of new identified wildlife mineral licks will be randomly sampled annually, after May, 2001.
- **Linkages between strategic and operational plans**
  The management practice of identifying, verifying, and buffering significant wildlife mineral licks is part of Canfor's Environmental Management System (EMS).

(1b) 1.2 Goal

Maintain flora and fauna on the landscape

The maintenance of flora and fauna on the landscape can be achieved by providing habitat for their life requisites: food, shelter, escape, and breeding.

(1b) 1.2a. Indicator

The amount of area in each seral stage at present and key points in time

Seral stage distribution "is important for the conservation of biodiversity because it enables timber harvests to be planned so as to maintain a full range of successional habitats for wildlife and ecosystem types over the long-term" (CCFM 1997: p. 2). It is assumed that by maintaining all seral stages on the landscape, habitat is available for all the flora and fauna that require these seral stages.

(1b) 1.2a.1 Objective

Maintain seral stages within the natural disturbance regimes at present and key points in time

The target (natural) seral stage distribution is one that approximates the expected distribution created by natural disturbance regimes. The natural disturbance regime has been modeled by using a theoretical fire-return interval.

- **Acceptable variance**
  For this planning horizon (200 years), the acceptable variance is to be within the range of the natural disturbance regimes for seral stages in the FMA and FMUs (G8C, G2C, and G5C E8C) as indicated in Figures 5-8, respectively. The acceptable variance represents a combination of both natural regions where they occur.

Figures 9 and 10, Foothills and Boreal Forest natural regions, are provided only as supplementary information.

The range of natural disturbance is represented by the "red" line in Figures 5-10, whereas the "yellow" bar represents the current or projected distributions.

- **Current status**
  The area of each seral stage by year in the FMA, FMUs (G8C, G2C, and G5C E8C) and natural regions (Foothills and Boreal Forest) is provided in Tables 4-9, respectively.

  Figures 5-8 indicate the present and forecasted distributions for the FMA and FMUs as compared to expected natural distributions. The observed differences are caused primarily by fire prevention and control and by anthropogenic disturbances.

- **Forecasting assumptions and analytical methods**
  Seral stage distributions under a natural fire regime were modeled by using a theoretical fire-return interval (Olympic Resource Management 2000). The amount of area in each seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) has been forecasted on the landbase at each key point in time (Figures 5-8). The key points in time are at years 0, 10, 20, 50, 100, and 200, where 1999 represents year 0. It is assumed these time periods provide a reasonable picture of the variability of seral stage over time. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

- **Forest management activities**
  The amount of each seral stage and its distribution will be compared to the amount of seral stage expected from a theoretical fire-return interval. Adjustments will be made to the harvest schedule as required to ensure the desired seral stage distribution is obtained over time

- **Implementation schedule**
  Preliminary comparisons between current status and the target seral stages have been completed. All future harvesting plans will follow the strategic direction as outlined in the DFMP and be adjusted as required to meet the desired seral stages over time.

- **Monitoring procedure**
  The amount of area of each seral stage that is on the landscape will be compared to the expected natural distributions at key points in time.

- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1b) 1.2b. Indicator

Presence of rare and endangered plants on the FMA area

A rare plant is one that either occurs in a limited area or in small numbers over a large area. On a provincial basis, a rare plant species is one that has a small overall population or is highly restricted to specific habitats and which is susceptible to human changes to the environment (Harms et al. 1992). Alberta Natural Heritage Information Centre (ANHIC) defines rare plants or plants of conservation concern as those that are ranked S1, S2 and, occasionally, S3 (Gould 1999):

S1 5 occurrences or only a few remaining individuals;

S2 6-20 occurrences or with many individuals in fewer occurrences; and

S3 21-100 occurrences may be rare and local throughout its range, or in restricted range (may be abundant in some locations or may be vulnerable to extirpation because of some factor of its biology).

(1b) 1.2b.1 Objective

Develop a predictive tool to determine the probability of the occurrence of rare and endangered plant species on the FMA area

- **Acceptable variance**

  Ecosites (ecological units) will be assigned a likelihood index or probability of containing rare or endangered plant species. After this index is developed, the variability in the index will be evaluated. However, assigning an acceptable level of variance is not appropriate.

- **Current status**

  A report has been written that focuses on the potential rare and endangered plants in the FMA area (Snyder 1998). This preliminary work is being built upon currently with the development of a predictive tool to determine the probability of occurrence of rare vascular plant species. The benefits to this approach include:

  - It would show resource managers the extent of critical rare plant habitats within the FMA area;
  - It would allow resource managers to do a direct comparison between critical rare plant habitats and areas of high economic potential; and
  - It would be the first step towards implementation of a rare plant monitoring program.

  Ten rare species of vascular and four non-vascular plant species were identified from the plot data during the temporary sample plot (TSP) program of 1997. Almost all of the vascular (90%) and non-vascular (75%) species are in the S1 and S2 categories.

- **Forecasting assumptions and analytical methods**
  The list of potential rare plants is taken from the Alberta Natural Heritage Information Centre (ANHIC) database of rare plant species in the province. Some plants on this list may be provincially or nationally rare but locally abundant (e.g., devils club). Each plant on the list is evaluated to determine the reason for its rareness (e.g., specific rare habitat or the species is at the limit of its range) and its habitat requirements. Plant habitat (ecosite) scores are generated and then weighted by the amount of area of each habitat to determine the relative importance of ecosites for rare plant habitat conservation. The information about the autecology (habitat requirements) of rare plant species is limited. Thus, in some cases, scant literature in association with expert opinion is used to identify soil/plant/climate relationships in order to assess the relative importance of each habitat for rare plant species.

- **Forest management activities**
  A list of plant species that may occur on each specific ecosite will be developed after the likelihood of rare and endangered plant species occurrence is determined by ecosite type. An effort will be made to scan, during operations, for potential rare plants on ecosites where they are likely to occur. If rare plant occurrence is verified, then options to deal with their management will be considered.

- **Implementation schedule**
  A predictive model, which will estimate the likelihood of occurrence of rare and endangered plant species by ecosite, will be completed by March 31, 2001. The results of the model will be used to identify options for mitigation of potential harvesting, treatment, and tending impacts on rare plant species. These management options will be in place before the summer field season of 2001. Appropriate staff will require training in the identification of rare and endangered plants for the summer field season of 2001. A field manual identifying these rare and endangered plants will be developed. During the pre-harvest assessment, areas scheduled for harvest that have a high likelihood of containing rare plant species will be scanned for the presence of rare plants.

- **Monitoring procedure**
  When rare and endangered plants are found, information will be recorded about their location, health, and habitat in order to validate and improve the model.

- **Linkages between strategic and operational plans**
  The rare and endangered plant species program outlined in the DFMP will be implemented through the operational plans and guidelines.

(1b) 1.2c. Indicator

Presence of endangered or threatened wildlife species (red and blue listings) on the FMA area

For the purpose of this plan, the classification of endangered or threatened wildlife species are designated as the provincial red and blue listed species. The wildlife species that are classified as endangered or threatened are those species that no longer have the capability to withstand the cumulative effects of habitat loss, isolation, and increased competition. These species also tend to be sensitive to human disturbance. Their populations have either declined or are in danger of declining to non-viable levels throughout their distribution ranges, making them the most vulnerable portion of Alberta's biodiversity. These species are placed on a status designation list (Alberta Environmental Protection 1996b).

(1b) 1.2c.1 Objective

To develop management strategies to address the identified endangered or threatened wildlife species on the FMA area

Canfor has a preliminary list (Snyder 1997) of endangered or threatened (red or blue listed) wildlife species that may occur in the FMA area and will be reviewing that list and developing management strategies for those red and blue listed species occurring in the FMA area.

- **Acceptable variance**

  Acceptable variance is zero with respect to the development of management strategies to address the identified endangered or threatened wildlife species.

- **Current status**

  Canfor commissioned a report on habitat requirements for animal species of special management concern in 1997. Included within the report is an interim list of red, blue, yellow and some green listed species that may occur on Canfor's FMA with a preliminary management recommendation written up for each species (Snyder 1997). This list was used to help develop the 7 species of special management concern discussed in "Critical Element 1b, Indicator 1.1b".

  Canfor has since developed specific management strategies for woodland caribou and trumpeter swan, which are blue listed (Alberta Environmental Protection 1996b). These management strategies are discussed in "Critical Element 1b, Objective 1.1b.2".

  In the interim, Canfor will continue the coarse filtered approach to wildlife management. This approach assumes that if habitat is maintained and available for the 7 identified species of special management concern, then the FMA area will contain a wide range of habitat conditions suitable of all other species.

- **Forecasting assumptions and analytical methods**
  Forecasting for woodland caribou and trumpeter swan is done in "Critical Element 1b, Objective 1.1b.2". The remaining species will be forecasted once management strategies are defined.
- **Forest management activities**
  The current provincial, national, and Canfor's preliminary lists of endangered or threatened wildlife species will be used to assess which species occur in the FMA area.

  Strategic and operational strategies will be developed and implemented for species that have not currently been addressed to ensure the Company's operations do not adversely affect the habitat for endangered and threatened wildlife species.
- **Implementation schedule**
  Confirmation of the preliminary list of the potential endangered and threatened wildlife species in the FMA area, as well developing the strategic and operational strategies for those species not currently addressed, will be developed by May, 2002.
- **Monitoring procedure**
  The progress in implementing the schedule will be reported in the Annual Performance Monitoring Report.
- **Linkages between strategic and operational plans**
  When management strategies are developed, they will be incorporated into future strategic and operational plans.

(1b) 1.2d Indicator

Type, amount, and location of habitat required for species of special management concern

Four species of special management concern, within the FMA area, have been selected for HSI modeling, through consultation with members from the Forest Ecosystem Management Task Force, Canfor, and the FMAC:

- moose (*Alces alces*);
- pine marten (*Martes americana*);
- barred owl (*Strix varia*); and
- pileated woodpecker (*Dryocopus pileatus*).

These species were selected because they represent a broad and variable range of habitat characteristics. Thus, if the habitat is available for these species, then it is assumed that the FMA area will contain a wide range of habitat conditions suitable for all other species in the planning area.

(1b) 1.2d.1 Objective

Compile a list of habitat requirements for species of special management concern within Canfor's FMA area

The techniques used to evaluate the suitability of habitat for specific species are called habitat suitability index (HSI) models. They are able to predict the value of a habitat to a specific species, based on life variables related to food, availability of cover, and the physical size of the potential habitat.

- **Acceptable variance**

  The acceptable variance for the four selected species is to maintain the carrying capacity within -10% of the current status at key points in time (0, 10, 20, 50, 100, and 200 years).

  The solid "red" line in Figures 11, 12, and 13 represents the acceptable variance for 3 of the 4 selected species (barred owl is currently unavailable). The bars represent the current and projected carrying capacities.

- **Current status**

  Available habitat was assessed from data obtained from the most recent AAC analysis, with the Canfor harvest sequencing applied; therefore, changes may arise as additional analyses are completed.

  The current (year 1999) HSI-Class percentages (nil, low, medium and high) and carrying capacity per hectare for species moose, pine marten and pileated woodpecker, are shown in Figures 14, 15, and 16, respectively. The data is shown for the entire FMA and by FMUs (G8C, G2C, and G5C E8C).

  An existing HSI model for barred owl will be used to calculate the carrying capacity for the species; however, the preliminary results are not yet available.

- **Forecasting assumptions and analytical methods**

  The assumptions of the HSI models themselves are described in Beck et al. (1996) and De La Mare (1998). The key assumptions of the HSI models being used are:

  - A larger area of poorer habitat is equivalent to a smaller area of higher quality habitat;
  - The quantity and quality of habitat can be used to estimate the maximum potential number of animals that it is able to support; and
  - The data available to drive the model is representative of the actual conditions.

  It is assumed that if habitat is available for these species of special management concern then, because of their varied habitat requirements, a relatively wide range of habitat conditions are present in the FMA area.

- **Forest management activities**

  In order to apply the HSI models, the relationship between important habitat characteristics and stand variables was evaluated and habitat values determined for each 20 year breast height age class for each yield group (Canfor 1999c). The habitat models have been applied to the landscape at key points in time (0, 10, 20, 50, 100, and 200 years) to determine the amount of potential habitat available (carrying capacity) for the selected species.

  The change in carrying capacity over time for moose, pine marten and pileated woodpecker is demonstrated in Figures 11, 12 and 13. The data is shown for the entire FMA and by FMUs (G8C, G2C, and G5C E8C).

  On an FMA level, carrying capacities do not fall below the acceptable variance with the exception of the pileated woodpecker which occurs in year 2049 (a variance of 16% as opposed to the 10% acceptable) and beyond. On an FMU level, the carrying capacities for moose do not fall below the acceptable variance. On the other hand, pine marten and pileated woodpecker fall below the acceptable variance in specific FMUs over certain periods of time (Figures 12 and 13).

  Further evaluation of carrying capacities that fall below the acceptable variance will be conducted and the results considered in current or future plan submissions.

  Canfor will work closely with the Alberta Environment, Land and Forest Service (LFS) and Natural Resources Service (NRS) and the Forest Management Advisory Committee (FMAC) to avoid management practices that place species of special management concern at risk (Canfor 1997).

  Canfor is also working on models that utilize an HSI type approach to evaluate wildlife habitat at the landscape level (1:100 000 scale). These models represent a variety of indicator wildlife species grouped into guilds (Canfor 1998b) and will then be applied at key points in time. If potential problems are identified, information from this new landscape level habitat evaluation project will provide insight into the development of preventative and mitigative strategies.

- **Implementation schedule**

  The HSI models are currently being used in the evaluation of results from the timber supply analysis for the DFMP. This wildlife habitat evaluation (using HSI) will be completed by March 31, 2001.

  The new landscape level habitat evaluation project will be completed by March 31, 2001; however, validation and testing of the model results, and development of operational strategies will be completed by May, 2003.

- **Monitoring procedure**
  Harvesting activities will be monitored (as per the forest management activity above) to ensure that they follow the management strategies defined in the DFMP.
- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(1b) 1.2d.2 Objective

Review the list of species of special management concern regarding potential addition of an indicator species for amphibians

The current list of species of special management concern includes representatives of birds, mammals, and fish. It has been noted by FMAC that amphibians are not part of the list and should be considered for future planning purposes.

- **Acceptable variance**
  The acceptable variance is zero with respect to the review of the list of species of special management concern regarding potential addition of an indicator species for amphibians.
- **Current status**
  Seven (7) species of special management concern have been identified in "Critical Element 1b, Indicator 1.1b".
- **Forecasting assumptions and analytical**
  No forecasting or analysis will be done until the review has been completed.
- **Forest management activities**
  The process for selection of an amphibian species of special management concern requires further assessment and consultation with experts.
- **Implementation schedule**
  The review will be completed in conjunction with the implementation schedule as per "Critical Element 1b, Objective 1.2c.1".
- **Monitoring procedure**
  The progress in implementing the schedule will be reported in the Annual Performance Monitoring Report.
- **Linkages between strategic and operational plans**
  When management strategies are developed, they will be incorporated into future strategic and operational plans.

(1c) Critical Element	**Genetic Diversity** Genetic diversity is conserved if the variation of genes within species is maintained.
(1c) 1. Value	**Genetic diversity**
(1c) 1.1 Goal	**Conserve genetic diversity of tree species** Regeneration will originate from three seed sources: authorized seed zones, breeding programs, and natural ingress. Regardless of the seed source, a diversity of genotypes will be represented.
(1c) 1.1a. Indicator	**The effective number of unrelated genotypes (trees) in the breeding program** A genotype is the genetic constitution of an organism. In order to maintain genetic variability there has to be an effective number of unrelated genotypes in the breeding program. This will ensure there is sufficient variability in the gene pool so trees can adapt to environmental stresses and change. The linkage between diversity and adaptation is well recognized in conservation biology and tree improvement, as genetic diversity is the raw material from which adaptations are derived thorough natural selection and other evolutionary forces (Edwards et al. 1999b).
(1c) 1.1a.1 Objective	**To maintain between 300 - 600 genotypes in breeding programs to safeguard long-term diversity** ♦ **Acceptable variance** The number of genotypes for each tree species in the breeding programs will be between 300 and 600. ♦ **Current status** Canfor participates in the B1 lodgepole pine breeding program in partnership with Weyerhaeuser Canada (Grande Prairie), Alberta Newsprint Company Ltd., and Alberta Environment, Land and Forest Service (LFS). They also participate in the G1 white spruce breeding program in association with Weyerhaeuser Canada (Grande Prairie) and the LFS. The goal for both programs is to provide a secure source of seed and propagation material to produce trees with fast growth, good general health, good form, and undiminished wood quality. The primary objectives of the programs are to (Edwards et al. 1999a and b): ➢ Provide genetically improved material for reforestation; ➢ Achieve optimum economic gain per unit of time; ➢ Predict, obtain, and verify genetic gains as quickly as possible; and

- Maintain genetic diversity and long-term adaptive capability through a sufficiently large mainline breeding population, an elite production population, and genetic archives (clone bank).

Another key objective is to maintain flexibility for future breeding cycles to accommodate unforeseen economic, industrial, political, climatic, or biological changes. Participants in the breeding programs are continually looking for superior trees to add to the programs. These trees come from within the breeding region, which ensures that they are adapted to the climate, soils, diseases, and pests within the Grande Prairie biogeoclimatic zone.

The B1 lodgepole pine breeding program has achieved the objective of having between 300 and 600 genotypes in the breeding program with 459 genotypes currently in the program (Edwards et al. 1999b). In 1998-99, one hundred trees were added to increase the geographic coverage of the parents and the overall genetic variability in the program.

In the G1 white spruce breeding program, 218 parent trees have been intensively grafted into clone banks at Smoky Lake (Edwards et al. 1999a). A further 140 non-intensive selections are planned to improve the geographic coverage and broaden the genetic base; these will be made when a good cone crop occurs. This will bring the total number of genotypes in the white spruce program to 358.

- **Forecasting assumptions and analytical methods**

The main assumption is that 300 to 600 genotypes in the breeding program for each tree species is sufficient to safeguard long-term genetic diversity. Preliminary analyses indicate that this range of genotypes is sufficient to capture the natural genetic diversity in the FMA area. Including more genotypes would yield relatively little additional protection.

As an additional safeguard, ingress and unharvested ecosystems will provide additional genetic variability.

- **Forest management activities**

A further 140 non-intensive selections are planned for the G1 white spruce program to improve the geographic coverage and broaden the genetic base; these will be made when a good cone crop occurs. A description of this activity will be provided in the DFMP.

- **Implementation schedule**

In August 1999, FMU G2C and the northern portion of FMU G5C had a sufficient cone crop for white spruce to enable collection of 30 additional trees. When the southern portions of FMU G5C have a sufficient cone crop, forty additional trees will be collected. Weyerhaeuser Canada (Grande Prairie) is required to collect 70 trees. All trees selected are registered with Alberta Environment as they are collected.

- **Monitoring procedure**
  Work Plan reports for both the B1 lodgepole pine and G1 white spruce programs are prepared annually. These reports will specifically state the number of genotypes in the breeding programs for each tree species.
- **Linkages between strategic and operational plans**
  Not applicable.

(1c) 1.1b. Indicator

The effective number of unrelated genotypes (trees) maintained in the seed orchard

Maintaining a sufficiently large effective number of unrelated trees in the seed orchard maintains the genetic diversity of the orchard.

(1c) 1.1b.1 Objective

To maintain sufficiently large and balanced orchard populations of unrelated trees (20 - 60 genotypes) to safeguard diversity in a given seed orchard

Effective number is a measure of the relative contribution of each genotype to a given seedlot, as well as of the number of genotypes. Any imbalance in genotypic representation is compensated for by increased number of ramets (or seedlings) per genotype (or family).

Progeny tests of all parents will be conducted within the tree breeding programs. This will provide a population for intensive selection of parents of the next generation seed orchard. Subsequent interbreeding and selection will provide continued progress and the expansion of the current breeding population currently under way will ensure long-term maintenance of genetic diversity (Edwards et al. 1999b).

- **Acceptable variance**
  The acceptable variance is zero for maintaining the minimum number of clones (20). However, more than 60 clones are acceptable.
- **Current status**
  The orchard for both the B1 lodgepole pine and G1 white spruce programs is located outside the FMA area near Huallen, Alberta. Both programs currently have at least 89 genotypes represented.
- **Forecasting assumptions and analytical methods**
  It is important to balance genetic gains (generally measured in yield) with genetic variability. Selecting superior parents from geographically dispersed areas within the breeding region will increase the likelihood of having relatively high genetic diversity within the breeding program.
- **Forest management activities**
  The selections for both species for phase 1 orchards are complete. The partners in both programs are in the process of implementing the phase 2 (2nd generation) breeding programs as described in the work plans (Edwards et al. 1999a and b).

- **Implementation schedule**
  The work plans developed for each species identify the activities and timelines of the breeding programs (Edwards et al. 1999a and b). Work plans for both are revised annually.
- **Monitoring procedure**
  Precise records are maintained for all components of the program. All trees (clones) selected for the programs are also registered with Alberta Environment.
- **Linkages between strategic and operational plans**
  Not applicable.

(1c) 1.1c. Indicator

The amount of area planted with non-seed orchard stock

A majority of the seedlings planted in the FMA area is from bulk seed collected from natural stands throughout the FMA area. The utilization of seed from natural stands helps to maintain the natural level of genetic variability that has evolved over time within the FMA area.

(1c) 1.1c.1 Objective

To plant 30% of the FMA area cut units with the bulk seed collection and 70% with seed orchard stock within the following Natural Subregions: Central Mixedwood, Dry Mixedwood, and Lower Foothills

- **Acceptable variance**
  The acceptable variance is to plant not more than 70% of the harvested area with seed orchard seed on a 5 year average.
- **Current status**
  The B1 lodgepole pine program trees in the seed orchard have been rouged and crown management has commenced. It will be three years before the orchard is in full seed production. Consequently, only a small amount of seed will be available each year for growing pine planting stock.

  Seed production from the G1 white spruce program has just commenced and it is anticipated that full production will be realized within the next three to five years. Until the production of seed from the seed orchard is available, harvested areas will be planted with seedlings grown from seed from bulk collections.

  Natural ingress plays a role in genetic diversity. Seedlings establish naturally from cones left on site after harvest, from seed from neighbouring stands, from advanced growth, and seedlings remaining on site after harvest.
- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  The bulk seed collection activities must continue to provide adequate seed for reforestation purposes. Individual seed collection and seed deployment must occur within a specific seed zone unless approved by the LFS.
- **Implementation schedule**
  The distribution of the seed resource for production of seedlings and planting will be implemented, within 3 years for pine and 3-5 years for spruce, as seed orchard seed becomes available.
- **Monitoring procedure**
  The area planted with seedlings derived from the bulk seed collections, and the area planted with stock grown from seed from the orchard will be reported in the annual performance monitoring report.
- **Linkages between strategic and operational plans**
  All new silviculture prescription will follow the strategic direction as outlined in the DFMP.

(1c) 1.1d. Indicator

The number of mother trees represented in the bulk seed collections over a ten year period

The greater the number of genetically distinct mother trees (obtained from wild seed collection) represented in the bulk seed collection, the higher will be the genetic diversity in the collection.

(1c) 1.1d.1 Objective

To include cones of at least 400 - 750 mother trees for the bulk seed collections for lodgepole pine and white spruce, and 50 - 150 mother trees for black spruce over a ten year period

- **Acceptable variance**
  The acceptable variance is zero for maintaining a minimum of 400 mother trees for lodgepole pine and white spruce and a minimum of 50 mother trees for black spruce.
- **Current status**
  Seed from white spruce is collected from approved seed zones, which possess relatively homogeneous biological, climatic, and geological conditions. Seed for lodgepole pine and black spruce is collected from within 80 km and 150 m in elevation of the planting site. The seedlings grown from the seed taken from a specific seed zone or area are planted in the same seed zone or area to which it has adapted, thereby ensuring they will survive and prosper.

  Canfor maintains a variety of records regarding seed collections but does not currently track the number of mother trees. Canfor estimates, however, that seed has been collected from 10 379 mother trees of lodgepole

pine, 742 of white spruce, and 40 of black spruce. These estimates are based on Canfor's supply of seed at the Alberta Tree Improvement and Seed Centre (as of September 1, 1999).

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  When a sufficient seed crop occurs, collections will be made to increase the number of mother trees for black spruce. Collections of seed for the remaining species will be made, as dictated by seed supplies.
- **Implementation schedule**
  The mother tree tracking system will be implemented during the next collection of seed, which depends on the need for seed and the presence of a sufficient seed crop.
- **Monitoring procedure**
  A record of the mother trees of each species represented in the bulk seed collection and the location and seed zone that the seed came from will be maintained on file.
- **Linkages between strategic and operational plans**
  The DFMP will be a guide for operational staff regarding the use of seedlings grown from the bulk seed collections.

(1c) 1.2 Goal

Maintain conditions that do not negatively impact on genetic diversity of wildlife species

(1c) 1.2a. Indicator

Landscape structure

Landscape level planning is a fundamental strategy for the conservation of genetic diversity of wildlife species and the long-term ecological sustainability of managed forest ecosystems. The spatial properties or "structure" of landscapes can be used as a surrogate measure of landscape level biodiversity values. To maintain the biodiversity of an area, land managers are challenged with managing landscapes to emulate the patterns and dynamics of natural landscape mosaics. Thus, the quantitative basis for measuring the structure of landscapes is a prerequisite for ecosystem-based forest management. Quantitative measures are required to establish objectives for landscape structure and evaluate the effects of management options on ecosystem values.

At the landscape level, there are a number of important factors relating to the conservation of genetic diversity of wildlife species. Landscape composition and spatial configuration define landscape structure. Composition is generally described by seral stage distribution (habitat type) and patch size distribution (habitat size), while configuration is represented by fragmentation, connectivity and patch shape.

The general consensus regarding the overall hierarchical structure of biological diversity suggests that higher levels of ecological organization, such as the landscape or ecosystem levels, ultimately limit the lower levels in the hierarchy, including the species or genetic levels (Gaines et al. 1999). Thus, landscape structure has an important function in the flow and exchange of genetic material and, ultimately, in the conservation of genetic diversity. Ecological systems are continually changing over time and are influenced by various natural and human-caused disturbances. Thus, both the temporal and spatial scales must be considered when developing a means to evaluate and monitor genetic diversity.

Landscape structure is described by various landscape properties; therefore it is necessary to identify indices that will be used to measure these properties. For detailed discussion around the distribution of seral stages please refer to the section "Critical Element 1a, Objective 1.2b.1". The distribution of patch sizes is reported by 0-100 ha, 100-500 ha and 500+ ha classes. These classes were defined based on extensive literature review and the maximum 500 ha aggregation rule (1 000 ha in the Caribou Area (Figure 17)) in the timber supply analysis (Canfor 1999b). Fragmentation is measured by mean patch size (MPS). Connectivity is quantified using the mean nearest neighbour distance (MNND). MNND describes the spatial context of a habitat patch in relation to its neighbours by increasing with increasing distance between patches. Patch shape is measured by the area-weighted mean shape index (AWMSI). AWMSI measures the perimeter-to-area ratio for a patch type or landscape using comparisons of patches to a standard shape.

(1c) 1.2a.1 Objective

To compare current landscape structure to future landscape structure at key points in time and develop management strategies

- **Acceptable variance**

  Landscape structure is characterized by various indices; therefore, it is necessary to establish acceptable variance for each measure separately.

  Distribution of Seral Stages

  Please refer to the section "Critical Element 1a, Objective 1.2b.1" for detailed discussion on the distribution of seral stages.

  Distribution of Patch Sizes

  Target distributions were derived for the Boreal Forest and Foothills natural disturbance types based on theoretical fire-return intervals of the two natural regions (Olympic Resource Management 2000). Targets for the Boreal Forest natural region were derived from measured patch size classes of four 20 year periods of unmanaged forests (Delong and Tanner 1996); while targets for the Foothills Natural Region were based on the distribution of patch sizes in historical pre-suppression air photos of the Foothills Model Forest in Hinton, Alberta (Andison 1997). The

targets for the reporting units (FMA and FMUs (G8C, G2C, and G5C E8C)) are weighted based on the proportion of areas in the Boreal Forest and Foothills natural regions (Table 12).

TABLE 12
Percent of Current Forested Landbase in Old Seral Stage

Reporting Units	0–100 ha		100–500 ha		500+ ha	
	LL	UL	LL	UL	LL	UL
FMA	10	16	14	25	53	82
FMU G8C	14	23	13	25	52	73
FMU G2C	14	23	13	25	52	73
FMU G5C E8C	9	15	14	25	53	83

Source: ORM compiled data

LEGEND:
LL – lower limit
UL – upper limit

For this planning horizon (200 years), the acceptable variance is to be within the range of natural disturbance types in the FMA and FMUs (G8C, G2C, and G5C E8C) as indicated in Figures 21-27. For more information, refer to Forecasting assumptions and analytical methods which provides a detailed explanation of the complexity.

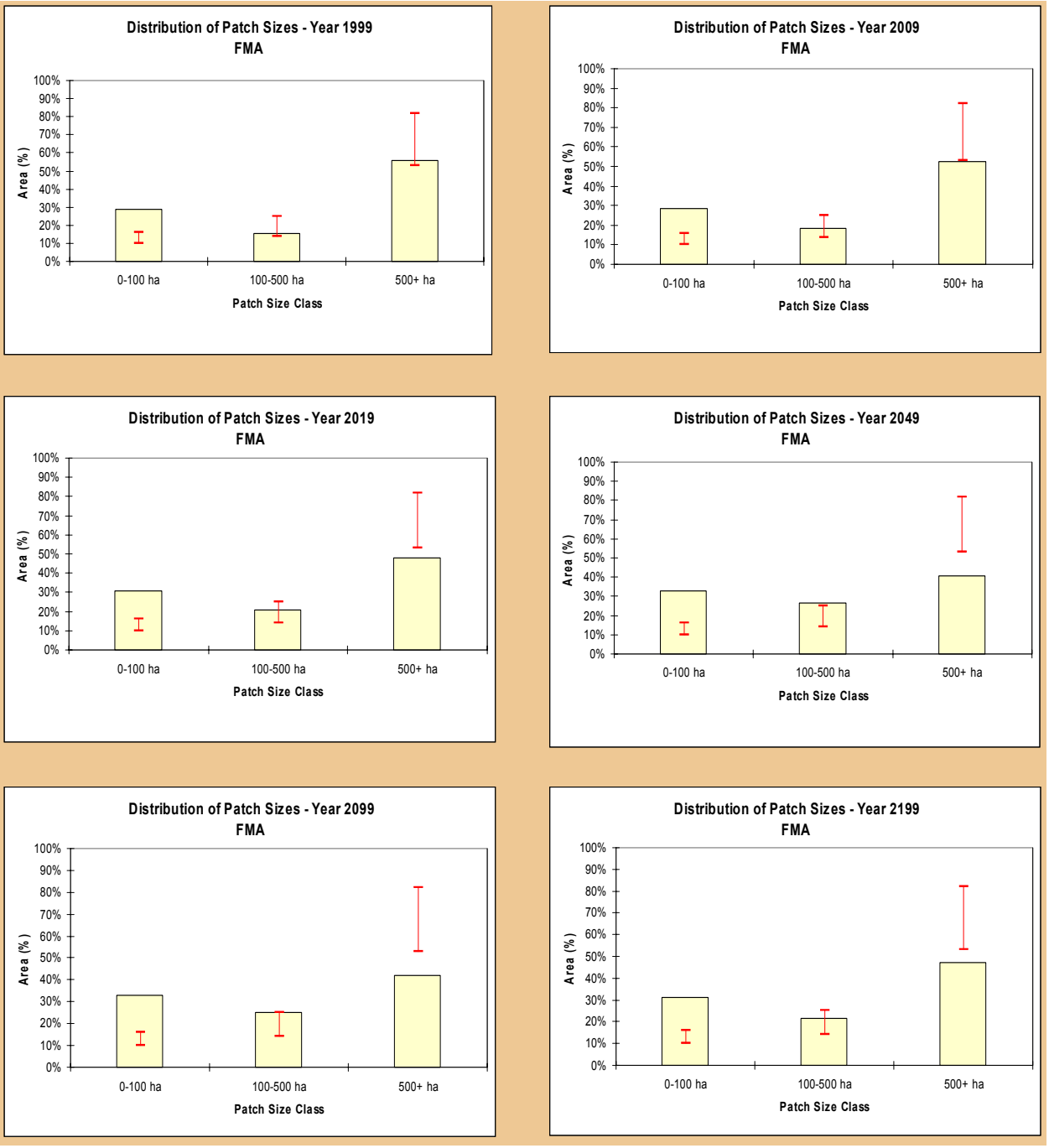
Fragmentation
As MPS (mean patch size) decreases fragmentation increases; therefore, lower limits were established for MPS at the landscape level. MPS will not fall below 25% of the current MPS for the FMA and each FMU at the key points in time, as indicated by the solid lines in Figure 25.

Connectivity
MNND (mean nearest neighbour distance) will not exceed the maximum MNND (as calculated from the current status plus 25%) for the FMA and each FMU at the key points in time, as indicated by the solid lines in Figure 26.

Patch Shape
The shape and spatial distribution of cut blocks (pioneer seral stage) affect patch shape and shape complexity at the landscape level. AWMSI (area-weighted mean shape index) will not fall below two times the current AWMSI of the pioneer seral stage for the FMA and each FMU at the key points in time, as indicated by the solid lines in Figure 27.

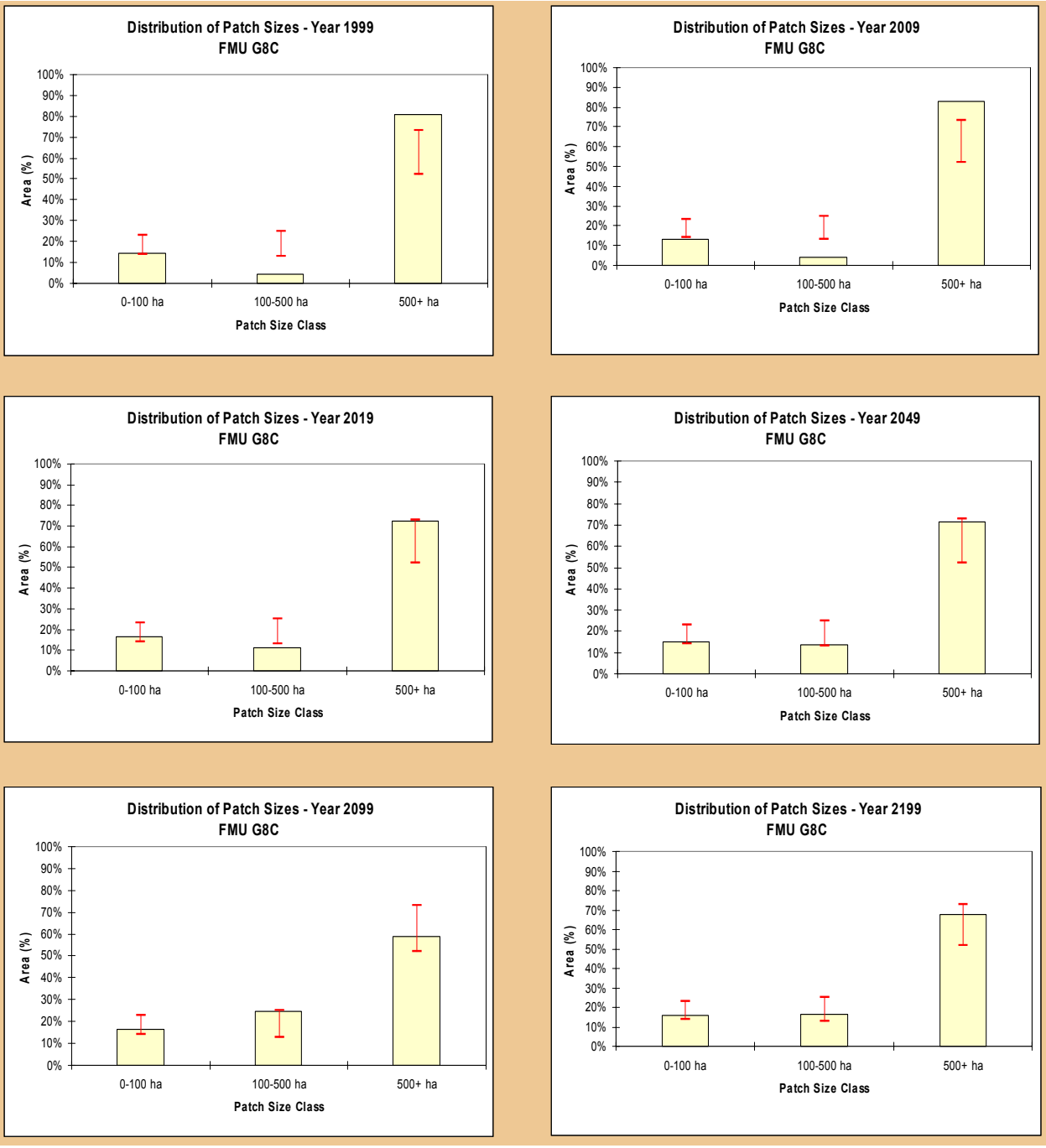
♦ Current status

Current status refers to the conditions observed for the year of 1999.



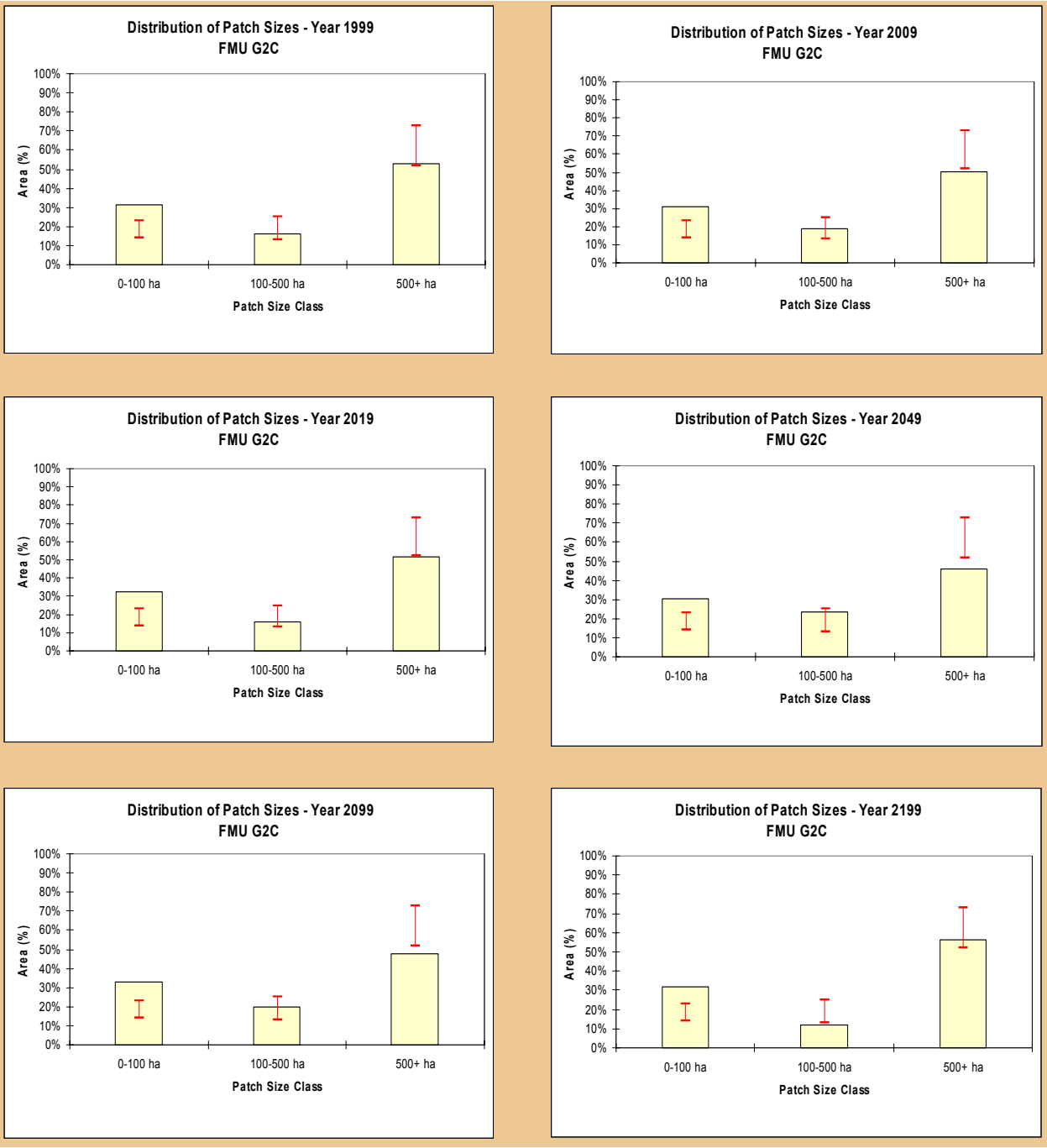
Source: ORM compiled data

FIGURE 21
FMA Distribution of Patch Size.



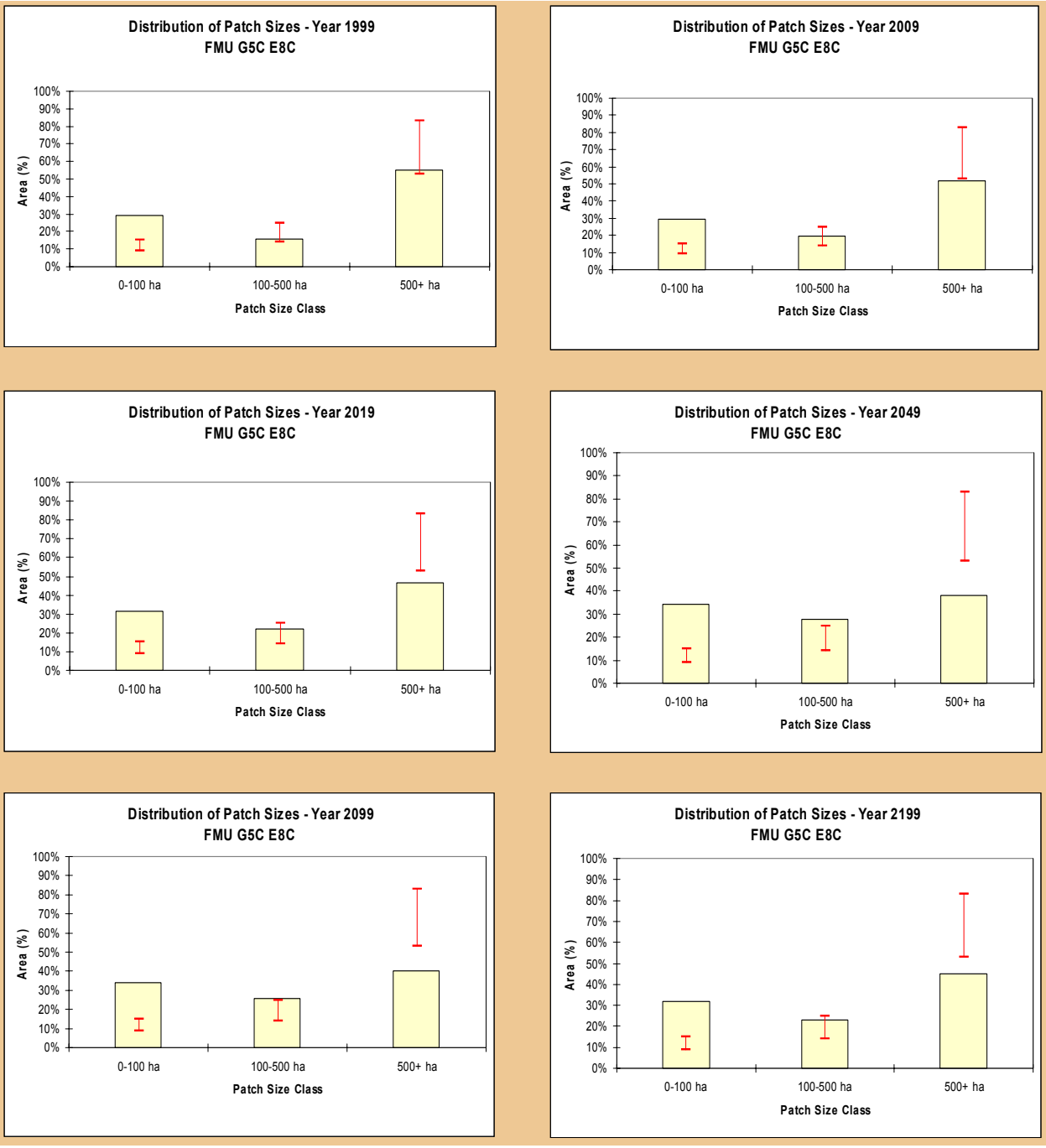
Source: ORM compiled data

FIGURE 22
FMU G8C Distribution of Patch Size.



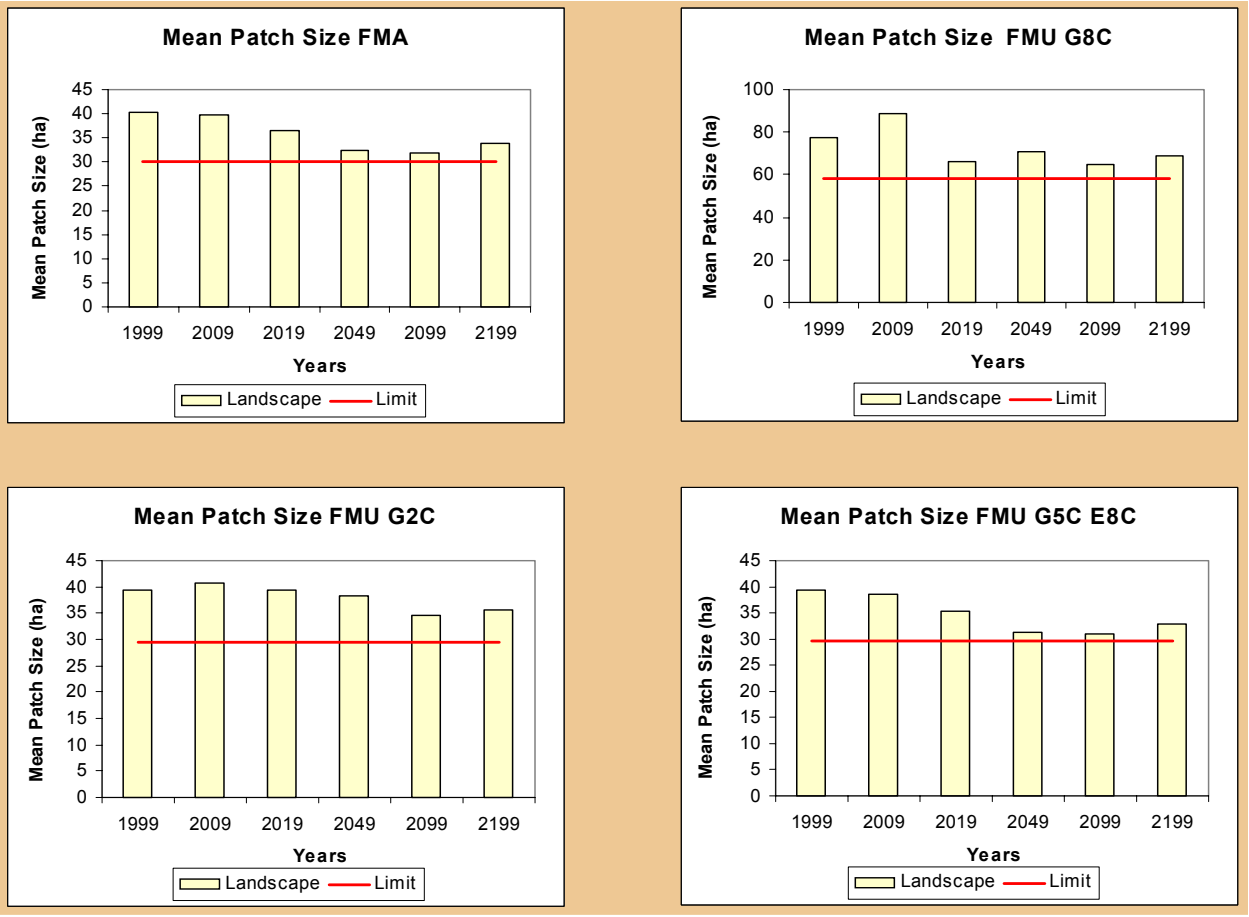
Source: ORM compiled data

FIGURE 23
FMU G2C Distribution of Patch Size.



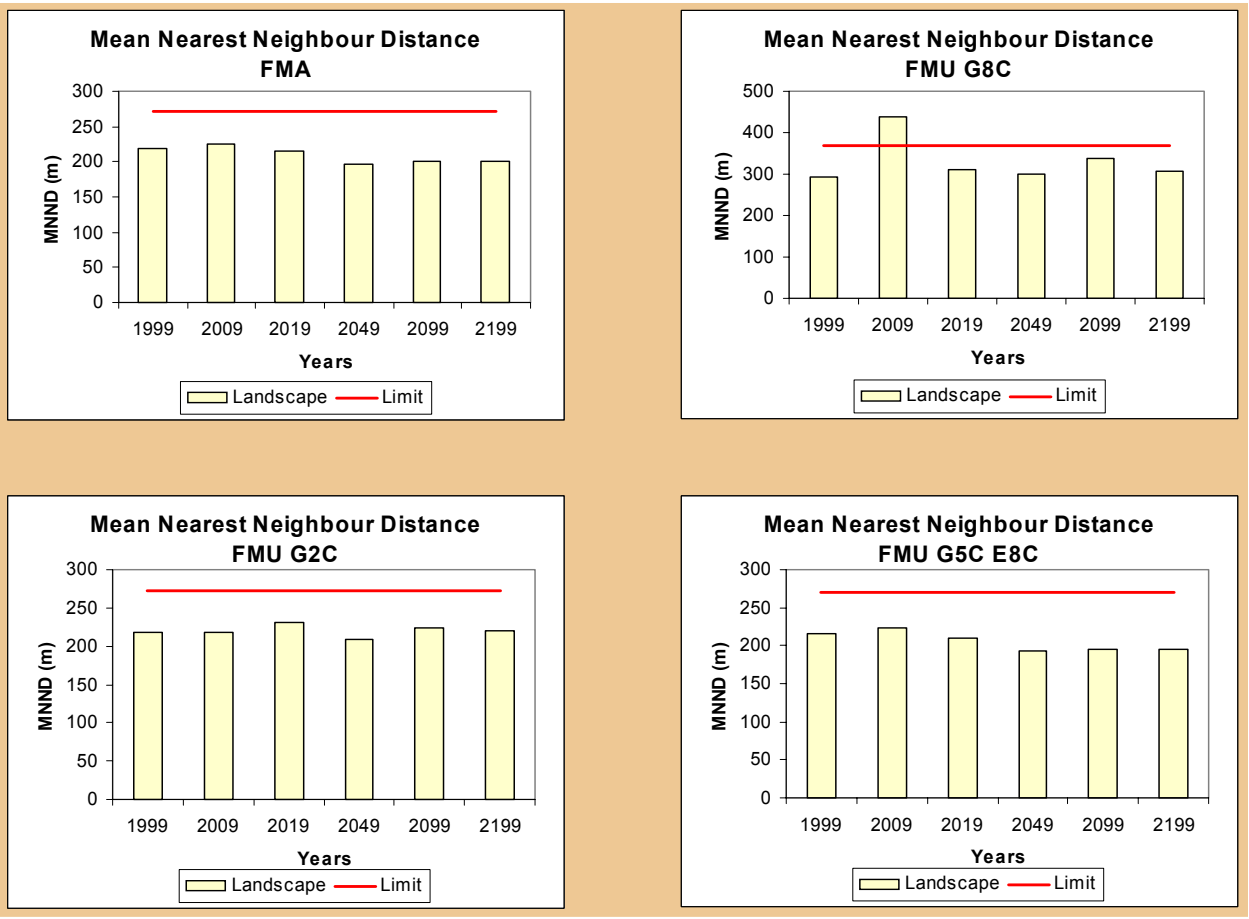
Source: ORM compiled data

FIGURE 24
FMU G5C E8C Distribution of Patch Size.



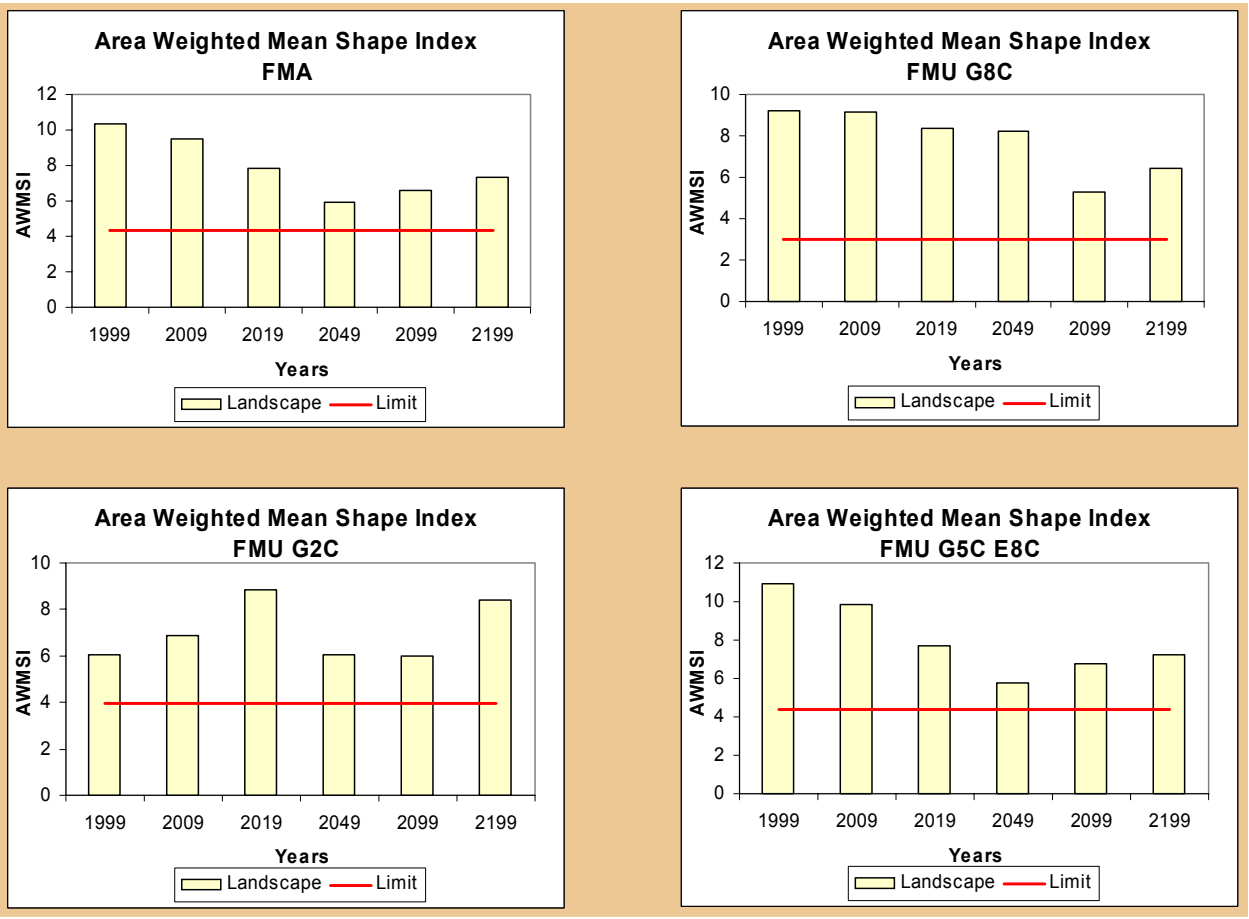
Source: ORM compiled data

FIGURE 25
Mean Patch Size for FMA and FMUs



Source: ORM compiled data

FIGURE 26
Mean Nearest Neighbour Distance for FMA and FMUs



Source: ORM compiled data

FIGURE 27
Area-weighted Mean Shape Index for FMA and FMUs

Distribution of Seral Stages
Please refer to the section "Critical Element 1a, Objective 1.2b.1" for detailed discussion on the distribution of seral stages.

Distribution of Patch Sizes
Generally, there is an abundance of smaller patches (0-100 ha) at both the FMA and FMU levels (with the exception of FMU G8C). FMU G8C has a shortage of mid-size (100-500 ha) patches (4 percent vs. the target of 13-25 percent) and it has some patches over 500 ha that represent 81 percent of this relatively small FMU. Figures 21-24 present the distribution of patch sizes at key points in time for the FMA and FMUs.

Fragmentation
MPS (mean patch size) at the landscape level is around 40 ha for all reported units with the exception of FMU G8C, where MPS is approximately 80 ha. This is attributed to the smaller size of this FMU with large patches of mature forest. Figure 25 presents the MPS at key points in time for the FMA and FMUs.

Connectivity
MNND (Mean Nearest Neighbour Distance) at the landscape level is around 220 m for all reported units with the exception of FMU G8C where the MNND is close to 300 m. This is attributed to the smaller size of this FMU with the spatial distribution of the patches. Figure 26 presents the MNND at key points in time for the FMA and FMUs.

Patch Shape
AWMSI (area-weighted mean shape index) at the landscape level is between 9 and 11 for all reported units with the exception of FMU G2C where the AWMSI is around 6. This is attributed to the patches being less complex (edge) in shape in FMU G2C. Figure 27 presents the AWMSI at key points in time for the FMA and FMUs.

♦ Forecasting assumptions and analytical methods

The forecasts presented here are based on the most current timber supply analysis and, therefore, may change as additional analyses are completed.

Distribution of Seral Stages
Please refer to the section "Critical Element 1a, Objective 1.2b.1" for detailed discussion on the distribution of seral stages.

Distribution of Patch Sizes
Analysis of the results show that it is very difficult to achieve the distribution of patch sizes as defined based on the theoretical fire-return intervals when this objective is considered secondary to other constraints in the timber supply analysis. More specifically, the existing ground rules (adjacency/green-up rules) and the maximum harvest block aggregation of 500 ha (1 000 ha in the caribou region) will likely work against

achieving the target distribution of patch sizes. The general trend is that the proportion of mid-size (100-500 ha) patches increases and the proportion of large (500+ ha) patches decreases, while the proportion of small patches remains relatively stable (around 32%). Figures 21-24 present the distribution of patch sizes at key points in time for the FMA and FMUs.

Fragmentation

Fragmentation metrics quantify the degree of isolation of elements within a landscape. This aspect of landscape configuration can influence a number of ecological processes. Evidence from mathematical modeling of population dynamics and species interactions in spatially subdivided populations and from empirical studies of bird communities suggest that the dynamics of local plant and animal populations in a patch are influenced by their proximity to other sub-populations of the same or competing species. As mentioned in the Indicator, MPS was selected as a measure of fragmentation. Cut block sizes and cut block aggregation strategies influence the MPS. The results in Figure 25 shows that the MPS exceeds the target over all time periods.

Connectivity

Connectivity is a complementary measure of the degree to which forest patches can be considered joined together on the basis of a minimum acceptable separation distance. As mentioned in the Indicator, MNND was selected as the measure of connectivity. The extent of the landscape affects the calculation of MNND because it only considers patches within the specified search radius of the focal patch that are also within the landscape boundary. The severity of this problem can be reduced if the landscape is increased relative to the average patch size and/or the search radius is decreased. More critically, the worthiness of the MNND is limited by the definition of the search radius. A search radius that has no ecological justification will produce arbitrary results; therefore, a 400-m search radius was chosen because it is an important distance with regards to moose and caribou habitat. Moose and caribou are two of the main species of special management concern in the FMA area. Figure 26 presents the MNND at key points in time for the FMA and FMUs. In 2009 in FMU G8C, the landscape level MNND exceeds the established upper limit. This is likely related to the relatively small size of the FMU.

Patch Shape

The complexity of patch shapes in combination with the area of the shapes can influence many ecological processes. Small mammal migration, woody plant colonization, and animal foraging strategies are influenced by patch shape. Many ecological effects attributed to the complexity of shape are actually related to "edge effects". In addition, shape influences the operability and economics of forest harvesting. For example, elongated harvest blocks require more road construction than compact blocks and,

thus, are more costly. Patch shape is measured by shape index that is based on the perimeter-to-area ratio that accentuates the fact that mapped cut blocks are simple in shape and usually somewhat rectangular. Where this is the case, the lack of measured complexity can be compensated operationally by feathering edges, variable retention, and cut block design and layout to create more edges relative to area.

The observed trend suggests that landscape level shape complexity decreases in the first 50-100 years and then it increases due to the aging aggregated cut blocks and the aging of set-aside, reserve areas. However, targets are being achieved in all time periods.

- **Forest management activities**
  Future spatial planning at the landscape level will be used to make adjustments to the harvesting plans to ensure the desired level of landscape structure is maintained at key points in time.
- **Implementation schedule**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.
- **Monitoring procedure**
  The landscape properties will be reported as per the monitoring program as defined in the DFMP. The DFMP will describe the important factors relating to landscape structure and the targets.
- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

2. Criterion	**Maintenance and Enhancement of Forest Ecosystem Condition and Productivity** Forest ecosystem condition and productivity are conserved if the health, vitality, and rates of biological production are maintained.
(2a) Critical Element	**Forest Health** Forest health is conserved if biotic (including anthropogenic) and abiotic disturbances and stresses maintain both ecosystem processes and ecosystem conditions within a range of natural variability.
(2a) 1. Value	**Healthy forest stands**
(2a) 1.1 Goal	**Conserve forest health**
(2a) 1.1a. Indicator	**Number of occurrences and amount of area impacted by fire, and catastrophic events of insects, disease, windfall, etc.** Fire has played a dominant role in the development and rejuvenation of stands within the boreal forest and foothill regions. Large fires tend to produce a more homogeneous pattern in structure, species composition, and age (i.e., less biodiversity at the landscape level). However, large fires have rejuvenating qualities that play a role in ecosystem condition and productivity. The goal in fire management is to reduce the number of fires and area lost to fire, while at the same time allowing for the use of fire as a silvicultural prescription to emulate the effect of fire on the landscape. In general, forests contain endemic levels of insects and disease that normally are not of management concern unless populations increase to epidemic (catastrophic) levels. Catastrophic windfall events, resulting from a number of natural and human-related causes, can produce localized conditions that are favorable for increased levels of insects.
(2a) 1.1a.1 Objective	**Limit the number of occurrences and amount of area impacted by fire, and catastrophic events of insects, disease, windfall, etc.** ♦ **Acceptable variance** The target for occurrences is zero; however, there is an inherent level of variability built in to natural processes and the Company develops a Forest Protection Plan for managing risks. The Company has no control over human-caused (i.e., public), other industrial fires, or lightning-caused fires; however, we do have control over fires caused by Company operations. The acceptable variance for Company-caused fires is zero. The risks associated with the other fires

are managed by assisting the Alberta Environment during high hazard conditions to reduce the potential area impacted.

The acceptable variance for catastrophic events of insects, disease, or windfall on the FMA area is zero.

Any fire, or other events identified in the objective, must be investigated and looked at for preventative action.

- **Current status**

As reported in the Forest Protection Plan (Canfor 2000e), there have been 175 fires in the FMA area during the last 14 years (1986 - 1999 inclusive), impacting a total of 183 ha. The average number of fire occurrences per year in the past 14 years has been 12.5, impacting an average of 13.1 hectares a year. Forty three percent (79 ha) of the burned area has been reforested.

There have been no catastrophic events of insect and disease in the FMA area since 1964.

Prior to 1997, no windfall assessment surveys were conducted within the FMA area; however, windfall was addressed operationally, as found. In 1997, a windfall assessment survey was conducted in the FMA area. As a result, a number of patches (130 hectares) in FMU G5C E8C in a localized area were identified as catastrophic windfall (i.e., area(s) of windfall that significantly affect the AAC). These patches were harvested in the 1998/1999 season, salvaging approximately 32 000 m^3.

Based on a reconnaissance survey in FMU G2C, approximately 231 hectares were harvested in 1999 in a catastrophic windfall area, salvaging approximately 39 500 m^3.

- **Forecasting assumptions and analytical methods**

Alberta Environment prepares fire weather, fire hazard, and fire spread indices that assist to forecast forest protection personnel and equipment requirements.

Canfor utilizes the Annual Report of Forest Health (Alberta Environmental Protection 1999a) to assist in forecasting the risk of outbreak of specific insect species.

- **Forest management activities**

Current forest management practices fall under provincial pre-suppression and wildfire suppression programs as well as insect and disease monitoring and control programs (Alberta Environmental Protection 1996a). Canfor works with the provincial government to assist in the delivery of these programs. Canfor's Forest Protection Plan provides greater detail on our programs for insect and disease as well as fire prevention.

To limit the occurrences of fire, the following activities occur:

- Development of a Forest Protection Plan including such activities as:
  - Assignment of Canfor personnel as fire duty officers each weekend during the fire season to act as the first contact for the Alberta Environment; and
  - Undertaking of infrared scanning each spring of all areas in which pile burning has occurred (within the recent winter months) in order to detect any hold over fires and to take the appropriate action to prevent a fire outbreak.
- Providing financial aid to supplement deployment of fire protection resources; and
- Research into silvicultural applications emulating fires is currently being undertaken by the EMEND Project, which is in part funded by Canfor (Canadian Forest Service 2000).

An assessment in FMU G2C will be conducted to determine current catastrophic windfall areas and any areas found will be incorporated into the 2001 AOP.

- **Implementation schedule**
  The programs for monitoring and addressing fire and catastrophic events of insect, disease, and windfall are currently in place.
- **Monitoring procedure**
  The number and occurrences of fires are tracked and reported annually in the Forest Protection Plan.

  Insect and disease outbreaks and catastrophic windfall events are monitored and appropriate action taken to reduce their spread.
- **Linkages between strategic and operational plans**
  Fire control and prevention, insect and disease monitoring, and practices to address windfall are primarily operational functions that will be described in the DFMP.

(2b) Critical Element

Ecosystem Resilience

Ecosystem resilience is conserved if ecosystem processes and the range of ecosystem conditions allow ecosystems to persist, absorb change, and recover from disturbances.

(2b) 1. Value

Ecosystem resilience

(2b) 1.1 Goal

Sustain capability of ecosystem to recover from both natural and human-caused disturbances

Ecosystems with a superior regenerative capacity and a varied composition of forest types (yield groups) and age classes (seral stages) are generally considered to be more resilient and, thus, more sustainable (CCFM 1997).

(2b) 1.1a. Indicator

The amount of area in the regenerated yield group

Successful regeneration of harvested sites is fundamental to sustainable forest ecosystems and continued productivity. The resilience and continued presence of forested lands is dependent on maintaining regeneration standards to support sustainability. It is therefore essential to make certain that harvested sites are successfully regenerated and are as productive as they are predicted to be in the DFMP.

(2b) 1.1a.1 Objective

To regenerate 100% of the harvested area as per the regenerated yield group as defined by the DFMP

- **Acceptable variance**
  Acceptable variance is plus or minus 10% of the area of regenerated yield groups, provided that the overall AAC is sustained (within -5%).

- **Current status**
  The 2000 ecosite classification field program, which is fundamental to the silviculture prescription program, is presently incorporating the regeneration strategy as defined in Table 13. The 2000 Silviculture AOP has incorporated the regeneration strategy for the 2000/2001 timber year cut units. However, the regeneration strategy is still subject to approval by Alberta Environment, as it forms part of the DFMP.

- **Forecasting assumptions and analytical methods**
  The following are the key assumptions for the regeneration strategy, all of which have been shown in the past to be reasonably accurate:

  - Early crop establishment (within 18 months) will achieve projected breast height ages within the stated times;
  - Silviculture treatment(s) successfully put the harvested stand on the growth and yield trajectory of the regenerated yield group;
  - Allowances for plantation failures, regeneration delay, and understorey protection are accurate; and
  - Tree improvement multipliers represent the actual improvement that will occur.

  The results of the timber supply analysis simulations will determine the current distribution of regenerated yield groups across the landscape. There are six scenarios that will be compared in order to understand the

TABLE 13
Regeneration Strategy

Yield Group	Natural Subregion	Regenerated Yield Group	Years to Breast Height*	Tree Improvement Multiplier**
1	All	2	4	0.50
2	All	2	4	0.50
3	CM, DM, LF, PP, SA	17	8	1.00
3	UF	17	11	1.00
4	All	4	5	0.50
5	CM, DM, PP	16	8	1.00
5	UF, LF, SA	5	0	1.00
6	All	17	0	1.00
7	All	7	4	0.50
8	CM, DM, LF, PP	8	6	1.07
8	UF, SA	8	9	1.00
9	CM, DM, LF, PP	9	6	1.07
9	UF, SA	8	9	1.00
10	CM, DM, LF, PP	8	6	1.00
10	UF, SA	8	9	1.00
11	CM, DM, LF, PP	11	7	1.07
11	UF, SA	8	9	1.00
12	All	12	15	1.00
13	All	13	23	1.00
14	UF, SA	14	7	1.00
14	DM, PP	14	10	1.00
15	DM, PP	15	9	1.00
15	CM, LF	16	9	1.00
15	UF, SA	16	12	1.00
16	CM, DM, LF, PP	16	9	1.00
16	UF, SA	16	12	1.00
17	CM, DM, LF, PP	17	9	1.00
17	UF, SA	16	12	1.00

Source: Canfor 2000: Table 11

*Includes an allowance for plantation failure and regeneration delay; an entry of 0 in this field indicates understorey protection.

**A value of less than 1.0 indicates a preference given to deciduous species; tree improvement multiplier indicates an allowance for non-treated areas.

relationships among timber supply constraints to timber supply and regeneration strategy (Canfor 1999b).

- **Forest management activities**
  The forest management activity is to incorporate the regeneration strategy in the development of regenerated growth and yield tables that will be used in the timber supply analysis.

- **Implementation schedule**
  All regeneration strategies, plans, and activities will follow the strategic direction as outlined in the DFMP. This means that harvested sites will

be treated using the appropriate techniques for the particular ecosite to ensure that the regenerating stand is on the growth and yield trajectory of the regenerated yield group.

In the interim, some of the strategies developed for the plan, such as the regeneration strategy, are being implemented in anticipation of approval in order to reduce time lags in meeting DFMP objectives.

- **Monitoring procedure**
  The regeneration strategy defined in the DFMP will be compared to planned and actual silviculture activities to ensure compliance to the acceptable variance. If results are below the acceptable variance over a 5 year period, a review of the effects of such changes on the DFMP will be evaluated. This will be reported on an annual basis in the Annual Performance Monitoring report and the 5 year Forest Stewardship Report.
- **Linkages between strategic and operational plans**
  All regeneration strategies, plans, and activities will follow the strategic direction as outlined in the DFMP.

(2b) 1.1b. Indicator

The amount of area in each seral stage at present and key points in time

Seral stage distribution is important for the conservation of ecosystem resilience because it provides for, over the long-term, a full range of ecosystem types and successional habitats that allow ecosystems to persist, absorb change, and recover from disturbances.

(2b) 1.1b.1 Objective

Maintain seral stages within the natural disturbance regimes at present and key points in time

The target (natural) seral stage distribution is one that approximates the expected distribution created by natural disturbance regimes within the two natural regions, Foothills and Boreal Forest (Figure 4). The natural disturbance regime has been modeled by using a theoretical fire-return interval.

- **Acceptable variance**
  For this planning horizon (200 years), the acceptable variance is to be within the range of the natural disturbance regimes for seral stages in the FMA and FMUs (G8C, G2C, and G5C E8C) as indicated in Figures 5-8, respectively. The acceptable variance represents a combination of both natural regions, where they occur.

  Figures 9 and 10, Foothills and Boreal Forest natural regions, are provided only as supplementary information.

  The range of natural disturbance is represented by the "red" line in Figures 5-10, whereas the "yellow" bar represents the current or projected distributions.

- **Current status**
  The area of each seral stage by year in the FMA, FMUs (G8C, G2C, and G5C E8C) and natural regions (Foothills and Boreal Forest) is provided in Tables 4-9, respectively.

  Figures 5-8 indicate the present and forecasted distributions for the FMA and FMUs as compared to expected natural distributions. The observed differences are caused primarily by fire prevention and control and by anthropogenic disturbances.

- **Forecasting assumptions and analytical methods**
  Seral stage distributions under a natural fire regime were modeled by using a theoretical fire-return interval (Olympic Resource Management 2000). The amount of area in each seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) has been forecasted on the landbase at each key point in time (Figures 5-8). The key points in time are at years 0, 10, 20, 50, 100, and 200, where 1999 represents year 0. It is assumed these time periods provide a reasonable picture of the variability of seral stage over time. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

- **Forest management activities**
  The amount of each seral stage and its distribution will be compared to the amount of seral stage expected from a theoretical fire-return interval. Adjustments will be made to the harvest schedule as required to ensure the desired seral stage distribution is obtained over time.

- **Implementation schedule**
  Preliminary comparisons between current status and the target seral stages have been completed. All future harvesting plans will follow the strategic direction as outlined in the DFMP and be adjusted as required to meet the desired seral stages over time.

- **Monitoring procedure**
  The amount of area of each seral stage that is on the landscape will be compared to the expected natural distributions at key points in time.

- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(2b) 1.1c. Indicator

Timeframe for treating harvested areas

Maintaining the health and productivity of forest ecosystems is a vital component to responsible stewardship and sustainable development of forested lands. It is important that harvested stands be treated properly and promptly in order to maintain the resilience and, thus long-term use, of forested land. Prompt treatment will also reduce the lag time between harvest and success-

ful regeneration, which will restore overall ecosystem productivity and resilience more rapidly.

(2b) 1.1c.1 Objective

All harvested sites are treated within 18 months after the end of the timber year

- **Acceptable variance**
  A level of variance of +3 months is acceptable in order to accommodate the occurrence of fire and periods of extreme weather conditions, including floods and drought. These natural events could delay the treatment of harvested areas.
- **Current status**
  Section 141.1(1) of the Timber Management Regulation (Alberta Regulation 60-73) states that reforestation in a cut unit must occur within two years after the end of the year of the cut. All harvested areas in the FMA area are properly treated within 18 months after the end of the timber year as of 1996 (Canfor 2000h), thereby exceeding the Alberta Provincial regulations pertaining to reforestation.
- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  Pre-harvest silviculture prescriptions (PHSP) will be assigned to all proposed harvested areas in order to plan silviculture activities in a timely manner to meet the stated objective.
- **Implementation schedule**
  It is currently implemented as of the 1996 timber year.
- **Monitoring procedure**
  All harvested sites will be monitored to ensure that site treatment occurs within 18 months from the end of the timber year in which the block was harvested. Silvicultural records will be maintained.
- **Linkages between strategic and operational plans**
  All site treatment strategies will follow the strategic direction as outlined in the DFMP.

(2b) 1.1d. Indicator

Soil productivity

As stated in the CSA Matrix (Appendix 6), soil productivity is covered in "Critical Element 3b, Goal 1.1" with three (3) indicators and three (3) objectives. Soil productivity is a Value in 3b, but the FMAC also viewed soil productivity as an indicator for "Critical Element 2b, Goal 1.1". Therefore, the write up for "Critical Element 3b, Goal 1.1" applies to this section as well.

(2c) Critical Element	**Ecosystem Productivity** Ecosystem productivity is conserved if ecosystem conditions are capable of supporting all naturally occurring species.
(2c) 1. Value	**Ecosystem productivity**
(2c) 1.1 Goal	**Maintain ecosystem productivity**
(2c) 1.1a. Indicator	**Level of suitable habitat for species of special management concern** Consultation with members from the Forest Ecosystem Management Task Force, Canfor, and the FMAC resulted in the selection of the following seven (7) species of special management concern: moose (*Alces alces*), pine marten (*Martes americana*) pileated woodpecker (*Dryocopus pileatus*), barred owl (*Strix varia*), woodland caribou (*Rangifer tarandus caribou*), bull trout (*Salvelinus fontinalis*), and trumpeter swan (*Cygnus buccinator*). Out of this group, the first four were selected for HSI modeling and the last three are to be managed by means of habitat constraint modeling. These seven species were selected because they represent a broad and variable range of habitat characteristics. Thus, if the habitat is maintained and available for these species, it is assumed that the FMA area will contain a wide range of habitat conditions suitable for all other species in the planning area.
(2c) 1.1a.1 Objective	**Maintain habitat conditions required by identified species of special management concern utilizing HSI models** The techniques used to evaluate the suitability of habitat for specific species are called habitat suitability index (HSI) models. They are able to predict the value of a habitat to a specific species, based on life variables related to food, availability of cover, and the physical size of the potential habitat. A HSI value of 0 indicates the lowest habitat and a value of 1 indicates the optimum habitat. HSI can be categorized into a scale of habitat quality as nil, low, medium, and high. Carrying capacity, the potential number of animals that would occur in a perfect unit of habitat (HSI = 1.0), can be estimated by multiplying the predicted number of animals by the total available habitat (De La Mare 1998). ♦ **Acceptable variance** The acceptable variance for the four selected species is to maintain the carrying capacity within -10% of the current status at key points in time (0, 10, 20, 50, 100, and 200 years). The solid "red" line in Figures 11, 12, and 13 represents the acceptable variance for 3 of the 4 selected species (barred owl is currently unavailable). The "yellow" bars represent the current and projected carrying capacities.

- **Current status**

  Available habitat was assessed from resultant data obtained from the most recent AAC analysis, with the harvest sequencing applied; therefore, changes may arise as additional analyses are completed.

  The current (year 1999) HSI-Class percentages (nil, low, medium and high) and carrying capacity per hectare for species moose, pine marten and pileated woodpecker, are shown in Figures 14, 15 and 16, respectively. The data is shown for the entire FMA and by FMUs (G8C, G2C, and G5C E8C).

  An existing HSI model for barred owl will be used to calculate the carrying capacity for the species; however, the preliminary results are not yet available.

- **Forecasting assumptions and analytical methods**

  The assumptions of the HSI models themselves are described in Beck et al. (1996) and De La Mare (1998). The key assumptions of the HSI models being used are:

  - A larger area of poorer habitat is equivalent to a smaller area of higher quality habitat;
  - The quantity and quality of habitat can be used to estimate the maximum potential number of animals that it is able to support; and
  - The data available to drive the model is representative of the actual conditions.

- **Forest management activities**

  In order to apply the HSI models, the relationship between important habitat characteristics and stand variables was evaluated and habitat values determined for each 20 year breast height age class for each yield group (Canfor 1999c). The habitat models have been applied to the landscape at key points in time (0, 10, 20, 50, 100, and 200 years) to determine the amount of potential habitat available (carrying capacity) for the selected species.

  The change in carrying capacity over time for moose, pine marten and pileated woodpecker is demonstrated in Figures 11, 12 and 13. The data is shown for the entire FMA and by FMUs (G8C, G2C, and G5C E8C).

  On an FMA level, carrying capacities do not fall below the acceptable variance, with the exception of the pileated woodpecker which occurs in year 2049 (a variance of 16% as opposed to the 10% acceptable) and beyond. On an FMU level, the carrying capacities for moose do not fall below the acceptable variance. On the other hand, pine marten and pileated woodpecker fall below the acceptable variance in specific FMUs over certain periods of time (Figures 12 and 13).

Further evaluation of carrying capacities that fall below the acceptable variance will be conducted and the results considered in current or future plan submissions.

Canfor will work closely with the Alberta Environment, Land and Forest Service (LFS) and Natural Resources Service (NRS) and the Forest Management Advisory Committee (FMAC) to avoid management practices that place species of special management concern at risk (Canfor 1997).

Canfor is also working on models that utilize a HSI-type approach to evaluate wildlife habitat at the landscape level (1:100 000 scale). These models represent a variety of indicator wildlife species grouped into guilds (Canfor 1998b) and will then be applied at key points in time. If potential problems are identified, information from this new landscape level habitat evaluation project will provide insight into the development of preventative and mitigative strategies.

- **Implementation schedule**

  The HSI models are currently being used in the evaluation of results from the timber supply analysis for the DFMP. This wildlife habitat evaluation (using HSI) will be completed by March 31, 2001.

  The new landscape level habitat evaluation project will be completed by March 31, 2001; however, validation and testing of the model results and development of operational strategies will be completed by May, 2003.

- **Monitoring procedure**

  Harvesting activities will be monitored (as per forest management activities) to ensure that they follow the management strategies defined in the DFMP.

- **Linkages between strategic and operational plans**

  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(2c) 1.1a.2 Objective

Maintain habitat conditions required by identified species of special management concern, using habitat constraint modeling

- **Acceptable variance**

  Woodland Caribou

  The target for woodland caribou is to have no more than 20% of the area in pioneer or young seral condition and at least 20% of the area must be in old seral condition (Table 10). The acceptable variance for the pioneer/young seral condition is no more than 25% of the area. The acceptable variance for the old seral condition is to be no less than 15% of the area.

Bull Trout

Within a defined watershed, total vegetated cover removal will not exceed 40% ECA above the H60. Total vegetated area includes the forested and non-forested vegetated covers (refer to "Critical Element 3c, Objective 2.1a.1" for further information regarding the H60 and ECA).

Trumpeter Swan

Zero variance with respect to harvesting within the no harvest buffers unless approved by Alberta Environment.

- **Current status**

Woodland Caribou

There are two woodland caribou herds within and adjacent to the FMA area: La Le Pech and the Little Smoky. Their total range is 466 127 hectares. The total amount of Caribou Area within the FMA area is 70 228 hectares as depicted in Figure 17 (representing 15% of the total area and 10.8% of the total FMA area of 649 160 hectares).

Table 10 displays the current status (1999) and projected status for pioneer/young and old seral stage distribution. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

Bull Trout

The total bull trout area identified within the FMA area is 242 828 hectares as indicated in Figure 18. This represents 37% of the total FMA area.

The H60 line has been determined for all watersheds aggregated up to a minimum of 500 ha in the bull trout area (Figure 19). There are a total of 163 watersheds in the bull trout area. More detailed description of the data is in Appendix 7, Tables 1-3. A summary of watersheds above the ECA of 35% flagged for concern is presented in Table 11. Further information regarding the flagging (concern areas), refer to the section on Forecasting assumptions and analytical methods below.

Trumpeter Swan

Alberta Environment, Natural Resource Services (NRS) has identified 45 areas, which have been buffered to protect nesting sites in the FMA area (Figure 20).

- **Forecasting assumptions and analytical methods**

Woodland Caribou

The constraints, defined under the forest management activities, used in the timber supply modeling for the DFMP will ensure woodland caribou are not adversely impacted by Canfor's operations.

Bull Trout

It is assumed that streamflow maximums will not adversely impact the ecosystem if no more than 20-40% of the total vegetated cover is removed within the area above H60 within a defined watershed.

The following will be used to evaluate potential watersheds that may require further adjustments:

- A base 0 (Equivalent Clearcut Area (ECA) value) has been calculated (Appendix 7, Table 1) which includes the 1999 Annual Operating Plan proposed areas as part of the harvested areas. The need to do this is to demonstrate present ECA values that will not change;
- ECA percentage report (Appendix 7, Tables 2 and 3), for year 10 (2009) and year 20 (2019), was based on the most recent AAC analysis; and
- The following criteria will be used to flag areas of concern:
  - ECA >35% in bull trout area; and
  - Visual representation.

For a more detailed discussion around ECAs and H60, see "Critical Element 3c, Objective 2.1a.1" or "Critical Element 4a, Objective 1.2a.1".

Trumpeter Swan

Buffer areas will be maintained, unless changes are recommended or approved by the LFS.

Forest management activities

Woodland Caribou

Cover constraints are being applied to forested stands identified within the Caribou Area (Figure 17) as follows:

- No more than 20% of the area can be in pioneer or young seral condition;
- At least 20% of the area must be in old seral condition;
- Maximum opening size of 1 000 ha; and
- 2 m green-up.

In addition, Canfor, as a member of the West Central Alberta Caribou Standing Committee (WCACSC), is participating in a three to five year research program which began in April 1998 (Rohner 1999). There are three components of this program:

- Predation;
- Forest renewal; and

- Responses to human infrastructure.

Bull Trout

Bull trout habitat is dependent on the amount of vegetated cover within a watershed. Vegetated cover removal must be controlled to maintain adequate habitat. The absolute amount of Equivalent Clearcut Area (ECA) that can be supported without adverse impacts to bull trout is not well understood; it differs depending upon watershed sensitivity. Given this lack of understanding, it is important to monitor the amount of ECAs.

Trumpeter Swan

Two hundred (200) metres of no harvest buffers are maintained around identified trumpeter swan areas to protect nesting sites, unless changes are recommended or approved by the LFS.

- **Implementation schedule**

Woodland Caribou

The cover constraints are currently being implemented in the Annual Operating Plan.

Bull Trout

ECA values have been calculated and data will be utilized in the 2001 AOP.

Trumpeter Swan

Protection of identified nesting sites has been implemented and will be maintained.

- **Monitoring procedure**

Woodland Caribou

- Canfor will monitor the DFMP cover constraints as stated in the forest management activities; and
- The status of the WCACSC research program will be monitored. Data coming from this research program will be used to enhance forest management within the Caribou Area (Figure 17).

Bull Trout

The Equivalent Clearcut Area (ECA) within the defined watersheds will be tracked.

Trumpeter Swan

Verify the presence of nest sites as identified in the active AOP planning areas and incorporate any new nest sites into future plans.

- **Linkages between strategic and operational plans**

All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(2c) 1.1b. Indicator

Number of ecosite phases distributed across the FMA area

Ecosite phases are based either on canopy species composition or the tallest vegetation layer, in the absence of a tree canopy. Ecosite phases are similar to the defined yield groups. However, ecosite phases represent substantially more ecological information, relating to productivity and ecosystem health than yield group alone.

Ecosite phases are subdivisions of ecosites, which are ecological units that develop under similar environmental influences (climate, moisture, and nutrient regimes) (Beckingham et al. 1996). They are functional units that have a characteristic range in plant communities.

The tree canopy and canopy-dependent factors, including understorey species abundance and composition and litter pH, act together to influence the type and quantity of organic matter, rates of decomposition, and a site's nutrient availability (Beckingham et al. 1996). Thus, identifying ecosite phases and understanding their distribution provides a wealth of ecological knowledge, summarized as comprehensively mapped units. Ecosite phases provide information for evaluating and maintaining the productivity of natural ecosystems.

(2c) 1.1b.1 Objective

Identify ecosite phase distribution objectives for application in the next DFMP

- **Acceptable variance**
  Not applicable until the research program is completed.

- **Current Status**
  The ecosite classification system was recently revised (GDC 2000) to include certain specific ecosites, ecosite phases, and plant community types that were not defined in the original field guides (Beckingham et al. 1996; Beckingham and Archibald 1996). This revision is currently being used for the 2000 ecosite classification field program.

  Information collected from this field program revision as well as data from other programs such as PSP and NIVMA plots is currently being analyzed for quality and integrity as inputs into the revised, predictive ecosite classification model.

- **Forecasting assumptions and analytical methods**
  The modeling system employed for mapping the ecosite phases uses a variety of ecological data: AVI, ecological plot data, LFS ecological plot data, ecosection classification, digital elevation models (DEM) and DEM derived data (e.g., slope, aspect), statistical techniques, and expert knowledge to identify and classify ecosites and ecosite phases. The methodology and assumptions will be explained in the final ecosite phase classification report, which is due by March 31, 2001.

- **Forest management activities**
  A strategy will be developed, which uses ecosite classification and ecosite phases in the strategic and operational planning.
- **Implementation schedule**
  There are two components to be completed:
  - Completion of the ecosite phase report and map by March 31, 2001; and
  - Linkages of ecosite classification and ecosite phases will define strategic direction for the future DFMP and operational planning by 2005.
- **Monitoring procedure**
  Monitoring will be undertaken of the quality and integrity of ecosite classification data being collected for various programs such as pre-harvest silviculture prescription, NIVMA, and PSP plots. The data from these programs will be used to validate and improve the predictive ecosite classification model.
- **Linkages between strategic and operational plans**
  The revised ecosite classification will be used for silviculture prescriptions to meet the regeneration objectives, to be defined in the DFMP.

(2c) 1.1c. Indicator

Measurement of tree growth (site index) based on yield curves (moisture and nutrient regime)

A common measure of the overall productivity of forested ecosystems (inferred through tree growth) is site index. Site index is commonly referred to as the predicted height for a specific tree species at a given breast height age (Beckingham et al. 1996).

The measurement of tree growth is directly related to the productivity of the site. Consequently, tree growth is a general indication of the overall site productivity.

(2c) 1.1c.1 Objective

Maintain growth and yield projections for tree species, as stated in the DFMP

- **Acceptable variance**
  A decrease of no more than 5% from the growth and yield projections, as outlined in the DFMP, will be considered acceptable. Measured growth or yield above the projected values is acceptable.
- **Current status**
  Yield curves, which predict the growth (height) of a particular tree species over time, have been developed for the FMA area for each tree species within each natural subregion (Canfor 1998a).

Yield tables, projecting the site height, volume (m^3/ha), periodic annual increment (PAI), and mean annual increment (MAI) have been developed for the dominant softwood and hardwood species for each yield group in each natural subregion (Canfor 1999e).

- **Forecasting assumptions and analytical methods**

The forecasting assumptions and analytical methods pertaining to the maintenance of growth and yield projections for tree species is outlined in the Growth and Yield Information Package, Detailed Forest Management Plan 1999 (Canfor 1999h). The following are the key assumptions for the regeneration strategy:

- Projected breast height ages will be achieved within the stated times;
- Silviculture treatment(s) successfully put the harvested stand on the growth and yield trajectory of the regenerated yield group;
- Allowances for plantation failures, regeneration delay, and understorey protection are accurate; and
- Tree improvement multipliers represent the actual improvement that will occur.

Site index values were calculated using temporary and permanent sample plot data (TSP and PSP, respectively) (Canfor 1999f). The site index models were subsequently evaluated using PSP data to ensure that the models accurately predict growth and yield values. Statistical and graphical validation of actual PSP height growth trajectories versus tree-based height growth was carried out to evaluate the models.

The yield tables were developed from models that used the TSP data collected in 1997.

Similar to the site index models, the volume-height models used to develop yield (volume) projections were validated using PSP data (Canfor 1999g). This validation was performed to confirm whether the volume-height models provide an acceptable estimation of actual values.

- **Forest management activities**

Operational (silviculture) plans will be developed in order to achieve the growth and yield projections, as outlined in the DFMP.

- **Implementation schedule**

Growth and yield projections and site index curve development have been completed. The implementation strategy will be outlined in the DFMP.

- **Monitoring procedure**

Canfor's PSPs and other growth and yield programs will be used to evaluate the growth and yield projections in non-harvested and regener-

ating stands. The data will be collected and analyzed within a regular schedule that will be detailed in the DFMP.

Four basic components of growth and yield will be monitored:

- Validation of growth and yield forecasts:
  - The growth and yield models will be validated to ensure that the predicted values are within the range of observed values.
- Performance standards will be monitored:
  - Early establishment (within 18 months);
  - Silviculture prescription described in the Silviculture AOP; and
  - Predicted heights (1.3 m) are achieved at predicted ages.
- Compliance monitoring:
  - Planned activities will be monitored to ensure they are implemented as stated in the DFMP.
- Long-term monitoring:
  - Growth and yield will be monitored, via PSPs, to ensure predicted values are realized over the long-term.

♦ **Linkages between strategic and operational plans**

All silviculture prescriptions will follow the strategic direction outlined in the DFMP.

3. Criterion

Conservation of Soil and Water Resources

Soil and water resources and physical environments are conserved if the quantity and quality of soil and water within forest ecosystems are maintained

(3a) Critical Element

Physical Environments

Physical environments are conserved if the permanent loss of forest area to other uses or factors is minimized, and if rare physical environments are protected

(3a) 1. Value

Gross landbase

(3a) 1.1 Goal

Minimize loss of landbase

Roads, wellsites, powerlines, pipelines, recreational sites, campsites, and gravel pits are all examples of dispositions that are withdrawn from the landbase by either the forest industry or the oil and gas industry. Many are withdrawn for about 10-20 years; therefore, they are considered permanent. Once no longer required, they are reclaimed and there is a process for adding the area back into the FMA area.

(3a) 1.1a. Indicator

The amount of productive area Canfor utilizes for future permanent roads (LOC)

Permanent roads are those roads that are managed through the License of Occupation (LOC) disposition process. All permanent roads have been excluded from the landbase in the net down process (Canfor 2000) using all of the following methods:

- AVI standards version 2.1 (Alberta Environmental Protection 1991);
- Additional roads buffered utilizing GIS methodology; and
- A 2% reduction on all yield tables (to allow for future roads).

(3a) 1.1a.1 Objective

To have less than 2% of productive area in Canfor's future permanent roads (LOC)

The total timber harvesting (productive) landbase of the FMA area is 509 459 ha, and the acceptable amount of new permanent roads is less than 2% of the productive landbase (10 189 ha).

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  The existing permanent roads in the FMA area do not contribute to the forested landbase. Consequently, they have been part of the net down for the allowable annual cut. Only main haul roads are constructed for permanent access, and these are managed through the License of Occupation (LOC) disposition process.

Currently, Canfor has not constructed any new LOCs in the FMA area since May 1, 1999. A new LOC road is planned for construction summer 2000.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  All Canfor's future permanent roads will be managed to ensure utility for all parties (integration) and to promote common corridors with other industrial activities where possible. Thus, all parties must effectively communicate their road building and construction plans.
- **Implementation schedule**
  All LOCs constructed as of May 1, 1999 will be tracked.
- **Monitoring procedure**
  All Canfor's future permanent roads will be digitized into the GIS. This procedure will be carried out on an annual basis for each new permanent road that Canfor constructs.

  A 5 year Road Development Plan map is part of the General Development Plan (GDP) that is submitted with the Annual Operating Plan on an annual basis. The actual and projected amount of road to be built will be tracked in the plan, commencing in May, 2001.
- **Linkages between strategic and operational plans**
  This objective has been communicated to operational staff to minimize the amount of permanent road construction.

(3a) 1.1b. Indicator

The amount of area permanently lost to other industry activities

All permanent dispositions built as of May 1, 1999 have been excluded from the landbase using AVI standards version 2.1 (Alberta Environmental Protection 1991).

There are no deductions made in the AAC for future oil and gas permanent withdrawals because oil and gas compensates the forest industry by paying for timber damages. Timber damage assessments (TDA) are calculated for all withdrawals from the landbase, based on area and stand type. The timber damage monies collected are used to offset and replace the AAC.

Salvaged wood is not AAC chargeable because compensation is received as described above; therefore, it is important that all accessible salvaged wood is utilized.

Seismic lines are not considered a permanent deduction. Therefore, Canfor has taken a net down on the yield tables of 1% (Canfor 2000).

These permanent withdrawals take many years to become part of the productive forestlands again. Working co-operatively with the other industries is important in maintaining the productive landbase.

(3a) 1.1b.1 Objective

To minimize loss of area by working with other parties

The rate at which these current and future landbase withdrawals revegetate to commercial tree species will affect the long-term sustainability of current harvest levels for the forest industry (Stelfox and Wynes 1999). The key means of minimizing loss of area is to communicate plans with other industries and integrate these plans, where feasible. These activities will also assist in meeting "Critical Element 4c, Objective 1.3a.1".

- **Acceptable variance**

  The Company has no direct control over the amount of other industries activity that occurs in the FMA area; we can only monitor trends and communicate with the companies on an informal basis

  The data listed in Table 14 will be monitored and if the variance in area withdrawn (excluding seismic) exceeds 10% of the highest value in the past 5 years, then a concern around the amount of other industrial activity will be raised with the Alberta Environment and actions will considered to try to reduce the area impacted.

TABLE 14
Summary of Landbase Withdrawals (1994-1999)

Period ending Dec. 31	Number of dispositions	Area withdrawn (ha) (no seismic)	Area of seismic (ha) (No. of programs)	Total area (ha)
1994	178	689	223 (15)	912
1995	173	501	676 (34)	1 177
1996	230	588	212 (55)	800
1997	246	649	227 (32)	876
1998	205	689	242 (26)	931
1999	151	337	170 (21)	507

Source: a compilation of Canfor data

- **Current status**

  The average amount of area withdrawn on an annual basis is approximately 576 hectares, as indicated in Table 14.

  Currently, Canfor's 5-year General Development Plan (GDP) map is forwarded to the main industry companies (oil/gas and timber) operating in the FMA area, along with an informational letter explaining our desire for sharing of access and communicating long-term plans. These companies are kept on a stakeholder database for ease of reference.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  An improved communication strategy will be developed and this strategy will be conveyed to the main industries regarding opportunities for reducing area lost due to linear disturbances and other dispositions, such as:
  - Recommending to develop a communication plan with other industry input;
  - Sharing access routes both in the short-term and long-term;
  - Determining where new roads (permanent or temporary) may have to go to support several activities;
  - Locating new roads to take advantage of existing permanent linear disturbances; and
  - Utilizing abandoned clearings for campsites.
- **Implementation schedule**
  On an annual basis, by August 1, an informational letter and access map (5-year GDP map) is sent to the main industry companies (since 1997). The improved communication strategy, as stated above, will be developed by December, 2001.
- **Monitoring procedure**
  The amount of area withdrawn on an annual basis, as shown in Table 14, is tracked in the landuse database. In addition, the key components of the communication plan will be tracked to ensure that they are followed.

  Area withdrawn for other industrial activities has a direct effect on many of the management objectives. Other industrial activities will be monitored through linear disturbance updates every 5 years to determine if any large effects upon our DFMP objectives have occurred (i.e., effect upon seral stages and HSIs).
- **Linkages between strategic and operational plans**
  Industrial plans are reviewed and their impact upon operational plans assessed.

(3a) 2. Value

Rare physical environments (presence of)

(3a) 2.1 Goal

Protect the natural states and processes of the rare physical environments

(3a) 2.1a. Indicator

The amount of area of lands excluded from harvest, in the DFMP

The areas protected from harvest (Figure 3) are the Parabolic Sand Dunes (contained in the Main Block) and Cactus Hills, Peace Parkland, and Peace River Dunvegan (contained in the Peace Block). These areas, also referred to as rare physical environments, have been excluded from the landbase in the net down process before the calculation of annual allowable cut (AAC) for the DFMP (Table 1).

(3a) 2.1a.1 Objective

One hundred percent (100%) of identified and validated rare physical environments will not be harvested

- **Acceptable variance**
  The acceptable level of variance is zero because 100% of the identified and validated rare physical environments will not be harvested.
- **Current status**
  The areas that have been identified as rare physical environments were not included in the calculation of AAC and will not be harvested.
- **Forecasting assumptions and analytical methods**
  These rare physical environments, although not harvested, contribute to other ecological values on the landbase (e.g., seral stages).
- **Forest management activities**
  There are no harvesting activities for these rare physical environments. There are Permanent Sample Plots (PSP) located in some of the rare physical environments. These plots will continue to be measured in the future.
- **Implementation schedule**
  Maintain current status.
- **Monitoring procedure**
  Ensure no harvesting occurs in these rare physical environments. These areas will be evaluated in the future as to their importance to the ecological attributes of the FMA area. New rare physical environments will be reviewed and considered in the future. The impact of any changes in the rare physical environments will be evaluated.
- **Linkages between strategic and operational plans**
  Harvest restrictions for the rare physical environments will be identified in the DFMP and incorporated into the operational plans.

(3a) 2.1a.2 Objective

No active reforestation of grasslands

Grasslands are not included in the timber supply analysis; however they are of ecological importance. Grasslands is defined in the AVI standards version 2.1 as areas that have less than 6% canopy cover and are non-forest vegetated land = "HG" greater than 4 ha in size.

- **Acceptable variance**
  Less than 0.5 ha of grasslands adjacent to a harvested area being reforested (based on the database query) will be considered acceptable.
- **Current status**
  The FMA area currently has 4 654 ha of grasslands (0.72% of gross landbase). The AVI database tracks the stand types that have been harvested and reforested. A query of a shape file, grass_aop database, revealed that in 1999, a negligible amount of 0.21 ha of grassland (that was originally classified as over 4 hectares) was reforested (representing 4 harvested areas) and in 1998 a total of 1.7 hectares (representing 5 harvested areas). It should be recognized that the areas above have not been field verified and may be a result of the inherent variability of AVI typing. Therefore, it can be said that there has been no active reforestation of any grasslands on the FMA area.
- **Forecasting assumptions and analytical methods**
  The grassland areas are defined by the AVI standard, version 2.1 and will be maintained as grasslands on the landbase.
- **Forest management activities**
  No reforesting of grasslands will be conducted.
- **Implementation schedule**
  Current practice.
- **Monitoring procedure**
  Ensure no reforestation occurs. When grasslands occur adjacent to or within proposed harvest areas, the status of the grassland (greater than 4 ha) will be confirmed. This information will be used to update the base information.
- **Linkages between strategic and operational plans**
  The reforestation restrictions for grasslands will be discussed in the DFMP and applied in operational plans.

(3a) 2.1a.3 Objective

Protect 100% of identified significant wildlife mineral licks

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  Currently, there are approximately 159 wildlife mineral licks protected on the FMA area, representing an area of 480 hectares (0.07% of the entire FMA area).

  Significant wildlife mineral licks are identified operationally during pre-harvest assessments and block layout. Licks are protected with a 100 m no harvest buffer. The licks are identified in the Annual Operating Plan

(AOP) maps as WLZ (wildlife zones). Approximately 85% of identified WLZ are wildlife mineral licks. The AOP documents each WLZ in the current operating area and describes in more detail the purpose of the WLZ designation.

- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  Management activities include identification, verification and buffering of significant wildlife mineral licks. New field staff will require training in the identification of wildlife mineral licks.
- **Implementation schedule**
  Protecting wildlife mineral licks is part of our current practice. Starting in May, 2001, a monitoring procedure will be implemented to verify that the objective is being met.
- **Monitoring procedure**
  A minimum of 10% of new identified wildlife mineral licks will be randomly sampled annually to verify that the objective is met, after May, 2001.
- **Linkages between strategic and operational plans**
  The management practice of identifying, verifying, and buffering significant wildlife mineral licks is part of Canfor's Environmental Management System (EMS).

(3a) 2.2 Goal

Identify areas to nominate for the Special Places Program

(3a) 2.2a. Indicator

Cactus Hills (84-9-W6M) and Peace Parkland (81-7-W6M)

The Cactus Hills and Peace Parkland will be nominated as special places under the Alberta Special Places Program. The Special Places Program aims to complete a network of protected areas to preserve the environmental diversity of the province's six natural regions and twenty subregions. The program balances the preservation of Alberta's natural heritage with three other cornerstone goals: heritage appreciation, outdoor recreation, and tourism/economic development.

(3a) 2.2a.1 Objective

Nominate Cactus Hills and Peace Parkland areas as candidate sites for the Alberta Special Places Program

- **Acceptable variance**
  These areas have already been nominated.
- **Current status**
  The Cactus Hills and Peace Parkland areas have been nominated under the Alberta Special Places Program. A local committee has been formed to review all nominated sites in the area. Results are pending.

- **Forecasting assumptions and analytical methods**
  These areas will be maintained as no harvest areas.
- **Forest management activities**
  There are no harvesting activities for these nominated sites.
- **Implementation schedule**
  Pending results from the local committee.
- **Monitoring procedure**
  Supply information as needed and monitor progress of the local committee and keep current as to status of nominated sites.
- **Linkages between strategic and operational plans**
  If the sites receive designation under the Alberta Special Places Program, the final boundaries will be incorporated into the future planning process.

(3a) 2.3 Goal

Maintain a combination of managed and rare physical environments on the forest landbase

Rare physical environments (Figure 3) are those areas protected from harvest: Parabolic Sand Dunes (Main Block) and Cactus Hills, Peace Parkland, and Peace River Dunvegan (Peace Block). All other areas outside of the rare physical environment, within the FMA area, are deemed to be managed.

(3a) 2.3a. Indicator

The amount of area in managed forests and rare physical environments

Forests have a range of timber and non-timber values. Canfor recognizes there are some rare physical environments that can contribute other ecological values and, therefore, will be protected from harvest.

(3a) 2.3a.1 Objective

A combination of managed and rare physical environments will always be maintained on the landbase

There is a need to ensure rare physical environments (identified) exist in the FMA area.

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  Within the FMA area, 10 585 ha have been designated as rare physical environments.
- **Forecasting assumptions and analytical methods**
  The area of rare physical environments will be maintained.
- **Forest management activities**
  No forest harvesting activities will occur in the rare physical environments; however, they contribute to other ecological values.

- **Implementation schedule**
  There is currently a combination of areas protected from harvest (rare physical environments) and managed areas in the FMA area.
- **Monitoring procedure**
  Ensure no harvesting occurs in these rare physical environments. These areas will be evaluated in the future as to their importance to the ecological attributes of the FMA area. New rare physical environments will be reviewed and considered in the future. The impact of any changes in the rare physical environments will be evaluated.
- **Linkages between strategic and operational plans**
  Harvest restrictions for the rare physical environments will be identified in the DFMP and incorporated into the operational plans.

(3b) Critical Element

Soil Resources

Soil resources are conserved if the ability of soils to sustain forest productivity is maintained within characteristic ranges of variation.

(3b) 1. Value

Soil productivity

(3b) 1.1 Goal

Minimize impact on soil productivity

Soil productivity is directly related to tree productivity (growth and volume). Thus, maintenance of soil productivity is an important consideration for short-term operational planning and long-term sustainable forest management.

(3b) 1.1a. Indicator

Measurement of site quality (site index) based on ecological type (moisture and nutrient regime)

Site quality is a measure of the potential productivity of a site. It is influenced by the amount of water, air, and nutrients in the soil that is available for plant growth and development. It is assumed that soil productivity is conserved if site quality is maintained.

(3b) 1.1a.1 Objective

To develop a predictive model of site quality (includes soil productivity) to aid in the formulation of site-specific forest management

Direct and indirect measures of site quality will be used. Direct measures of site quality include site index curves, species site index comparisons, and growth intercepts. Indirect measures of site quality include plant indicators, physiographic site classification, ecosystem classification, and soil-site evaluation.

- **Acceptable variance**
  The variability in the prediction of site index will be reported by March 31, 2001, after the site quality prediction model is developed.

♦ **Current status**

Tree growth (site index) can be used as a surrogate to measure soil productivity (site quality). Canfor has developed site indices (growth and yield tables) for defined yield groups (Canfor 1999h) that play an important role in the prediction of future forest growth. The amount of area forested by site index in relation to yield group is demonstrated in Table 15.

TABLE 15
Site Index Summary by Yield Group

	Yield Group	Site Index (m)	Total Area Forested (ha)
1	AW +(S) -AB AW	18.5	13 911.43
2	AW +(S)-CD AW	17.7	84 307.14
3	AWSW/PBSW/BWSW*	18.1	70 741.99
4	BW/BWAW+(S) BW	16.7	9 281.77
5	FB+OTHERS FB	12.0	8 445.25
6	H+(S)/S AW	17.0	53 460.06
7	PB+(S) PB	17.7	23 705.38
8	PL/PLFB+(H)PL	14.7	53 087.79
9	PLAW/AWPL PL	16.9	19 602.21
10	PLSB+OTHERS PL	11.0	10 618.15
11	PLSW/SWPL + (H) PL	16.4	23 145.17
12	SBLT/LTSB (G,M,F) SB	10.5	57 187.36
13	SBLT/LTSB(U) SB	7.8	30 016.83
14	SBPL/SBSW/SBFB SB	11.7	18 903.88
15	SW/SWFB + (H)-AB SW	13.8	29 980.58
16	SW/SWFB +(H)-CD SW	13.9	36 485.58
17	SWAW/SWAWPL SW	15.7	49 415.44
	TOTALS	14.7	592 296.01

* Yield Group 3 – contains all understorey area.
Source: ORM compiled data, May 31, 2000.

♦ **Forecasting assumptions and analytical methods**

The main assumption is that, in natural stands, site index is a reasonable direct measure of site quality and a reasonable indirect measure of soil productivity. All assumptions and analytical methods for developing a predictive model of site quality will be identified in the final project report, which is due by March 31, 2001.

♦ **Forest management activities**

All harvested stands must be regenerated in a manner to ensure growth predictions are met. Various strategies will be identified in the DFMP and are also addressed in various parts in the SFMP to meet this objective.

Canfor is also working towards the development of a model to predict site quality and potential soil productivity. The model will tie tree pro-

ductivity (site index) to ecological function (ecosite), providing a framework for an ecologically based evaluation of site-specific forest management activities.

- **Implementation schedule**
  The final model will be available by March 31, 2001. The model will be evaluated and tested to determine its use in strategic and operational planning.
- **Monitoring procedure**
  Site index data used for the DFMP will be used to verify the accuracy of the model.
- **Linkages between strategic and operational plans**
  After the model is evaluated, its use will be determined and any relevant components will be incorporated operationally.

(3b) 1.1b. Indicator

The amount of coarse and fine woody debris on site, post-harvesting

Coarse and fine woody debris consists of stems, branches, tops, and leaves. The finer the material, the faster it decomposes and provides nutrients and detritus (functional organic matter) to the soil. Coarser material tends to use up nitrogen near the beginning of the decomposition process; whereas, it adds nitrogen to the soil when more advanced stages of decomposition are reached. The amount of available nitrogen in the soil is a key factor in soil productivity.

(3b) 1.1b.1 Objective

To develop a methodology to measure coarse and fine woody debris on site, post-harvesting

It is desirable to understand the nutrient cycling characteristics of the specific site to effectively manage the amount of woody debris left on site, post-harvest.

- **Acceptable variance**
  The acceptable level of variance in the amount of coarse and fine woody debris on site, post-harvesting, will be determined after an assessment of the existing data.
- **Current status**
  From 1994 to 1997, waste and residue surveys were undertaken to assess merchantable waste left on site, post-harvesting (Canfor 1994). The data from those surveys provide a preliminary estimate of an element of coarse woody debris (CWD). Pre-harvest CWD data also have been collected in the 1997 inventory program for the DFMP and during the operational cruise program.
- **Forecasting assumptions and analytical methods**
  The target amounts of woody debris to be left on site will be based on an assessment of existing data.

When the ecological classification project is completed (after the approval of the DFMP), a review of scientific literature and the ecological classification of the FMA area will provide sufficient guidance for developing an effective methodology for the management of woody debris left on site, post-harvest.

- **Forest management activities**
  Forest management activities will be based upon the target level of woody debris required on post-harvest blocks. This will vary by the type of stand and by the specific harvesting and silviculture system. On most sites, a range in the size and distribution of woody debris will remain.

  CWD data have been collected in the 1997 inventory program for the DFMP (Canfor 1997b) and during the annual operational cruise program (Canfor 2000f). A strategy for establishing targets using the pre-harvest CWD data and the waste and residue post-harvest surveys preliminary CWD data, will be developed.

- **Implementation schedule**
  Target levels that achieve maintenance of soil productivity will be determined and reported in the DFMP.

- **Monitoring procedure**
  Monitoring surveys, tied into the DFMP targets, will be conducted every two years (commencing in 2001) to ensure the targets for the amount and distribution of coarse and fine woody debris are achieved.

- **Linkages between strategic and operational plans**
  Target levels for coarse and fine woody debris will be identified in the DFMP and achieved through operational practices.

(3b) 1.1c. Indicator

Measure of site disturbance (i.e., ruts and roads)

Soil modifications (disturbances) are primarily classed into three categories: compaction, erosion, and soil chemical alteration.

Soil modifications affect physical soil processes important to an organism's health, including water supply and flux, heat flux, nutrient availability, soil strength, and gas diffusion (McNabb 1995).

(3b) 1.1c.1 Objective

To meet the Forest Soil Conservation Report Guidelines

Soil conservation focuses on three main operational areas (AFPA and LFS 1999): roading and decking areas, skidding, and site treatment.

The Forest Soils Conservation Report is a guideline and working tool to address potential impacts on forest soils such as ruts in the block and amount of internal roading. The impacts of site treatment, although recognized as a factor in the conservation of forest soils, have not been addressed in the report, but will be addressed as a separate report at a later date.

According to the Forest Soil Conservation Report:

- "Temporary road, bared landing areas and displaced soil should not exceed more than 5% of the total cutblock area unless justified in the AOP process. Examples where areas may exceed the 5% may include small block size, topography or in-block chipping operations" (AFPA and LFS 1999: p. 3);" and
- "The target is to keep the rutting to less than 2% of the block area as measured by a linear transect system" (AFPA and LFS 1999: p. 6).

- **Acceptable variance**
  An acceptable level of variance is inherent in the above guidelines.
- **Current status**
  Targets are achieved through minimizing road widths, use of seismic lines, and optimizing economical skidding distance. Blocks are evaluated for their soil, water, and landscape characteristics in order to design activities that minimize rutting. Contractors and equipment operators are trained to conduct their work in an environmentally sensitive and safe manner.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Conduct soil rutting surveys and road measurements on a statistical relevant proportion of the new harvested areas.
- **Implementation schedule**
  Sampling procedures will be developed by May 1, 2001 in order to conduct field surveys by October 31, 2001.
- **Monitoring procedure**
  Currently, Canfor's EMS inspection forms (for harvesting and silviculture activities) record soil disturbance status. If work is required, mitigative action is undertaken and documented on the comment sheet. The work is then monitored on the next block visit.

  The results of the surveys, being conducted after October 31, 2001, will be monitored in relationship to the targets to determine if objectives have been met.
- **Linkages between strategic and operational plans**
  The DFMP will discuss road access and its affects on strategic and operational planning. The specifics on site disturbance guidelines (e.g., ruts and roads) will be determined in the new ground rules to be developed within 6 months after the approval of the DFMP.

(3b) 2. Value

Soil quantity

(3b) 2.1 Goal

Minimize soil erosion

(3b) 2.1a. Indicator

Occurrence of slumping caused by road construction

Slumping is a term for a type of soil erosion that occurs on a slope. In general, it is a type of mass wasting which is the down slope movement of rock fragments and/or soil (Mayhew and Penny 1992). Water is an important trigger because it lubricates clay rich strata that serve as a sliding plane.

(3b) 2.1a.1 Objective

To have zero slumping events from road construction activities in any given operating season

Roads located across steep slopes are the major areas susceptible to slumping. Careful planning (road location) and proper road construction techniques can minimize slumping events.

- **Acceptable variance**
  Techniques to minimize slumping must be used; however, it is recognized that some slopes are susceptible to slumping. The objective is to have zero slumping events; however, an acceptable level of variance would be two slumps in an operating season. Any slump, however, must be documented and preventative and corrective action implemented immediately.

- **Current status**
  Visual inspections are conducted annually by driving on the main roads and by using aerial reconnaissance on roads that have been put to bed. These inspections (and results) are documented in the forest road maintenance system database on an annual basis.

  There are no major slumps in the FMA area. Two minor slumps have occurred in past years, but they are stable and are currently being monitored:

  - Adjacent to the south bank of the Wapiti River in Township 70 Range 5 W6M; and
  - Adjacent to a Class 2 road in Township 59 Range 5 W6M.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  When slumps are identified, the appropriate mitigative action will be undertaken.

- **Implementation schedule**
  The programs and procedures for identifying and addressing slumps are currently in place.

- **Monitoring procedure**
  Sections of road of high slumping/erosion hazard are identified and tagged for monitoring in the Forest Road Maintenance System (FRMS) database.

  Any mass wasting found is reported and documented in the Company's Incident Tracking System (ITS) database, as well as the FRMS, and appropriate mitigation measures are applied immediately to prevent further erosion.

- **Linkages between strategic and operational plans**
  The practice of mitigating slumping is primarily an operational function.

(3b) 2.1b. Indicator

Number of locations that have slumped on sensitive or steep slopes due to harvesting

(3b) 2.1b.1 Objective

To have zero slumping events due to harvesting activities on steep or sensitive slopes

Measures will be carried out to minimize mass wasting from harvesting activities on steep or sensitive slopes.

- **Acceptable variance**
  Techniques to minimize slumping must be used; however, it is recognized that some slopes are susceptible to slumping. The objective is to have zero slumping events; however, an acceptable level of variance would be one slump per operating season. Any slump, however, must be documented and preventative and corrective action implemented immediately.

- **Current status**
  There are no active slumps on steep or sensitive slopes in harvested areas.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Steep or sensitive slopes are documented on the block maps and will be used to determine the proper harvesting/treatment procedures.

- **Implementation schedule**
  The system is being implemented through the Canfor's EMS.

- **Monitoring procedure**
  Areas of steep or sensitive slopes within harvest blocks will be identified in the Cut Block Management System (CBMS) database, recorded on the block maps and scheduled for monitoring.

  Any mass wasting found is reported and documented in the Company's Incident Tracking System (ITS) database, as well as the CBMS, and

appropriate mitigation measures are applied immediately to prevent further erosion.

- **Linkages between strategic and operational plans**
  The practice of identification and mitigation of slumping is primarily an operational function.

(3c) Critical Element

Water Resources

Water resources are conserved if water quality and quantity is maintained.

(3c) 1. Value

Water quality and quantity

(3c) 1.1 Goal

Conserve water quality and quantity

(3c) 1.1a. Indicator

The amount of siltation caused by road construction in forestry operations

The three main sources of sediment in streams are from soil erosion, mass erosion, and stream bank erosion (Heatherington 1987). However, the issue of concern is the amount of siltation. When the suspended particles settle out of the water, they may cover gravelly streambeds, which are important spawning grounds for fishes in the Salmonidae family (i.e., whitefish, grayling, and trout).

(3c) 1.1a.1 Objective

To assess current methodologies and practices to measure siltation caused by forest road construction

Siltation from road construction can cause higher than normal sediment concentrations in watercourses. This increase is usually of short duration and occurs during active road construction, snowmelt, and following summer precipitation.

- **Acceptable variance**
  The acceptable variance is zero in assessment of methodologies and practices to measure siltation. The amount of acceptable variance will be determined once baseline data is collected and analyzed.
- **Current status**
  The Company is not activity measuring siltation of streams. However, Canfor adheres to legal requirements and the practices as outlined in the Canfor Erosion Control Manual (Canfor 1992).
- **Forecasting assumptions and analytical methods**
  The program that will be developed for stream crossings, after methodology is determined, will define the baseline criteria against which monitoring data will be compared.
- **Forest management activities**
  The appropriate methodology and practice will be determined for measuring siltation caused by road construction.

- **Implementation schedule**
  Various methodologies to measure siltation will be assessed by May, 2001 and a sampling program will be developed by September, 2001.
- **Monitoring procedure**
  There are two parts to the monitoring:
  - The Company will continue to monitor as per the Canfor Erosion Control Manual (Canfor 1992) until the assessment is completed; and
  - After an assessment of methodologies and collection of baseline data, a monitoring program will be developed.
- **Linkages between strategic and operational plans**
  The DFMP will provide an objective to assess methodologies and practices to measure siltation caused by forest road construction.

(3c) 1.1b. Indicator

The level of response to identified problems regarding siltation

The annual road-maintenance inspection program will be used to identify actual and potential siltation events.

(3c) 1.1b.1 Objective

To track mitigative efforts made in response to siltation events found during annual road maintenance inspections

- **Acceptable variance**
  Acceptable variance is zero with respect to development and implementation of mitigative action plans.
- **Current status**
  Annual road maintenance inspections are conducted by driving on the main roads and by using aerial reconnaissance on roads that have been put to bed. Areas where active roads and stream crossings have actual and/or potential siltation events are documented in the Forest Road Maintenance System database (FRMS). All mitigative actions are recorded.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Maintain and follow-up of current status.
- **Implementation schedule**
  The annual road maintenance inspection and tracking program is currently in place.
- **Monitoring procedure**
  Maintain and follow-up of current status. Record in the Company's ITS database significant siltation events that require follow-up.

- **Linkages between strategic and operational plans**
  Annual road maintenance inspections are an operational activity.

(3c) 1.1c. Indicator

Amount of forest cover (i.e., buffer zones) along watercourses (in the watershed)

(3c) 1.1c.1 Objective

To manage forest cover along watercourses to meet objectives defined in the DFMP

The main intent is to manage forest cover along watercourses in order to minimize any adverse effects of timber harvesting on water quality and riparian habitat for fish and other wildlife.

- **Acceptable variance**
  Acceptable variance is zero in regards to no harvesting within buffered watercourses, as identified within approved operational plans.

- **Current status**
  Currently, 6.2% of the FMA area (40 000 ha) is assigned to watercourse buffers. These buffer areas were excluded from the landbase as part of the net down process for the calculation of the AAC as per current operating ground rules.

  Buffers are currently managed according to Canfor's ground rules (Canfor 1988):

  - Large permanent creeks - no disturbance or removal of merchantable timber within 60 m of the high water mark, unless approved by forest officer in writing;
  - Small permanent creeks -no disturbance or removal of merchantable timber within 30 m of the high water mark, unless approved by forest officer in writing;
  - Intermittent creeks - no buffer required unless requested by a forest officer in writing;
  - Lakes (with recreational value) greater than 4 ha - no disturbance or removal of merchantable timber within 100 m of the high water mark, unless approved by forest officer in writing; and
  - Lakes (with little or no recreational value) greater than 16 ha - no disturbance or removal of merchantable timber within 100 m of the high water mark, unless approved by forest officer in writing.

- **Forecasting assumptions and analytical methods**
  Buffers will continue to be designated along watercourses to minimize any adverse effects of timber harvesting on water quality and riparian habitat.

- **Forest management activities**
  The intent is to manage buffers according to the current ground rules until new ground rules, allowing greater flexibility to manage buffers for wildlife habitat, are cooperatively developed with the LFS. Watercourse buffers will be assessed in relationship to the natural disturbance processes to determine their efficient application.

  The strategy for the development of the new ground rules will be identified in the DFMP.

- **Implementation schedule**
  The implementation schedule will be outlined in the DFMP.

- **Monitoring procedure**
  The forest management activities occurring within the watercourse buffers will be continually evaluated to ensure they follow the current ground rules. After the new ground rules are developed, monitoring of forest activities will be based on the new standards.

- **Linkages between strategic and operational plans**
  Watercourse buffers will be managed to meet the operational ground rules and the strategic objectives outlined in the DFMP. Any deviations to the present operating ground rules will be required to be approved by Alberta Environment.

(3c) 1.1d. Indicator

Number of incidents of excursions of herbicide

There are two primary regulations that deal with herbicides in Alberta, and they fall under the pesticide regulations in the Alberta Environment Protection and Enhancement Act (Alberta Environmental Protection 1992):

- Pesticide (Ministerial) Regulation (AR 43/97); and
- Pesticide Sales, Handling, Use and Application Regulation (AR 24/97).

Herbicides may be used for conifer release or to prepare a site for artificial regeneration of desired tree species, provided the sites meet conditions outlined in Guidelines for the use of Herbicides for Silvicultural in Alberta (Alberta Environmental Protection 1998).

(3c) 1.1d.1 Objective

To have zero excursions of herbicides in water

An excursion occurs when any vegetation outside the target zone is affected by herbicide.

- **Acceptable variance**
  The acceptable variance for excursions is zero.

- **Current status**
  Canfor embarked on the "go-slow" herbicide experience building program in 1995 with a stem injection herbicide ("Vision" silviculture her-

bicide) project of approximately 80 ha in area. This was followed with 250 ha of single-stem stand tending using basal bark application of "Release" silviculture herbicide to woody competition in a defined radius around coniferous crop trees in 1996. In 1997, approximately 450 ha were treated, again using basal bark application to treat defined radii around crop trees.

Since meeting operational experience requirements in 1997, Canfor has a herbicide stand tending program based on treatment needs. In 1998, Canfor began using a wider array of herbicide treatments based on competition species, density, and crop tree status. In 1998, 1 150 ha were treated followed by 1 987 ha in 1999.

The array of treatment types (4 to 6) and how treatments are prescribed became much more prescriptive in 1998. Other treatment methods including motor-manual, girdling, clipping, and grazing were added to the suite of treatments considered in making prescriptions. This document moved from a herbicide use proposal to being a fully developed stand tending/vegetation management plan.

Canfor reports all excursions to the LFS in accordance with regulations. Canfor had one slight excursion in 1998 (understorey vegetation damage only) and one excursion in 1999 (aerial spraying occurred in an incorrect block) which was reported in the Canfor 2000 Vegetation Management Plan and Herbicide Proposal. Neither of these excursions impacted any watercourses.

- **Forecasting assumptions and analytical methods**

  The assumption is that no excursions in the water occurred if the vegetation adjacent to the water body has no indication of being adversely affected by the herbicide application one year after application (Canfor 2000g).

- **Forest management activities**

  Canfor follows legislated protocols outlined in Articles 43/97 and Article 24/97 within the Alberta Environment Protection and Enhancement Act. Canfor also adheres to recommendations outlined in the Guidelines for the use of Herbicides for Silvicultural in Alberta (Alberta Environmental Protection 1998) to:

  - Minimize herbicide use;
  - Protect wildlife;
  - Maintain block diversity;
  - Maintain habitat diversity;
  - Avoid watercourses;

- Properly apply specific herbicides;
- Involve and notify the public; and
- Monitor the short-term and long-term effects of herbicide use.

- **Implementation schedule**

Current status will be maintained. Practices are in place to prevent herbicide excursions and the annual monitoring and reporting system is being used.

- **Monitoring procedure**

Canfor's herbicide monitoring program has two primary components: monitoring during operations and follow-up monitoring.

During operations

During basal bark and backpack foliar applications, the Canfor designated on-site supervisor monitors and records application details: areas, product use, and times. The supervisor also monitors and records weather information: wind (speed and direction), temperature, and relative humidity.

For aerial applications, the Canfor on-site supervisor monitors and conducts all reconnaissance flights with the pilots, supervises the block monitors, and reports any excursions or other incidents to LFS. Most importantly, the supervisor works with pilots and monitors to ensure Canfor standard operating procedures are followed and risk of off-target application is minimized. The block monitors (either Canfor employees or independent contractor employees) assess and record weather conditions. They relay this information to the site supervisor and the pilot and participate in spray-no spray decisions. The monitors record loads and times for blocks they monitor. Finally, they give the pilot feedback on spray pattern behavior.

Pilots work with the site supervisor and the monitors to make spray-no spray decisions. The pilot is ultimately in charge of ensuring safe, accurate application. If an incident or excursion occurs, and the pilot is aware of it, he is responsible for reporting to the site supervisor. The pilot maintains a set of load and treatment records.

On the aerial application program, a new system of block control will be used. On the reconnaissance flight, the Canfor supervisor will confirm the block location with the pilot and GPS coordinates taken to ensure return to the same block. Blocks will not be sprayed without a monitor present in the block. When the monitor is positioned, the Canfor supervisor will confirm location. If there is any disagreement between the monitor and pilot as to block location, no spraying will occur until the Canfor supervisor resolves the location concern.

The mixers ensure loads are mixed correctly and record where loads went and what area was treated. When the pilot and the mixer records can not be reconciled, the monitor records act as a check and balance.

Follow-up monitoring

Follow-up monitoring includes an evaluation of treatment effectiveness, excursions, and operational herbicide monitoring plots.

Internal monitoring mechanisms will ensure stand tending treatments are achieving their goals and not jeopardizing coniferous or deciduous fibre supply. If this is not the case, treatment threshold and intervention options will be adjusted to better achieve the goals of the DFMP.

Excursions known to have occurred at the time of treatment are reported immediately to LFS using the Herbicide Excursion Reporting Form found in the Forest Management Herbicide Reference Manual (Alberta Environmental Protection 1999b). An excursion assessment flight is made the spring after treatment. All blocks where excursions are suspected to have occurred are flown. Twenty-five percent of the total area treated with herbicides is also flown on a random check basis. If excursions are found, they are evaluated and sampling intensity may be increased as a result.

Canfor has established three operational herbicide-monitoring plots that are annually re-measured and evaluated.

- **Linkages between strategic and operational plans**
  Herbicide application and monitoring is primarily an operational function; however, strategies for herbicide use will be identified in the DFMP.

(3c) 2. Value

Water cycle

(3c) 2.1 Goal

Minimize the effect of the removal of forest cover on the water cycle

(3c) 2.1a. Indicator

Amount of forest cover removed and its spatial distribution within a defined watershed

Water yield refers to streamflow quantity and timing. It is of concern since streamflow is a key determinant of the energy available for erosion, transport, and deposition of sediment within channels. Streamflow is also a key component in determining the morphology of channels, with implications for the quality and quantity of fish habitat. Finally, water yield is an important component in determining the availability and suitability of water for beneficial uses.

Water yield quantity and timing can be altered by compaction or disturbance of the ground surface, as with roads and skid trails. Water yield is also affected by vegetation growth or removal. Water yield generally increases after timber harvest through a reduction in transpiration and precipitation inter-

ception losses. Removal of forest canopy also affects snow accumulation and melt processes, often resulting in an increase in snowpack accumulation and melt rates, thereby increasing runoff rate and volume (Various 1997).

(3c) 2.1a.1 Objective

To not exceed a range of 20-40% of forest cover removal, above the "H60" line, in relationship to the total vegetated area within a defined watershed as per the DFMP

Water yield increases can be directly modeled, but equivalent clearcut area (ECA) is often used as a surrogate. ECA is a primary factor considered in an evaluation of the potential effect of past and proposed forest harvesting on water yield. ECA is usually expressed as a percent of watershed area. The index (hydrological recovery) takes into account the initial percentage of crown removal and the recovery through regrowth of vegetation since the initial disturbance. (Various 1997)

H60 is the elevation above which 60% of the watershed lies. The watershed area above the H60 is considered as the source area for the major snowmelt peak flows (Anonymous 1995 IWAP guidebook).

- **Acceptable variance**
  Within a defined watershed, total vegetated cover removal will not exceed 40% ECA above the H60. Total vegetated area includes the forested and non-forested vegetated covers.

- **Current status**
  Canfor adheres to current ground rules (Canfor 1988) regarding percent removal of merchantable timber in accordance with Section 4.1 which stipulates:

  "approximately 50 percent of the merchantable volume covering 50 percent of the merchantable area may be harvested in the first cut (unless approved otherwise) with the balance to be taken in the second cut, in order to:

  - Minimize the impact on watershed, wildlife, aesthetics, and site productivity;
  - Break up the continuity of slash fuels and forest cover types; and
  - Reduce susceptibility to destructive agencies."

  A need has been identified to determine the effect of forest cover removal on water yield, and new watershed objectives have recently been developed and will be incorporated into the DFMP. As a result, we are moving towards adherence to this new objective as stated above.

  The H60 line has been determined for all watersheds aggregated up to a minimum of 500 ha in the bull trout area and up to a minimum of 1 000 ha for the remainder of the FMA area (Figure 19). The components neces-

sary to calculate the ECA have been determined. The components are listed below:

- Streams have been reclassified according to Strohler;
- Major and sub-watershed areas;
- Bull trout area;
- H60 areas within watersheds;
- Forested area by watershed;
- Amount of forested areas, forest cover removed (harvested area), non-forest vegetated area, non-vegetated area, and roads by watershed; and
- Hydrological recovery (for fully stocked stands) is defined in Table 16.

TABLE 16
Hydrological Recovery

Height (m)	% Recovery
0	0
1	20
2	40
3	60
4	80
5	100

Source: ORM compiled data.

There are a total of 297 watersheds in the FMA area. More detailed description of the data is in Appendix 7, Tables 1-3. A summary of the watersheds above the ECA of 35% in the bull trout area and above the ECA of 40% for the remainder of the FMA area flagged for concern is presented in Table 11. Since there are no ECAs above the 40% flagged for concern for areas outside the bull trout area, the Table 11 referenced in "Critical Element 1b, Objective 1.1b.2" (bull trout section of habitat constraint modeling) can be used in this section as well. Further information regarding the flagging (concern area) is in the section on Forecasting assumptions and analytical methods below.

- **Forecasting assumptions and analytical methods**

It is assumed that streamflow maximums will not adversely impact the ecosystem if no more than 20-40% of the total vegetated cover is removed within the area above the H60 within a defined watershed. As the outcomes in relation to the ECAs are not fully understood, the following

procedure will be used to evaluate watersheds that may require further adjustments:

- A base 0 (ECA value) has been calculated (Appendix 7, Table 1) which includes the 1999 AOP proposed areas as part of the harvested areas. The need to do this is to demonstrate present ECA values that will not change;
- ECA percentage report (Appendix 7, Tables 2-3) for year 10 (2009) and year 20 (2019) was based on the most recent AAC analysis; and
- The following criteria will be used to flag areas of concern:
  - ECA >35% in bull trout area;
  - ECA >40% outside bull trout area; and
  - Visual representation.

- **Forest management activities**

Flagged areas of concern will be evaluated and action will be taken depending on the level of importance. Such action could be:

- No change to be made within the DFMP; however, areas of concern will be flagged for operational considerations; and
- Adjustments to the harvest sequencing in the TSA (Timber Supply Analysis).

All decisions and assumptions will be documented in the DFMP.

- **Implementation schedule**

Implementation of the above strategies for the TSA is in the DFMP. New operational ground rules will be completed within 6 months after the approval of the DFMP.

- **Monitoring procedure**

Canfor will monitor the harvest sequence, as part of the TSA, in order to evaluate the effect on the ECA to determine if any adjustments are required before the final submission of the DFMP.

Each watershed will be monitored, as harvested areas are planned, to ensure that there is less than 40% ECA or such ECA percentage as defined in the DFMP.

It should be noted that ECA is one of the methods being used. Many agencies are utilizing ECA as a surrogate for water yield. The Company will keep informed of research being conducted on ECA throughout North America.

- **Linkages between strategic and operational plans**

The DFMP will define the operational strategies for implementing and monitoring the ECA in future planning areas.

4. Criterion	**Forest Ecosystem Contributions to Global Ecological Cycles** Forest conditions and management activities contribute to the health of global ecological cycles.
(4a) Critical Element	**Global Ecological Cycles** The processes that are responsible for recycling water, carbon, nitrogen, and other life-sustaining elements are maintained.
(4a) 1. Value	**Local contribution to global ecological cycles** Due to the complexity of global ecological cycles, it is often difficult to visualize the impact the local forests have on the global environment. Forests are particularly important to global cycles because of their long life span, vast area, and their unique characteristics as efficient carbon storehouses.
(4a) 1.1 Goal	**Minimize disturbances that negatively impact carbon cycles** Both natural and human-induced disturbances, including fires, insects, diseases, and harvesting, affect the movement of carbon from forests and forest soils to the atmosphere.
(4a) 1.1a. Indicator	**Amount of area under forest cover** It is widely understood that forests and forest soils represent large reservoirs of carbon that have accumulated over hundreds and thousands of years. Thus, altering the amount of land that is forested has a notable impact on the global carbon cycle. It is important to have the forests continually growing (evergreen).
(4a) 1.1a.1 Objective	**All harvested sites are treated within 18 months after the end of the timber year** ♦ **Acceptable variance** A level of variance of +3 months is acceptable in order to accommodate the occurrence of fire and periods of extreme weather conditions, including floods and drought. These natural events could delay the treatment of harvested areas. ♦ **Current status** Section 141.1(1) of the Timber Management Regulation (Alberta Regulation 60-73) states that reforestation in a cut unit must occur within 2 years after the end of the year of the cut. All harvested areas in the FMA area are properly treated within 18 months after the end of the timber year as of the 1996 timber year (Canfor 2000h), thereby exceeding the Alberta Provincial regulations pertaining to reforestation. ♦ **Forecasting assumptions and analytical methods** No forecasting or analysis is required.

- **Forest management activities**
  Pre-harvest silviculture prescriptions (PHSP) will be assigned to all proposed harvested areas in order to plan silviculture activities in a timely manner to meet the stated objective.
- **Implementation schedule**
  It is currently implemented as of the 1996 timber year.
- **Monitoring procedure**
  All harvested sites will be monitored to ensure that site treatment occurs within 18 months from the end of the timber year in which the block was harvested. Silvicultural records will be maintained.
- **Linkages between strategic and operational plans**
  All site treatment strategies will follow the strategic direction as outlined in the DFMP.

(4a) 1.1b. Indicator

Number of occurrences and amount of area impacted by fire, and catastrophic events of insects, disease, windfall, etc.

Forest stand dynamics strongly influence the process of carbon exchange and storage in the boreal forest. When catastrophic events occur on a large scale, both in area and frequency, the overall forest age is shifted back to younger stands, resulting in reduced carbon storage in biomass (Kurz and Apps 1993; Kurz et al. 1995). Although younger stands do accumulate carbon at a higher rate than do older stands, converting older to younger does not decrease the amount of carbon released into the atmosphere because of the abundance of already stored carbon in older aged stands (Harmon et al. 1990). Therefore, controlling the rate of stand senescence through proper forest management could have direct benefits in controlling global carbon cycles. An important step in this process would be to decrease the amount of area lost to fire and other catastrophic events.

(4a) 1.1b.1 Objective

Limit the number of occurrences and amount of area impacted by fire, and catastrophic events of insects, disease, windfall, etc.

- **Acceptable variance**
  The target for occurrences is zero; however, there is an inherent level of variability built in to natural processes and the Company develops a Forest Protection Plan for managing risks.

  The Company has no control over human-caused fires (i.e., public), other industrial fires, or lightning-caused fires; however, we do have control over fires caused by Company operations. The acceptable variance for Company-caused fires is zero. The risks associated with the other fires are managed by assisting the Alberta Environment during high hazard conditions to reduce the potential area impacted.

The acceptable variance for catastrophic events of insects, disease, or windfall on the FMA area is zero.

Any fire, or other events identified in the objective, must be investigated for preventative action.

- **Current status**

As reported in the Forest Protection Plan (Canfor 2000e), there have been 175 fires in the FMA area (1986 - 1999 inclusive), impacting a total of 183 ha. The average number of fire occurrences per year in the past 14 years has been 12.5, impacting an average of 13.1 hectares a year. Forty three percent (79 ha) of the burned area has been reforested.

There have been no catastrophic events of insect and disease in the FMA area since 1964.

Prior to 1997, no windfall assessment surveys were conducted within the FMA area; however, windfall was addressed operationally as found. In 1997, a windfall assessment survey was conducted in the FMA area. As a result, a number of patches (130 hectares) in FMU G5C E8C in a localized area were identified as catastrophic windfall (i.e., area(s) of windfall that significantly affect the AAC). These patches were harvested in the 1998/1999 season, salvaging approximately 32 000 m^3.

Based on a reconnaissance survey in FMU G2C, approximately 231 hectares were harvested in 1999 in a catastrophic windfall area, salvaging approximately 39 500 m^3.

- **Forecasting assumptions and analytical methods**

Alberta Environment prepares fire weather, fire hazard, and fire spread indices that assist to forecast forest protection personnel and equipment requirements.

Canfor utilizes the Annual Report of Forest Health (Alberta Environmental Protection 1999a) to assist in forecasting the risk of outbreak of specific insect species.

- **Forest management activities**

Current forest management practices fall under provincial pre-suppression and wildfire suppression programs as well as insect and disease monitoring and control programs (Alberta Environmental Protection 1996a). Canfor works with the provincial government to assist in the delivery of these programs. Canfor's Forest Protection Plan provides greater detail on our programs for insect and disease as well as fire prevention.

To limit the occurrences of fire, the following activities occur:

- Development of a Forest Protection Plan including such activities as:
  - Assignment of Canfor personnel as fire duty officers each weekend during the fire season to act as the first contact for the Alberta Environment; and
  - Undertaking of infrared scanning each spring of all areas in which pile burning has occurred (within the recent winter months) in order to detect any hold over fires and to take the appropriate action to prevent a fire outbreak.
- Providing financial aid to supplement deployment of fire protection resources; and
- Research into silvicultural applications emulating fires is currently being undertaken by the EMEND Project, which is in part funded by Canfor (Canadian Forest Service 2000).

An assessment in FMU G2C will be conducted to determine current catastrophic windfall areas and incorporate any areas found into the 2001 AOP.

- **Implementation schedule**
  The programs for monitoring and addressing fire and catastrophic events of insect, disease, and windfall are currently in place.
- **Monitoring procedure**
  The number and occurrences of fires are tracked and reported annually in the Forest Protection Plan.

  Insect and disease outbreaks and catastrophic windfall events are monitored and appropriate action taken to reduce their spread.
- **Linkages between strategic and operational plans**
  Fire control and prevention, insect and disease monitoring, and practices to address windfall are primarily operational functions that will be described in the DFMP.

(4a) 1.1c. Indicator

The numbers of equipment in use and amount of technology with low carbon dioxide (CO_2) and nitrogen oxides (NO_X) emissions

Nitrogen oxides (NO_X) are a major pollutant in the atmosphere, being a precursor to acid rain, photochemical smog, and ozone accumulation.

Carbon dioxide is a greenhouse gas of major concern in the study of global warming. It is estimated that the amount in the air is increasing by 0.4% annually. Anthropogenic carbon dioxide is emitted mainly through the burning of fossil fuels and deforestation.

(4a) 1.1c.1 Objective

To promote use of equipment and technology that minimizes CO_2 and NO_X emissions

- **Acceptable variance**
  Not known to date.
- **Current status**
  No programs are in place to address this issue.
- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  The following tasks will be undertaken:
  - Identify all equipment and technologies, in the woodlands operation, that are potential sources of CO_2 and NO_X emissions;
  - Identify alternative sources of equipment and technologies that can be used to reduce CO_2 and NO_X and emissions; and
  - Design programs that will promote the use of new CO_2 and NO_X reduction equipment and technologies.
- **Implementation schedule**
  A program to promote the use of CO_2 and NO_X friendly equipment and technologies will be in place by June, 2002.
- **Monitoring procedure**
  The changes that have been made by Canfor and its contractors to utilize CO_2 and NO_X friendly equipment and technologies will be monitored.
- **Linkages between strategic and operational plans**
  A program to promote the use of CO_2 and NO_X friendly equipment is primarily an operational function.

(4a) 1.2a. Indicator

Amount of forest cover removed and its spatial distribution within a defined watershed

Water yield refers to streamflow quantity and timing. It is of concern since streamflow is a key determinant of the energy available for erosion, transport, and deposition of sediment within channels. Streamflow is also a key component in determining the morphology of channels, with implications for the quality and quantity of fish habitat. Finally, water yield is an important component in determining the availability and suitability of water for beneficial uses.

Water yield quantity and timing can be altered by compaction or disturbance of the ground surface, as with roads and skid trails. Water yield is also affected by vegetation growth or removal. Water yield generally increases after timber harvest through a reduction in transpiration and precipitation interception losses. Removal of forest canopy also affects snow accumulation and

melt processes, often resulting in an increase in snowpack accumulation and melt rates, thereby increasing runoff rate and volume (Various 1997).

(4a) 1.2a.1 Objective

To not exceed a range of 20-40% of forest cover removal, above the "H60" line, in relationship to the total vegetated area within a defined watershed as per the DFMP

Water yield increases can be directly modeled, but equivalent clearcut area (ECA) is often used as a surrogate. ECA is a primary factor considered in an evaluation of the potential effect of past and proposed forest harvesting on water yield. ECA is usually expressed as a percent of watershed area. The index (hydrological recovery) takes into account the initial percentage of crown removal and the recovery through regrowth of vegetation since the initial disturbance (Various 1997).

H60 is the elevation above which 60% of the watershed lies. The watershed area above the H60 is considered as the source area for the major snowmelt peak flows (Anonymous 1995 IWAP guidebook).

- **Acceptable variance**
  Within a defined watershed, total vegetated cover removal will not exceed 40% ECA above the H60. Total vegetated area includes the forested and non-forested vegetated covers.

- **Current status**
  Canfor adheres to current ground rules (Canfor 1988) regarding percent removal of merchantable timber in accordance with Section 4.1 which stipulates:

  "approximately 50 percent of the merchantable volume covering 50 percent of the merchantable area may be harvested in the first cut (unless approved otherwise) with the balance to be taken in the second cut, in order to:

  - Minimize the impact on watershed, wildlife, aesthetics, and site productivity;
  - Break up the continuity of slash fuels and forest cover types; and
  - Reduce susceptibility to destructive agencies."

  A need has been identified to determine the effect of forest cover removal on water yield, and new watershed objectives have recently been developed and incorporated into the DFMP. As a result, we are moving towards adherence to this new objective as stated above.

  The H60 line has been determined for all watersheds aggregated up to a minimum of 500 ha in the bull trout area and up to a minimum of 1 000 ha for the remainder of the FMA area (Figure 19). The components neces-

sary to calculate the ECA have been determined. The components are listed below:

- Streams have been reclassified according to Strohler;
- Major and sub-watershed areas;
- Bull trout area;
- H60 areas within watersheds;
- Forested area by watershed;
- Amount of forested areas, forest cover removed (harvested area), non-forest vegetated area, non-vegetated area, and roads by watershed; and
- Hydrological recovery (for fully stocked stands is defined in Table 16).

There are a total of 297 watersheds in the FMA area. More detailed description of the data is in Appendix 7, Tables 1-3. A summary of the watersheds above the ECA of 35% in the bull trout area and above the ECA of 40% for the remainder of the FMA area flagged for concern is presented in Table 11. Since there are no ECAs above the 40% flagged for concern for areas outside the bull trout area, Table 11 referenced in "Critical Element 1b, Objective 1.1b.2" (bull trout section of habitat constraint modeling) can be used in this section as well. Further information regarding the flagging (concern area) is in the section on Forecasting assumptions and analytical methods below.

♦ Forecasting assumptions and analytical methods

It is assumed that streamflow maximums will not adversely impact the ecosystem if no more than 20-40% of the total vegetated cover is removed within the area above the H60 within a defined watershed. As the outcomes in relation to the ECAs are not fully understood, the following procedure will be used to evaluate watersheds that may require further adjustments:

- A base 0 (ECA value) has been calculated (Appendix 7, Table 1) which includes the 1999 AOP proposed areas as part of the harvested areas. The need to do this is to demonstrate present ECA values that will not change;
- ECA percentage report (Appendix 7, Tables 2-3) for the year 10 (2009) and year 20 (2019) was based on the most recent AAC analysis; and
- The following criteria will be used to flag areas of concern:
  - ECA >35% in bull trout area;

- ECA >40% outside bull trout area; and
- Visual representation.

♦ **Forest management activities**
Flagged areas of concern will be evaluated and action will be taken depending on the level of importance. Such action could be:

➢ No change to be made within the DFMP; however, areas will be flagged for operational considerations; and

➢ Adjustments to the harvest sequencing in the TSA (Timber Supply Analysis).

All decisions and assumptions will be documented in the DFMP.

♦ **Implementation schedule**
Implementation of the above strategies for the TSA will be in the DFMP. Operational guidelines will be developed after the approval of the DFMP.

♦ **Monitoring procedure**
Canfor will monitor the harvest sequence, as part of the TSA, in order to evaluate the effect on the ECA to determine if any adjustments are required before the final submission of the DFMP.

Each watershed will be monitored, as harvested areas are planned, to ensure that there is less than 40% ECA or such ECA percentage as defined in the DFMP.

It should be noted that ECA is one of the methods being used. Many agencies are utilizing ECA as a surrogate for water yield. The Company will keep informed of research being conducted on ECA throughout North America. After the DFMP approval, the ECA will be evaluated to determine if ECA percentages are realistic or if there is another procedure.

♦ **Linkages between strategic and operational plans**
The DFMP will define the operational strategies for implementing and monitoring the ECA in future planning areas.

(4a) 1.3a. Indicator

The amount of coarse and fine woody debris on site, post-harvesting

Coarse and fine woody debris consists of stems, branches, tops, and leaves. The finer the material, the faster it decomposes and provides nutrients and detritus (functional organic matter) to the soil. Coarser material tends to use up nitrogen near the beginning of the decomposition process; whereas, it adds nitrogen to the soil when more advanced stages of decomposition are reached. The amount of available nitrogen in the soil is a key factor in soil productivity.

(4a) 1.3a.1 Objective

To develop a methodology to measure coarse and fine woody debris on site, post-harvesting

It is desirable to understand the nutrient cycling characteristics of the specific site to effectively manage the amount of woody debris left on site, after harvest.

- **Acceptable variance**
  The acceptable level of variance in the amount of coarse and fine woody debris on site, post-harvesting, will be determined after an assessment of the existing data.

- **Current status**
  From 1994 to 1997, waste and residue surveys were undertaken to assess merchantable waste left on site, post-harvesting (Canfor 1994). The data from those surveys provide a preliminary estimate of an element of coarse woody debris (CWD). Pre-harvest CWD data also have been collected in the inventory program for the DFMP and during the operational cruise program.

- **Forecasting assumptions and analytical methods**
  The target amounts of woody debris to be left on site will be based on an assessment of existing data.

  When the ecological classification project is completed (after the approval of the DFMP), a review of scientific literature and the ecological classification of the FMA area will provide sufficient guidance for developing an effective methodology for the management of woody debris left on site, post-harvest.

- **Forest management activities**
  Forest management activities will be based upon the target level of woody debris required on post-harvest blocks. This will vary by the type of stand and by the specific harvesting and silviculture system. On most sites, a range in the size and distribution of woody debris will remain.

  CWD data have been collected in the inventory program for the DFMP (Canfor 1997b) and during the annual operational cruise program (Canfor 2000f). A strategy for establishing targets will be developed, which will use the pre-harvest CWD data and the waste and residue post-harvest surveys preliminary CWD data.

- **Implementation schedule**
  Target levels that achieve maintenance of soil productivity will be determined and reported in the DFMP.

- **Monitoring procedure**
  Monitoring surveys, tied into the DFMP targets, will be conducted every two years, commencing 2001, to ensure the targets for the amount and distribution of coarse and fine woody debris are achieved.

- **Linkages between strategic and operational plans**
  Target levels for coarse and fine woody debris will be identified in the DFMP and achieved through operational practices.

(4a) 1.3b. Indicator

Presence of vascular plant species that can be used to indicate potential nitrogen levels

It is widely believed that many forest floor and understorey plant species can provide relatively precise information on most growth-related site quality factors (Corns and Pluth 1984; La Roi et al. 1988). Because direct measures of site quality are time consuming and expensive, plant species that convey information about nitrogen offer a cost-effective alternative to intensive site evaluations. Information on site nitrogen will help to minimize impacts to nitrogen cycles and, thus, allow forest managers to more effectively select practices that maintain productivity.

(4a) 1.3b.1 Objective

To understand, through modelling, the role of vascular plants as indicators of potential nitrogen levels

- **Acceptable variance**
  Not applicable.
- **Current status**
  Canfor is currently undertaking a study to determine the relationship between site nitrogen and types and abundance of plant species (Canfor 1998b).
- **Forecasting assumptions and analytical methods**
  Based on plot data, a gradient from low to high nitrogen concentration will be developed for the FMA area. Plant species will be analyzed for abundance and occurrence along this nitrogen concentration gradient using multivariate statistical techniques. Any species that show significant clustering on a particular area of the nitrogen gradient will be used as an indicator of nitrogen levels.
- **Forest management activities**
  Information about plant species indicator value for nitrogen concentration will be used to estimate a site's nitrogen level and develop appropriate management strategies. Based on ecological site characteristics, Canfor will select practices that minimize negative impacts to nitrogen cycles, thus maintaining site productivity potential. For example, nitrogen level prediction models could be used to identify productive sites where genetically superior trees would best respond.
- **Implementation schedule**
  The study to determine the relationship between site nitrogen and types and abundance of plant species will be completed by March 31, 2001. The development of forest management activities based on plant species

indicator value for site nitrogen levels will be developed by December 31, 2002.

- **Monitoring procedure**
  The plant indicator model for site nitrogen level will be tested by comparing a site's predicted nitrogen level with the site's productivity, as measured by site index (height of tree at 50 years breast height). Data for this model validation could come from the TSP, PSP, or PHSP data collection programs.
- **Linkages between strategic and operational plans**
  There is no linkage until the above mentioned study is completed and validated.

(4b) Critical Element — Utilization and rejuvenation are balanced and sustained

(4b) 1. Value — Sustainable yield of timber

(4b) 1.1 Goal — Maintain harvest level related to the AAC as defined in the DFMP

One of the purposes of establishing an allowable annual cut is to ensure that the local productive capacity of the forest is not exceeded on a long-term basis (forest sustainability).

(4b) 1.1a. Indicator — The amount harvested versus the approved AAC

It is important to maintain sustainability of the forest by ensuring that the harvested amount does not exceed the annual allowable cut and follows the management strategies defined in the DFMP.

(4b) 1.1a.1 Objective — Operational practices meet the DFMP management strategies that make up the AAC

Many of the indicators and objectives discussed throughout this SFMP will be incorporated into the DFMP and in the calculation of the AAC.

In order to sustain the AAC, operational practices will closely follow the forest management strategies that are stated in the DFMP.

- **Acceptable variance**
  Any variances identified operationally will be evaluated to ensure the management strategies are still being met.
- **Current status**
  The following are some of the key components being met from the 1991 DFMP (Canfor 1991), which make up the AAC:
  - The amount harvested in relation to 5 year cut control;

- The amount harvested in relation to 5 year cut control on an administrative area basis;
- The amount harvested in relation to amount of volume available on a township basis;
- Early crop establishment (treat within 2 years of harvest);
- Ecosite classification implementation for silviculture prescriptions;
- Landscape ecological classification was developed for the FMA area;
- All harvested areas are surveyed 4 years after treatment;
- Genetic improved seedlings are being used;
- High quality seedlings are being used;
- Timber loss is minimized by establishing windfirm boundaries during cut block layout; and
- FMA area was reclassified using AVI inventory standards version 2.1.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Establish a formal monitoring and linkage program that proactively tracks operational practices to the new DFMP.

- **Implementation schedule**
  The implementation schedule for the monitoring and linkage program noted above will be defined in the DFMP. The actual program will be applied in the 2002 AOP.

  New operational ground rules will be completed within 6 months after the approval of the DFMP.

- **Monitoring procedure**
  A monitoring schedule will be established that ensures management strategies are met.

- **Linkages between strategic and operational plans**
  The strategies outlined in the DFMP will be implemented operationally.

  Development of the new DFMP will be monitored and components will be used as a guide to direct operational planning in order to reduce the transition period for incorporating the new forest management strategies.

(4b) 1.2 Goal

To reforest every hectare harvested

Reforestation of every hectare harvested is a legal responsibility as stated in the Timber Management Regulations, Section 123:

> "Unless the Minister orders otherwise, a timber licensee or holder of a forest management agreement shall, within 2 years of completing the cut in each area from which coniferous timber has been cut, carry out all treatment necessary to reforest each area to the level required in section 137."

As stated in "Critical Element 4b, Objective 1.2b.1", Canfor strives to improve upon the 2 year rule requirement by treating harvested sites within 18 months after the end of the timber year.

In many instances, Canfor exceeds the regulations to ensure that the regenerated stands meet the yields predicted in the 1991 DFMP.

(4b) 1.2a. Indicator

The amount of harvested area in the regenerated yield group

Successful regeneration of harvested sites is fundamental to sustainable forest ecosystems and continued productivity. It is, therefore, essential to make certain that harvested sites are successfully regenerated and are as productive as they are predicted to be in the DFMP.

(4b) 1.2a.1 Objective

To regenerate 100% of the harvested area as per the regenerated yield group as defined in the DFMP

- **Acceptable variance**
  Acceptable variance is plus or minus 10% of the area of regenerated yield groups, provided that the overall AAC is sustained (to within -5%).
- **Current status**
  The 2000 ecosite classification field program, which is fundamental to the silviculture prescription program, is presently incorporating the regeneration strategy as defined in Table 13. The 2000 Silviculture AOP has incorporated the regeneration strategy for the 2000/2001 timber year cut units. However, the regeneration strategy is still subject to approval by Alberta Environment, as it forms part of the DFMP.
- **Forecasting assumptions and analytical methods**
  The following are the key assumptions for the regeneration strategy, all of which have been shown in the past to be reasonably accurate:
  - Early crop establishment (within 18 months) will achieve projected breast height ages within the stated times;
  - Silviculture treatments successfully put the harvested stand on the growth and yield trajectory of the regenerated yield group;

- Allowances for plantation failures, regeneration delay, and understorey protection are accurate; and
- Tree improvement multipliers represent the actual improvement that will occur.

The results of the timber supply analysis simulations will determine the current distribution of regenerated yield groups across the landscape. There are six scenarios that will be compared to better understand the relationships among timber supply constraints to the timber supply and regeneration strategy (Canfor 1999b).

- **Forest management activities**
  The forest management activity is to incorporate the regeneration strategy in the development of regenerated growth and yield tables, which will be used in the timber supply analysis.
- **Implementation schedule**
  All regeneration strategies, plans and activities will follow the strategic direction outlined in the DFMP. This means that harvested sites will be treated using the appropriate techniques for the particular ecosite to ensure that the regenerating stand is on the growth and yield trajectory of the regenerated yield group.

  In the interim, some of the strategies developed for the plan, such as the regeneration strategy, are being implemented in anticipation of approval in order to reduce time lags in meeting DFMP objectives.
- **Monitoring procedure**
  The regeneration strategy defined in the DFMP will be compared to planned and actual silviculture activities to ensure compliance to the acceptable variance. If results are below the acceptable variance, over a 5 year period, a review of the effects of such changes on the DFMP will be evaluated. This will be reported in the Annual Performance Monitoring Report and the 5 year Forest Stewardship Report.
- **Linkages between strategic and operational plans**
  All regeneration strategies, plans and activities will follow the strategic direction outlined in the DFMP.

(4b) 1.2b. Indicator

Total area harvested annually compared to total area reforested (planting or seeding)

All harvested areas are promptly reforested to ensure early crop establishment. Prompt treatment of harvested sites will reduce the lag time between harvest and successful regeneration. This allows the regenerated growth and yield projections to be met, as established in the DFMP.

(4b) 1.2b.1 Objective

All harvested sites are treated within 18 months after the end of the timber year

- **Acceptable variance**
  A level of variance of +3 months is acceptable in order to accommodate the occurrence of fire and periods of extreme weather conditions, including floods and drought. These natural events could delay the treatment of harvested areas.
- **Current status**
  Section 141.1(1) of the Timber Management Regulation (Alberta Regulation 60-73) states that reforestation in a cut unit must occur within 2 years after the end of the year of the cut. All harvested areas in the FMA area are properly treated within 18 months after the end of the timber year as of the 1996 timber year (Canfor 2000h), thereby exceeding the Alberta Provincial regulations pertaining to reforestation.
- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  Pre-harvest silviculture prescriptions (PHSP) will be assigned to all proposed harvested areas in order to plan silviculture activities in a timely manner to meet the stated objective.
- **Implementation schedule**
  It is currently implemented as of the 1996 timber year.
- **Monitoring procedure**
  All harvested sites will be monitored to ensure that site treatment occurs within 18 months after the end of the timber year in which the block was harvested. Silvicultural records will be maintained.
- **Linkages between strategic and operational plans**
  All site treatment strategies will follow the strategic direction outlined in the DFMP.

(4b) 1.3 Goal

Maximize utilization of merchantable wood

A merchantable coniferous tree is defined as follows (Canfor 1994):

- Minimum 15 cm at the stump (measured at 30 cm from the ground) and reaching 4.88 m usable length;
- 11 cm top diameter; and
- At least 50 % sound wood.

A merchantable coniferous log or broken piece contains (Canfor 1994):

- At least 50% usable sound wood; and

- 2.44 meters in length and meets the 11 cm small end diameter.

(4b) 1.3a. Indicator

Amount of merchantable wood (m^3) left on site

Waste is defined as the volume of merchantable timber (as defined above) left on the harvested area that should have been removed in accordance with the minimum utilization standards set by the regulatory authority.

The amount of wasted merchantable timber varies depending on the experience of the operator, the type of machinery used, and the quality of the standing timber.

Waste minimization is an important objective because more of the tree is used and, consequently, less standing timber may have to be harvested.

(4b) 1.3a.1 Objective

To leave less than 1% of merchantable wood on site

Merchantable wood waste will be evaluated on an operating and FMA area basis.

- **Acceptable variance**
  The acceptable amount of merchantable wood left on site will not exceed 1%.

- **Current status**
  Canfor conducted waste surveys from 1994-97 to determine the amount of waste left behind during harvesting operations.

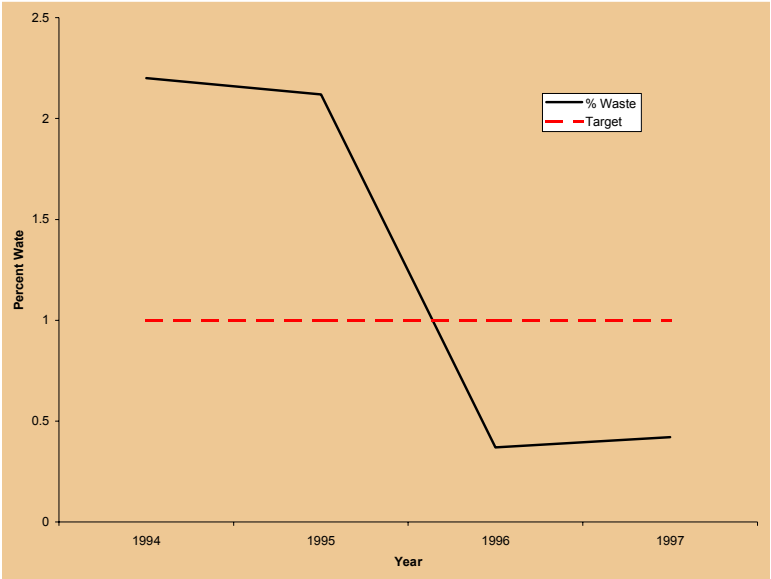
  Waste survey results for 1996 and 1997 have shown that Canfor has not exceeded the 1% target by operating area or for the FMA area overall, with an average of 0.37% and 0.42% waste, respectively. This is a significant improvement from 1994 and 1995 survey results that showed an average of 2.2% and 2.12% waste, respectively (Figure 28).

  Surveys ceased after 2 years of excellent results. It was felt that waste minimization efforts were achieving the desired results. The need for surveys has recently been re-evaluated and it was decided to re-initiate the surveys.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Waste surveys will be conducted on the FMA area to measure merchantable waste left on site. The overall target is not to exceed 1%. If the results show that waste exceeds the overall target in any one operating area, then an evaluation of the logging practices will be done and corrective action implemented.

- **Implementation schedule**
  Waste surveys will be conducted every 2 years, commencing in 2001.



Source: Canfor's Wood Waste and Residue Survey Results (1994-1997)

FIGURE 28
Waste Survey Results (1994-1997)

- **Monitoring procedure**
  Monitoring will be conducted through surveys. Action will be taken if the results show that waste exceeds the acceptable variance.
- **Linkages between strategic and operational plans**
  Target levels of waste will be identified in the AOP and achieved through operational practices.

(4b) 1.3b. Indicator

Amount of accessible merchantable industrial salvaged wood brought in on an annual basis

Industrial salvaged wood is merchantable coniferous wood removed from various dispositions as described below. Canfor has first right of refusal to purchase salvage wood from within the FMA area by virtue of Forest Management Agreement 9900037.

It is important that all accessible merchantable coniferous salvaged wood is utilized from within the FMA area. It also assists Canfor to offset the loss of timber created by the withdrawal of productive landbase caused by industrial activity.

(4b) 1.3b.1 Objective

To utilize 100% of accessible merchantable industrial salvaged wood from permanent land withdrawals

Roads, wellsites, powerlines, pipelines, recreational sites, campsites, and gravel pits are all examples of dispositions that are withdrawn from the landbase by

either the forest industry or the oil and gas industry. Many are withdrawn for about 10-20 years; therefore, they are considered permanent.

- **Acceptable variance**
  The salvaged wood process has an inherent level of variability due to the level of activity and its complexity. It may never be possible to determine if 100% has been salvaged; however, it is desirable to utilize as much as is accessible and known. Some examples of complexity are:
  - Salvaged wood may be used by the disposition holder during site construction; and
  - Salvaged wood from a number of nearby dispositions may be decked in one location.
- **Current status**
  Table 17 shows the amount of wood salvaged from the FMA area during the period 1995/1996 to 1999/2000.

TABLE 17
Amount of Wood Salvaged from the FMA Area

Year	1999/2000*	1998/1999	1997/1998	1996/1997	1995/1996
Amount of wood (m^3)	25 166	10 277	11 494	8 044	14 397

Source: Canfor internal summary of volume delivered from FIRS (Forest Information Resource System)
* Volume indicated is higher than average due to the removal of forest cover for the Alliance pipeline project in the FMA area.

- **Forecasting assumptions and analytical methods**
  All known salvage wood will be utilized by Canfor.
- **Forest management activities**
  Canfor endeavors to cooperate with other industries so the location and approximate quantity of salvage wood is known.
- **Implementation schedule**
  Each disposition that is applied for withdrawal from the FMA area receives a signed consent from the Company, as well as a signed salvage commitment form indicating whether we accept or decline any salvaged wood from that disposition.

  The landuse database, which has the records of all dispositions that have been applied for withdrawal, has the capability to track a number of salvage components. By September 30, 2000, Canfor will evaluate the role of the database for tracking the amount of anticipated and actual salvaged amounts, in order to determine if the stated objective was achieved for the 2000 timber year.

- **Monitoring procedure**
  The amount of salvaged wood (m^3) utilized by the Company is currently tracked via FIRS (Forest Information Resource System) database and inputted into the landuse database.
- **Linkages between strategic and operational plans**
  The salvaged wood program is primarily an operational activity.

(4c) Critical Element

Protection of Forest Lands

Forest lands are protected from sustained deforestation or conversion to other uses

(4c) 1. Value

Forests on the landbase

(4c) 1.1 Goal

Maintain forests on the landbase

Canfor helps to minimize the loss of forests on the landbase by managing the amount of permanent roads they construct. Canfor can not control the amount of land lost to other industrial activities. It can, however, work with other industries to promote shared access.

(4c) 1.1a. Indicator

The amount of productive area Canfor utilizes for future permanent roads (LOC)

Permanent roads include both those roads constructed by Canfor and roads constructed by other industries or government. Permanent roads are those roads that are managed through the License of Occupation (LOC).

(4c) 1.1a.1 Objective

To have less than 2% of productive area in Canfor's future permanent roads (LOC)

The total timber harvesting (productive) landbase of the FMA area is 509 459 ha, and the acceptable amount of new permanent roads is less than 2% of the productive landbase (10 189 ha).

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  The existing permanent roads in the FMA area do not contribute to the forested landbase. Consequently, they have been part of the net down for the allowable annual cut. Only main haul roads are constructed for permanent access, and these are managed through the License of Occupation (LOC) disposition process.

  Currently, Canfor has not constructed any new LOCs in the FMA area since May 1, 1999. A new LOC road is planned for construction in summer 2000.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  All Canfor's future permanent roads will be managed to ensure utility for all parties (integration) and to promote common corridors with other industrial activities, where possible. Thus, all parties must effectively communicate their road building and construction plans.
- **Implementation schedule**
  All LOCs constructed as of May 1, 1999 will be tracked.
- **Monitoring procedure**
  All Canfor's future permanent roads will be digitized into the GIS. This procedure will be carried out on an annual basis for each new permanent road that Canfor constructs.

  A 5 year Road Development Plan map is part of the General Development Plan (GDP) that is submitted with the Annual Operating Plan on an annual basis. The actual and projected amount of road to be built will be tracked in the plan, commencing in May, 2001.
- **Linkages between strategic and operational plans**
  This objective has been communicated to operational staff to minimize the amount of permanent road construction.

(4c) 1.1b. Indicator

The amount of area in each seral stage at present and key points in time

Seral stage distribution is important for maintaining forests on the landbase because it provides for, over the long-term, a full range of ecosystem types that contribute to the health of the global ecological cycles.

(4c) 1.1b.1 Objective

Maintain seral stages within the natural disturbance regimes at present and key points in time

The target (natural) seral stage distribution is one that approximates the expected distribution created by natural disturbance regimes within the two natural regions, Foothills and Boreal Forest (Figure 4). The natural disturbance regime has been modeled by using a theoretical fire-return interval.

- **Acceptable variance**
  For this planning horizon (200 years), the acceptable variance is to be within the range of the natural disturbance regimes for seral stages in the FMA and FMUs (G8C, G2C, and G5C E8C), as indicated in Figures 5-8, respectively. The acceptable variance represents a combination of both natural regions where they occur.

  Figures 9 and 10, Foothills and Boreal Forest natural regions, are provided only as supplementary information.

The range of natural disturbance is represented by the "red" line in Figures 5-10, whereas the bar represents the current or projected distributions.

- **Current status**
  The area of each seral stage by year in the FMA, FMUs (G8C, G2C, and G5C E8C) and natural regions (Foothills and Boreal Forest) is provided in Tables 4-9, respectively.

  Figures 5-8 indicate the present and forecasted distributions for the FMA and FMUs as compared to expected natural distributions.

- **Forecasting assumptions and analytical methods**
  Seral stage distributions under a natural fire regime were modeled by using a theoretical fire-return interval (Olympic Resource Management 2000). The amount of area in each seral stage in the FMA and FMUs (G8C, G2C, and G5C E8C) has been forecasted on the landbase at each key point in time (Figures 5-8). The key points in time are at years 0, 10, 20, 50, 100, and 200, where 1999 represents year 0. It is assumed these time periods provide a reasonable picture of the variability of seral stage over time. These forecasts are based on the most current AAC analysis and, therefore, may change as additional analyses are completed.

- **Forest management activities**
  The amount of each seral stage and its distribution will be compared to the amount of seral stage expected from a theoretical fire-return interval. Adjustments will be made to the harvest schedule, as required, to ensure the desired seral stage distribution is obtained over time.

- **Implementation schedule**
  Preliminary comparisons between current status and the target seral stages have been completed. All future harvesting plans will follow the strategic direction as outlined in the DFMP and adjusted, as required, to meet the desired seral stages over time.

- **Monitoring procedure**
  The amount of area of each seral stage that is on the landscape will be compared to the expected natural distributions at key points in time.

- **Linkages between strategic and operational plans**
  All new harvesting plans will follow the strategic direction as outlined in the DFMP.

(4c) 1.1c. Indicator

The amount of area identified as low productive sites

Productivity generally refers to the innate capacity of an environment to produce plant and animal biomass. Within forestry, specifically, it is the wood volume or yield that trees can produce within a given period of time. In terms of the DFMP, low productive sites are identified as yield group 13 (SBLT/

LTSB (U) - basically black spruce (SB) and larch (LT) stand types) (Canfor 1999h).

(4c) 1.1c.1 Objective

Designate all low productive yield groups as no harvest zones, subject to operational verification

The yield groups are based on overstorey and understorey tree canopy composition and density, taken from AVI data. Yield tables, evaluating the productivity of each yield group, have been produced. Yield group 13 (SBLT/LTSB (U)) is the only yield group considered to have low productivity and has not been considered in the AAC calculation.

- **Acceptable variance**
  No low productive sites (yield group 13) will be scheduled for harvesting after operational verification.
- **Current status**
  Approximately 30 000 ha were classified as yield group 13. A negligible amount of yield group 13 has been harvested, approximately 16 ha (Canfor 2000).
- **Forecasting assumptions and analytical methods**
  AVI cover type stratification work has been completed and all yield groups identified.
- **Forest management activities**
  Operationally, low productive sites (greater than 1 ha) within cut units are currently identified as per "Critical Element 4c, Objective 1.1c.2" and are not harvested.
- **Implementation schedule**
  Yield group 13 is excluded from the calculation of the AAC.
- **Monitoring procedure**
  Yield group 13 has been identified using AVI and removed from the AAC. Any discrepancies will be recorded in the GIS map database.
- **Linkages between strategic and operational plans**
  The strategies outlined in the DFMP will be followed operationally.

(4c) 1.1c.2 Objective

Delineate all low productive sites (>1 ha) within harvested areas as "no harvest zones"

Low productive sites take a longer time or never reach an adequate volume to warrant harvesting. These sites are also difficult to reforest and could be lost from the forested landbase if disturbed. Some examples of low productive sites that will be delineated include areas of high or perched water table (typically yield group 13, but could include other stand types).

- **Acceptable variance**
  The acceptable variance is zero regarding harvesting on areas delineated as no harvest zones.

- **Current status**
  No harvest zones are delineated on the 1:5 000 scale block maps during the:

  - Planning stage (field reconnaissance or air photo interpretation);
  - Layout stage;
  - Pre-harvest silviculture prescription program; and
  - Block review with the harvesting contractor.

  The current status of non-harvested areas in yield group 13 from the past 3 years is:

  - 1997 - harvested 2 929.1 ha, of which 26 patches were non-harvested (25.2 ha). Of those 26 patches, only 2 were SB, yield group 13 (1.1 ha);
  - 1998 - harvested 2 476.7 ha, of which 53 patches were non-harvested (92.1 ha). Of those 53 patches, 5 were SB yield group 13 (1.9 ha); and
  - 1999 proposed (cut over updates not completed) - proposed harvested was 6 215 ha, of which only 5.3 hectares were yield group 13. Of this, only 1 patch was greater than 1 hectare.

- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.

- **Forest management activities**
  Low productive sites (greater than 1 ha) within cut units are delineated operationally.

- **Implementation schedule**
  Protocols are currently in place for identifying low productive, no harvest zones within proposed harvested areas.

- **Monitoring procedure**
  The annual cutover update program will be used to manage information regarding blocks with no harvest zones.

  Representative sample of the harvested areas will be inspected to ensure that identified no harvest zones have remained unharvested, starting in May, 2001.

- **Linkages between strategic and operational plans**
  The operational plan will follow the strategies for low productive stands as stated in the DFMP.

(4c) 1.2 Goal

Productive lands are restored to productive status (excluding cut units)

The intent of this section is to deal with industrial areas, other than cut units, that were once productive and require some additional treatment to restore the areas back to productive status.

Productive lands that are impacted by fire are discussed in the "Critical Element 4c, Objective 1.2a.2". Catastrophic insect, disease, and windfall events are discussed in "Critical Element 2a, Objective 1.1a.1".

(4c) 1.2a. Indicator

The amount of productive area regenerated (excluding cut units)

(4c) 1.2a.1 Objective

Track amount of previously withdrawn areas brought back into productive status

The types of previously withdrawn areas from the FMA area and brought back into production could include abandoned wellsites, roads, pipelines, campsites, and/or gravel pits.

Once those areas are no longer required, they are reclaimed and there is a regulatory process for adding the area back into the FMA area. The concern with most of these areas is that they are currently reclaimed with grass or other vegetative cover, which conflicts with seedling establishment. From a forestry perspective, it would be more efficient to bring those lands back into productive status, providing the site is reclaimed to allow for seedling establishment.

- **Acceptable variance**
  All areas reforested will be tracked. The acceptable variance is zero.
- **Current status**
  In 1999, at the request of the LFS, Canfor reforested 5 dispositions. These sites were excellent candidates for reforestation in that:
  - Only some sites had been seeded to grass (but not established);
  - They were within Canfor's reforestation program area; and
  - They were reclaimed to allow for seedling establishment.

  Tracking of previously withdrawn lands commenced in 1999. The silviculture database is the mechanism by which these lands are tracked.
- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.

- **Forest management activities**
  In order to maximize the future reforestation of withdrawn areas, Canfor and the government will cooperate to identify sites that are best suited for seedling establishment.

  These areas will be tracked in a non-liability silviculture database due to different forest management requirements. A separate system for monitoring seedling establishment and growth will be established.

- **Implementation schedule**
  A meeting with LFS will be initiated prior to July 31, 2000 to discuss implementation of the forest management activity described above.

  The silviculture database currently contains the records for these previously withdrawn areas; however, these records will be incorporated into a separate non-liability silviculture database by September 30, 2000.

- **Monitoring procedure**
  A monitoring system for these areas will be developed by May 1, 2002.

- **Linkages between strategic and operational plans**
  Tracking and reforestation of withdrawn areas are primarily an operational function; however, once the lands are successfully regenerated, they will play a role in future AAC calculations.

(4c) 1.2a.2 Objective

Track burned areas to ensure that they have been regenerated (with preference to natural regeneration)

Productive forested areas that have been burned need to be returned to productive status. This ensures that the forested landbase does not suffer from sustained deforestation.

Sites will be monitored to ensure they regenerate, and the level of stand management required to bring the stand into productive status will be determined.

- **Acceptable variance**
  The acceptable level of variance is to track regeneration success on fires greater than four hectares.

- **Current status**
  Information on burned areas is supplied to the Company by Alberta Environment.

  As reported in the Forest Protection Plan (Canfor 2000e), there have been 175 fires in the FMA area during the last 14 years (1986-1999 inclusive), impacting a total of 183 ha.

  A total of 79 ha of the burned area has been reforested, of which 59 ha was within existing harvested areas and required immediate reforestation in order to meet legal requirements. These areas (that were burned) are currently tracked in the silviculture database.

- **Forecasting assumptions and analytical methods**
  No forecasting or analysis is required.
- **Forest management activities**
  Canfor will continue to keep track of new burned areas.
- **Implementation schedule**
  Protocols have been established to address when reforestation of burned areas are required. Examples of when reforestation efforts would be required include whenever a fire is in a harvested area or an adequate seed source is not available.
- **Monitoring procedure**
  All burned areas greater than 4 hectares will be monitored to ensure that the forested landbase does not suffer from sustained deforestation.

  Burned areas, greater than 4 hectares, that are included in harvested or planned cut units, will continue to be tracked in the silviculture database. Any burned areas that are outside the harvest plans will be removed from the silviculture database and will be tracked in the non-liability silviculture database. A separate monitoring program will be developed as per "Critical Element 4c, Objective 1.2a.1".
- **Linkages between strategic and operational plans**
  Fire losses are not considered in the net down process for the calculation of the AAC; however, a catastrophic fire would necessitate a revision.

(4c) 1.3 Goal

Minimize the loss of forest on the landbase due to access

Forestry is only one of many stakeholders that use roads and seismic lines (linear disturbances) as a transportation network. The energy sector constructs cutlines for seismic exploration and these lines are later used for future exploration and as access (roads).

The rate at which these current and future landbase deletions (e.g., seismic lines, wellsites, pipelines, and access roads) revegetate to commercial tree species will affect the long-term sustainability of current harvest levels for the forest industry (Stelfox and Wynes 1999). Promoting shared access with other resource users is key to reducing the impact that roads have on the landbase.

(4c) 1.3a. Indicator

Degree of access integration

It is important to promote shared access and integration of operations because it is both cost-effective and environmentally sound.

(4c) 1.3a.1 Objective

To maximize and promote shared access by all resource users

Canfor communicates with other industries operating in the FMA area regarding opportunities for sharing access by:

- Utilizing existing linear disturbances, such as seismic lines, for new roads;
- Utilizing road use agreements as a method to share current road infrastructure; and
- Developing integrated operational plans with other timber users.

- **Acceptable variance**
  Not applicable.

- **Current status**
  Currently, Canfor's 5-year General Development Plan (GDP) map is forwarded to the main industry companies (energy sector and timber) operating on the FMA area, along with an informational letter explaining our desire for sharing of access and communicating long-term plans.

  The use of seismic lines for access is a common practice. The majority of block roads (temporary roads) constructed by Canfor utilize seismic lines, where appropriate. Main roads utilize seismic corridors, where applicable, as well.

  Road use agreements are currently in place with the energy sector as well as other forest companies operating in the area.

  Canfor and Tolko have worked closely in managing and sharing road access in areas where harvesting interests overlap.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Canfor will develop a communication strategy, as detailed in "Critical Element 3a, Objective 1.1b.1" and convey this strategy to the main industries regarding opportunities for sharing access. However, it must be recognized that Alberta Environment is responsible for approval of access development for all other industries operating in the FMA area.

- **Implementation schedule**
  The communication strategy, as stated above, will be developed by December 31, 2001.

- **Monitoring procedure**
  The communication strategy will be reviewed annually to ensure proper and effective communication flow between stakeholders.

- **Linkages between strategic and operational plans**
  Industrial plans are reviewed and their impact upon operational plans assessed.

5. Criterion

Multiple Benefits to Society

Forests provide a sustained flow of benefits for current and future generations. Multiple goods and services are provided over the long-term.

(5a) Critical Element

Extraction rates are within the long-term productive capacity of the resource base

(5a) 1. Value

Sustainable yield of timber

(5a) 1.1 Goal

Maintain sustainable harvest levels on the FMA area

The amount of harvest never exceeds, on a long-term basis, the amount that the forest can grow.

(5a) 1.1a. Indicator

Long-term harvest levels vs. actual extraction rates as per the DFMP

The production and delivery of forest products add to the economy through the payment of wages, taxes, profits, and other fees such as stumpage fees (CCFM 1997). Thus, maintaining the capacity of the forested landbase is necessary so that it can support a flow of timber and non-timber benefits for current and future generations.

(5a) 1.1a.1 Objective

To harvest at a level less than or equal to the long-term level

The annual allowable cut is calculated to ensure that the local productive capacity of the forest is not exceeded on a long-term basis (sustained yield).

- **Acceptable variance**
  In any one year, the harvest level can vary as long as the total amount harvested in established 5 year periods (cut control) does not exceed 5% of the total approved annual allowable cut.
- **Current status**
  The current AAC, as per our 1991 approved DFMP, is 730 000 m^3. Presently the Company is harvesting below this level, as indicated in Table 18.

TABLE 18
Actual Harvested Volume vs. the AAC

Cut control period	Harvested (m^3)	AAC	Variance
1988-1992	3 080 603	3 354 500	273 897
1993-1997	3 142 717	3 650 000	507 283
1998-2002	3 283 847	3 650 000	366 153
Totals	9 507 167	10 654 500	1 147 333

Source: based on 5-year General Development Plan Cut Control Table

The preliminary runs of the Timber Supply Analysis indicate a new conifer AAC of approximately 635 000 m^3, as compiled by Olympic Resources Management data. This number is subject to change as work continues on the Timber Supply Analysis. The Timber Supply Analysis runs are expected to be completed and submitted to the Alberta Environment for approval, at the earliest, by September 30, 2000.

- **Forecasting assumptions and analytical methods**
  Many of the indicators and objectives and their forecasts discussed throughout this SFMP will be incorporated in the calculation of the AAC.

  The assumptions of the approved AAC will be explained further in the DFMP.

- **Forest management activities**
  Actual and proposed harvest levels will by monitored to ensure that cut control volumes are met, as established in the DFMP.

- **Implementation schedule**
  The cut control table will by followed, as defined in the DFMP (current practice).

- **Monitoring procedure**
  The extraction rates will be compared to the AAC to ensure the acceptable variance is not exceeded.

- **Linkages between strategic and operational plans**
  A comparison of the cut control volumes will be made to the annual harvested and proposed extraction rates on an annual basis. An adjustment will be made within the 5 year cut control, as required, to ensure the acceptable variance is not exceeded.

(5b) Critical Element

Resource businesses exist within a fair and competitive investment and operating climate

(5b) 1. Value

Economic benefit to local communities

Canfor provides economic and social benefits at the local and provincial level. The FMAC emphasized very strongly that local communities need to benefit from the presence of the FMA area and the activities of the industries that operate in the FMA area. The local communities referred to in this Value are those adjacent to the FMA area: for example, Valleyview, DeBolt, Fox Creek, Spirit River, Fairview, Grande Cache, and Grande Prairie.

(5b) 1.1 Goal

Local communities and contractors have the opportunity to share in benefits such as jobs, contracts, and services

Canfor strives to hire local contractors and suppliers if they:

- Offer competitive skills;

- Have proper equipment;
- Deliver goods and services at a competitive price; and
- Provide overall service.

It is Canfor's overall strategy to form long-term partnerships with suppliers and contractors to better service the needs of both parties.

Canfor hires contractors in accordance to EMS policy MSP I-04. This policy requires contractors to have the appropriate level of skill and knowledge and to meet all company environmental requirements and other performance requirements.

(5b) 1.1a. Indicator

The economic contribution that Canfor Grande Prairie Operations makes to local communities and contractors

The forestry, agriculture and petroleum industries have played a major role in the economic stability of Northwestern Alberta by providing jobs and contracts. Canfor contributes to the local economy in the form of wages and benefits, property taxes, purchases of goods and services, and community support.

(5b) 1.1a.1 Objective

To maintain Canfor's contribution to local communities and contractors

Canfor's key contributions to the local communities are indicated in Table 19.

- **Acceptable variance**
  The acceptable variance is to maintain Canfor's contribution to local communities in relation to the prevailing economic climate.
- **Current status**
  Table 19 describes the key contributions that Canfor has made in 1998 and 1999.
- **Forecasting assumptions and analytical methods**
  Contributions to the local communities will be maintained in relation to the prevailing economic climate.
- **Forest management activities**
  Finalize the data stratification for local versus non-local contractors and suppliers. Develop the spreadsheets necessary to link accounting information with data stratification to facilitate the reporting of contractor and supplier information.
- **Implementation schedule**
  The above activities will be completed by April 30, 2001.
- **Monitoring procedure**
  The information contained in Table 19 will be reported in the Annual Performance Monitoring Report.

TABLE 19
Key Contributions to Local Communities

Contribution	Amount ($MM) 1999	Amount ($MM) 1998
Property Taxes	0.6	0.6
Salary and Wages & Benefits	11.6	10.6
Contract Services Local [1]	26.8	32.3 (combined) [2]
Contract Services Non-local [1]	2.3	
Supplies	4.6	4.6
Energy	2.2	1.9
Stumpage	10.9	6.8
Community Donations	0.1	0.1
TOTAL	59.1	56.9

Source: Canfor accounting ledger

[1] Canfor's accounting ledger currently does not distinguish between local and non-local contractors. However, an estimate of the local versus non-local has been determined, based on preliminary data stratification.

[2] Local plus non-local contract services.

- **Linkages between strategic and operational plans**
  All woodlands contractors must be hired according to MSP I-04 (EMS policy). This ensures appropriate training is in place prior to performing work in the FMA area.

(5b) 1.1b. Indicator

The financial commitments as stated in Section 33, facility operation and FMA renewal commitments, of the Forest Management Agreement 9900037 are met

The following two objectives are from Section 33 of Forest Management Agreement 9900037, signed on May 5, 1999.

(5b) 1.1b.1 Objective

Within 60 months of the signed Forest Management Agreement 9900037, the company shall upgrade its sawmill and fingerjoint as per Section 33 of the Forest Management Agreement 9900037

"33. (1) The Company shall upgrade its sawmill and fingerjoint plant (the "facilities") at Grande Prairie, Alberta at a minimum capital cost of $33 million.

(2) The Company shall complete the upgrade of the facilities under subparagraph (1) within sixty months following the commencement date of this Agreement as follows:

(a) within twenty-four months following the commencement date of this Agreement, the Company shall have expended $15 million towards the initial upgrade of the facilities; and

(b) within sixty months following the commencement date of this Agreement the Company shall have expended an additional $15 million towards the upgrade of the facilities."

- **Acceptable variance**
  The acceptable variance is zero unless mutually agreed to by both Canfor and Alberta Environment.
- **Current status**
  In the fall of 1998, Canfor spent $3.2 million on a high-speed edger to improve the throughput of logs in the sawmill. In addition, Canfor initiated a $22 million upgrade to the sawmill at Grande Prairie, commencing in the fall of 1999. The upgrade was completed on May 17, 2000.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  The commitments in Section 33 subparagraph 2(a) have been met. The remaining amount of capital expenditure ($8 million) identified in subparagraph 2(b) will be included in Canfor's new 5 year strategic plan to be completed for the 2001 Business Plan by November, 2000.
- **Monitoring procedure**
  The woodlands manager has the responsibility to review, on an annual basis until the target is achieved, the follow-up reports of the AFE (authority for expenditure) for the sawmill upgrades. After the target is met, information will remain on file for government review.
- **Linkages between strategic and operational plans**
  Not applicable.

(5b) 1.1b.2 Objective

To submit to the Minister for approval, a forestry project, in accordance with Section 33 subparagraph 4 of the Forest Management Agreement 9900037

"(4) No later than the tenth anniversary of the commencement date of this Agreement, the Company shall submit to the Minister a proposal for a forest industry project (the "forest project"), including an implementation timetable, that is acceptable to the Minister."

- **Acceptable variance**
  Zero variance.

- **Current status**
  Canfor submitted a proposal on January 12, 2000 to utilize 170 000 m^3 of deciduous from Canfor's FMA area plus an additional volume of 775 000 m^3 from other areas that was made available through the North Central Re-Allocation Program process (initiated by the Alberta Government). The proposal included the construction of a $197 million OSB plant, to be built in the MD of Greenview No. 16 (Canfor 2000b). In February 2000, the timber rights were awarded to Ainsworth Lumber Company Ltd.

  At the time of writing, Canfor has submitted no additional proposed forestry project to the Alberta Government.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Not applicable.

- **Implementation schedule**
  Canfor will continue to investigate opportunities for a forestry project related to the FMA area.

- **Monitoring procedure**
  Canfor Management will monitor the progress of meeting the objective and report it in the Annual Performance Monitoring Report.

- **Linkages between strategic and operational plans**
  Not applicable.

(5c) Critical Element

Forests provide a mix of market and non-market goods and services

(5c) 1. Value

Multiple benefits from forests

(5c) 1.1 Goal

Maintain the opportunity for others to use the forest for market and non-market goods and services

(5c) 1.1a. Indicator

Amount of coniferous timber available to locals

Forest Management Agreement 9900037 contains provisions for the amount of the conifer volume available. Two objectives will be discussed together in the following text.

(5c) 1.1a.1 Objective

0.5 % of the conifer AAC is made available for local use

As stated in the Forest Management Agreement 9900037, the following volumes are made available for local use:

"8. (2) The minister also reserves the following rights to the timber on the forest management area:..... (d) the right, after consulting with the Company, to issue coniferous timber dispositions from within the forest management area to provide timber for local use in construction and maintenance of public works by any local authority, municipality, county, the Crown in the right of Alberta or Canada and for local residents provided, however, that the total volume of timber cut under authority of such timber dispositions does not exceed 0.5% of the Company's approved annual allowable cut."

(5c) 1.1a.2 Objective

Up to a set volume of 10 000 m^3 of conifer is available in the FMA area for a Community Timber Use Program

As stated in the Forest Management Agreement 9900037, the following volume of coniferous timber is available for a Community Timber Use Program:

"8. (2) The minister also reserves the following rights to the timber on the forest management area:.....(e) the right, after consulting with the Company, to issue coniferous timber dispositions from within the forest management area to provide timber for a Community Timber Use Program for up to 10,000 cubic metres of coniferous timber annually."

- **Acceptable variance**
  The maximum volume available annually cannot be exceeded since this quantity is defined in the Forest Management Agreement 9900037.
- **Current status**
  The local demand for timber, as allocated by Alberta Environment, is currently met from lands outside the FMA area. During 1998 and 1999, an average of two permits per year were issued for Local Timber Permit (LTP) purposes from within the FMA area, totaling 150 m^3 (equivalent to 0.02% of the 1991 approved AAC).

  The timber available for the Community Timber Use Program has not been required to date.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable because the amount of coniferous timber withdrawn from the AAC is not directly managed by Canfor.
- **Implementation schedule**
  Canfor will work with the Alberta Environment in assigning areas for the allocation of the timber.

- **Monitoring procedure**
  The amount of coniferous timber extracted through these programs will be tracked as part of the total amount of coniferous timber extracted from the FMA area on an annual basis.
- **Linkages between strategic and operational plans**
  The timber required will be made available within Canfor's operational plans.

(5c) 1.1b. Indicator

Recreational opportunities

There is a need to fully understand the current and future recreational use of the FMA area.

(5c) 1.1b.1 Objective

Complete a recreational assessment within 5 years after the DFMP is approved

The inventory will be broad-based and will include a report on who uses the forest, what general lands are used, and for what purpose. Canfor will evaluate future opportunities identified within the boundaries of the FMA area.

- **Acceptable variance**
  Zero variance in respect to completing the assessment within the stated time.
- **Current status**
  It is recognized there are a variety of current recreational uses on the FMA area, such as campgrounds (4) operated by Canfor, and hunting, fishing, canoeing, river boating, trail riding, etc.

  Baseline data for recreational activities on the FMA area are not available.
- **Forecasting assumptions and analytical methods**
  Not applicable until assessment is completed.
- **Forest management activities**
  Management strategies for implementation will be developed after the report is completed and evaluated.
- **Implementation schedule**
  The broad-based inventory will be completed within five years after the approval of the DFMP.
- **Monitoring procedure**
  The status of the survey will be monitored annually to ensure the stated objective is met.
- **Linkages between strategic and operational plans**
  Known current uses will be incorporated into operational plans, as necessary.

(5c) 1.1b.2 Objective

Ensure 100% of Canfor campgrounds are maintained on the FMA area for the use by the public

Canfor manages four (4) campgrounds on the FMA area.

- **Acceptable variance**
  No campgrounds will be removed.
- **Current status**
  Four existing campgrounds are managed: Smoky Flats, Economy Lake, Westview Recreation Area, and Frying Pan Creek (Canfor 1998c).
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  Completed.
- **Monitoring procedure**
  Campgrounds are maintained for the use of the public.
- **Linkages between strategic and operational plans**
  Not applicable.

(5c) 1.1b.3 Objective

Promote Canfor campgrounds to the public

- **Acceptable variance**
  Not applicable.
- **Current status**
  Canfor has produced a brochure of public campsites (including mapped locations and description of facilities) in the FMA area (Canfor 1998c) and has distributed it to the Muskoseepi Park office, Rotary bus tours, and the tourism office. Copies are also available at the Canfor Woodlands office in Grande Prairie.

  The Rotary bus tour co-ordinator requested 600 brochures for the summer 2000 bus tour program.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  Expand circulation of the brochure, as required.

- **Monitoring procedure**
  Canfor will maintain a list of where brochures were distributed (Canfor 2000c: Tab "brochure").
- **Linkages between strategic and operational plans**
  Not applicable.

(5c) 1.1c. Indicator

Communication with trappers impacted by harvest operations

Canfor, in consultation with the Trappers Association and the Sturgeon Lake Cree Nation, has developed a Trappers Notification and Compensation Program (Canfor 1997a). This program was reviewed with the FMAC.

(5c) 1.1c.1 Objective

Contact all trappers directly impacted by harvest operations

- **Acceptable variance**
  Zero variance, providing that a reasonable effort at contact is made.
- **Current status**
  The Trappers Notification and Compensation Program was implemented for the 1998 season. The plan defines compensation criteria, as well as other actions. It specifies personal contacts to be made with the trappers concerning:
  - Cabin, trapline, and important wildlife areas;
  - When and where harvesting, road building, log hauling and silviculture activities will occur; and
  - Exact locations of cut blocks and logging roads.

  Canfor maintains a current list of all senior trappers on the FMA area.

  Implementation of the direct communication is accomplished by hiring a person as per Section 1.3 of the Trappers Notification and Compensation Program. Contacts are documented using the Trappers' Notification form.

  Currently, a reasonable effort is made to contact all trappers affected within the first 1-3 years of the AOP/5-year GDP by September 30 each year, for example:
  - In 1998, 15 of the 17 trappers affected by 1998 harvesting operations were notified; however, the two remaining trappers were notified in 1997.
  - In 1999, 12 of the 15 trappers affected by 1999 harvesting operations were notified; however, one of the three were notified in 1998 and the other two have no record on file of being contacted. In addi-

tion in 1999, for the 2000 harvest operations, 12 of the 14 were given notification.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  The current program is scheduled for a revision by June 30, 2000. The revised program will be implemented after September 30, 2000. A database will be developed, by September 30, 2000, to track all contacts to monitor conformance to the program. Comments made by the trappers will be tracked in the ITS public comments database, as per the EMS MSP I-03 - Public Communication.
- **Implementation schedule**
  Dates will be established as per forest management activities.
- **Monitoring procedure**
  Monitoring of trapper notifications will be through a database, as indicated in the Forest management activities.
- **Linkages between strategic and operational plans**
  The trapline allocations, as identified in the 1991 DFMP (Canfor 1991: p. 116), are referenced to the current harvest planning activities. The affected trappers are notified according to the Trappers Notification and Compensation Program.

(5c) 1.1d. Indicator

Communication with outfitters impacted by harvest operations

(5c) 1.1d.1 Objective

Contact all outfitters directly impacted by harvest operations

- **Acceptable variance**
  Zero variance in respect to contacting affected outfitters.
- **Current status**
  No formal communication plan is in place. However, Canfor has recently obtained a list of outfitters who use the FMA area. This list has been entered into the stakeholder database.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Once the implementation activities listed below are complete, then input received from the outfitters can be incorporated into Canfor's harvest planning.

- **Implementation schedule**
  Canfor has only recently obtained a list of all outfitters active on the FMA area from the Professional Outfitters Association. A letter will be sent by September 30, 2000 to individual outfitters requesting information regarding their operating area and the type of information that they desire to receive from Canfor.
- **Monitoring procedure**
  Canfor will keep a record of all letters sent and responses received. A management strategy will be determined, based on the responses.
- **Linkages between strategic and operational plans**
  No link to the DFMP at this time.

(5c) 1.2 Goal

Improve the value of raw timber material from the FMA area

(5c) 1.2a. Indicator

To increase lumber recovery from the conifer timber resource during the milling process

Increasing the Lumber Recovery Factor (LRF) results in better utilization of the timber resource (i.e., mill production will increase utilizing the same volume of logs).

(5c) 1.2a.1 Objective

Increase mill recovery of logs at the mill site by 14%

- **Acceptable variance**
  The acceptable variance to the increase in LRF of 14% is zero. The timeframe in which to achieve the 14% is between 3 and 6 months after the May target date.
- **Current status**
  A $22 million upgrade to the mill is now completed. The LRF prior to the upgrade was 235 fbm/m^3. As a result of the upgrade, the LRF is forecasted to increase 15.4% (278 fbm/m^3). This modernization will increase the yearly mill output from 175 MM board feet to 200 MM board feet, utilizing the same volume of logs, providing the log profiles do not change.
- **Forecasting assumptions and analytical methods**
  Logs with sweep will now be curved sawn, which will result in higher lumber recovery and increased grade outturn.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  The mill upgrade was completed on May 17, 2000.

- **Monitoring procedure**
  The log profiles will be monitored in relation to the recovery rate of the mill. If the log profile is different than forecasted, the recovery rate will be compared to what the previous rate would have been prior to the mill upgrade, in order to get a fair comparison.
- **Linkages between strategic and operational plans**
  Not applicable.

6. Criterion

Accepting Society's Responsibility for Sustainable Development

Society's responsibility for sustainable forest management requires that fair, equitable, and effective forest management decisions are made.

> "…. fairness is defined in terms of inclusiveness, while an effective decision is one that incorporates and mediates the broad spectrum of concerns on a given issue." (CCFM 1997: p. 112)

(6a) Critical Element

Forest Management

Forests are managed in ways that reflect social values, and management is responsive to changes in those values.

(6a) 1. Value

Social values

(6a) 1.1 Goal

To be responsive to the social values identified by the FMAC and other publics

(6a) 1.1a. Indicator

Topics in the current Issue List (compiled by the FMAC since inception) are addressed by the Company to the Committee's satisfaction

The Forest Management Advisory Committee was formed in 1995 as a public consultation initiative by Canfor as a way to include public input into the Detailed Forest Management Plan. The Issues List has been developed during the past 5 years. The list is a "living document", which means all new issues are incorporated as they are raised. Canfor takes responsibility for ensuring that all issues are addressed to the Committee's satisfaction.

(6a) 1.1a.1 Objective

100% of the topics in the Issue List, as of June 30, 2000, are addressed to the Committee's satisfaction by the submission date of the DFMP

Issues raised after June 30, 2000 will still be tracked and addressed in the Issues List (Forest Management Advisory Committee 1995); however, Canfor may not be able to completely address those issues to the Committee's satisfaction, due to time constraints.

- **Acceptable variance**
  To address 90% of the topics to the Committee's satisfaction is acceptable.
- **Current status**
  The Issues List was initiated in 1995 and is a "living" document. It is updated as an issue's status changes or as new issues are raised. The Committee approves all revisions.
- **Forecasting assumptions and analytical methods**
  The Issues List will be maintained for the life of the Committee.

- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  Issues are addressed by Canfor as they are added to the Issues List.
- **Monitoring procedure**
  A matrix will be developed, by November 30, 2000, to track the status of each issue (e.g., some of the categories that could be included are "incorporated into the DFMP", "not addressed", and "addressed outside of DFMP"). The FMAC will be consulted (before the submission date of the DFMP) regarding the effectiveness of the proposed monitoring system.
- **Linkages between strategic and operational plans**
  The Issues List will be incorporated into the DFMP. Operational procedures may be modified to address FMAC issues.

(6a) 1.1b. Indicator

The number of Canfor responses to written letters or public meeting issues, etc.

Canfor recognizes the right of the public to provide input. The process used to address public input is stated in the Public Involvement Program (Canfor 1998) and the Environmental Management System (EMS).

(6a) 1.1b.1 Objective

100% of public issues received after November 1999 are responded to by Canfor

Canfor's Environmental Management System was registered in November, 1999. Therefore, that is the date at which Canfor committed to a tracking process for public input external to the FMAC process. It should be noted that letters received prior to November, 1999 received a response. However, Canfor's tracking system was not in place at that time. Letters and responses were kept on file.

The FMAC process tracks Committee input via the Issues List discussed in "Critical Element 6a, Objective 1.1a.1".

- **Acceptable variance**
  Zero variance.
- **Current status**
  A computerized Incident Tracking System (ITS) has been developed for tracking public issues. Currently there are a total of six entries:
  - Three relate to the Swan Lake Recreational Area and are positive comments (received before November, 1999);
  - Two relate to Canfor's certification pursuit. Response letters are on file and attached in the ITS;

- One relates to comments received at an April 12, 2000 public meeting in which the Canfor's herbicide spray program was discussed. Verbal responses were provided at the meeting to address concerns.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Activities are dependent on the issues raised.

- **Implementation schedule**
  The Incident Tracking System (ITS) has been implemented as of November, 1999. Issues must be documented as per the EMS guidelines and submitted to the EMS representative for entry into the ITS.

- **Monitoring procedure**
  Public input will be reported and responses documented, as they occur. ITS makes provisions for monitoring the progress of required action plans.

- **Linkages between strategic and operational plans**
  Operational procedures may be modified to address public issues.

(6b) Critical Element

Duly established Aboriginal and treaty rights are respected

(6b) 1. Value

Understand and respect treaty and Aboriginal rights

(6b) 1.1 Goal

Avoid infringement of treaty and Aboriginal rights

(6b) 1.1a. Indicator

Amount of opportunity for input by Aboriginal peoples

The most effective spokespersons for Aboriginal rights are members of the Aboriginal communities. Therefore, the most effective way to both understand and avoid infringement of treaty and Aboriginal rights is to provide a mechanism whereby Aboriginal peoples can most easily provide input to Canfor.

(6b) 1.1a.1 Objective

To provide increased opportunities for input

- **Acceptable variance**
  Zero variance with regard to Canfor initiating a meeting to develop an improved mechanism for increasing input opportunities.

- **Current status**
  The current mechanism for providing input to Canfor has been through the Forest Management Advisory Committee (FMAC). Sturgeon Lake Cree Nation and Metis Nation of Alberta, Local 1990 have been members of the FMAC since inception (1995). Therefore, they have had opportunity to provide input regarding forest management activities that may impact treaty and Aboriginal rights. The Metis Nation of Alberta,

Local 1990 representative, although no longer active on the board for the Metis, continues to represent the Metis point of view.

Canfor has met independently (March 24, 2000) with the Sturgeon Lake Cree Nation to provide their input to the CSA Matrix (Appendix 6).

On April 20, 2000 and May 12, 2000 Canfor representatives met with Sturgeon Lake Cree Nation Band representatives to discuss issues of mutual interest. Discussions related to increased opportunity for input into forest planning included the use of traditional knowledge, as noted in the draft strategic plan discussion paper presented at the May 12, 2000 meeting.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Changes to forest management activities, as a result of Aboriginal input, will be documented.
- **Implementation schedule**
  Canfor has initiated meetings with the Sturgeon Lake Cree Nation to discuss increased opportunities for input. Based on consensus reached to date, Canfor has agreed to do some additional work on the draft strategic plan over the summer and meet again with Sturgeon Lake by the end of September, 2000. The goal is to have a plan in place by December 31, 2000.

  Canfor will commence meetings with the Metis Nation of Alberta, Local 1990, by March 31, 2001, to determine the most effective mechanism for increasing input opportunities.
- **Monitoring procedure**
  Monitoring of action items, in relation to input received from Aboriginal peoples regarding forest management activities, will be tracked in the ITS database. Correspondence, feedback, responses, and other pertinent documents will be kept on file.
- **Linkages between strategic and operational plans**
  If Aboriginal input leads to changes in operational procedures, details will be specified in the operating plans.

(6b) 1.1a.2 Objective

To be responsive to aboriginal input

The improved mechanism(s), as discussed in the previous objective, will include provisions for how and in what timeframe Canfor will respond to input received from Sturgeon Lake Cree Nation and Metis Nation of Alberta, Local 1990.

- **Acceptable variance**
  Zero variance with regard to Canfor's following the agreed to mechanism of response.

- **Current status**
  Canfor has historically met with Sturgeon Lake Cree Nation on an informal basis as issues arise, in addition to their participation on the FMAC since inception (1995).

  The Metis Nation of Alberta, Local 1990 has participated on the FMAC since inception (1995).

  Plans are under development to determine the needs of the Metis Nation, Local 1990 in responding to their input.

  On April 20, 2000 and May 12, 2000, Canfor representatives met with Sturgeon Lake Cree Nation Band representatives to discuss issues of mutual interest. Discussions occurred around communication (responding to input), as noted in the draft outline of the strategic plan discussion paper presented at the April 20, 2000 meeting.

- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  Changes to forest management activities, as a result of Aboriginal input, will be documented.

- **Implementation schedule**
  Canfor has initiated meetings with the Sturgeon Lake Cree Nation to discuss communication between both parties (responding to input). Based on consensus reached to date, Canfor has agreed to do some additional work on the draft strategic plan over the summer and meet again with Sturgeon Lake by the end of September, 2000. The goal is to have a plan in place by December 31, 2000.

  Canfor will commence meetings with the Metis Nation of Alberta, Local 1990, by March 31, 2001, to determine the most effective mechanism for Canfor to respond to Aboriginal input.

- **Monitoring procedure**
  Monitoring of action items in relation to input received from Aboriginal peoples will be tracked in the ITS database. Correspondence, feedback, responses, and other pertinent documents will be kept on file.

- **Linkages between strategic and operational plans**
  If Aboriginal input leads to changes in forest management activities, details will be specified in the operating plans.

(6c) Critical Element	**The special and unique needs of Aboriginal peoples are respected and accommodated in forest management decisions**
(6c) 1. Value	**Understand and respect Aboriginal special needs**
(6c) 1.1 Goal	**Effective consultation with Aboriginals**
(6c) 1.1a. Indicator	**Early consultation prior to decisions being made** Early consultation will ensure that planning is sensitive to Aboriginal issues in a proactive way rather than in a reactive way.
(6c) 1.1a.1 Objective	**To develop and implement early consultation** The improved mechanism, as discussed in the previous objectives, will include provisions for early consultation with Sturgeon Lake Cree Nation and Metis Nation of Alberta, Local 1990. ♦ **Acceptable variance** Zero variance with regard to implementing an early consultation process (improved mechanism for input). ♦ **Current status** The FMAC is the current primary mechanism for providing information, in a timely manner, to the two groups. Sturgeon Lake Cree Nation and Metis Nation of Alberta, Local 1990 have been members of the FMAC since its inception (1995). Therefore, they have had opportunity to provide input regarding forest management activities that may impact treaty and Aboriginal rights. The Metis Nation of Alberta, Local 1990 representative, although no longer active on the board for the Metis, continues to represent the Metis point of view. In addition to the FMAC, Canfor provides all trappers information regarding operational plans as much as 5 years in advance in order to ensure early consultation. ♦ **Forecasting assumptions and analytical methods** Not applicable. ♦ **Forest management activities** Changes to forest management activities, as a result of Aboriginal input, will be documented. ♦ **Implementation schedule** Canfor has initiated meetings with the Sturgeon Lake Cree Nation to discuss development of communication objectives between both parties. At the scheduled September, 2000 meeting for the strategic plan, clarification regarding early consultation will be discussed.

Canfor will commence meetings with the Metis Nation of Alberta, Local 1990, by March 31, 2001, to determine a method to develop and implement early consultation.

- **Monitoring procedure**
  Action items, in relation to input received from Aboriginal peoples, will be monitored (tracked) in the ITS database. Correspondence, feedback, responses and other pertinent documents will be kept on file.
- **Linkages between strategic and operational plans**
  If Aboriginal input leads to changes in forest management activities, details will be specified in the operating plans.

(6c) 1.2 Goal

To be open to the development of partnerships and working arrangements with Aboriginals that are based on good, sound business practices and are mutually beneficial

(6c) 1.2a. Indicator

Employment and business opportunities

(6c) 1.2a.1 Objective

To identify present and future employment and business opportunities

Canfor intends to work with both Sturgeon Lake Cree Nation and the Metis Nation of Alberta, Local 1990 to develop individualized 5 year strategic plans for working together. Key interests or areas of concern need to be identified by all parties. Identification of key issues is one of the primary tasks. Those issues that provide mutual benefits, are appropriate, and are desirable to address or resolve will be included in those plans.

- **Acceptable variance**
  The acceptable variance is zero with respect to the initiation of the 5 year strategic plans.
- **Current status**
  Canfor has a history of working with Aboriginal peoples to provide employment and contract opportunities. The Company continues our association with Aboriginal peoples by directly hiring, or providing funding for, initiatives such as stand tending contracts, ground application of herbicide, specific stand-by fire crews, Adult Vocational Center (AVC) training, and Trappers Compensation and Notification program.

  On April 20, 2000, Canfor initiated dialog with Sturgeon Lake Cree Nation regarding development of a 5 year strategic business plan (Canfor 2000d). After the initial meeting, Sturgeon Lake Cree Nation requested that Canfor develop and submit a draft strategic business plan to the Band Council for consideration. Development of this plan is progressing. Once completed, approval is required at the Canfor corporate level, as well as the Band Council level.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  See current status.
- **Implementation schedule**
  Based on consensus reached to date, Canfor has agreed to do some additional work on the draft strategic plan over the summer and meet again with Sturgeon Lake by the end of September, 2000. The goal is to have a plan in place by December 31, 2000.

  Contact with Metis Nation of Alberta, Local 1990 will be initiated by March 31, 2001.
- **Monitoring procedure**
  Correspondence, feedback, responses, and other pertinent documents will be kept on file.
- **Linkages between strategic and operational plans**
  If required, operational plans will be modified, based on Aboriginal input.

(6c) 1.3 Goal

Respect special cultural and historic sites

(6c) 1.3a. Indicator

Location of special cultural and historic sites

The location of these sites is confidential and, therefore, no mapping can be provided.

(6c) 1.3a.1 Objective

Re-assess the status of the existing archaeological and historical overview assessment that was completed on the FMA area and update, if necessary

A report (Altamira Consulting Ltd. 1998) was completed, which used literature reviews and topographic features, to assess the likelihood for locations to have archaeological potential (eight sites are located within the FMA area). No field inspections were conducted.

- **Acceptable variance**
  Zero variance in regards to conducting a re-assessment of the report.
- **Current status**
  Although the archaeological and historical overview assessment has been completed, the document has not yet been re-assessed for the next action item. In addition to the overview document, Canfor has actively sought input from Aboriginal peoples to help identify special cultural and historic sites.
- **Forecasting assumptions and analytical methods**
  Not applicable at this time.

- **Forest management activities**
  The activity is to re-assess the document to determine the next step. In the interim, all identified special cultural and historic sites will be buffered.
- **Implementation schedule**
  Within one year after approval of the DFMP, the existing report will be reviewed and an action plan prepared.
- **Monitoring procedure**
  Documentation regarding known sites will be kept on file and will remain strictly confidential.
- **Linkages between strategic and operational plans**
  All identified special cultural and historic sites will be buffered. Operational procedures may be modified to decrease the likelihood of accidental disturbance of currently unknown sites.

(6d) Critical Element

The decision-making process is developed with input from directly affected and local interested parties

(6d) 1 Value

Public input

(6d) 1.1 Goal

To proactively involve directly affected and local interested parties in the development of the decision-making process

(6d) 1.1a. Indicator

Approved terms of reference for the FMAC

(6d) 1.1a.1 Objective

To conduct the activities of the FMAC according to the Terms of Reference

The FMAC Terms of Reference Section B: Defined Goals (Canfor 2000a: p. 3) states that the FMAC will:

"i) Provide input on:

(1) values, goals, and indicators and objectives as related to CSA (completed - April 12, 2000); and

(2) design of Sustainable Forest Management (SFM) system, monitoring system, and evaluation process (by the one year CSA surveillance audit).

ii) Review performance evaluations and recommendations for improvement (at key points in time, i.e., audit results, Annual Report Card, and Forest Stewardship Report)

iii) Develop communication strategy to provide feedback to interested parties about the defined forest area, particularly the results of performance evaluations related to the critical elements of the

Canadian Council Forest Ministers (CCFM) Criteria (completed February 23, 2000)

iv) Participate in the development of the Detailed Forest Management Plan and Forest Ecosystem Management Objectives, and (by April 30, 2001)

v) In partnership with Canfor, will refine and implement the Public Involvement Program (completed February 28, 1998)"

- **Acceptable variance**
  Zero variance to the above activities (defined goals).
- **Current status**
  See above text under the objective.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  The following points (Canfor 2000a: p. 4) summarize approximate key dates for the preparation of the Detailed Forest Management Plan (DFMP) and CSA Certification. These dates are guidelines and other issues may cause a delay or acceleration of the proposed dates (e.g., the 6th bullet has a required date of submission by April 30, 2001 but Canfor is aiming for December 2000.)

  - Continue monthly meetings — Year 2000;
  - Initiate Public Group Meeting for CSA Certification — January, 2000;
  - Complete pre-audit input — April, 2000;
  - Complete input for Timber Supply Analysis — Mid-2000;
  - Post Audit review update — September 2000; and
  - Submit Detailed Forest Management Plan — December 2000.

  In addition, the FMAC will continue to meet semi-annually (or more, as necessary) after submission of the DFMP. The purpose of the meetings will be to provide continued input regarding forest management practices and to conduct an annual SFMP review.
- **Monitoring procedure**
  The Terms of Reference will be reviewed annually with the FMAC.
- **Linkages between strategic and operational plans**
  Future feedback from the FMAC may result in changes to operational plans.

(6e) Critical Element	**Decisions are made as a result of informed, inclusive, and fair consultation with people who have an interest in forest management or are affected by forest management decisions**
(6e) 1. Value	**Informed and enlightened public**
(6e) 1.1 Goal	**To provide information regarding forest management practices to the public** The document entitled, "A Public Involvement Program for Canadian Forest Products Ltd.'s Forest Management Agreement 7700021" (Canfor 1998) describes the main principles and initiatives that Canfor is implementing to inform the public and solicit public feedback, including the maintenance of a stakeholder list for communication purposes. (The Forest Management Agreement area number changed from 7700021 to 9900037 on May 5, 1999 when the new Forest Management Agreement was signed.)
(6e) 1.1a. Indicator	**A report on Canfor's forest management practices**
(6e) 1.1a.1 Objective	**To provide an annual report to the public on Canfor's forest management practices** The Annual Public Report will be completed by summarizing the Company's performance and forest management activities from the Annual Performance Monitoring Report. The content and date of submission for the Annual Performance Monitoring Report will be described in the DFMP. ♦ **Acceptable variance** The Annual Public Report will be available for public review within two months after the submission of the Annual Performance Monitoring Report. ♦ **Current status** The first Annual Performance Monitoring Report will be completed in 2001. ♦ **Forecasting assumptions and analytical methods** Not applicable. ♦ **Forest management activities** Not applicable. ♦ **Implementation schedule** The draft outline of the Annual Performance Monitoring Report will be in place by May 1, 2001 and submitted concurrently with the CSA Annual Performance Monitoring Report. ♦ **Monitoring procedure** The monitoring function is inherent in the above reports.

- **Linkages between strategic and operational plans**
  Not applicable.

(6e) 1.1b. Indicator

Copies of DFMP, AOP/5-year GDP, and SFMP are available at local public libraries

(6e) 1.1b.1 Objective

To provide copies of the DFMP, AOP/5-year GDP and SFMP to all public libraries in the local area

The libraries to receive copies are located in Grande Prairie, DeBolt, Valleyview, Spirit River, and Grande Cache.

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  The 1991 approved DFMP and 1999-2004 AOP/5-year GDP are in the Grande Prairie library. In addition, the AOP/5-year GDP was submitted to the Spirit River, DeBolt, and Valleyview libraries.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  The AOP/5-year GDP will be submitted to the libraries within two months of submission to the Alberta Environment.

  The SFMP will be submitted to the libraries within two months after CSA certification.

  The DFMP will be submitted to the libraries within two months after approval from the Alberta Environment.
- **Monitoring procedure**
  Correspondence regarding the above submissions is kept on file.
- **Linkages between strategic and operational plans**
  Not applicable.

(6e) 1.1c. Indicator

Amount of elementary, secondary, and post-secondary school-based forest educational opportunities supported by Canfor

(6e) 1.1c.1 Objective

To participate in at least 5 different types of educational opportunities

The following are examples of educational opportunities in which Canfor has participated in past years:

- Support of Forest Resource Educator position;
- National Forestry week activities (Walk Through the Forest, Arbor day);
- Northern Alberta Forestry show (trade show held every other year);
- Elementary or secondary classroom presentations (as requested from the forest educator);
- Presentations to special interest groups (varies based on requests);
- Mentor program with Grande Prairie Regional College (GPRC) (work experience for students); and
- Presentations to GPRC forestry classes (as requested).

- **Acceptable variance**
  Zero variance on an annual basis.
- **Current status**
  Canfor has participated in all the examples listed above (Canfor 2000c: Tab "educational opportunities"). The Forest Resource Educator tracks presentations to the classroom. National Forestry Week activities are kept on file as is trade show participation and presentations made to GPRC forestry classes. Canfor has participated in the Mentor program since the inception (September 1998) of the forestry program at GPRC. Presentations made to special interest groups may or may not be kept on file and some are listed in the Forest Resource Educator's summary report.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  The Forest Resource Educator is supported currently as a 5 year program, which is due for renewal July 1, 2002.

  The GPRC Mentor program occurs during the school term (September to December and/or January to March).

  National Forestry Week activities occur during the first full week in May.

  The Northern Alberta Forestry show occurs during National forestry Week in the odd numbered years.

The remainder do not have time frames and are completed on an as needed basis.

- **Monitoring procedure**
  The educational opportunities that Canfor has participated in will be reported in the Annual Performance Monitoring Report.
- **Linkages between strategic and operational plans**
  Not applicable.

(6e) 1.1d. Indicator

Use of experts (i.e., herbicide guest lecture, wildlife biologists, ecological task force, etc.) to increase knowledge and understanding of forest ecosystems for the FMAC

(6e) 1.1d.1 Objective

Utilize the information provided by experts to increase knowledge and understanding of forest ecosystems for the FMAC

- **Acceptable variance**
  Not applicable.
- **Current status**
  Canfor has regularly brought in experts to explain some of the more technical aspects of forest ecosystems. In addition, field tours were offered to show the field application of the practices discussed at the meetings. The following is a summary of the presentations and field tours offered:
  - April 1996: Joint meeting with Forest Ecosystem Management Task Force (Government perspective of public involvement and its importance as well as a university professor's discussion of old growth);
  - July 1996: FMAC field tour: stand tending and herbicide sites;
  - April 1997: Presentation from Warren Eastland (caribou expert) and Paul Hvengaard (bull trout expert);
  - May 1997: Two members attended the ecosystem management workshops held at the GPRC;
  - June 1997: Member attended the Forest*Care* audit and reported back to the Committee at the September meeting;
  - July 1997: Fish shocking and bridge construction field tour;
  - September 1997: Two members attend forest industry reverse trade fair;
  - October 1997: Joint meeting with Forest Ecosystem Management Task Force;
  - December 1997: Article on ecosystem management by Dr. Dan Gilmore handed out;

- February 1999: Sustaining the boreal forest conference in Edmonton - 1 or 2 members attended;
- October 1999: Randy Webb presentation on timber and resource supply analysis;
- December 1999: Paul Wooding and Mike Alexander discussed forest management certification programs; and
- May 2000: Randy Webb presentation on timber and resource supply analysis.

- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  On an as needed basis.
- **Monitoring procedure**
  The documentation of experts advising the FMAC is contained in the FMAC minutes.
- **Linkages between strategic and operational plans**
  Not applicable.

(6e) 2. Value

Informed company

Informed company means that the company is aware of public issues.

(6e) 2.1 Goal

To obtain public input on forest management practices using an open, transparent and accountable process

(6e) 2.1a. Indicator

Amount of different types of public involvement opportunities that have been incorporated into the Company's planning as per the Public Involvement Program

Section 3 of the Public Involvement Program (Canfor 1998) contains the following different types of public involvement:

- Forest Management Advisory Committee;
- Public meetings, e.g;
  - AOP open house;
  - Townhall meetings; and
  - Herbicide public meetings as required.
- Written submissions;

- Annual trapper notifications;
- Field tours;
- Annual Performance Monitoring Report;
- Annual Public Report; and
- Stakeholder database.

(6e) 2.1a.1 Objective

To incorporate at least 4 different types of public involvement opportunities into the Company's planning activities on an annual basis

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  The following is the current status and brief history of the Company's public involvement activities (Canfor 2000c: Tab "public involvement opportunities"):
  - Active FMAC meeting on a monthly basis;
  - Annual AOP/5-year GDP open houses in Grande Prairie as well as Valleyview. At Valleyview open house (April 2000), comments were received regarding herbicide spray program. All comments were responded to verbally at the meeting. A brief summary of comments received are on file;
  - Townhall meetings for the DFMP in November, 1998 in Valleyview, Crooked Creek, and Grande Prairie. Minutes of those meetings are on file;
  - Two written submissions since November, 1999. Response letters are on file and tracked in the Incident Tracking System;
  - Trapper Notification program has been in place for two years; and
  - The stakeholder database is currently used.
- **Forecasting assumptions and analytical methods**
  Not applicable.
- **Forest management activities**
  Not applicable.
- **Implementation schedule**
  Canfor will continue with the FMAC, AOP/5-year GDP open houses and Trapper Notification program. A field tour has been offered to the FMAC in August, 2000. The stakeholder database is periodically updated.

- **Monitoring procedure**
  The public involvement opportunities in which Canfor participates will be reported in the Annual Performance Monitoring Report.
- **Linkages between strategic and operational plans**
  The Public Involvement Program has a direct link to the DFMP; therefore, the operational plans must consider the applicable public input that is received.

(6f) Critical Element	**Collective understanding of forest ecosystems, values, and management is increased and used in the decision-making process**
(6f) 1. Value	**Knowledge of forest ecosystems and processes**
(6f) 1.1 Goal	**To use adaptive management to improve the knowledge regarding ecological processes and the natural historic and current disturbance patterns for each ecosystem, and to apply this knowledge to management of the resources within the FMA area**
(6f) 1.1a. Indicator	**The degree to which the actual field performance aligns with the DFMP** Field performance includes results of actual practices, as well as the results of on-going research.
(6f) 1.1a.1 Objective	**To produce a Forest Stewardship Report, every 5 years, as a measure of accountability to the public of management effectiveness** The Forest Stewardship Report, required by the Alberta Environment, will identify monitoring programs and research needed to correct performance problems and to enhance success. The report will also include an evaluation of SFMP goals and objectives (actual vs. planned). The submission schedule will be detailed in the DFMP.

- **Acceptable variance**
  The Forest Stewardship Report shall be submitted within one month of the submission schedule, as stated in the DFMP.
- **Current status**
  The first submission is required 5 years after the approval of the DFMP as stated in the Interim Forest Management Planning Manual (Alberta Environmental Protection 1998a).
- **Forecasting assumptions and analytical methods**
  Not applicable.

- **Forest management activities**
  A Forest Stewardship Report will be prepared to report on the effectiveness of forest management activities in meeting the DFMP objectives.
- **Implementation schedule**
  The first submission will be 5 years after the DFMP approval.
- **Monitoring procedure**
  The monitoring activities and results will be contained within the Forest Stewardship Report.
- **Linkages between strategic and operational plans**
  Verification of strategic and operational compliances with respect to the SFMP and DFMP.

(6f) 1.1a.2 Objective

To validate Canfor's assumptions and test new theories to improve our knowledge of forest ecosystems by conducting on-going research

- **Acceptable variance**
  The acceptable variance is zero.
- **Current status**
  There are various programs and initiatives being conducted to increase knowledge about the forest, such as:

  Pre-harvest Silviculture Prescriptions (PHSP)
  Silviculture prescriptions (treatments) are based upon ecological site classification surveys conducted annually on proposed harvest areas.

  Refined northern and west-central Alberta field guides
  A total of 1395 local plots in the FMA area were used to refine the field guides (Canfor 1999i). The refined field guides provide a more locally explicit description of the ecosites, ecosite phases, and plant community types in the FMA area. The ecological inventory information will provide input to the modelling forecasting tools.

  Ecosite and Ecosystem mapping
  In this project, various sources of data (AVI, ecological plot data, digital elevation models (DEM) and DEM derived data (e.g., slope and aspect) are used in combination with statistical techniques and expert knowledge to identify and map ecosites and ecosite phases (Canfor 1998b). Ecosites provide an ecological foundation for site assessment, silviculture prescriptions, defining summer ground, development of yield curves, and productivity assessment. The resulting maps will define the forest at various spatial scales of management and operational importance.

  Succession analysis and modeling
  This program focuses on evaluation, analysis, and modeling of chronosequences (changes over time) for each ecosite in the FMA area (Can-

for 1998b). Relationships between stand age, stand structure, and biodiversity will be identified. This knowledge of successional patterns will assist us to understand temporal changes in forest condition at both the stand and landscape levels.

Forest productivity assessment, analysis and modeling

The scope of this project is to assess forest productivity in the FMA area. The relationship between forest productivity and numerous ecological variables will be evaluated and predictive models developed (Canfor 1998b). The results from this research will increase our understanding about the relationship between forest productivity and the chemical, physical, and biological properties of soil.

Plant biodiversity analysis and mapping

Plant species will be evaluated in terms of the environmental and the soil and site variables that influence their distribution, abundance, and growth. A predictive model will be developed (Canfor 1998b) that evaluates the likelihood of ecosites having rare plant species and high plant biodiversity values. Thus, knowledge of plant biodiversity will allow flexibility in ecologically based, long-term forest management planning.

Wildlife habitat evaluation

Wildlife species guilds (Canfor 1998b) will be developed through an analysis of habitat suitability for various wildlife species at the ecosection level. Each ecological unit will be evaluated to determine the degree to which it can support the life stages of guild representatives. Thus, knowledge of habitat suitability for several guilds that represent a wide range in habitat conditions will allow flexibility in ecologically based, long-term forest management planning.

EMEND (Ecosystem management by emulating natural disturbance)

The EMEND project will study how harvest and regeneration of upland, mixedwood forest can best approximate natural disturbance regimes (Canfor 1998d). Predictive models will project the ecological effects of alternative harvesting decisions (various amounts of residual structure left after harvest) on boreal landscapes. A number of disciplines will be conducting research under the EMEND umbrella (Canadian Forestry Service 2000). Such integration focuses all efforts toward providing increased understanding of natural, disturbance-based forest management.

Growth and Yield (several programs)

The growth and yield data (Canfor 1999b and Canfor 1998a) will be tied to the relevant ecosite characteristics, allowing the development of ecological based yield curves for timber supply analysis and evaluation. By using an ecological foundation for the development of yield curves, productivity and fiber flow will be tied to the ecological processes acting at the site or stand level. This will facilitate the integration of timber supply analysis with site level operations and silviculture.

Collection of data on coarse woody debris & snags (pre-harvest)
Coarse woody debris and snag information was collected on 1395 plots and used to assist in developing targets for the timber supply analysis for the DFMP (Canfor 1997b). Canfor is also collecting the same information in the annual operational cruise program to determine the existing amount of coarse woody debris and snags (Canfor 2000f). This information will assist in the development of harvesting and silviculture strategies that emulate the natural range of variability of coarse woody debris and snags.

- **Forecasting assumptions and analytical methods**
  Forecasting and analytical methods are different for each of the various programs listed. See above.
- **Forest management activities**
  The management activities for each of the programs are separately identified. See above.
- **Implementation schedule**
  To carry out and analyze the various different research and monitoring programs as generalized above. The actual schedule will be stated in the DFMP.
- **Monitoring procedure**
  The monitoring program will be stated in the DFMP.
- **Linkages between strategic and operational plans**
  These links will be described in the DFMP. Each program is independent of the other.

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7 Glossary

AAC

This is the acronym for "annual allowable cut". It is the volume of wood (m^3) that can be harvested in one year from any area of forest under a sustained yield management regime. It is a calculation based on the potential fertility of the site, the state and potential of the stands currently growing in the forest, and assumptions about how existing or anticipated future stands will continue to grow, the risks of loss, and constraints on operability. (Dunster and Dunster 1996)

adaptive management

A learning approach to management that incorporates the experience gained from the results of previous actions into decisions. It is a continuous process requiring constant monitoring and analysis of the results of past actions that are used to update current plans and strategies. (Canfor 1999)

ANHIC

This is the acronym for "Alberta Natural Heritage Information Centre".

anthropogenic

Made or induced by humans. (Canfor)

AOP

This is the acronym for "annual operating plan".

AWMSI

This is the acronym for "area-weighted mean shape index".

basic forestry practices

Regular scarification and planting techniques, as well as some stand tending practices such as thinning and use of herbicides are considered. Basic forestry practices maintain growth on the site (knock back the competition for a time to allow the crop trees to grow) and meet legislative requirements. (Canfor)

carbon dioxide (CO_2)

Carbon dioxide is a molecule formed from one atom of carbon and two of oxygen. It is a greenhouse gas of major concern in the study of global warming. (Canfor)

carrying capacity

The average number of livestock and/or wildlife that can be sustained on a management unit, compatible with management objectives for the unit. It is a function of site characteristics, management goals, and management intensity. (PBC, MF 2000)

coarse woody debris

Sound or rotting logs, stumps, or large branches that have fallen or been cut and left in the woods. It also includes trees and branches that are dead but remain standing or leaning. (Dunster and Dunster 1996)

courduroy

A temporary road or pathway built by placing logs crosswise to the road direction to act as a firm surface for hauling or skidding logs. (Dean 1978)

criterion

A distinguishable characteristic of sustainable forest management; a value that must be considered in setting objectives and in assessing performance. (CSA 1996)

defined timber yield

The amount of timber removed between May 1 and April 30 of the following year. (Canfor)

DEM

This is the acronym for "digital elevation model", a computer generated model of the landform in three dimensions. (Dunster and Dunster 1996)

DFA

This is the acronym for "Defined Forest Area", a specified area of forest, land, and water delineated for the purpose of registration of a Sustainable Forest Management system. (CSA 1996)

down woody debris

Debris left after harvesting. Although sometimes visually unappealing, it plays an important role in nutrient cycling, and provides microsites for conifer seedlings and habitat for wildlife. (Canfor)

ECA

This is the acronym for "equivalent clearcut area".

ecosite

This is an ecological unit where the vegetative cover develops under similar environmental influences (climate, moisture, regime, and nutrient regime). It is based on the combined interaction of biophysical factors. (Canfor)

ecosite phase

This is an ecological unit, a subdivision of an ecosite, that is based on the dominant canopy structure and composition. The level of resolution of the data is at the stand level. (Canfor)

EMS

This is the acronym for "environmental management system". It is registered under ISO 14001 and comprises systems to manage the environment.

enhanced forest management

A management practice that includes the use of genetically improved seedlings, spacing of trees, etc. It is any practice that will yield more growth (m^3/ha) than the site previously had, but NOT maximize it as in Intensive Forest Management (see below). (Canfor)

fine woody debris

The smaller branches, twigs, leaves, and roots from trees that have fallen or been cut and left in the woods. (Dunster and Dunster 1996)

fingerjoint

This is a value added product that joins trim ends to produce dimensional lumber. (Canfor)

FIRS

This is the acronym for "forest information resource system".

FMA

This is the acronym for "forest management agreement", a legal agreement signed between the Company and the Province of Alberta. It defines the rights, responsibilities, and constraints that apply to a specified area of forest for the purpose of removing timber for commercial purposes. The forested area to which the agreement applies is called the "FMA area." The FMA area may comprise one or several FMUs (see below). (Canfor)

FMU

This is the acronym for "forest management unit", an area of forest managed as a unit for fibre production. (Dunster and Dunster 1996)

genotypes

The genetic make up of an organism, this being the sum total of all the genetic information in the organism. (Dunster and Dunster 1996)

goal

A broad, general statement that describes a desired state or condition related to one or more forest values. (CSA 1996)

H60

H60 is the elevation above which 60% of the watershed lies (the watershed area above the H60 is considered as the source area for the major snowmelt peak flows).

Habitat Suitability Index (HSI)

A measure, estimated by modelling, of the value of habitat for wildlife species by relating a species' needs for food and cover to structural and spatial attributes of vegetation types within a defined area. (Beck et al. 1996)

hydrological recovery

Hydrological recovery takes into account the initial percentage of crown removal and the recovery through regrowth of vegetation since the initial disturbance. (Canfor)

indicator

A measurable variable used to report progress toward the achievement of a goal. (CSA 1996)

intensive forest management

A management practice would most likely be used only on private land. This practice maximizes the growth potential of the site. (Canfor)

LOC

This is the acronym for "License of Occupation".

LRF

This is the acronym for "Lumber Recovery Factor".

LRS

This is the acronym for "Alberta Environment, Land and Forest Service"

MAI

This is the acronym for "mean annual increment", the average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in a tree's life, being highest in the middle years and then slowly decreasing with age. The point at which the MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting. (PBC, MF 2000)

MNND

This is the acronym for "mean nearest neighbor distance".

MPS

This is the acronym for "mean patch size".

net down (procedure)

The process of identifying the net land base, which is the number of hectares of forestland that actually contribute to the allowable annual cut. Areas and/or volumes are sequentially deleted or reduced from the gross land base for a number of considerations, including private ownership, non- forest or non-productive, environmentally sensitive, unmerchantable, and inaccessible. (PBC, MF 2000)

NIVMA

This is the acronym for "Northern Interior Vegetation Management Association".

NRS

This is the acronym for "Alberta Environment, Natural Resources Service"

objective

A clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator. (CSA 1996)

PAI

This is the acronym for "periodic annual increment", the growth increment added in the past few years. (Dunster and Dunster 1996)

Patch

A specific area wherein relatively homogeneous environmental conditions occur. Boundaries are defined by measureable changes in one or several environmental variables.

PHA

This is the acronym for "pre-harvest assessment", a survey carried out on a stand prior to logging to collect specific information on the silvicultural conditions such as planting survival, free-growing status, stocking, etc. (PBC, MF 2000)

PHSP

This is the acronym for "pre-harvest silviculture prescriptions", a document that applies site-specific field data and develops forest management prescriptions for areas in advance of logging. (PBC, MF 2000)

PSP

This is the acronym for "permanent sample plots".

ramet

Offspring produced from vegetative reproduction. (Dunster and Dunster 1996)

seismic line

Strips of land that have had the vegetation (and sometimes the surface soils) removed to permit the placement and detonation of underground explosive charges so that the underlying geological structure can be determined, primarily for the purpose of oil and gas exploration. (Dunster and Dunster 1996)

seral stage

The series of plant community conditions that develop during ecological succession from bare ground (or major disturbances) to the potential plant community capable of existing on a site where stand replacement begins and the secondary successional process starts again. (Dunster and Dunster 1996)

silviculture prescriptions

A site-specific operational plan that prescribes the nature and extent of any timber harvesting and silviculture activities that are designed to achieve required forest management objectives, including reforestation of a free-growing stand to specified standards. (Canfor 1999)

site index

A measure of forest site productivity expressed as the average height of the tallest trees in the stand at a defined index age. Common index ages are 40, 50, 70, 75, and 100 years. This is usually expressed as the predicted height for a specific tree species at a given breast height age. (Dunster and Dunster 1996; Beckingham et al. 1996)

sustainable forest management performance

The assessable results of sustainable forest management as measured by the achievement, or lack thereof, of established objectives for a defined forest area. (CSA 1996)

Sustainable Forest Management system

This refers to the structure, responsibilities, practices, procedures, processes, and timeframes set by a registration applicant [in this case, Canfor] for implementing, maintaining, and improving sustainable forest management. (CSA 1996)

sustained yield of timber

A forest management regime that involves more or less continuous harvesting, balanced by growth, over managed forest units. (Canfor 1999)

TSP

This is the acronym for "temporary sample plot".

value

A principle, standard, or quality considered worthwhile or desirable. (CSA 1996)

WCACSC

This is the acronym for "West-Central Alberta Caribou Standing Committee".

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4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
1. Conservation of Biological Diversity - Biological diversity is conserved by maintaining the variability of living organisms and the complexes of which they are part.				
(1a) Ecosystem diversity is conserved if the variety and landscape-level patterns of communities and ecosystems that naturally occur on the DFA (Defined forest area) are maintained through time.	1.Landscape level ecosystem diversity	1.1 Provide support to areas of rare physical environments	1.1a. The amount of area of lands excluded from harvest, in the DFMP 1.1b. Cactus Hills (84-9-W6M) and Peace Parkland (81-7-W6M)	1.1a.1 100% of identified and validated rare physical environments will not be harvested (as in Critical Element 3a Objective 2.1a.1) 1.1b.1 Nominate Cactus Hills and Peace Parkland areas as candidate sites for the Alberta Special Places program (formally known as Special Places 2000 program) As in Critical Element 3a, Objective 2.2a.1
		1.2 Maintain range of seral stages	1.2a. The amount of area in old seral stage at present and key points in time 1.2b. The amount of area in each seral stage at present and key points in time	1.2a.1 Maintain old seral stages within the natural disturbance regimes at present and key points in time 1.2b.1 Maintain seral stages within the natural disturbance regimes at present and key points in time (As in: Critical Element 1b Objective 1.2a.1 Critical Element 2b Objective 1.1b.1 and Critical Element 4c Objective 1.1b.1)

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(1b) Species diversity is conserved if all native species found on the DFA prosper through time.	1. Landscape level species diversity and abundance	1.1 Minimize impacts on wildlife species population abundance	1.1a. Amount of Canfor Licence of Occupation (LOC) access into the Caribou Area that is gated	1.1a.1 100% of Canfor's Licence of Occupation (LOC) roads into the Caribou Area will be gated or other appropriate control measures, as approved by the government, will be implemented
			1.1b. Level of suitable habitat for species of special management concern	1.1b.1 Maintain habitat conditions required by identified species of special management concern utilizing HSI models (As in Critical Element 2c Objective 1.1a.1)
				1.1b.2 Maintain habitat conditions required by identified species of special management concern, using habitat constraint modeling (As in Critical Element 2c Objective 1.1a.2)
			1.1c. Amount of significant wildlife mineral licks	1.1c.1 Protect 100% of identified significant wildlife mineral licks (as in Critical Element 3a Objective 2.1a.3)
		1.2 Maintain flora and fauna on the landbase	1.2a. The amount of area in each seral stage at present and key points in time	1.2a.1 Maintain seral stages within the natural disturbance regimes at present and key points in time (as in: Critical Element 1a Objective 1.2b.1 Critical Element 2b Objective 1.1b.1 and Critical Element 4c .Objective 1.1b.1)
			1.2b. Presence of rare plants on the FMA area	1.2b.1 Develop a predictive tool to determine the probability of the occurrence of rare plants on the FMA

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
1b) Species diversity is conserved if all native species found on the DFA prosper through time.	1. Landscape level species diversity and abundance *(Continued from above)*	1.2 Maintain flora and fauna on the landbase (*continued from above)*	1.2c. Presence of endangered or threatened wildlife species (*red and blue listings)* on the FMA area 1.2d. Type, amount and location of habitat required for species of special management concern	1.2c.1 To develop management strategies to address the identified endangered or threatened wildlife species on the FMA area 1.2d.1 Compile a list of habitat requirements for species of special management concerns within Canfor's FMA area (linked To Critical Element 1b, Objective 1.1b.1) 1.2d.2 Review the list of species of special management concern regarding potential addition of an indicator species for amphibians

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(1c) Genetic diversity is conserved if the variation of genes within species is maintained.	1. Genetic diversity	1.1 Conserve genetic diversity of tree species	1.1a. The effective number of unrelated genotypes (trees) in the breeding program	1.1a.1 To maintain between 300 –600 genotypes in breeding program to safeguard long-term diversity
			1.1b. The effective number of unrelated genotypes (trees) maintained in the seed orchard	1.1b.1 To maintain sufficiently large orchard populations of unrelated trees (20–60 genotypes) to safeguard diversity in a given seed orchard
			1.1c. The amount of area planted with non-seed orchard stock (bulk seed collection from the FMA area)	1.1c.1 To plant 30% of the FMA area cut units with the bulk seed collection and 70% with seed orchard stock within the following Natural Subregions: Central Mixedwood, Dry Mixedwood and Lower Foothills
			1.1d. The number of mother trees represented in the bulk seed collections (*wild seed collections*) over a ten-year period	1.1d.1 To include cones of at least 400-750 mother trees for the bulk seed collections for lodgepole pine and white spruce, and 50-150 mother trees for black spruce over a 10 year period
		1.2 Maintain conditions that do not negatively impact on genetic diversity of wildlife species	1.2a. Landscape structure	1.2a.1 To compare current landscape structure to future landscape structure at key points in time and develop management strategies

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity – Forest ecosystem condition and productivity are conserved if the health, vitality, and rates of biological production are maintained.				
(2a) Forest health is conserved if biotic (including anthropogenic) and abiotic disturbances and stresses maintain both ecosystem processes and ecosystem conditions within a range of natural variability.	1. Healthy forest stands	1.1 Conserve forest health	1.1a. Number of occurrences and amount of area impacted by fire, and endemic events of insects, disease, windfall, etc.	1.1a.1 Limit the number of occurrences and amount of area impacted by fire, and endemic events of insects, disease, windfall, etc. (as in Critical Element 4a Objective 1.1b.1)

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(2b) Ecosystem resilience is conserved if ecosystem processes and the range of ecosystem conditions allow ecosystems to persist, absorb change, and recover from disturbances.	1. Ecosystem resilience	1.1 Sustain capability of ecosystem to recover from both natural and human-caused disturbances	1.1a. The amount of area in the regenerated yield group 1.1b. The amount of area in each seral stage at present and key points in time 1.1c. Timeframe for treating harvested areas 1.1d. Soil productivity	1.1a.1 To regenerate 100% of the harvested area as per the regenerated yield group as defined in the DFMP (as in Critical Element 4b Objective 1.2a.1) 1.1b.1 Maintain seral stages within the natural disturbance regimes at present and key points in time (as in: Critical Element 1a Objective 1.2b.1 Critical Element 1b Objective 1.2a.1 And Critical Element 4c .1.1b.1) 1.1c.1 All harvested sites are treated within 18 months after the end of the timber year (As in Critical Element 4a Objective 1.1a.1 And Critical Element 4b Objective 1.2b.1) 1.1d.1 (As covered in Critical Element 3b –Goal 1.1 soil productivity)

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(2c) Ecosystem productivity is conserved if ecosystem conditions are capable of supporting all naturally occurring species.	1. Ecosystem productivity	1.1 Maintain ecosystem productivity	1.1a. Level of suitable habitat for species of special management concern	1.1a.1 Maintain habitat conditions required by identified species of special management concern utilizing HSI models (as in Critical Element 1b Objective 1.1b.1) 1.1a.2 Maintain habitat conditions required by identified species of special management concern, using habitat constraint modeling (As in Critical Element 1b Objective 1.1b.2)
			1.1b. Number of ecosite phases distributed across the FMA area	1.1b.1 Identify ecosite phase distribution objectives for application in the next DFMP
			1.1c. Measurement of tree growth (site index) based on yield curves (moisture and nutrient regime)	1.1c.1 Maintain growth and yield projections for tree species, as stated in the DFMP

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
3. Conservation of Soil and Water Resources - Soil and water resources and physical environments are conserved if the quantity and quality of soil and water within forest ecosystems are maintained.				

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(3a) Physical environments are conserved if the permanent loss of forest area to other uses or factors is minimized, and if rare physical environments are protected.	1. Gross landbase	1.1 Minimize loss of landbase	1.1a. The amount of productive area Canfor utilizes for future permanent roads (LOC)	1.1a.1 To have less than 2% of productive area in Canfor's future permanent roads (LOC) (As in Critical Element 4c Objective 1.1a.1)
			1.1b.The amount of area permanently lost to other industry activities	1.1b.1 To minimize loss of area by working with other parties (linked to Critical Element 4c. Objective 1.3a.1)
	2. Rare physical environments (presence of)	2.1 Protect the natural states and processes of the rare physical environments	2.1a. The amount of area of lands excluded from harvest, in the DFMP	2.1a.1 100% of identified and validated rare physical environments will not be harvested (As in Critical Element 1a objective.1.1a.1)
				2.1a.2 No active reforestation of grasslands
				2.1a.3 Protect 100% of identified significant wildlife mineral licks (as in Critical Element 1b Objective 1.1c.1)
		2.2 Identify areas to nominate for the Alberta Special Places program	2.2a. Cactus Hills (84-9-W6M) and Peace Parkland (81-7-W6M)	2.2.a.1 Nominate Cactus Hills and Peace Parkland areas as candidate sites for the Alberta Special Places program (as in Critical Element 1a Objective 1 1b.1)
		2.3. Maintain a combination of managed and rare physical environments on the forest landbase	2.3a. The amount of area in managed forests and rare physical environments	2.3a.1 A combination of managed and rare physical environments will always be maintained on the landbase

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(3b) Soil resources are conserved if the ability of soils to sustain forest productivity is maintained within characteristic ranges of variation.	1 Soil productivity	1.1 Minimize impact on soil productivity (Linked to Critical Element 2b ecosystem resiliency - Indicator 1.1d)	1.1a. Measurement of site quality (site index) based on ecological type (moisture and nutrient regime)*(linked to Critical Element 2c Indicator 1.1c*	1.1a.1 To develop a predictive model of site quality (includes soil productivity) to aid in the formulation of site specific forest management
			1.1b. The amount of coarse and fine woody debris on site, post-harvesting	1.1b.1 To develop a methodology to measure coarse and fine woody debris on site, post-harvesting (as in Critical Element 4a Objective 1.3a.1)
			1.1c. Measure of site disturbance (i.e., ruts and roads)	1.1c.1 To meet the Forest Soil Conservation Guidelines
	2. Soil quantity	2.1 Minimize soil erosion	2.1a. Occurrence of slumping caused by road construction	2.1a.1 To have zero slumping events from road construction activities in any given operating season
			2.1b. Number of locations that have slumped on sensitive or steep slopes due to harvesting	2.1b.1 To have zero slumping events due to harvesting activities on steep or sensitive slopes

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(3c) Water resources are conserved if water quality and quantity is maintained.	1. Water quality and quantity	1.1 Conserve water quality and quantity	1.1a. The amount of siltation caused by road construction in forestry operations	1.1a.1 To assess current methodologies and practices to measure siltation caused by forestry road construction
			1.1b. The level of response to identified problems regarding siltation	1.1b.1 To track mitigative efforts made in response to siltation events found during annual road maintenance inspections
			1.1c. Amount of forest cover (i.e., buffer zones) along watercourses [in the watershed]	1.1c.1 To manage forest cover along watercourses to meet objectives defined in the DFMP
			1.1d. Number of incidents of excursions of herbicide	1.1d.1 To have zero excursions of herbicides in water
	2. Water cycle	2.1 Minimize the effect of the removal of forest cover on the water cycle *(variables of temperature, flow rates, in-stream flow rates.)*	2.1a. Amount of forest cover removed and its spatial distribution within a defined watershed	2.1a.1 To not exceed a range of 20-40% of forest cover removal, above the “H60” line, in relationship to the total vegetated area within a defined watershed as per the DFMP (as in Critical Element 4a Objective 1.2a.1)

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
4. Forest Ecosystem Contributions to Global Ecological Cycles - Forest conditions and management activities contribute to the health of global ecological cycles. This contribution is maintained if.				
(4a) The processes that are responsible for recycling water, carbon, nitrogen, and other life-sustaining elements are maintained;	1. Local contribution to global ecological cycles	1.1 Minimize disturbances that negatively impact carbon cycles	1.1a. Amount of area under forest cover 1.1b. Number of occurrences and amount of area impacted by fire, and endemic events of insects, disease, windfall, etc. 1.1c. The numbers of equipment in use and amount of technology with low carbon dioxide (CO_2) and nitrogen oxides (NO_x) emissions	1.1a.1 All harvested sites are treated within 18 months after the end of the timber year (as in Critical Element 2b Objective 1.1c.1 And Critical Element 4b Objective 1.2b.1) 1.1b.1 Limit the number of occurrences and amount of area impacted by fire, and endemic events of insects, disease, windfall, etc. (as in Critical Element 2a Objective 1.1a.1) 1.1c.1 To promote use of equipment and technology that minimizes CO_2 and NO_x emissions

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(4a) The processes that are responsible for recycling water, carbon, nitrogen, and other life-sustaining elements are maintained;	1. Local contribution to global ecological cycles (*continued from above)*	1.2 Minimize disturbances that negatively impact water cycles	1.2a. Amount of forest cover removed and its spatial distribution within a defined watershed	1.2a.1 To not exceed a range of 20-40% of forest cover removal, above the “H60” line, in relationship to the total vegetated area within a defined watershed as per the DFMP (as in Critical Element 3c Objective 2.1a.1)
		1.3 Minimize negative impacts to nitrogen cycles	1.3a. The amount of coarse and fine woody debris on site post-harvesting	1.3a.1 To develop a methodology to measure coarse and fine woody debris on site, post harvesting (as In Critical Element 3b Objective 1.1b.1)
			1.3b. Presence of vascular plant species that can be used to indicate potential nitrogen levels	1.3b.1 To understand, through modelling, the role of vascular plants as indicators of potential nitrogen levels

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(4b) Utilization and rejuvenation are balanced and sustained	1. Sustainable yield of timber	1.1 Maintain harvest level related to the AAC as defined in the DFMP	1.1a. The amount harvested versus the approved AAC	1.1a.1 Operational practices meet the DFMP management strategies that make up the AAC
		1.2 To reforest every hectare harvested	1.2a. The amount of harvested area in the regenerated yield group	1.2a.1 To regenerate 100% of the harvested area as per the regenerated yield group as defined in the DFMP (As in Critical Element 2b Objective 1.1a.1)
			1.2b. Total area harvested annually compared to total area reforested (planting or seeding)	1.2b.1 All harvested sites are treated within 18 months after the end of the timber year (As In Critical Element 2b Objective 1.1c.1 and Critical Element 4a Objective 1.1a.1)
		1.3 Maximize utilization of merchantable wood	1.3a. Amount of merchantable wood (m^3) left on site	1.3a.1 To leave less than 1% of merchantable wood on site
			1.3b. Amount of industrial salvaged wood brought in on an annual basis	1.3b.1 To utilize 100% of merchantable industrial salvage wood from permanent land withdrawals

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(4c) Forest lands are protected from sustained deforestation or conversion to other uses.	1. Forests on the landbase	1.1 Maintain forests on the landbase	1.1a. The amount of productive area Canfor utilizes for future permanent roads (License of Occupation (LOC))	1.1a.1 To have less than 2% of productive area in Canfor's future permanent roads (LOC) (As in Critical Element 3a Objective 1.1a.1)
			1.1b. The amount of area in each seral stage at present and key points in time	1.1b.1 Maintain seral stages within the natural disturbance regimes at present and key points in time (as in: Critical Element 1a Objective 1.2b.1 Critical Element 1b Objective 1.2a.1 and Critical Element 2b Objective 1.1c.1)
			1.1c. The amount of area identified as low productive sites	1.1c.1 Designate all low productive yield groups as no harvest zones, subject to operational verification. 1.1c.2 Delineate all low productive sites (>1 ha) within harvested areas as "no harvest zones"

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(4c) Forestlands are protected from sustained deforestation or conversion to other uses.	1. Forests on the landbase *(continued from above)*	1.2 Productive lands are restored to productive status (excluding cut units)	1.2a. The amount of productive area regenerated (excluding cut units)	1.2a.1 Track amount of previously withdrawn areas brought back into productive status 1.2a.2 Track burned areas to ensure that they have been regenerated (with preference to natural regeneration)
		1.3 Minimize loss of forest on the landbase due to access	1.3a. Degree of access integration	1.3a.1 To maximize and promote shared access by all resource users (Linked to Critical Element 3a Objective 1.1b.1)

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
5. Multiple Benefits to Society Forest provide a sustained flow of benefits for current and future generations. If multiple goods and services are provided over the long-term. Multiple benefits are maintained if				
(5a) Extraction rates are within the long-term productive capacity of the resource base	1. Sustainable yield of timber	1.1 Maintain sustainable harvest levels on the FMA area	1.1a. Long-term harvest level vs. actual extraction rates as per the DFMP	1.1a.1 To harvest at a level less than or equal to the long-term harvest level

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(5b) Resource businesses exist within a fair and competitive investment and operating climate	1. Economic benefit to local communities	1.1 Local communities and contractors have the opportunity to share in benefits such as jobs, contracts and services	1.1a. The economic contribution that Canfor Grande Prairie operations makes to local communities and contractors 1.1b. The financial commitments as stated in Section 33, facility operation and FMA renewal commitments, of the Forest Management Agreement 9900037 are met	1.1a.1 To maintain Canfor's contribution to local communities and contractors 1.1b.1 Within 60 months of the signed Forest Management Agreement 9900037, the company shall upgrade its sawmill and finger joint as per Section 33 of the Forest Management Agreement 9900037 1.1b.2 To submit to the Minister for approval, a forestry project, in accordance with Section 33 subparagraph 4 of the Forest Management Agreement 9900037

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(5c) Forests provide a mix of market and non-market goods and services.	1. Multiple benefits from forests	1.1 Maintain the opportunity for others to use the forest for market and non-market goods and services	1.1a. Amount of coniferous timber available to locals	1.1a.1 0.5% of the conifer AAC is made available for local use as per FMA Agreement 9900037 1.1a.2 Up to a set coniferous volume of 10 000 m^3 is available in the DFA for a community timber use program
			1.1b. Recreational opportunities	1.1b.1 Complete a recreational assessment within 5 years after the DFMP is approved 1.1b.2 Ensure 100% of Canfor campgrounds are maintained on the FMA area for the use by the public 1.1b.3 To promote Canfor campgrounds to the public
			1.1c. Communication with Trappers impacted by harvest operations	1.1c.1 To contact all Trappers directly impacted by harvest operations
			1.1d. Communicate with Outfitters impacted by harvest operations	1.1d.1 To contact all Outfitters directly impacted by harvest operations
		1.2 To improve the value of the raw timber material from the FMA area	1.2a. To increase lumber recovery of the conifer timber resource during the milling process	1.2a.1 Increase mill recovery by 14% of the logs at the mill site

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
6. Accepting Society's Responsibility for Sustainable Development - Society's responsibility for sustainable forest management requires that fair, equitable, and effective forest management decisions are made. Sustainable forest management requires that				
(6a) Forests are managed in ways that reflect social values, and management is responsive to changes in those values	1. Social values	1.1 To be responsive to the social values identified by the FMAC and other publics	1.1a. Topics in the current Issue List (compiled by the FMAC since inception) are addressed by the Company to the Committee's satisfaction 1.1b. The number of Canfor responses to written letters, or public meeting issues	1.1a.1 100% of the topics in the Issue List, as of June 30, 2000 are addressed to the Committee's satisfaction by the submission date of the DFMP 1.1b.1 100% of public issues received after November 1999 are tracked and responded to by Canfor

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(6b) Duly established aboriginal and treaty rights are respected	1. Understand and respect treaty and Aboriginal rights	1.1 Avoid infringement of treaty and Aboriginal rights	1.1a. Amount of opportunity for input by Aboriginal peoples	1.1a.1 To provide increased opportunities for input 1.1a.2 To be responsive to Aboriginal input

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(6c) The special and unique needs of Aboriginal peoples are respected and accommodated in forest management decisions	1. Understand and respect Aboriginal special needs	1.1 Effective consultation with Aboriginals	1.1a. Early consultation prior to decisions being made	1.1a.1 To develop and implement early consultation
		1.2 To be open to the development of partnerships and working arrangements with Aboriginals that are based on good, sound business practices and are mutually beneficial	1.2a. Employment and business opportunities	1.2a.1 To identify present and future employment and business opportunities
		1.3 Respect special cultural and historic sites	1.3a. Location of special cultural and historic sites	1.3a.1 Re-assess the status of the existing Archaeological and Historical Overview Assessment that was completed on the FMA area and update, if necessary

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(6d) The decision-making process is developed with input from directly affected and local interested parties.	1. Public input	1.1 To proactively involve directly affected and local interested parties in the development of the decision-making process	1.1a Approved terms of reference for the FMAC	1.1a.1 To conduct the activities of the FMAC according to the Terms of Reference

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(6e) Decisions are made as a result of informed, inclusive, and fair consultation with people who have an interest in forest management or are affected by forest management decisions; and	1. Informed and enlightened public	1.1 To provide information regarding forest management practices to the public	1.1a. A report on Canfor's forest management practices	1.1a.1 To provide a report card to the public on Canfor's forest management practices annually
			1.1b. Copies of DFMP, AOP/5-year GDP and SFMP are available at local public libraries	1.1b.1 To provide copies of the DFMP, AOP/ 5-year GDP and SFMP to all public libraries in the local area
			1.1c. Amount of elementary, secondary and post- secondary school-based forest educational opportunities supported by Canfor	1.1c.1 To participate in at least 5 different types of educational opportunities
			1.1d. Use of experts (i.e., herbicide guest lecture, wildlife biologists, ecological task force, etc.) to increase knowledge and understanding of forest ecosystems for the FMAC	1.1d.1 Utilize the information provided by experts to increase knowledge and understanding of forest ecosystems for the FMAC
	2. Informed company	2.1 To obtain public input on forest management practices using an open, transparent and accountable process	2.1a. Amount of different types of public involvement opportunities that have been incorporated into the Company's planning as per the Public Involvement Program	2.1a.1 To incorporate at least 4 different types of public involvement opportunities into the Company's planning activities on an annual basis

4.4 CCFM Criteria and Critical Elements	**Value** - a principle, standard, or quality considered worthwhile or desirable.	**Goal** - a broad, general statement that describes a desired state or condition related to one or more forest values.	**Indicator** - a measurable variable used to report progress toward the achievement of a goal.	**Objective** - a clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator.
(6f) Collective understanding of forest ecosystems, values, and management is increased and used in the decision-making process.	1 Knowledge of forest ecosystems and processes	1.1 To use adaptive management to improve the knowledge regarding ecological processes and the natural historic and current disturbance patterns for each ecosystem, and to apply this knowledge to management of the resources within the FMA area	1.1a. The degree to which the actual field performance aligns with the DFMP	1.1a.1 To produce a Forest Stewardship Report, every 5 years, as a measure of accountability to the public of management effectiveness 1.1a.2 To validate Canfor's assumptions and test new theories to improve our knowledge of forest ecosystems by conducting on-going research

TABLE 1 ECA values for 1999, all watersheds

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
0	6232.6	3225.4	433.2	55.7	670.1	19.0	326.4	345.5	9.4		
1	22421.3	12452.0	726.3	325.5	751.4	0.9	270.5	271.5	2.1	Y	
9	4588.7	2655.0	49.8	24.4	695.1	15.6	504.1	519.8	19.1		
15	1219.4	686.2	20.2	27.7	25.8	0.0	9.7	9.7	1.4		
27	1638.7	853.3	169.2	19.8	1.2	0.0	0.4	0.4	0.0		
31	3256.0	1619.1	222.9	138.1		0.0			0.0		
33	8343.6	3465.8	1274.8	166.5	118.6	0.0	70.1	70.1	1.5		
45	1464.3	954.3	1.1	1.6	100.6	2.1	53.1	55.2	5.8		
49	1648.5	940.6	57.7	6.8		0.0			0.0		
64	1856.2	975.4	123.6	15.7	46.3	0.0	32.9	32.9	3.0		
68	4523.8	2126.4	423.1	103.8	23.7	2.0	2.5	4.5	0.2		
73	2377.4	1254.9	72.4	45.9	109.4	6.9	75.1	82.0	6.1		
101	1196.5	649.7	35.4	15.4	75.1	7.9	52.9	60.8	8.8		
106	2525.9	1235.5	266.1	47.3	15.5	0.0	5.2	5.2	0.3		
125	4233.7	2239.8	168.2	79.1	12.5	4.7	4.2	8.9	0.4		
127	1815.3	881.6	175.7	31.3	24.2	0.0	1.5	1.5	0.1		
128	2694.9	1484.8	48.0	3.2	238.2	13.0	172.9	185.9	12.0		
145	2900.7	1630.1	109.0	3.1	10.7	0.0	0.7	0.7	0.0		
147	5533.0	3220.5	73.9	18.3	164.9	3.0	117.7	120.6	3.7		
155	1157.5	680.1	9.4	0.0	112.1	2.7	73.3	76.0	11.0		
157	2016.3	1107.2	42.3	6.6	59.5	3.9	42.1	45.9	4.0		
181	1262.8	643.8	146.7	7.9	2.8	0.0	0.2	0.2	0.0		
231	2264.8	1080.0	260.6	49.0	2.7	0.0	0.2	0.2	0.0		
268	1915.0	1076.1	39.5	22.3	3.4	0.0	2.5	2.5	0.2		
299	1140.5	668.5	6.6	9.5	100.8	0.0	74.6	74.6	11.1		
320	4920.3	2645.8	242.4	39.1	89.6	0.0	5.6	5.6	0.2		
332	1753.9	859.2	178.8	34.0	19.0	0.0	2.7	2.7	0.3		
336	1626.3	952.9	12.5	8.1	263.9	0.0	184.2	184.2	19.1		
351	16974.7	9544.2	324.0	246.7	538.9	6.1	308.4	314.4	3.2		
377	1392.4	654.9	146.8	19.3	3.5	0.0	0.7	0.7	0.1		
397	3391.1	1855.6	44.8	52.9	27.2	0.0	1.7	1.7	0.1	Y	
406	920.4	493.4	25.7	27.4	4.3	0.0	0.3	0.3	0.1	Y	
409	1653.9	932.5	15.0	42.3	0.0	15.2	15.2	1.6			
411	3082.8	1852.3	10.1	16.7	227.0	0.2	85.7	85.9	4.6		
438	872.3	506.4	31.6	9.9	0.5	0.0	0.0	0.0	0.0	Y	
440	3025.5	1749.9	53.5	29.5	19.6	0.0	2.3	2.3	0.1		
445	1582.8	942.8	10.3	11.7	19.1	3.2	8.1	11.3	1.2		
447	1316.7	1064.2	78.4	173.0	71.9	1.1	44.8	45.9	4.0		
457	2303.4	1284.6	64.3	19.0	228.0	0.2	164.4	164.6	12.2		

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
461	1907.6	1128.2	33.4	20.9		0.0			0.0	Y	
462	539.9	312.9	0.5	6.9		0.0			0.0	Y	
468	1687.7	933.9	18.0	50.8	27.5	0.9	14.7	15.6	1.6		
472	679.6	374.8	20.1	12.5		0.0			0.0	Y	
475	1389.3	799.4	39.2	10.1	13.8	0.7	8.7	9.4	1.1		
478	2789.5	1603.9	68.9	24.2	16.8	6.8	1.2	8.0	0.5		
480	1002.4	548.4	27.6	8.3	60.5	2.4	37.3	39.7	6.9	Y	
498	752.5	405.8	20.7	20.7	50.9	0.0	31.5	31.5	7.4	Y	
515	535.3	330.3	3.6	6.6	0.6	0.2	0.0	0.2	0.1	Y	
527	510.0	303.3	13.5	5.1	63.5	0.4	42.1	42.5	13.4	Y	
533	1277.4	754.5	8.1	4.7		1.1			0.0	Y	
534	1384.8	763.4	29.1	28.0	139.1	0.6	79.1	79.7	10.0	Y	
536	1035.0	593.7	27.1	0.0	29.4	0.0	21.7	21.7	3.5		
539	2962.6	1764.4	30.7	8.0	39.5	0.0	8.5	8.5	0.5	Y	
565	1569.5	906.3	11.4	7.4	157.5	0.0	95.4	95.4	10.4		
583	753.4	442.0	1.8	1.5		0.0			0.0	Y	
586	1035.9	569.3	20.2	22.0	58.2	0.0	23.1	23.1	3.9	Y	
595	1408.5	838.4	9.0	31.9	32.3	0.0	8.5	8.5	1.0	Y	
643	3480.9	2027.7	62.8	24.6	188.5	0.0	122.6	122.6	5.9		
645	1302.1	779.0	14.5	3.1	205.3	0.0	148.0	148.0	18.7		
646	2629.6	1477.7	26.9	68.5	23.2	1.9	15.6	17.4	1.2		
656	1092.1	629.2	8.1	11.4	210.7	0.3	154.9	155.2	24.3		
670	661.6	388.1	13.9	27.7	10.4	0.4	5.4	5.8	1.5		
696	1048.5	540.9	7.6	24.6	1.0	0.0	0.3	0.3	0.0	Y	
697	1538.6	900.6	31.3	8.0	32.7	1.5	6.7	8.1	0.9		
727	2041.0	1204.1	4.9	10.1	276.0	5.9	185.9	191.8	15.8		
729	2088.3	1229.4	7.9	29.7	530.4	0.0	319.5	319.5	25.8		
769	1548.7	856.2	46.2	37.5	2.4	2.7	0.3	3.0	0.3		
771	1286.8	691.6	30.3	48.2	10.0	1.8	0.6	2.5	0.3		
807	639.7	341.7	30.9	9.4	11.3	0.0	2.9	2.9	0.8	Y	
817	3974.2	2292.4	26.6	41.9	562.4	0.0	250.3	250.3	10.8		
827	4927.2	2799.4	60.6	34.9	153.6	13.7	108.1	121.8	4.2		
855	1227.0	682.1	35.1	7.6	59.0	0.0	27.4	27.4	3.8	Y	
913	605.3	354.0	15.3	6.0	32.0	2.2	15.1	17.2	4.6	Y	
915	2003.4	1078.1	86.8	36.2	175.4	9.0	80.2	89.2	7.6	Y	
965	1669.3	981.1	18.8	8.5	342.1	0.3	143.9	144.3	14.4	Y	
1035	5187.9	2979.7	102.4	21.8	522.2	16.4	297.3	313.7	10.1	Y	
1101	695.2	364.0	42.1	6.5	66.4	0.0	20.9	20.9	5.1	Y	
1120	882.0	491.7	26.6	10.6	38.3	4.1	16.1	20.3	3.9	Y	

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
1137	1450.8	788.8	53.2	31.1	78.5	8.0	43.9	51.9	6.1	Y	
1261	1187.8	636.9	51.1	31.7	146.0	3.3	84.6	87.9	12.7	Y	
1289	566.7	297.4	30.1	7.1	147.2	0.0	81.1	81.1	24.8	Y	
1310	579.6	309.2	24.4	14.1	126.4	0.0	81.7	81.7	24.5	Y	
1320	882.2	530.8	13.9	12.9	156.7	0.0	52.3	52.3	9.6	Y	
1378	2165.2	1295.5	19.3	23.0	124.0	2.0	84.5	86.5	6.6	Y	
1426	527.6	310.8	8.9	0.0	5.9	0.0	0.4	0.4	0.1	Y	
1466	1164.6	712.1	0.2	7.2	9.9	0.0	7.3	7.3	1.0	Y	
1496	622.9	365.0	4.1	8.1		0.0			0.0	Y	
1500	808.1	461.3	8.4	25.2		0.0			0.0	Y	
1563	5782.2	3369.7	39.2	40.4	659.2	23.4	487.8	511.2	14.9	Y	
1589	1267.4	736.4	3.2	13.7	0.3	0.0	0.0	0.0	0.0	Y	
1692	1298.3	794.2	2.4	0.9		0.0			0.0	Y	
1704	769.8	443.6	10.5	2.4		1.4			0.0	Y	
1775	617.4	364.7	3.3	5.0	31.2	0.0	23.1	23.1	6.3	Y	
1846	1369.7	786.1	4.4	19.0	137.0	14.3	101.2	115.5	14.4	Y	
1863	877.3	509.7	4.0	12.4		0.0			0.0	Y	
1938	1145.1	684.8	0.5	4.3	129.7	0.0	95.0	95.0	13.9	Y	
1943	835.5	498.2	0.2	0.0	18.5	0.0	13.7	13.7	2.7	Y	
2057	609.4	369.6	0.0	0.0	221.5	1.5	161.9	163.4	44.0	Y	***
2237	8883.0	4077.5	1037.0	183.7	78.0	0.8	7.5	8.2	0.2		
2256	2172.8	1224.7	102.3	35.6	95.4	0.0	36.0	36.0	2.7		
2260	1188.4	599.5	49.7	42.9	9.4	0.6	3.6	4.1	0.6		
2270	2490.9	1271.1	190.6	21.3	70.7	0.0	24.6	24.6	1.7		
2296	3682.1	1648.1	530.6	53.7	144.3	0.0	43.2	43.2	2.0		
2299	2061.3	1100.5	107.4	60.2	4.7	0.0	0.3	0.3	0.0		
2316	2961.9	1576.9	178.9	43.3	99.7	0.0	52.8	52.8	3.0		
2357	1104.3	437.3	143.5	0.4	1.4	0.0	0.5	0.5	0.1		
2371	1591.4	707.2	213.9	3.6	3.8	0.0	1.4	1.4	0.2		
2380	26574.0	15515.4	349.0	163.3	3092.8	23.0	1408.0	1431.0	9.0	Y	
2382	29849.6	16051.6	1295.7	378.2	963.5	18.8	537.5	556.3	3.2	Y	
2402	2754.5	1145.5	358.9	163.2	19.2	0.0	7.3	7.3	0.5		
2439	1161.1	625.8	55.4	13.3	7.7	3.5	0.5	4.0	0.6		
2514	1013.8	526.1	87.7	0.0		0.0			0.0		
2525	1687.1	945.3	25.6	8.1		7.9			0.0		
2555	1980.4	1078.2	74.4	24.7	1.1	4.6	0.1	4.7	0.4		
2561	9870.9	5516.6	252.9	70.9	376.8	23.1	211.7	234.8	4.1		
2596	1571.6	761.5	132.0	30.4	18.0	0.0	1.1	1.1	0.1		
2652	2164.6	1102.2	112.6	40.2	27.6	9.9	8.3	18.2	1.5		

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
2670	1565.4	920.6	98.8	8.6	3.7	0.0	0.2	0.2	0.0		
2684	1707.7	1052.1	69.4	1.6	14.5	3.1	3.5	6.5	0.6		
2693	1147.6	677.3	20.7	0.0	97.4	8.5	63.5	72.1	10.2		
2720	1237.1	712.8	59.5	11.5	6.4	0.0	0.4	0.4	0.1		
2723	1485.6	818.3	48.9	11.0	104.3	0.0	55.5	55.5	6.4		
2769	2366.8	1321.1	37.9	50.0	149.6	6.4	109.5	115.9	8.5		
2772	1545.8	897.5	37.4	22.3	1.1	0.0	0.1	0.1	0.0		
2781	1047.8	569.8	60.7	22.9	10.4	0.0	7.7	7.7	1.2		
2793	2398.6	1392.1	38.4	3.7	165.6	0.0	97.1	97.1	6.8		
2796	2432.2	1431.6	27.2	28.4	294.6	0.0	200.5	200.5	13.7		
2799	1611.4	915.0	35.5	11.0	50.2	4.1	36.8	40.8	4.3		
2810	6089.1	3448.1	96.1	49.4	991.3	13.0	684.1	697.1	19.6		
2825	3842.4	2188.2	94.8	25.8	91.2	5.7	35.7	41.4	1.8		
2858	4323.2	2410.0	91.8	18.8	225.0	1.9	49.2	51.0	2.0		
2942	1102.1	592.7	46.2	0.0	5.9	1.3	2.2	3.5	0.6		
2946	1826.3	1040.6	2.4	16.0	136.4	5.8	79.2	85.0	8.1		
3031	1892.1	1060.9	56.8	16.4	82.3	0.0	45.7	45.7	4.1		
3118	2790.9	1556.3	65.8	19.0	103.5	3.9	31.1	35.0	2.2		
3135	1139.5	678.4	9.5	1.1	72.5	1.4	47.2	48.6	7.0		
3259	1092.8	639.1	6.0	0.1	77.6	0.1	22.6	22.7	3.5		
3287	1374.3	675.0	149.6	0.9	28.4	2.9	4.2	7.1	0.9		
3295	1924.3	1133.8	2.8	5.3	287.2	2.7	84.3	87.0	7.6		
3369	2041.6	1184.8	19.1	9.6	231.3	4.6	158.4	163.0	13.5		
3388	1049.2	652.6	3.0	1.1	26.3	1.4	9.4	10.8	1.6		
3473	2205.0	1331.6	4.6	2.6	458.7	0.0	162.0	162.0	12.1		
3508	3727.2	2179.5	36.3	41.7	400.2	11.2	206.0	217.2	9.8		
3513	1144.3	617.7	20.6	23.3	196.1	1.0	140.0	141.0	22.0		
3523	1186.2	633.3	24.5	69.8	266.6	1.6	191.4	193.0	29.3		
3535	2920.8	1651.3	51.9	65.7	171.6	1.1	98.7	99.9	5.9		
3542	2447.0	1428.0	20.7	1.3	71.0	0.0	20.0	20.0	1.4		
3551	3338.5	2029.0	6.1	21.3	809.0	8.1	232.2	240.3	11.8		
3650	1138.3	649.4	3.3	4.5	284.9	7.1	79.4	86.5	13.1		
3701	1691.7	1037.7	9.8	0.5	253.1	7.2	161.2	168.4	16.0		
3734	4033.8	2357.0	30.1	64.2	960.6	9.2	452.4	461.6	19.3		
3746	1364.6	735.9	21.3	21.7	192.0	0.0	80.0	80.0	10.6		
3858	1363.7	793.3	16.8	6.2	47.0	0.0	16.3	16.3	2.0		
3890	1441.3	838.5	30.7	9.5	246.0	1.1	100.7	101.8	11.7		
3937	4188.9	2405.6	40.1	18.4	520.9	0.0	199.3	199.3	8.1	Y	
3957	3532.9	2020.1	69.5	48.7	555.2	0.5	388.4	388.9	18.6	Y	

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
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3972	1998.8	1107.6	10.4	13.3	453.7	2.6	144.2	146.8	13.1		
4042	513.6	316.0	1.5	1.1	129.1	0.0	50.1	50.1	15.8	Y	
4098	862.6	479.2	7.4	17.9	38.1	0.5	10.7	11.2	2.3	Y	
4108	1454.9	786.8	18.0	12.0	243.4	1.6	79.4	81.0	10.0	Y	
4111	17481.1	9921.6	312.2	316.1	1099.8	31.1	656.9	688.0	6.7	Y	
4117	2819.7	1699.8	17.3	2.7	345.7	0.0	195.3	195.3	11.4	Y	
4120	1377.2	823.1	4.4	17.0	358.1	0.0	155.3	155.3	18.8	Y	
4174	511.7	282.9	1.5	7.1	57.9	0.0	35.9	35.9	12.6	Y	
4186	579.8	325.1	1.6	8.8	86.5	0.0	42.0	42.0	12.9	Y	
4203	706.9	412.0	2.0	0.7	149.4	0.0	77.6	77.6	18.7	Y	
4237	588.6	357.0	3.0	0.5	261.4	0.0	59.7	59.7	16.6	Y	
4257	620.0	350.6	5.8	5.3	232.7	0.0	129.5	129.5	36.3	Y	***
4265	526.1	291.5	13.5	13.7	145.3	0.0	53.9	53.9	17.7	Y	
4311	1285.0	763.2	22.7	2.6	184.6	0.2	85.8	86.0	10.9	Y	
4316	1062.0	625.8	12.9	1.9	47.7	0.0	23.2	23.2	3.6	Y	
4318	907.6	536.4	8.4	2.6	53.2	0.0	29.6	29.6	5.4	Y	
4319	614.1	352.6	3.0	0.0	12.1	0.0	3.4	3.4	1.0	Y	
4374	1365.5	779.6	48.5	23.4	144.8	0.0	49.2	49.2	5.9	Y	
4378	4146.9	2262.7	215.0	31.4	348.0	8.5	252.0	260.5	10.5	Y	
4382	1024.7	621.9	8.3	1.0	14.1	0.0	3.6	3.6	0.6	Y	
4414	2903.2	1649.8	68.7	42.6	218.3	0.0	96.8	96.8	5.6	Y	
4484	875.3	500.9	23.3	0.8	52.8	0.0	29.1	29.1	5.5	Y	
4492	1878.1	1104.8	11.7	19.1	111.3	0.0	31.6	31.6	2.8	Y	
4502	1372.7	749.8	25.8	16.5	239.3	0.0	162.1	162.2	20.9	Y	
4509	2370.6	1382.0	8.0	21.8	125.5	5.5	82.4	87.9	6.3	Y	
4539	986.4	545.6	40.9	11.2	39.4	0.0	16.1	16.1	2.7	Y	
4557	1661.3	901.0	95.0	10.6	37.4	0.0	9.6	9.6	1.0	Y	
4687	542.7	313.6	12.2	0.0		0.0			0.0	Y	
4702	508.5	300.7	5.0	6.2	61.5	3.5	45.5	49.1	15.9	Y	
4743	1468.3	795.1	61.7	6.1	266.3	2.6	187.7	190.3	22.1	Y	
4773	1353.6	783.2	25.7	11.4	165.5	0.5	112.7	113.2	14.0	Y	
4776	811.5	462.5	28.3	2.7	12.1	0.0	3.1	3.1	0.6	Y	
4826	1063.2	632.3	10.0	0.3	257.2	4.1	189.4	193.5	29.9	Y	
4846	681.8	386.9	21.7	1.1	158.9	0.6	117.6	118.2	28.9	Y	
4864	729.7	385.2	34.6	14.8	42.3	0.0	10.9	10.9	2.6	Y	
4868	1177.8	628.4	46.6	32.8	83.6	0.0	19.8	19.8	2.9	Y	
4877	1079.0	641.3	9.5	2.1	141.7	0.7	99.2	99.8	15.3	Y	
4908	1778.0	1033.7	34.9	0.2	233.0	3.6	153.9	157.5	14.7	Y	
4909	716.5	403.9	23.2	0.0	12.9	0.0	3.3	3.3	0.8	Y	

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
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4955	959.7	542.1	27.6	10.3	13.4	0.1	6.5	6.6	1.2	Y	
4995	814.2	352.4	31.9	46.0	1.5	0.2	0.3	0.5	0.1	Y	
5006	9710.2	5608.3	144.0	33.6	63.4	6.0	13.8	19.9	0.3	Y	
5060	677.3	409.8	0.0	0.0	11.2	0.7	8.3	8.9	2.2	Y	
5087	707.7	384.2	15.5	26.0	13.5	0.0	2.1	2.1	0.5	Y	
5099	974.1	593.4	33.8	1.7		0.1			0.0	Y	
5123	641.8	356.3	30.3	1.4	145.0	3.6	103.9	107.6	27.6	Y	
5125	1882.4	1095.3	20.8	0.0	448.7	6.4	327.7	334.2	29.8	Y	
5197	7033.0	3979.3	134.9	3.8	954.2	16.2	699.7	715.9	17.3	Y	
5227	803.7	476.2	17.6	6.7	25.1	0.2	15.7	15.9	3.2	Y	
5274	1159.3	611.6	8.9	49.6	40.2	0.0	28.8	28.8	4.6	Y	
5340	1062.3	622.5	10.1	12.9	276.9	5.4	204.9	210.3	33.0	Y	
5382	797.0	409.8	2.3	8.2	104.4	3.5	68.8	72.3	17.4	Y	
5392	1594.9	897.8	59.3	11.4	173.3	0.5	126.1	126.6	13.2	Y	
5397	798.5	417.1	5.9	54.8	11.2	0.4	2.9	3.3	0.8	Y	
5578	723.8	432.8	2.2	0.0	139.6	2.6	102.0	104.6	23.9	Y	
5599	625.7	344.0	20.5	0.0	140.2	1.5	103.7	105.3	28.8	Y	
5642	1303.8	791.6	7.0	0.8	377.8	9.4	254.7	264.1	32.7	Y	
5654	1713.3	973.3	28.2	12.1	3.1	0.2	0.2	0.4	0.0	Y	
5676	1176.4	666.8	8.3	31.9	3.2	5.9	0.5	6.4	0.9	Y	
5703	539.9	305.1	12.8	3.0		6.2			0.0	Y	
5729	1451.2	847.1	9.7	24.5	407.1	1.0	271.2	272.1	31.7	Y	
5783	743.6	429.8	2.3	0.0	83.9	3.8	57.6	61.3	14.1	Y	
5803	609.3	363.3	10.9	3.5	41.2	1.5	21.2	22.7	6.1	Y	
5844	790.6	458.1	13.4	0.4	61.5	4.2	45.5	49.7	10.5	Y	
5907	1465.9	879.7	2.9	8.9	137.3	1.0	101.6	102.6	11.6	Y	
6006	905.6	510.1	7.7	0.0	51.2	1.3	37.9	39.2	7.5	Y	
6181	1002.3	589.6	6.6	0.0	3.3	0.3	1.9	2.1	0.4	Y	
6182	547.1	344.0	8.3	0.0	97.1	0.8	71.6	72.4	20.5	Y	
6306	606.0	362.9	0.0	0.0		0.0			0.0	Y	
6397	2128.2	1220.4	41.4	0.4	350.2	4.1	257.7	261.8	20.7	Y	
6408	2202.0	1312.0	13.2	21.6	2.8	1.0	2.1	3.1	0.2	Y	
6432	519.7	279.9	4.6	14.6	19.1	0.0	14.1	14.1	5.0	Y	
6482	671.3	349.5	17.0	12.8	30.1	4.9	22.2	27.1	7.3	Y	
6483	7311.3	4216.5	121.9	59.4	546.1	9.8	404.1	413.9	9.5	Y	
6524	750.3	503.6	6.5	13.1	204.9	1.2	148.8	150.0	29.3	Y	
6558	828.5	498.1	11.3	0.0	83.8	1.3	62.0	63.4	12.4	Y	
6632	1304.0	744.8	23.3	0.0	237.3	0.0	175.0	175.0	22.8	Y	
6637	521.1	287.4	6.5	0.0	14.8	0.0	2.4	2.4	0.8	Y	

TABLE 1 ECA values for 1999, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
6674	2847.5	1642.9	39.9	11.9	262.6	1.3	191.8	193.1	11.5	Y	
6703	545.1	317.0	0.5	5.9	112.5	1.1	68.8	69.9	21.9	Y	
6751	553.9	355.1	10.8	0.0	112.0	0.0	82.9	82.9	22.6	Y	
6803	530.9	321.6	3.8	0.0	83.2	2.4	61.5	63.9	19.5	Y	
6806	3415.7	2055.1	25.9	6.4		0.0			0.0	Y	
6819	1126.9	672.5	18.9	0.0	2.8	0.0	2.1	2.1	0.3	Y	
6833	528.1	324.3	3.4	0.0		0.0			0.0	Y	
6865	541.8	324.3	1.8	0.0		0.0			0.0	Y	
6979	557.5	313.7	1.5	0.8		0.0			0.0	Y	
7092	704.8	350.8	24.6	22.3	75.6	0.2	56.0	56.2	15.0	Y	
7157	718.4	388.2	14.5	2.6	53.3	1.8	39.4	41.3	10.2	Y	
7179	1116.3	656.1	10.0	4.8		0.0			0.0	Y	
7214	604.8	354.9	19.1	5.2		0.0			0.0	Y	
7216	1015.5	520.7	76.5	7.1	1.3	0.0	0.3	0.3	0.1	Y	
7218	737.3	435.6	11.7	0.2		0.0			0.0	Y	
7232	1581.5	957.5	13.7	0.0		0.0			0.0	Y	
7259	841.7	473.7	26.7	0.8	25.6	0.1	19.0	19.1	3.8	Y	
7262	592.8	335.9	14.3	0.0	62.4	0.0	46.1	46.1	13.2	Y	
7420	1013.8	592.2	22.1	9.7	81.2	0.0	60.1	60.1	9.8	Y	
7443	582.7	321.8	4.0	4.0		0.0			0.0	Y	
7509	846.4	487.2	9.8	10.8		0.0			0.0	Y	
7532	1721.2	981.9	13.2	35.5		0.0			0.0	Y	
7555	531.3	304.8	6.9	0.3		0.0			0.0	Y	
7576	588.2	305.5	29.2	4.3		0.0			0.0	Y	
7592	1643.5	989.1	2.7	2.2		0.0			0.0	Y	
7615	927.8	536.3	17.0	0.0		0.0			0.0	Y	
7658	1730.6	965.4	25.9	24.4	219.6	0.3	162.5	162.7	16.4	Y	
7659	2329.3	1183.6	8.2	211.9		0.1			0.0	Y	
7816	1503.0	859.1	15.2	31.6	0.4	1.2	0.0	1.2	0.1	Y	
7855	775.1	421.2	6.6	20.8		0.0			0.0	Y	
7964	840.7	489.6	0.0	23.8		0.0			0.0	Y	
8027	1157.8	687.9	11.7	13.3		0.0			0.0	Y	
8324	549.6	308.3	6.3	11.8	2.9	0.0	2.2	2.2	0.7	Y	
8351	1118.9	663.8	0.2	11.7		0.0			0.0	Y	
8820	2776.5	1646.2	32.1	18.9	266.0	0.0	165.2	165.2	9.8		
8895	7116.0	4127.6	86.0	49.0	676.0	14.2	326.5	340.8	8.1		
8926	1777.6	1013.0	18.0	20.2	96.8	7.5	55.2	62.7	6.0		
9183	3176.2	1830.8	20.4	23.5	114.5	1.0	62.6	63.7	3.4		
9226	4099.4	2350.4	56.8	49.9	585.5	8.9	327.9	336.8	13.9		

TABLE 1 ECA values for 1999, all watersheds (concluded)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
9228	2904.0	1638.2	46.2	37.2	145.2	1.0	100.8	101.8	6.0		
9296	2212.6	1242.0	43.6	70.6	111.9	0.2	53.9	54.1	4.2		
9467	1615.7	936.0	5.2	21.8	134.6	2.8	55.8	58.6	6.2		
9494	1067.3	602.9	20.5	32.4	68.6	0.4	42.9	43.3	6.9		
9560	2917.7	1680.7	33.3	33.4	78.8	11.1	51.8	62.9	3.6		
9604	8718.2	4909.5	136.8	104.7	1142.8	40.9	810.8	851.7	16.7		
9676	1753.6	952.5	33.9	14.3	246.4	6.7	176.0	182.6	18.4		
9685	1098.3	646.3	9.9	13.3	9.5	3.3	5.3	8.6	1.3		
9693	2749.8	1586.9	12.2	35.7	117.3	6.7	77.2	83.9	5.2		
9704	2941.6	1569.4	205.3	3.2	318.1	16.1	227.9	244.1	13.6		
9726	1342.1	765.3	16.1	13.2	337.8	15.1	232.9	248.0	31.1		
9908	1674.6	961.9	14.3	3.1	341.9	14.2	250.2	264.4	26.7		
9964	3998.8	2343.6	67.2	42.6	204.8	4.2	129.7	133.9	5.5		
10003	1015.0	591.0	14.9	9.5		1.5			0.0		
10052	1675.3	910.2	77.8	1.3	301.0	15.0	211.4	226.4	22.6		
10264	1053.9	604.5	27.1	8.6	71.6	2.3	45.2	47.5	7.5		
10277	6491.6	3654.9	81.4	115.4	643.7	12.4	436.0	448.4	12.0		
10293	2700.7	1498.2	46.1	26.2	2.2	1.7	0.5	2.3	0.1		
10363	1279.5	735.1	1.2	4.2	25.8	3.8	10.3	14.1	1.9		
10388	1056.3	591.0	4.8	19.7	73.7	1.8	53.5	55.3	9.3		
10413	1436.3	765.7	21.9	35.8	11.7	0.0	7.4	7.4	0.9		
10440	1764.5	885.6	31.8	68.7	151.4	3.2	102.9	106.1	11.5		
10725	1772.4	955.3	27.5	4.3		0.0			0.0		
10773	1249.7	736.7	0.4	0.1	0.1	0.0	0.0	0.0	0.0	Y	
Total	649159.9	363250.2	18343.7	7547.5	44095.5	801.9	25118.0	25919.8	6.8		

TABLE 2 ECA values for 2009, all watersheds

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
0	6232.6	3225.4	433.2	55.7	634.3	19.0	407.6	426.6	11.6		
1	22421.3	12452.0	726.3	325.5	980.4	0.9	567.2	568.1	4.3	Y	
9	4588.7	2655.0	49.8	24.4	883.1	15.6	410.9	426.6	15.7		
15	1219.4	686.2	20.2	27.7		0.0	0.0	0.0	0.0		
27	1638.7	853.3	169.2	19.8	195.8	0.0	144.8	144.8	14.2		
31	3256.0	1619.1	222.9	138.1	548.2	0.0	405.7	405.7	22.0		
33	8343.6	3465.8	1274.8	166.5	546.4	0.0	295.3	295.3	6.2		
45	1464.3	954.3	1.1	1.6	425.5	2.1	167.1	169.1	17.7		
49	1648.5	940.6	57.7	6.8		0.0	0.0	0.0	0.0		
64	1856.2	975.4	123.6	15.7	185.0	0.0	100.8	100.8	9.2		
68	4523.8	2126.4	423.1	103.8		2.0	0.0	2.0	0.1		
73	2377.4	1254.9	72.4	45.9	197.3	6.9	97.3	104.2	7.8		
101	1196.5	649.7	35.4	15.4	189.1	7.9	79.9	87.8	12.7		
106	2525.9	1235.5	266.1	47.3	182.2	0.0	134.8	134.8	9.0		
125	4233.7	2239.8	168.2	79.1	365.9	4.7	208.4	213.1	8.8		
127	1815.3	881.6	175.7	31.3		0.0	0.0	0.0	0.0		
128	2694.9	1484.8	48.0	3.2	267.7	13.0	113.7	126.7	8.2		
145	2900.7	1630.1	109.0	3.1	255.0	0.0	147.6	147.6	8.5		
147	5533.0	3220.5	73.9	18.3	728.9	3.0	432.7	435.7	13.2		
155	1157.5	680.1	9.4	0.0	273.6	2.7	100.7	103.4	14.9		
157	2016.3	1107.2	42.3	6.6	417.2	3.9	175.5	179.3	15.5		
181	1262.8	643.8	146.7	7.9	249.8	0.0	155.7	155.7	19.7		
231	2264.8	1080.0	260.6	49.0	470.4	0.0	262.0	262.0	19.5		
268	1915.0	1076.1	39.5	22.3	3.4	0.0	1.1	1.1	0.1		
299	1140.5	668.5	6.6	9.5	206.1	0.0	138.1	138.1	20.5		
320	4920.3	2645.8	242.4	39.1	1225.6	0.0	817.4	817.4	28.3		
332	1753.9	859.2	178.8	34.0	162.0	0.0	117.6	117.6	11.3		
336	1626.3	952.9	12.5	8.1	264.0	0.0	89.3	89.3	9.3		
351	16974.7	9544.2	324.0	246.7	729.1	6.1	418.9	425.0	4.3		
377	1392.4	654.9	146.8	19.3	0.6	0.0	0.2	0.2	0.0		
397	3391.1	1855.6	44.8	52.9	537.3	0.0	385.3	385.3	20.3	Y	
406	920.4	493.4	25.7	27.4		0.0	0.0	0.0	0.0	Y	
409	1653.9	932.5	15.0	42.3	137.3	0.0	89.6	89.6	9.5		
411	3082.8	1852.3	10.1	16.7	46.2	0.2	34.2	34.3	1.8		
438	872.3	506.4	31.6	9.9	247.4	0.0	143.6	143.6	26.7	Y	
440	3025.5	1749.9	53.5	29.5	112.4	0.0	78.4	78.4	4.3		
445	1582.8	942.8	10.3	11.7	2.5	3.2	1.5	4.7	0.5		
447	1316.7	1064.2	78.4	173.0	327.7	1.1	193.7	194.9	17.0		
457	2303.4	1284.6	64.3	19.0	409.4	0.2	222.6	222.8	16.5		

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
461	1907.6	1128.2	33.4	20.9	575.7	0.0	399.8	399.8	34.4	Y	
462	539.9	312.9	0.5	6.9	102.4	0.0	75.0	75.0	23.9	Y	
468	1687.7	933.9	18.0	50.8	12.1	0.9	4.1	4.9	0.5		
472	679.6	374.8	20.1	12.5	167.8	0.0	112.2	112.2	28.4	Y	
475	1389.3	799.4	39.2	10.1	210.1	0.7	142.8	143.5	17.1		
478	2789.5	1603.9	68.9	24.2	455.7	6.8	279.5	286.3	17.0		
480	1002.4	548.4	27.6	8.3	201.1	2.4	116.1	118.5	20.5	Y	
498	752.5	405.8	20.7	20.7	31.4	0.0	21.5	21.5	5.0	Y	
515	535.3	330.3	3.6	6.6		0.2	0.0	0.2	0.1	Y	
527	510.0	303.3	13.5	5.1	72.6	0.4	26.3	26.7	8.4	Y	
533	1277.4	754.5	8.1	4.7	14.8	1.1	10.8	11.9	1.6	Y	
534	1384.8	763.4	29.1	28.0	110.3	0.6	40.3	41.0	5.2	Y	
536	1035.0	593.7	27.1	0.0	125.0	0.0	80.6	80.6	13.0		
539	2962.6	1764.4	30.7	8.0		0.0	0.0	0.0	0.0	Y	
565	1569.5	906.3	11.4	7.4	204.1	0.0	97.9	97.9	10.7		
583	753.4	442.0	1.8	1.5		0.0	0.0	0.0	0.0	Y	
586	1035.9	569.3	20.2	22.0	16.8	0.0	2.3	2.3	0.4	Y	
595	1408.5	838.4	9.0	31.9	3.2	0.0	0.7	0.7	0.1	Y	
643	3480.9	2027.7	62.8	24.6	433.4	0.0	264.1	264.1	12.6		
645	1302.1	779.0	14.5	3.1	211.2	0.0	102.1	102.1	12.9		
646	2629.6	1477.7	26.9	68.5	314.8	1.9	213.6	215.5	14.3		
656	1092.1	629.2	8.1	11.4	217.2	0.3	98.9	99.1	15.5		
670	661.6	388.1	13.9	27.7	7.9	0.4	1.8	2.3	0.6	Y	
696	1048.5	540.9	7.6	24.6		0.0	0.0	0.0	0.0	Y	
697	1538.6	900.6	31.3	8.0	87.1	1.5	64.4	65.9	7.1		
727	2041.0	1204.1	4.9	10.1	365.3	5.9	198.9	204.8	16.9		
729	2088.3	1229.4	7.9	29.7	374.9	0.0	157.8	157.8	12.8		
769	1548.7	856.2	46.2	37.5	234.7	2.7	173.7	176.4	19.5		
771	1286.8	691.6	30.3	48.2	152.2	1.8	112.6	114.4	15.8		
807	639.7	341.7	30.9	9.4	25.2	0.0	18.5	18.5	5.0	Y	
817	3974.2	2292.4	26.6	41.9	162.1	0.0	27.7	27.7	1.2		
827	4927.2	2799.4	60.6	34.9	450.2	13.7	244.0	257.7	9.0		
855	1227.0	682.1	35.1	7.6	75.4	0.0	44.9	44.9	6.3	Y	
913	605.3	354.0	15.3	6.0	30.6	2.2	16.0	18.2	4.9	Y	
915	2003.4	1078.1	86.8	36.2	74.0	9.0	28.7	37.7	3.2	Y	
965	1669.3	981.1	18.8	8.5	91.0	0.3	33.7	34.1	3.4	Y	
1035	5187.9	2979.7	102.4	21.8	733.2	16.4	446.3	462.7	14.9	Y	
1101	695.2	364.0	42.1	6.5	4.2	0.0	2.6	2.6	0.6	Y	
1120	882.0	491.7	26.6	10.6	18.4	4.1	2.2	6.4	1.2	Y	

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
1137	1450.8	788.8	53.2	31.1	53.6	8.0	12.4	20.4	2.4	Y	
1261	1187.8	636.9	51.1	31.7	86.2	3.3	25.4	28.7	4.1	Y	
1289	566.7	297.4	30.1	7.1	84.3	0.0	24.9	24.9	7.6	Y	
1310	579.6	309.2	24.4	14.1	104.6	0.0	24.9	24.9	7.5	Y	
1320	882.2	530.8	13.9	12.9	52.4	0.0	9.9	9.9	1.8	Y	
1378	2165.2	1295.5	19.3	23.0	113.2	2.0	51.5	53.5	4.1	Y	
1426	527.6	310.8	8.9	0.0	69.4	0.0	48.4	48.4	15.1	Y	
1466	1164.6	712.1	0.2	7.2	9.9	0.0	4.4	4.4	0.6	Y	
1496	622.9	365.0	4.1	8.1		0.0	0.0	0.0	0.0	Y	
1500	808.1	461.3	8.4	25.2		0.0	0.0	0.0	0.0	Y	
1563	5782.2	3369.7	39.2	40.4	855.0	23.4	428.8	452.2	13.2	Y	
1589	1267.4	736.4	3.2	13.7	268.9	0.0	199.0	199.0	26.9	Y	
1692	1298.3	794.2	2.4	0.9	368.7	0.0	272.8	272.8	34.3	Y	
1704	769.8	443.6	10.5	2.4	136.6	1.4	101.1	102.5	22.5	Y	
1775	617.4	364.7	3.3	5.0	182.3	0.0	131.3	131.3	35.7	Y	***
1846	1369.7	786.1	4.4	19.0	323.6	14.3	218.6	232.9	28.9	Y	
1863	877.3	509.7	4.0	12.4	214.1	0.0	156.3	156.3	30.4	Y	
1938	1145.1	684.8	0.5	4.3	168.8	0.0	98.1	98.1	14.3	Y	
1943	835.5	498.2	0.2	0.0	139.8	0.0	83.5	83.5	16.8	Y	
2057	609.4	369.6	0.0	0.0	221.5	1.5	101.8	103.2	27.8	Y	
2237	8883.0	4077.5	1037.0	183.7	163.1	0.8	120.7	121.5	2.4		
2256	2172.8	1224.7	102.3	35.6	67.4	0.0	49.9	49.9	3.8		
2260	1188.4	599.5	49.7	42.9		0.6	0.0	0.6	0.1		
2270	2490.9	1271.1	190.6	21.3	57.6	0.0	42.6	42.6	2.9		
2296	3682.1	1648.1	530.6	53.7	364.9	0.0	209.2	209.2	9.6		
2299	2061.3	1100.5	107.4	60.2	544.7	0.0	373.2	373.2	30.9		
2316	2961.9	1576.9	178.9	43.3	259.2	0.0	138.9	138.9	7.9		
2357	1104.3	437.3	143.5	0.4	13.6	0.0	10.1	10.1	1.7		
2371	1591.4	707.2	213.9	3.6		0.0	0.0	0.0	0.0		
2380	26574.0	15515.4	349.0	163.3	1857.1	23.0	1029.5	1052.6	6.6	Y	
2382	29849.6	16051.6	1295.7	378.2	2614.5	18.8	1634.1	1652.8	9.5	Y	
2402	2754.5	1145.5	358.9	163.2	66.2	0.0	49.0	49.0	3.3		
2439	1161.1	625.8	55.4	13.3	11.4	3.5	8.4	11.9	1.7		
2514	1013.8	526.1	87.7	0.0	45.4	0.0	32.2	32.2	5.3		
2525	1687.1	945.3	25.6	8.1	21.4	7.9	14.3	22.1	2.3		
2555	1980.4	1078.2	74.4	24.7	113.5	4.6	73.8	78.4	6.8		
2561	9870.9	5516.6	252.9	70.9	591.1	23.1	367.8	390.9	6.7		
2596	1571.6	761.5	132.0	30.4		0.0	0.0	0.0	0.0		
2652	2164.6	1102.2	112.6	40.2	78.9	9.9	53.9	63.7	5.2		

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
2670	1565.4	920.6	98.8	8.6	0.0	0.0	0.0	0.0	0.0		
2684	1707.7	1052.1	69.4	1.6	144.4	3.1	103.7	106.8	9.5		
2693	1147.6	677.3	20.7	0.0	84.8	8.5	25.1	33.6	4.8		
2720	1237.1	712.8	59.5	11.5	1.9	0.0	1.3	1.3	0.2		
2723	1485.6	818.3	48.9	11.0	72.4	0.0	38.3	38.3	4.4		
2769	2366.8	1321.1	37.9	50.0	147.4	6.4	43.0	49.4	3.6		
2772	1545.8	897.5	37.4	22.3	45.5	0.0	33.6	33.6	3.6		
2781	1047.8	569.8	60.7	22.9	34.4	0.0	21.8	21.8	3.5		
2793	2398.6	1392.1	38.4	3.7	107.6	0.0	67.0	67.0	4.7		
2796	2432.2	1431.6	27.2	28.4	255.3	0.0	160.6	160.6	11.0		
2799	1611.4	915.0	35.5	11.0	49.6	4.1	29.4	33.4	3.5		
2810	6089.1	3448.1	96.1	49.4	805.5	13.0	498.2	511.2	14.4		
2825	3842.4	2188.2	94.8	25.8	160.5	5.7	107.5	113.2	4.9		
2858	4323.2	2410.0	91.8	18.8	239.7	1.9	174.7	176.6	7.1		
2942	1102.1	592.7	46.2	0.0	79.9	1.3	58.5	59.8	9.3		
2946	1826.3	1040.6	2.4	16.0	101.6	5.8	62.1	67.9	6.5		
3031	1892.1	1060.9	56.8	16.4	50.5	0.0	26.2	26.2	2.3		
3118	2790.9	1556.3	65.8	19.0	3.9	3.9	1.8	5.6	0.3		
3135	1139.5	678.4	9.5	1.1	47.4	1.4	19.1	20.5	3.0		
3259	1092.8	639.1	6.0	0.1	64.7	0.1	47.7	47.8	7.4		
3287	1374.3	675.0	149.6	0.9		2.9	0.0	2.9	0.3		
3295	1924.3	1133.8	2.8	5.3	89.4	2.7	58.5	61.2	5.4		
3369	2041.6	1184.8	19.1	9.6	171.3	4.6	105.8	110.3	9.1		
3388	1049.2	652.6	3.0	1.1	9.7	1.4	4.8	6.2	0.9		
3473	2205.0	1331.6	4.6	2.6	368.9	0.0	246.4	246.4	18.4		
3508	3727.2	2179.5	36.3	41.7	355.1	11.2	196.3	207.4	9.3		
3513	1144.3	617.7	20.6	23.3	179.2	1.0	58.0	58.9	9.2		
3523	1186.2	633.3	24.5	69.8	219.3	1.6	88.7	90.3	13.7		
3535	2920.8	1651.3	51.9	65.7	77.1	1.1	28.0	29.1	1.7		
3542	2447.0	1428.0	20.7	1.3	37.3	0.0	27.6	27.6	1.9		
3551	3338.5	2029.0	6.1	21.3	75.6	8.1	35.1	43.2	2.1		
3650	1138.3	649.4	3.3	4.5	84.4	7.1	50.0	57.1	8.7		
3701	1691.7	1037.7	9.8	0.5	193.8	7.2	121.7	128.9	12.2		
3734	4033.8	2357.0	30.1	64.2	377.5	9.2	254.5	263.7	11.0		
3746	1364.6	735.9	21.3	21.7	29.2	0.0	12.0	12.0	1.6		
3858	1363.7	793.3	16.8	6.2		0.0	0.0	0.0	0.0		
3890	1441.3	838.5	30.7	9.5	28.5	1.1	13.2	14.3	1.6		
3937	4188.9	2405.6	40.1	18.4	356.0	0.0	229.4	229.4	9.4	Y	
3957	3532.9	2020.1	69.5	48.7	669.8	0.5	259.0	259.5	12.4	Y	

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
3972	1998.8	1107.6	10.4	13.3	205.1	2.6	129.0	131.5	11.7		
4042	513.6	316.0	1.5	1.1	65.2	0.0	45.9	45.9	14.5	Y	
4098	862.6	479.2	7.4	17.9	13.4	0.5	9.9	10.4	2.1	Y	
4108	1454.9	786.8	18.0	12.0	289.9	1.6	187.3	188.9	23.4	Y	
4111	17481.1	9921.6	312.2	316.1	1664.8	31.1	986.1	1017.2	9.9	Y	
4117	2819.7	1699.8	17.3	2.7	236.0	0.0	121.7	121.7	7.1	Y	
4120	1377.2	823.1	4.4	17.0	175.2	0.0	102.0	102.0	12.3	Y	
4174	511.7	282.9	1.5	7.1	56.8	0.0	10.6	10.6	3.7	Y	
4186	579.8	325.1	1.6	8.8	54.3	0.0	30.9	30.9	9.5	Y	
4203	706.9	412.0	2.0	0.7	127.8	0.0	74.8	74.8	18.1	Y	
4237	588.6	357.0	3.0	0.5	52.1	0.0	38.2	38.2	10.6	Y	
4257	620.0	350.6	5.8	5.3	81.7	0.0	60.4	60.4	17.0	Y	
4265	526.1	291.5	13.5	13.7	44.6	0.0	20.7	20.7	6.8	Y	
4311	1285.0	763.2	22.7	2.6	60.8	0.2	39.2	39.4	5.0	Y	
4316	1062.0	625.8	12.9	1.9	37.3	0.0	26.4	26.4	4.1	Y	
4318	907.6	536.4	8.4	2.6	42.5	0.0	20.7	20.7	3.8	Y	
4319	614.1	352.6	3.0	0.0		0.0	0.0	0.0	0.0	Y	
4374	1365.5	779.6	48.5	23.4	65.6	0.0	38.3	38.3	4.6	Y	
4378	4146.9	2262.7	215.0	31.4	396.4	8.5	175.1	183.6	7.4	Y	
4382	1024.7	621.9	8.3	1.0	57.3	0.0	42.4	42.4	6.7	Y	
4414	2903.2	1649.8	68.7	42.6	339.4	0.0	202.8	202.8	11.8	Y	
4484	875.3	500.9	23.3	0.8	35.4	0.0	7.0	7.0	1.3	Y	
4492	1878.1	1104.8	11.7	19.1	190.1	0.0	136.7	136.7	12.2	Y	
4502	1372.7	749.8	25.8	16.5	184.5	0.0	129.4	129.4	16.7	Y	
4509	2370.6	1382.0	8.0	21.8	493.9	5.5	354.6	360.1	25.8	Y	
4539	986.4	545.6	40.9	11.2	50.3	0.0	32.9	32.9	5.6	Y	
4557	1661.3	901.0	95.0	10.6	16.4	0.0	12.1	12.1	1.2	Y	
4687	542.7	313.6	12.2	0.0	0.6	0.0	0.3	0.3	0.1	Y	
4702	508.5	300.7	5.0	6.2	40.8	3.5	11.4	14.9	4.8	Y	
4743	1468.3	795.1	61.7	6.1	205.6	2.6	106.8	109.4	12.7	Y	
4773	1353.6	783.2	25.7	11.4	101.3	0.5	55.0	55.5	6.9	Y	
4776	811.5	462.5	28.3	2.7	94.3	0.0	69.0	69.0	14.1	Y	
4826	1063.2	632.3	10.0	0.3	227.8	4.1	120.4	124.6	19.3	Y	
4846	681.8	386.9	21.7	1.1	165.3	0.6	71.8	72.4	17.7	Y	
4864	729.7	385.2	34.6	14.8	14.3	0.0	10.6	10.6	2.5	Y	
4868	1177.8	628.4	46.6	32.8	192.4	0.0	132.9	132.9	19.7	Y	
4877	1079.0	641.3	9.5	2.1	259.3	0.7	176.7	177.4	27.2	Y	
4908	1778.0	1033.7	34.9	0.2	345.7	3.6	222.1	225.7	21.0	Y	
4909	716.5	403.9	23.2	0.0	96.6	0.0	67.5	67.5	15.8	Y	

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
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4955	959.7	542.1	27.6	10.3	189.5	0.1	134.1	134.2	23.5	Y	
4995	814.2	352.4	31.9	46.0	31.0	0.2	17.1	17.2	4.5	Y	
5006	9710.2	5608.3	144.0	33.6	575.0	6.0	391.5	397.5	6.9	Y	
5060	677.3	409.8	0.0	0.0	11.2	0.7	8.3	8.9	2.2	Y	
5087	707.7	384.2	15.5	26.0	148.5	0.0	107.1	107.1	26.8	Y	
5099	974.1	593.4	33.8	1.7	50.7	0.1	23.4	23.5	3.7	Y	
5123	641.8	356.3	30.3	1.4	120.1	3.6	60.4	64.1	16.4	Y	
5125	1882.4	1095.3	20.8	0.0	360.4	6.4	119.2	125.6	11.2	Y	
5197	7033.0	3979.3	134.9	3.8	907.0	16.2	277.4	293.6	7.1	Y	
5227	803.7	476.2	17.6	6.7	15.0	0.2	7.6	7.8	1.6	Y	
5274	1159.3	611.6	8.9	49.6	71.2	0.0	30.1	30.1	4.8	Y	
5340	1062.3	622.5	10.1	12.9	404.6	5.4	113.4	118.7	18.6	Y	
5382	797.0	409.8	2.3	8.2	88.4	3.5	52.3	55.9	13.4	Y	
5392	1594.9	897.8	59.3	11.4	247.5	0.5	135.3	135.8	14.2	Y	
5397	798.5	417.1	5.9	54.8	39.7	0.4	25.8	26.2	6.2	Y	
5578	723.8	432.8	2.2	0.0	137.3	2.6	32.4	35.0	8.0	Y	
5599	625.7	344.0	20.5	0.0	39.0	1.5	7.0	8.5	2.3	Y	
5642	1303.8	791.6	7.0	0.8	332.8	9.4	196.8	206.2	25.5	Y	
5654	1713.3	973.3	28.2	12.1	156.1	0.2	115.2	115.4	11.5	Y	
5676	1176.4	666.8	8.3	31.9	157.0	5.9	103.4	109.2	16.0	Y	
5703	539.9	305.1	12.8	3.0	51.9	6.2	34.0	40.3	12.4	Y	
5729	1451.2	847.1	9.7	24.5	349.6	1.0	226.8	227.7	26.5	Y	
5783	743.6	429.8	2.3	0.0	91.3	3.8	32.1	35.9	8.2	Y	
5803	609.3	363.3	10.9	3.5	149.5	1.5	106.6	108.1	28.8	Y	
5844	790.6	458.1	13.4	0.4	61.5	4.2	39.9	44.1	9.3	Y	
5907	1465.9	879.7	2.9	8.9	234.4	1.0	142.4	143.3	16.2	Y	
6006	905.6	510.1	7.7	0.0	54.8	1.3	35.8	37.1	7.1	Y	
6181	1002.3	589.6	6.6	0.0	101.9	0.3	73.9	74.1	12.4	Y	
6182	547.1	344.0	8.3	0.0	96.6	0.8	16.9	17.7	5.0	Y	
6306	606.0	362.9	0.0	0.0	66.3	0.0	48.2	48.2	13.3	Y	
6397	2128.2	1220.4	41.4	0.4	480.9	4.1	265.6	269.7	21.3	Y	
6408	2202.0	1312.0	13.2	21.6	295.4	1.0	190.0	191.0	14.4	Y	
6432	519.7	279.9	4.6	14.6	41.6	0.0	30.8	30.8	10.8	Y	
6482	671.3	349.5	17.0	12.8	69.8	4.9	49.5	54.4	14.7	Y	
6483	7311.3	4216.5	121.9	59.4	547.9	9.8	202.8	212.6	4.9	Y	
6524	750.3	503.6	6.5	13.1	200.1	1.2	80.0	81.2	15.9	Y	
6558	828.5	498.1	11.3	0.0	83.8	1.3	50.6	52.0	10.2	Y	
6632	1304.0	744.8	23.3	0.0	288.7	0.0	172.3	172.3	22.4	Y	
6637	521.1	287.4	6.5	0.0		0.0	0.0	0.0	0.0	Y	

TABLE 2 ECA values for 2009, all watersheds (continued)

Area Above H60 line (ha)											
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6674	2847.5	1642.9	39.9	11.9	259.0	1.3	159.5	160.9	9.6	Y	
6703	545.1	317.0	0.5	5.9	82.3	1.1	30.6	31.6	9.9	Y	
6751	553.9	355.1	10.8	0.0	112.0	0.0	33.6	33.6	9.2	Y	
6803	530.9	321.6	3.8	0.0	83.2	2.4	16.5	18.8	5.7	Y	
6806	3415.7	2055.1	25.9	6.4	100.5	0.0	68.7	68.7	3.3	Y	
6819	1126.9	672.5	18.9	0.0	8.0	0.0	5.4	5.4	0.8	Y	
6833	528.1	324.3	3.4	0.0	43.7	0.0	32.4	32.4	9.9	Y	
6865	541.8	324.3	1.8	0.0	162.1	0.0	94.0	94.0	28.8	Y	
6979	557.5	313.7	1.5	0.8	26.9	0.0	19.9	19.9	6.3	Y	
7092	704.8	350.8	24.6	22.3	75.6	0.2	32.3	32.5	8.7	Y	
7157	718.4	388.2	14.5	2.6	53.3	1.8	25.1	26.9	6.7	Y	
7179	1116.3	656.1	10.0	4.8	108.6	0.0	74.9	74.9	11.3	Y	
7214	604.8	354.9	19.1	5.2	2.0	0.0	1.5	1.5	0.4	Y	
7216	1015.5	520.7	76.5	7.1		0.0	0.0	0.0	0.0	Y	
7218	737.3	435.6	11.7	0.2	8.4	0.0	6.2	6.2	1.4	Y	
7232	1581.5	957.5	13.7	0.0	0.1	0.0	0.1	0.1	0.0	Y	
7259	841.7	473.7	26.7	0.8	107.2	0.1	72.1	72.3	14.4	Y	
7262	592.8	335.9	14.3	0.0	116.0	0.0	76.0	76.0	21.7	Y	
7420	1013.8	592.2	22.1	9.7	81.2	0.0	36.1	36.1	5.9	Y	
7443	582.7	321.8	4.0	4.0	154.8	0.0	114.6	114.6	35.2	Y	***
7509	846.4	487.2	9.8	10.8	10.0	0.0	7.4	7.4	1.5	Y	
7532	1721.2	981.9	13.2	35.5	180.3	0.0	133.4	133.4	13.4	Y	
7555	531.3	304.8	6.9	0.3	12.7	0.0	8.7	8.7	2.8	Y	
7576	588.2	305.5	29.2	4.3		0.0	0.0	0.0	0.0	Y	
7592	1643.5	989.1	2.7	2.2	106.9	0.0	79.1	79.1	8.0	Y	
7615	927.8	536.3	17.0	0.0	0.1	0.0	0.1	0.1	0.0	Y	
7658	1730.6	965.4	25.9	24.4	227.9	0.3	148.4	148.6	15.0	Y	
7659	2329.3	1183.6	8.2	211.9	182.8	0.1	135.3	135.3	11.4	Y	
7816	1503.0	859.1	15.2	31.6	39.3	1.2	29.1	30.3	3.5	Y	
7855	775.1	421.2	6.6	20.8	22.1	0.0	16.4	16.4	3.8	Y	
7964	840.7	489.6	0.0	23.8	53.7	0.0	39.8	39.8	8.1	Y	
8027	1157.8	687.9	11.7	13.3	84.9	0.0	62.9	62.9	9.0	Y	
8324	549.6	308.3	6.3	11.8	5.0	0.0	2.2	2.2	0.7	Y	
8351	1118.9	663.8	0.2	11.7		0.0	0.0	0.0	0.0	Y	
8820	2776.5	1646.2	32.1	18.9	200.4	0.0	122.5	122.5	7.3		
8895	7116.0	4127.6	86.0	49.0	470.3	14.2	247.5	261.7	6.2		
8926	1777.6	1013.0	18.0	20.2	142.4	7.5	92.0	99.5	9.6		
9183	3176.2	1830.8	20.4	23.5	189.3	1.0	111.6	112.7	6.1		
9226	4099.4	2350.4	56.8	49.9	438.2	8.9	266.0	274.9	11.4		

TABLE 2 ECA values for 2009, all watersheds (concluded)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
9228	2904.0	1638.2	46.2	37.2	150.7	1.0	101.4	102.3	6.1		
9296	2212.6	1242.0	43.6	70.6	332.8	0.2	193.1	193.2	15.0		
9467	1615.7	936.0	5.2	21.8	55.7	2.8	25.2	28.0	3.0		
9494	1067.3	602.9	20.5	32.4	92.2	0.4	60.5	60.9	9.8		
9560	2917.7	1680.7	33.3	33.4	563.4	11.1	352.4	363.4	21.1		
9604	8718.2	4909.5	136.8	104.7	1622.0	40.9	858.2	899.2	17.7		
9676	1753.6	952.5	33.9	14.3	239.9	6.7	160.2	166.9	16.8		
9685	1098.3	646.3	9.9	13.3	25.3	3.3	18.2	21.5	3.3		
9693	2749.8	1586.9	12.2	35.7	445.8	6.7	297.4	304.1	18.9		
9704	2941.6	1569.4	205.3	3.2	248.6	16.1	78.6	94.7	5.3		
9726	1342.1	765.3	16.1	13.2	261.0	15.1	110.7	125.8	15.8		
9908	1674.6	961.9	14.3	3.1	269.4	14.2	100.8	114.9	11.6		
9964	3998.8	2343.6	67.2	42.6	659.3	4.2	436.7	440.8	18.3		
10003	1015.0	591.0	14.9	9.5	240.3	1.5	167.3	168.8	27.8		
10052	1675.3	910.2	77.8	1.3	190.4	15.0	68.6	83.6	8.3		
10264	1053.9	604.5	27.1	8.6	54.9	2.3	9.2	11.5	1.8		
10277	6491.6	3654.9	81.4	115.4	556.6	12.4	258.9	271.4	7.2		
10293	2700.7	1498.2	46.1	26.2	0.6	1.7	0.3	2.0	0.1		
10363	1279.5	735.1	1.2	4.2	9.7	3.8	4.8	8.6	1.2		
10388	1056.3	591.0	4.8	19.7	71.6	1.8	20.8	22.6	3.8		
10413	1436.3	765.7	21.9	35.8	9.1	0.0	4.5	4.5	0.6		
10440	1764.5	885.6	31.8	68.7	133.0	3.2	49.2	52.3	5.7		
10725	1772.4	955.3	27.5	4.3	159.2	0.0	117.8	117.8	12.0		
10773	1249.7	736.7	0.4	0.1	85.5	0.0	62.9	62.9	8.5	Y	
Total	649159.9	363250.2	18343.7	7547.5	59472.1	801.9	34105.5	34907.4	9.1		

TABLE 3 ECA values for 2019, all watersheds

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
0	6232.6	3225.4	433.2	55.7	569.2	19.0	183.6	202.6	5.5		
1	22421.3	12452.0	726.3	325.5	3394.5	0.9	1906.9	1907.9	14.5	Y	
9	4588.7	2655.0	49.8	24.4	673.9	15.6	310.5	326.1	12.0		
15	1219.4	686.2	20.2	27.7		0.0	0.0	0.0	0.0		
27	1638.7	853.3	169.2	19.8	8.2	0.0	3.2	3.2	0.3		
31	3256.0	1619.1	222.9	138.1	116.4	0.0	73.7	73.7	4.0		
33	8343.6	3465.8	1274.8	166.5	504.1	0.0	186.2	186.2	3.9		
45	1464.3	954.3	1.1	1.6	233.5	2.1	107.7	109.8	11.5		
49	1648.5	940.6	57.7	6.8		0.0	0.0	0.0	0.0		
64	1856.2	975.4	123.6	15.7	148.8	0.0	50.5	50.5	4.6		
68	4523.8	2126.4	423.1	103.8	246.7	2.0	126.4	128.4	5.0		
73	2377.4	1254.9	72.4	45.9	75.1	6.9	21.1	28.0	2.1		
101	1196.5	649.7	35.4	15.4	42.1	7.9	11.7	19.6	2.8		
106	2525.9	1235.5	266.1	47.3	81.2	0.0	26.7	26.7	1.8		
125	4233.7	2239.8	168.2	79.1	911.6	4.7	361.1	365.7	15.2		
127	1815.3	881.6	175.7	31.3	319.2	0.0	114.8	114.8	10.9		
128	2694.9	1484.8	48.0	3.2	185.2	13.0	119.2	132.1	8.5		
145	2900.7	1630.1	109.0	3.1	515.8	0.0	226.3	226.3	13.0		
147	5533.0	3220.5	73.9	18.3	364.0	3.0	165.4	168.4	5.1		
155	1157.5	680.1	9.4	0.0	178.9	2.7	47.8	50.5	7.3		
157	2016.3	1107.2	42.3	6.6	285.9	3.9	113.0	116.9	10.1		
181	1262.8	643.8	146.7	7.9	141.6	0.0	12.9	12.9	1.6		
231	2264.8	1080.0	260.6	49.0	90.5	0.0	41.7	41.7	3.1		
268	1915.0	1076.1	39.5	22.3		0.0	0.0	0.0	0.0		
299	1140.5	668.5	6.6	9.5	198.5	0.0	41.4	41.4	6.1		
320	4920.3	2645.8	242.4	39.1	636.3	0.0	300.8	300.8	10.4		
332	1753.9	859.2	178.8	34.0	217.0	0.0	101.5	101.5	9.8		
336	1626.3	952.9	12.5	8.1	249.9	0.0	147.7	147.7	15.3		
351	16974.7	9544.2	324.0	246.7	1158.6	6.1	601.3	607.3	6.2		
377	1392.4	654.9	146.8	19.3	138.3	0.0	102.3	102.3	12.8		
397	3391.1	1855.6	44.8	52.9	523.7	0.0	236.4	236.4	12.4	Y	
406	920.4	493.4	25.7	27.4	230.7	0.0	138.1	138.1	26.6	Y	
409	1653.9	932.5	15.0	42.3	140.5	0.0	63.7	63.7	6.7		
411	3082.8	1852.3	10.1	16.7	46.2	0.2	7.1	7.3	0.4		
438	872.3	506.4	31.6	9.9	45.3	0.0	21.7	21.7	4.0	Y	
440	3025.5	1749.9	53.5	29.5	96.3	0.0	43.7	43.7	2.4		
445	1582.8	942.8	10.3	11.7	28.2	3.2	19.3	22.5	2.4		
447	1316.7	1064.2	78.4	173.0	108.9	1.1	53.1	54.2	4.7		
457	2303.4	1284.6	64.3	19.0	385.6	0.2	207.0	207.2	15.4		

TABLE 3 ECA values for 2019, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
461	1907.6	1128.2	33.4	20.9	457.1	0.0	217.5	217.5	18.7	Y	
462	539.9	312.9	0.5	6.9	181.6	0.0	106.3	106.3	33.9	Y	
468	1687.7	933.9	18.0	50.8	17.0	0.9	11.2	12.0	1.3		
472	679.6	374.8	20.1	12.5	115.6	0.0	58.4	58.4	14.8	Y	
475	1389.3	799.4	39.2	10.1	301.0	0.7	173.8	174.4	20.8		
478	2789.5	1603.9	68.9	24.2	136.0	6.8	49.0	55.8	3.3		
480	1002.4	548.4	27.6	8.3	75.8	2.4	37.6	40.0	6.9	Y	
498	752.5	405.8	20.7	20.7	91.8	0.0	58.5	58.5	13.7	Y	
515	535.3	330.3	3.6	6.6	108.8	0.2	76.7	76.9	23.0	Y	
527	510.0	303.3	13.5	5.1	21.8	0.4	4.6	5.1	1.6	Y	
533	1277.4	754.5	8.1	4.7	322.2	1.1	227.2	228.2	29.9	Y	
534	1384.8	763.4	29.1	28.0	117.9	0.6	71.8	72.4	9.1	Y	
536	1035.0	593.7	27.1	0.0	112.6	0.0	58.9	58.9	9.5		
539	2962.6	1764.4	30.7	8.0	857.6	0.0	620.3	620.3	34.6	Y	
565	1569.5	906.3	11.4	7.4	118.5	0.0	54.4	54.4	5.9		
583	753.4	442.0	1.8	1.5	219.1	0.0	159.1	159.1	35.9	Y	***
586	1035.9	569.3	20.2	22.0	254.2	0.0	188.1	188.1	31.9	Y	
595	1408.5	838.4	9.0	31.9	418.0	0.0	307.9	307.9	36.3	Y	***
643	3480.9	2027.7	62.8	24.6	411.6	0.0	155.8	155.8	7.5		
645	1302.1	779.0	14.5	3.1	333.9	0.0	172.5	172.5	21.7		
646	2629.6	1477.7	26.9	68.5	256.5	1.9	87.4	89.3	5.9		
656	1092.1	629.2	8.1	11.4	256.7	0.3	133.5	133.7	21.0		
670	661.6	388.1	13.9	27.7	193.9	0.4	140.4	140.9	35.0	Y	***
696	1048.5	540.9	7.6	24.6	7.2	0.0	5.2	5.2	0.9	Y	
697	1538.6	900.6	31.3	8.0	87.1	1.5	17.5	19.0	2.0		
727	2041.0	1204.1	4.9	10.1	428.1	5.9	237.3	243.2	20.0		
729	2088.3	1229.4	7.9	29.7	351.0	0.0	215.2	215.2	17.4		
769	1548.7	856.2	46.2	37.5	234.7	2.7	39.3	42.0	4.6		
771	1286.8	691.6	30.3	48.2	152.2	1.8	36.7	38.6	5.3		
807	639.7	341.7	30.9	9.4	21.1	0.0	12.6	12.6	3.4	Y	
817	3974.2	2292.4	26.6	41.9	362.9	0.0	266.9	266.9	11.5		
827	4927.2	2799.4	60.6	34.9	274.1	13.7	129.9	143.5	5.0		
855	1227.0	682.1	35.1	7.6	49.1	0.0	21.2	21.2	3.0	Y	
913	605.3	354.0	15.3	6.0	13.8	2.2	6.5	8.7	2.3	Y	
915	2003.4	1078.1	86.8	36.2	121.9	9.0	79.5	88.5	7.5	Y	
965	1669.3	981.1	18.8	8.5	94.1	0.3	68.4	68.8	6.9	Y	
1035	5187.9	2979.7	102.4	21.8	707.1	16.4	407.7	424.1	13.7	Y	
1101	695.2	364.0	42.1	6.5	6.3	0.0	4.7	4.7	1.2	Y	
1120	882.0	491.7	26.6	10.6	122.3	4.1	89.5	93.6	17.9	Y	

TABLE 3 ECA values for 2019, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
1137	1450.8	788.8	53.2	31.1	48.5	8.0	35.3	43.3	5.1	Y	
1261	1187.8	636.9	51.1	31.7	19.7	3.3	14.6	17.9	2.6	Y	
1289	566.7	297.4	30.1	7.1	42.0	0.0	31.1	31.1	9.5	Y	
1310	579.6	309.2	24.4	14.1		0.0	0.0	0.0	0.0	Y	
1320	882.2	530.8	13.9	12.9	18.7	0.0	13.8	13.8	2.5	Y	
1378	2165.2	1295.5	19.3	23.0	555.3	2.0	389.1	391.2	29.7	Y	
1426	527.6	310.8	8.9	0.0	124.9	0.0	58.1	58.1	18.2	Y	
1466	1164.6	712.1	0.2	7.2	362.4	0.0	256.1	256.1	36.0	Y	***
1496	622.9	365.0	4.1	8.1	149.6	0.0	109.8	109.8	29.7	Y	
1500	808.1	461.3	8.4	25.2	204.3	0.0	150.1	150.1	32.0	Y	
1563	5782.2	3369.7	39.2	40.4	771.8	23.4	325.9	349.3	10.2	Y	
1589	1267.4	736.4	3.2	13.7	268.9	0.0	147.3	147.3	19.9	Y	
1692	1298.3	794.2	2.4	0.9	369.4	0.0	109.6	109.6	13.8	Y	
1704	769.8	443.6	10.5	2.4	151.3	1.4	91.2	92.6	20.3	Y	
1775	617.4	364.7	3.3	5.0	182.3	0.0	86.9	86.9	23.6	Y	
1846	1369.7	786.1	4.4	19.0	294.2	14.3	57.3	71.6	8.9	Y	
1863	877.3	509.7	4.0	12.4	212.7	0.0	39.4	39.4	7.7	Y	
1938	1145.1	684.8	0.5	4.3	92.8	0.0	14.1	14.1	2.1	Y	
1943	835.5	498.2	0.2	0.0	95.5	0.0	27.2	27.2	5.5	Y	
2057	609.4	369.6	0.0	0.0	60.9	1.5	12.5	13.9	3.8	Y	
2237	8883.0	4077.5	1037.0	183.7	400.8	0.8	289.2	290.0	5.7		
2256	2172.8	1224.7	102.3	35.6	17.1	0.0	1.6	1.6	0.1		
2260	1188.4	599.5	49.7	42.9		0.6	0.0	0.6	0.1		
2270	2490.9	1271.1	190.6	21.3	57.6	0.0	7.3	7.3	0.5		
2296	3682.1	1648.1	530.6	53.7	371.2	0.0	190.8	190.8	8.8		
2299	2061.3	1100.5	107.4	60.2	418.5	0.0	43.8	43.8	3.6		
2316	2961.9	1576.9	178.9	43.3	337.8	0.0	173.5	173.5	9.9		
2357	1104.3	437.3	143.5	0.4	13.6	0.0	1.0	1.0	0.2		
2371	1591.4	707.2	213.9	3.6		0.0	0.0	0.0	0.0		
2380	26574.0	15515.4	349.0	163.3	2607.2	23.0	1281.4	1304.5	8.2	Y	
2382	29849.6	16051.6	1295.7	378.2	2724.6	18.8	1427.6	1446.4	8.3	Y	
2402	2754.5	1145.5	358.9	163.2	66.2	0.0	4.7	4.7	0.3		
2439	1161.1	625.8	55.4	13.3	11.4	3.5	2.8	6.3	0.9		
2514	1013.8	526.1	87.7	0.0	182.6	0.0	115.3	115.3	18.8		
2525	1687.1	945.3	25.6	8.1	21.2	7.9	5.3	13.2	1.3		
2555	1980.4	1078.2	74.4	24.7	95.5	4.6	25.5	30.1	2.6		
2561	9870.9	5516.6	252.9	70.9	448.5	23.1	242.3	265.4	4.6		
2596	1571.6	761.5	132.0	30.4	91.0	0.0	67.3	67.3	7.5		
2652	2164.6	1102.2	112.6	40.2	78.2	9.9	14.9	24.7	2.0		

TABLE 3 ECA values for 2019, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
2670	1565.4	920.6	98.8	8.6	316.3	0.0	233.6	233.6	22.9		
2684	1707.7	1052.1	69.4	1.6	301.5	3.1	198.1	201.1	17.9		
2693	1147.6	677.3	20.7	0.0	137.5	8.5	69.5	78.1	11.0		
2720	1237.1	712.8	59.5	11.5	198.6	0.0	146.1	146.1	18.9		
2723	1485.6	818.3	48.9	11.0	70.9	0.0	22.6	22.6	2.6		
2769	2366.8	1321.1	37.9	50.0	480.4	6.4	261.9	268.3	19.7		
2772	1545.8	897.5	37.4	22.3	404.7	0.0	252.4	252.4	27.0		
2781	1047.8	569.8	60.7	22.9	30.7	0.0	6.6	6.6	1.0		
2793	2398.6	1392.1	38.4	3.7	100.2	0.0	18.3	18.3	1.3		
2796	2432.2	1431.6	27.2	28.4	241.5	0.0	47.8	47.8	3.3		
2799	1611.4	915.0	35.5	11.0	43.9	4.1	8.1	12.2	1.3		
2810	6089.1	3448.1	96.1	49.4	1076.3	13.0	510.7	523.8	14.7		
2825	3842.4	2188.2	94.8	25.8	110.6	5.7	69.4	75.2	3.3		
2858	4323.2	2410.0	91.8	18.8	197.7	1.9	132.3	134.2	5.4		
2942	1102.1	592.7	46.2	0.0	82.9	1.3	51.4	52.7	8.2		
2946	1826.3	1040.6	2.4	16.0	97.9	5.8	15.3	21.1	2.0		
3031	1892.1	1060.9	56.8	16.4	164.9	0.0	90.2	90.2	8.1		
3118	2790.9	1556.3	65.8	19.0	10.1	3.9	7.3	11.2	0.7		
3135	1139.5	678.4	9.5	1.1	323.5	1.4	136.9	138.3	20.1		
3259	1092.8	639.1	6.0	0.1	81.4	0.1	45.4	45.5	7.0		
3287	1374.3	675.0	149.6	0.9	3.3	2.9	2.4	5.3	0.6		
3295	1924.3	1133.8	2.8	5.3	164.9	2.7	92.7	95.4	8.4		
3369	2041.6	1184.8	19.1	9.6	282.5	4.6	148.6	153.1	12.7		
3388	1049.2	652.6	3.0	1.1	64.1	1.4	32.4	33.9	5.2		
3473	2205.0	1331.6	4.6	2.6	454.5	0.0	159.9	159.9	12.0		
3508	3727.2	2179.5	36.3	41.7	268.5	11.2	110.8	122.0	5.5		
3513	1144.3	617.7	20.6	23.3	214.7	1.0	134.1	135.1	21.1		
3523	1186.2	633.3	24.5	69.8	13.4	1.6	0.2	1.8	0.3		
3535	2920.8	1651.3	51.9	65.7	363.0	1.1	259.7	260.9	15.3		
3542	2447.0	1428.0	20.7	1.3	195.5	0.0	126.0	126.0	8.7		
3551	3338.5	2029.0	6.1	21.3	120.1	8.1	82.2	90.3	4.4		
3650	1138.3	649.4	3.3	4.5	52.4	7.1	22.3	29.4	4.5		
3701	1691.7	1037.7	9.8	0.5	397.9	7.2	158.2	165.4	15.7		
3734	4033.8	2357.0	30.1	64.2	377.8	9.2	161.4	170.6	7.1		
3746	1364.6	735.9	21.3	21.7	80.2	0.0	48.7	48.7	6.4		
3858	1363.7	793.3	16.8	6.2	220.0	0.0	154.1	154.1	19.0		
3890	1441.3	838.5	30.7	9.5	70.9	1.1	46.2	47.3	5.4		
3937	4188.9	2405.6	40.1	18.4	381.5	0.0	215.3	215.3	8.8	Y	
3957	3532.9	2020.1	69.5	48.7	473.0	0.5	300.0	300.5	14.4	Y	

TABLE 3 ECA values for 2019, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
3972	1998.8	1107.6	10.4	13.3	204.1	2.6	90.6	93.1	8.3		
4042	513.6	316.0	1.5	1.1	76.3	0.0	32.7	32.7	10.3	Y	
4098	862.6	479.2	7.4	17.9	13.9	0.5	7.7	8.2	1.7	Y	
4108	1454.9	786.8	18.0	12.0	254.6	1.6	75.2	76.8	9.5	Y	
4111	17481.1	9921.6	312.2	316.1	2662.2	31.1	1230.6	1261.8	12.3	Y	
4117	2819.7	1699.8	17.3	2.7	377.5	0.0	247.7	247.7	14.4	Y	
4120	1377.2	823.1	4.4	17.0	113.6	0.0	33.7	33.7	4.1	Y	
4174	511.7	282.9	1.5	7.1		0.0	0.0	0.0	0.0	Y	
4186	579.8	325.1	1.6	8.8	45.4	0.0	29.7	29.7	9.1	Y	
4203	706.9	412.0	2.0	0.7	100.2	0.0	45.8	45.8	11.1	Y	
4237	588.6	357.0	3.0	0.5	50.8	0.0	20.8	20.8	5.8	Y	
4257	620.0	350.6	5.8	5.3	92.4	0.0	52.6	52.6	14.8	Y	
4265	526.1	291.5	13.5	13.7	13.1	0.0	5.4	5.4	1.8	Y	
4311	1285.0	763.2	22.7	2.6	72.4	0.2	27.8	28.0	3.6	Y	
4316	1062.0	625.8	12.9	1.9	67.9	0.0	35.8	35.8	5.6	Y	
4318	907.6	536.4	8.4	2.6	30.2	0.0	20.2	20.2	3.7	Y	
4319	614.1	352.6	3.0	0.0	123.2	0.0	86.8	86.8	24.4	Y	
4374	1365.5	779.6	48.5	23.4	37.9	0.0	19.4	19.4	2.3	Y	
4378	4146.9	2262.7	215.0	31.4	136.7	8.5	22.5	30.9	1.2	Y	
4382	1024.7	621.9	8.3	1.0	167.1	0.0	116.2	116.2	18.4	Y	
4414	2903.2	1649.8	68.7	42.6	239.1	0.0	102.6	102.6	6.0	Y	
4484	875.3	500.9	23.3	0.8	59.6	0.0	44.1	44.1	8.4	Y	
4492	1878.1	1104.8	11.7	19.1	143.8	0.0	57.0	57.0	5.1	Y	
4502	1372.7	749.8	25.8	16.5	136.2	0.0	57.1	57.2	7.4	Y	
4509	2370.6	1382.0	8.0	21.8	456.0	5.5	237.8	243.3	17.4	Y	
4539	986.4	545.6	40.9	11.2	37.9	0.0	17.2	17.2	2.9	Y	
4557	1661.3	901.0	95.0	10.6	16.4	0.0	6.8	6.8	0.7	Y	
4687	542.7	313.6	12.2	0.0	78.2	0.0	53.3	53.3	16.4	Y	
4702	508.5	300.7	5.0	6.2		3.5	0.0	3.5	1.1	Y	
4743	1468.3	795.1	61.7	6.1	96.1	2.6	14.1	16.7	1.9	Y	
4773	1353.6	783.2	25.7	11.4	25.6	0.5	6.2	6.7	0.8	Y	
4776	811.5	462.5	28.3	2.7	86.3	0.0	40.4	40.4	8.2	Y	
4826	1063.2	632.3	10.0	0.3	175.9	4.1	50.7	54.8	8.5	Y	
4846	681.8	386.9	21.7	1.1	113.2	0.6	31.3	31.9	7.8	Y	
4864	729.7	385.2	34.6	14.8	14.3	0.0	8.8	8.8	2.1	Y	
4868	1177.8	628.4	46.6	32.8	158.0	0.0	67.8	67.8	10.0	Y	
4877	1079.0	641.3	9.5	2.1	232.4	0.7	51.9	52.6	8.1	Y	
4908	1778.0	1033.7	34.9	0.2	267.2	3.6	63.0	66.6	6.2	Y	
4909	716.5	403.9	23.2	0.0	81.4	0.0	23.8	23.8	5.6	Y	

TABLE 3 ECA values for 2019, all watersheds (continued)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
4955	959.7	542.1	27.6	10.3	156.8	0.1	61.3	61.4	10.8	Y	
4995	814.2	352.4	31.9	46.0	149.1	0.2	88.4	88.6	23.0	Y	
5006	9710.2	5608.3	144.0	33.6	997.1	6.0	579.9	585.9	10.2	Y	
5060	677.3	409.8	0.0	0.0	11.1	0.7	2.9	3.5	0.9	Y	
5087	707.7	384.2	15.5	26.0	104.0	0.0	39.9	39.9	10.0	Y	
5099	974.1	593.4	33.8	1.7	42.0	0.1	20.1	20.2	3.2	Y	
5123	641.8	356.3	30.3	1.4	161.9	3.6	62.7	66.4	17.0	Y	
5125	1882.4	1095.3	20.8	0.0	480.2	6.4	261.6	268.0	23.9	Y	
5197	7033.0	3979.3	134.9	3.8	517.9	16.2	225.6	241.9	5.9	Y	
5227	803.7	476.2	17.6	6.7	1.1	0.2	0.2	0.4	0.1	Y	
5274	1159.3	611.6	8.9	49.6	14.3	0.0	3.7	3.7	0.6	Y	
5340	1062.3	622.5	10.1	12.9	115.9	5.4	41.2	46.6	7.3	Y	
5382	797.0	409.8	2.3	8.2	33.0	3.5	8.5	12.0	2.9	Y	
5392	1594.9	897.8	59.3	11.4	147.8	0.5	38.6	39.1	4.1	Y	
5397	798.5	417.1	5.9	54.8	29.2	0.4	8.4	8.8	2.1	Y	
5578	723.8	432.8	2.2	0.0	110.7	2.6	74.9	77.5	17.7	Y	
5599	625.7	344.0	20.5	0.0	86.9	1.5	58.0	59.5	16.3	Y	
5642	1303.8	791.6	7.0	0.8	151.8	9.4	26.3	35.7	4.4	Y	
5654	1713.3	973.3	28.2	12.1	204.2	0.2	122.7	122.8	12.3	Y	
5676	1176.4	666.8	8.3	31.9	88.9	5.9	29.9	35.8	5.3	Y	
5703	539.9	305.1	12.8	3.0	50.9	6.2	3.2	9.4	2.9	Y	
5729	1451.2	847.1	9.7	24.5	282.0	1.0	96.3	97.3	11.3	Y	
5783	743.6	429.8	2.3	0.0	123.5	3.8	71.8	75.6	17.3	Y	
5803	609.3	363.3	10.9	3.5	61.5	1.5	19.4	20.9	5.6	Y	
5844	790.6	458.1	13.4	0.4	61.5	4.2	8.9	13.1	2.8	Y	
5907	1465.9	879.7	2.9	8.9	180.9	1.0	37.2	38.2	4.3	Y	
6006	905.6	510.1	7.7	0.0	54.8	1.3	9.7	11.0	2.1	Y	
6181	1002.3	589.6	6.6	0.0	161.6	0.3	71.0	71.3	11.9	Y	
6182	547.1	344.0	8.3	0.0	5.9	0.8	4.3	5.2	1.5	Y	
6306	606.0	362.9	0.0	0.0	66.3	0.0	37.4	37.4	10.3	Y	
6397	2128.2	1220.4	41.4	0.4	219.5	4.1	46.7	50.8	4.0	Y	
6408	2202.0	1312.0	13.2	21.6	295.4	1.0	80.1	81.1	6.1	Y	
6432	519.7	279.9	4.6	14.6	34.2	0.0	14.8	14.8	5.2	Y	
6482	671.3	349.5	17.0	12.8	52.3	4.9	20.6	25.5	6.9	Y	
6483	7311.3	4216.5	121.9	59.4	350.4	9.8	183.1	192.9	4.4	Y	
6524	750.3	503.6	6.5	13.1	131.4	1.2	93.3	94.5	18.5	Y	
6558	828.5	498.1	11.3	0.0	83.8	1.3	6.3	7.6	1.5	Y	
6632	1304.0	744.8	23.3	0.0	124.6	0.0	54.4	54.4	7.1	Y	
6637	521.1	287.4	6.5	0.0		0.0	0.0	0.0	0.0	Y	

TABLE 3 ECA values for 2019, all watersheds (concluded)

Area Above H60 line (ha)											
Watershed ID	All Watershed Area (ha)	Forested (including harvested areas)	Non-Forest Vegetated	Non-Vegetated	Harvested	Roads	ECA Area (Harvested)	Overall ECA Area (Harvested + Road)	ECA %	Bull Trout?	Area of Concern
6674	2847.5	1642.9	39.9	11.9	401.3	1.3	184.0	185.3	11.0	Y	
6703	545.1	317.0	0.5	5.9	16.7	1.1	11.1	12.1	3.8	Y	
6751	553.9	355.1	10.8	0.0	33.4	0.0	2.6	2.6	0.7	Y	
6803	530.9	321.6	3.8	0.0	10.4	2.4	0.8	3.2	1.0	Y	
6806	3415.7	2055.1	25.9	6.4	98.7	0.0	52.1	52.1	2.5	Y	
6819	1126.9	672.5	18.9	0.0	7.8	0.0	1.7	1.7	0.2	Y	
6833	528.1	324.3	3.4	0.0	43.7	0.0	29.5	29.5	9.0	Y	
6865	541.8	324.3	1.8	0.0	162.1	0.0	30.4	30.4	9.3	Y	
6979	557.5	313.7	1.5	0.8	26.9	0.0	19.4	19.4	6.2	Y	
7092	704.8	350.8	24.6	22.3	10.1	0.2	7.5	7.7	2.0	Y	
7157	718.4	388.2	14.5	2.6	33.1	1.8	5.1	6.9	1.7	Y	
7179	1116.3	656.1	10.0	4.8	108.6	0.0	34.8	34.8	5.2	Y	
7214	604.8	354.9	19.1	5.2	2.0	0.0	1.0	1.0	0.3	Y	
7216	1015.5	520.7	76.5	7.1	14.9	0.0	11.0	11.0	1.8	Y	
7218	737.3	435.6	11.7	0.2	24.4	0.0	17.6	17.6	3.9	Y	
7232	1581.5	957.5	13.7	0.0	333.3	0.0	240.3	240.3	24.7	Y	
7259	841.7	473.7	26.7	0.8	107.2	0.1	11.9	12.0	2.4	Y	
7262	592.8	335.9	14.3	0.0	113.8	0.0	10.3	10.3	3.0	Y	
7420	1013.8	592.2	22.1	9.7	124.7	0.0	86.0	86.0	14.0	Y	
7443	582.7	321.8	4.0	4.0	154.8	0.0	79.5	79.5	24.4	Y	
7509	846.4	487.2	9.8	10.8	10.0	0.0	6.2	6.2	1.3	Y	
7532	1721.2	981.9	13.2	35.5	180.3	0.0	107.3	107.3	10.8	Y	
7555	531.3	304.8	6.9	0.3	12.7	0.0	1.4	1.4	0.5	Y	
7576	588.2	305.5	29.2	4.3	32.4	0.0	22.9	22.9	6.9	Y	
7592	1643.5	989.1	2.7	2.2	190.0	0.0	130.4	130.4	13.2	Y	
7615	927.8	536.3	17.0	0.0	267.9	0.0	176.6	176.6	31.9	Y	
7658	1730.6	965.4	25.9	24.4	331.1	0.3	176.6	176.9	17.8	Y	
7659	2329.3	1183.6	8.2	211.9	182.8	0.1	113.1	113.1	9.5	Y	
7816	1503.0	859.1	15.2	31.6	218.5	1.2	154.1	155.3	17.7	Y	
7855	775.1	421.2	6.6	20.8	22.1	0.0	13.7	13.7	3.2	Y	
7964	840.7	489.6	0.0	23.8	53.7	0.0	38.5	38.5	7.9	Y	
8027	1157.8	687.9	11.7	13.3	99.5	0.0	54.0	54.0	7.7	Y	
8324	549.6	308.3	6.3	11.8	6.6	0.0	4.6	4.6	1.5	Y	
8351	1118.9	663.8	0.2	11.7	35.6	0.0	26.4	26.4	4.0	Y	
8820	2776.5	1646.2	32.1	18.9	230.1	0.0	60.7	60.7	3.6		
8895	7116.0	4127.6	86.0	49.0	941.1	14.2	567.4	581.7	13.8		
8926	1777.6	1013.0	18.0	20.2	135.4	7.5	24.0	31.5	3.0		
9183	3176.2	1830.8	20.4	23.5	74.1	1.0	7.1	8.1	0.4		
9226	4099.4	2350.4	56.8	49.9	393.6	8.9	67.0	75.9	3.1		

TABLE 3 ECA values for 2019, all watersheds (concluded)

Area Above H60 line (ha)											
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9228	2904.0	1638.2	46.2	37.2	182.7	1.0	82.8	83.8	5.0		
9296	2212.6	1242.0	43.6	70.6	130.4	0.2	70.2	70.3	5.5		
9467	1615.7	936.0	5.2	21.8	73.3	2.8	47.1	49.9	5.3		
9494	1067.3	602.9	20.5	32.4	129.2	0.4	54.0	54.4	8.7		
9560	2917.7	1680.7	33.3	33.4	449.7	11.1	115.8	126.9	7.4		
9604	8718.2	4909.5	136.8	104.7	1734.5	40.9	899.6	940.5	18.5		
9676	1753.6	952.5	33.9	14.3	243.7	6.7	65.1	71.7	7.2		
9685	1098.3	646.3	9.9	13.3	28.0	3.3	13.7	17.0	2.6		
9693	2749.8	1586.9	12.2	35.7	353.5	6.7	150.4	157.1	9.8		
9704	2941.6	1569.4	205.3	3.2	385.1	16.1	252.6	268.7	15.0		
9726	1342.1	765.3	16.1	13.2	276.2	15.1	174.4	189.5	23.8		
9908	1674.6	961.9	14.3	3.1	242.6	14.2	169.8	184.0	18.6		
9964	3998.8	2343.6	67.2	42.6	511.1	4.2	147.6	151.8	6.3		
10003	1015.0	591.0	14.9	9.5	190.0	1.5	64.5	66.0	10.9		
10052	1675.3	910.2	77.8	1.3	159.6	15.0	115.7	130.7	13.0		
10264	1053.9	604.5	27.1	8.6	1.8	2.3	0.5	2.8	0.4		
10277	6491.6	3654.9	81.4	115.4	1055.2	12.4	702.4	714.8	19.1		
10293	2700.7	1498.2	46.1	26.2	272.1	1.7	201.3	203.1	13.1		
10363	1279.5	735.1	1.2	4.2	134.4	3.8	92.5	96.2	13.0		
10388	1056.3	591.0	4.8	19.7	71.3	1.8	37.8	39.6	6.6		
10413	1436.3	765.7	21.9	35.8	24.3	0.0	11.4	11.4	1.4		
10440	1764.5	885.6	31.8	68.7	227.2	3.2	164.0	167.1	18.2		
10725	1772.4	955.3	27.5	4.3	159.2	0.0	112.2	112.2	11.4		
10773	1249.7	736.7	0.4	0.1	84.4	0.0	18.6	18.6	2.5	Y	
Total	**649159.9**	**363250.2**	**18343.7**	**7547.5**	**67707.2**	**801.9**	**33648.9**	**34450.7**	**9.0**		