Local Level Indicators of Sustainable Forest Management for the Foothills Model Forest

INITIAL STATUS REPORT

foothills
model *forest*
a growing understanding

A C K N O W L E D G M E N T S

To obtain further information about publications referenced in this report, please contact the Foothills Model Forest at (780) 865-8330, by email at: **Fran.Hanington@gov.ab.ca** or by visiting the website, **www.fmf.ab.ca**. Information that supports this report may be available from Foothills Model Forest partner organizations.

FOOTHILLS MODEL FOREST
LOCAL-LEVEL INDICATORS PROJECT

The Foothills Model Forest is located in west-central Alberta and covers an area of approximately 2.75 million hectares. It is part of the Canadian Model Forest Network, funded and administered by Natural Resources Canada (Canadian Forest Service) with additional cash and in-kind contributions provided by program partners.

The Foothills Model Forest and its partners have developed region-specific, or local-level, indicators to measure performance against six criteria of sustainable forest management set out by the Canadian Council of Forest Ministers.

The project was undertaken to provide information on the state of the forest and on forestland uses. When viewed in conjunction with a local set of goals and the national criteria, this information will enable Albertans to make informed decisions about our forestlands.

This document provides initial benchmark reporting on a "starter" set of 39 indicators, including data collected up to and during the year 2000. More indicators will likely be reported upon in the future.

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The Foothills Model Forest

The Foothills Model Forest (FMF) in west-central Alberta, covers an area of approximately 2.75 million hectares. Included in the land base are: Weldwood of Canada Limited's Forest Management Agreement area, Jasper National Park of Canada, Willmore Wilderness Park and other provincial land holdings. The region spans several ecological zones including Lower Foothills and Upper Foothills, Montane, Sub-alpine and Alpine.

The Foothills Model Forest is one of 11 Model Forests that make up Canada's Model Forest Network. A Model Forest is a working model to demonstrate and promote the implementation of sustainable forest management. The Network is funded and administered by Natural Resources Canada (Canadian Forest Service) with other cash and in-kind contributions provided by program partners.

Forest Regions of Canada
- Boreal - Predominantly Forest
- Boreal - Forest and Grassland
- Boreal - Forest and Barren
- Great Lakes - St. Lawrence
- Montane
- Coast
- Columbia
- Deciduous
- Subalpine
- Acadian
- Grassland
- Tundra

1 McGregor Model Forest
2 Foothills Model Forest
3 Prince Albert Model Forest
4 Manitoba Model Forest
5 Lake Abitibi Model Forest
6 Eastern Ontario Model Forest
7 Waswanipi Model Forest
8 Bas-Saint-Laurent Model Forest
9 Fundy Model Forest
10 Nova Model Forest
11 Western Newfoundland Model Forest

Forestry Centres and Headquarters of the Canadian Forest Service
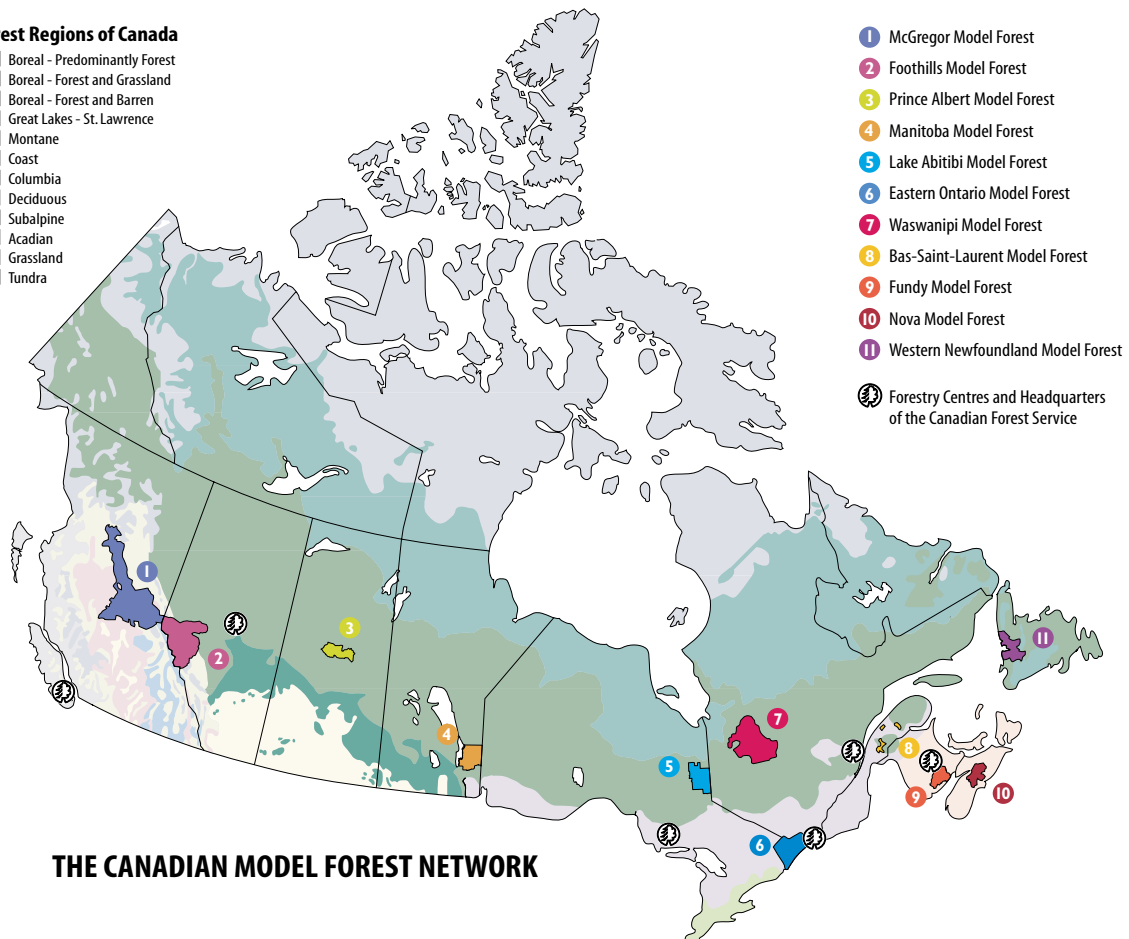
THE CANADIAN MODEL FOREST NETWORK

The Foothills Model Forest has four principal sponsors, which have made a five-year financial commitment to the organization. Three of the sponsors - Weldwood of Canada Limited (Hinton Division), Alberta Sustainable Resource Development and Jasper National Park of Canada (Parks Canada) - have land or resource management responsibility within the Foothills Model Forest land base. The Canadian Forest Service is the fourth sponsor.

The Foothills Model Forest is based in the town of Hinton, a resource-based community of approximately 10,000 people, 285 kilometres west of Edmonton and 85 kilometres east of Jasper.

**FOOTHILLS MODEL
FOREST
LAND BASE**

Legend
- Protected Areas
- Weldwood FMA
- Alberta Crown Units
- Highways
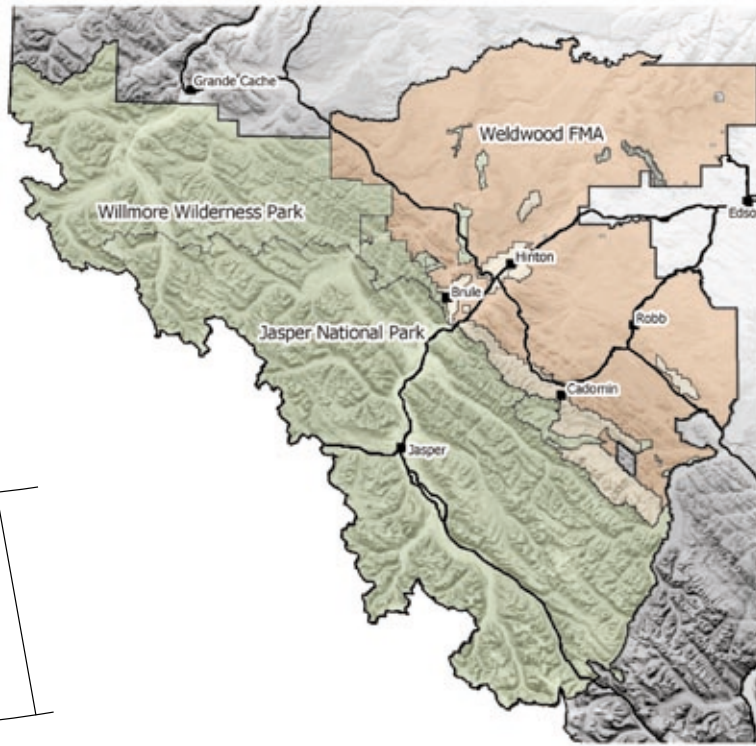
Local-level Indicators for Sustainable Forest Management - Initial Status Report

One of the commitments of Canada's Model Forest Network is to develop a working set of local-level indicators that will guide measurement of the results of human activity in the forest. This document reports these measurements for the Foothills Model Forest. Future reports will update results so trends can be identified and assessed.

Sustainable Forest Management

"Our goal is to maintain and enhance the long-term health of our forest ecosystems, for the benefit of all living things both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations."

Canada Forest Accord, May 1, 1998

The Montreal Process

In September, 1993, the Conference on Security and Cooperation in Europe (CSCE) sponsored an international seminar in Montreal on the sustainable development of boreal and temperate forests. The focus was on developing criteria and indicators for the assessment of these forests. Canada reports on the Montreal Process to the international community through the Canadian Council of Forest Ministers (CCFM) framework of criteria and indicators of sustainable forest management.

Montreal Process, Year 2000 Progress Report

How is progress measured?

Progress towards sustainable forest management is measured against a series of yardsticks of varying detail and complexity. These yardsticks include Criteria, which broadly outline those conditions considered essential to sustainability. Goals summarize, more specifically, what is to be achieved under the Criteria. And Indicators identify the individual factors to be measured. Goals and indicators identified by the Foothills Model Forest reflect local needs and conditions, but they are also consistent with Canada's national framework of sustainable forest management criteria.

Criteria: *The criteria identified in the Montreal Process are the essential components of the sustainable management of forests. They include vital functions and attributes, socio-economic benefits, and the laws and regulations that constitute the forest policy framework.*

Montreal Process, Year 2000 Progress Report

Goal: *A broad statement describing a desired state or condition. Goals are mandated by legislation and-or agreed to through a process of stakeholder input and participation.*

Foothills Model Forest LLI Project Team

Indicators: *The Montreal Process indicators provide ways to assess or describe a criterion. Many indicators are quantitative, whereas others are qualitative or descriptive. All indicators provide information about the present conditions of forests and their use and, over time, will establish the direction of change in these variables.*

Montreal Process, Year 2000 Progress Report

Practical application of Indicators

Indicators are conditions and activities that can be measured to provide objective insight into the state of the forest. Two types of indicators exist: *activity* indicators and *state* indicators. Activity indicators provide a measure of the degree to which certain activities have taken place. Such indicators are often relatively easy to measure, and provide *indirect* assessments of progress towards environmental management goals. For example, the number of people attending an open house provides an indirect measure of public participation in decision-making. State indicators, however, are *direct* measurements of some environmental, economic, or social condition of interest. Population density of caribou and volume of wood available are examples of state indicators. Indicators ideally are integrative, in that they are able to measure performance against more than one goal.

Criteria and indicators are tools for characterizing the state of forests and for providing information on how forest lands and uses are changing. By comparing these changes against Goals, those with an interest in sustainable forest management can make informed decisions.

Process

The Canadian Council of Forest Ministers identified six national criteria of sustainable forest management. These criteria are conditions, which Canada believes must exist for sustainable forest management to become reality. For the criteria to be effective, they must be adopted by land and resource managers, and adapted to local conditions.

The Foothills Model Forest accepted the task of measuring these national criteria, and began by identifying local goals and indicators that would support the intent of Canada's broad commitment to sustainable development.

Partners with major forest resource management responsibilities in the Foothills Model Forest worked with stakeholders, including members of the public, to develop their own individual goals for sustainable forest management. They then collaborated with each other to identify shared goals for sustainable forest management. The Board of Directors of the Foothills Model Forest reviewed the resulting set of shared goals, and ultimately endorsed them as reflective of Board members' values and priorities.

The next requirement was for a set of indicators that would measure performance against these goals. An initial set of indicators was developed with input from many Foothills Model Forest partners, and was reviewed by technical specialists representing the agencies with primary responsibility for forest management within the Foothills Model Forest. This "reality check" allowed those involved to develop categories for those indicators that can reported upon now, and those that will be reported upon later.

A Partnership

The Foothills Model Forest land base is considerable, and the major land and resource management partners - the Alberta Government, industry, and Parks Canada - have different management priorities. Despite these differences, the partners agree on a wide range of priorities and goals.

One of the strengths of the Foothills Model Forest - the ability to build cooperative partnerships has been especially important in agreeing upon goals and indicators for this project. Working with a multi-jurisdictional group of partners requires innovation and risk. Being able to refer to common goals and indicators is good news for ecological and social environments, and cost-effective. The Local Level Indicators for Sustainable Forest Management Initial Status Report has drawn upon a partnership of over 40 organizations, the principal sponsors, and the Foothills Model Forest Board of Directors and Executive Committee.

Role of the Foothills Model Forest

The Foothills Model Forest has no land or resource management mandate. It is an organization designed to support research that serves all its partners. Data for this project were for the most part, collected by agencies with land and resource management responsibilities.

The Data

The Foothills Model Forest can now assemble and present some of the scientific data to allow for measurement for most of the chosen indicators. Data for others will be available in the future.

The intent of this report is to repeat the monitoring and measuring over time, to reflect changes and trends as they occur.

You are now invited to take a look at the six national criteria and the goals of sustainable forest management shared by the Foothills Model Forest partners.

The Six National Canadian Council of Forest Ministers (CCFM) Criteria

   I.   Conservation of biological diversity

   II.   Maintenance and enhancement of forest ecosystem condition and productivity

   III.   Conservation of soil and water resources

   IV.   Forest ecosystem contributions to global ecological cycles

   V.   Multiple benefits to society

   VI.   Accepting society's responsibility for sustainable development

Summary of Goals and Indicators

Goals shared by all the Foothills Model Forest partners are listed below, according to the CCFM Criterion.

Indicators that currently can be reported are listed below each goal. Each listed indicator is considered to provide a measure of performance for that goal. Many of these indicators serve also as measures of other goals, as described in the subsequent text. It will be noted that no indicators are listed for some goals. As elaborated in the text, this may be because:

- the relevant indicators are reported against other goals;
- indicators have been identified, but data are currently unavailable; or
- further research is required to develop suitable indicators for the goal.

Criterion 1: Conservation of Biological Diversity

Goal 1.1 Maintain viable populations of all currently occurring native species
    Indicator 1.1.1 Caribou population status
    Indicator 1.1.2 Grizzly bear population status
    Indicator 1.1.3 Grizzly bear habitat effectiveness
    Indicator 1.1.4 Grizzly bear security area
    Indicator 1.1.5 Fish population status
    Indicator 1.1.6 Percentage of stream crossings meeting standards
    Indicator 1.1.7 Density of stream crossings

Goal 1.2 Maintain genetic diversity
    (see text)

Goal 1.3 protect rare ecological sites and special landscape features
    (see text)

Goal 1.4 Maintain natural diversity, pattern and stages of forest ecosystems over time
    Indicator 1.4.1 Makeup of forest by age class
    Indicator 1.4.2 Makeup of forest by size class
    Indicator 1.4.3 Density of roads by Forest Management Unit
    Indicator 1.4.4 Canceled road dispositions by Forest Management Unit

Criterion 2: Maintenance and Enhancement of Forest Ecosystem Condition and Productivity

Goal 2.1 Maintain the sustainable productive capacity of ecosystems
    Indicator 2.1.1 Percentage of harvest area satisfactorily restocked
    Indicator 2.1.2 Forest productivity (periodic timber volume increment)

Goal 2.2 Maintain natural ecological processes
    Indicator 2.2.1 Occurrence and severity of wildfire
    Indicator 2.2.2 Occurrence of insects and disease pathogens

Goal 2.3 Conserve the forest land base
    Indicator 2.3.1 Forest Area by protection status (International Union for the Conservation of Nature and Natural Resources (IUCN) designation)
    Indicator 2.3.2 Mining area by disposition
    Indicator 2.3.3 Oil and Gas area by disposition
    Indicator 2.3.4 Kilometres of seismic lines per year

Criterion 3: Conservation of Soil and Water Resources

Goal 3.1 Protect water quality
Indicator 3.1.1 Water temperatures, monitoring watersheds
Indicator 3.1.2 Application of best management practices

Goal 3.2 Conserve quantity and timing of water yields
(see text)

Goal 3.3 Conserve soil productivity
(see text)

Goal 3.4 Minimize erosion and soil losses resulting from human activities
Indicator 3.4.1 Alberta Soil Conservation Guidelines compliance

Goal 3.5 Conserve landforms
(see text)

Criterion 4: Forest Ecosystem Contributions to Global Ecological Cycles

Goal 4.1 Conserve air quality and maintain contributions of forests to carbon cycling
(see text)

Criterion 5: Multiple Benefits to Society

Goal 5.1 Sustainable use of biological resources
Indicator 5.1.1 Timber harvest relative to Annual Allowable Cut
Indicator 5.1.2 Trapping harvest
Indicator 5.1.3 Number of fishing licenses sold
Indicator 5.1.4 Hunting statistics
Indicator 5.1.5 Grazing: Stocking versus capacity

Goal 5.2 Opportunities for consumptive and non-consumptive use
Indicator 5.2.1 Recreation by reservation type

Goal 5.3 Develop new economic uses
(see text)

Goal 5.4 Maintain a competitive, profitable and sustainable local economy
Indicator 5.4.1 Population migration
Indicator 5.4.2 Economic diversity index

Goal 5.5 Contribute to the economic and social health of the region
Indicator 5.5.1 Regional employment statistics
Indicator 5.5.2 Employment by industry
Indicator 5.5.3 Regional income distribution
Indicator 5.5.4 Education in the region
Indicator 5.5.5 Regional real estate values
Indicator 5.5.6 Net regional product

Goal 5.6 Optimize benefits through integration of resource uses
(see text)

Goal 5.7 Minimize threats resulting from large-scale natural disturbances
(see text)

Local Level Indicators of Sustainable Forest Management for the Foothills Model Forest

Goal 6.1 Ensure key policy decisions are timely, fair, open and equitable
   (see text)

Goal 6.2 Ensure broad participation of interested parties in decision-making processes
   Indicator 6.2.1 Activities that allow interested parties to participate in decision-making activities

Goal 6.3 Conserve historical resources
   (see text)

Goal 6.4 Promote cooperation, partnership and shared responsibility for sustainable forest management
   Indicator 6.4.1 Activities demonstrating sustainable forest management participation

Goal 6.5 Communicate the concepts and benefits of sustainable forest management, and increase levels of education, knowledge and awareness
   Indicator 6.5.1 Activities demonstrating communications and education

Goal 6.6 Continual improvement of sustainable forest management practices
   (see text)

CRITERION 1

Conservation of Biological Diversity

The following is a summary of the four goals identified under this section, and the indicators chosen for measurement of performance against each goal.

GOAL 1.1 **Maintain viable populations of all currently occurring native species**

Indicator 1.1.1 Caribou population status

Indicator 1.1.2 Grizzly bear population status

Indicator 1.1.3 Grizzly bear habitat effectiveness

Indicator 1.1.4 Grizzly bear security area

Indicator 1.1.5 Fish population status

Indicator 1.1.6 Percentage of stream crossings meeting standards on Weldwood's Forest Management Area

Indicator 1.1.7 Density of stream crossings

GOAL 1.2 **Maintain genetic diversity**

(see text)

GOAL 1.3 **Protect rare ecological sites and special landscape features**

(see text)

GOAL 1.4 **Maintain natural diversity, pattern and stages of forest ecosystems over time**

Indicator 1.4.1 Makeup of forest by age class

Indicator 1.4.2 Makeup of forest by size class

Indicator 1.4.3 Density of roads by Forest Management Unit

Indicator 1.4.4 Canceled road dispositions by Forest Management Unit

GOAL 1.1
Maintain viable populations of all currently occurring native species

Measuring performance under Goal 1.1

The key measurable under this goal is population assessment. It would be impossible to develop detailed data for every species living within the Foothills Model Forest land base. Consequently, certain species have been selected for reporting here either because they are at risk, they are potentially useful indicators of general ecosystem condition, or they are of special economic or cultural value. A report entitled *The General Status of Alberta Wild Species 2000* (Alberta Sustainable Resource Development) explains the provincial and national system for assigning the status of species, and indicates that caribou are designated as "At Risk." In 2001, the ESCC recommended that grizzly bears be designated "threatened", or likely to become endangered if limiting factors are not reversed. Grizzly bears "may be at risk." This status applies to Alberta as a whole, and populations of the species within the Foothills Model Forest may be either better or worse off relative to those found elsewhere in the province.

Two elements of population assessment are population status and habitat supply.

1) Population Status

Numerous techniques are available for the assessment of population status and distribution. The methods employed by the Alberta Government are explained *The General Status of Alberta Wild Species 2000* (Alberta Sustainable Resource Development). The protocols usually involve evaluation of:

- abundance - based on estimate of number of breeding individuals;

- breeding distribution relative to abundance by and within natural regions; and,

- population trends - anticipated change in breeding population in coming years.

The following indicators can be reported upon at this time:

1.1.1 Caribou population status

1.1.2 Grizzly bear population status

1.1.5 Fish population status

2) Habitat Supply

Habitat supply is an element that has been studied on much of the Foothills Model Forest land base since 1956. The habitat requirements

of at least 35 terrestrial species have been assessed, and those of four native sports fish species are now being assessed. Habitat supply is not a definitive indicator of population maintenance, but it is often an important factor controlling population levels.

The indicators that can be reported upon are:

1.1.3   Grizzly bear habitat effectiveness

1.1.4   Size of grizzly bear security area

1.1.6   Percentage of stream crossings meeting standards on Weldwood's FMA

1.1.7   Density of stream crossings by watershed

1.4.3   Density of roads by Forest Management Unit

INDICATOR 1.1.1
Caribou population status

Woodland Caribou population status was selected as an indicator because of the species' designation as "Threatened" (*Alberta Wildlife Act,* Alberta Sustainable Resource Development). This status applies to Alberta as a whole, and populations of the species within the Foothills Model Forest may be either better or worse off relative to those found elsewhere in the province. In 2001, the Minister of Alberta Sustainable Resource Development designated the species as "threatened," or likely to become endangered if limiting factors are not reversed. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Woodland Caribou as "threatened" in western Canada in 2001.

Foothills Model Forest partners are active within the West Central Alberta Caribou Standing Committee. Caribou management zones have been established based on presence of caribou and their habitat. Within and beyond the Foothills Model Forest land base, the boundaries of these zones were developed using local knowledge, radio-telemetry data and aerial and ground-based survey data collected between 1979 and 1996. The two management zones monitored for this indicator contain the Little Smoky and A la Peche herds, whose ranges

extend beyond the Foothills Model Forest boundaries. To augment knowledge of caribou distribution, wildlife managers have instituted a system of sighting cards, which allow members of the public and employees of resource extraction companies to provide information on caribou sightings. The information is entered in a provincial Biodiversity Species Observation Database. Additional information is available from surveys conducted on other big game species.

The measure used for this indicator is population data for the Little Smoky and A la Peche herds, with data provided by Alberta Sustainable Resource Development.

Woodland caribou population estimates are difficult to obtain by helicopter surveys, because of the heavy forest cover that characterizes typical winter ranges. (Summer surveys are not meaningful due to the lack of snow and extensive distribution of animals). However, with the larger radio-collared samples that have been obtained in recent years, researchers have been able to develop population estimates with better numbers.

In Jasper National Park, the South Jasper herd is considered a sedentary mountain ecotype that remains within protected areas for the entire year. No interchange with the A La Peche herd to the north was documented during a three-year telemetry study from 1989 to 1992. Fall surveys conducted from 1993 to 2000 resulted in a minimum average count of 110 animals in this population, however recent aerial surveys suggest there may be fewer than 50 animals remaining. A current management issue concerns the potential increased impact of wolf predation on this herd, which may be facilitated by keeping the Maligne Lake road plowed during the winter. Estimates are as follows:

HERD	POPULATION ESTIMATE, 2001
Little Smoky	80
A La Peche	150

(Data compiled from SRD)

In addition to these estimates, adult female survival and calf/cow ratios provide indices for assessing population status (Table C1 and C2). The positive/negative differences between these two parameters are used to project population trajectories. Annual recruitment, for example, must replace annual mortality for populations to persist). Annual recruitment is the number of calves surviving their first year, or being successfully recruited into the population.

**FOOTHILLS MODEL FOREST
WOODLAND CARIBOU HOME RANGES**

Legend
MCP Home Ranges
☐ A La Peche, Summer
☐ A La Peche, Winter
☐ Jasper, Winter and Summer
☐ Little Smoky, Winter and Summer
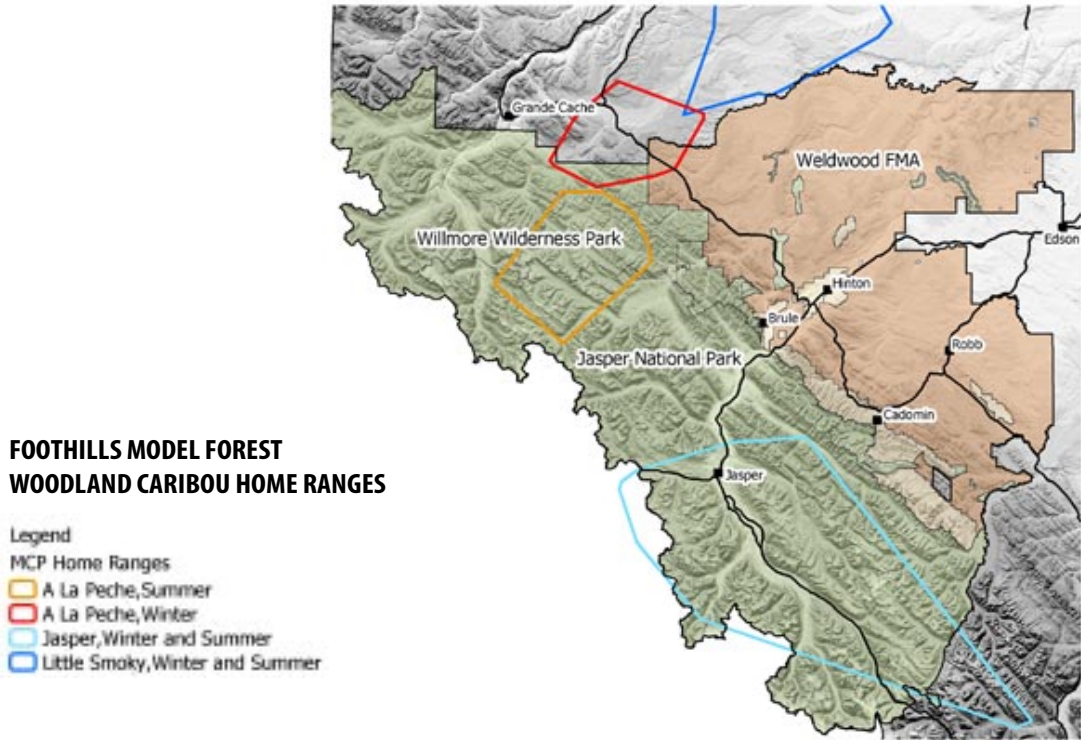
Map of minimum convex polygons with data for collared caribou from 1981-2000

Minimum Convex Polygon (MCP) - This kind of polygon is a shape representing the smallest possible area in which all sightings can be mapped.

Mean annual adult female survival for the A La Peche (ALP) and Little Smoky (LS) herds of woodland caribou

Herd	Percent survival (Mean)	Confidence Interval	Number of Animals In sample	Number of Years sampled	Dates
ALP	92.4	87.2-96.9	31	4	10/97-09/01
LS	87.3	75.9-96.6	18	2.6	03/99-09/01

Confidence Interval - likely upper and lower percent survival
(Data compiled from LSAS)

Mean calf-cow ratios, standard deviation, the number of surveys and years that ratios were obtained for the A La Peche (ALP) and Little Smoky (LS) of woodland caribou

Herd	Calves per 100 cows (mean)	Standard deviation	Number of Surveys	Years
ALP	27.6	1.16	8	1991 – 2000
LS	22.9	2.11	5	1982 - 2000

Standard deviation- an estimate of the variability in cow-calf ratio

(Data compiled from SRD)

INDICATOR 1.1.2
Grizzly bear population status

Grizzly bears are an important wildlife species from an ecological, economic and social standpoint.

The General Status of Alberta Wild Species 2000 (Alberta Sustainable Resource Development) explains the provincial and national system for assigning the status of species, and indicates that grizzly bears "may be at risk." This status applies to Alberta as a whole, and populations of the species within the Foothills Model Forest may be either better or worse off relative to those found elsewhere in the province.

The Foothills Model Forest Grizzly Bear Research Project is researching grizzly bear population trends and status over an area of approximately 9700 square kilometres in west-central Alberta. In 1999, 21 grizzly bears were captured and 19 radio-collared. In 2000, 24 grizzly bears were captured and 21 radio-collared. In 2001, 29 grizzly bears were captured and 23 radio-collared.

West-central Alberta provides approximately 69 percent of the current primary range available to grizzly bears in Alberta, and it is thought that this area supports approximately 68 percent of the estimated current resident provincial grizzly bear population (Management Plan for Grizzly Bears in Alberta, 1990).

Mortality figures for grizzly bears are not yet available for the complete Foothills Model Forest land base. The grizzly bear research program notes four legal kills since 1999. Jasper National Park of Canada recorded 12 human-caused grizzly bear deaths during the period 1987 to 2000. Data obtained through the Grizzly Bear Research Project is expected to yield more complete estimates of mortality over the broader land base. Additional project information is available from the Foothills Model Forest Grizzly Bear Research Project 2000 Annual Report.

The measure for this indicator is the estimated number and density of grizzly bears in the study area. The numbers that follow were provided by the Foothills Model Forest Grizzly Bear Research Project.

**FOOTHILLS MODEL FOREST
GRIZZLY BEAR RESEARCH PROJECT**

Legend
Grizzly Bear Project Area (2001)
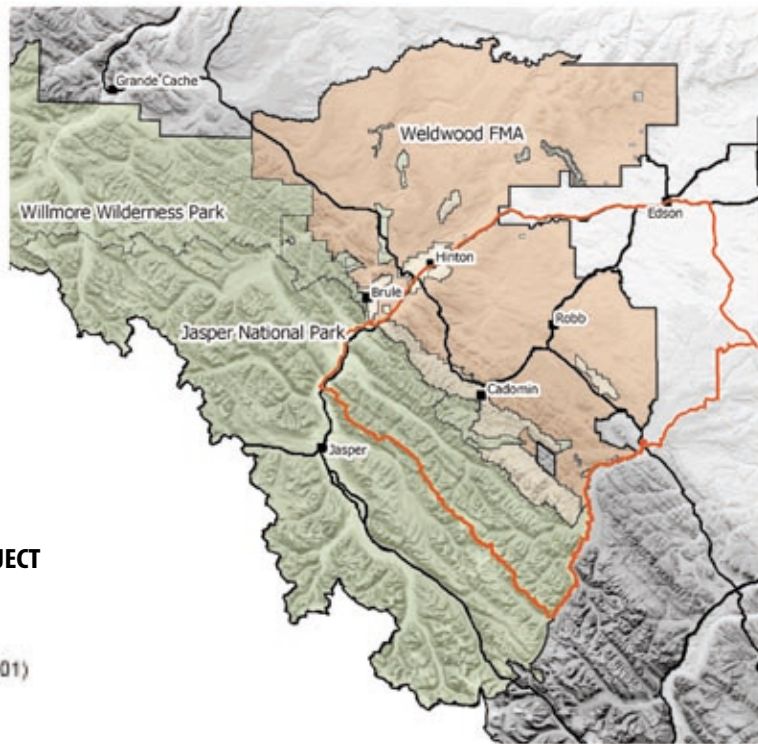
Grizzly bear population (estimate based on 1999 study)-
Mean estimate of 80 bears, with a confidence interval of 66-147 bears.

Population density based on most recent (1999) DNA hair snagging study:
14.9 grizzly bears per 1000 square kilometres.

INDICATOR 1.1.3
Grizzly bear habitat effectiveness

Research findings have found that current definition of habitat effectiveness (as determined through Cumulative Effective Assessment model output) is a poor predictor of grizzly bear use or density (Stenhouse et al. 2002). Researchers are now evaluating using Resource Selection Function models in place of the previous habitat effectiveness approach. Annual reviews of progress in this area are required to guide management actions.

**FOOTHILLS MODEL FOREST
BEAR MANAGEMENT UNITS**

Legend
Bear Management Units (2001)

FOOTHILLS MODEL FOREST
GRIZZLY BEAR HABITAT EFFECTIVENESS
BY BEAR MANAGEMENT UNIT

Legend
Grizzly Bear Habitat Effectiveness
- 0 – 50%
- 51 – 60%
- 61 – 70%
- 71 – 80%
- 81 – 90%
- 91 – 100%
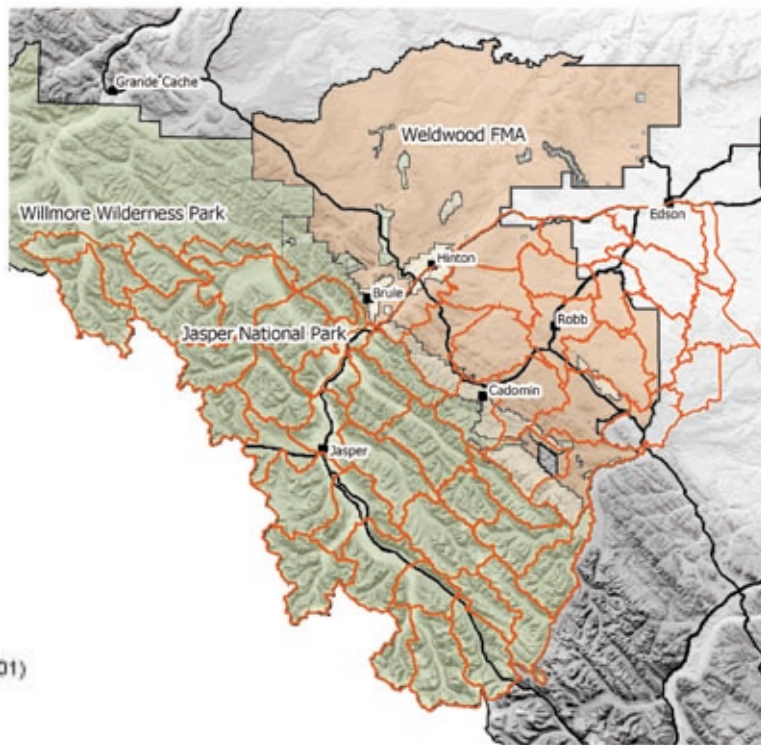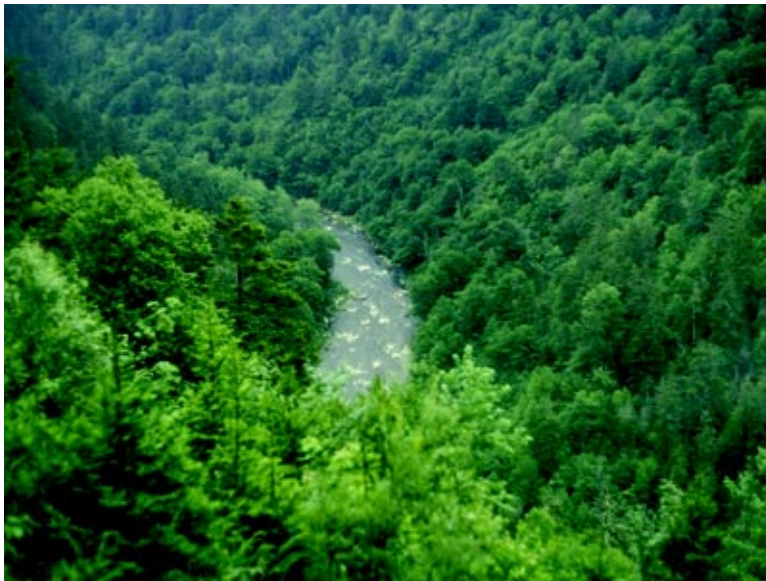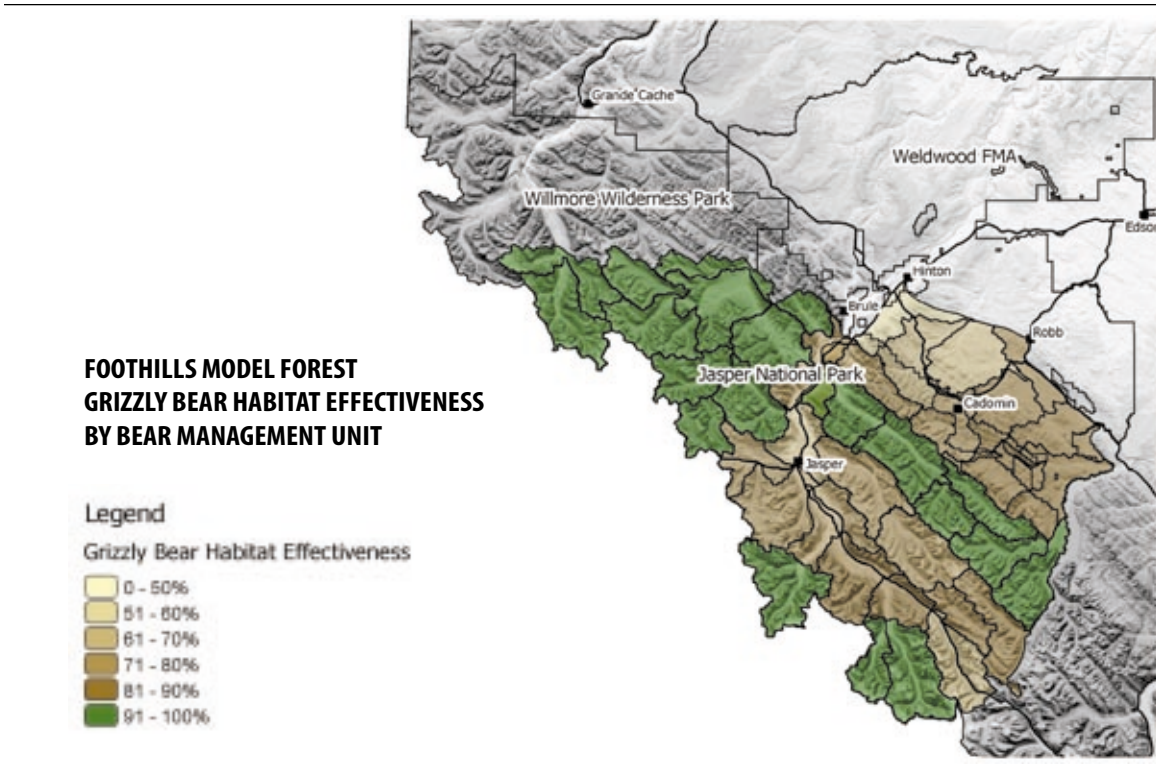
INDICATOR 1.1.4
Grizzly bear security area

A grizzly bear security area is an area where an adult female can feed for 24 to 48 hours secure from human disturbance. While there may be some human presence, it is not considered significant enough to disrupt the bear's activity pattern. The size of an individual security area is approximately nine square kilometres.

The measure for this indicator is the percentage of land within each bear management unit that would be considered a grizzly bear security area. Data were provided by Foothills Model Forest and Jasper National Park of Canada.

FOOTHILLS MODEL FOREST
GRIZZLY BEAR HABITAT SECURITY AREA

Legend
Grizzly Bear Security Use
- 0 - 50%
- 51 - 60%
- 61 - 70%
- 71 - 80%
- 81 - 90%
- 91 - 100%
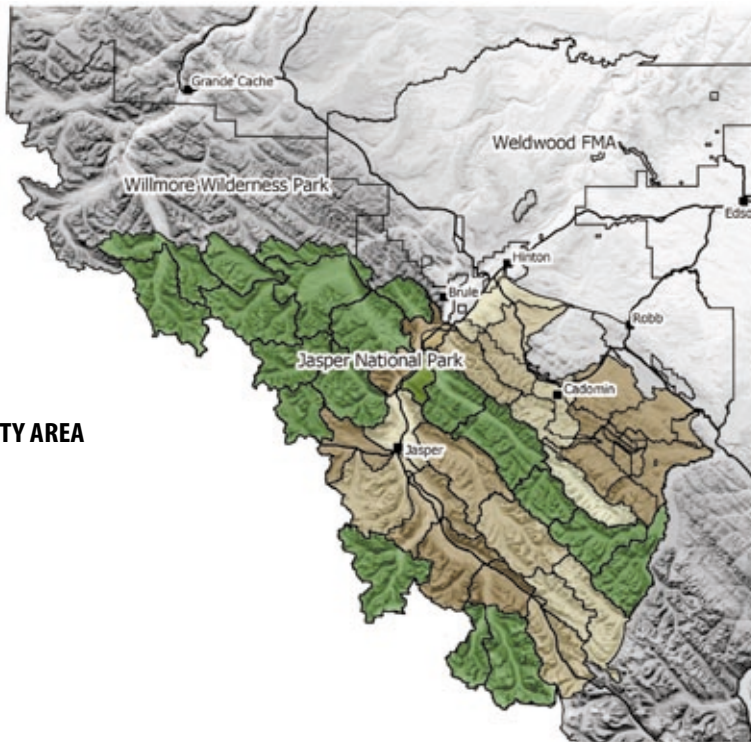
Grizzly Bear Research Project Security Area

BMU	Security Area Percent Use	BMU	Security Area Percent Use
Beaverdam	84.4	Lower Miette	81.1
Brazeau	88.5	Lower Snake Indian	99.9
Cardinal	87.8	Lower Snaring	99.0
Fiddle	68.0	Mid Athabasca	77.6
Gregg	61.7	Middle Snake Indian	98.3
Isaak	96.6	Moosehorn	100.0
Lower Rocky	93.8	North Brazeau	58.5
Maskuta	51.5	Poboktan	57.2
Medicine Tent	48.2	Rock Creek	99.9
Pembina	89.9	Short	98.0
Restless	99.5	Smoky	94.6
Southesk	99.0	Sunwapta/Athabasca	86.2
Upper Rocky	98.0	Tonquin	63.7
Whitehorse	57.4	Upper Athabasca	99.4
3-Valley Confluence	52.9	Upper Maligne	63.9
Athabasca Falls	80.6	Upper Miette	99.7
Blue Creek	98.3	Upper Snake Indian	97.9
Chaba	97.8	Upper Snaring	99.0
Lower Athabasca	83.4	Upper Sunwapta	69.6
Lower Maligne	73.8	Whirlpool	99.4

(Data compiled from the FMF)
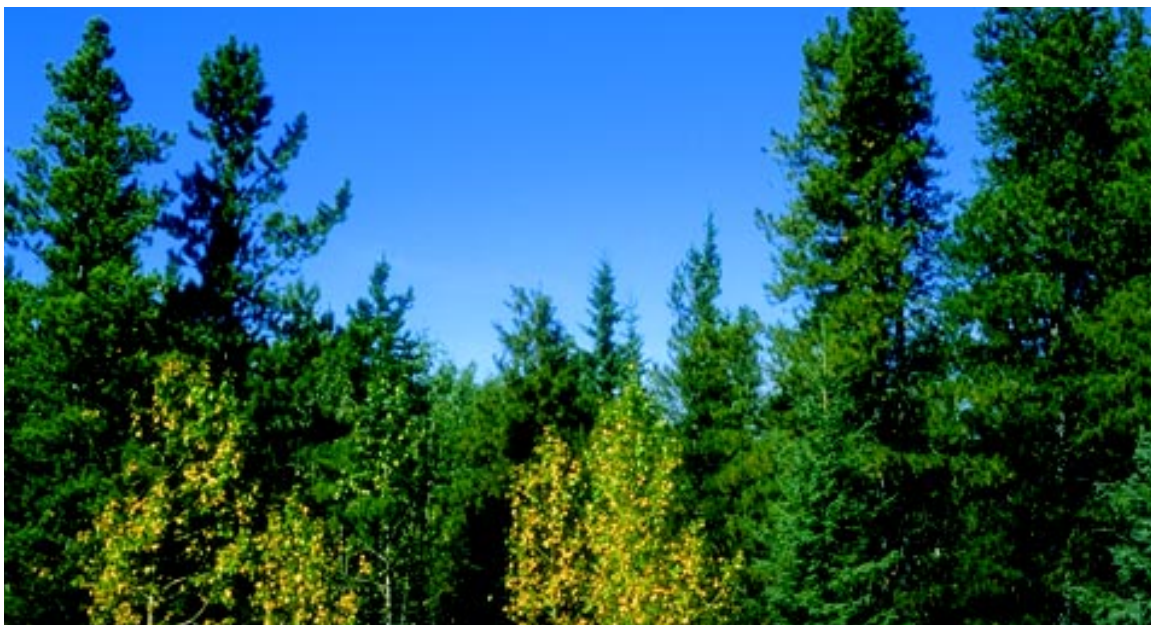
INDICATOR 1.1.5
Fish population status

The Foothills Model Forest has identified two indicators for fish population status. The first indicator is relative abundance of the native Athabasca rainbow trout at selected sites. The second indicator is the fish community composition at selected sites. The sites are located within a number of watersheds where monitoring studies have occurred. Data for these indicators are available from 1970.

These two indicators have high natural variation across the landscape, from season to season and from year to year. We also expect that the response to a natural or human caused change

will vary between species and also between life stages. For example, changes in water quality may elicit different responses from juvenile rainbow trout, adult rainbow trout and juvenile long nosed suckers. The low signal to noise ratio for these indicators presents a major challenge to their effective use. However, the ongoing human-use study and the channel classification project should indicate which techniques provide the best means for reducing the noise that results from the high natural variation. During 2002, the best techniques for calculating an effective relative abundance and community composition indicators should be finalized.

Population estimates are given with a confidence level of 95 percent.

**FOOTHILLS MODEL FOREST
MONITORING WATERSHEDS**
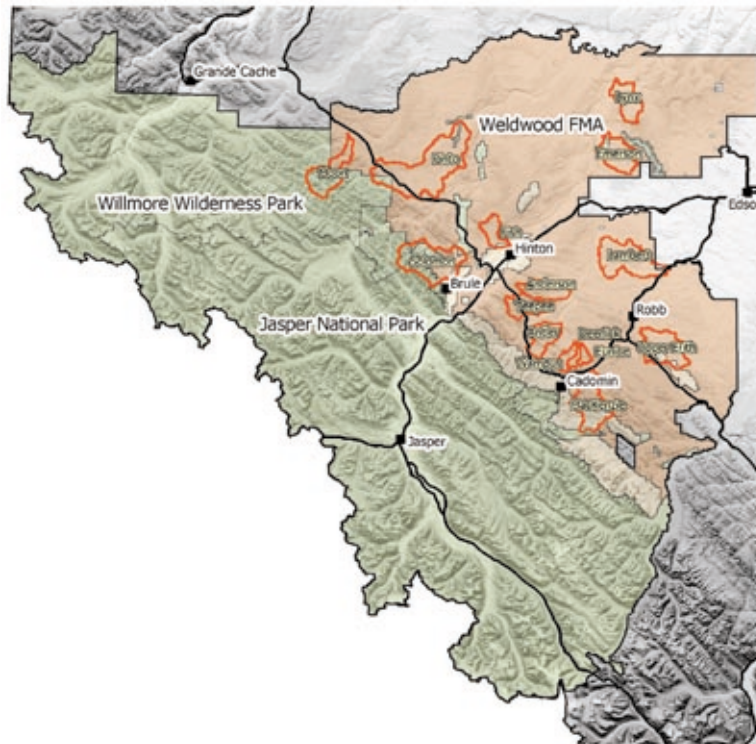
Legend
Monitoring watersheds

Population
Number of Rainbow Trout caught, per 0.1 hectare of water surface

Where data points are absent from the following graphs, data was unavailable for that species at that time.

Figure 1
Relative abundance of rainbow trout at Location ID 304, Anderson Creek, between 1996 and 2001.

(Data compiled from the FMF)
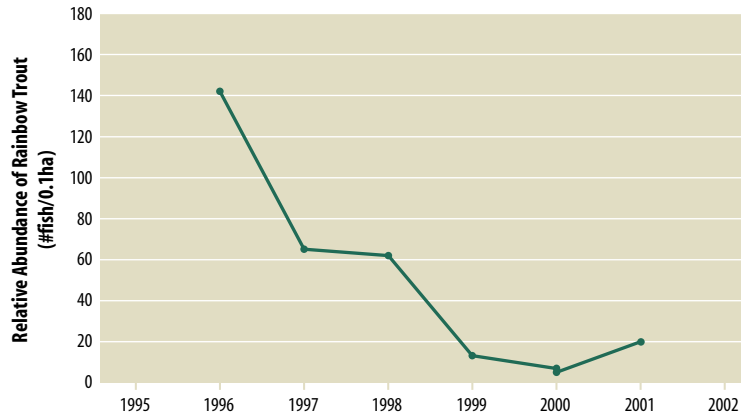
Figure 2
Relative abundance of rainbow trout at Location ID 336, Antler Creek, between 1996 and 2001.

(Data compiled from the FMF)
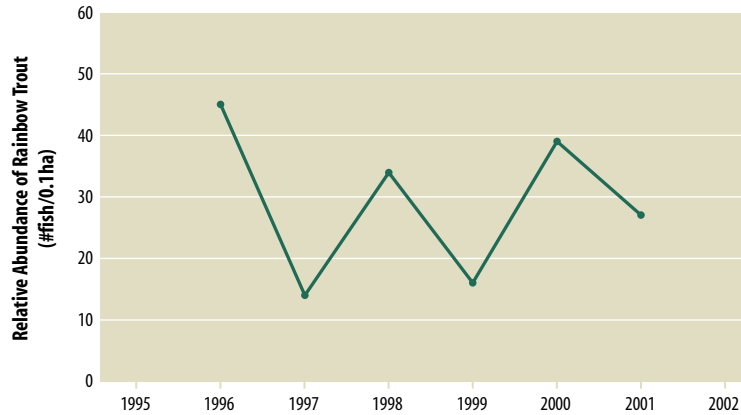
Figure 3
Relative abundance of rainbow trout at Location ID 363, Mary-Gregg Creek, between 1996 and 2001.
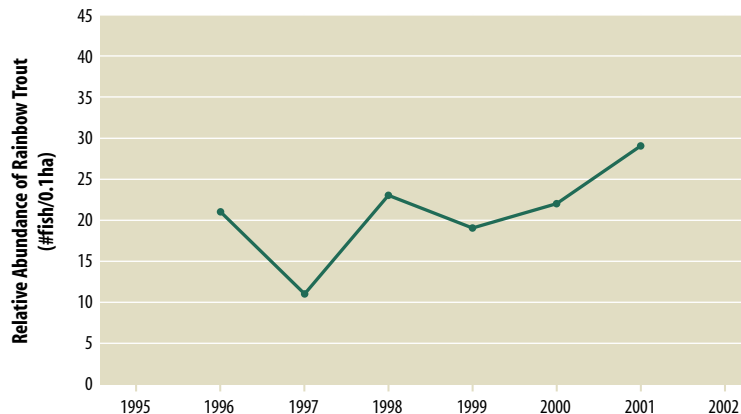
(Data compiled from the FMF)

Population
Number of Rainbow Trout caught, per 0.1 hectare of water surface

* Where data points are absent from the following graphs, data was unavailable for that species at that time.

Figure 4
Relative abundance of rainbow trout at Location ID 413, Upper Deerlick Creek, between 1970 and 2001.

(Data compiled from the FMF)
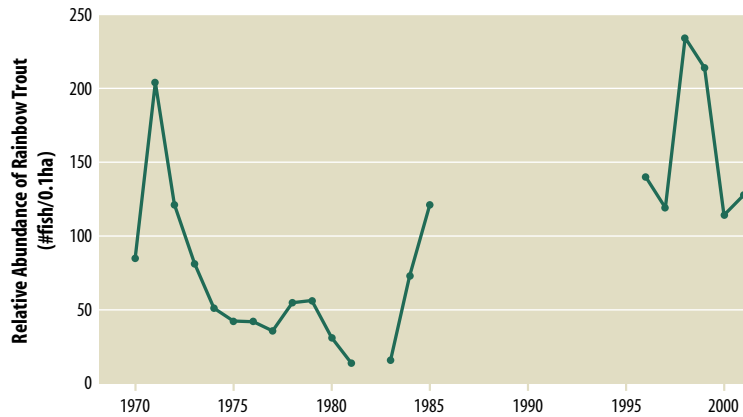
Figure 5
Relative abundance of rainbow trout at Location ID 418, Lower Deerlick Creek, between 1970 and 2001.

(Data compiled from the FMF)
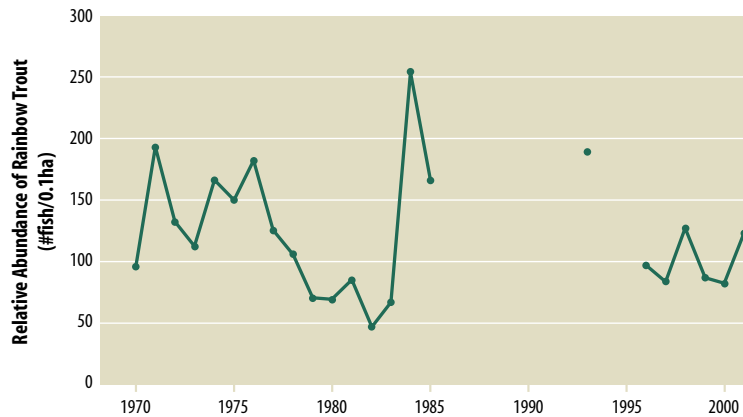
Figure 6
Relative abundance of rainbow trout at Location ID 350, Upper Wampus Creek, between 1970 and 2001.
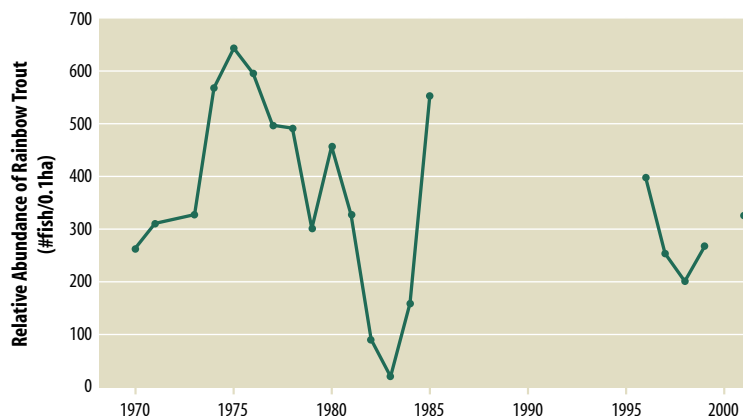
(Data compiled from the FMF)

Population
Number of Rainbow Trout caught, per 0.1 hectare of water surface

* Where data points are absent from the following graphs, data was unavailable for that species at that time.

Figure 7
Relative abundance of rainbow trout at Location ID 401, Lower Wampus Creek, between 1970 and 2001.

(Data compiled from the FMF)

figure 7
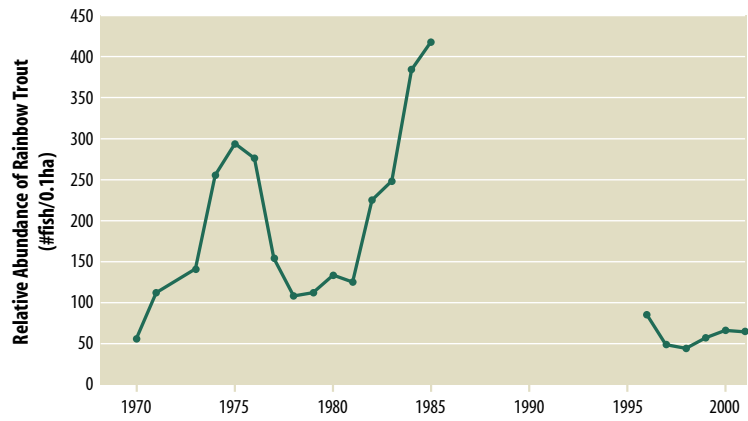
Distribution of species by site - year 2000

Legend	
Brook trout	BKTR
Bull trout	BLTR
Burbot	BURB
Mountain Whitefish	MNWH
Rainbow Trout	RNTR
Spoonhead Sculpin	SPSC

Figure 1
Fish community composition at Location ID 304, Anderson Creek on September 22, 2000.

(Data compiled from the FMF)
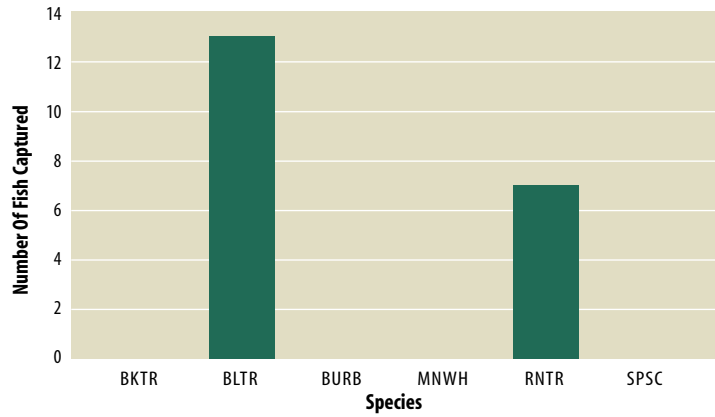
Figure 2
Fish community composition at Location ID 336, Antler Creek on September 21, 2000.

(Data compiled from the FMF)
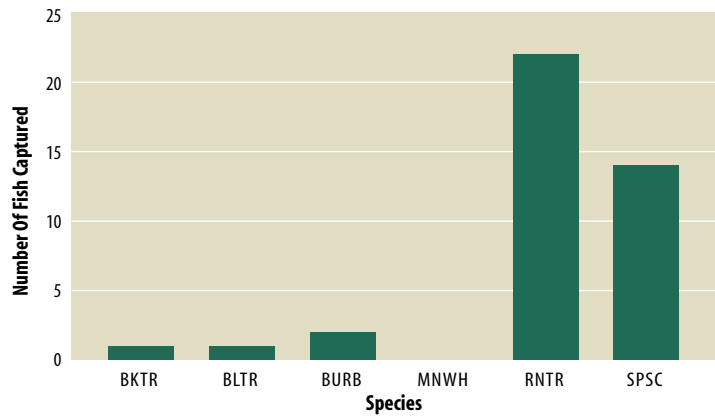
Figure 3
Fish community composition at Location ID 363, Mary-Gregg Creek on September 19, 2000.

(Data compiled from the FMF)
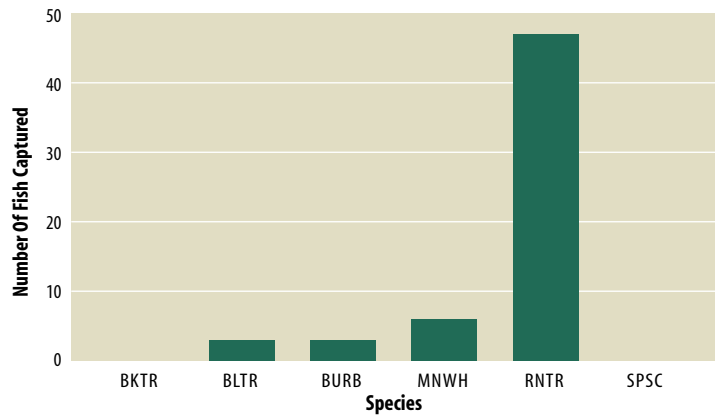
Distribution of species by site - year 2000

Legend	
Brook trout	BKTR
Bull trout	BLTR
Burbot	BURB
Mountain Whitefish	MNWH
Rainbow Trout	RNTR
Spoonhead Sculpin	SPSC

Figure 4
Fish community composition at Location ID 413, Upper Deerlick Creek on September 14, 2000.

(Data compiled from the FMF)
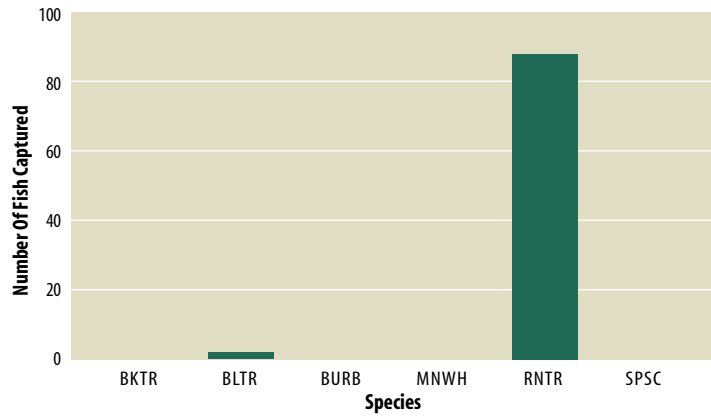
Figure 5
Fish community composition at Location ID 418, Lower Deerlick Creek on August 24, 2000.

(Data compiled from the FMF)
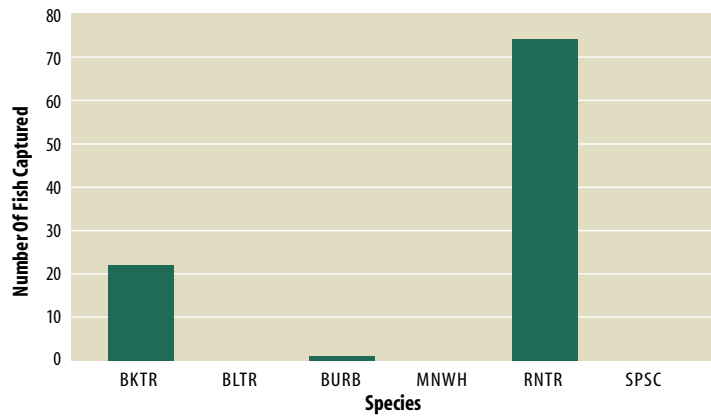
Figure 6
Fish community composition at Location ID 418, Lower Wampus Creek on September 15, 2000

(Data compiled from the FMF)
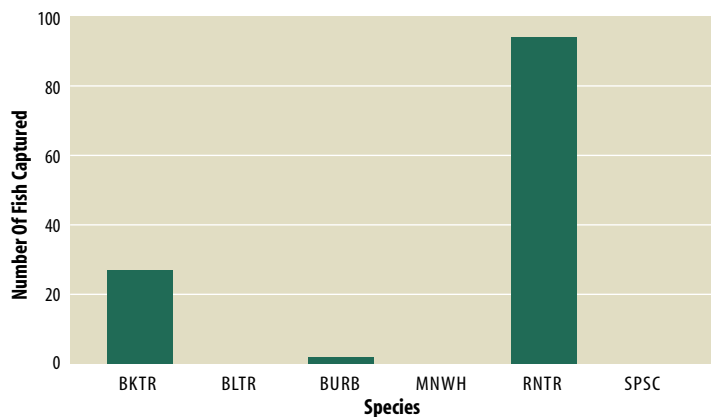
NDICATOR 1.1.6
Percentage of stream crossings meeting standards on Weldwood's Forest Management Area

This indicator measures the percentage of watercourse crossings on Weldwood of Canada's Forest Management Area (FMA). The construction and maintenance of these crossings (bridges, culverts, etc) can affect the ability of fish to move up or down stream, and can have a bearing on the conservation of biological diversity because barriers to fish movement can impact and fragment local fish populations.

The measure used for this indicator is the percentage of watercourse crossings that meet standards for fish passage on fish bearing streams on the Weldwood Forest Management Area. The fish passage standard used here is Weldwood's own standard, and incorporates legal requirements such as compliance with the Fisheries Act (Canada) and Water Act (Alberta). The standards are available on request. Whether or not a crossing impedes or blocks fish passage can be a subjective determination, but it is made by trained professionals. Factors such as species and size of fish, flow rates through a culvert, length of culvert, whether or not there are resting places within the culvert and depth of outlet pool are all considered.

The Weldwood Stream Crossing database documents the environmental performance of 1,169 stream crossings on the company's FMA. This total does not yet include all existing crossings of permanent streams on the FMA. A total of 635 stream crossings were inspected between May 1, 2000 and October 30, 2000. These include crossings owned by Weldwood (615) and other interests (oil and gas, government, and others (20).

Percentage of watercourse crossings that meet standards for fish passage on fish-bearing streams, Weldwood of Canada Forest Management Area

Year	1996	1997	1998	1999	2000
Percent meeting standards	92.7	95.0	92.6	95.4	96.5
Number inspected	444	648	533	526	635

Source: Weldwood of Canada, 2000 Sustainable Forest Management Stewardship Report

NDICATOR 1.1.7
Density of stream crossings

In addition to performance, the density of watercourse crossings is another factor that may influence populations of native fish species. While the Weldwood Stream Crossing database documents conditions on most of the industrial road crossings within the Weldwood land base, the density indicator will report on all watercourse crossings within the monitoring watersheds. As a result, the density indicator will also report on provincial highways, railways and roads managed by a variety of LOC holders.

To report on this indicator, all intersections between streams and roads or railways will first be identified using Global Information Systems (GIS). Next, all crossings will be visited in the field. Each crossing will be categorized as either bridge, culvert, removed or road de-activated. As per the Federal Fisheries Act, any culvert within a fish-bearing stream will be considered as a potential fish migration barrier, unless the responsible party has completed work to indicate otherwise. This field survey is planned for completion in 2002.

Densities were calculated from the number of crossings per square kilometer of watershed area.

Figure 1
Road-stream crossing frequency

Watershed	Area (km2)	GIS Order 3	SURVEY Order 3	GIS Order 4	SURVEY Order 4	GIS Order 5	SURVEY Order 5
Anderson	66.4	5	6	4	5	0	
Antler	73.3	0	0	2	2	0	0
Deerlick	15.1	2	1	0	0	0	0
Emerson	100.4	1	1	1	0	0	0
Eunice	48.1	2	1	0	0	0	0
Fish	177	1	1	0	0	0	0
Lambert	80.1	0	0	1	1	0	0
Lynx	139.8	2	4	1	4	0	0
Moon	110.8	0	0	0	0	0	0
Pinto	334.3	5	4	4	4	1	1
Solomon	192.5	1	2	0	0	0	0
Teepee	69.9	13	13	2	3	1	1
Upper Erith	128.4	5	9	2	7	0	0
Wampus	28.4	0	0	3	1	0	0

(Data compiled from the FMF)

Figure 2
Road-stream crossing densities
(number per square kilometre)

Watershed	Area (km2)	GIS Order 3	SURVEY Order 3	GIS Order 4	SURVEY Order 4	GIS Order 5	SURVEY Order 5
Anderson	66.4	0.08	0.09	0.06	0.08	0.00	0.00
Antler	73.3	0.00	0.00	0.03	0.03	0.00	0.00
Deerlick	15.1	0.13	0.07	0.00	0.00	0.00	0.00
Emerson	100.4	0.01	0.01	0.01	0.00	0.00	0.00
Eunice	48.1	0.04	0.02	0.00	0.00	0.00	0.00
Fish	177	0.01	0.01	0.00	0.00	0.00	0.00
Lambert	80.1	0.00	0.00	0.01	0.01	0.00	0.00
Lynx	139.8	0.01	0.03	0.01	0.03	0.00	0.00
Moon	110.8	0.00	0.00	0.00	0.00	0.00	0.00
Pinto	334.3	0.01	0.01	0.01	0.01	0.00	0.00
Solomon	192.5	0.01	0.01	0.00	0.00	0.00	0.00
Teepee	69.9	0.19	0.19	0.03	0.04	0.01	0.01
Upper Erith	128.4	0.04	0.07	0.02	0.05	0.00	0.00
Wampus	28.4	0.00	0.00	0.11	0.04	0.00	0.00

(Data compiled from the FMF)

GOAL 1.2
Maintain genetic diversity

Measuring performance under Goal 1.2

Genetic diversity is the variation of genes within a species. Direct physiological measurement of genetic variability (i.e. DNA analysis) has to date been the subject of occasional research only. The Foothills Model Forest has supported such research on lodgepole pine, the tree species subject to most harvesting and reforestation on the land base. The research, conducted by the University of Alberta, found no significant differences in the genetic diversity of young stands established after harvest and that of the mature fire-origin stands.
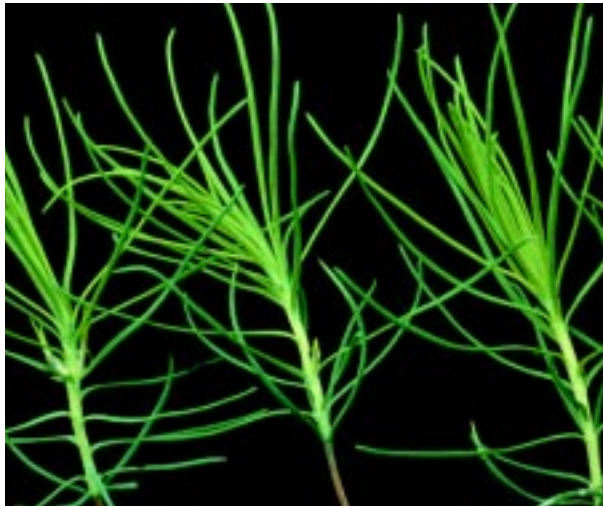
Some activities, such as those specifically influencing the genetic stock of trees or wildlife in the forest, may have direct effects on genetic diversity. Other activities, such as those affecting habitat conditions, may have indirect effects. The need and means for monitoring genetic diversity directly, or for monitoring activities likely to effect genetic diversity, will be reviewed in the light of further research, and the level of such activities.

GOAL 1.3
Protect rare ecological sites and special landscape features

Measuring performance under Goal 1.3

A rare site or feature is one distinguished by a small number of occurrences (perhaps 10 or less), restricted geographic range or sparse occurrence over a large area. Special features may be defined in terms of rarity, fragility, ecological importance, scientific value, and uniqueness.

Indicators, and inventories of indicator status, are currently being developed. Reporting on indicators for this goal has been deferred pending completion of these inventories. Indicators will measure the proportion of the land base occupied by special landscape features, environmentally significant areas and other special features under protection.

GOAL 1.4

Maintain natural diversity, pattern and stages of forest ecosystems over time

Measuring performance under Goal 1.4

The elements to be measured include:

Area by forest type and age class

Natural disturbance (fire, insect, pest, disease, wind) results in a distribution of forest vegetation age classes over the landscape, according to the type, frequency and extent of the disturbance. Given the goal of maintaining these age patterns when introducing human-caused disturbance on parts of the landscape, measuring the status of and trends in the patterns provides us with an important indicator.

The indicators that can be reported upon are:
1.4.1 Makeup of forest by age class
1.4.2 Makeup of forest by size class

Access and access use

Road access is measured because it influences the structure of landscapes directly, affecting the connectivity and utilization of landscape components by humans and wildlife. Roads can change, or facilitate human uses that change forest biodiversity. They increase "forest edge" habitat and influence the movement of species and genes.

The indicators that can be reported upon are:
1.4.3 Density of roads by Forest Management Unit
1.4.4 Canceled road dispositions by Forest Management Unit

INDICATOR 1.4.1
Makeup of forest by age class

Historical disturbances such as forest fires, defoliating insect outbreaks, and wind storms have resulted in a distribution of forest age classes across the Foothills Model Forest. Today, natural disturbance regimes are influenced by human activity, such as fire suppression, prescribed burning and forest harvesting. Certain species are believed to be sensitive to the differences between stands of different ages, and it is hoped that maintaining a distribution of stand ages within a natural range of variability will provide habitat for native species. Therefore, measuring the status of, and trends in, forest age classes provides an important indicator of biological diversity.

Landscape fire behavior patterns have been studied extensively by Foothills Model Forest and its partners, including Weldwood and Jasper National Park of Canada. The resulting database is unrivalled in North America in its area (over one million hectares mapped to date), detail (the age of most stands is known to the nearest 10 years) and accuracy (extensive cross-checking with independent data sources has been done). This work has been documented in several Foothills Model Forest reports, and other publications. (There is currently no age-class information available for Willmore Wilderness Park.)

It is important to recognize that natural disturbance regimes vary considerably among areas with different climate, elevation, or topography. These factors are also used to divide Alberta into six natural regions, two of which occur in Foothills Model Forest (Rocky Mountain and Foothills). The boundary between these natural regions occurs along the eastern slopes of the Rocky Mountain Front Range.

In the Foothills east of the Front Range, historical disturbance regimes, combined with recent (since 1955) forest harvesting activity, have resulted in the age class distribution illustrated below. In Jasper National Park of Canada, where few fires burned during the 1900s, little young forest is present. Interestingly, the most extensive age class in both areas is that between 100 and 120 years, reflecting a period of intense fire activity throughout western North America during the late 1800s.

AGE-CLASS DISTRIBUTION, FOOTHILLS MODEL FOREST, 1995

Figure 1 **Foothills Area**
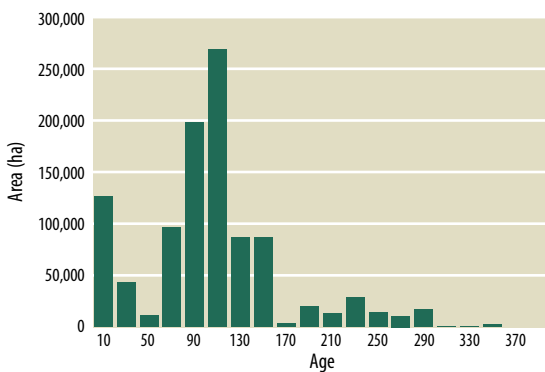
Figure 2 **Jasper National Park**

(Data compiled from the FMF and Jasper National Park of Canada)
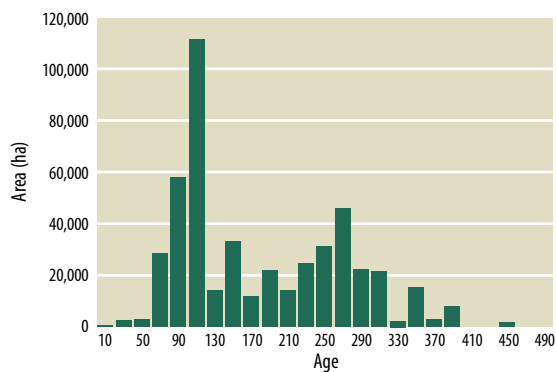
While the above figures illustrate the overall makeup of forest by age-class in two major areas of Foothills Model Forest, there is considerable variability within each area. Elevation, climate, and ecological factors such as the lifespan of dominant tree species all contribute to this variability. The following figure illustrates the variability among natural sub-regions.

AGE CLASS DISTRIBUTION BY NATURAL SUBREGION

Foothills Area
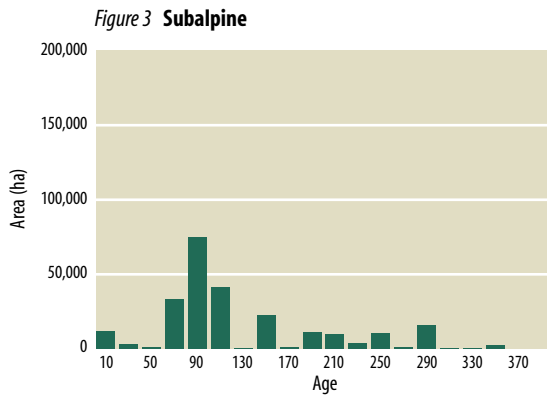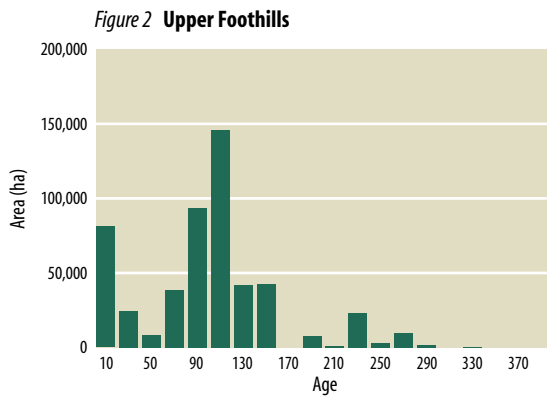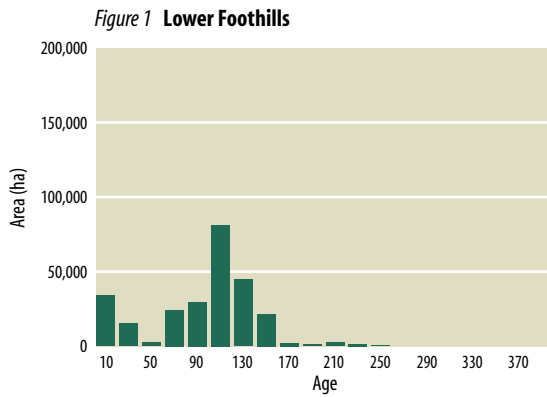
Figure 1 **Lower Foothills**

Figure 2 **Upper Foothills**

Figure 3 **Subalpine**

Jasper National Park of Canada

Figure 4 **Montane**

Figure 5 **Subalpine and Alpine**

(Data compiled from the FMF and Jasper National Park of Canada)
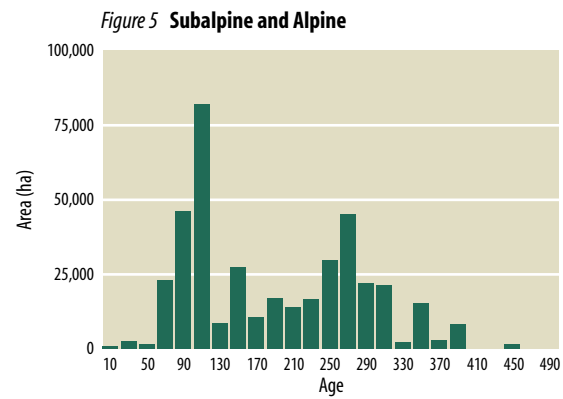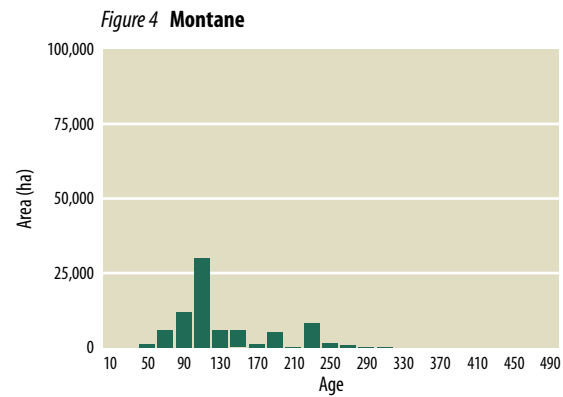
INDICATOR 1.4.2
Makeup of forest by size class

Disturbance events (such as forest fires) that convert older forest to young forest have created a mosaic of stands of different ages. The spatial arrangement of these stands is an important aspect of ecosystem pattern. For example, stands of a particular age arranged in a few very large patches may support many species that require interior forest habitat. Conversely, the same stands dispersed among a large number of very small patches may be unsuitable for such species, and instead favor species that thrive along the boundaries between stands of different age. The stand origin map of Foothills Model Forest makes it possible to measure this aspect of ecosystem pattern, and trends in this pattern are possible as the map is updated to reflect new disturbances.

For this report, the 1950 stand origin map was used to describe the makeup of forest by size class. Because few stands in Foothills Model Forest were logged before 1950, stand size distributions in 1950 reflect the influence primarily of natural disturbance (fire) only. Future status reports will permit assessments of changes over time in the makeup of the forest by size class.

Stands were divided into two age classes: young and old. Young forest includes those stands disturbed at least once since 1930 (i.e., 20 years old in 1950). Old forest includes those stands that have not been disturbed since 1810 (i.e., 140 years old in 1950). These successional stages represent two extremes along a continuum of stand ages.

**FOOTHILLS MODEL FOREST
STAND ORIGIN**

Legend

Fire Origin

- pre 1710
- pre 1810
- 1811 - 1830
- 1831 - 1850
- 1851 - 1870
- 1871 - 1890
- 1891 - 1910
- 1911 - 1930
- 1931 - 1950
- 1951 - 1970
- 1971 - 1990
- 1991 - 1997
- Non forested
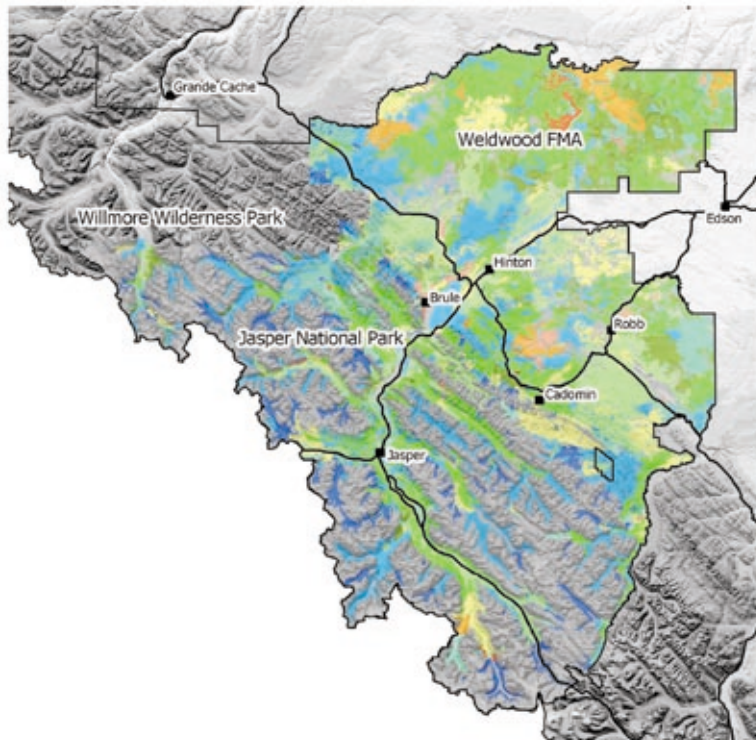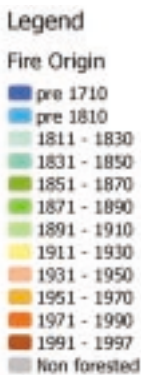
As discussed under *Indicator 1.4.1 Makeup of forest by age class*, natural disturbance regimes within Foothills Model Forest vary considerably among natural sub-regions. Thus, the size class distributions are shown for each natural sub-region separately. The sub-alpine natural sub-region is divided into two areas–that in Jasper National Park, and that along the Front Range east of Jasper National Park of Canada.

In this analysis, natural sub-region boundaries do not divide patches; stands that cross sub-region boundaries are assigned to the sub-region in which most of the patch occurs.

As shown on the following page, both young and old forest patches in 1950 were distributed across a wide range of patch sizes, from less than one hectare to over 10,000 hectares. Large patches, which dominated all parts of Foothills Model Forest except the Montane natural sub-region, reflect the historical legacy of infrequent but very large forest fires characteristic of this region. The Montane natural sub-region is unique in this area; more frequent, smaller fires there have created a more finely textured mosaic of relatively small stands.

SIZE DISTRIBUTION, YOUNG AND OLD CLASSES

Size distribution of young (less than 20 years) and old (greater than 140 years) forest patches in Foothills Model Forest (excluding Willmore Wilderness Park), as of 1950.

* Bars represent the percent of forest in each size class by age class (young or old) in each of the five natural sub-region areas.

YOUNG FOREST PATCHES

Figure 1 **Montane**

Figure 2 **Subalpine** (JNP)

Figure 3 **Subalpine** (east of JNP)

Figure 4 **Upper Foothills**

Figure 5 **Lower Foothills**

OLD FOREST PATCHES

Figure 6 **Montane**

Figure 7 **Subalpine** (JNP)

Figure 8 **Subalpine** (east of JNP)

Figure 9 **Upper Foothills**
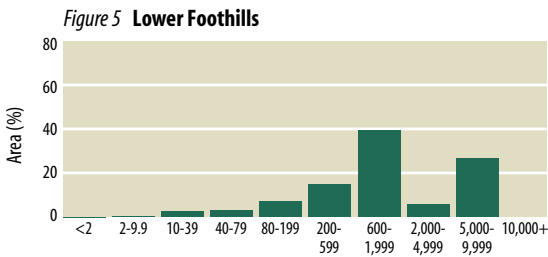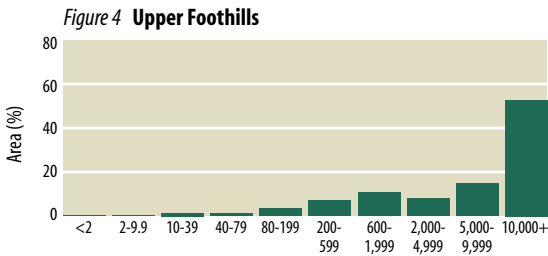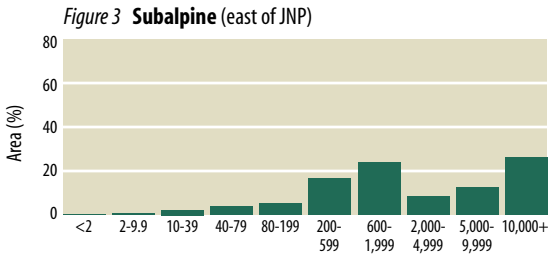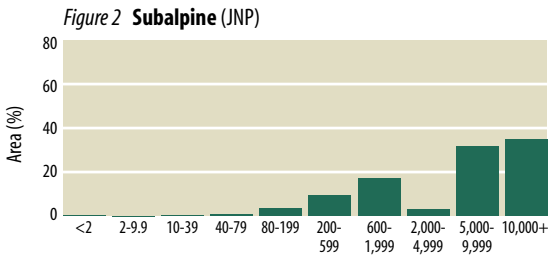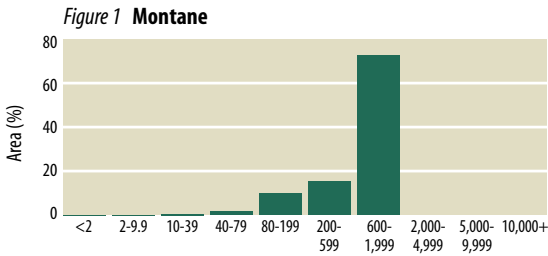
Figure 10 **Lower Foothills**
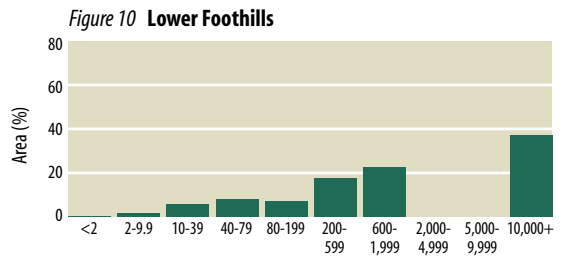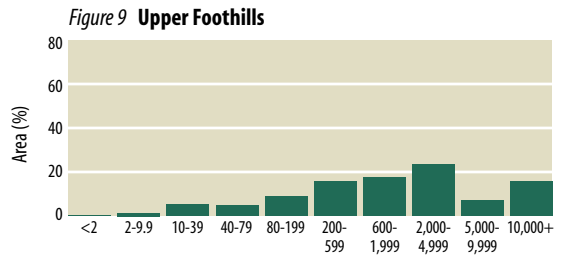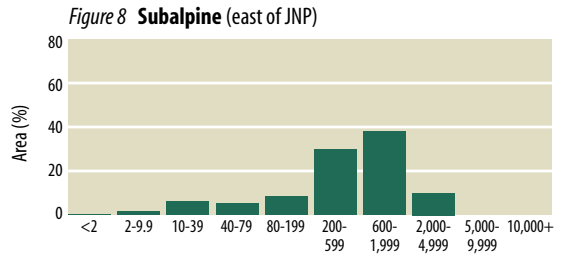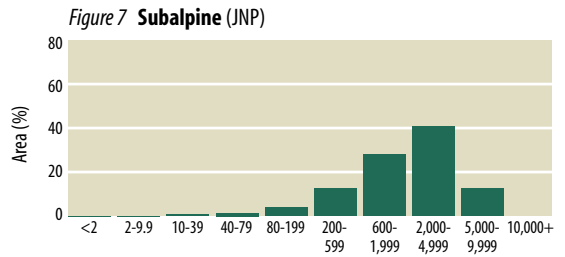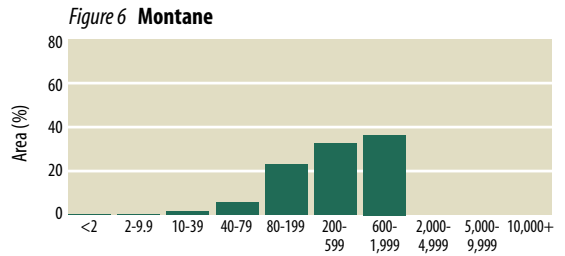
(Data compiled by D.W. Andison)

INDICATOR 1.4.3
Density of roads by Forest Management Unit

Roads represent a unique form of disturbance on the landscape. Linear corridor development influences the structure of landscapes directly, by potentially changing or facilitating human uses that change forest biodiversity by affecting the connectivity and utilization of landscape components by wildlife. Linear corridors also have the potential to affect water quality (with the input of sediment) and subsequently, aquatic habitat. The most important effects of linear corridor developments are direct and indirect mortality, and the loss of habitat effectiveness as a result of habitat avoidance in the vicinity of disturbance corridors.

The measure for this indicator is the density of roads within the Foothills Model Forest area. Monitoring is conducted through interpretation of remote satellite imagery, supplemented with field knowledge and records. The accompanying map and table illustrate the road the road density of all-weather roads across the Foothills Model Forest by comparing actual kilometers of road to area (km2).

Figure 1
FOOTHILLS MODEL FOREST ROAD DENSITIES

Legend
Road Density (km/km2)
- 0.00 - 0.05
- 0.06 - 0.15
- 0.16 - 0.30
- 0.31 - 0.61
- 0.62 - 1.03
- 1.04 - 2.68
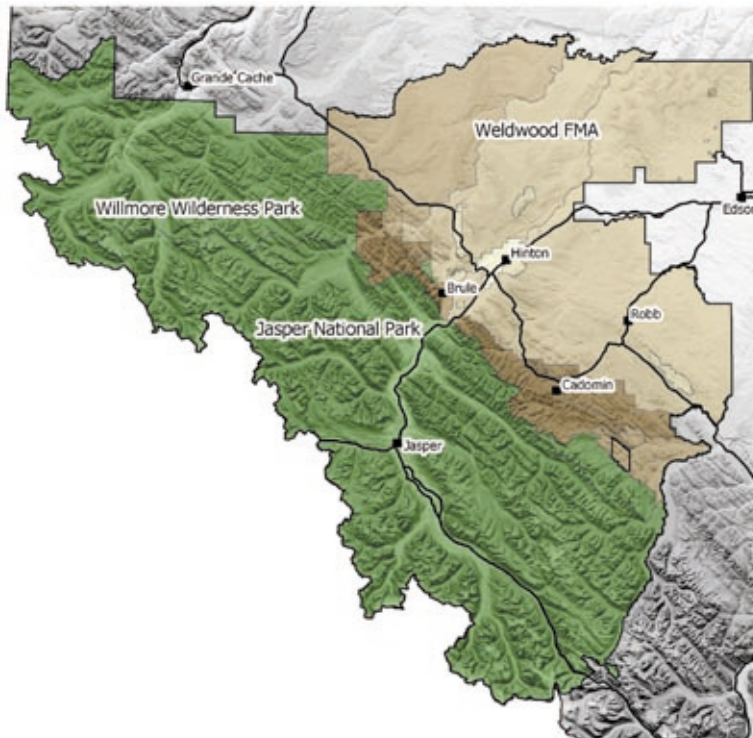
(Data compiled by SRD)

Figure 2 **Forest Management**

Unit	Road Density (kilometre per square kilometre)
E1N	0.51
E11	0.29
E11	0.02
E11N	0.21
E3	0.85
E3N	0.47
E4	0.09
E4N	0.50
E4N	0.21
E4N	0.12
E5	0.15
E5N	0.14
E6	0.86
E6N	0.46
E7N	0.30
E9	1.57
H1	0.80

Other units

Jasper National Park	0.05
Willmore Wilderness Park	0.00

(Data compiled by SRD)

INDICATOR 1.4.4
Cancelled road dispositions by Forest Management Unit

As previously noted, roads have a strong influence on forest ecosystems. Reclaiming and closing roads that are no longer required or are redundant eases the impact of roads on wildlife and fisheries resources as well as some broader cumulative-effect implications.

In most cases, a cancelled road is reclaimed and removed from service. It is possible, however, that the public may choose to continue using the road where it is possible to travel over or around barriers. There are also instances when a road is cancelled but the right of way remains for uses such as ski trails.

The measure for this indicator is the percentage of road cancelled by area (hectares)from dispositions within the Foothills Model Forest. An analysis of the percentage of roads cancelled for those dispositions issued between 1995 and the end of 2000 is provided. Ten percent of the disposition area originally approved for road dispositions between 1995 and 2000 within the Foothills Model Forest has been cancelled. Further data and analysis will be required to assess the impact of these and future cancellations on effective road density and landscape disturbance.

Foothills Model Forest Percent of Road Area (hectares) Cancelled from Disposition by Forest Management Unit (FMU) for Dispositions Issued between 1995 and 2000

| FMU | Year Road Disposition Issued | | | | | | Area | Percent Cancelled |
	1995	1996	1997	1998	1999	2000		Total
11N	0.0	0.0	100.0		0.0	0.0		20.9
3N ***	9.3	12.0	30.2	23.6	7.2	1.2		13.6
4N	18.6	18.3	4.2	15.7	5.1	0.0		8.8
5N	0.0	0.0	100.0	46.1	0.0	21.9		15.0
6N	3.7	1.5	2.3	1.0	0.0	3.3		2.1
7N	12.2	28.1	3.4	29.9	7.0	5.1		13.0
E11	0.0	0.0	0.0	0.0	0.0	0.0		35.7
E3	0.0	0.0	0.0	21.9	0.0	0.0		18.0
E4	0.0	0.0	0.0	0.0	0.0			0.0
E5	0.0	0.0	0.0	0.0	0.0	0.0		0.0
E6	0.0	0.0	0.0	21.2	0.0	0.0		2.1
E9	70.3	0.0	0.0	0.0	0.0	0.0		3.5
H1	0.0	0.0	0.0	0.0	0.0			0.0
Grand Total								
	Active Area under Disposition in 2000 (ha)							
	532.287	804.739	560.372	548.989	1067.36	848.193	4361.9	
	Area Cancelled from Disposition to end of 2000 (ha)							
	58.848	127.322	144.601	74.583	49.768	29.744	484.9	
	Percent of Area of Original Dispositions Cancelled by end of 2000							
	10.0	13.7	20.5	12.0	4.5	3.4		10.0

*** Interpretation Example: Of those dispositions issued in 1995 in FMU 3N, 9.3 percent were cancelled

(Data compiled from Land Status Automated System (LSAS))

CRITERION 2

Maintenance/ Enhancement of Forest Ecosystem Condition and Productivity

GOAL 2.1 **Maintain the sustainable productive capacity of ecosystems**

Indicator 2.1.1 Percentage of harvest area satisfactorily restocked

Indicator 2.1.2 Forest productivity (periodic timber volume increment)

GOAL 2.2 **Maintain natural ecological processes**

Indicator 2.2.1 Occurrence and severity of wildfire

Indicator 2.2.2 Occurrence of insects and disease pathogens

GOAL 2.3 **Conserve the forest land base**

Indicator 2.3.1 Forest Area by protection status (International Union for the Conservation of Nature and Natural Resources (IUCN) designation)

Indicator 2.3.2 Mining area by disposition

Indicator 2.3.3 Oil and gas area by disposition

Indicator 2.3.4 Kilometres of seismic lines per year

GOAL 2.1

Maintain the sustainable productive capacity of ecosystems

Measuring performance under Goal 2.1

The Canadian Council of Forest Ministers (CCFM) has identified ecosystem resilience as a key component of any system to assess maintenance and enhancement of ecosystem productivity. The most direct indicators currently available for measuring ecosystem productivity are those related to tree growth:

- 2.1.1 Percent of harvest area satisfactorily restocked

- 2.1.2 Forest Productivity (periodic timber volume increment)

For the purpose of this report, measures of productive capacity include several other indicators described elsewhere, such as:

- Population trends of selected species (Indicators 1.1.1, 1.1.2, 1.1.3)

- Habitat supply (Indicators 1.1.4, 1.1.5, 1.1.6, 1.1.7)

- Landscape patterns (Indicator 1.4.1)

- Exploitation rates of biological production (Indicators 5.1.2, 5.1.3, 5.1.4, 5.1.5)

INDICATOR 2.1.1
Percentage of harvest area satisfactorily restocked

Reforestation is the establishment of a new forest on areas that have been harvested. Harvested areas are tracked until they are satisfactorily restocked (SR) and/or free to grow (FTG). Satisfactorily restocked means that sufficient new trees exist on the site to re-stock it to its pre-harvest condition. Free-to-grow means the new trees have grown to the point at which they are clear of competitive plants, and can be expected to reach full maturity.

Because of the delay between harvest and reforestation declaration, the area that is successfully reforested is always less than the total area harvested. Prior to March 1, 1991, reforestation requirements stipulated that harvested areas had to be satisfactorily restocked, but not necessarily free to grow within 10 years of harvest. Since March 1, 1991, reforested areas must be free to grow within 14 years of harvest. Harvest areas are tracked in

Weldwood's silviculture records until the Alberta Government's reforestation requirement has been met, and then through timber inventory updates. Areas that are found to be not satisfactorily restocked (NSR) are re-treated on a priority basis to establish reforestation according to either a legal obligation or a corporate commitment to successfully reforest harvested areas.

Information is provided below for Weldwood's Forest Management Area only. The measure for this indicator is the percent of Weldwood's harvested area that is successfully restocked each year (May 1-April 30).

Percentage of area successfully restocked (as of April 30, 2000)

Area successfully restocked divided by the restocked area plus the area requiring further treatment.

From Weldwood of Canada Sustainable Forest Management Stewardship Report 2000

115,029 ha /119,880 ha = 95.95 percent satisfactorily restocked

*Note: areas treated but not yet surveyed are not included

Reforestation liability report as of April 30, 2000

From Weldwood of Canada Sustainable Forest Management Stewardship Report 2000

	Status[1]	Description	Year-end Balance (m²)
Total	NSR	Treatment Required	4,852 [3]
	SSU	Treated - Awaiting Survey	47,129 [3]
	SR	Established	115,028
	FTG	Free Growing	0

1 - Definitions

  NSR - Not Sufficiently Restocked

  SSU - Stocking Status Unknown; SSU includes areas site prepared only, site prepared and planted, and planted.

  SR - Surveyed, Sufficiently Restocked

  FTG - Free-To-Grow

2 - This table includes areas previously treated under original responsibility by the Land and Forest Service (quota and non-quota) that are now part of the Forest Management Agreement (FMA) landbase. Areas under permanent or temporary deletions (mines and pastures) are not included.

3 - Totals revised from 1998 year-end balance to reflect review of Silviculture Records Management System data

INDICATOR 2.1.2
Forest productivity (periodic timber volume increment)

On Weldwood's FMA, a point-in-time measure of forest productivity is the total volume growth during the preceding 10-year period. This is defined as the periodic increment. The current calculation (see table) is based on the AAC-contributing land base, and uses merchantable volume at a 10 cm stump and 8 cm top utilization.

Comparing the 1999 periodic increment with subsequent measurements will indicate changes in forest productivity. Under consideration is using total volume as a better measure of periodic increment, since younger age classes will not show merchantable periodic increment.

Forest productivity will be reported with the timber supply analysis for each Forest Management Plan (FMP) revision submitted to the Alberta Government. The next FMP revision is scheduled for 2008.

Forest Productivity for the Weldwood FMA

FMP Year	Contributing Area (ha)	Periodic Increment (m²/decade)[1]
1999	715,341	15,627,972

1 coniferous and deciduous volume, 10/8 utilization

(Data compiled by Weldwood of Canada, Hinton Division)

For unallocated Crown Forest Management Units in the Foothills Model Forest which have no associated forest management plans, no accurate calculation of periodic increment, other measures of forest growth, or annual allowable cut (AAC) are curently available. For these scattered land bases within the Foothills Model Forest, stand growth rates will be calculated in conjunction with future Forest Management Plans.

GOAL 2.2

Maintain natural ecological processes

Measuring performance under Goal 2.2

Measuring the incidence of natural disturbances such as insect attack, disease infestation and fire damage gives important insights into trends of ecosystem condition and productivity. The CCFM has identified ecosystem resilience as a key component of any system to assess maintenance of ecosystem productivity.

Measures of how natural ecological processes are being maintained include indicators described elsewhere in this report, such as:

- Population trends of selected species (Indicators 1.1.1, 1.1.2, 1.1.3)

- Forest productivity (Indicator 2.1.2)

And two indicators described below:

- 2.2.1. Occurrence and severity of wildfire

- 2.2.2 Occurrence of insects/disease pathogens

INDICATOR 2.2.1
Occurrence and severity of wildfire

Fire is a significant agent of forest disturbance simply because a major fire will cause the death of most trees in a burned area. Since the World War II, significant resources have been provided for efforts to reduce the severity of wildfire, through early detection and suppression.

Wildfire history data exists for Alberta including Jasper National Park of Canada back to 1931. Readily retrievable information for all fire sizes, small to large, however, is available only from 1961 for the Foothills Model Forest. Classification of the fire cause according to the ignition source or the general human-related activity, which started the fire, fire size, location and year of the fire started is assembled here to enable a determination of trends. Initially, railroad fires dominated the human-caused fires, and there were more lightening-caused fires than human-caused fires. However, with increased vehicle access, the advent of all-terrain vehicles and increased recreational and industrial activities, human-caused fires now well exceed lightening-caused fires. The number and area of fires caused by man versus lightning is an indication of the extent to which natural ecological processes may have been disrupted.

ALBERTA - AREA BURNED, BY YEAR
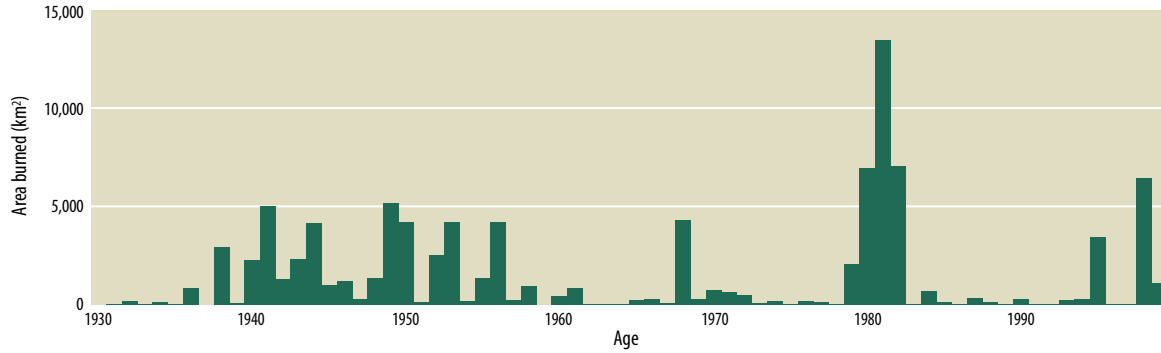
ALBERTA - AREA BURNED, BY DECADE
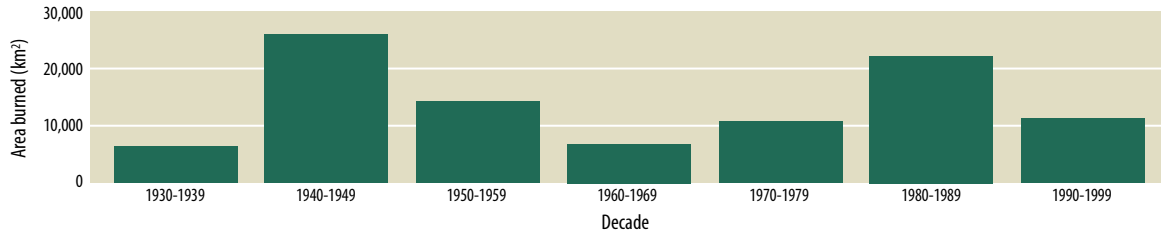
Number of fires by class, by decade, Foothills Model Forest

Lightning-Caused				
Decade	Class B	Class C	Class D	Class E
1960	22	2	1	2
1970	15	2	1	2
1980	34	3	5	2
1990	21	1	0	0

Class A: < 0.11. hectares
Class B: 0.11-4.0 hectares
Class C: 4.1-40.0 hectares
Class D: 40.1-200.0 hectares
Class E: 200.1 hectares and greater

Human-Caused				
Decade	Class B	Class C	Class D	Class E
1960	30	1	2	0
1970	53	5	25	0
1980	57	13	2	4
1990	45	11	5	2

INDICATOR 2.2.2
Occurrence of insects and disease pathogens

Forests, insects and disease are always present on the Foothills Model Forest land base. They affect the lifecycle of the individual trees, or groups of trees, however, since 1954, there have been no major outbreaks of insect or disease on the Weldwood Forest Management Area (FMA) within Foothills Model Forest. An Integrated Pest Management Committee has been established for the Northern East Slopes Region, which includes portions of the Foothills Model Forest.

There is no complete monitoring and recording program for insect and disease outbreaks across the entire Foothills Model Forest area. However, Weldwood of Canada, the Alberta Government and Parks Canada have gathered some information.

In 2000, Weldwood continued participation in the Integrated Pest Management Committee for the Northern East Slopes Region. There were two documented incidents on the FMA in 2000: There were several hectares of complete defoliation by Large Aspen Tortrix -south of Silver Summit Road in the Marlboro Working Circle. This was part of a larger infestation outside of the FMA. There were approximately four hectares of moderate infestation by Dwarf Mistletoe with scattered patches of severe infestation detected near Thunder Lake in Embarras 15. Mountain pine beetles were also detected at 11 Alberta Sustainable Resource Development pheromone-bait sites in Willmore Wilderness Park, west of the FMA. This was down slightly from 1999 monitoring results. Control by Alberta Sustainable Resource Development on the Willmore bait sites will take place in spring 2002 to enable the completion of an over-winter larvae survival study. Alberta Sustainable Resource Development has also developed a mountain pine beetle hazard rating system. A program was started in summer 1999 and continued in 2000 using pheromone traps to monitor and trap multiple insect species at Weldwood's Hinton wood yard. Results showed that insect occurrences in the wood yard were low.

Alberta Sustainable Resource Development monitors insects and disease that are significant to forest resources in terms of reducing growth and increasing mortality. Mountain Pine Beetle (MPB) has serious implications for the forests of western Alberta. They can affect every aspect of forestry, from the social values (aesthetics, fire risk, recreation opportunities) to the economic values (less Annual Allowable Cut, control costs, fire risk, timber degrade, reduced tourism). To help deal with the potential impacts of Mountain Pine Beetle, the Alberta Government has a zero tolerance policy for this insect, which means all detected beetles must be controlled. Spruce Budworm and Gypsy Moth are also monitored Aspen defoliators (such as forest tent caterpillar) have been monitored for some years. (They cause significant visual impacts but relatively small resource impacts unless they occur for several years in a row.) Mistletoe has significant impacts on tree growth, and influences cut block layout and sometimes the species chosen for re-planting.

Jasper National Park of Canada in 1999 conducted aerial and ground surveys on three square kilometres in the Little Smoky Area, finding:

Live trees attacked by MPB	5
Trees dead from 1998 MPB attacks	11
Trees dead from 1997 MPB attacks	2
Douglas Fir beetle infestations	6

Similar surveys in 2000 found:

Trees dead from 1998 MPB attacks	70
Trees dead from 1999 MPB attacks	Several at 13 sites further south
Douglas Fir beetle infestations	39
Western balsam bark beetle infestations	Scattered
Large-spored spruce-Labrador tea rust	Severe in places

GOAL 2.3

Conserve the forest land base

Measuring performance under Goal 2.3

This goal relates to the conservation of land which supports forest growth and addresses the issue of this land being converted to non-forest land uses such as mining, gravel and borrow pits, agriculture, reservoirs, facilities, rights-of-way and roads.

Commercially productive forest-land in Alberta is usually defined as land capable of producing a minimum of 50 cubic metres of merchantable timber per hectare. The area of commercially productive land designated for timber production is an important indicator of fibre sustainability.

The following indicators have been identified:

- 2.3.1 Forest area by International Union for the Conservation of Nature and Natural Resources (IUCN) designation
- 2.3.2 Mining area by disposition
- 2.3.3 Oil and gas area by disposition
- 2.3.4 Hectares of seismic lines per year

I NDICATOR 2.3.1
Forest area by protection status (International Union for the Conservation of Nature and Natural Resources (IUCN) designation)

Protected areas are viewed around the world as key tools to protect biological diversity. They act as refuges for wildlife that need undisturbed areas in which to live, and provide society with areas for nature appreciation. They are also valued for spiritual enrichment and recreation opportunities. A network of permanent protected areas is integral to many commitments to which the Province of Alberta is a signatory, including the National Forest Strategy (Canada's Forest Accord, 1992); the Tri-Council Commitment to Complete Canada's Networks of Protected Areas (1992); and the Canadian Biodiversity Strategy.

In order to meet international standards of protection and be deemed credible, the protected areas follow standards set by the International Union for the Conservation of Nature and Natural Resources (IUCN). To meet these
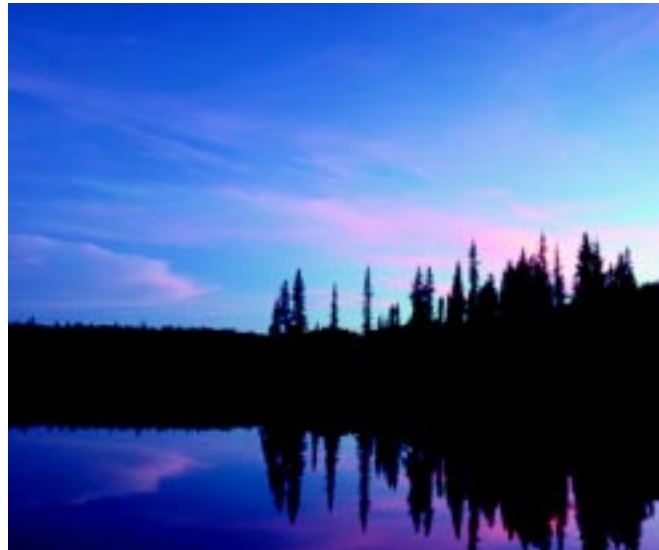
standards, protected areas must be permanently designated. The IUCN Protected Area Management Categories are outlined in the accompanying table. This indicator assesses how adequately an area of interest represents the range of variation within a region. It is a measure that indicates that the protected area represents the forest types found within the eco-region. Within the Foothills Model Forest, the areas protected cover 1,653,440.60 hectares, spread across three eco-regions (Montane, Cordillera and Boreal Plains) and fall within the IUCN Protected Area Management Category II (National Park) and Category IV (Habitat/Species Management Area). Details are outlined in the accompanying table.

IUCN Protected Area Management Categories

Category	Purpose
Ia	**Strict Nature Reserve/Wilderness Protection Area:** managed mainly for science or wilderness protection - an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
Ib	**Wilderness Area:** protected area managed mainly for wilderness protection - large area of unmodified or slightly modified land and/or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition.
II	**National Park:** protected area managed mainly for ecosystem protection and recreation - natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of the designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational or visitor opportunities, all of which must be environmentally and culturally compatible.
III	**Natural Monument:** protected area managed mainly for conservation of specific natural features - area containing specific natural or natural/cultural feature(s) of outstanding or unique valued because of their inherent rarity, representativeness or aesthetic qualities or cultural significance.
IV	**Habitat/Species Management Area:** protected area managed mainly for conservation through management intervention - area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats to meet the requirements of specific species.
V	**Protected Landscape/Seascape:** protected area managed mainly for landscape/seascape conservation or recreation - area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
VI	**Managed Resource Protected Area:** protected area managed mainly for the sustainable use of natural resources - area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while also providing a sustainable flow of natural products and services to meet community needs.

Foothills Model Forest
Area Designation by IUCN Protected Area Management Category

Protected Area Type	Eco-Region Name	Protected Area Name	IUCN Category	DATE established	Area (ha)
Wildland Park	Montane Cordillera	Brazeau Canyon Wildland	II	2000	2,203.4
Natural Area	Montane Cordillera	Cadomin Cave Natural Area	IV	2001	82.6
Natural Area	Montane Cordillera	Cardinal Divide Natural Area	IV	2001	628.2
Natural Area	Montane Cordillera	Grave Flats Natural Area	IV	1982	1,001.8
National Park	Montane Cordillera	Jasper National Park of Canada	IV	1907	1,121,485.3
Natural Area	Boreal Plains	Pinto Creek Canyon Natural Area	IV	2000	1,232.6
Wildland Park	Montane Cordillera	Rock Lake-Solomon Creek Wildland Park	II	2000	34,673.6
Provincial Park	Boreal Plains	Sundance Provincial Park	II	1999	2,763.0
Wildland Park	Montane Cordillera	Whitehorse Wildland	II	1998	17,504.1
Natural Area	Boreal Plains	Wildhay Glacial Cascades Natural Area	IV	2000	2,476.7
Provincial Park	Montane Cordillera	William A. Switzer Provincial Park	II	1958	6,234.9
Wilderness Park	Montane Cordillera	Willmore Wilderness Park	II	1959	459,745.4

IUCN CODE - Number of ha in Protected Area
Management Category by Eco-Region

Boreal Plains	II	2,763.0
	IV	7,118.3
	Total	**9,881.2**
Montane Cordillera	II	1,641,846.7
	IV	1,712.6
	Total	**1,643,559.3**
Total	II	1,644,609.7
	IV	8,830.9
	Total	**1,653,440.6**

INDICATOR 2.3.2
Mining area by disposition

Measuring the incidence of human-caused disturbance on the landscape offers a way to track factors that could potentially impact ecosystem condition and resilience. Mining is one such factor that can be readily quantified.

Coal mining in the Foothills Model Forest presently occurs in four locations, and has a long history in the area. Beginning in approximately 1910, mining occurred in various locations across much of the area, with production peaking in the 1930s and 1940s. All coal was extracted using underground methods, but surface pits were used just before mining came to an end in the early 1950s, a result of a decline in the use of coal by the railroads.

Demand for high quality coking coal by offshore steel producers restarted the coal industry in the foothills. Cardinal River Coals began producing coking coal in 1969, followed by Gregg River in 1982. Thermal coal is produced by the other two existing mines—Coal Valley and Obed Mountain mines—which commenced production in 1977 and 1982 respectively.

Coal mines require provincial environmental operating approvals, and are also granted surface rights under the Public Lands Act(usually an Mineral Surface Lease (MSL) disposition for the mine and a Miscellaneous Lease (MLL) disposition for the plant site). Luscar Ltd. currently has the surface rights for all four mines, which it owns.

Although 21,887.7 hectares are currently under mineral surface lease disposition, 7407.2 hectares have been cleared and disturbed to date for mining activities. The following data illustrate the cumulative total area cleared and disturbed for mining to date by year since 1996. See accompanying map for locations within the Foothills Model Forest.

**WEST-CENTRAL ALBERTA
MINING LOCATIONS**

Legend
• Operating Coal Mine Locations
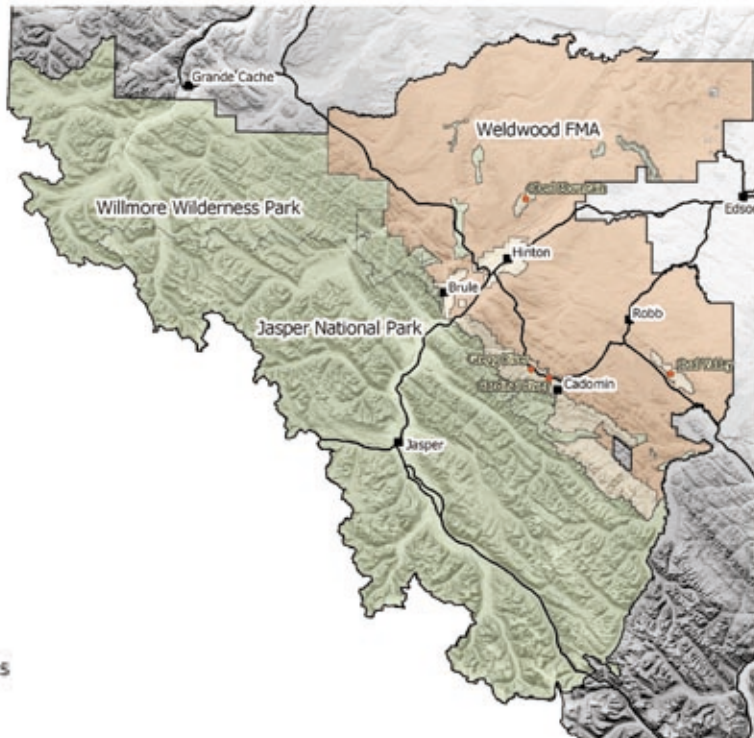
Mining data, Foothills Model Forest, 1996-2000

Total Area Cleared & Disturbed (ha)				
1996	1997	1998	1999	2000
6,042.8	6,480.5	6,759.5	7,017.6	7,407.2

INDICATOR 2.3.3
Oil and gas area by disposition

Measuring the incidence of human-caused disturbance on the landscape offers a way to track factors that could potentially impact ecosystem condition and resilience. Oil and gas activity is one such factor that can be readily quantified.

The energy sector first exerted its influence in the Foothills Area in the early 1970s. Before then, there was very little activity. For the first years there were as few as 20 applications for oil and gas dispositions annually, but in the 1980's the numbers began to rise. Today, approximately 200 applications for oil and gas dispositions are received annually in Foothills Forest Area.

The energy sector activity initially focused on the eastern portion of the Foothills Model Forest, and has slowly has moved west to the East Slopes. The number of pipelines, particularly, and accompanying gas plants, have increased. The Eastern Slopes (E4, E5, E9, E11) are receiving increasing numbers of new applications, whereas in the past, little activity occurred. The Eastern Slopes north of Hinton have greater activity than areas further south, although applications south of Hinton are also starting to increase. The demand for oil and gas continues to rise, although it is very dependent on oil and gas prices due to the higher drilling costs in the Foothills area. The "energy boom" has started in the Foothills Model Forest, and has likely not yet peaked.

The data that follow illustrate the level of oil and gas activity since 1990, identifying the amount of disposition area that was approved for development annually in each of the Forest Management Units (FMU) across the Foothills Model Forest. A total of 8,078.2 hectares was approved from 1990 to 2000 (inclusive), with 6,895.1 hectares of this amount still under disposition.

The information was compiled from Land Status Automated System (LSAS), a computerized database system that provides information on Public Lands (surface) and Crown Minerals in Alberta. The type of information includes ownership, administration authority, activities and reservations that exist across Alberta on Crown Lands. This data is essential to the management of agreements that cover publicly-owned resources.

Oil and gas activities, including well sites, pipelines, power lines, access roads and other miscellaneous developments such as battery sites and storage sites, are granted surface rights under the Public Lands Act. Different types of dispositions are issued dependent on the purpose of the activity. Of the area that was approved from 1990 to 2000 (inclusive) for activities related to oil and gas activities, 38 percent is held for the use of access roads, 34 percent for well sites, 24 percent for pipelines, four percent for power lines, and one percent for miscellaneous uses.

Number of hectares added each year, oil and gas dispositions by Forest Management Unit (FMU) in the Foothills Model Forest

(Data compiled from LSAS)

Year											
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
454.1	631.7	316.9	587.2	536.7	389.8	496.0	1,068.9	1,125.8	892.0	1,579.0	8,078.0

 Number of hectares added each year

* In 2000, 6,895.1 hectares were still under disposition.

INDICATOR 2.3.4
Kilometres of seismic lines per year

Natural gas reservoirs and oil pools underlie much of Alberta's forests. To find these deposits, oil and gas companies use a process called seismic exploration, in which explosive or vibration energy is used to analyze the rock strata beneath. Energy waves are generated near the earth's surface by detonation of an explosive charge known as a source. The energy travels through the earth to a subsurface target, where it is reflected back to the surface to be recorded on a grid of receivers. The recorded energy waves are then computer-analyzed to identify potential petroleum reserves.

Seismic exploration requires clearing straight lines through the forest. To minimize negative impacts (including physical and sensory), controls are placed on line location, line width and timing of the program. In addition, prompt clean-up enables salvage of merchantable timber, establishment of erosion control measures and slash treatment to reduce fire hazard. Where lines cross-traveled roads, they are reduced to hand cut widths (1.5 m) to limit visibility and reduce sight lines from the roads. Most plant communities recover by the end of the first or second growing season, as the majority of seismic activities are conducted in the winter on frozen ground. Creative solutions are being developed to protect sensitive resources such as rare plant communities, popular hiking and canoe trails, archaeological sites, and long-term research plots.

Traditionally, these lines were eight metres wide—the width of a normal bulldozer blade. However, with current technology and concern to reduce the "footprint" on the landscape, avoidance techniques and hand cut lines have been used to reduce the line width and vegetation disturbance, particularly in sensitive landscapes. Fewer trees are removed, resulting in less impact to the timber operators. Previously cut lines are also re-used.

To enhance exploration results, many seismic operators are now utilizing the three-dimensional (3-D) process, resulting in significant oil and gas discoveries. It is the grid of sources and receivers that makes 3-D different from the 2-D or straight-line operations of the past. This new technology presented challenges for land managers to protect resources while providing for the exercise of oil and gas rights. Cooperative planning with seismic operators is crucial to reducing the resource impacts of this intensive operation.

Geophysical or seismic activities are not governed under the Public Lands Act, but rather by the Exploration Regulation. As a result, and due to the confidentiality of the information, specific locations of seismic activity are not always available on an annual basis. However, the number of kilometres of seismic programs conducted in a year within a defined area is available (by township or by summary of entire townships). The Foothills Model Forest has had an increase of seismic activity on its land base over the last few years. Within the Foothills

Model Forest, 8,665.6 km of seismic lines were applied for in the year 2000. This accounted for 8.8 percent of the seismic activity applied for in the Green Area, and 2.5 percent of the provincial seismic activity. Note, these totals are comprised of both actual (where available) and proposed activity (when the actual information is not yet available).

Kilometres of Seismic Activity, Foothills Model Forest, 1998-2000
No data = N/D

Year	Number of km	Green Area Total	Provincial Total
1998	2,130.70	N/D	N/D
1999	7,049.80	58,889.40	136,266.20
2000	8,665.60	98,440.00	347,316.70

List of townships from which seismic line data were extracted:

Twp 58 Rges 23-25 W5M	Twp 47 Rges 18-25 W5M
Twp 57 Rges 17-27 W5M	Twp 46 Rges 18, 20-24 W5M
Twp 56 Rges 17-27 W5M	Twp 45 Rges 19-24 W5M
Twp 55 Rges 18-27 W5M	Twp 44 Rges 20-23 W5M
Twp 54 Rges 19-27 W5M	Twp 43 Rges 20-22 W5M
Twp 53 Rges 23-27 W5M	Twp 56 Rge 1 W6M
Twp 52 Rges 21-27 W5M	Twp 55 Rges 1-3 W6M
Twp 51 Rges 20-27 W5M	Twp 54 Rges 1-3 W6M
Twp 50 Rges 19-27 W5M	Twp 53 Rge 1 W6M
Twp 49 Rges 18-26 W5M	Twp 52 Rges 1-2 W6M
Twp 48 Rges 18-26 W5M	Twp 51 Rges 1-2 W6M

CRITERION 3

Conservation of Soil and Water Resources

GOAL 3.1

Protect water quality

Measuring performance under Goal 3.1

Water is an important part of the sustainable forest management equation. Forests play a key role in capturing and cleaning fresh water supplies that are critical to human and wildlife populations alike.

Two indicators described elsewhere provide "surrogate" measures because they point to where problems in water quality may be expected:

- Density of stream crossings (see Indicator 1.1.7)
- Stream crossings meeting standards (see Indicator 1.1.6)

Two direct indicators that can be reported upon are:

- 3.1.1 Water temperature data, monitoring watersheds
- 3.1.2 Application of best management practices

INDICATOR 3.1.1
Water temperatures, monitoring watersheds

Native fish species, including bull trout and arctic grayling require cold water. As water temperatures increase, these species experience reduced growth and survival. In addition, introduced species including brook trout are adapted to a wider range of temperatures and in warmer water temperatures, juvenile brook trout may out-compete juvenile bull trout for food and territory. As a result, increased water temperatures may create conditions that favour introduced species over native fish.

Water temperature increases may occur as a result of either forest practices or annual climatic variation. Forest practices that result in increased sun exposure to the ground or the stream itself may contribute to increases in water temperature. To determine whether water temperature increases are the result of forest practices or climatic conditions, water

temperature readings from remote recorders will be installed in both treatment and control watersheds and the readings will be paired with summer air temperature obtained from nearby

fire lookout towers. These fire towers maintain long-term records and as a result, analysis of these data should help to control for climate change and annual weather variation.

FOOTHILLS MODEL FOREST MONITORING WATERSHEDS

Legend
☐ Monitoring watersheds
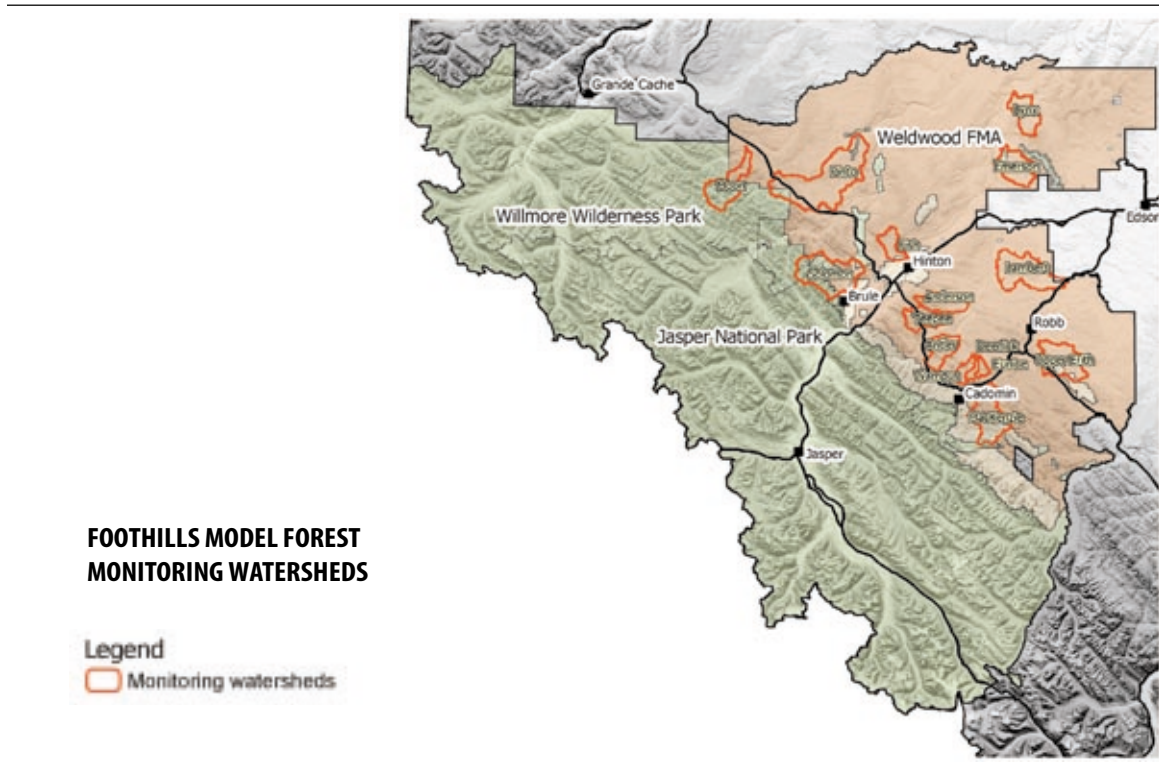
Mean daily maximum temperatures (degrees Centigrade) by month for selected Foothills Model Forest monitoring watersheds

Water shed	Jul 1999	Aug 1999	Sept 1999	Oct 1999	May 2000	Jun 2000	July 2000	Aug 2000	Sept 2000	Oct 2000
Fish	12	13.5	8.3	3.5	10	9.6	13.2	12.2	7.5	7
Deerlick	9.6	12.7	7.7	2.7	5.9	7.9	11.1	11.9	6.8	9.7
Wampus	9.4	12	6.9	2.4	5.5	7	11	11.4	6.3	9.3

Note: These are the three watersheds for which data are available for two full years (area of watershed by square kilometre).

INDICATOR 3.1.2
Application of best management practices

Weldwood of Canada conducts an annual assessment to quantify its application of water quality Best Management Practices for new Weldwood roads and watercourse crossings. Water quality refers to chemical or physical properties of water, generally in relation to substances dissolved in or carried by water. Water temperature is also considered an aspect of water quality. For forest management purposes, water quality includes nutrients, pollutants, sediment, and water temperature as they affect aquatic ecosystems and species. A Best Management Practice (BMP) is a procedure or practice designed to minimize the impact of an activity on a resource value, in this case water quality. A BMP includes regulatory requirements, ground rules, guidelines, and standard operating procedures.

The measure for this indicator is the percent application of water quality Best Management Practices for new Weldwood roads and watercourse crossings.

There were four recorded environmental events related to water quality and road and watercourse crossing construction from May 1, 1999-December 31, 2000 (see table below). The events were discovered and addressed through the Environmental Event reporting process. This includes an action plan to remediate the actual event and implement corrective measures to prevent reoccurrence. Approximately 600 permanent and temporary watercourse crossings were installed during the period, so compliance over the reporting period was estimated at 99.3 per cent.

**Environmental events related to water quality Best Management Practices,
May 1, 1999 - December 31, 2000**

(Weldwood of Canada Sustainable Forest Management Stewardship Report, 2000)

Event #	Date	Type[1]	Description	Effect[2]
99-04	05/99	AOP/GRD Rule	Winter crossing on an ephemeral draw not installed correctly and not removed prior to break-up.	Low
00-10	06/00	AOP/GRD Rule	Logging Crew skidded through an intermittent watercourse. Winter crossing on an ephemeral draw not removed prior to break-up	Low
00-13	10/00	AOP/GRD Rule	Road construction activities resulted in the release of sediment into a small permanent watercourse.	Moderate
00-14	11/00	AOP/GRD Rule	Logging contractor skidded through an intermittent watercourse.	Moderate

1 Contravention type. AOP = Annual Operating Plan, GRD Rule = Operating Ground Rules

2 Actual effect of event on environment, subjective rank.

GOAL 3.2
Conserve quantity and timing of water yields

The quantity and timing of water yields have been the subject of much research along Alberta's Eastern Slopes. Some of this research has taken place within the Foothills Model Forest, including monitoring and assessment of selected watershed basins. Analyses and results were not available for this publication, but it is hoped that both direct measures of water flows, and indirect measures of hydrological recovery after disturbances like logging and wildfire, will be reported in future.

GOAL 3.3
Conserve soil productivity

Conservation of soil productivity in forest ecosystems may be measured by indicators of forest productivity, such as periodic and maximum annual increment. See:

• Indicator 2.1.2 Forest Productivity (periodic timber volume increment).

The adequacy of practices for conserving soil productivity are also indicated by:

• Indicator 3.4.1 Alberta Soil Conservation Guidelines compliance/non-compliance.

More direct and site specific measures of soil quality and productivity may be necessary if and where, in future, the above two indicators indicate problems.

GOAL 3.4

Minimize erosion and soil losses resulting from human activities

Measuring performance under Goal 3.4

Erosion is the movement of soil by wind, water or ice. It is a natural process which can be accelerated by human activity and which can have negative effects on water quality and soil productivity. The indicator of measures taken to minimize human-caused erosion is:

- Indicator 3.4.1 Alberta Soil Conservation Guidelines compliance/non-compliance statistics

INDICATOR 3.4.1
Alberta Soil Conservation Guidelines compliance

Weldwood conducts an annual assessment of its percent compliance with the Alberta Soil Conservation Guidelines (ASCG). A joint task force comprised of the Alberta Forest Products Association and the Alberta Land and Forest Service Division developed the ASCG. The ASCG is applicable to temporary roads and decking areas, harvesting, skidding, and reforestation. Key areas of concern for the ASCG are soil rutting and compaction.

The measure for this indicator is the percentage of cut blocks that are in compliance with the ASCG.

Compliance with Alberta soil conservation guidelines, 1994-1999
(Weldwood of Canada, Sustainable Forest Management Stewardship Report, 2000)

Operating year (May 1-April 30)

Category	1994	1995	1996	1997	1998	1999
Area Harvested (ha)	7,134	5,904	6,340	5,811	6,237	7,489
# of Cutblocks harvested	369	298	267	306	321	339
Soil Conservation Incidents	0	0	1	0	2	0
Percent Compliance	100	100	99.6	100	99.4	100

*1 Includes only cut blocks that have skid clearance according to the Silviculture Liability report. Partial cut blocks were not included, and some blocks from previous years' cut were added.

GOAL 3.5
Conserve landforms
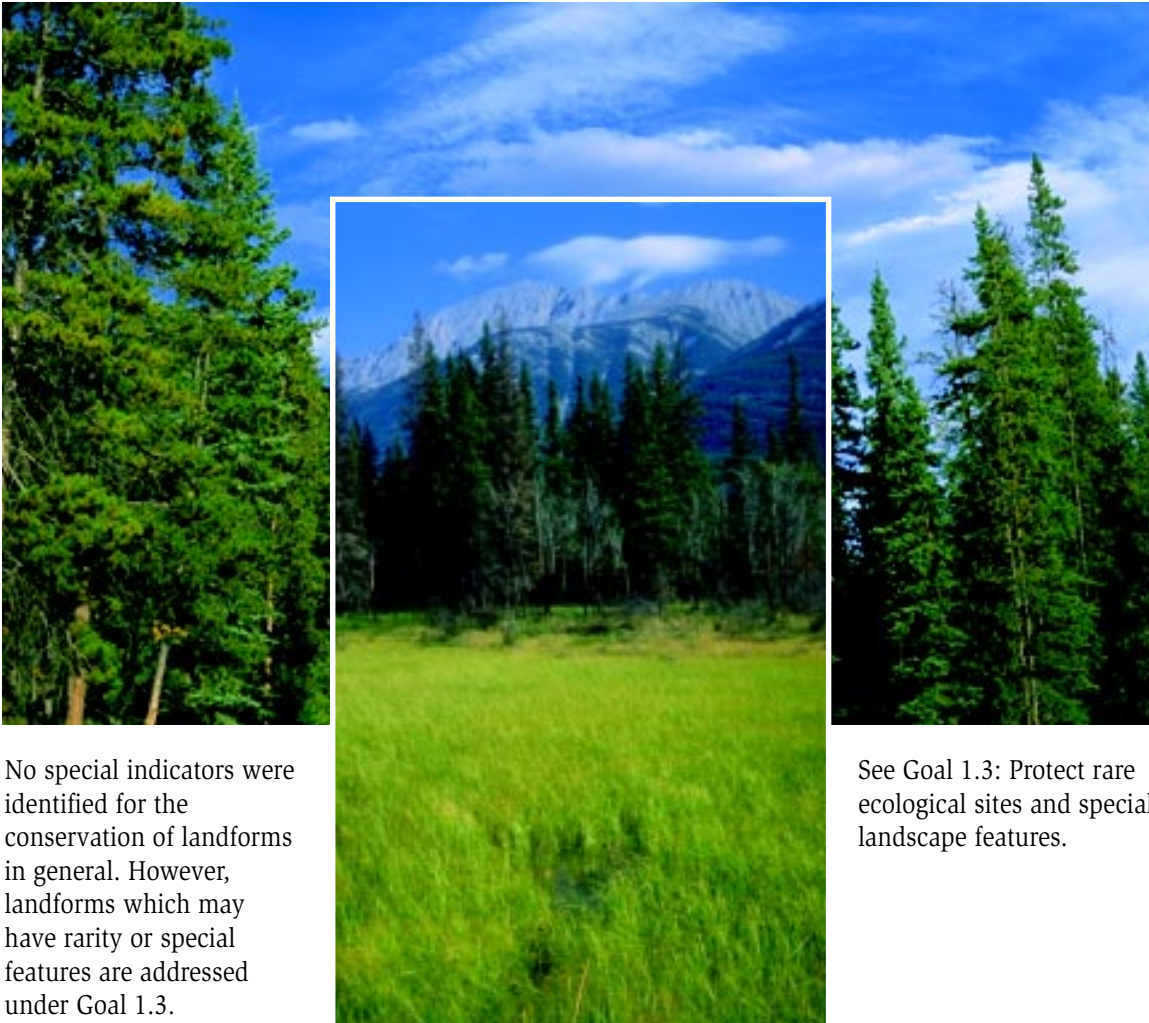
No special indicators were identified for the conservation of landforms in general. However, landforms which may have rarity or special features are addressed under Goal 1.3.

See Goal 1.3: Protect rare ecological sites and special landscape features.

CRITERION 4

Forest Ecosystem Contributions to Global Ecological Cycles

The following summarizes the two goals identified under this criterion, and the indicators chosen for measurement of performance against each goal.

GOAL 4.1 **Conserve air quality and maintain contributions of forests to carbon cycling**

Global ecological cycles are negatively impacted by fossil fuel emissions and positively influenced by the uptake and storage of carbon by forests. The technology and protocols for monitoring these impacts are complex and evolving. No definitive suite of indicators has been agreed on for the Foothills Model Forest. However, a number of indicators included elsewhere in this report provide some measure of the contribution of the Forest to carbon cycling, and will over time help in determining whether this contribution is increasing or decreasing. They are:

Indicators:

- 1.4.1 Make up of forest by age class
- 2.1.1. Percentage of harvest area satisfactorily restocked
- 2.2.1 Occurrence and severity of wildfire
- 2.3.1 Forest area by protection status
- 2.3.2 Mining area by disposition
- 2.3.3 Oil and gas area by disposition
- 2.3.4 Hectares of seismic lines per year

CRITERION 5

Multiple Benefits to Society

The following summarizes the seven goals identified under this criterion, and the indicators chosen for measurement of performance against each goal.

GOAL 5.1 **Sustainable use of biological resources**

Indicator 5.1.1   Timber harvest relative to annual allowable cut

Indicator 5.1.2   Trapping harvest

Indicator 5.1.3   Number of fishing licenses sold

Indicator 5.1.4   Hunting statistics

Indicator 5.1.5   Grazing: stocking versus capacity

GOAL 5.2 **Opportunities for consumptive and non-consumptive use**

Indicator 5.2.1   Recreation by reservation type

GOAL 5.3 **Develop new economic uses**

(see text)

GOAL 5.4 **Have a competitive, profitable and sustainable local economy**

Indicator 5.4.1   Population migration

Indicator 5.4.2   Economic diversity index

GOAL 5.5 **Contribute to the economic and social health of the region**

Indicator 5.5.1   Regional employment statistics

Indicator 5.5.2   Employment by industry

Indicator 5.5.3   Regional income distribution

Indicator 5.5.4   Education in the region

Indicator 5.5.5   Regional real estate values

Indicator 5.5.6   Net regional product

GOAL 5.6 **Optimize benefits through integration of resource uses**

(see text)

GOAL 5.7 **Minimize threats resulting from large-scale natural disturbances**

(see text)

GOAL 5.1
Sustainable use of biological resources

Measuring performance under Goal 5.1

Biological resources of the forest are a benefit to society, and this goal envisions their sustainable flow for current and future generations. Indicators chosen under this goal measure rates of extraction, looking specifically at timber, trapping, fishing, hunting and grazing.

- 5.1.1. Timber harvest relative to annual allowable cut

- 5.1.2 Trapping harvest

- 5.1.3 Number of fishing licenses sold

- 5.1.4 Hunting statistics

- 5.1.5 Grazing: stocking vs. capacity

Although Indicators 5.1.2, 5.1.3 and 5.1.4 are not compared to an actual allowable harvest,

they provide trends. This information is utilized by biologists, together with limited survey data, to determine shifts that should be made in the issuance of licenses and restrictions including closure of certain areas to hunting and fishing activities.

INDICATOR 5.1.1
Timber harvest relative to Annual Allowable Cut

The Annual Allowable Cut (AAC), is the annual timber extraction rate approved by the Alberta Government. Calculations are made in accordance with the Alberta Forest Act, which stipulates that annual timber extraction rates for Forest Management Agreements (FMA) (such as

that held by Weldwood of Canada) must be sustainable. The AAC is re-evaluated regularly (usually at 10-year intervals), and in cases of catastrophic events such as large fires or insect and disease outbreaks, is recalculated as necessary.

Within its FMA, Weldwood measures its annual harvest as a proportion of the available AAC within a "cut control" period. Cut control is the term used to compare actual cut (harvested volume) to the allowable cut. The FMA specifies cut control requirements as a minimum and a maximum harvest to be achieved. Weldwood has set an objective of complying with these cut control requirements.

A total of 78 percent of the 19,000,000 cubic metres (m³) Periodic Allowable Cut (PAC) for the period June 15, 1988 to June 14, 1998 was harvested (see table below). The 10-year carry-over was 4,186,850 m³. Approximately 75 percent of this amount (3,000,000 m³) will be harvested in the next 10-year period, from June 15, 1998-June 15, 2008. The PAC for the periods June 15, 1998 to June 14, 2003 and June 15, 2003-June 14, 2008 for conifer are 11,180,335 m³ (2,236,067 m³, multiplied by five years) and 759,115 m³ for deciduous (151,823 m³ multiplied by five years). In 1999 (May 1, 1999 - April 30, 2000), the harvest was 2,198,727 m³ of coniferous and 95,469 m³ of deciduous.

Periodic Allowable Cut Control for the period June 15, 1988-June 14, 1998
(Taken from Weldwood Sustainable Forest Management Stewardship Report, 2000)

	5-Year Total (m³) 1988 –1998	5-Year Total (m³) 1993-1998	10-Year Total (m³) 1988-1999
Periodic Allowable Cut	9,500,000	9,500,000	19,000,000
Harvest	5,594,196	9,176,001	14,813,150
% 5-Year PAC	59%	97%	N/A
% 10-Year PAC	29%	48%	78%

INDICATOR 5.1.2
Trapping harvest

With few exceptions (e.g. Provincial Parks), individual trap lines (which are called Registered Fur Management Areas - RFMAs) cover most provincial crown lands within the Foothills Model Forest Area. The majority of the Foothills Model Forest area is within two Fur Management Zones (FMZ), which reflect zones of similar environmental features. These are FMZ 4, which includes primarily the upper and lower foothills plus portions of the parkland natural region and FMZ 5 consisting of the mountain units. In a RFMA, a trapper may harvest fur-bearing animals during designated

seasons that vary in length (the longest being the beaver season of October 1 to May 15; the shortest being the lynx season of December 1 to January 31). In addition, an individual may obtain a Resident Fur Management Licence (RFML), which allows the person to harvest fur-bearing animals on any private land the trapper has permission to enter on. Harvest limits vary from one wolverine or fisher per year to no restriction for the number of red squirrels that can be harvested. Trappers are required to provide a signed affidavit each year indicating the number of each species harvested.

In general, trapping activity in the FMF area has declined over the last 20 years as the cost of trapping has increased without a corresponding increase in fur prices. As a result, tracking fur harvest as an indicator of sustainable resource management is of limited use due to the variability in trapper effort. The economic

viability of trapping combined with society's views on the use of fur for clothing will be variables that significantly affect the future of trapping not only within the FMF area, but also throughout Canada. Consequently, fur harvest could be considered as a minor economic indicator in the FMF area, rather than an indicator of SFM.

Sustaining healthy populations of fur-bearing animals and their habitats, while maintaining the opportunity to harvest them when markets warrant the effort, is a simpler, more meaningful measure or indicator for the FMF area. Currently there is no comprehensive mandate to ensure that a diversity of furbearer habitat is maintained within each RFMA.

Official summaries of trapping harvests are shown on the following page. Note that trapping is prohibited in national and provincial parks.

**FOOTHILLS MODEL FOREST
TRAPLINES**

Legend
☐ Traplines
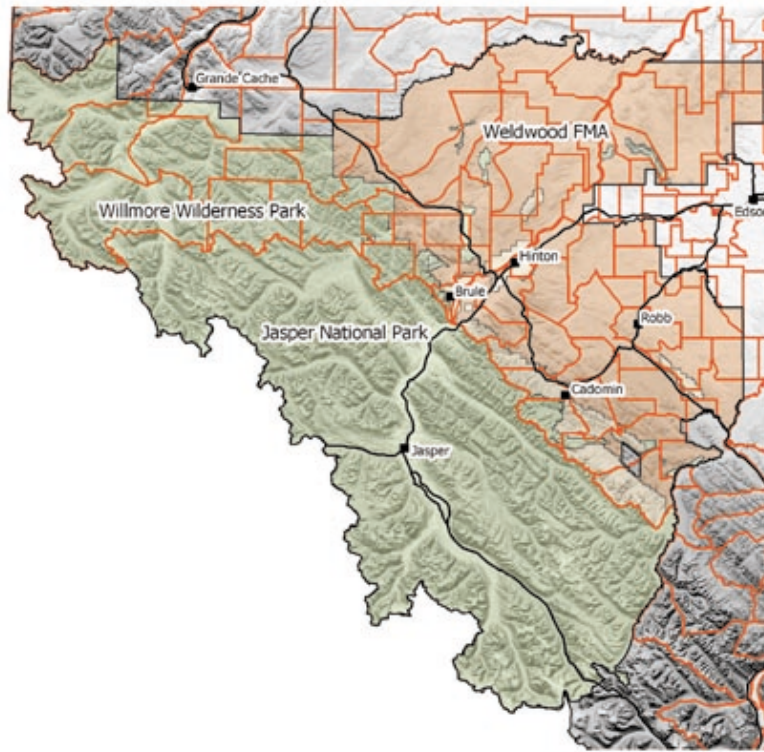
(Data was compiled by SRD)

Trapping Records 1990 - 2000
(Data compiled from SRD, Foothills Model Forest Region)

Species	Year										
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Beaver	335	284	315	320	254	201	183	221	248	172	233
Black Bear	5	1	2	4	3	2	4	6	5	3	
Coyote	114	75	82	111	86	90	60	75	86	30	72
Fisher	6	1	4	19	7	1	2	4	21	5	6
Fox	14	7	13	14	13	10	3	4	23	4	4
Lynx	13	6	21	20	9	8	5	10	8	1	9
Marten	13	4	12	21	19	19	21	35	535	290	507
Mink	26	15	23	15	17	8	3	4	14	11	6
Muskrat	603	645	743	462	398	398	328	432	26	6	23
Otter	0	0	0	2	0	0	1	1	8	3	1
Raccoon	0	0	0	0	0	0	0	1	0	0	0
Red Squirrel	3044	1362	1735	1417	1808	1433	739	459	1472	566	597
Weasel	222	88	202	191	158	102	112	53	79	37	58
Wolf	17	6	19	24	27	47	24	20	76	19	40
Wolverine	2	0	1	1	2	0	0	0	2	0	3
Other	4	0	0	0	0	0	0	0	0	0	1
TOTAL	4418	2494	3172	2617	2816	2320	1483	1323	2604	1149	1563

INDICATOR 5.1.3
Number of fishing licenses sold

Fish are a difficult resource to measure. An indication of the benefits provided to society, along with the activity to sustain the fisheries resource can be found by examining the number of fishing licences sold. Sport fishing licences provide some protection against over fishing, primarily through the impact on fishing activities, such as season restrictions and other special regulations, which attempt to maintain a sustainable fisheries resource.

The Foothills Model Forest is located within Alberta's Provincial Zone 1 Fish Management Zone - Eastern Slopes, stretching along the Rocky Mountains from Montana to the Grande Prairie region. The Foothills Model Forest contributes to the headwaters of many

significant watersheds including the North Saskatchewan Rivers, the Athabasca and Pembina Rivers, and the Smoky River. Within this zone, there are a number of alpine and foothills lakes with clear, cold streams that support numerous trout and mountain whitefish populations and Arctic grayling populations in the north. The following are the common game fish found in Zone 1:

- Yellow Perch
- Northern Pike
- Rainbow Trout
- Brook Trout
- Mountain Whitefish
- Walleye
- Arctic Grayling
- Lake Whitefish
- Brown Trout
- Cutthroat Trout
- Lake Trout
- Bull Trout

Alberta is well known for its fishing opportunities, enjoyed by residents and sportsmen around the world. Compared to other parts of Canada, Alberta has a relatively small number of fish bearing water bodies. The Alberta Government stocks many lakes with fish. Because of the high ratio of anglers per lake, the province has the third highest angling pressure in Canada. Sport fishing is so popular that demand often exceeds the capabilities of Alberta waters to produce sufficient numbers of fish. "Catch-and-release", or "zero-catch limit" fishing is part of the solution to enable angling, as it is highly valued today, as a high-quality recreational experience, rather than just a way to secure food. Much of the angling in the Foothills Model Forest also includes fly-fishing along the many streams for sports fish including such species as Rainbow Trout, Brook Trout and Bull Trout.

Sport fishing licences may be purchased anywhere in Alberta. The numbers identified in the accompanying table reflects the provincial sport fishing licences purchased at private licence issuers in communities within and adjacent to the Foothills Model Forest. Fishing is also allowed in Jasper National Park of Canada, although a sport fishing licence specific to the National Park is required. Purchases for these national sport-fishing licences are identified in the accompanying table.

Alberta Environment:
Resident Sports Fishing Licenses

Location	Year Issued		
	1998	1999	2000
Edson	2425	2194	2185
Grande Cache	879	827	687
Hinton	2101	2107	2129
Robb	106	94	92

* includes both annual and seasonal permits

Jasper National Park of Canada:
Fishing permits sold

Type of Permit	Year Issued					
	1989 -1990	1990-1991	1991-1992	1992-1993	1993-1994	1994-1995
Seven Day	7598	7047	6807	6429	6674	7641
Annual	4263	3888	3438	2837	2727	2644

INDICATOR 5.1.4
Hunting statistics

Wildlife requires habitat. To that end, the protection of critical wildlife habitat has become an issue relative to the combined impacts of timber harvest, the energy industry and increased recreational pressures. If productive populations are to be maintained, policies, which provide protection for these habitats, must be maintained and strengthened.

The Foothills Model Forest Area encompasses a diverse area of habitats for wildlife. Consequently, there are a number of wildlife species available to hunters within the region. A number of strategies are employed to control the harvest for certain species such as limited permits for grizzly bears, moose, antlerless elk, non-trophy sheep, quotas for cougars and minimum horn size restrictions for trophy bighorn sheep. In contrast, supplemental licenses are available for antlerless white-tailed deer in some areas to encourage additional harvest. Upland game bird and migratory bird seasons are relatively stable compared to big game seasons.

Autumn big game seasons open as early as late August for bighorn sheep as well as pre-rifle archery seasons for elk, moose, white-tailed deer and mule deer. Rifle season opens in mid September and continues as late as mid-December for antlerless elk in areas where haystack depredation is a reoccurring problem. Migratory and upland game bird seasons are also open throughout the region between September and December. Cougar seasons begin in December and continue to late February while grizzly and black bear spring seasons begin in early April and continue to early June (black bear can also be hunted in the fall).

As the harvest of more game species has become regulated through permit draws, wildlife managers have been able to better control and predict the outcome for game populations. This has lessened the likelihood of over harvest and for the most part, wildlife populations have responded favourably. However, inventories occur infrequently and the potential still exists

for dramatic declines (resulting from disease and/or unlicensed harvest) to remain undetected until licensed harvest becomes excessive. Additionally, as the amount of vehicle access increases as a result of industrial activity, so does the ability of unlicensed harvest to increase. Without a means of tracking these mortality agents, sustaining game populations becomes more challenging. More frequent inventories would reduce the risk of excessive harvest occurring.

The following tables provide harvest statistics, which can be used to measure success or failure of land use strategies to provide for elk and moose habitat. Alberta Government statistics drawn from telephone surveys and harvest records show the number of antlered elk harvested and the number of hunter-days expended per moose harvested. The latter numbers are given for three separate categories to reflect the season in which animals were taken.

Table 1

Number of antlered elk harvested by Wildlife Management Unit (WMU) within the Foothills Model Forest study area (1995 – 2000; based on compulsory registration).

	YEAR					
WMU	1995	1996	1997	1998	1999	2000
340	22	20	27	14	25	6
342	7	11	4	2	12	2
344	27	15	26	9	42	5
346	50	53	49	39	33	44
436	4	1	1	2	0	0
437	3	1	4	0	0	1
438	6	1	6	0	8	1
439	1	2	1	2	12	1
440	1	2	2	2	0	0
442	4	1	7	4	0	1
444	13	8	6	3	0	1

Bold numbers are from the telephone questionnaire and are estimates rather than actual registrations.
(Data compiled by SRD)

Table 2

Number of hunter days per moose harvested during the "Calling Season" by WMU within the foothills natural region of the Foothills Model Forest study area (1995 – 2000; based on telephone questionnaires).

	YEAR					
WMU	1995	1996	1997	1998	1999	2000
340	14.0	10.8	9.1	9.7	29.1	16.8
342	10.5	11.4	4.6	3.0	18.4	45.7
344	10.7	11.4	7.6	4.4	8.2	5.5
346	14.6	9.1	7.3	6.2	15.0	8.6

(Data compiled by SRD)

Table 3

Number of hunter days per moose harvested during the "Late Season" by WMU within the foothills natural region of the Foothills Model Forest study area (1995 – 2000; based on telephone questionnaires).

	YEAR					
WMU	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
340	31.4	17.5	26.2	23.3	24.9	28.5
342	57.3	13.8	0.0	39.7	25.3	43.4
344	79.0	24.8	0.0	32.2	23.3	14.4
346	47.0	18.4	20.9	11.0	24.3	13.0

Bold numbers are from general seasons (before introductions of late season draws).
(Data compiled by SRD)

Table 4

Number of hunter days per moose harvested during the "Permit Only Season" by WMU within the sub alpine natural region of the Foothills Model Forest study area (1995 – 2000; based on telephone questionnaires).

	YEAR					
WMU	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
436	12.6	25.3	10.2	29.0	6.0	0.0
437	9.4	5.5	9.6	5.4	6.9	5.6
438	8.4	12.2	14.6	17.2	18.8	12.0
439	0.0	N/A	0.0	16.0	9.3	0.0
440	12.3	12.2	0.0	18.4	10.7	8.5
442	15.0	21.3	15.5	11.5	31.5	0.0
444	10.2	9.7	N/A	6.3	0.0	12.0

(Data compiled by SRD)

INDICATOR 5.1.5
Grazing: Stocking versus capacity

Alberta Sustainable Resource Development issues a variety of dispositions for grazing purposes on an as-need/as-applied for basis. An evaluation of the full capacity for grazing opportunities in the Green Area has not been completed, as one of the prime objectives for the Green Area is to grow forests. Grazing is considered a use of the forest managed to meet public expectations and is to be implemented in an integrated manner.

Stocking rates are set by Alberta Sustainable Resource Development for each disposition type (Forest Grazing Licences, Grazing Leases, Grazing Permits, Head Tax Permits) so that livestock needs are matched with the available forage supply, to prevent overgrazing and to ensure protection of the plants and soil. Stocking is calculated in terms of Animal Units (AU). The AU defines the daily forage intake relative to the standard animal. In grazing terms, the AU represents one mature cow of approximately 1,000 pounds (455 kg), either dry or with calf up to six months of age. The Animal Unit Month (AUM) is the amount of forage required by an AU for one month, and is usually set at about 1,000 pound (455 kg) of forage dry matter.

Total AUMs represent the carrying capacity or the long-term average grazing that is available in an average year on a disposition with good management. Carrying capacities are determined from range surveys, ecological classification, mapping, grazing and plant clipping studies. Carrying capacity calculations include consideration of livestock and wildlife forage needs as well as an adequate protection of the plants and soil. Long-term carrying capacity is established at a level that will maintain the forage vigour and productivity and maintain the rangeland in healthy condition.

Detailed Carrying Capacity and Range Plant Community guides have been developed for several sub-regions within the province. These guides outline the species composition, forage production and suggested stocking rate (ha/AUM) of each range plant community. Stocking rate (ha/AUM) for each plant community is based on the fact that one Animal Unit (AU) requires 455 kg of dry weight forage for one month of grazing, and that only 25 percent of the total forage in a forest and only 50 percent of the total forage in a grassland is available for livestock use. These plant communities are then mapped to determine area covered by each community type. The calculation of area is important in the calculation of carrying capacity.

In addition, incidental grazing occurs through Commercial Trail Riding (CTR) Permits within Willmore Wilderness Park. CTR annual operating plans from 1999 to 2001 indicate an average of 8,643 horse use days within Willmore Wilderness Park. This does not include horse use days from the public or the hunting guides and outfitters.

Summary of grazing activity within the Foothills Model Forest:

32 active grazing dispositions occupying 7,987 hectares

AUMs allocated and used for June 1 to October 31, 2000	
Allocated	4,324 AUMS
Grazed	3,634 AUMS
Percent sustainable use	84 %

(Data compiled by SRD)

GOAL 5.2

Opportunities for comsumptive and non-consumptive use

Indicators of resource uses listed under Goals 5.1, and of land uses listed under goal 2.3, when viewed together, provide a profile of the some of the most important forest uses in the Foothills Model Forest, and provide insight into the opportunities being provided for both consumptive and non-consumptive use. However, one of the most important opportunities, recreational use, is provided for by a range of recreational reservations, as measured by the following indicator.

INDICATOR 5.2.1
Recreation by reservation type

Recreation is one of the values of the forest, and measures of recreational opportunities are an important component of sustainable forest management.

Recreation management of provincial lands has changed considerably over the last 15 years. Alberta Sustainable Resource Development was initially the principal manager of all recreational sites within the Green Area. The primary purpose for this was to enable recreational activities, while centralizing use of the forested land base to assist in fire prevention activities. However, with reduced budgets, increased interest for tourism opportunities, additions to Parks and Protected Areas through the Special Places Program and a transfer of mandate of recreation sites to the Alberta Community Development, Parks and Protected Areas, nearly the full mandate of recreation management lies with this new department. Other partners, such as Weldwood and private recreational operators, also contribute to recreation management in the Foothills Model Forest.

Alberta Community Development maintains a network of parks and protected areas. Many of these areas are tourism attractions, providing a range of outdoor recreation opportunities where Albertans and visitors enjoy and learn about our natural and cultural heritage. The number of hectares within or directly linked to the Foothills Model Forest which are maintained within this network include the following:

Reserve Type	Number of Hectares
Provincial Parks	9,835.15
Wildland Parks	57,148.15
Wilderness Area	459,671.04
Forest Recreation Area	443.38
Natural Area	3,708.97

(Data compiled by SRD)

Over the last five years, management and maintenance of several public campgrounds and recreational sites have been turned over to partnerships between Alberta Community Development (Parks & Protected Areas), Weldwood and Fox Creek Development Association, although Sustainable Resource Development still has interim agreements for some of the sites. Sites within the Foothills Model Forest include the following Forest Recreation Areas:

- Coalspur
- Emerson Lakes
- Fairfax Lake
- Little Sundance Creek
- Lovett River
- McLeod Group Campground
- McLeod River
- Pembina Forks
- Petite Lake
- Watson Creek
- Whitehorse Creek
- Wildhay River Group Campground

Weldwood also manages and maintains the Gregg River Day Use Area, which contains the historic Gregg Cabin, built in the early 1900's by the Dominion Forestry Branch. In addition, Weldwood manages and maintains seven trails that are used for non-motorized access – hiking, mountain biking, horseback riding and cross-country skiing.

- Bighorn Trail
- Canyon Creek Trail
- Emerson Lake Trail
- Happy Creek Trail
- Pine Management Trail
- Spruce Management Trial
- Wild Sculpture Trail

Others trails exist, particularly snowmobile trails, which are maintained and managed by various snowmobile groups from various towns

within and in close proximity to the Foothills Model Forest.

Campgrounds also exist within the Provincial and Wildland Parks. A listing of all the parks and associated recreation areas within the FMF include:

- William A. Switzer Provincial Park - Blue Lake, Cache Lake, Graveyard Lake, Greg Lake, Lakeside Lake and Jarvis Lake Provincial Recreation Areas
- Sundance Provincial Park - Emerson Lakes
- Rock Lake - Solomon Creek Wildland Park - Rock Lake Provincial Recreation Area
- Whitehorse Wildland Park - Whitehorse Creek Recreation Area
- Brazeau Canyon Wildland Park
- Big Berland Forest Recreation Area
- Weald Group Forest Recreation Area
- Wildhorse Lake Forest Recreation Area (including Kinky Lake Campground)

Privately-owned campgrounds include Folding Mountain and Alpine RV campgrounds. The Town of Hinton manages the Maskuta Creek , Roundcroft and Hinton campgrounds and these are operated by the Hinton Community Association.

Alberta Sustainable Resource Development, however, still issues a variety of dispositions for recreation purposes on an as-need/as-applied for basis. Surface rights are granted to commercial and non-commercial users under the Public Lands Act and include such uses as horse-holding areas, recreational campgrounds and storage sites. For more general public use, reservations (Crown land set aside outside of provincial parks and protected areas) are created to protect such areas as public campgrounds and trails not actively managed. The following table provides information and extent of these uses. Recreation data are not reported for Jasper National Park of Canada. Appropriate indicator(s) and data sets will be evaluated in 2003.

Foothills Model Forest
Extent of Recreation Types

Recreation Type	# Ha	Total	Reservation or Disposition
Commercial Development	12.9	2	Disposition
Trail Riding Base Camp	0.4	1	Disposition
Horse Holding Area	44.3	15	Disposition
Other Personal Use	0.4	1	Disposition
Storage Site	2.0	1	Disposition
Recreational Cottage	0.5	2	Disposition
Day Use	29.0	1	Reservation
Viewpoint	16.2	1	Reservation
Staging Area	72.9	5	Reservation
Trail *	9544.4	1	Reservation
Snowmobile Trail **	0**	3	Reservation
Hiking Trail*	3303.6	2	Reservation
Cross Country Ski Trail*	3000.0	5	Reservation
TOTAL	**16641.6**	**45**	

**Snowmobile trails cover extensive areas - trails approximately eight metres in width

(number of hectares of trail unavailable)

Trails cover extent of area that trail system crosses

(Data compiled by SRD)

GOAL 5.3
Develop new economic uses

No specific data has been provided for the assessemnt of this goal. However, the goal is closely linked to the creation of economic diversity. See:

• 5.4.2 Economic diversity index.

As new economic uses are developed over time, they will also be reflected by new or expanded indicators for Goals 5.1 and 5.2

GOAL 5.4
Maintain a competitive, profitable and sustainable local economy

Measuring performance under Goal 5.4

This goal concentrates on the forest's ability to maintain its contributions to local economies. This is one of the forest's benefits to society, expressed in factors such as options for employment and a general sense of community security. The primary indicators are as follows:

• 5.4.1 Population migration
• 5.4.2 Economic diversity index

by identifying historic and contemporary patterns of change in relation to regional social and economic conditions. Variables include: change in total population, and population breakdown by age and sex, five-year migration rates. Data are drawn from the census of Canada based on five-year intervals (1986, 1991, 1996).

Note: YH94 = Yellowhead 94

Figure 1
Population, 1996

Census Division	1986	1991	1996
YH 94	8,230	8,692	9,352
Hinton	8,629	9,046	9,961
Jasper	3,927	3,619	4,301
Grande Cache	3,646	3,842	4,441
Alberta	2,365,825	2,545,553	2,696,826
Canada	24,083,495	27,296,859	28,846,761

(Data provided by Population Statistics: Canada, Alberta and Census Subdivisions)

INDICATOR 5.4.1
Population migration

Resource-dependent communities are particularly vulnerable to business cycles and market fluctuations that directly affect migration patterns in local human populations. Population and migration data can make important contributions to the ongoing discussion of sustainability in forest-sector host communities

Figure 2
Percentage Change for Canada, Alberta and Census Subdivisions

Census Division	1981 to 1986	1986 to 1991	1991 to 1996
YH 94	4.0	1.2	7.6
Hinton	3.4	4.8	10.1
Jasper	14.8	-7.8	20.6
Grande Cache	-19.2	5.4	15.6
Alberta	5.7	7.6	5.9
Canada	5.1	7.9	5.7

Additional data is provided in Appendix B

Figure 3
Male Population by Age Cohorts, 1996

Census Division	Male population	Male pop. Percent of total. pop.	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75+
YH 94	4,960	53.0	1,160	665	580	910	680	530	305	130
Hinton	5,140	51.5	1,335	750	885	990	605	325	200	50
Jasper	2,210	51.4	335	435	530	490	210	100	85	25
Grande Cache	2,390	54.0	585	370	445	455	330	155	40	10
Alberta	1,348,310	50.0	315,125	191,960	217,475	242,965	161,915	102,050	74,015	42,805
Canada	14,170,030	49.1	3,025,210	1,955,185	2,226,965	2,403,010	1,847,515	1,224,320	943,365	544,460

Figure 4
Female Population by Age Cohorts, 1996

Census Division	Female population	Female pop. Percent of total pop.	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75+
YH 94	4,395	47.0	1,135	515	605	845	590	375	210	120
Hinton	4,835	48.5	1,295	735	880	895	510	285	155	80
Jasper	2,090	48.6	330	480	485	365	165	110	80	75
Grande Cache	2,040	46.0	550	340	355	380	260	105	30	20
Alberta	1,348,525	50.0	299,370	184,985	218,585	236,835	157,760	100,910	82,535	67,545
Canada	14,676,735	50.9	2,876,065	1,901,990	2,271,945	2,458,695	1,862,880	1,265,140	1,118,570	921,450

(Data for the above tables provided by Population Statistics: Canada, Alberta and Census Subdivisions)

Figure 5
Percentage of Total Male Population by Age Cohorts, 1996

Census Division	0-14 yrs	15-24 yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65-74 yrs	75+ yrs
YH 94	23.4	13.4	11.7	18.3	13.7	10.7	6.1	2.6
Hinton	26.0	14.6	17.2	19.3	11.8	6.3	3.9	1.0
Jasper	15.2	19.7	24.0	22.2	9.5	4.5	3.8	1.1
Grande Cache	24.5	15.5	18.6	19.0	13.8	6.5	1.7	0.4
Alberta	23.4	14.2	16.1	18.0	12.0	7.6	5.5	3.2
Canada	21.3	13.8	15.7	17.0	13.0	8.6	6.7	3.8

Figure 6
Percentage of Total Female Population by Age Cohorts, 1996

Census Division	0-14 yrs	15-24 yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65-74 yrs	75+ yrs
YH 94	25.8	11.7	13.8	19.2	13.4	8.5	4.8	2.7
Hinton	26.8	15.2	18.2	18.5	10.5	5.9	3.2	1.7
Jasper	15.8	23.0	23.2	17.5	7.9	5.3	3.8	3.6
Grande Cache	27.0	16.7	17.4	18.6	12.7	5.1	1.5	1.0
Alberta	22.2	13.7	16.2	17.6	11.7	7.5	6.1	5.0
Canada	19.6	13.0	15.5	16.8	12.7	8.6	7.6	6.3

Figure 7
Mobility Status, 1996

	Canada	Alberta	YH 94	Hinton	Jasper	Grande Cache
Total population 1 year + by place of residence 1 year ago	28,155,225	2,631,840	9,245	9,810	4,200	4,220
Non-movers	23,802,645	2,135,735	8,240	7,615	2,910	3,115
Movers	4,352,585	496,105	1,005	2,200	1,295	1,105
Intra-provincial movers	1,290,145	112,285	395	585	200	310
Inter-provincial movers	293,345	54,690	90	315	365	300
External movers	228,690	18,730	15	0	65	10
Total population 5 year + by place of residence 5 year ago	26,604,135	2,474,855	8,745	9,090	4,030	3,915
Non movers	15,079,415	1,244,925	5,830	3,915	1,930	1,745
Movers	11,524,725	1,229,930	2,910	5,175	2,095	2,170
Non-migrants	6,130,735	705,840	1,080	2,760	735	1,060
Migrants	5,393,985	524,090	1,830	2,410	1,360	1,115
Internal migrants	4,465,295	453,840	1,775	2,385	1,285	1,100
Intra-provincial movers	3,575,025	291,200	1,345	1,470	510	580
Inter-provincial movers	890,270	162,640	430	910	775	520
External migrants	928,690	70,250	55	20	80	10

(Data for the above tables provided by Population Statistics: Canada, Alberta and Census Subdivisions)

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Figure 8
Mobility Status, 1991

	Canada	Alberta	YH 94	Hinton	Jasper	Grande Cache
Total population 1 year + by place of residence 1 year ago	26,430,895	2,454,685	8,515	8,925	3,300	3,665
Non-movers	22,108,675	1,929,955	7,595	6,915	2,470	2,905
Movers	4,322,225	524,730	915	2,020	835	760
Intra-provincial movers	3,767,630	439,360	750	1,550	620	605
Inter-provincial movers	319,200	63,015	150	415	190	150
External movers	235,395	22,355	20	50	20	0
Total population 5 year + by place of residence 5 year ago	24,927,870	2,291,070	7,940	8,255	3,100	3,365
Non movers	13,290,685	1,081,105	5,210	3,420	1,460	1,355
Movers	11,637,185	1,209,960	2,735	4,835	1,640	2,010
Non-migrants	5,776,215	668,220	1,335	2,215	760	625
Migrants	5,860,970	541,745	1,390	2,625	880	1,385
Internal migrants	4,947,645	466,860	1,355	2,500	830	1,350
Intra-provincial movers	3,970,600	296,845	1,080	1,375	425	580
Inter-provincial movers	977,050	170,015	270	1,120	405	775
External migrants	913,320	74,890	45	125	50	30

Figure 9
Mobility Status, 1986

	Canada	Alberta	YH 94	Hinton	Jasper	Grande Cache
Total population 5 year + by place of residence 5 year ago	23,189,245	2,133,860	7,525	7,735	3,670	3,125
Non movers	13,053,240	1,039,285	4,825	3,325	1,440	1,270
Movers	10,136,005	1,094,575	2,695	4,410	2,230	1,855
Non-migrants	5,622,150	599,690	1,275	2,510	910	785
Migrants	4,513,855	494,890	1,425	1,900	1,325	1,070
From same census division	980,240	89,050	285	120	15	30
From same province	2,145,215	172,565	955	990	530	480
From different province	924,490	177,285	165	725	730	440
From outside Canada	463,905	55,985	20	65	40	115

(Data for the above tables provided by Population Statistics: Canada, Alberta and Census Subdivisions)

INDICATOR 5.4.2
Economic diversity index

Economic diversity is an important concept for natural resource-based communities. The more diverse a community is, the less vulnerable it will be to large economic shocks. Economic diversity is the proportion of total income derived from one sector, divided by the total

income from all sectors. If one sector causes high dependence, diversity drops. The level of diversity ranges from zero to 2.48907, with zero being the least diverse and 2.48907 being the most diverse.

Forest reliance is another concept related to diversity. Forest reliance is a measure of the importance of the forest industry in the economy. It is calculated using employment and income in the forest sector as a proportion of the total employment and income in all sectors. Jasper is zero percent forest reliant, whereas Hinton is approximately 40 percent forest reliant. Data are based on five year intervals (1986, 1991, 1996).

The following shows diversity index ratings for selected communities within the Foothills Model Forest, and other communities within Alberta for comparison (1996 data):

Alberta	**2.032436**
Edson	2.16058
Grande Cache	1.82129
Hinton	1.982755
Jasper	1.68965
Edmonton	**1.87457**
Calgary	**1.9517**
Red Deer	1.96824
Slave Lake	2.07796
Whitecourt	1.95298

(Data compiled from Statistics Canada census information)

GOAL 5.5

Contribute to the economic and social health of the region

Measuring performance under Goal 5.5

This goal is related to the forest's ability to maintain its contributions to the broader welfare of the region. This is one of the forest's benefits to society expressed in factors such as employment rates, wage levels, education and real estate values. The primary indicators are:

- 5.5.1 Regional employment statistics
- 5.5.2 Employment by industry
- 5.5.3 Regional income distribution
- 5.5.4 Education in the region

- 5.5.5 Regional real estate values
- 5.5.6 Net regional product

INDICATOR 5.5.1
Regional employment statistics

Indicators of employment and labour force participation provide an important source of understanding about the health of a community. Healthy communities are marked by high labour force participation and low unemployment,

indicative of a large proportion of residents in the labour force and able to find gainful employment. In addition to employment and labour force participation rates, a healthy and productive community is defined by other aspects of employment such as working conditions, employment stability, and compatibility with local levels of available human capital. These and other aspects of employment, combined with employment statistics, provide a multi-dimensional perspective on the regional labour market. Variables include: unemployment rates (male and female), labour force participation rates, full and part-time employment, and employment by industrial classification (a measure of economic diversity). Data are based on five year intervals.

**Foothills Model Forest
Employment**

Notes on Employment

The unemployment rate measures the proportion of people in the labour force who were actively searching for a job but did not have work in the week prior to the census. This includes people who were temporarily laid off or who had arrangements to start a new job within four weeks. Those who did not actively seek employment, such as discouraged workers or domestic workers, are considered to be not in the labour force.

The participation rate measures the number of people in the labour force as a proportion of the total population. The labour force is comprised of both employed and unemployed persons.

**Figure 1
Labour Force Activity by Gender, 1996**

Census Division	15 Years and Over		In labour force		Employed		Unemployed	
	male	female	male	female	male	female	male	female
YH 94	3,795	3,265	3,025	2,075	2,785	1,940	240	135
Hinton	3,790	3,535	3,245	2,285	3,040	2,165	205	115
Jasper	1,860	1,725	1,625	1,385	1,555	1,345	70	35
Grande Cache	1,660	1,490	1,425	905	1,360	830	70	75
Alberta	1,021,435	1,033,585	810,015	676,965	750,840	628,865	59,170	48,100
Canada	11,022,455	11,606,470	8,007,955	6,804,745	7,191,125	6,127,615	816,830	677,130

**Figure 2
Unemployment and Participation Rate by Gender, 1986-1996**

Census Division	1986				1991				1996			
	unemployment rate		participation rate		unemployment rate		participation rate		unemployment rate		participation rate	
	male	female	male	female	male	female	male	female	male	female	male	female
YH 94	10.2	10.6	79.9	49.3	8.6	6.0	82.4	62.8	7.9	6.5	79.7	63.6
Hinton	11.2	7.9	88.8	60.0	7.3	8.1	89.1	65.7	6.3	5.0	85.6	64.6
Jasper	9.3	7.9	91.2	77.3	2.2	4.0	89.1	79.6	4.3	2.5	87.4	80.3
Grande Cache	11.7	8.2	86.7	66.4	9.5	10.8	89.4	66.8	4.9	8.3	85.8	60.7
Alberta	9.8	9.6	82.7	62.5	7.5	8.2	81.8	66.2	7.3	7.1	79.3	65.5
Canada	9.6	11.2	77.5	55.9	10.1	10.2	76.4	59.9	10.2	10.0	72.7	58.6

(Data compiled from Statistics Canada census information)

INDICATOR 5.5.2
Employment by industry

Employment by industry provides an indication of the economic health of sectors within the region. It is also a way of tracking economic diversity. If all employment is derived from a single sector, the economy and the labour force are more susceptible to external shocks. This also connects to community. Some would argue that more diversity in the labour force (and therefore the community) provides a healthier social network.

Figure 1
Employment by Industry, 1996

	YH 94	Hinton	Jasper	Grande Cache	Alberta
All industries	5,065	5,465	3,010	2,300	1,461,360
Agricultural and related service industries	820	10	0	10	88,815
Fishing and trapping industries	0	0	0	0	370
Logging and forestry industries	255	205	0	70	5,760
Mining (including milling), quarrying and oil well industries	605	925	10	655	75,200
Manufacturing industries	440	815	15	170	121,365
Construction industries	460	295	80	90	100,680
Transportation and storage industries	415	280	345	55	72,150
Communication and other utility industries	40	90	25	120	43,325
Wholesale trade industries	85	180	35	60	76,115
Retail trade industries	430	815	405	190	178,125
Finance and insurance industries	75	90	45	15	40,075
Real estate operator and insurance agent industries	20	105	10	15	28,015
Business service industries	155	145	50	30	101,790
Government service industries	145	120	265	300	75,410
Educational service industries	225	275	120	125	97,535
Health and social service industries	170	195	130	160	132,610
Accommodation, food and beverage service industries	385	610	1,245	140	107,975
Other service industries	335	295	230	100	116,040

(Data compiled from Statistics Canada census information)

Figure 2
Employment by Industry, 1991

	YH 94	Hinton	Jasper	Grande Cache	Alberta
All industries	4,620	5,085	2,460	2,065	1,404,835
Agricultural and related service industries	795	20	15	0	94,320
Fishing and trapping industries	0	0	0	0	380
Logging and forestry industries	185	300	0	60	6,045
Mining (including milling), quarrying and oil well industries	560	835	10	430	79,695
Manufacturing industries	330	815	10	240	106,905
Construction industries	540	350	105	65	102,095
Transportation and storage industries	320	190	405	50	65,150
Communication and other utility industries	80	45	20	145	46,145
Wholesale trade industries	165	125	20	30	64,565
Retail trade industries	325	545	285	210	172,700
Finance and insurance industries	25	85	95	25	44,210
Real estate operator and insurance agent industries	55	80	45	30	26,425
Business service industries	75	110	35	20	80,055
Government service industries	270	195	255	265	102,470
Educational service industries	185	270	80	105	96,715
Health and social service industries	185	280	100	110	125,780
Accommodation, food and beverage service industries	335	530	790	140	94,820
Other service industries	190	295	180	115	96,355

(Data compiled from Statistics Canada census information)

INDICATOR 5.5.3
Regional income distribution

The distribution of material resources within a community is one way of measuring equality. Therefore, an assessment of income distribution allows us to examine concentrations and deficiencies in wealth according to specific characteristics such as gender and race. If employment income appears to be evenly

distributed, it is likely that a large proportion of the community is benefiting from the local economy. Conversely, if employment income is concentrated in a small proportion of residents, then questions may arise regarding equity and long-term community well being. Variables include: median incomes for male and female and income distribution for male and female. Data are based on five year intervals (1986, 1991, 1996).

Figure 1
Median Household Income, 1986-1996*

Census Division	Median household income		
	1986	1991	1996
YH 94	35,979	39,591	41,704
Hinton	57,322	56,914	58,028
Jasper	44,260	50,385	50,364
Grande Cache	56,249	58,919	62,176
Alberta	42,623	43,255	42,701
Canada	39,795	41,822	40,209

*adjusted to 1996 dollars

Figure 2
Percentage Change in Median Household Income, 1986-1996*

Census Division	Percent change in median		
	1986 to 1991	1991 to 1996	1986 to 1996
YH 94	10.0	5.3	15.9
Hinton	-0.7	2.0	1.2
Jasper	13.8	-0.0	13.8
Grande Cache	4.7	5.5	10.5
Alberta	1.5	-1.3	0.2
Canada	5.1	-3.9	1.0

*adjusted to 1996 dollars

(Data for Figures 1 & 2 compiled from Statistics Canada census information)

Figure 3
Households by Income Range for Selected Jurisdictions, 1996

Income range	YH 94	Hinton	Jasper	Grande Cache	Alberta	Canada
All private households	3,265	3,435	1,545	1,400	979,175	10,820,050
Under $10,000	225	160	55	45	66,115	865,955
10,000-19,999	490	250	185	115	132,575	1,724,510
20,000-29,999	500	265	175	90	133,080	1,453,675
30,000-39,999	310	350	195	95	123,810	1,340,905
40,000-49,999	500	325	145	115	114,800	1,215,060
50,000-59,999	285	455	190	160	101,300	1,053,970
60,000-69,999	280	515	105	225	83,100	849,865
70,000-79,999	190	330	95	190	62,300	645,280
80,000-89,999	125	240	125	105	46,420	473,285
90,000-99,999	125	205	110	80	31,830	329,945
100,000 and over	240	340	160	180	83,835	867,605
Average income	47,612	58,796	55,654	63,725	51,118	48,552
Median income	41,704	58,028	50,364	62,176	42,701	40,209

Figure 4
Incidence of Low Income by Family and Individual, 1986-1996

Census Division	Incidence of low income (proportion of population)					
	1986		1991		1996	
	economic families	unattached individuals	economic families	unattached individuals	economic families	unattached individuals
YH 94	16.1	33.7	11.9	24.1	12.3	23.8
Hinton	9.8	18.1	7.7	16.6	8.3	23.4
Jasper	7.0	24.5	6.0	20.3	5.1	36.5
Grande Cache	7.2	7.8	5.4	25.5	10.3	19.4
Alberta	13.8	32.2	13.9	35.5	14.9	39.2
Canada	14.3	38.0	13.2	36.5	16.3	42.2

(Data for Figures 3 & 4 compiled from Statistics Canada census information)

INDICATOR 5.5.4
Education in the region

Communities with well-educated residents who possess diverse skills and entrepreneurial capacity are better able to adapt to changing labour market conditions. These attributes are all aspects of human capital. Low human capital communities, those that lack leadership, have low education attainment levels, and either poor skills or very specialized skills, will have greater difficulty making adjustments to global, national, or regional economic changes. Variables include: full-time school attendance, education attainment, highest level of education achieved. Data are based on five year intervals (1986, 1991, 1996).

Figure 1

Education Categories as a Percentage of Total Population 15 Years +, 1996

Census Divisions	Total population	Less than grade 9	Gr. 9-13	Some trades or non-university	Some university
YH 94	7,060	10.8	49.4	30.0	9.8
Hinton	7,330	6.7	46.6	33.4	13.3
Jasper	3,585	2.1	34.0	36.1	27.6
Grande Cache	3,155	5.5	44.5	36.6	13.3
Alberta	2,055,020	7.5	37.8	31.1	23.5
Canada	22,628,925	12.1	37.0	27.9	23.0

Figure 2

Education Categories as a Percentage of Total Population 15 Years +, 1986

Census Divisions	Total population	Less than grade 9	Gr. 9-13	Some trades or non-university	Some university
YH 94	6,030	20.5	48.4	22.6	8.5
Hinton	6,155	9.0	47.1	31.2	12.7
Jasper	3,310	3.0	43.5	28.7	24.6
Grande Cache	2,380	9.5	47.1	29.4	14.1
Alberta	1,779,375	10.8	41.2	27.3	20.6
Canada	19,634,100	17.3	39.9	24.4	18.4

(Data for Figures 1 & 2 compiled from Statistics Canada census information)

INDICATOR 5.5.5
Regional real estate values

There is substantial anecdotal evidence that the boom and bust cycles of primary resource industries cause similar cycles in host community property values. Dramatic increases and decreases in the value of land often translate into stressful, if not destructive, circumstances for the average resident. Both market and non-market factors play a role in the value of real estate. Depending on the extent to which these factors can be identified and anticipated, residents of resource-dependent communities may be able to mitigate some of the historic volatility in local real estate markets. Variables include: average value of a dwelling, average gross rent, owner's major payments on housing, percentage of owned versus rented dwellings. Data are based on five year intervals (1986, 1991, 1996).

Figure 1
Average Dwelling Value and Payments, 1986-1996*

Census Division	Average value of dwelling			Average major payments (monthly)			Average gross rent (monthly)		
	1986	1991	1996	1986	1991	1996	1986	1991	1996
YH 94	84,592	87,158	105,245	532	540	582	489	525	444
Hinton	100,480	104,550	111,949	944	750	786	713	568	570
Jasper	142,211	163,899	225,783	793	612	809	790	614	650
Grande Cache	73,449	77,892	92,762	889	724	673	766	593	595
Alberta	114,725	122,795	126,979	817	769	738	682	611	555
Canada	114,575	154,834	147,877	675	759	754	621	622	595

values adjusted for inflation to 1996 dollars.

Figure 2
Change in Average Dwelling Value and Payments, 1986-1996*

Census Division	Percent change over five years					
	Value of dwellings		Owners major payments		Gross rent	
	1986 to 1991	1991 to 1996	1986 to 1991	1991 to 1996	1986 to 1991	1991 to 1996
YH 94	3.0	20.8	1.5	7.7	7.4	-15.5
Hinton	4.1	7.1	-20.5	4.7	-20.3	0.3
Jasper	15.3	37.8	-22.8	32.2	-22.3	5.8
Grande Cache	6.0	19.1	-18.6	-7.0	-22.6	0.4
Alberta	7.0	3.4	-5.9	-4.0	-10.4	-9.2
Canada	35.1	-4.5	12.4	-0.7	0.1	-4.3

based on values adjusted for inflation to 1996 dollars

(Data for Figures 1 & 2 compiled from Statistics Canada census information)

INDICATOR 5.5.6
Net regional product

Net regional product (NRP) is the combination of all payments by a specific sector for labour, capital, resource rents (i.e., primary inputs to production), and indirect taxes net of subsidies. NRP is also a measure of the "value-added" in an economy. In short, net regional product is the value of goods and services produced in the region in a year. A sectoral analysis of the NRP indicates the contribution made by that sector to the economy. A region such as the Foothills Model Forest will be interested in keeping the forestry sector NRP stable or growing (on a per capita basis) for sustainability. NRP per capita represents a "standard of living" measurement. For trend analysis, it will be measured in constant dollars. Data was provided by Statistics Canada, the Alberta economic accounts, the Alberta input-output tables, the Alberta Government, and in some cases, primary data collected from companies. NRP has some drawbacks, and is not considered a complete measure because traditional economic accounts ignore the value of natural capital. Steps may be taken in the future to incorporate natural capital. Measurement intervals parallel Statistics Canada census years.

Net Regional Product, 1996

Sector	Net Regional Product ($)	Percent of Total Foothills Model Forest
Forestry	176,371,082.60	27.3
Wood	20,385,051.20	3.2
Mining	179,023,084.70	27.7
Crude petroleum and natural gas	90,068,192.80	13.9
Visitor	108, 915,564.40	16.8
Rest of the economy	72,140,069.00	11.2
Total Foothills MF	646,903,044.80	100.0

Population (1996) Foothills Model Forest   15,540

Foothills Model Forest per capita 1995	$41,628
Alberta Gross Domestic Product per capita 1995 **	$31,078
Canada Gross Domestic Product per capita 1995 **	$26,213

*** Data compiled from Alberta Treasury 1996: Alberta Economic Accounts*

GOAL 5.6
Optimize benefits through integration of resource uses

Definitive indicators for this goal have not to date been identified, agreed upon, or reported. Determination of whether benefits have been optimized is difficult. It is also contentious and likely to remain so, because partners assess forest values in different ways and from varying perspectives. Nevertheless, there is both a recognized need for and a trend towards the integration of uses in the Foothills Model Forest. Ways if measuring this trend will be explored for future reporting.

GOAL 5.7
Minimize threats resulting from large-scale natural disturbances

Large-scale natural disturbances may result from fire, and from insect or disease infestation of forest trees. Many activities take place in the Foothills Model Forest aimed at minimizing threats from such disturbances. These include those of the provincial forest protection program, forest protection agreements between the provincial government and disposition holders, and *FireSmart* and prescribed fire initiatives as being implemented around Jasper and Hinton. The most definitive indicators of whether threats are being minimized are trends in the incidence and extent of the disturbances. Thus the selected indicators for this goal are the occurrence and severity of wildfire , insects and disease, as reported under Goal 2.2:

- 2.2.1 Occurrence and severity of wildfire;
- 2.2.2 Occurrence of insects and disease

CRITERION 6

Accepting Society's Responsibility for Sustainable Development

GOAL 6.1 **Ensure key policy decisions are timely, fair, open and equitable**

(see text)

GOAL 6.2 **Ensure broad participation of interested parties in decision-making processes**

Indicator 6.2.1 Activities that allow interested parties to participate in decision-making activities

GOAL 6.3 **Conserve historical resources**

(see text)

GOAL 6.4 **Promote cooperation, partnership and shared responsibility for sustainable forest management**

Indicator 6.4.1 Activities demonstrating sustainable forest management participation

GOAL 6.5 **Communicate the concepts and benefits of sustainable forest management, and increase the levels of education, knowledge and awareness**

Indicator 6.5.1 Activities demonstrating communication and education

GOAL 6.6 **Continual improvement of sustainable forest management practices**

(see text)

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GOAL 6.1

Ensure key policy decisions are timely, fair, open and equitable

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Achievement of this goal is difficult to measure because perceptions of what is timely, open and equitable are understandably variable and subjective. No specific indicators are reported here, but some measure of progress towards the goal are provided by the following incators reported in

other parts of this report:

- 6.2.1 Activities that allow interested parties to participate in the decision-making process

- 6.4.1 Activities demonstrating participation

- 6.5.1 Activities demonstrating communication

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GOAL 6.2

Ensure broad participation of interested parties in decision-making processes

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Measuring against Goal 6.2

Broad and equitable sharing of desion-making powers is seen as an important component of a sustainable community. This goal is addressed by an activity indicator, which takes note of the various examples of broad participation in decision-making processes. The primary indicator is:

- Indicator 6.2.1 - Activities that allow interested parties to participate in decision-making activities

INDICATOR 6.2.1
Activities that allow interested parties to participate in decision-making activities

Each of the Foothills Model Forest partners has principles and methods that enable interested parties the opportunity to participate in the decision-making process. These methods range from municipal and provincial elections to stakeholder involvement groups to a commitment to respond with information when questions or concerns are raised.

Weldwood of Canada, for instance, makes the commitment to respond to public input (through strategic, landscape Detailed Forest Management Plans to operational, localized Compartment Plans)- either accepting it or rejecting it – with an explanation of why the request or suggestion can or cannot be accepted. Agencies involved in consultative processes give stakeholders a seat at the table and an opportunity to be heard. A distinction is sometimes made between those who have responsibility for management – and hence accountability – and those who are not vested with this responsibility and accountability. The former are accountable to society for the results of their actions, and are rewarded or penalized by society in accordance with their performance. It is a fine line, however, as being accountable obliges decision-makers to listen to parties who may not have accountability, but who certainly have a firm interest in the kind of world that is left for future generations.

Energy developments are regulated primarily by the Alberta Energy and Utilities Board (AEUB), whose mission is to ensure that the discovery, development, and delivery of Alberta's resources occurs in a manner that is fair, responsible and in the public interest. Before any permits or licenses are issued, the AEUB requires development proponents to inform potentially affected parties, including other industrial users and the public, of the nature of the proposal and invite comments or concerns. The extent of public consultation expected is related to both the size and type of proposed projects. Consultation and discussion may include public meetings and open houses. Project proponents deal directly with the concerns identified by providing more information, detailing justifications, or by altering their project plan.

Some larger projects may also require approvals from Alberta Environment. This process may involve specific environmental planning or impact assessment protocols and may require public notification. This provides another opportunity to deal with the public's unresolved environmental concerns before projects proceed. The public has an opportunity to contest approved projects by appealing to the Alberta Environmental Appeal Board (AEAB). The AEAB will determine if the parties are directly affected, and may conduct a public hearing.

The Natural Resources Conservation Board (NRCB) reviews applications for approval of major natural resource development projects in Alberta. Projects reviewed under the NRCB Act include those from the forest, recreation and tourism and mining industries, water management projects and projects referred to the NRCB by the Alberta Cabinet. The NRCB must decide if these projects are in the public interest, and in making this determination must consider social, economic and environmental effects. The Minister of Alberta Sustainable Resource Development is responsible for the NRCB. NRCB approvals must be authorized by the Alberta Cabinet, and are in addition to any licenses, permits or approvals stipulated by other acts, regulations or by-laws.

Where unresolved concerns remain, the Board responsible determines whether the concerned parties are directly affected (the AEAB must also determine whether the issue is environmental in nature) and may initiate a public hearing process. Following the hearing the Board responsible may issue the approval, direct changes to the plan, or refuse the proposal.

The following is a listing of activities undertaken by some of the Foothills Model Forest partners to enable interested parties to participate in the decision-making process:

Alberta Sustainable Resource Development:

- Local Advisory Committees for small timber permit holders.

- Public input into department-led Crown planning initiatives, such as the Special Places program or Forest Management Plan development.

- Northern East Slopes Integrated Resource Management Steering Committee

Private Sector:

- Cheviot Mine Environmental Impact Assessment Panel hearings

- Cadomin Environmental Protection Association

- Cardinal River Coals hunter meetings: public access trails

- Weldwood's Forest Resource Advisory Group: 10 meetings in 1999; eight meetings in 2000.

- Weldwood's newspaper advertisements soliciting input on the identification of Canadian Standards Association (CSA) values, indicators, goals, objectives and strategies, placed in 1999 and 2000. Also CSA Open House in Hinton in 2000; nine attendees.

Parks Canada

In Jasper National Park of Canada (JNP), the public is consulted on a range of issues from the development of the park management plan to changes to fishing regulations.
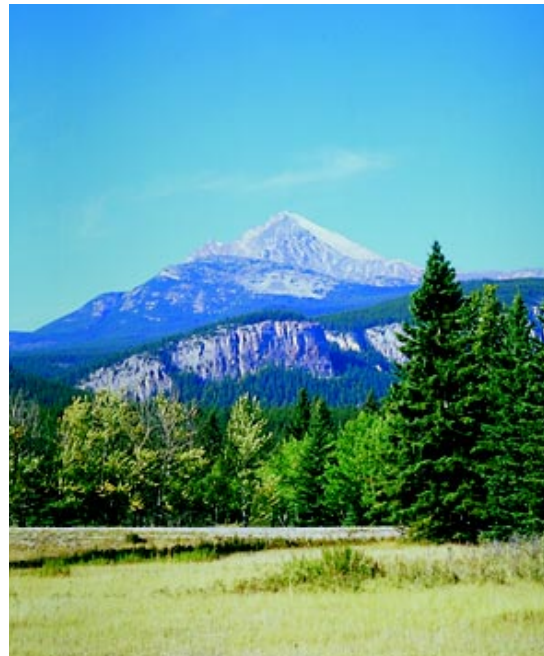
A key opportunity for public participation for JNP is the Park Management Planning process. JNP has a requirement to table its Park Management Plan in Parliament every 10 years, with a review or update every five years. JNP is also embarking on an annual reporting program, which will include public involvement. A routine opportunity for public participation occurs as the Park executes its duties for projects, which are subject to the Canadian Environmental Assessment Act. Under such projects a range of participation occurs from the informal/passive offer of involvement to structure formal consultative processes. Likewise, the building permit/development review process has opportunities for public participation in decisions.

Other opportunities are created as needs arise, such as the recent creation of a Trail Stewardship program, where a diverse group of stakeholders and Park staff work to address trail issues and concerns. JNP convenes participatory processes as needed to address specific matters arising from the JNP management plan, such as area plans.

GOAL 6.3
Conserve historical resources

Historical resources include pre-contact archaeological sites, aboriginal resources (e.g. campsites, other occurrences of artifacts), and non-aboriginal sites (artifactual and structural remains and still-standing structures relating to historical events and themes).

Reporting on indicators for this goal has been deferred pending completion of inventories currently underway.

GOAL 6.4
Promote cooperation, partnership and shared responsibility for sustainable forest management

Sustainable forest management is not the responsibility of any one agency or sector. Its success will rely on an ever-expanding group of supporters who will work together towards a common goal.

The indicator chosen for measurement against this goal is an activity-based listing of participation in the reporting period. The primary indicator is:

INDICATOR 6.4.1
Activities demonstrating sustainable forest management participation

This indicator demonstrates the general level of effort expended by those participating in activities that promote sustainable forest management.

For this report, information was only available from Weldwood of Canada, Hinton Division.

Weldwood participation in Sustainable Forest Management (SFM) initiatives during 2000

(Weldwood of Canada, 2000 Sustainable Forest Management Stewardship Report)

Initiative	Description
Alberta Chamber of Resources	Resource management issues forum and initiatives
Canadian Pulp and Paper Association Biodiversity Network*	National and international forest biodiversity conservation
Canadian Pulp and Paper Association Forest Management Committee*	National and international forest management
Cheviot Mine Environmental Impact Assessment Panel Hearings	Cumulative effects of coal mine development on an area that includes portions of FMA
Endangered Species Conservation Committee	Alberta species at risk designations and recovery efforts (AFPA representative)
Forest Resource Advisory Group (FRAG)	Public consultation, including liaison with other public groups
Foothills Model Forest Land Managers Forum	SFM for Foothills Model Forest landbase, which includes FMA
Ground Rules Standing Committee	Ground rules development and implementation
Integrated Pest Management Committee	Forest insect and disease management
Integrated Resource Management Steering Committee (IRMSC)	IRM policy and implementation
Northern East Slopes Integrated Resource Management Strategy	SFM for Northern East Slopes Region, which includes FMA
Policy Committee	Forest policy direction and confirmation
Regional Carnivore Management Group	Carnivore conservation initiatives for Northern East Slopes Region, which includes FMA
West Central Alberta Caribou Standing Committee (also Research and Habitat Subcommittees)	Caribou conservation initiatives for west central Alberta caribou range, which includes portion of FMA
Alberta Genetic Resources Council	Tree improvement deployment policy
AFPA Forest Management Committee	Forest management policy
AFPA Silviculture Committee	Silviculture policy
AFPA Forest Planning Subcommittee	Forest Management Planning manual
AFPA Herbicide Task Force	Herbicide policy
AFPA Land Use Subcommittee	Land use policy
AFPA Timber Damage Subcommittee	Timber damage appraisal system
AFPA Forest Protection Committee	Forest protection policy
Alberta Forestry Research Institute Advisory Committee	Directs forestry research in Alberta
Yellowhead Corridor Working Group	Development nodes in the Yellowhead Corridor

(AFPA = Alberta Forest Products Association)

* Now Forest Products Association of Canada

GOAL 6.5

Communicate the concepts and benefits of sustainable forest management, and increase levels of education, knowledge and awareness.

The overall goal of sustainable forest management requires the support, understanding and participation of the broader public as well as government and industry. Achieving this requires communication and education activities that inform and engage the general public and community stakeholders.

INDICATOR 6.5.1
Activities demonstrating communication and education

The following is a list of activities undertaken by the Foothills Model Forest and some of its partners:

Foothills Model Forest Communications Initiatives

April 1999 - March 2001

The following activities were implemented to reach local, provincial and national audiences, and are categorized by communications objective.

Media Relations

- Articles, stories and interviews in local, provincial and national newspapers, TV and radio stations

Government Relations

- Individual meetings and presentations
- Tours

Knowledge Transfer

- Two newsletters per year
- Annual Report
- Natural Disturbance Quick Notes – six per year
- Research forums, workshops, symposiums and presentations
- Web site (www.fmf.ab.ca)
- Foothills Model Forest Research tool kits

Community Relations

- Print and radio advertisements
- Interpretive Tours
- Interpretive Programs
- Natural Resources Interpretive Park
- Conferences and Trade Shows
- Presentations
- Kiosks (external)

Developed proposal for school library

Educational Relations

(In conjunction with Forest Environment Education Society of Alberta - FEESA)

- Two edu-kits
- Numerous eco-tours
- Newsletters
- In-class presentations
- Representation at Alberta Teachers' Conventions, professional development days and other educational conferences and fairs
- Forest Education Leadership Institute

Cardinal River Coals Communications Initiatives

The following communications initiatives are predominantly ongoing interface activities with relevant Cardinal River Coals' publics.

- Luscar Mine-Cadomin Environmental Protection Association (CEPA) annual meetings to review information and discuss current mining activity.
- Hunter access trails meeting-CRC meets each spring, to discuss the status of the public access trails across the mine.
- Federation of North American Wild Sheep (FNAWS) and Rocky Mountain Elk Foundation.

Other Presentations - CRC is called on to make presentations to community groups such as the Rotary Club and the Chamber of Commerce

- Cheviot Mine - CRC held 65 meetings, 11 open houses and had a mailing list of 950 addresses in the Cheviot public consultation program.
- CRC maintains ongoing communication with the following groups: CEPA, Alexis and Smallboys First Nations, the Alpine club and the Mountain Park Historic Association.

Weldwood of Canada Communication initiatives, 2000

The following communications initiatives were used to reach both internal and external audiences. They are grouped accordingly below.

Internal Communications

- Quarterly Newsletter
- Communication Boards
- Mill Employee Education Program
- Information Sharing
- Presentation Library

External Communications

- Four TreeBune issues
- Audience Identification/ Interface
- Speaking Engagements/ Speakers Bureau
- Response to Inquiries
- Emergency Communications Plan
- Stewardship Publications and advertisements
- Hinton Trade Fair
- Open Houses
- Permanent Kiosks

(Developed proposal for school libraries)

- Website (www.hintonforestry.weldwood.com)
- Forest History Project

(Project continued in 2000)

- Public Tours - Weldwood/ Foothills Model Forest
- Recreation Program
- Forest Resources Advisory Group

(Public report to the community on FRAG activities developed and published in local newspaper)

- Forest Certification Communication

In 2000, the Weldwood Forest Resources Department also designed and developed a new website - *www.hintonforestry.weldwood.com*. This website was part of Weldwood's commitment to continue improving communication with the public. It includes an e-mail address the public can use to ask questions.

Parks Canada Communications Initiatives, 1998-2000

The following communications initiatives were used to reach both internal and external audiences, and are grouped below by year.

1998

- Ecological Issues In Jasper: fact sheets and presentations.

- Park Management Plan: fact sheets, displays and discussion with Parks Canada staff, newspaper advertisements, public service announcements and 1-800 line; 3,463 draft plans sent to individuals and organizations, management plan and analysis of public comments mailed out, plan placed on website.

- Canadian Environmental Assessment Act (CEAA): ongoing notification of opportunity to review and comment on environmental assessments as per the CEAA, notification through newspaper and direct consultation.

1998 & 1999

- Jasper Community Plan: newsletter inserted in local paper, deposited in local mailboxes and mailed to 2,400 national stakeholders, start regular community plan meetings with town representatives, 2 working meetings with residents, numerous meetings of the community plan working group consisting of 3 representatives of the Jasper Town Committee, open houses (2 in Jasper, 1 each in the cities), newsletter and questionnaire distributed to mailing list of 1,500 people, the same newsletter included as insert in local Jasper paper and deposited in each Jasper mailbox, draft plan distributed to public libraries and Federal offices and on the Internet site, open house.

- River Use Guidelines: options presented to the public for management scenarios for the Maligne River through the distribution of a discussion paper.

- OCA Panel: opportunities to provide input to the Panel on Outlying Commercial Accommodation through website, public libraries in Edmonton, Calgary, Banff, Jasper, Canmore. Round Tables held in Banff and Jasper February 1999.

- Garbage fees: - discussions with Jasper Town Committee on fees and associated regulation changes.

2000

- Aquatics management: questionnaire used to obtain feedback on proposed changes to fisheries management.

- Private Home Accommodation: discussions and consultation on future of private home accommodation in JNP.

- Community housing needs: discussion and consultation with the community on availability of affordable housing.

- Water and sewer fee changes: Discussions with Jasper Town Committee on fees and associated regulation changes and monthly mail outs to residents.

- Monthly standing meetings with various groups: Jasper Environmental Association, Jasper Town Committee, Chamber of Commerce, Northern East Slopes Environmental Resources Committee.

- Jasper National Park of Canada website (www.worldweb.com/ParksCanada/Jasper/).

GOAL 6.6

Continual improvement of sustainable forest management practices

Until recently there has been no mechanism for consistently measuring changes in the quality of sustainable forest management practice. The development of SFM indicators, and the associated ability to measure and report them, are still evolving. The ultimate indicator of performance against this goal is the regular and accurate reporting of local level indicators agreed by SFM partners as appropriate measures of SFM performance. This report is a step in that direction.

Local Level Indicators of Sustainable Forest Management for the Foothills Model Forest