CONSERVING CANADA'S NATURAL CAPITAL: THE BOREAL FOREST

Al-Pac Case Study Report

Prepared for the

National Round Table on the Environment and the Economy

Prepared by

Daniel Farr, Biota Research
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Marian Weber, Alberta Research Council

July 2004

This case study has been commissioned as background research for the NRTEE's Conserving Canada's Natural Capital: The Boreal Forest program. The views expressed in the case study are those of the authors, and do not necessarily represent those of the National Round Table, its members, or the members of the program's Task Force.

CONSERVING CANADA'S NATURAL CAPITAL: THE BOREAL FOREST

Al-Pac Case Study Report – Part 1
Management Objectives

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Executive summary

This is Part 1 of a three-part case study report examining conservation issues within the Alberta-Pacific Forest Industries (Al-Pac) Forest Management Area (FMA) in northeastern Alberta. The goal of the present document is to highlight a range of management objectives that would promote the conservation of natural capital in the Al-Pac FMA. The other two parts of the case study report examine regulatory and fiscal barriers to achieving these objectives and policy options for promoting them. The case study was commissioned by the National Round Table on the Environment and the Economy (NRTEE) as part of its Conserving Canada's Natural Heritage: The Boreal Forest program.

The specific questions examined in this document are: What key conservation values should be promoted in the Al-Pac FMA? What indicators of natural capital correspond to these conservation values, and what human activities affect these indicators? And, finally, what specific management objectives for land uses in the Al-Pac FMA could be adopted to promote the conservation of natural capital?

Conservation values relevant to the case study area were drawn from the criteria of sustainable forest management identified by the Canadian Council of Forest Ministers. They include biological diversity, ecosystem condition and productivity, soil and water resources, global ecological cycles (e.g., carbon), and economic and social benefits. Potential trends in indicators corresponding to these conservation values were projected using a simulation model initialized with a description of current landscape composition and inputs defining rates of landscape change and resource development in the case study area. These trends are intended to foster an understanding of the challenges involved in achieving specific management objectives that would promote one or more conservation values.

The following is a brief summary of values that would be promoted by each management objective, relevant land use impacts and trends in related indicators.

Maintain total forest cover

This management objective would promote several conservation values, including the conservation of biodiversity, soil resources, water quality and carbon storage. Causes of deforestation in the study area include forestry roads and landings, energy sector clearings (e.g., well sites, pipelines, roads, seismic lines, surface mines), agricultural expansion and climate change.

Forest cover in the study area has declined by approximately 3% over the past several decades due to industrial development primarily in the forestry and energy sectors. Continued industrial expansion over the next several decades would increase the industrial footprint by 150%, with an additional 4% of forest converted to industrial uses.

Maintain the natural disturbance regime

Natural disturbances in the form of forest fires, insect outbreaks and other disturbances have strongly influenced vegetation structure and composition in the study area since the retreat of glacial ice sheets approximately 10,000 years ago. Maintaining the natural disturbance regime within the region would promote the conservation of species that require early successional habitats and fire-created structures. It would also promote ecosystem productivity through the release of nutrients contained in living and dead vegetation. In mature forest stands that are logged, maintaining residual structures in the form of standing dead trees, downed logs and live trees in a manner approximating natural disturbance would promote the conservation of biodiversity.

Although modern fire suppression and control practices are in place, fire is still a major player in the study area, with an average of 0.5% of the forest burning each year. Salvage logging in a portion of these burned stands reduces the legacy of natural disturbance in the future forest by removing standing dead trees and other structures used by many species. During conventional (non-salvage) logging of mature stands by clearcutting, the amount of residual structure remaining is limited, particularly in coniferous-dominated stands.

An implication of future natural disturbance is the difficulty of sustaining a constant supply of wood fibre. A timber supply analysis for Al-Pac's FMA, in which annual fire losses are considered, suggests that current harvest levels would be difficult to sustain for more than 40 to 60 years, after which significant shortages in available hardwood and softwood fibre are projected. Current harvest levels in the case study area were computed to be sustainable only if no wood is lost to forest fires.

Maintain old forest

Old forest stands generally contain the highest number of plant and animal species of all the successional stages in the boreal forest. Maintaining old forest within the range of natural variability would promote the conservation of species that require such conditions. It would also promote the conservation of above-ground carbon, productivity and aesthetic values.

About 10% of the study area is currently covered by older forest stands, or about 40% of the merchantable forest. Under the current forestry regulatory regime, future logging activity would reduce the supply of old forest considerably within the next several decades. The added effects of fire would accelerate this rate of loss, with the combined disturbances of logging and fire reducing the future supply of old forest below the range of natural variability.

Maintain key aquatic and hydrological features

The boreal forest provides numerous water-related services, including the recycling of water to the atmosphere, water filtration and wildlife habitat. Maintaining key aquatic and

hydrological features would promote the conservation of biological diversity, soil and water resources. Industrial activities affect surface and groundwater in diverse ways, including by causing local disruption of groundwater flow around oil wells and oil sands mines, roads and forestry cutblocks. Logging can also affect the flow and biodiversity of streams and influence riparian vegetation near cutblocks. Point-source industrial inputs of organic material and toxins have raised concerns over human consumption of fish from the Athabasca River and its tributaries.

Historical and projected trends in water quality at the scale of the entire Al-Pac FMA are unavailable, but approximately 3% of wetland cover in the region has been converted to other land uses during the past several decades. Over the next several decades, it is estimated that an additional 4% of wetlands will be lost, mainly due to oil sands mining; roads are an additional threat to wetland integrity through flow disruption.

Recognize and protect areas of traditional Aboriginal use and value

This management objective is expected to provide socio-economic and cultural benefits for Aboriginal peoples while promoting conservation of natural capital throughout the FMA. Aboriginal peoples form a significant component of the population living within the area of research. Until very recently, Aboriginal peoples pursued a traditional way of life, based largely on hunting, fishing, trapping and gathering activities, and respect for and stewardship of the land were the foundations of their relationship with the forest. Protecting areas of traditional use and value to Aboriginal peoples and involving them in land and resource management decisions would help meet all of the conservation values identified earlier.

The development of conventional oil and gas, oil sands and forestry resources has profoundly affected the traditional way of life of the Aboriginal communities in the case study area. In many areas, traditional land- and resource-based activities can no longer be conducted—partly because some areas are physically impossible to use following development, and partly because of the negative impact of resource extraction on wildlife populations and on water quality and quantity.

Establish areas within the managed forest where human impacts are prohibited or severely reduced

Establishing additional protected areas in the study area would promote the conservation of biological diversity by fostering improved knowledge of the effects of human activities on regional flora and fauna, and by providing refugia for species and natural communities that are sensitive to human activities.

A total of 96,000 ha (1.5%) of the study area is designated as protected under provincial statutes or forestry ground rule designations (e.g., buffer zones). Options for establishing additional protected areas are declining within the Al-Pac FMA as resource development activities continue to reduce the area of undisturbed landscapes. Establishing protected areas in undeveloped landscapes is further complicated by resource allocation decisions

that foster competition for land between industrial users and those who promote protected areas. For example, reducing the land base available for timber harvest would potentially reduce the sustainable level of wood harvest. Although reasonable levels of protection are an important stated societal value, attaining these in the case study area remains challenging because of conflicting historic and current resource allocation decisions.

Reduce linear disturbance density and manage human access

Roads and other linear developments are thought to have many negative ecological effects. Thus, reducing the rate of forest and landscape fragmentation by linear developments in the case study area would promote the conservation of biological diversity. Some wildlife species such as arctic grayling and woodland caribou are particularly sensitive to overharvesting and human disturbance along roads and other access routes such as seismic lines. Managing human access along linear features would help protect such species from further population declines.

There are currently over 100,000 km of linear developments in the Al-Pac FMA, with an average density of 1.8 km/km^2. If forestry activity persists at current levels, and if the energy sector expands at expected rates, the average density of linear developments will increase to over 5.0 km/km^2. This trend would have negative effects on many species. For example, woodland caribou habitat quality in the study area has declined by 23% over the past several decades, with further declines expected if trends in industrial development continue.

Maintain terrestrial carbon stocks and sinks

Carbon storage is a critical component of the global carbon cycle, which regulates the earth's climate. As such, carbon storage is one of the vital ecosystem services provided by the boreal forest. In the boreal forest, most stored carbon is below ground, with peatlands responsible for the accumulation of large quantities of carbon due to slow decomposition rates in cold, saturated soils. The conversion of forested land and peatlands for roads, plant sites, mines, well sites and other land uses increases the rate at which carbon is released into the atmosphere. In addition, forest harvesting shifts the composition of a managed forest from older, carbon-rich stands to young stands that contain less carbon.

Simulated projections suggest that the amount of above-ground and below-ground carbon will decline over the next 50 years by approximately 22 million t. This trend would be accelerated by increased fire rates induced by climate change.

Introduction

This document is Part 1 of a three-part case study report commissioned by the National Round Table on the Environment and the Economy (NRTEE) as part of its Conserving Canada's Natural Heritage: The Boreal Forest program. The primary objective of this part of the report is to establish some common ground on a range of management objectives that could be used to promote the conservation of natural capital within the Alberta-Pacific Forest Industries (Al-Pac) Forest Management Area (FMA). These objectives provide the basis for the subsequent examination of regulatory and fiscal barriers to achieving these objectives and policy options for promoting them (which are reviewed in Parts 2 and 3). The present document includes a general overview of land use patterns and indicator trends within the Al-Pac FMA, along with the natural capital, resource values and other relevant characteristics of the area, the history of land and resource use, and potential land use trajectories.

The specific questions examined in this part of the report are as follows:

- What key conservation values should be promoted in the Al-Pac FMA? Examples of conservation values might include the maintenance of biodiversity, ecosystem condition and productivity, hydrological function and aquatic resources, contribution to the global carbon cycle, etc.

- What indicators of natural capital correspond to these conservation values, and what human activities may adversely affect these indicators? Examples of indicators of natural capital might include extent of forest cover, wetlands, old growth forest and undisturbed landscapes; persistence of natural disturbance regimes (and resulting landscape characteristics); quantity and quality of surface water; and carbon balance (i.e., greenhouse gas emissions and carbon sequestration). Examples of human activities that may affect these indicators include road building, timber harvesting, seismic exploration, oil and gas production (e.g., wells, surface mining), human access for recreation (including hunting and fishing), disruption of natural disturbance regimes and point/non-point sources of water pollution.

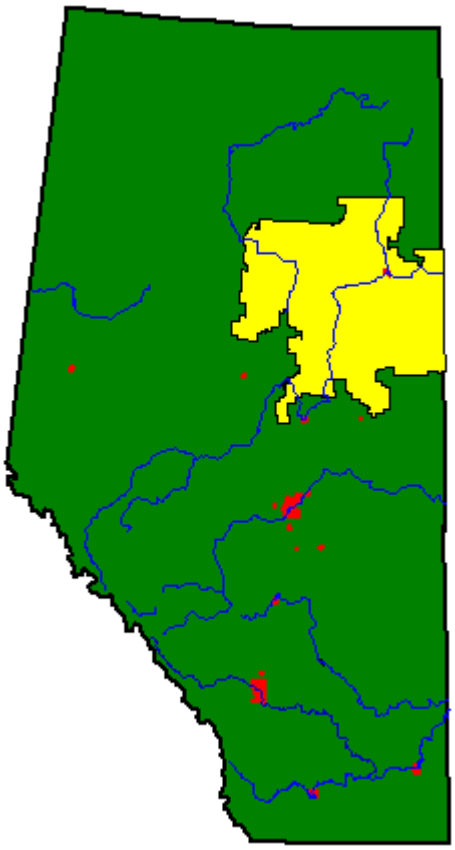
- What specific management objectives for land uses in the Al-Pac FMA could be adopted to promote the conservation of natural capital? Examples of management objectives might include:
    - maintain total forest cover;
    - maintain the natural disturbance regime (including land use practices that resemble, to the extent possible, patterns of natural disturbance);
    - maintain old forest within the natural range of variability across the landscape;
    - maintain key aquatic and hydrological features (e.g., surface water quality and quantity, wetlands);
    - recognize and protect areas of traditional Aboriginal use and value;

- establish areas within the managed forest where human impacts are prohibited or severely reduced (e.g., protected areas, roadless areas, ecological benchmark areas);
- reduce linear disturbance density and manage human access; and
- maintain terrestrial carbon stocks and sinks.

Overview of the case study area

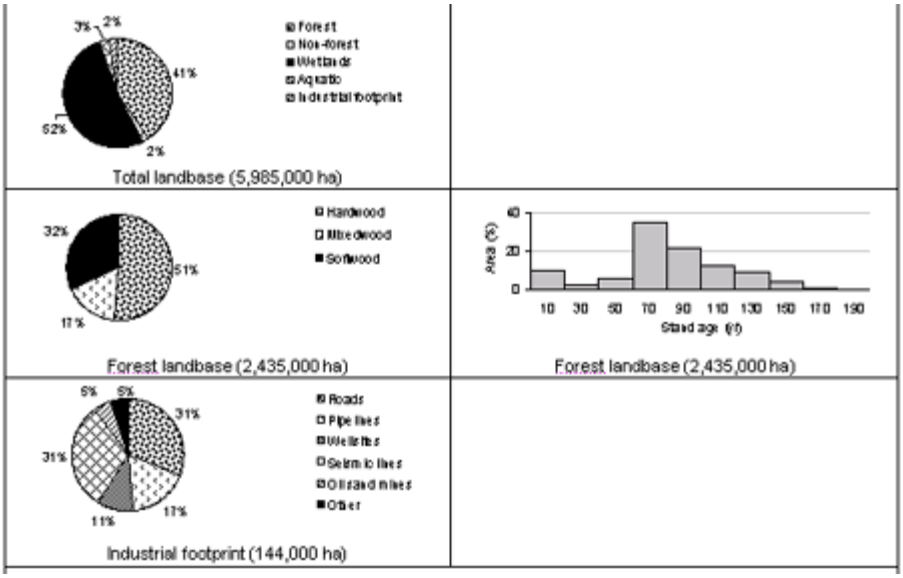
The case study area covers approximately 6 million ha (60,000 km^2) in northeastern Alberta (Figure 1). It includes all lands within the outer perimeter of the Al-Pac FMA, some of which are excluded from the area encompassed by Al-Pac's Forest Management Agreement; these exclusions include settlements, oil sands mines, fen/bog complexes, and Indian reserves. The area is bordered by agricultural lands to the south, Saskatchewan to the east and other forestry leaseholders to the west. Lands north of the study area include unallocated and relatively unproductive northern forest and Wood Buffalo National Park. Topography is generally flat except for several hill complexes and major river valleys. Most of the numerous small lakes, rivers and streams in the region feed into the Athabasca River and its tributaries. The typically boreal climate is characterized by long, cold winters and short, cool summers (Alberta Environmental Protection 1994b).

Figure 1. Location of the Al-Pac FMA in Alberta



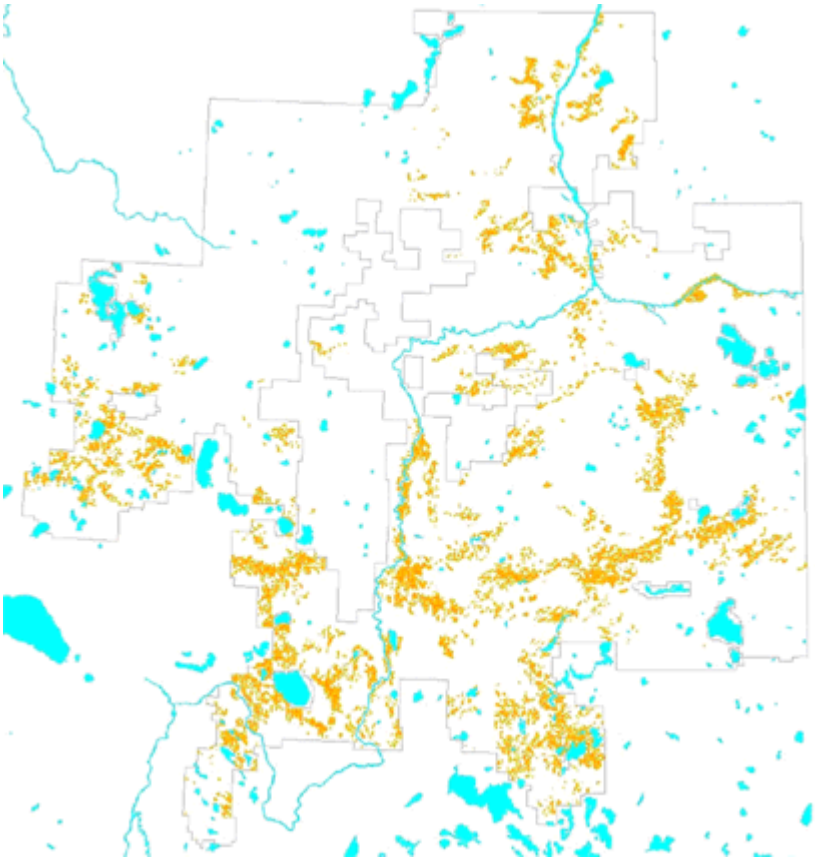
Regional vegetation is a complex mosaic dominated by upland forest communities and wetlands (Figure 2). Approximately half of the forest in the area consists of deciduous stands (mostly trembling aspen), one-third is dominated by softwood species such as spruce and pine, with the remainder composed of mixedwood communities of trembling aspen, white spruce and pine (Figure 2). The distribution, composition and structure of natural forest communities in the region have been strongly influenced by a history of frequent forest fires. Currently, about half of the forest originated on land subject to wildfire between 60 and 100 years ago; one-quarter is older than 100 years (Figure 2). Of the remaining stands younger than 60 years, approximately half are fire-origin, with the remainder originating on logged areas.

Figure 2. Composition of the Al-Pac FMA in 2003. Source: Al-Pac



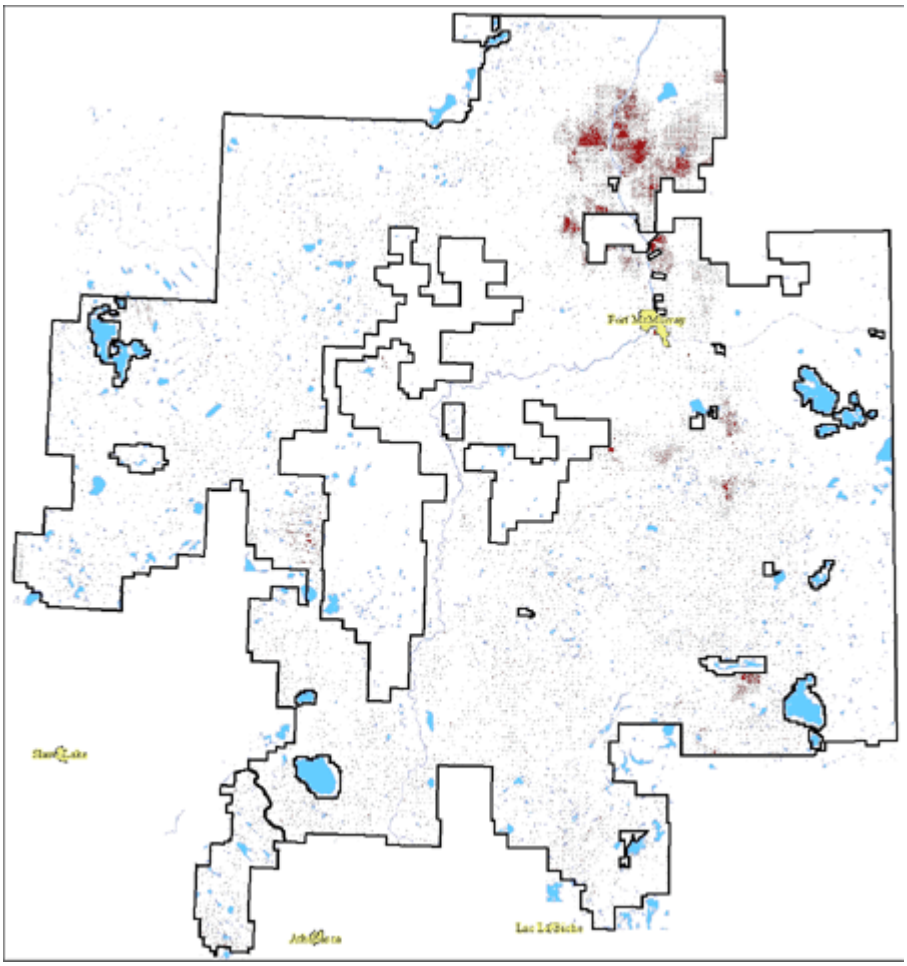
Two major industrial sectors dominate land use in the region: forestry and energy. Large-scale industrial forestry began in the early 1990s with the construction of the Al-Pac pulp mill near the town of Athabasca, 150 km northeast of Edmonton. Smaller-scale conifer harvesting has been occurring throughout the study area for several decades (Wetherell and Kmet 2000). To date, approximately 250,000 ha of forest have been harvested throughout the FMA (Figure 3).

Figure 3. Map showing the distribution of inventoried harvest areas in the Al-Pac FMA in 2003. Source: Al-Pac



The energy sector has been active since the 1940s, with approximately 30,000 wells having been drilled for conventional oil, natural gas and in situ oil sands (i.e., oil sands too deep below the surface for open pit mining) (Figure 4).

Figure 4. Distribution of well sites in the Al-Pac FMA in 2003. Source: Al-Pac



The density of wells in some parts of the study area approaches one well per hectare (Smith and Lee 2000). Most wells are located within a clearing approximately 1 ha in size, with an accompanying access road connected to the main transportation network. The distribution of pipelines and seismic lines in the region (most of which are associated with conventional gas production and exploration) is shown in Figures 5 and 6. Industrial roads, built primarily by the forestry and energy sectors, span approximately 25,000 km (Figure 7).

Figure 5. Distribution of pipelines in the Al-Pac FMA in 2003. Source: Al-Pac

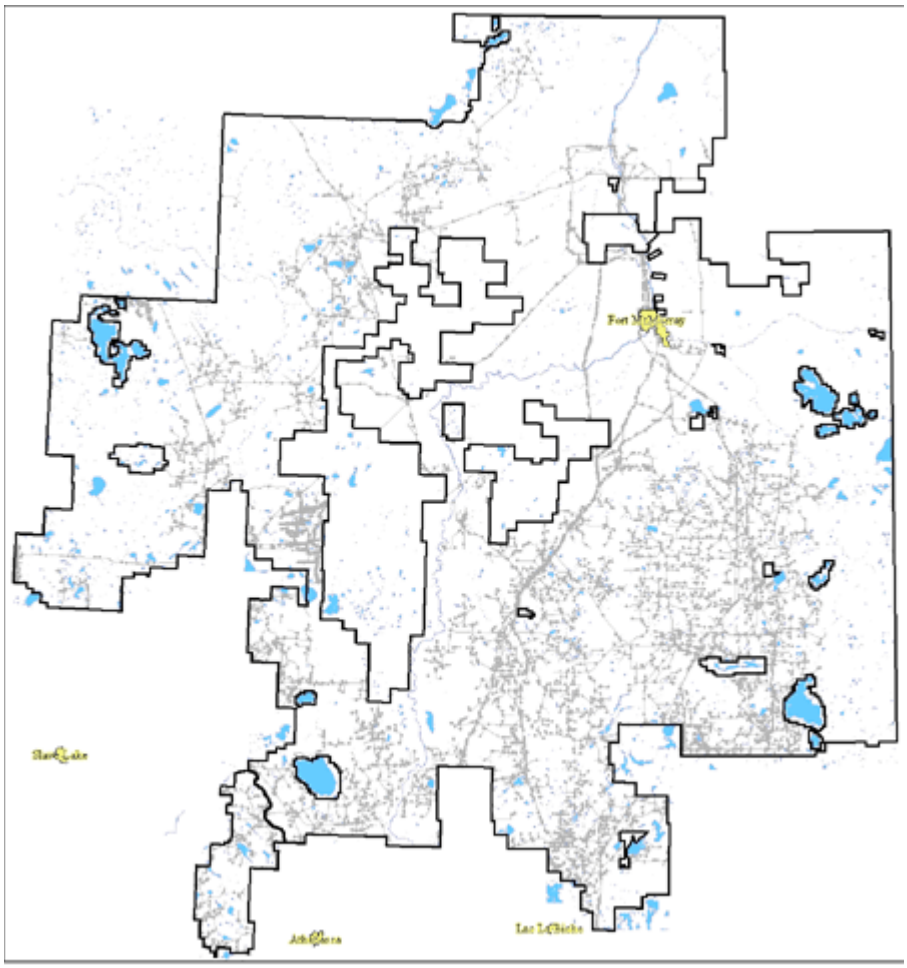


Figure 6. Distribution of seismic lines in the Al-Pac FMA in 2003. Source: Al-Pac

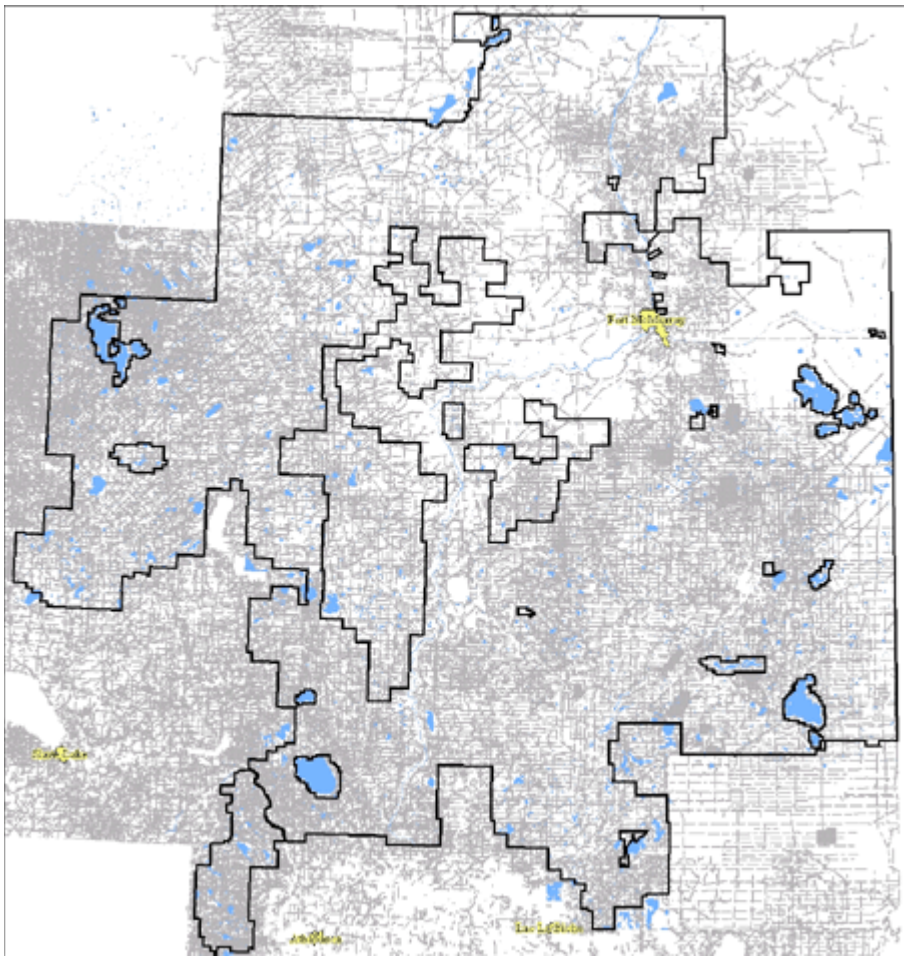
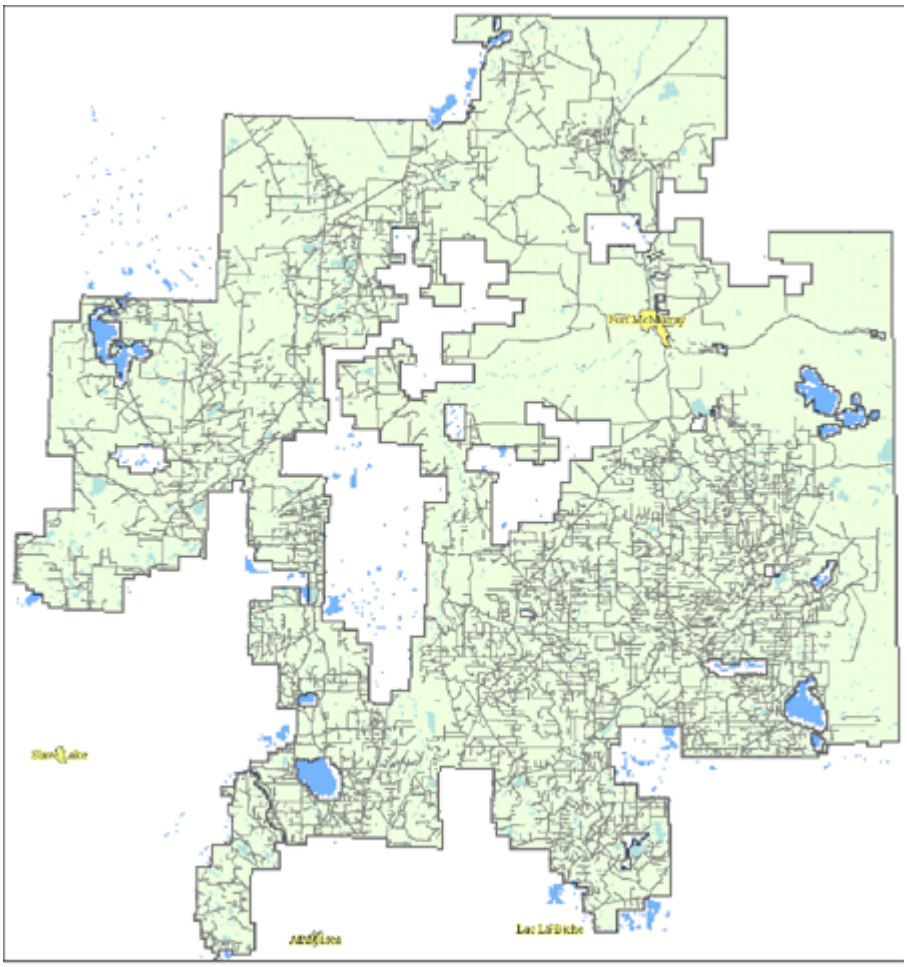


Figure 7. Distribution of minor roads in the Al-Pac FMA in 2003. Source: Al-Pac



Bitumen is also extracted from oil sands via surface mining within a potential mineable area of 345,000 ha. A significant portion of the mineable area is within the Al-Pac FMA. Oil sands mines currently cover an area of approximately 7,000 ha in the northern part of the study area.

The industrial footprint, defined as lands under some form of development, occupies approximately 2% (144,000 ha) of the Al-Pac FMA (Figure 2). (Forestry cutblocks are not included in this total because they are rapidly regenerated after disturbance to their original cover type, i.e., native forest vegetation.) Almost two-thirds of the industrial footprint is associated with the exploration and production activities of the energy sector (e.g., seismic lines, well sites, access roads, pipelines, oil sands mines), with the remainder consisting of public and forestry roads, settlements and other infrastructure.

Most of the human population in the region lives in Fort McMurray and numerous smaller settlements. There are 10 Aboriginal communities and Indian reserves within the FMA, and several additional ones just outside the study area. The entire FMA is covered

with registered traplines, and the Aboriginal population uses the land for hunting, fishing, trapping, harvesting and gathering, as well as for spiritual and cultural purposes. Various guide-outfitters work in the area, which is also used extensively for recreation, hunting and fishing, birdwatching and tourism. (Al-Pac 1999).

Key conservation values

Conservation may be defined as "the maintenance or sustainable use of the Earth's resources in a manner that maintains ecosystems, species and genetic diversity and the evolutionary and other processes that shaped them" (NRTEE 2003b). In the context of this case study, the ecosystems, species, genes and ecological processes to be maintained in the Al-Pac FMA are considered to be natural capital, "assets in their role of providing natural resource inputs and environmental services for economic production" (NRTEE 2003b).

The NRTEE (2003b) identified three forms of natural capital:

- natural resource stocks, both renewable and non-renewable;
- land on which human activities can take place; and
- ecosystems that provide direct and indirect services.

Which aspects of natural capital should be promoted in the Al-Pac FMA? The Canadian Council of Forest Ministers (CCFM 2000) identified six criteria "that define a set of values Canadians want to enhance and sustain," of which the first five most directly represent aspects of natural capital.

Criteria for sustainable forest management
1. Biological diversity
2. Ecosystem condition and productivity
3. Soil and water resources
4. Role in global ecological cycles
5. Economic and social benefits
6. Society's responsibility for sustainable development

Source: CCFM 2000.

The Government of Alberta, as a member of the CCFM and a signatory to the National Forest Strategy (National Forest Strategy Coalition 2003), has adopted the CCFM criteria and indicators framework for monitoring progress toward sustainable forest management. The five criteria related to natural capital (1 to 5) thus represent appropriate conservation objectives to be promoted in the Al-Pac FMA.

Indicators of natural capital

The purpose of the natural capital indicators proposed in this case study is to foster understanding of landscape conditions consistent with conservation values. They are similar to the national indicators promoted by the NRTEE's (2003a) Indicators Initiative,

modified for added relevance to the case study region. Note that one national indicator (the biodiversity index) has not yet been developed, but the NRTEE (2003a) has strongly recommended that development proceed under the auspices of the Canadian Biodiversity Index program (Federal–Provincial–Territorial Biodiversity Working Group 2003). See NRTEE (2003a) for a discussion of the relevance of each of these indicators to natural capital.

National indicators of natural capital
1. Air quality
2. Freshwater quality
3. Greenhouse gas emissions
4. Forest cover
5. Extent of wetlands
6. Biodiversity index (in development)

Source: NRTEE 2003a.

The indicators used in this case study are set out below:

Indicators of natural capital in northeastern Alberta
Forest cover
Area of industrial activity or "footprint"
Area of old forest
Long-term wood supply
Area of wetlands
Area of protected lands
Length of linear developments
Caribou habitat supply
Watercourse fragmentation by culverts
Above-ground carbon stocks

Potential trends in these indicators were projected using ALCES (A Landscape Cumulative Effects Simulator), a simulation model initialized with a set of rules defining the rates at which the area of each cover type, as well as the length of each linear feature, may change in the future. Such changes generally arise from land uses such as forestry and energy, and from natural processes such as forest fire and vegetation succession. Since the total area of the region remains constant throughout all simulations, an increase in the area of one cover type requires an equivalent decrease in the area of one or more other cover types. The model thus tracks potential changes in the composition of the study area and calculates outputs associated with natural resource production. Included in the model are inputs defining the rates at which industrial disturbances recover and are reclaimed to native vegetation (e.g., seismic lines, well sites). When reviewing simulation model results, it is appropriate to focus on the relative direction of projected trends, not precise numbers at any future point in the simulation interval. The simulations are intended to provide strategic-level insights and are not expected to be highly accurate in a given year. A more detailed description of the ALCES simulation model is available at www.foremtech.com.

Model inputs for the case study area were described previously (Schneider et al. 2003). For some variables, input values were revised to reflect changes in the landscape composition and estimated land use trajectories since the Schneider et al. (2003) study. Landscape composition, obtained from Al-Pac, was based on two sources of digital land cover information: Alberta Vegetation Inventory and Phase 3 Forest Inventory. The parameters used for timber supply analyses (e.g., harvest sequence, utilization standards, wood production) were drawn from Al-Pac's draft Detailed Forest Management Plan (Al-Pac 2004). Potential trends in future energy sector development were based on interviews with industry representatives conducted by Al-Pac's energy sector liaison officer (D. Pope, pers. comm.). Because the pace of oil and gas development is uncertain, projected trends used in model simulations were bracketed by 20% above and below this best guess.

Management objectives to promote conservation of natural capital

The management objectives identified in this case study provide a conceptual framework for subsequent discussions of regulatory and fiscal obstacles to conservation of natural capital and policy options to overcome such obstacles. They are drawn from the criteria and indicators of sustainable forest management identified by the Canadian Council of Forest Ministers (CCFM 2000), condensed and modified for relevance to the case study area. These objectives represent a series of measures that would promote one or more conservation values, including biological diversity, ecosystem condition and productivity, soil and water resources, global ecological cycles, and economic and social benefits. Historical and potential future trends in key indicators, and a discussion of important land use impacts, are intended to foster an understanding of the challenges involved in achieving each management objective.

The management objectives developed for this case study are as follows:

- maintain total forest cover;
- maintain old forest;
- maintain the natural disturbance regime;
- maintain key aquatic and hydrological features;
- recognize and protect areas of traditional Aboriginal use and value;
- establish areas within the managed forest where human impacts are prohibited or severely reduced;
- reduce linear disturbance density and manage human access; and
- maintain terrestrial carbon stocks and sinks.

Maintain total forest cover

Values promoted

Forest cover is among the most defining ecological characteristics of the Al-Pac FMA, occupying approximately 2.4 million ha or 41% of the study area. Maintaining forest cover would promote the conservation of biodiversity by providing habitat for forest-dependent species. It would also promote the conservation of soil resources essential for the production of wood fibre; soils also perform ecologically important roles in filtering and moderating the flow of surface and groundwater, and cycling nutrients. Additional ecosystem services include removal of air pollutants and moderation of local weather. Since forests contain the majority of the above-ground biomass and biotic carbon in the region, maintaining forest cover would also promote carbon storage. The economic and social benefits associated with forest cover are many. These flow from forestry, hunting and trapping of forest wildlife, fishing, recreational activities, and respect for cultural and spiritual values, including those held by Aboriginal people (Anielski and Wilson 2001).

Impacts of land use

Deforestation is a globally important problem with considerable local relevance, due to the dependence of local communities on the employment and revenues associated with wood production and the value of the ecological services described above. Causes of deforestation in the study area include forestry roads and landings, energy sector clearings (e.g., well sites, pipelines, roads, seismic lines, surface mines), industrial emissions, and forest clearing associated with agricultural expansion and timber harvest just south of the study area. Climate change poses an additional threat to forest cover, with increasing temperatures and drier soil conditions predicted to cause a gradual replacement of forested communities with grasslands (Bergeron and Flannigan 1995).

Indicator trends

Forest cover in the study area has declined by approximately 3% over the past several decades (Figure 8), having been replaced by industrial clearings associated with both the forestry and energy sectors. Most (80%) of the industrial footprint currently present in the region consists of linear developments (e.g., roads, pipelines, seismic lines), with the remainder composed of well sites, oil sands mines and cutblock landings (Figure 9). Continued industrial expansion over the next several decades would increase the industrial footprint by over 150%, to approximately 380,000 ha from the current 144,000 ha. Most of this increase is expected to be associated with oil sands mines, pipelines and roads (Figure 9). The net loss of forest cover during this period is estimated to be approximately 4% (Figure 8). In this projection, some features (e.g., major roads) are expected to last indefinitely, while others (e.g., narrow seismic lines) are expected to be much more short-lived.

Figure 8. Historical and projected trends in forest cover in the Al-Pac FMA

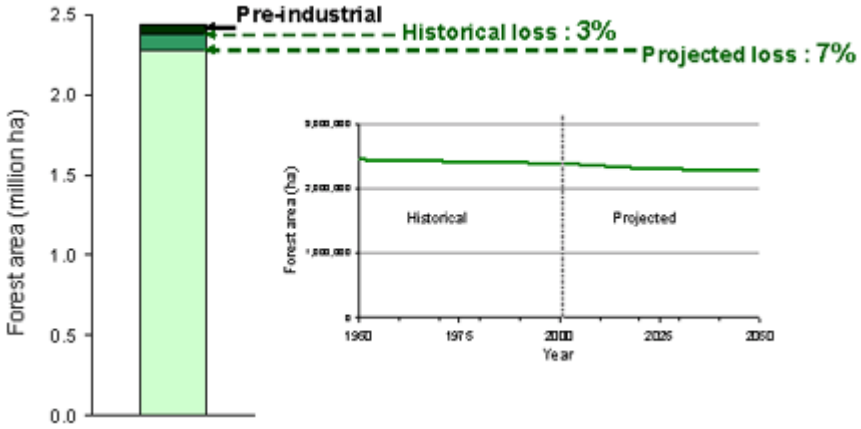
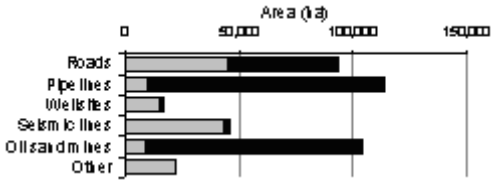


Figure 9. Projected changes in the industrial footprint in the Al-Pac FMA, 2000–50. Light shading indicates area in 2000; dark shading represents the additional area in 2050 under a moderate energy sector scenario



Maintain the natural disturbance regime

Values promoted

Natural disturbance is a defining aspect of the boreal forest, and it has historically been the strongest influence on vegetation structure and composition in the study area. Forest fires and other natural processes such as insect outbreaks, wind events and canopy gap dynamics have strongly influenced forest biodiversity and ecological processes at a range of spatial scales. A key characteristic of boreal natural disturbance regimes is their variability; disturbances are highly variable in size, frequency and intensity (Eberhart and Woodard 1987, Cumming 1997, Johnson et al. 1998, Stelfox and Wynes 1999). Maintaining a natural disturbance regime within the region would promote the conservation of species that require early successional habitats and fire-created structures; these include woodpeckers (Hobson and Schieck 1999), bark beetles and fire-dependent plants such as fireweed. Natural disturbances also promote ecosystem productivity by releasing nutrients contained in living vegetation and returning it to the soil. Some nutrients are also subsequently transported to nearby water bodies via surface and subsurface flow. Also, while forest fires release biotic carbon during combustion, much carbon remains in the form of tree boles that decompose slowly. In addition, younger

seral stages created by fire sequester carbon at higher rates than the older stands they replace.

At the scale of individual forest stands, forests disturbed by natural processes contain a wide range of residual structures (Stelfox 1995, Lee and Crites 1999). For example, post-fire stands typically retain most of the biomass present prior to burning (Eberhardt and Woodard 1987). These residual structures, in the form of standing dead trees, downed logs and live trees that survive fire, provide habitat for numerous species. Increasing the proportion of logged stands containing residual structure thus would promote the conservation of biodiversity.

Impacts of land use

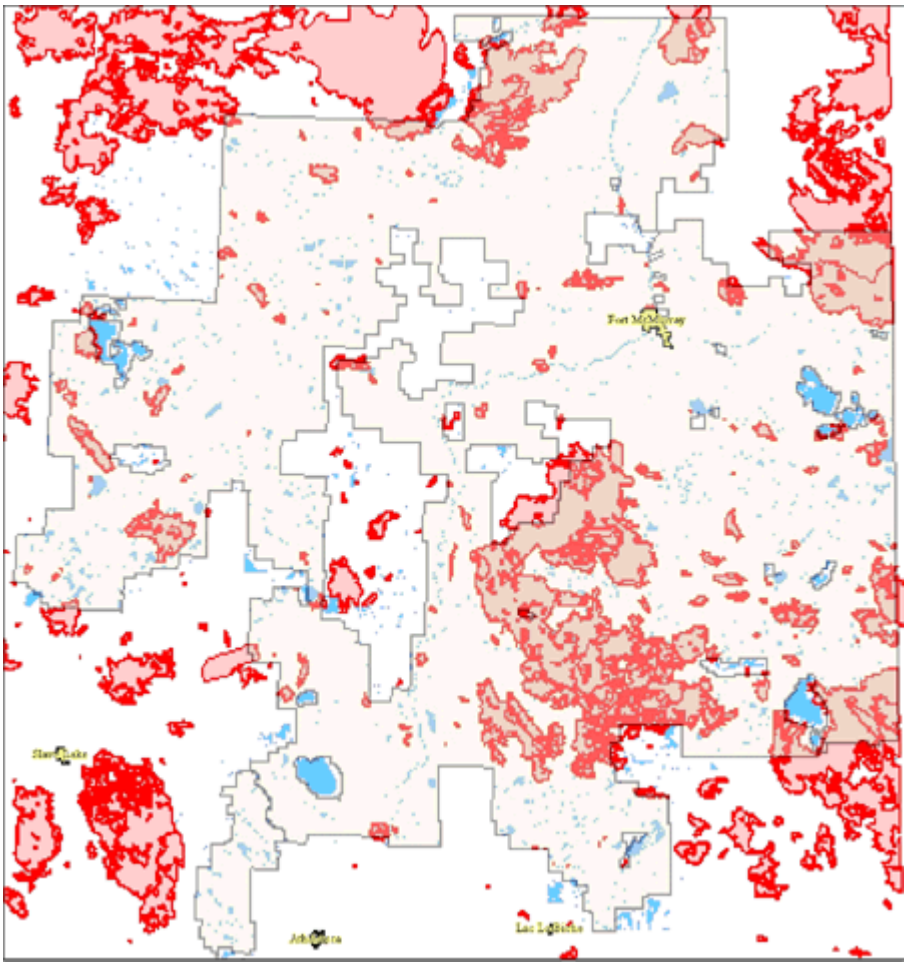
Modern fire suppression and control practices have been implemented in northeastern Alberta since the 1960s (Murphy 1985), although the degree to which these activities have successfully reduced the area burned is unclear (Cumming 1997, 2001). While the area burned may be smaller, many of the areas that do burn are subject to salvage logging. Salvage logging reduces the legacy of natural disturbance in the future forest by removing standing dead trees used by species such as woodpeckers and bark beetles (Lindenmayer et al. 2004).

Conventional (non-salvage) logging also affects forest stands by removing much of the structure that would otherwise remain after fire. In Alberta and elsewhere in Canada's boreal forest, clear-cutting is the primary logging method. Al-Pac has introduced modified clear-cutting to increase the retention of residual structure (Al-Pac 1999). On average, approximately 5% of merchantable volume is retained in the primarily deciduous stands logged by Al-Pac. While this represents a relatively narrow range of variability compared with natural disturbance, structured clear-cutting promotes the conservation of species that depend on such structures. However, coniferous stands harvested by quota holders generally contain little or no retained merchantable volume.

Indicator trends

Approximately 900,000 ha were burned by fire in the Al-Pac FMA between 1970 and 2003 (Figure 10), an average annual fire rate of around 0.5%, or 27,000 ha per year. Historical records suggest that prior to 1950, fires were more frequent (Andison 2003), burning at least 1% of the forest per year. It is possible that fire suppression during the past few decades has reduced the incidence of fire in the study area. Alternatively, recent weather and fuel conditions may have been less conducive to fire than several decades ago.

Figure 10. Distribution of fires in and around the Al-Pac FMA, 1970–2003. Source: Al-Pac



The extent of salvage logging in the study area is variable, but during the past decade it is estimated that approximately one-quarter of the merchantable forest that burned was subsequently salvage-logged (D. Pope, pers. comm.). A summary of salvage logging of stands burned in 1999 indicated that there were plans to salvage log 56% of the merchantable forest burned that year, although some of this area subsequently proved to be unsalvageable (Al-Pac 2004). Factors affecting the extent of salvage logging include road access and the recoverable volume of wood remaining. Also, mature stands that contain a relatively large volume of salvageable wood per hectare are more likely to be salvaged than younger burned stands.

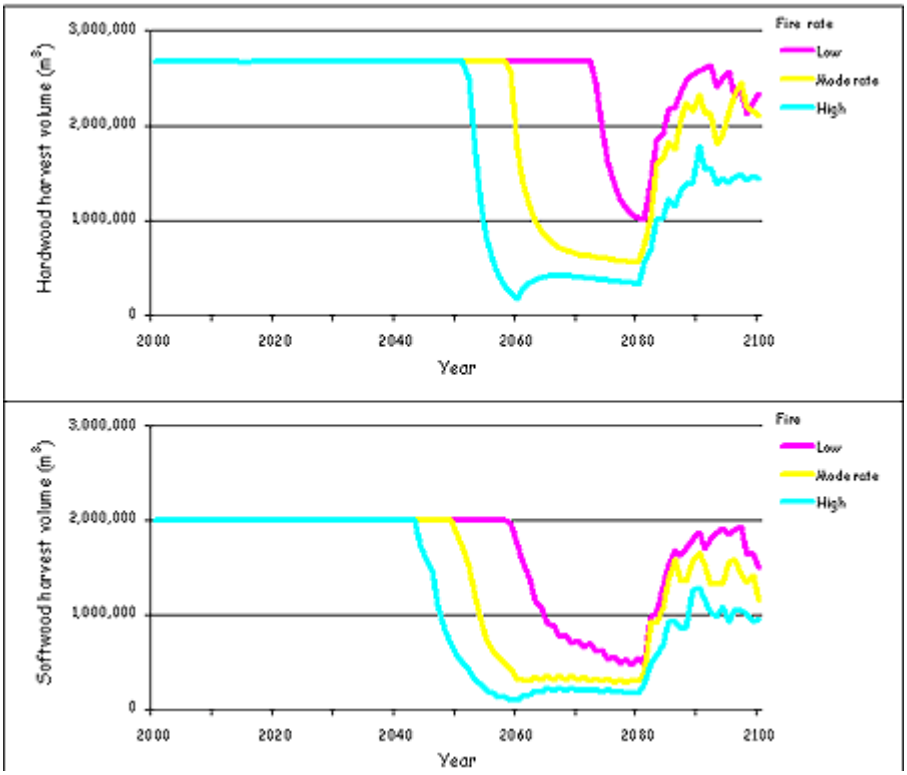
The future extent of salvage logging (and thus of naturally disturbed areas) is difficult to predict because the future extent of forest fire is uncertain. If fires burn at a rate similar to before 1950 (1.25% per year, Andison 2003), then an average of 7,500 ha of forest would be salvage-logged each year. This assumes that future rates of salvage logging remain constant at 25%, which is probably conservative as an expanding road network increases the proportion of burned areas that are accessible. Because salvage logging is directed

disproportionately toward mature stands that contain relatively high wood volume, the future supply of stands with a significant structural legacy would be limited.

The future extent of conventional (i.e., non-salvage) logging is more predictable than that of salvage logging. The area of conventionally logged stands in the study area is currently approximately 250,000 ha (Figure 3). By the year 2050, it is anticipated that an additional 500,000 ha will have been harvested. If Al-Pac remains the only operator leaving residual structure on its cutblocks, then approximately 30% of all cutblocks (i.e., in conifer-dominated stands) will contain little or no residual structure.

A related implication of future natural disturbance is the difficulty of sustaining a constant supply of wood fibre. Sustainable harvest levels in Canada's boreal forest generally do not factor in future losses associated with fire, because the future incidence of forest fire is uncertain (Armstrong et al. 1999). Instead, harvest levels are typically recalculated after major fire losses occur. A timber supply analysis for Al-Pac's FMA, in which annual fire losses are considered, suggests that current harvest levels (2.7 million m^3 hardwood and 2.0 million m^3 softwood per year) would be difficult to sustain for more than 40 to 60 years, after which significant shortages in available hardwood and softwood fibre are projected (Figure 11). Shortfalls caused by fire losses would increase the reliance of companies on salvage logging, further reducing the extent of naturally disturbed areas.

Figure 11. Projected trends in harvest volume to the year 2100 in the Al-Pac FMA under three potential scenarios of fire frequency: low (0.83% per yr); moderate (1.25% per yr); and high (2.5% per yr)



Maintain old forest

Values promoted

Old forest stands generally contain the highest number of plant and animal species of all the successional stages in the boreal forest. This is due to the diverse array of habitat conditions that develop over time, including relatively old, tall, large-diameter trees, standing dead and fallen trees, diverse forest floor micro-topography (pit and mound), canopy gaps created by fallen trees, and a wide range of tree ages and sizes due to ongoing recruitment in canopy gaps (Stelfox 1995). Many species reach their peak abundances in older seral stages (Angelstam and Mikusinski 1994, Schieck et al. 1995, Kirk et al. 1996). Thus, maintaining old forest within the range of natural variability would promote the conservation of species that require such conditions. It would also promote the conservation of above-ground carbon, as the volume of stored carbon tends to increase as stands get older. Older forests are also valued for their high rates of primary and secondary productivity, as well as for their aesthetic appeal.

Impacts of land use

Logging and fire are the primary causes of a projected reduction in the area of older forest stands in the study area. Logging, in particular, affects the area of older forest because older stands are harvested before younger stands (this enhances the long-term wood supply). The rate of wood production peaks at around 70 years in hardwood-dominated stands, and 90 to 100 years in softwood-dominated stands.

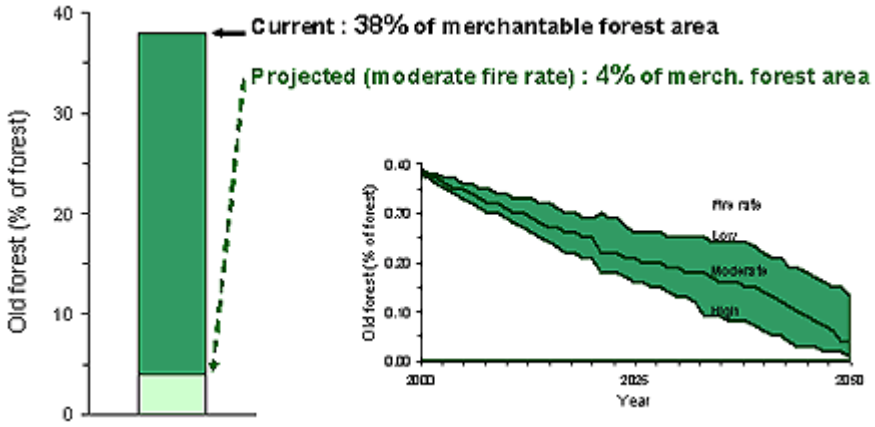
Declines in the area of older stands threaten the persistence of species that require these stands. The effects of habitat loss on some species are compounded by their negative response to fragmentation. For example, the density of black-throated green warblers is lower in smaller forest patches than larger ones (Schmiegelow unpubl. data).

Increased fire rates are predicted to occur in this region due to global climate change (Bergeron and Flannigan 1995, Bhatti et al. 2002), a trend that would further threaten the supply of older forest stands.

Indicator trends

Approximately 40% of the merchantable forest in the study area, or 10% of the total area, is covered by older forest stands (Figure 12). Historically, the area of old forest in the region has probably fluctuated considerably within a wide range of natural variability, and the amount at any given time thus represents a “snapshot” of many possible amounts. In an analysis of old forest supply in the Al-Pac FMA, Andison (2003) estimated the “natural” range of variability in older stands to be 8% to 33% of the land base.

Figure 12. Projected trends in the area of old forest in the Al-Pac FMA under three potential fire rates. (Fire rates as in Figure 11.)



Future logging activity in the study area would reduce the supply of old forest considerably within the next several decades (Figure 12). This is consistent with a maximum sustained yield policy in which "over mature" stands reduce the capacity of the land base to produce wood fibre (Alberta Environmental Protection 1994a, 1996). By the end of the first rotation (i.e., after several decades), old forests would be restricted to merchantable stands ineligible for harvest (e.g., riparian buffers, steep slopes) and non-merchantable stands. The added effects of fire would accelerate this rate of loss (Figure 12), with the combined disturbances of logging and fire reducing the future supply of old forest below the range of natural variability within the next few decades. Since fires burn both merchantable and non-merchantable stands, areas in which no logging takes place cannot be expected to provide substantial areas of old forest, particularly if fire rates increase due to climate change.

Maintain key aquatic and hydrological features

Values promoted

The boreal forest provides numerous water-related services, including the recycling of water to the atmosphere (via evaporation and evapotranspiration) and the filtration of water as it flows over the ground surface and through the soil (Thormann et al. 2004). Bodies of surface water such as wetlands, lakes and streams provide habitat for many species, including those that are truly aquatic (e.g., fish, loons) and those that require aquatic habitat for part of their life history (e.g., frogs, beavers, pelicans).

A dominant aquatic influence in the study area is the large area of wetlands. These are lands that are saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, water-dependent vegetation and various kinds of biological activity that is adapted to a wet environment. A combination of environmental factors, including flat topography, an abundance of poorly drained glacial deposits and

cool, humid climate have resulted in extensive wetland areas throughout Alberta's boreal forest (Vitt et al. 1996, Thorman et al. 2004). In the study area, wetlands are the dominant natural community type, covering just over half of the 6-million-ha land base. Most wetlands in the region are peatlands (e.g., fens and bogs), characterized by scattered, slow-growing stands of black spruce and treeless habitats dominated by grasses, sedges and mosses. Important ecological services provided by wetlands include water filtration, storage and moderation of flow regimes, carbon sequestration and wildlife habitat.

Reducing negative effects on water quality and quantity, in addition to reducing the rate at which wetlands are removed or degraded, would promote the conservation of biological diversity, soil and water resources, and carbon balance.

Impacts of land use

Many wetlands and water bodies in northeastern Alberta are fed by groundwater sources that may be sensitive to industrial activities such as the pumping of groundwater down in situ oil sands wells (Alberta Environment 2003) and the dewatering of aquifers near oil sands mines (Griffiths and Woynillowicz 2003). Roads may also disrupt water movement, leading to an impoundment of surface water that alters the distribution of surface and subsurface water (and associated plant communities) adjacent to the road (Poff et al. 1997, Thormann et al. 2004). Finally, water withdrawals from the Athabasca River in the oil sands area may lead to undesirably low flows, particularly during the winter when natural flows are frequently low.

Logging can temporarily alter local hydrologic regimes by altering groundwater recharge–discharge dynamics, the position of the water table and stream flow (Thormann et al. 2004), although the effects of logging on hydrological regimes appear to be similar to those of other disturbances such as fire (Carignan et al. 2000, Prepas et al. 2001, 2003). Harvesting of riparian vegetation can increase stream water temperature and exposure to ultraviolet radiation, which may alter stream invertebrate communities and contribute to increased algal growth (Thormann et al. 2004).

Threats to water quality in the study area include point-source pollution from the Al-Pac pulp mill and other pulp mills located upstream on the Athabasca River. Pulp mill residues are toxic to many aquatic and non-aquatic organisms (including humans), and the decomposition of organic material downstream of the mill during periods of low flow (i.e., winter) may deplete oxygen to levels that threaten the survival of fish. Contaminated water used during bitumen extraction from oil sands may leak from tailings ponds. Historically, logging and road construction have been shown to cause erosion and deposition of sediments into watercourses. However, regulations have largely eliminated this negative impact in most areas (Plamondon 1982 in Thormann et al. 2004).

Oil sands mining and to a lesser extent peat mining are the major causes of wetland removal in the study area. Because peat in wetlands accumulates very slowly, it is essentially a non-renewable resource (Pembina Institute 2001). In addition, the success of efforts to create wetland environments on reclaimed mine sites is unproven.

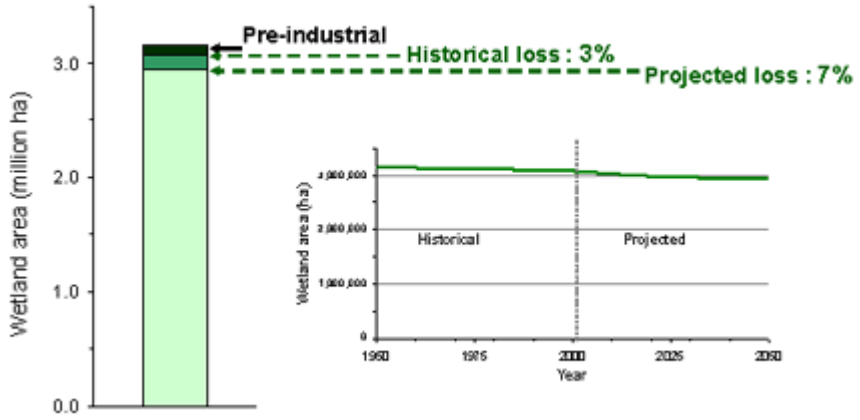
The indirect effects of industrial activity on wetlands (i.e., alteration of the hydrological regimes) may be more significant than the direct losses of wetlands from industrial clearing. As noted earlier, roads constructed through wetlands may impede the flow of surface and subsurface water, increasing the amount of accumulated surface water on one side of a road, while reducing water availability on the other side. This may turn may lead to plant mortality and habitat change adjacent to the road (Poff et al. 1997, Thormann et al. 2004). Factors influencing the type and severity of road effects on wetlands include road location relative to surface flow patterns, the abundance and size of culverts, and the porosity of materials used to construct the roadbed.

Groundwater removal during in situ oil production and dewatering of local aquifers during oil sands mining may also disrupt wetlands that depend on groundwater recharge (Griffiths and Woynillowicz 2003). An additional potential impact is local contamination of wetlands from industrial spills and mine tailings. Ground vegetation in wetlands may be particularly sensitive to industrial emissions and acidic precipitation, an impact that is probably restricted to the northern portion of the study area where refineries and other emission-causing plants are concentrated.

Indicator trends

Approximately 3% of wetland cover in the region has been converted to other land uses during the past several decades (Figure 13). Over the next several decades, it is estimated that an additional 4% of wetlands will be lost, mainly due to oil sands mining (Figure 13). Trends associated with the indirect effects of industrial activity on wetlands are difficult to quantify, but continued expansion of the transportation network in the region would potentially cause damage to extensive areas of wetlands.

Figure 13. Historical and projected trends in wetland area in the Al-Pac FMA under a moderate energy sector development scenario



Recognize and protect areas of traditional Aboriginal use and value

Values promoted

This management objective is expected to provide socio-economic as well as cultural benefits for Aboriginal peoples while promoting conservation of natural capital throughout the FMA.

Aboriginal peoples form a significant component of the population living within the area of research. In fact, the entire Al-Pac FMA is made up of lands that were extensively used by various Aboriginal groups for many generations. For example, the Fort McKay First Nations' traditional lands in the northeastern part of the FMA encompassed an area of approximately 38,000 km^2 (Fort McKay First Nations 1994). The traditional territory of the Bigstone Cree encompasses the western part of the Al-Pac FMA, from Peerless Lake in the north to Calling Lake in the south. Their traditional way of life was based largely on hunting, fishing, trapping and gathering activities and continued until the 1960s or 1970s, depending on the area. Respect for and stewardship of the land were the foundations of their relationship with the forest. Aboriginal people lived lightly on the land and "managed" its products wisely. Protecting areas of traditional use and value to Aboriginal people and involving them in land and resource management decisions would help meet all of the conservation objectives identified earlier.

Impacts of land use

The development of conventional oil and gas in the 1940s, of oil sands in the 1970s and of forestry resources on a major scale in the 1990s has profoundly affected the traditional way of life of the Aboriginal communities in the Al-Pac FMA. Most of the biophysical impacts of land use discussed above have directly affected the land and resources that Aboriginal people relied upon for their livelihood. In many areas, land and resource-based activities are now physically impossible (due, for example, to clear-cutting) or have been negatively affected due to the impact of resource extraction on wildlife populations and on water quality and quantity. In the Fort McKay area for instance, most people have stopped fishing in the Athabasca River as a result of the deterioration of the fishery resources and concerns over industrial pollution. Nevertheless, the connection with the land remains strong and is culturally critical, and a number of Aboriginal people still maintain an active "bush life."

Aboriginal communities started mapping their traditional lands in the 1980s, with government and industry funding. Traditional land use studies have now been completed for several communities within the FMA. These studies identify areas of traditional and current importance to bush economy users for hunting, trapping, fishing and gathering, as well as for spiritual and historical uses. They also illustrate the wealth of knowledge that exists among Aboriginal people in connection with the land. This knowledge is valuable for resource managers and developers, and it may help to provide a better understanding

of the impact of industrial development on forest ecosystems and to develop more sustainable approaches to land and resource use.

Establish areas within the managed forest where human impacts are prohibited or severely reduced

Values promoted

Establishing additional protected areas in the study area would promote the conservation of biological diversity in various ways.

Contribution to knowledge

Limited scientific understanding and economic feasibility will always prevent resource managers from conducting their business in a way that eliminates negative ecological effects. Additional protected areas would help address this issue by fostering improved knowledge of the effects of human activities on regional flora and fauna. Indeed, several authorities argue that protected areas, in which industrial activity is either prohibited or severely restricted, are a critical element of sustainable forest management (Environment Canada 1994, Senate Subcommittee on the Boreal Forest 1999, NRTEE 2003b). By comparing ecological conditions in protected (or benchmark) areas with those in the rest of the landscape, researchers can gauge how far conservation objectives have been achieved on the working landscape. Because ecological conditions are geographically variable, many benchmark areas dispersed throughout the working landscape would provide more reliable comparisons than fewer benchmark areas, particularly if they are not widely dispersed. Adequate representation of different ecological zones is also considered an important criterion for protected area selection (Kavanaugh and Iacobelli 1995).

Conservation of biological diversity

Protected areas would promote the conservation of biodiversity by providing refugia for species and communities (such as older forest) that are sensitive to human activities. They would also provide sources of individuals, seeds, pollen and spores for introduction to the working landscape if conservation efforts there are unsuccessful. As well, large protected areas would foster the persistence of natural disturbance regimes such as forest fire, and they would provide a buffer against shifting environmental conditions associated with climate change. Corridors in which only limited and sensitive land use is permitted may also promote connectivity among protected areas and facilitate movement of certain wildlife species (Harrison 1992).

Improved market access for forestry companies

Forestry companies must demonstrate that their tenures contain ecological protected areas in order to achieve certain market certification standards, such as Forest Stewardship Council (FSC) certification (FSC 2000). Because certification provides an improved image in the international marketplace, establishing protected areas potentially results in greater market access for certified companies. Al-Pac is currently seeking FSC certification (S. Dyer, pers. comm). In a previous Detailed Forest Management Plan, Al-

Pac proposed the protection of the Liege River watershed in the northwestern part of the FMA (Al-Pac 1999). This would have added an additional 140,000 ha of protected areas within or adjacent to the FMA. This was viewed by Al-Pac as a strategy to achieve its goal of sustaining all species within its FMA, a goal that is consistent with provincial direction to maintain species diversity (Alberta Environmental Protection 1998a).

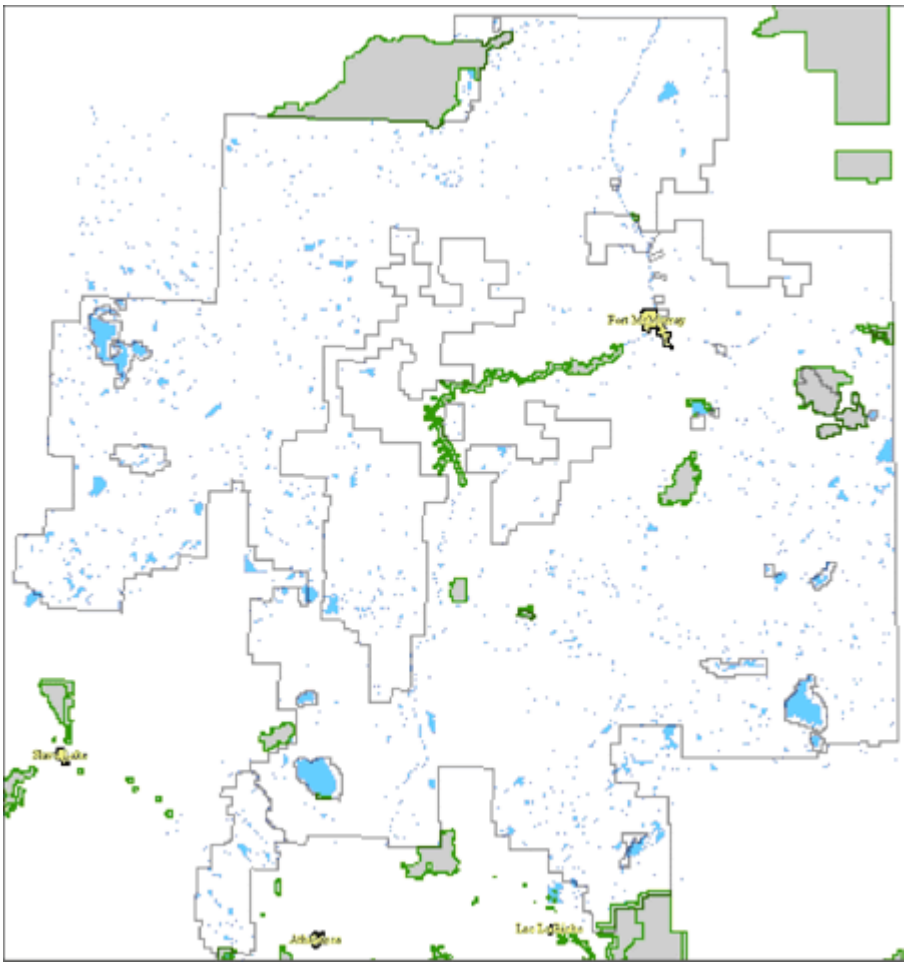
Contribution to traditional way of life

Finally, the establishment of more protected areas would help meet the basic needs of Aboriginal communities and preserve areas that are critical to their cultural identity.

Impacts of land use

A total of 96,000 ha (1.5%) of the study area is designated as protected under provincial statutes or forestry ground rule designations (e.g., buffer zones) (Figure 14). (Some types of industrial activity may be permitted in parts of these areas.) The total area protected in the region would increase to 4.7% if the three large protected areas bordering the study area (Figure 14) were included in the total.

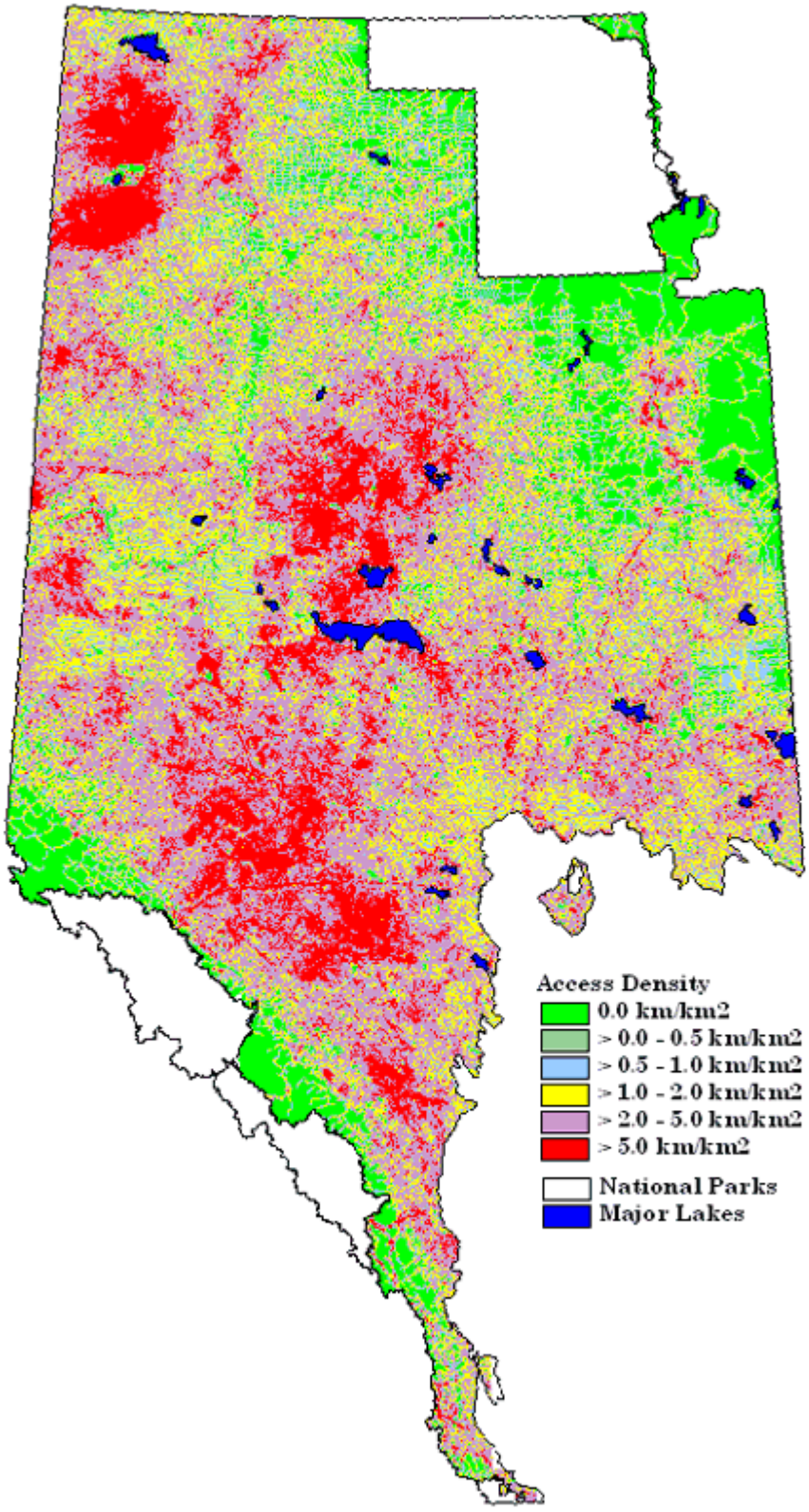
Figure 14. Map showing the location of protected areas in and around Al-Pac's FMA in 2003. Source: Al-Pac



The Senate Subcommittee on the Boreal Forest (1999) recommended that up to 20% of Canada's boreal forest be set aside as protected areas, including "areas of old growth boreal forest, areas used traditionally for native trapping, representative ecological areas and areas of significant wildlife habitat." Approximately 12% of the boreal forest natural region in Alberta is protected, although over 90% of this area is within Wood Buffalo National Park in the northern part of the province. One outcome of the provincial Special Places Program was to increase the level of protection of underrepresented landforms and ecological sub-zones (termed natural history themes) in Alberta to at least 2.75% of each natural history theme (Alberta Environmental Protection 1998b). Schneider (2002) recommended the addition of three large (500,000 ha) protected areas in and near the Al-Pac FMA (Birch Mountains, Athabasca Rapids, Cold Lake) plus a larger number of smaller protected areas to protect unique landscape features such as sand dune complexes and highly productive areas such as major river corridors.

An analysis of linear developments in the boreal forest natural region of Alberta outside Wood Buffalo National Park (Alberta Environmental Protection 1998b) concluded that approximately 13% of the region was roadless. A subsequent analysis of the Western Sedimentary Basin conducted by ForestWatch Alberta suggested that most of the Al-Pac FMA was within 1 km of an access corridor (including seismic lines) (Figure 15).

Figure 15. Density of roads, seismic lines and other linear disturbances in Alberta as of 1995–99. Source: Smith and Lee (2000)

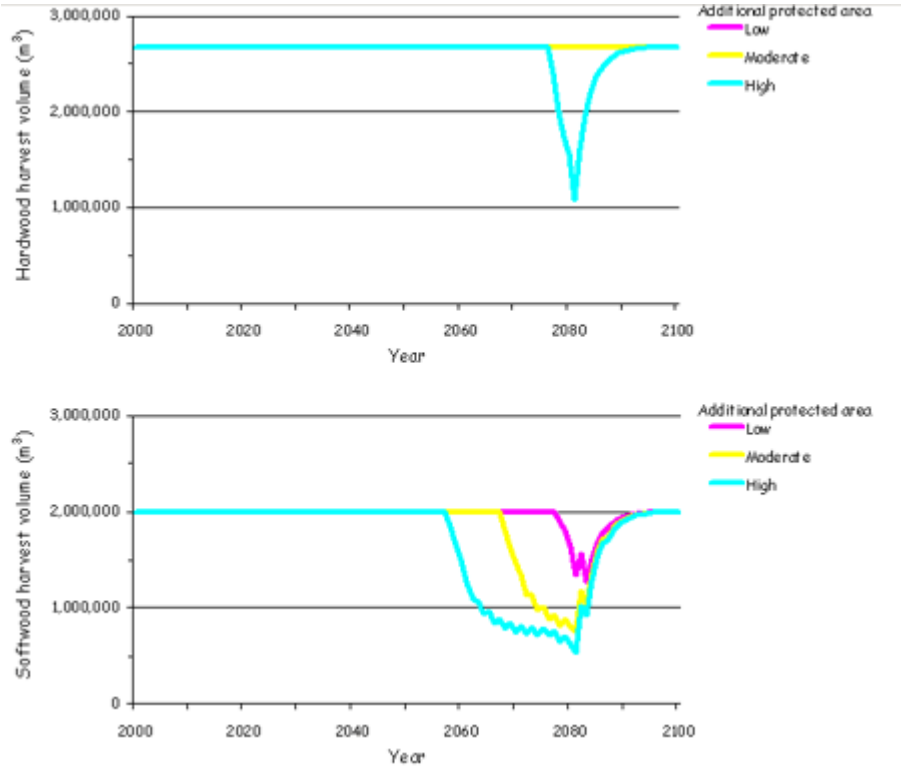


Indicator trends

Options for establishing additional protected areas are declining within the Al-Pac FMA as resource development activities continue to reduce the area of undisturbed landscapes (see Figures 3 to 7). Establishment of protected areas in undeveloped landscapes is further complicated by resource allocation decisions that foster competition for land between industrial users and those who want to promote protected areas. More than 80% of townships in the region contain one or more petroleum wells (a surrogate for other industrial activity), with most of the remaining 20% of townships under some form of resource tenure (Cumming and Cartledge unpubl. data). Because there is currently no requirement and little incentive to establish additional protected areas in the Al-Pac FMA, the future area of protected land will remain unchanged under the current management regime.

A major barrier to the establishment of protected areas is that they would potentially constrain the activities of the forestry and energy sectors. For example, removing an additional 10% of merchantable forest from lands available for timber harvest beyond the existing protected areas already in place would contribute to shortfalls in softwood (but not hardwood) supply (Figure 16). (This projection assumes future losses to fire are minimal; fires are expected to exacerbate future fibre shortfalls.)

Figure 16. Projected trends in harvest volume under alternative levels of additional protected area in the Al-Pac FMA. Low = 0%; moderate = 10%; high = 20% reduction of merchantable forest area available for harvest. Additional declines in wood availability associated with fire are not included in these projections



Reduce linear disturbance density and manage human access

Values promoted

Roads and other linear developments are thought to have many negative ecological effects (Reed et al. 1996, Forman and Alexander 1998, Trombulak and Frissell 2000), and reducing the rate of fragmentation by linear developments in the Al-Pac FMA would promote the conservation of biological diversity. Some wildlife species such as woodland caribou are also sensitive to human disturbance along linear corridors, and managing human access would help protect such species from further population declines. Reducing the amount of forest cleared for linear developments would also promote the conservation of above-ground carbon, as well as promote economic values by reducing the rate at which lands are removed from the forest-producing land base. Reducing the disruption of surface and subsurface water flow (which in turn would reduce the release of carbon to the atmosphere due to decomposition and methanogenesis) would further promote the conservation of above-ground and soil carbon.

Impacts of land use

Arguably the most significant negative effects of linear developments on biodiversity in the Al-Pac FMA are associated with woodland caribou. Caribou habitat is degraded by linear developments because caribou tend to avoid such features, probably due to increased risk of predation by wolves (Curatolo and Murphy 1986, James and Stuart-Smith 2000, Dyer et al. 2001). The habitat quality of approximately 48% of core caribou range in northern Alberta has been reduced due to proximity to linear developments and other industrial features such as well sites (Dzus 2001). Mortality of woodland caribou near roads and seismic lines is likely increased due to poaching and native hunting (Dzus 2001).

Effects of linear developments on other species are not as well documented, but preliminary evidence suggests that the abundance of several neotropical birds may be reduced in areas with high densities of linear developments (Schmeigelow and Cumming unpubl. data). Related research suggests increased nest predation on birds nesting adjacent to linear developments, particularly wide pipeline rights-of-way (Anderson et al. 1977, Fleming 2001). There is also some evidence that movement patterns of selected mammal species, including flying squirrels and pine marten, may be disrupted by linear developments (Marklevitz 2003).

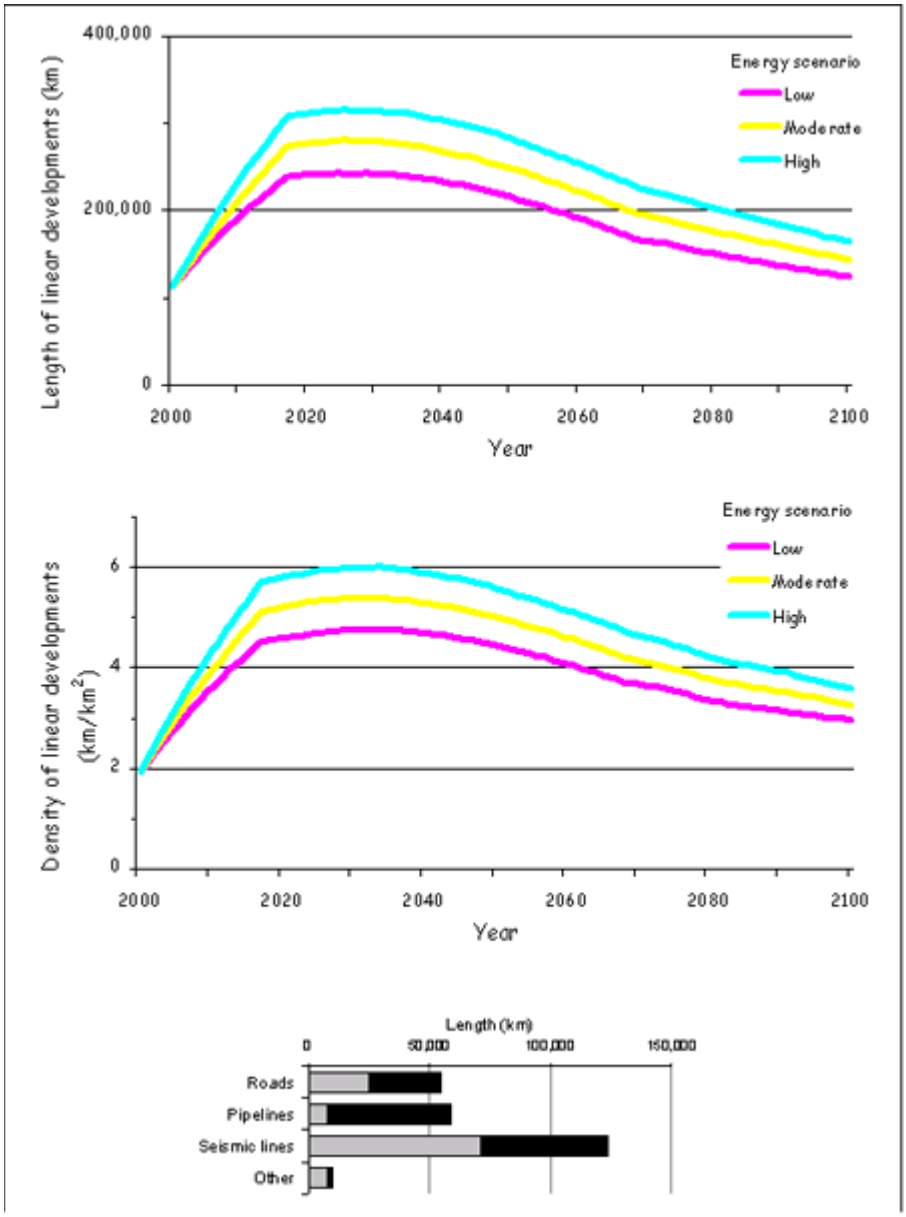
Poorly constructed or maintained road stream crossings can result in barriers to fish movements by creating hanging culverts, velocity barriers or low-head dams (M. Sullivan, pers. comm.). These barriers prevent fish from gaining access to upstream spawning areas or re-colonizing large areas after natural events such as droughts or winterkill. They may also isolate and fragment populations, threatening the long-term viability of sensitive species such as arctic grayling (Thormann et al. 2004). Roads, seismic lines and other linear developments that facilitate motorized access are thought to increase fishing pressure, particularly at watercourse crossings. Boreal fish populations may be far more sensitive to increased fishing pressure due to road access than to habitat change from logging and other forms of land use (Post and Sullivan 2002).

Other ecological effects of roads in particular include the disruption of surface water flow (Jones et al. 2000), potentially leading to upstream wetting and downstream drying, plus associated habitat change and release of biotic carbon. Roads have historically caused erosion and increased flow of sediments into streams, but this impact has been reduced by improved construction and design standards.

Indicator trends

There are currently over 100,000 km of linear developments in the Al-Pac FMA. Two-thirds of these features are seismic lines; the remainder are roads, pipelines and transmission lines (Figure 17). This represents an average density of 1.8 km/km^2 over the entire FMA, although linear development densities vary considerably among different parts of the FMA (Figure 15).

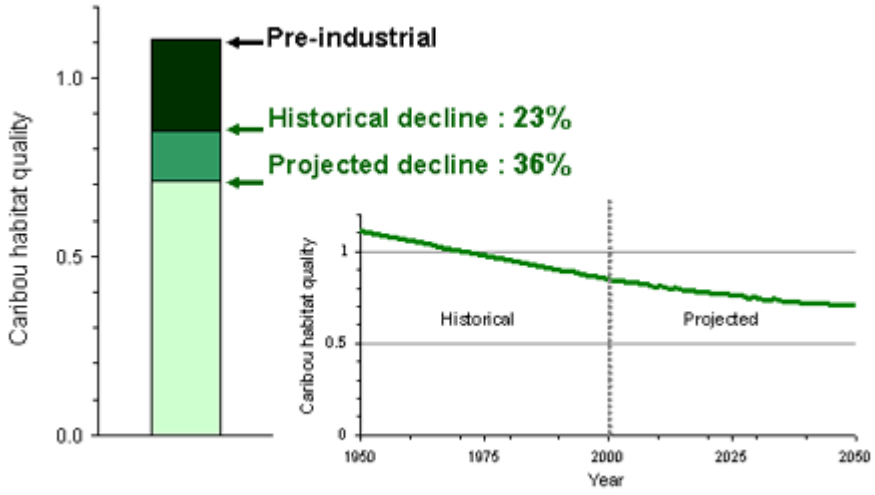
Figure 17. Projected trends in the length and composition of linear developments in the Al-Pac FMA. Lines in top two graphs represent projected trends under three scenarios of energy sector development (low, moderate, high). In the bottom graph, light shading indicates length in 2000, dark shading represents the additional length in 2050 under a moderate energy sector development scenario



If forestry activity persists at current levels, and if the energy sector expands at expected rates (D. Pope, pers. comm.), the average density of linear developments in the Al-Pac FMA will increase to over 5 km/km^2 (Figure 17). The forest sector requires additional haul roads and temporary in-block roads; the energy sector requires additional roads, pipelines and seismic lines.

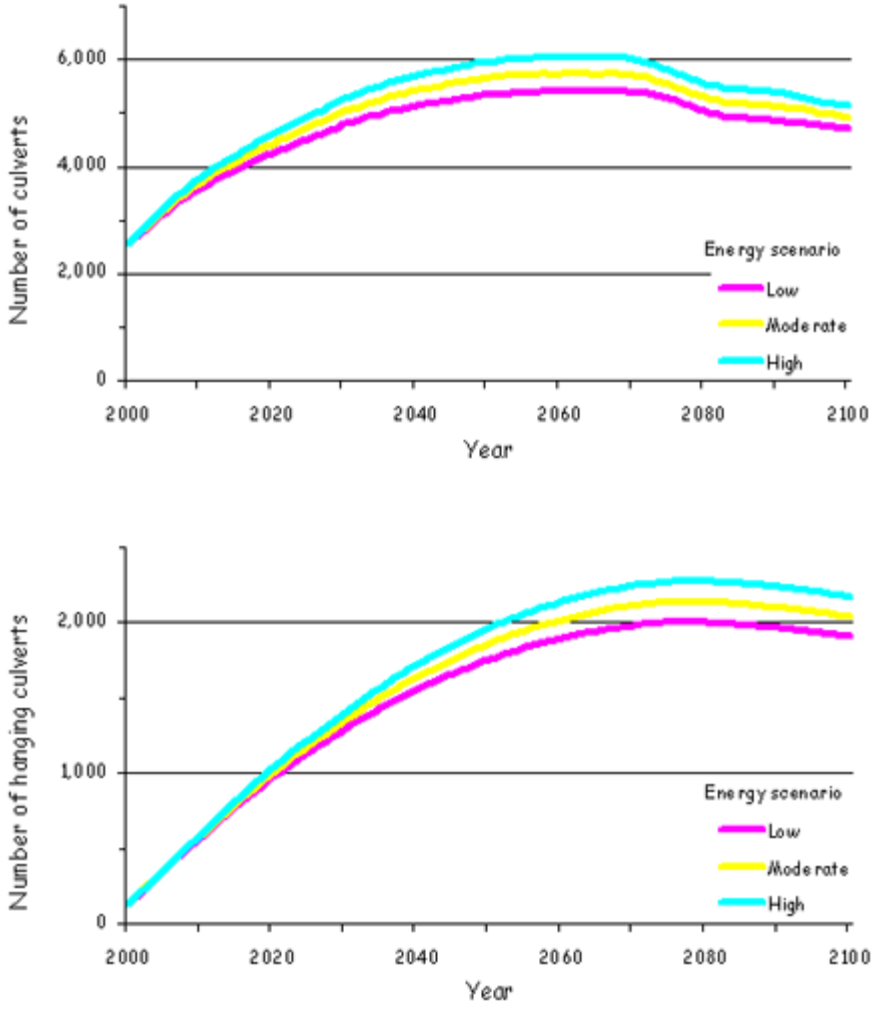
The implications of this increase in linear developments are perhaps most serious for woodland caribou. Populations throughout northern Alberta have probably declined in recent years (Dzus 2001), and recent research suggests some negative demographic trends. Declines in habitat quality due to avoidance of linear developments have been implicated as a major cause of this trend. A habitat model developed by the Boreal Caribou Committee suggests that habitat quality has declined by 23% over the past 50 years, and that further declines are expected (Figure 18).

Figure 18. Historical and projected trends in caribou habitat quality in the Al-Pac FMA under a moderate energy sector development scenario. Values below one represent demographic conditions that would result in declining populations



As noted above, linear developments may also cause fragmentation of streams. There are now approximately 2,500 stream crossings in the FMA, and the average length of stream between hanging culvert crossings that obstruct fish movement is 380 km. By 2030, the average length of stream between hanging culverts would be 40 km, a level that would impede natural fish movement and significantly increase the ease of human access to the region's stream network (Figure 19).

Figure 19. Projected trends in watercourse fragmentation in the Al-Pac FMA, 2000-2100. Lines represent projected trends under three energy sector development scenarios (low, moderate, high)



Maintain terrestrial carbon stocks and sinks

Values promoted

Carbon storage is a critical component of the global carbon cycle, which regulates the earth's climate. As such, carbon storage is one of the vital ecosystem services provided by the boreal forest. The potential significance of global climate change associated with increasing atmospheric carbon has been well documented. In the boreal forest, most stored carbon is below ground, with peatlands responsible for the accumulation of large quantities of below-ground carbon due to slow decomposition rates in cold, saturated soils. Reducing carbon emissions from disturbed vegetation and soil would promote the conservation of natural capital in the form of stored carbon.

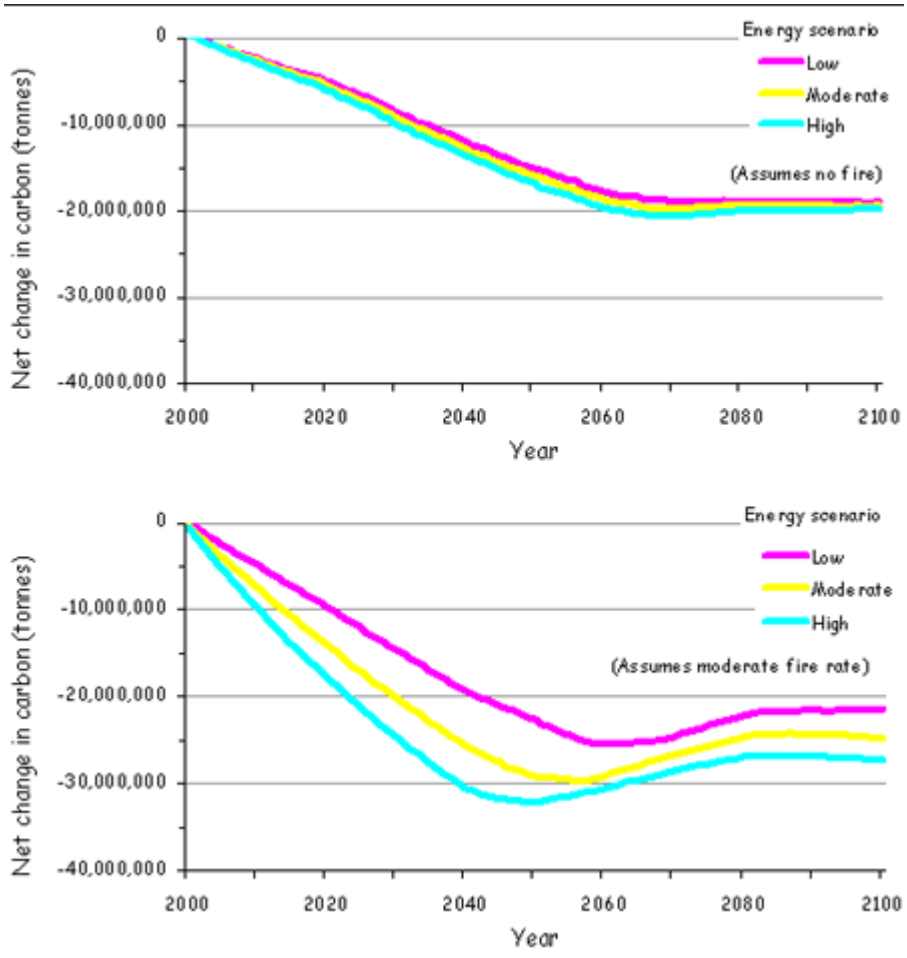
Impacts of land use

When forest vegetation is disturbed or cleared (for timber, roads, plant sites, mines, well sites or other uses), above-ground vegetation decomposes more quickly, increasing the rate at which carbon dioxide is released into the atmosphere. In addition, a dominant carbon sequestering agent (trees) is removed. Forest harvesting, in particular, also results in the conversion of older, carbon-rich stands to young stands that contain less carbon, and it may also temporarily cause soil saturation until vegetation becomes re-established. Saturated soils and submerged vegetation impounded by roads passing through wetlands may also release carbon through methanogenesis; wetland areas deprived of historical water sources may release carbon through organic decomposition.

Indicator trends

Simulated projections suggest that the amount of above-ground and below-ground carbon will decline over the next 50 years by approximately 22 million t (Figure 20). This trend would be accelerated by increased fire rates induced by climate change.

Figure 20. Projected trends in above-ground carbon in the Al-Pac FMA, 2000-2100. Lines represent projected trends under three energy sector development scenarios (low, moderate, high)



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CONSERVING CANADA'S NATURAL CAPITAL: THE BOREAL FOREST

Al-Pac Case Study Report – Part 2
Regulatory Barriers and Options

Prepared for the
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This case study has been commissioned as background research for the NRTEE's Conserving Canada's Natural Capital: The Boreal Forest program. The views expressed in the case study are those of the authors, and do not necessarily represent those of the National Round Table, its members, or the members of the program's Task Force.

Executive Summary

This document is Part 2 of a three-part case study report on conservation issues within the Alberta-Pacific (Al-Pac) Forest Management Area (FMA) in northeastern Alberta. The case study was commissioned by the National Round Table on the Environment and the Economy (NRTEE) as part of its Conserving Canada's Natural Heritage: The Boreal Forest program. The overall objective of the case study is to identify fiscal and regulatory barriers to conservation and policy options for conserving natural capital, while recognizing the importance of resource development and other economic and social values for land use in this area. The present document focuses on regulatory barriers and options.

The discussion begins with brief introductory comments in Section 1. Section 2 provides an overview of the objectives and scope of the case study, including the presentation of working definitions for the terms "conservation" and "natural capital," which were included in the NRTEE report entitled *Securing Canada's Natural Capital: A Vision for Nature Conservation in the 21st Century* (2003). For purposes of the case study, the term "regulatory" is broadly defined to include the legal, institutional and policy framework for managing land and resource use within the Al-Pac FMA. Topics addressed in Section 2 include the relationship between the case study objectives and the broader concept of sustainable development, the distinctive constellation of resource values within the Al-Pac FMA, and the constitutional and jurisdictional context for the case study.

Section 3 briefly describes the case study methodology, beginning with the analytical framework that was developed by the project team. Central to that framework is the list of management objectives that could be used to promote the conservation of natural capital within the Al-Pac FMA. (These objectives and the rationale for selecting them are described in Part 1 of the case study report.) This section then describes the research methods (the use of interviews with key individuals and a stakeholder workshop) and discusses the involvement of Aboriginal peoples in the case study. As noted in that discussion, the case study design and the limited time and budget for this project made it difficult to obtain input from Aboriginal peoples.

Section 4 presents a series of nine cross-cutting barriers to the conservation of natural capital in the Al-Pac FMA. Seven of these barriers were identified by the NRTEE in *Securing Canada's Natural Capital*. Two additional barriers were included because of the importance attached to them by interviewees and workshop participants. All of these barriers are cross-cutting because they apply to many of the specific management objectives referred to above. The barriers are:

- lack of political will and accountability on the part of governments;
- inadequate integration of decision making across sectors and land uses, as well as among regulatory processes;
- lack of conservation planning at a landscape level;
- constraints and incentives relating to the resource disposition and tenure systems;
- key stewards are often not "at the table";

- lack of economic benefits and incentives for key stewards;
- lack of information tools to support decision making;
- failure to integrate true costs and benefits of nature; and
- lack of financial resources to support conservation and partnerships.

While many of these barriers are fairly general, they highlight some of the policy "fundamentals" that arguably must be in place for successful implementation of specific management objectives designed to conserve natural capital within a sustainable development framework.

Concerns regarding political will and accountability were of several types. Interviewees and workshop participants highlighted the need for transparency about the fundamental political and economic choices that guide government decision making on land and resource use, and they argued that governments should be accountable for the resulting trade-offs that may affect natural capital. The importance of following through with the implementation of policy directions and recommendations from multi-stakeholder processes was also noted, as was the need for an institutional focal point for accountability. Finally, stakeholders commented on the absence of effective accountability mechanisms in some legislation governing land and resource use.

Many stakeholders identified the lack of effective integration of decision making across sectors and land uses, as well as among regulatory processes, as the primary barrier to conserving natural capital on the working landscape within the Al-Pac FMA. Numerous specific examples of this lack of integration were identified. All of these examples point to the need for integrated landscape management in order to set and achieve landscape-level objectives in a context of multiple activities, competing land use values and significant cumulative effects. Several interviewees and workshop participants argued strongly that this approach must include a new governance model for managing land and resource use within the Al-Pac FMA.

There was also general agreement that the lack of land use planning at the landscape level was a significant barrier to the conservation of natural capital. This barrier was discussed in some detail in the NRTEE report *Securing Canada's Natural Capital*. The Al-Pac FMA case study highlighted specific deficiencies in the applicable planning processes and underlined the importance of planning as an integrative mechanism and a means of managing cumulative effects.

Constraints and incentives relating to the resource disposition and tenure systems in the Al-Pac FMA are also examined in some detail. In particular, the orientation of the tenure regimes to maximizing short-term economic benefits and the resulting lack of flexibility to accommodate other values, including the conservation of natural capital, were noted by stakeholders in relation to both the energy and forestry sectors. Options for reforming the tenure regimes include extending the timelines for resource development in order to facilitate planning and inter-industry cooperation, moving to larger blocks of resource rights with fewer tenure holders, and relaxing the "use it or lose it" requirement that applies to both the forestry and the oil and gas sectors.

The absence of key stewards and other stakeholders from the "table" is a barrier to conserving natural capital that reflects several underlying problems. In some instances, there is no inclusive and transparent decision-making process in which stakeholders can participate (i.e., there is no "table"). Within the Al-Pac FMA, this problem is illustrated by the absence of a comprehensive planning process and the closed nature of government decision making on the issuance of resource rights. Some interviewees and workshop participants also raised concerns about the lack of effective and high-level participation by government in multi-stakeholder forums, linking this deficiency to subsequent problems with the implementation of recommendations from these forums. Finally, the challenge of ensuring full and effective participation by Aboriginal peoples in decision making was noted by many stakeholders. This issue is revisited in a subsequent section.

Interviewees and workshop participants commented in some detail on the lack of information tools to support decision making as a barrier to the conservation of natural capital. The need for additional scientific research to support decision making was noted, as was the existence of some best practices in the area of modelling land use scenarios within the Al-Pac FMA. Stakeholders also commented on the need to ensure that existing information is easily accessible, the importance of linking information to decision making, and the need to incorporate traditional land use studies and the traditional ecological knowledge of Aboriginal peoples into decision making.

Lack of financial resources to support conservation and partnerships was a barrier identified by the NRTEE that resonated with many stakeholders familiar with the Al-Pac FMA. The detrimental impact of government cutbacks on the departments and agencies charged with managing land and resources was widely noted, as was the significant revenue stream accruing to government from resource development. There is a broad consensus that management capacity is not keeping up with the pace of development and that this growing gap places natural capital at risk.

The lack of economic benefits and incentives for key stewards and the failure to integrate the true costs and benefits of nature into decision making are two barriers that were identified by the NRTEE in *Securing Canada's Natural Capital*. Both of these barriers are relevant to the Al-Pac FMA. They are, however, discussed in Part 3 of the case study report, which deals with fiscal issues and the use of economic instruments to conserve natural capital.

Overall, the case study highlights compelling reasons to focus on the regulatory fundamentals in the context of multiple and increasing demands on the land and resource base. The most important general lesson from the regulatory component of the Al-Pac case study is that conservation of natural capital on this type of working landscape is difficult to achieve without the ability to address cumulative effects through integrated landscape management.

Section 5 of this document examines regulatory barriers and policy options that relate to the following eight management objectives:

- maintain total forest cover;
- maintain the natural disturbance regime;

- maintain old forest;
- maintain key aquatic and hydrological features;
- recognize and protect areas of traditional Aboriginal use and value;
- establish areas within the managed forest where human impacts are prohibited or severely reduced;
- reduce linear disturbance density and manage human access; and
- maintain terrestrial carbon stocks and sinks.

In each case, a number of regulatory barriers to progress are identified and policy options suggested. The level of detail contained in these sections cannot easily be captured in an executive summary, so readers are referred to Section 5 itself for specifics.

Section 6 presents areas for additional research and analysis. All of the policy options surveyed in this document could be the subject of more detailed examination in order to generate specific proposals for legal, institutional and policy reform. Additional work could also focus on the potential for using specific federal and provincial legislation to conserve natural capital.

Part 2 concludes by noting that the case study findings are relevant not only to the Al-Pac FMA, but also to the boreal forest as a whole. There is clearly considerable potential for regulatory reform that would promote the conservation of natural capital within the case study area. The Al-Pac FMA also offers decision makers and stakeholders in other parts of the boreal forest an opportunity to look ahead to a scenario of intense, multiple and sometimes competing land uses and values. The lessons from this case study thus suggest how legislation, policies and land use practices could be modified throughout Canada's boreal forest in order to promote the conservation of natural capital within a sustainable development framework for managing land and resource use.

1. Introduction

This is Part 2 of a three-part case study report examining conservation issues within the Alberta-Pacific (Al-Pac) Forest Management Area (FMA) in northeastern Alberta. The goal of this part is to explore regulatory barriers to the conservation of natural capital and policy options for overcoming those barriers. The term "regulatory" is broadly defined to include the legal, institutional and policy framework for managing land and resource use within the Al-Pac FMA. The other two parts of the case study report review conservation values, land and resource uses, and management objectives for the Al-Pac FMA (Part 1) and discuss fiscal barriers and associated policy options, including the use of economic instruments, relating to the conservation of natural capital (Part 3).

This present document begins with brief sections on the objectives and scope of the Al-Pac case study and the study methodology. The discussion then turns to a two-stage analysis of barriers and policy options. The first stage addresses cross-cutting barriers to the conservation of natural capital and corresponding regulatory responses. The second stage focuses on specific regulatory issues relating to each of the management objectives identified in Part 1 of the report. Throughout these sections, instances where stakeholders within the Al-Pac FMA have adopted innovative approaches to promoting or facilitating the conservation of natural capital are identified as "best practices." For ease of reference, key recommendations and conclusions are italicized. The final sections identify areas for future research and provide brief concluding comments.

2. Objectives and Scope of the Case Study

This section reviews the principal objectives of the case study and considers their relationship to the broader issue of sustainable development. It also highlights the distinctive resource values of the Al-Pac FMA and comments briefly on the approach taken to constitutional and jurisdictional issues.

2.1. Objectives

The basic objectives and scope of the case study were defined in the Request for Proposals issued by the NRTEE and were further refined in the project proposal. The case study is intended to identify fiscal and regulatory barriers to conservation and policy options for conserving natural capital, while recognizing the importance of resource development and other economic and social values for land use in this area.

The case study is one of three case studies commissioned by the NRTEE as part of its Conservation of Canada's Natural Heritage: The Boreal Forest program. The goal of the program is "to advance conservation in balance with economic activity on public lands allocated for resource development in Canada's boreal forest through regulatory and fiscal policy reform." The Boreal Forest program builds on the findings, conclusions and recommendations contained in *Securing Canada's Natural Capital: A Vision for Nature Conservation in the 21st Century*.[1]

[1] NRTEE, *Securing Canada's Natural Capital: A Vision for Nature Conservation in the 21st Century* (Ottawa: 2003).

Securing Canada's Natural Capital also provides working definitions for two of the key terms relating to the case study objectives. Appendix A to the NRTEE's report defines "conservation" as "the maintenance or sustainable use of the Earth's resources in a manner that maintains ecosystems, species and genetic diversity and the evolutionary and other processes that shaped them."[2] "Natural capital" is defined as "natural assets in their role of providing natural resource inputs and environmental services for economic production."[3] The discussion of this term identifies three main categories of natural capital (renewable and non-renewable natural resource stocks, land and ecosystems) and notes that resource stocks provide raw materials for production, land provides space for economic activity, and "ecosystems are essential for the services they provide directly and indirectly to the economy."[4] The case study did not involve a detailed analysis of definitional issues. Most interviewees and workshop participants appeared to understand clearly the focus of inquiry and were able to offer specific comments on obstacles and policy options relating to the conservation of natural capital.

The focus on conservation of natural capital is consistent with the NRTEE's overall mandate, which is to "play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development." The following section reviews briefly the connection between the specific objective of the case study and the broader issues relating to sustainable development.

2.2. Conservation of Natural Capital and Sustainable Development

Several people who were interviewed for the case study said that the outline of issues and options distributed before the interviews[5] was too narrowly focused on conservation. They argued that a broader sustainable development perspective should be explicitly adopted when considering issues and policy options relating to land and resource management in the Al-Pac area. This issue was also discussed with NRTEE staff on several occasions during the case study.

The authors of this case study report recognize that the design and implementation of policies affecting land and resource use in the Al-Pac FMA will, or at least should, involve a careful consideration of economic, social and environmental values. Determining the appropriate balance between these three elements of sustainable development is a matter of political and, ultimately, social choice. The full range of factors that should inform this choice and the over-arching policy and institutional framework that will be required to achieve sustainable development in practice are matters that the NRTEE task force for the Boreal Forest program may want to examine. They are, however, beyond the scope of this case study. The focus here is simply on the principal barriers to the conservation of natural capital in the Al-Pac FMA and the policy options that could be used to promote this value, should it be recognized as important by decision makers.

[2] Ibid., p. 100.
[3] Ibid., p. 102.
[4] Ibid.
[5] See Appendix 2.

2.3. Resource Values and Policy Choices in the Al-Pac FMA

The information and analysis presented in Part 1 of this report demonstrate clearly the pervasive and long-term challenges that must be addressed if the conservation of natural capital is to co-exist with economic development on the working landscape within the Al-Pac FMA. Many of the issues raised by the range and intensity of development occurring on the Al-Pac FMA are also being played out—or may be played out in the future—in other areas of the boreal forest. In some respects, however, the Al-Pac FMA embodies a unique set of challenges.

In particular, the presence of globally significant bitumen reserves in oil sands distinguishes portions of the Al-Pac FMA from other areas of the boreal forest. This subsurface resource has two important implications. First, its high economic value will inevitably affect the trade-offs that governments and society as a whole are prepared to make between industrial activity and the conservation of natural capital. Second, producing this resource precludes or constrains some conservation options because of its relatively significant ecological impacts, whether from surface mining or from in situ operations.

The concentration of high subsurface resource values and significant ecological effects from development within the oil sands area creates a very challenging environment for initiatives directed at conserving natural capital. While mitigation and reclamation in the oil sands area may be capable of maintaining or restoring some aspects of natural capital, particularly over the long term, many of the stakeholders interviewed for this case study accept that economic development in the oil sands area is inevitable and some argued that this development will have a significant ecological cost. In addition, some interviewees spoke of the need for policies that would provide opportunities for offsetting these activities in areas outside the Al-Pac FMA.

This situation is not, however, typical of the boreal forest as a whole. While the implications of oil sands development for natural capital are undoubtedly significant from a local and regional perspective, the total area that is likely to be disturbed through surface mining and in situ operations remains a relatively small portion of Canada's boreal forest. For that reason, the regulatory analysis for this case study has not examined environmental issues unique to oil sands surface mining and in situ recovery. These issues include the reclamation of open-pit mines, the management of large tailing ponds, the intense development footprint from in situ recovery, and the local air quality issues associated with bitumen production and processing.

This choice of emphasis is not intended to downplay the importance of oil sands development from environmental, economic and social perspectives. For many local residents, notably Aboriginal peoples, managing the environmental effects of oil sands development is vitally important. Efforts to reconcile social, cultural, economic and environmental values in this context clearly merit attention and support. In terms of the broader objectives of this case study, however, choices must be made and all issues cannot receive equal attention. The decision not to examine in detail the issues specific to oil sands development reflects the limited resources available for this case study and the interest of the NRTEE in results that are "nationally applicable." It should be noted, however, that few if any stakeholders interviewed for this case study appear willing to "write off" the oil sands area in terms of natural capital, and many individuals and organizations are working hard to ensure that industrial development in this area does not come at an unacceptable environmental price.

2.4. Constitutional and Jurisdictional Issues

The regulatory context for land and resource management within the Al-Pac FMA is, of course, defined at a fundamental level by Canada's constitution. The constitution has potentially important implications for conservation in the boreal forest because it establishes the division of powers between the federal and provincial orders of government and it entrenches the legal rights of Aboriginal peoples. These constitutional issues are not, however, addressed in any detail in this case study.

The NRTEE's Request for Proposals states that the case study should focus particularly on barriers to conservation that are "national in scope" and that it should identify "nationally applicable" areas of recommendation and "national level" incentives and instruments. The analysis is not, however, restricted to areas of federal jurisdiction, nor is the case study intended to address the constitutional or intergovernmental aspects of resource and environmental management in the Al-Pac FMA. The "national" focus is achieved by highlighting the particular barriers and policy options that are most likely to be relevant in other areas of the boreal forest and, indeed, throughout other parts of Canada.

The case study was therefore guided by the assumption that there are opportunities for both orders of government to contribute to achieving conservation objectives in the boreal forest within the current constitutional framework, although it is recognized that the provincial role is predominant in relation to many regulatory and fiscal tools. In particular, the provincial government owns Crown land and resources in the Al-Pac FMA and exercises most, but not all, of the regulatory powers relating to land and resource use. As a result, authority in areas such as land use planning, resource disposition and the regulation of many of the activities that may affect natural capital is in provincial hands.

Federal authority, while more limited in scope, can be important in certain areas such as the protection of fisheries and migratory birds, the regulation of toxic substances and the management of transboundary issues. Recent federal legislation dealing with species at risk supports a federal role in certain circumstances. The federal government also has constitutional authority over "Indians" and "lands reserved for the Indians" [6] and is responsible for ensuring that Aboriginal and treaty rights are not unjustifiably infringed. Some projects in the Al-Pac FMA are also subject to both federal and provincial requirements for environmental assessments. Under the Canadian Environmental Assessment Act, any federal assessment must consider the environmental effects of a project "on the current use of lands and resources for traditional purposes by aboriginal persons" as well as on historical and archeological sites. Finally, the federal government has the capacity to support initiatives and influence activities through a broad range of policies and programs, including the use of tax incentives and the ability to fund activities in areas of provincial jurisdiction (the federal "spending power").

The discussion of regulatory issues in this document is not, however, organized along jurisdictional lines. Rather, it focuses on a set of barriers and management objectives, many of which could be addressed in varying degrees by the federal and Alberta governments acting either individually or cooperatively. The types of intergovernmental conflict or cooperation that

[6] Constitution Act, 1867, s. 91(24).

could arise in this context and their implications for the conservation of natural capital are left for others to consider.

A review of the evolution of Aboriginal rights through constitutional jurisprudence is also beyond the scope of this case study. The role of Aboriginal peoples in managing the boreal forest is rapidly evolving in Canada as a result of legal and political developments. One of the legal issues that has been the subject of intense debate and scrutiny by the courts is the government's duty to consult with Aboriginal peoples when its actions or decisions may infringe on their rights and to accommodate these rights when making decisions that affect them. This duty is particularly relevant to decisions pertaining to resource developments that have the potential to negatively affect lands and resources traditionally used by Aboriginal peoples and the environment in which they live. While judicial consideration of the "duty to consult and accommodate" is ongoing, the federal and provincial governments, including the Alberta government, are developing Aboriginal consultation policies that may help to shape future land and resource management decisions and lead to a greater involvement of Aboriginal communities in the decision-making process. These legal and policy developments may, in turn, influence the conservation of natural capital in the boreal forest.

Furthermore, some Aboriginal organizations in Canada have entered into agreements with resource companies that address a broad range of issues, including the conservation of natural capital. One person interviewed for this case study remarked that, after climate change, Aboriginal peoples were likely to be the single greatest influence on the future of the boreal forest over the coming century. This important set of issues could only be briefly examined within the time frame and budget allocated for this case study. Aboriginal involvement in the case study is discussed in the following section on study methodology.

3. Case Study Methodology

This section of the document discusses three aspects of the case study methodology that are relevant to the regulatory analysis: (1) the general analytical framework, (2) the research methods and (3) the involvement of Aboriginal stakeholders.

3.1. Analytical Framework

The regulatory analysis presented in this part of the report fits within the overall analytical framework that was developed for the Al-Pac FMA case study by the project team.[7] Central to this framework is the set of possible management objectives for the Al-Pac FMA that was identified and discussed in Part 1. These objectives were selected because they indicate how land and resource use in the area could be managed in ways that would promote the conservation of various aspects of natural capital. The initial selection of objectives was based on the expertise of project team members and a review of relevant literature. The objectives were refined by the project team through a process that included further analysis by team members and consideration of input received from stakeholder interviews and from the case study workshop, held in Fort McMurray on May 3, 2004.

[7] Project team members are Daniel Farr (Biota Research Ltd.), Steven Kennett and Monique Ross (Canadian Institute of Resources Law), Brad Stelfox (Forem Technologies) and Marian Weber (Alberta Research Council).

Part 1 of the report shows how these objectives are related both to the conservation values within the Al-Pac FMA and to the suite of human land and resource uses that will, or may, have negative impacts on natural capital in the region. Part 1 thus provides the basis for the discussion in Parts 2 and 3 of barriers to conserving natural capital (i.e., barriers to achieving these management objectives) and policy options for overcoming those barriers.

3.2. Research Methods

The primary research method used for this analysis of regulatory issues and options was a series of key interviews, some in person but most by telephone. Interviewees included members of the task force overseeing the NRTEE's Boreal Forest program and representatives from government (federal and provincial), industry (oil and gas, forestry), environmental groups and Aboriginal organizations. A list of interviewees is included as Appendix 1. The selection of interviewees was based primarily on the project team's knowledge of key stakeholders and on suggestions from task force members, NRTEE staff, interviewees themselves and other contacts. The project team's objective was to interview a broad range of key stakeholder representatives and other individuals having an interest in or knowledge about the Al-Pac FMA. The interviewees do not, however, constitute a representative sample of any broader group. Time and budget limitations precluded a more comprehensive set of interviews.

Potential interviewees were generally contacted first by e-mail to determine whether they were willing to be interviewed. The initial contact letter is included in Appendix 2. At least one follow-up e-mail was sent to potential interviewees who did not respond to the initial request for an interview. All interviewees were sent an outline of discussion points prior to the interview (see Appendix 2). A few of the people who were contacted recommended others within their organizations as appropriate interviewees and, in some instances, several people from one organization were interviewed. Interviews generally lasted about one hour and covered some, but not all, of the issues identified in the outline. Some interviews followed the questions listed in the outline fairly closely, while others adopted a less structured approach. All interviews were conducted on a not-for-attribution basis.

The information and ideas obtained from interviews were supplemented by input received at the stakeholder workshop in Fort McMurray. The workshop agenda and a copy of the "Issue and Option Outline for Workshop Participants," which was distributed prior to the workshop, are included in Appendix 3. Members of the project team participated in the workshop, and summary notes prepared by NRTEE staff were reviewed and incorporated into the case study report.

The discussion that follows is based primarily on these sources of stakeholder input, although it also reflects the expertise of project team members and the results of a review of selected relevant publications. In a project of this scope, the presentation of findings inevitably reflects a series of explicit and implicit choices regarding the appropriate areas of emphasis and the depth of analysis to be presented. The authors have endeavoured to provide as complete and balanced a review of issues and options as possible within the time and budget available for this project.

3.3. Involvement of Aboriginal Peoples

At the outset, it is important to note that Aboriginal peoples[8] are "not just another stakeholder," since they enjoy special constitutional protection of their rights. As noted earlier, they are entitled to be consulted by government in the context of resource development that may affect their rights, and the courts and governments are currently engaged in defining what are "adequate" consultation processes.

The Aboriginal communities living within or in proximity to the Al-Pac FMA have been deeply affected by the intensity of resource development, starting with oil sands and conventional oil and gas development and followed by forestry operations. From their standpoint, participation in an interview process that solicits their views on land and resource management issues, in order to formulate recommendations to government on legal and fiscal reform, is potentially a "consultation process." Because of the current legal uncertainty and political developments in this area, Aboriginal communities have been reluctant to be interviewed by consultants whose role was unclear to them. They have taken the view that they should have been approached by the NRTEE at the outset of the project and involved in the formulation and planning of the research. One Aboriginal community member declined to be interviewed because she viewed the interview as a form of consultation with Al-Pac, and Al-Pac has not yet discussed the impacts of its activities nor entered into an agreement with her community. The same reluctance was expressed by an elder from another Aboriginal community, who objected to what he viewed as improper consultation with the community. He considered that a telephone interview was unsatisfactory and that a face-to-face interview was preferable. He further mentioned that he was reluctant to participate without the support of the other elders in the community.

The limited time and budget available for this research project did not allow for the kind of interviews that would have been considered adequate by Aboriginal representatives. A complicating factor is the fact that Aboriginal communities within the Al-Pac FMA, particularly those located in the Fort McMurray area, are inundated with requests for consultation from resource companies, government agencies and other parties. Many Aboriginal representatives and community members therefore suffer from overload. As a result, they have neither the time nor the human capacity to entertain requests for interviews by consultants when these interviews do not meet an immediate need or bring a direct benefit to them.

Nevertheless, the project team was able to obtain some input from two Aboriginal communities, and several Aboriginal representatives did participate in the Fort McMurray workshop at the invitation of the NRTEE. Further, non-Aboriginal interviewees and workshop participants offered their views on Aboriginal issues, and these views are also included in this report.

4. Cross-Cutting Barriers to the Conservation of Natural Capital

Interviews for this case study, the stakeholder workshop and the review of issues by the project team highlighted a number of cross-cutting barriers to conservation. These issues are characterized as cross-cutting because they are relevant to many of the specific management objectives that were identified in Part 1 of this report.

[8] The term "Aboriginal peoples" as used in this report encompasses the Indian and Métis peoples as per s. 35 of the Constitution Act, 1982.

Many of these barriers are already well known. In particular, the case study provided an opportunity to elicit comments on the following "barriers to progress" that the NRTEE identified in its report on *Securing Canada's Natural Capital:*[9]

- lack of political will and accountability on the part of governments;
- lack of conservation planning at a landscape level;
- key stewards are often not "at the table";
- lack of economic benefits and incentives for key stewards;
- lack of information tools to support decision making;
- failure to integrate the true costs and benefits of nature; and
- lack of financial resources to support conservation and partnerships.

In addition to these seven barriers, interviewees and workshop participants identified the following two areas of concern:

- inadequate integration of decision making across sectors and land uses, as well as among regulatory processes; and
- constraints and incentives relating to resource disposition and tenure systems.

These two topics are related to several of the barriers identified by the NRTEE. They warrant special attention, however, because of their obvious importance to stakeholders and because the defining features of the Al-Pac FMA include the multitude of land and resource uses and the presence of extensive and often overlapping industrial tenures.

While many of these barriers are fairly general in nature, they highlight some of the policy "fundamentals" that arguably must be in place for successful implementation of specific management objectives designed to conserve natural capital within a sustainable development framework. All of the interviewees for this case study commented in detail on the cross-cutting barriers to conservation that they considered most important. In some cases, they also provided detailed illustrations of these barriers within the Al-Pac FMA and suggested regulatory and fiscal measures to address them. These barriers were also addressed by stakeholders at the case study workshop.

4.1. Lack of Political Will and Accountability by Governments

Political will and accountability are, of course, axiomatic requirements for effective, sustained and democratically responsive initiatives in any area of public policy. The NRTEE identified lack of political will and accountability as the first barrier to conservation in its report *Securing Canada's Natural Capital*. There was virtual unanimity among stakeholders interviewed for this

[9] NRTEE, *supra* note 1, pp. 39–41.

case study that effective action to conserve natural capital in the Al-Pac FMA will require political commitment—including a willingness to make hard choices—and institutional arrangements that ensure the accountability of government and other stakeholders for their decisions. Many interviewees and workshop participants also noted room for improvement in these areas within the Al-Pac FMA.

Characterizing the problem as "lack of political will" and "lack of accountability" may, at first glance, appear to invite a descent into an adversarial and subjective questioning of motives and allocation of blame. It was evident from the interviews and the workshop, however, that a measured and objective discussion of political will and accountability is possible in relation to resource and environmental management within the Al-Pac FMA. A number of stakeholders made it clear that, in their view, attention to both of these issues is an important prerequisite to progress in conserving natural capital. They also provided specific and well-documented concerns in each of these areas. Comments can be grouped into four broad categories.

4.1.1. Transparency about political choices and their implications

First, some stakeholders noted that the perceived lack of political will to make greater progress on conserving natural capital may reflect a conscious—although not always clearly articulated—choice by government to favour economic objectives over environmental ones. As noted above, there are high value surface and subsurface resources within the Al-Pac FMA. It is also evident that the Government of Alberta relies heavily on natural resource revenues to fund programs, maintain low tax rates and progressively pay down the public debt. Resource development is also a significant source of revenue for the federal government. A number of interviewees argued that governments appear overwhelmingly preoccupied with short-term revenue maximization, apparently (in the view of some interviewees) at the expense of other values. In this context, the political reality may be that the governments are reluctant to forgo any significant amount of resource revenue in order to conserve more natural capital in all or part of the Al-Pac FMA.

Interviewees who saw the political and economic calculus guiding government decision making in these terms raised two further points. The first is that the options for conserving natural capital will obviously be constrained, although there are undoubtedly some regulatory and fiscal measures that could achieve gains in conserving natural capital without significantly affecting resource revenues, at least over the longer term. The second point made by some interviewees is that government should be more forthright in stating its priorities and assuming responsibility for the consequences of its choices. This latter point highlights an important linkage between political will and accountability.

In particular, several interviewees expressed the view that government has created incentives and regulatory requirements that drive resource development at the expense of natural capital, while maintaining publicly that all values can be accommodated on the landscape. There is clearly a perception among some stakeholders from both industry and the environmental community that, when the inevitable trade-offs become evident, project proponents and other stakeholders are left to fight it out while government steps aside and, in effect, avoids being held directly accountable for its policy direction. In other words, governments are seen by some stakeholders as aggressively pursuing an economic development agenda within the Al-Pac FMA while avoiding, at least to some extent, accountability for the resulting environmental trade-offs.

This perception is particularly troubling in a context where multi-stakeholder groups have been attempting to reach consensus on how to balance economic, social and environmental objectives and where project proponents feel that they are "on the hook" in regulatory and stakeholder processes when values collide. Without a clear indication of the extent of political will within government to move forward in certain directions, there is a real risk of growing frustration among the non-governmental stakeholders who are trying to resolve complex issues but do not understand the real "rules of the game" by which government is playing. *An important general lesson from the Al-Pac FMA case study is therefore that government should be transparent and accountable when setting policy direction and making choices between economic development and the conservation of natural capital. Without this transparency and accountability, informed, democratic choice becomes difficult and stakeholders may be thrust into conflicts that they cannot satisfactorily resolve.*

4.1.2. Political will to follow through on explicit policy direction and multi-stakeholder processes

A second area of concern relating to political will and accountability is what many interviewees and some workshop participants identified as a systematic failure of the Government of Alberta to follow through on important strategic policy directions and on the implementation of recommendations from multi-stakeholder processes that it has initiated or supported. This pattern is seen by some stakeholders as an important barrier to progress in conserving natural capital within the Al-Pac FMA and elsewhere in Alberta. This is because it has occurred in relation to directly relevant areas of public policy and because it is seen as undermining the credibility and usefulness of multi-stakeholder processes, which are generally seen as necessary to manage cumulative effects and conserve natural capital in a multi-use area such as the Al-Pac FMA. Two specific examples were raised in a number of interviews.

The first example is the Alberta Forest Conservation Strategy. This extensive multi-stakeholder process addressed issues that are directly relevant to the conservation of natural capital in the Al-Pac FMA and throughout Alberta's boreal forest. It produced a series of recommendations for aligning provincial law and policy with principles of sustainable and ecosystem-based forest management, an approach that several interviewees saw as a promising basis for conserving natural capital on the working landscape. While a detailed examination of this process and its outcome is beyond the scope of this case study, it is significant that interviewees from industry, government and environmental organizations all commented on the government's failure to implement the recommendations that emerged from this process. One interviewee with specific knowledge of this process stated that opposition was already mobilized within government to kill the stakeholder recommendations before they were officially submitted. The document that was finally endorsed by government, *Alberta's Forest Legacy*,[10] was characterized by several interviewees as being significantly weaker than the recommendations that emerged from the multi-stakeholder process.

The second example of lack of political will is the Government of Alberta's apparent failure to follow through on its recent integrated resource management (IRM) initiative.[11] Once again, the

[10] This document is available at www3.gov.ab.ca/srd/forests/fmd/legacy/pdf/legacy.pdf.
[11] Information on the IRM initiative can be found at www3.gov.ab.ca/env/irm/index.html.

policy issues are directly relevant to conservation of natural capital in the Al-Pac FMA and elsewhere and will be returned to below. The IRM initiative began with a statement of government policy, *Alberta's Commitment to Sustainable Resource and Environmental Management,*[12] that specifically endorsed an integrated approach to decision making. The establishment within Alberta Environment of the Integrated Resource Management Branch, whose mandate was to promote IRM, followed from this commitment. The cornerstone of this initiative was the development of regional strategies, the first of which was the multi-stakeholder Northern East Slopes (NES) Strategy.

The interviews for this case study indicate, however, that there is widespread consensus among stakeholders that the Alberta government lacked the political will to carry through with these important initiatives. One interviewee with first-hand knowledge of this process stated that key resource management departments successfully resisted the IRM initiative even though it reflected official government policy. As a result, officials from the IRM Branch were, in the interviewee's words, left to argue with officials in other departments without any effective support at the higher bureaucratic and political levels. Another interviewee commented that the underlying problem might relate to the absence of a policy framework for reconciling provincial and local objectives and for evaluating the resulting trade-offs. The IRM Branch was apparently disbanded in the spring of 2004, and the people interviewed for this case study were uncertain what measures, if any, would be taken to implement Alberta's commitment to IRM.

As for the NES Strategy, the consensus among interviewees who commented on this issue was that opposition from important resource management departments—notably Alberta Sustainable Resource Development and Alberta Energy—has effectively blocked implementation of the multi-stakeholder recommendations. If this assessment is accurate, it will be a disappointment for the stakeholders who devoted considerable time and effort to the process and may further erode confidence in the IRM approach to consensus building around difficult land use issues in Alberta.

The perception that the Government of Alberta was unwilling to follow through on the Alberta Forest Conservation Strategy and the IRM initiative is particularly relevant to this case study because of its implications for two areas of public policy—sustainable forest management and integrated resource management—that are widely seen as important for the conservation of natural capital on working landscapes. Furthermore, these experiences may undermine the credibility of important ongoing initiatives within the Al-Pac FMA, notably the provincial government's Regional Sustainable Development Strategy (RSDS) and the stakeholder-led Cumulative Effects Management Association (CEMA). *The general lessons are simple but important. Progress in addressing complex land use issues through internal government initiatives and multi-stakeholder processes should be backed by a political commitment to follow through at the implementation stage.*

[12] Government of Alberta, *Alberta's Commitment to Sustainable Resource and Environmental Management* (Edmonton: March 1999).

4.1.3. Lack of an institutional focal point for accountability

The third issue relates directly to the lack of institutional accountability as a barrier to the conservation of natural capital. Interviewees and participants at the workshop commented that, while many departments and agencies make decisions affecting natural capital and other values in the Al-Pac FMA, no single land and resource manager is accountable for the cumulative effects—including the effects on natural capital—of these decisions. For example, decisions on resource dispositions (e.g., mineral rights issuance, forestry quota allocations and FMAs) and authorizations for specific projects and activities (e.g., well licences, pipeline licences, approvals for seismic programs, issuance of licences of occupation for roads) are made within several departments and agencies, each of which has its own sectoral mandate.

Although accountability for cumulative effects falls in certain respects within the mandate of Alberta Sustainable Resource Development (ASRD), this department does not have authority over many of the decisions that contribute to these effects. Thus, the accountability of ASRD for multiple use, non-market benefits and other important land-use issues is not supported by a compatible authority structure for making decisions. This topic is further discussed in Part 3.

There are, of course, some mechanisms for interdepartmental coordination, including the Sustainable Development Coordinating Council of deputy ministers. However, interviewees who commented on this issue generally felt that these forums were used primarily for information exchange, rather than as a means to integrate and achieve collective accountability for decision making by the respective departments and agencies.

Lack of accountability as a barrier to the conservation of natural capital in the Al-Pac FMA can therefore be characterized as a structural issue. It is a direct result of fragmented legal and administrative arrangements that tend to focus decision makers on relatively narrow issues without providing an overarching entity that is directly and visibly accountable for the cumulative landscape-level implications of these decisions for ecological processes and natural capital. This barrier is part of a cluster of issues related to the lack of integration in resource and environmental management, a topic addressed in more detail below.

4.1.4. Absence of effective accountability mechanisms in legislation

The final point concerning political will and accountability centres on the lack of formal accountability mechanisms within legislation governing land and resource use in the Al-Pac FMA. For example, one interviewee commented on the absence of clear requirements or targets relating to biodiversity protection, the protection of key ecological areas, the monitoring of impacts and reclamation efforts, the management of cumulative effects and other issues that are critically important for the conservation of natural capital. The flexibility and discretion built into Alberta's legislation and policy, it was argued, make it very difficult to assess the performance of government and industry in ways that will hold decision makers accountable.

4.2. Inadequate Integration of Decision Making Across Sectors and Land Uses, as well as Among Regulatory Processes

The interviews for this case study and the comments received at the stakeholder workshop suggest a broad consensus that the absence of integrated decision making across sectors and land

uses and among the stages of decision making that make up the regulatory regime is a significant barrier to conserving natural capital in the Al-Pac FMA. This issue was not identified by the NRTEE as a separate barrier in *Securing Canada's Natural Capital*, although it was referred to at various points in that report, notably in relation to conservation planning.[13] Since the principal human impacts on natural capital in the Al-Pac FMA stem from the cumulative effects[14] of multiple activities, an integrated approach to land and resource management is essential in order to set and achieve landscape-level objectives related to the conservation of natural capital. This approach is commonly referred to as integrated landscape management (ILM) or integrated resource management (IRM).

The basic characteristics of ILM can be only briefly summarized here, although more detailed discussions of this issue are available.[15] ILM involves decision making that is integrated across the full range of sectors and activities occurring on the landscape, among the various stages of decision making that make up the regulatory regime,[16] and over meaningful spatial and temporal scales. Improved integration can be achieved through inter-industry cooperation, at the operational level of regional resource and environmental management, through discrete changes to resource management and regulatory processes (e.g., rights disposition or environmental assessment processes) or through structural changes to the legal and institutional framework for decision making. Throughout the regulatory regime, a wide variety of integrative mechanisms could be used to promote ILM.

ILM has received considerable attention over the past several years at the national level, within Alberta and in relation to the Al-Pac FMA. A national workshop that examined this issue in 2003[17] has resulted in an ongoing initiative by leading stakeholders from industry, government and non-governmental organizations that is directed to promoting ILM throughout Canada.[18] Within Alberta, the Alberta Chamber of Resources has established an ILM program that has, among other things, encouraged inter-industry cooperation to reduce the industrial footprint and contributed to the establishment of an industrial research chair in ILM (held by Stan Boutin at the University of Alberta).[19] Al-Pac has been a driving force in this program. As noted above, the Government of Alberta has endorsed an integrated approach to resource and environmental

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[13] NRTEE, *supra* note 1, pp. 45–48, 59–65.

[14] The assessment and management of cumulative effects was an important topic of discussion at the workshop in Fort McMurray.

[15] See, for example, Steven A. Kennett, *Integrated Landscape Management in Canada: Initial Overview and Analytical Framework*, Report prepared for the International Council on Mining and Metals, February 9, 2004 (available from the author at the Canadian Institute of Resources Law or from Tony Andrews, Executive Director, Prospectors and Developers Association of Canada).

[16] The principal stages include: (1) strategic policy direction regarding land and resource use; (2) land use planning (including protected area designation, "integrated" or comprehensive planning and sector-specific planning); (3) issuance of resource rights (e.g., issuance of legal rights to forestry operators, oil and gas companies and other users of land and resources); (4) review and approval of proposed projects and activities (e.g., environmental assessment); and (5) detailed regulation of projects and activities.

[17] *Report on the National Landscape Management Workshop*, held at Chateau Cartier, Aylmer, Quebec, April 23–25, 2003. This workshop was sponsored by Wildlife Habitat Canada, the Prospectors and Developers Association of Canada, The Canadian Forest Products Association of Canada, Parks Canada and Environment Canada.

[18] Information on the Landscape Management Coalition can be obtained from the co-chairs of this initiative: Jean Cinq-Mars (President, Wildlife Habitat Canada) and Tony Andrews (Executive Director, Prospectors and Developers Association of Canada).

[19] See: www.acr-alberta.com/Projects/ILM_backgrounder.htm; www.biology.ualberta.ca/boutin.hp/boutin.html.

management at the level of strategic policy, although initiatives in this area have yet to yield significant results.[20] Finally, the need for improved integration in decision making has been widely recognized in relation to the Al-Pac FMA. For example, a chapter on the Al-Pac FMA that was included in a recent book entitled *Towards Sustainable Management of the Boreal Forest* concluded as follows:

> The next challenge to address in the achievement of sustainable forest management will be to deal effectively with the cumulative impacts of natural disturbances, forest management, and other overlapping (often competing) land uses, such as the activities of the energy sector. … Integrating industrial activity across sectors will ultimately require regional management through combined actions of government, industry and the public. This is now the big challenge for achieving truly sustainable forest management in Alberta.[21]

It is virtually self-evident that reconciling multiple human land uses with the conservation of natural capital on a working landscape such as the Al-Pac FMA requires ILM.

For many workshop participants and people interviewed for this case study, the lack of integration in decision making on land and resource use is the primary barrier to conserving natural capital on the working landscape within the Al-Pac FMA. The absence of integrated decision making was also identified as an important barrier to achieving other economic and social objectives that require decision makers to address resource use conflicts and cumulative effects.

The workshop and interviews for this case study confirmed that the lack of integrated decision making across resource sectors and among other activities on the land base is a pervasive problem in the Al-Pac FMA. Most components of the regulatory regime are still based on sectoral silos that impede efforts to set landscape-level objectives and manage cumulative effects. Workshop participants commented on the impediments to integration that result from the competing mandates and conflicting objectives of different regulatory authorities.

Interviewees and workshop participants also confirmed that integrated planning is a key requirement for conserving natural capital within a sustainable development framework. Deficiencies in land use planning within the Al-Pac FMA are examined below as a separate barrier to the conservation of natural capital. It was clear from the interviews and the workshop, however, that the need for integration goes beyond the land use planning stage of decision making. In particular, the lack of integration at the level of broad land use policy and among the rights issuance, project review and regulatory stages of decision making was also identified as problematic.

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[20] See, for example, Steven A. Kennett, *Integrated Resource Management in Alberta: Past, Present and Benchmarks for the Future*, CIRL Occasional Paper #11 (Calgary: Canadian Institute of Resources Law, February 2002); Steven A. Kennett, "Reinventing Integrated Resource Management in Alberta: Bold New Initiative or 'Déjà vu all over again'?," *Resources* (Winter 2002).

[21] Daryll Hebert et al., "Chapter 22—Implementing sustainable forest management: some case studies," in Phillip J. Burton et al., eds., *Towards Sustainable Management of the Boreal Forest* (Ottawa: National Research Council of Canada, 2003), pp. 919–920.

A recurring theme in the interviews and in comments from some of the workshop participants was the apparent disconnect within government between decision making on resource dispositions and the efforts to manage the individual and cumulative effects of industrial activities in order to conserve natural capital and achieve other land use values. Many stakeholders commented specifically on what they saw as the single-minded pursuit of revenue maximization and accelerated development that, in their view, is driving the mineral leasing system operated by Alberta Energy. Some stakeholders also commented on an apparent disconnect between the forestry and the fish and wildlife components of the Department of Sustainable Resource Development.

The requirements and incentives embedded in the leasing and tenure regimes are reviewed in more detail below. For present purposes, the key point is that resource dispositions set the development process in motion, but are made without an open and transparent review of cumulative effects issues and environmental impacts. In both the forestry and the energy sectors, resource disposition decisions receive little or no public input. Furthermore, as noted by many stakeholders, the disposition processes for these two sectors are completely separate and lack effective coordination.

An interdepartmental administrative mechanism called the Crown Mineral Disposition Review Committee (CMDRC) is apparently intended to review proposed mineral dispositions for environmental concerns before they are posted. However, two interviewees who commented on this process referred to it as a "joke" and a "bloody farce." The short time for review, a lack of human resources, an inadequate information base for evaluating proposals, and the CMDRC's purely advisory function (i.e., lack of decision-making authority) were identified as problems. It was also noted that this process is not transparent or open to public involvement. Furthermore, Alberta has nothing approximating the pre-tenure planning requirements that are discussed in the case study report on the Muskwa-Kechika Management Area in British Columbia. One interviewee stated, however, that the CMDRC process is effective in identifying all environmental concerns associated with any proposed mineral lease.

The lack of integrative mechanisms at other stages of decision making was also noted in several interviews. The Alberta Energy and Utilities Board has issued a series of decisions over the past several years calling for guidance on integrating individual project approvals for oil sands projects within an overall framework for managing regional cumulative effects.[22] All interviewees who commented on this issue acknowledged that the Cumulative Effects Management Association (CEMA) process has yet to deliver this framework, although large projects continue to be proposed and approved.

Failure to achieve effective integration of the regulatory processes that govern operational planning was also noted. One interviewee commented that some efforts are made by government to coordinate energy and forestry activities when proposals from both sectors arrive

[22] See, for example: Energy Utilities Board (EUB), Application by Syncrude for the Aurora Mine, EUB Decision 97-13, October 24, 1997; EUB, Application by Suncor Energy Inc. for Amendment of Approval No. 8101 for the Proposed Project Millennium Development, Addendum B to EUB Decision 99-7, July 23, 1999; EUB, Petro-Canada Oil and Gas Steam-Assisted Gravity Drainage Project, Mackay River Project, Athabasca Oil Sands Area, EUB Decision 2000-50, July 14, 2000; EUB, TrueNorth Energy Corporation Application to Construct and Operate an Oil Sands Mine and Cogeneration Plant in the Fort McMurray Area, EUB Decision 2002-089, October 22, 2002.

simultaneously, but that this process is ad hoc and is relatively ineffective in achieving integration when proposals and operational plans arrive sequentially. The different planning cycles and time frames of energy and forestry operations, driven by both economic and regulatory factors, were identified in many interviews as barriers to operational coordination.

Several interviewees commented on the lack of integration in decision making regarding roads and other disturbances (both linear and non-linear). The interviews suggest that all stakeholders recognize the importance of this issue and that some progress has been made through inter-industry cooperation and the efforts of government land managers. However, interviewees indicated that there are still instances of parallel roads being developed by different sectors and a failure to achieve optimal infrastructure coordination because of different planning horizons. Barriers and policy options relating to the management of linear disturbances are revisited later in this document.

Lack of integration within the forestry sector—between the FMA holder and embedded quota holders—was also raised in several interviews. There is currently no single management regime that applies to all forestry operations within the Al-Pac FMA. Several interviewees indicated that the companies involved are taking steps to improve coordination of forestry operations in order to save costs and reduce the extent and duration of industrial activities. The issue of establishing a single land manager for the forest resource is also, apparently, under consideration as part of the review of tenure arrangements and related issues by the Department of Sustainable Resource Development. No details on possible or proposed changes were forthcoming from the interviews.

A comprehensive and detailed examination of regulatory options for achieving integrated landscape management in the Al-Pac FMA is beyond the scope of this case study. Several of the interviewees who addressed this topic noted the apparent collapse of the Alberta government's recent IRM initiative and were uncertain what measures, if any, might be adopted to promote integration. A couple of interviewees indicated that there is renewed policy direction from senior government officials to improve coordination between the key departments of Energy, Sustainable Resource Development and Environment. However, these interviewees did not provide specific details on the policy, institutional and legal instruments that might be used to achieve this objective and overcome long-standing barriers to integration.

It is, however, possible to identify several general regulatory options that could be adopted to improve integration. Integrated land use planning, a topic addressed in the following section, is generally seen as a potentially effective integrative mechanism. One interviewee commented that the integrative value of planning would be enhanced if it established clearly defined and, where possible, quantifiable objectives, thresholds and limits for land and resource use. Furthermore, the effectiveness of planning as an integrative mechanism clearly depends on its ability to guide and constrain decisions at the resource disposition, project review and regulatory stages for the full range of land and resource uses. The pre-tenure review and planning process adopted in the Muskwa-Kechika Management Area in British Columbia illustrates how planning can be tied to rights issuance and subsequent resource development.

The logic of integration could also be built into project review processes and regulatory processes to ensure coordination across sectors and land uses and to provide a framework for

cumulative effects management. Regulatory integration in areas such as operational planning requirements and reclamation could also be implemented.

Several interviewees and workshop participants argued that a new governance model is required to manage land and resource use in the Al-Pac FMA and similar areas. Integration could be promoted by establishing a single agency charged with overall landscape management or by combining certain functions across all sectors (e.g., establishing one rights issuance agency that would allocate all industrial tenures on the landscape and another body that would conduct all environmental assessments for major projects). For example, some workshop participants suggested that a "cumulative effects agency" could be established.

The single-agency governance model could be implemented through a central, arm's-length agency or it could follow a bottom-up approach that would empower local stakeholders and land managers to define landscape-level objectives and oversee their implementation. Either approach would allow for broad political direction (and accountability) for land use policy, but would insulate day-to-day decisions from direct political control. Specific suggestions included a provincial land use commissioner or the establishment of delegated administrative authority, perhaps on a regional level. The result, ideally, would be an increased ability of the land manager to adopt a long-term perspective and make the difficult choices that are required to conserve natural capital on working landscapes.

The single-agency model is used for federal lands in the United States that are managed, respectively, by the Bureau of Land Management and the U.S. Forest Service. Workshop participants also identified the Tennessee Valley Authority as an example of a "central power base" with broad management authority in a defined geographic area. The Northwest Power Planning Council in the Columbia River basin is yet another U.S. example of this type of institutional arrangement. There are clearly both advantages and disadvantages associated with these types of management agencies. A thorough review of this topic is, however, beyond the scope of this case study. Nonetheless, this approach has the obvious advantage of providing a central point of accountability for setting and achieving landscape-level objectives, and it could provide greater institutional continuity over time.[23] It would therefore constitute a marked departure from the current situation where the future state of natural capital in an area such as the Al-Pac FMA is, in important respects, determined through a series of largely independent and uncoordinated decisions that are made within sectoral and project-specific contexts.

The interviewees for this case study did not comment in detail on how realistic this option is for Alberta. In fact, the need for structural integration to achieve ILM may not be widely recognized. Some stakeholders continue to be involved in processes that are intended to address cumulative effects and broader landscape-level issues but that do not tackle directly the obstacles to integration that are built into the current regulatory regime. For example, one interviewee noted that CEMA was charged with developing elements of a new environmental management system for the oil sands area and that the intent was to hand this system over to government for implementation. However, this interviewee stated that the structural obstacles to implementing such a system—notably the lack of an institutional home for it within government—have not yet

[23] The departments and agencies responsible for environmental and resource management in the Government of Alberta have undergone numerous departmental and administrative reorganizations over the past couple of decades.

been addressed. Designing a management system without considering the need for a comprehensive, authoritative and integrated institutional structure to ensure implementation may be a recipe for frustration and failure.

4.3. Lack of Conservation Planning at a Landscape Level

The lack of conservation planning at a landscape level was identified by the NRTEE as a general barrier to the conservation of natural capital across much of Canada. The interviews and workshop conducted for this case study left no doubt that many stakeholders see this barrier as particularly relevant to the Al-Pac FMA. The general case for integrated landscape planning is described in *Securing Canada's Natural Capital* and will not be repeated here.[24] Stakeholders' comments on the state of planning within the Al-Pac FMA are summarized below.

An Integrated Resource Plan (IRP) has been completed for the Fort McMurray area and was recently amended to allow for oil sands development affecting a wetland complex that had previously been designated for protection.[25] This IRP is a product of a long-standing provincial government program that, as one interviewee noted, was considered state of the art in the 1970s. Several interviewees noted, however, that the Alberta government's commitment to integrated resource planning has faltered over the past couple of decades and that the IRP process was largely dismantled in the 1990s through cutbacks and administrative reorganizations. Stakeholders from industry and environmental groups who commented on integrated resource planning in Alberta generally agreed that this process is currently inadequate.

Views on the required changes ranged from support for a reinvigorated and slightly modified version of the IRP model to arguments that the planning process requires a fundamental rethinking. Weaknesses in Alberta's IRP process have been discussed in the literature and were raised in the interviews. The principal points raised in the context of this case study included:

- the tendency of IRPs to adopt a "multiple use" approach that sets broad management objectives and provides little specific guidance on priorities and trade-offs;

- the inadequacy of a zoning system that simply identifies permitted and not permitted uses in a context where natural capital and other land use values are affected by cumulative effects relating to the intensity, as well as the type, of activity;

- the failure of the IRP to provide useful guidance on thresholds and other key issues (i.e., lack of assistance on the types of issues that are being addressed through CEMA); and

- the inadequacy of resources to fund planning and systematically update plans.

There is also a perception on the part of some stakeholders that the IRP does not constitute a meaningful constraint on development and that government will simply amend restrictions on land use in order to accommodate new projects.

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[24] NRTEE, *supra* note 1, pp. 45–56.
[25] Government of Alberta, *Fort McMurray–Athabasca Oil Sands Subregional Integrated Resource Plan* (Edmonton: 1996).

These concerns reflect criticisms of the IRP process that are well documented elsewhere.[26]

Landscape-level planning in the case study area also occurs through Al-Pac's Detailed Forest Management Plan (DFMP). Several interviewees commented that Al-Pac is providing significant planning leadership for the area and that the DFMP addresses many issues that are relevant to integrated landscape management in general and to the conservation of natural capital in particular. However, it was also noted that this process cannot provide fully integrated landscape-level planning because of its sectoral nature and because of the broad range of relevant factors that are beyond the control of Al-Pac and of the government department with authority to approve the plan. In particular, the Al-Pac DFMP cannot adequately anticipate or direct oil and gas activity on the land base. Furthermore, coordination with a range of other land and resource users, including quota holders within the FMA, remains a challenge.

Another process that involved "conservation planning" was Alberta's protected areas policy, Special Places 2000. A review of that process is beyond the scope of this case study. Special Places 2000 resulted in the designation of some protected areas within the boreal forest of northern Alberta. Interviewees from government, industry and environmental groups confirmed that the current government position is that protected area targets have been met and that this process is now complete. This stance is a barrier to expanding the level of protection in the Al-Pac FMA, even if private agents are able to form contracts that neutralize development rights through conservation easement types of arrangements. This issue will be returned to below in the discussion of the establishment of protected areas as a management objective for the Al-Pac FMA.

Finally, the CEMA process could be characterized as a planning exercise since it is intended, in part, to develop thresholds for the management of cumulative effects in the oil sands area. Several interviewees commented that CEMA has yet to deliver the products that it was intended to produce, and they offered various explanations for the delay. One suggestion was that the process attempted to address too many issues simultaneously. Another interviewee commented that there are built-in incentives for the delay as participants from industry attempt to secure approvals for their projects before limitations emanating from CEMA are in place. *Government, it was argued, should fix firm timelines and convey more clearly the message that a failure of stakeholders to deliver the required management tools will result in government developing these tools itself.* This type of threat, it was suggested, has helped to spur consensus-based processes in other contexts, notably Alberta's Clean Air Strategic Alliance (CASA). The comparison between CEMA and CASA was raised in a couple of interviews, with one interviewee commenting that current criticisms of CEMA resemble those directed at CASA during its early years.

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[26] For commentary on the IRP process, see: Environment Council of Alberta, Policy Advisory Committee, *Our Dynamic Forests: The Challenge of Management,* A Discussion Paper Prepared for the Alberta Conservation Strategy Project (Edmonton: December 1990), p. 48; Oswald Dias and Brian Chinery, "Addressing Cumulative Effects in Alberta: The Role of Integrated Resource Planning," in Alan J. Kennedy, ed., *Cumulative Effects Assessment in Canada: From Concept to Practice* (Calgary: Alberta Association of Professional Biologists, 1994), pp. 312–316; Roger Creasey, *Cumulative Effects and the Wellsite Approval Process,* Thesis submitted to the Faculty of Graduate Studies in partial fulfillment of the requirements for the degree of Master of Science, Resources and Environment Program, University of Calgary, December 1998, pp. 78–80, 155–157; Steven A. Kennett and Monique M. Ross, "In Search of Public Land Law in Alberta," *Journal of Environmental Law and Practice* 8 (1998): pp. 151–159.

The research and interviews for this case study do not constitute a thorough examination of past and ongoing planning exercises in the Al-Pac FMA. Nonetheless, they do confirm that *there is broad support for the use of integrated planning as a tool for identifying conservation values and formulating objectives for land and resource use that balance conservation with the social and economic components of sustainable development.* The design and implementation of an effective and efficient planning process would give rise to a multitude of legal, institutional and policy issues. A review of the full range of options for establishing comprehensive land use planning and integrating this process with decision making at the resource disposition, project review and regulatory stages is beyond the scope of this case study. For a discussion of an existing landscape-level planning process, albeit one developed in a context that differs in important respects from the Al-Pac FMA, see the case study report on the Muskwa-Kechika Management Area.

4.4. Constraints and Incentives Relating to the Resource Disposition and Tenure Systems

The resource disposition and tenure systems that apply to forestry and to the oil and gas industry within the Al-Pac FMA were identified in many interviews as important barriers to the conservation of natural capital.[27] While resource tenures were not included in the list of general barriers in *Securing Canada's Natural Capital*, the NRTEE did comment on two of the key issues raised by interviewees for this case study: (1) the "use it or lose it" requirements built into some tenure arrangements and (2) the absence of mechanisms to facilitate the surrender of resource rights by companies.[28]

Dispositions and tenures on public lands in Alberta are granted for specific resources and services flowing from the land base, and they do not provide incentives (or opportunities) for disposition holders to manage for multiple benefits on the landscape. In addition, the departments that allocate dispositions have sector-specific mandates, and therefore government processes for allocating dispositions also fail to integrate multiple values. This situation has led to the general perception that resource disposition processes and tenure arrangements are primarily designed to promote the rapid development and full utilization of specific resources (e.g., oil, gas and fibre) without providing adequate flexibility to accommodate conservation objectives within a sustainable development framework. In particular, the pace and spatial distribution of development is driven by allocation decisions that, from the perspective of many stakeholders, reflect narrow economic objectives but have very significant impacts for natural capital and other values. Furthermore, the tenure instruments issued to holders of resource rights often constrain the ability of these companies to coordinate and adjust their activities in order to conserve natural capital.

This lack of flexibility is seen by some stakeholders as putting companies between "a rock and a hard place." On one hand, companies must contend with the set of regulatory requirements and incentives contained in the tenure regime that are designed to maximize development, while, on the other, they face pressure from some regulators, the public and, in some cases, the market to

[27] For a discussion of this issue, see: Monique M. Ross, *Legal and Institutional Responses to Conflicts Involving the Oil and Gas and Forestry Sectors*, CIRL Occasional Paper #10 (Calgary: Canadian Institute of Resources Law, January 2002), pp. 13–22.
[28] NRTEE, *supra* note 1, p. 63.

conserve natural capital and address other land use values by reducing individual and cumulative impacts. For example, one interviewee from the energy sector stated that, in his view, the government's resource disposition policy leads companies into areas where they arguably should not be operating—and then leaves them to try to sort out the resulting regulatory and stakeholder issues.

One important feature of both the forestry and the oil and gas tenure regimes is the use-it-or-lose-it requirement. For example, forest management agreements require "full utilization" of the resource and allow the government to reduce allocations and reassign resource rights if a company does not make full use of merchantable timber. While there is apparently some room for negotiation in practice, this requirement has been a source of concern and uncertainty as forest companies address issues such as the establishment of ecological benchmark areas and the retention of structure in clear-cut stands and burned stands that are salvage-logged. The ability of companies to undertake research, practise adaptive management in response to new scientific information, and respond to evolving stakeholder concerns is potentially constrained by this use-it-or-lose-it approach to tenures.

In the oil and gas sector, the use-it-or-lose-it approach is embedded in the five-year time limit for exploration activity on mineral leases for conventional oil and gas. While the short planning horizons and rapid development approvals in the oil and gas sector are commonly linked to market pressures and the "economics" of the industry, many interviewees identified the regulatory time frame within the tenure regime as a key driver of this approach to development. Companies, it was argued, are often obliged to rush exploration and drilling activities in order to complete work before the expiry of their leases. As a result, they may find that measures to minimize impacts on natural capital through project-specific mitigation and coordination with other companies are too time-consuming.

Several interviewees also commented that the competitive bidding process for mineral rights makes long-term planning and coordination difficult because companies obtain a competitive advantage by keeping their interests and plans confidential. Furthermore, the policy of issuing conventional oil and gas leases for small areas and for specific subsurface strata can result in a multitude of fragmented and overlapping interests, further complicating the task of coordinating exploration and development so as to minimize impacts on natural capital. Several interviewees noted the contrast between this approach to conventional oil and gas development and the larger leases and longer time frames for planning that are used for oil sands projects. Not surprisingly, some of the best examples of inter-industry cooperation to minimize the industrial footprint on the Al-Pac FMA have involved Al-Pac and large oil sands companies.

The current disposition and tenure system for conventional oil and gas in Alberta was characterized by several interviewees as being designed to achieve two principal objectives: (1) the maximization of revenue to government at the rights issuance stage and (2) the rapid development of oil and gas reserves by establishing a highly competitive environment and preventing companies from holding on to undeveloped mineral rights. One interviewee also noted that the policy of offering mineral rights for small geographic areas facilitates rights acquisition by smaller companies that depend on the rapid development of their reserves. These companies, it was argued, face significantly different economic incentives than do the larger companies that have a variety of investment opportunities at any point in time and may be

content to hold inactive leases for relatively long periods. Particularly as the Western Sedimentary Basin matures, maintaining production levels will require finding and developing smaller reserves, a niche that may be best suited to smaller oil and gas companies.

Thus, while the tenure system may be "rational" from the perspective of maximizing the short-term benefits associated with individual resource sectors, some stakeholders see it as a significant barrier to the coordination and planning of development that is required to improve conservation of natural capital. Interviewees suggested several options for adjusting the tenure regime in order to increase companies' flexibility in managing their operations to minimize individual and cumulative impacts on natural capital.

One suggestion was to lengthen the five-year timeline for activity on conventional mineral leases, thereby allowing companies more time to plan optimal development from both economic and environmental perspectives. Longer time frames would also facilitate coordinated operational planning among oil and gas companies, forest companies and other land and resource users. Coordinated planning could reduce environmental impacts and costs to companies through measures such as the design of common transportation infrastructure, improved planning and sequencing of development in order to minimize disturbance (e.g., location of well sites in areas that will be harvested by forest companies), and the coordination of operations in order to minimize the total duration of industrial activity in an area.

Inter-industry cooperation could also be facilitated by moving to larger tenures in environmentally sensitive areas, thereby reducing the number of companies whose activities would have to be coordinated. Issuing mineral rights in larger blocks could also increase the flexibility of disposition holders to adjust the location and timing of their operations. Finally, this change in disposition policy would make it more likely that mineral rights would be held by large companies. As noted by a number of interviewees, larger companies may be more willing and able than smaller ones to adjust their operations to minimize adverse impacts on natural capital because of their greater human and financial resources, their technical expertise and their concern for their reputations. For example, several interviewees commented that smaller companies may not have the personnel to participate in inter-industry or multi-stakeholder planning processes or the expertise, equipment and money needed to adopt state-of-the-art techniques for minimizing impacts (e.g., low- or no-impact seismic).

Some interviewees argued that the tenure regimes should include formal mechanisms allowing companies to relinquish resource rights in order to achieve conservation objectives (e.g., offset areas, ecological benchmarks). From a corporate perspective, there are sometimes compelling reasons to forgo development in an area where rights have been acquired in order to address stakeholder concerns, provide an offset for the effects of intense industrial activity in other areas, or establish a benchmark for evaluating the effects of development and the success of mitigation and reclamation measures. Companies may be reluctant to surrender rights, however, if they thereby forfeit the money that they paid to the Crown to acquire those rights and if there is a risk that they will lose competitive advantage if the rights are subsequently reissued to another company. The effectiveness of this technique for addressing stakeholder concerns will obviously be undermined if surrendered rights are subsequently reissued by government.

Interviewees recognized that there is an important public interest at stake in any decision that would potentially reduce government revenues from development of a publicly owned resource. However, there is clearly some support for developing within the tenure regime a more formal process for reviewing and implementing the surrender of resource rights when this option meets the needs of the various interested parties, including the rights holder and government. An explicit mechanism for addressing this issue would, it was argued by some interviewees, be preferable to the current ad hoc approach.

An issue relating to forest tenure that was raised in several interviews was the accounting for timber loss to fire, insects and disease when calculating annual allowable cut (AAC) and associated minimum cut levels. For example, some interviewees stated that current methods for calculating AAC do not adequately take account of fire, with the result that some forestry companies will face progressively tightening wood supplies. The result could be the use of more intensive forest management, which might adversely affect some aspects of natural capital. Other interviewees maintained that periodic recalculations of AACs in conjunction with the forestry planning cycle reflect fire events and other changes in wood supply. A thorough examination of this issue is beyond the scope of this case study. Nonetheless, it is clear that *ignoring probable losses of wood to future forest fires essentially overestimates wood supply, thus increasing pressure on natural capital.*

Several interviewees indicated that the Government of Alberta is currently reviewing forestry tenure issues and is aware of the issues noted above. It was suggested that this review might include a reexamination of the Forests Act, something that a number of interviewees felt was long overdue. However, no specific details about the government's policy direction were revealed during the interviews. A detailed examination of the existing legal and policy regime from the perspective of conserving natural capital and the elaboration of a comprehensive set of regulatory options for tenure reform are beyond the scope of this case study. Additional discussion of the economic incentives embedded in tenure regimes is included in Part 3 of this case study report.

4.5. Key Stewards Are Often Not "at the Table"

The participation of key stewards "at the table" was identified as an issue in the NRTEE report *Securing Canada's Natural Capital* and was raised in several different contexts by interviewees and workshop participants. There was general agreement that stakeholder participation in decision making is essential when addressing complex land use issues and identifying ways to balance the conservation of natural capital with other objectives. In the context of the Al-Pac FMA, three main points emerge from the interviews and the workshop.

First, the case study illustrates that key stewards and stakeholders may not be at the table because there is no "table" or forum for involving them in decision making. As noted above, there is currently no integrated land use planning process for engaging all stakeholders in decision making across the entire Al-Pac FMA. Similarly, government allocates subsurface and surface resources without public environmental reviews or other inclusive processes. Alberta also lacks the type of arm's-length and independent monitoring agencies that have been established, for example, to provide expert and stakeholder oversight of the major diamond mining projects in

the Northwest Territories.[29] *Lack of participation by key stewards may thus be the result of gaps in the institutional framework for integrated landscape management and situations where the decision-making process is closed to key stakeholders and to the public as a whole.*

Second, some interviewees and workshop participants stated that government itself is sometimes insufficiently engaged in multi-stakeholder processes. The CEMA process was identified in several interviews as a model of inclusive, multi-stakeholder involvement. A concern expressed by a number of stakeholders, however, was that the Alberta government is not taking the appropriate leadership role in this process. Moreover, it has not provided the participation by high-level officials and the commitment of financial and in-kind resources that is needed to facilitate effective decision making and to ensure a genuine government commitment to the process and its outcomes. One interviewee contrasted the Alberta government's relatively passive role in this process with the active involvement of the Government of British Columbia in the Muskwa-Kechika area. Another interviewee commented, however, that senior government officials are well briefed on the CEMA process and are fully supportive.

A thorough examination of the CEMA process could not be undertaken for this case study. However, comments on CEMA and other multi-stakeholder processes in Alberta suggest a broad consensus among interviewees and workshop participants that *active participation by senior representatives of all stakeholder groups, including government, is essential to achieving effective decision making at multi-stakeholder tables and to ensuring that the results of these processes have a reasonable prospect of being implemented by the ultimate decision makers at the senior bureaucratic and political levels.*

Third, several interviewees and workshop participants commented specifically on the challenges of ensuring full and effective participation by Aboriginal peoples at the consultation and decision-making tables. The issues include defining appropriate roles for Aboriginal peoples, government and industry in consultation processes, incorporating information regarding traditional land use and traditional ecological knowledge, and developing mechanisms that meet the varied needs of different Aboriginal communities. These issues are returned to below in the discussion of a specific management option that focuses on Aboriginal interests and involvement in managing the use of land and resources.

4.6. Lack of Economic Benefits and Incentives for Key Stewards

A lack of economic benefits and incentives was identified by the NRTEE as an important barrier to the conservation of natural capital. This barrier clearly relates most directly to fiscal issues, the topic of Part 3 of this report.

Interviewees were somewhat divided on the importance of this barrier within the Al-Pac FMA. Some stakeholders felt that a "business case" already exists for certain measures, such as road sharing, that can reduce the footprint of industrial activity and thereby promote conservation of natural capital. Others argued that industry is facing increasing public demands to incorporate conservation objectives into planning and operations, without any fiscal incentives to

[29] For information on the Independent Environmental Monitoring Agency for the BHP-Billiton Ekati mine, see: www.monitoringagency.net/default.htm. For information on the Environmental Monitoring Advisory Board for the Diavik mine, see: www.emab.ca.

compensate for the costs incurred in doing so. For example, it was noted that companies that invest time and money in inter-industry cooperation to plan operations or that redesign roads and other disturbances in order to minimize impacts on natural capital do not receive any benefits in the tax and royalty systems.

It appears from the interviews that there are no explicit policy mechanisms within the Al-Pac FMA to recognize the economic value of natural capital that is conserved by this type of discretionary action. However, cost savings may sometimes be sufficient to induce companies to undertake these initiatives. Interestingly, perhaps the most explicit use of fiscal incentives to promote behaviour that yields both conservation and economic benefits is Al-Pac's waiver of timber damage payments for companies that undertake low-impact seismic operations. Interviewees identified a number of specific areas where economic benefits and incentives could be provided to encourage stewards to conserve natural capital. These options are discussed below in relation to specific management objectives, as well as in Part 3 of this report.

4.7. Lack of Information Tools to Support Decision Making

The importance of information to support decision making was raised in many of the interviews and was discussed in some detail at the workshop, supporting the NRTEE's conclusion that deficiencies in this area may be a significant barrier to the conservation of natural capital. Interviewees and workshop participants elaborated on this issue in several ways.

First, many stakeholders commented on the existing information base and the available tools to support decision making. A strongly held view among some stakeholders is that more scientific information is urgently needed, notably regarding the impacts of development on certain elements of natural capital (e.g., biodiversity) and the corresponding thresholds, limits or targets for land use that would be appropriate for achieving specified conservation objectives. Several areas of scientific uncertainty were noted. Examples included the effects of forest fragmentation on certain species (e.g., neotropical migrants) and the role of fire in the natural disturbance regime. On other issues, such as the impacts of linear disturbances on caribou, the evidence seems clearer. Overall, good science is seen as an important foundation for good decision making. *Several interviewees specifically suggested that direct fiscal incentives in the tax or royalty regime should be provided to encourage companies to fund the necessary research.*

Some interviewees noted, however, that the Al-Pac FMA already has a relatively detailed information base when compared with many other areas. Several interviewees commented favourably on the extensive research program supported by Al-Pac and some other resource companies. Furthermore, the development of the ALCES© model for simulating land use scenarios was identified as a best practice within the Al-Pac FMA.[30] Several interviewees stated that this type of scenario modelling is a revolutionary new management tool that allows decision makers to evaluate the cumulative effects of multiple land uses over large spatial and temporal scales. Use of this type of tool, it was argued, should become standard practice for all stages of decision making, from broad policy and planning decisions through to the resource disposition,

[30] Al-Pac was a principal sponsor of the development of ALCES and has actively promoted its application to land and resource management within the Al-Pac FMA. For more information on ALCES, see www.foremtech.com. Brad Stelfox, the scientist who developed ALCES, is a member of the team of consultants that conducted this case study. Dr. Stelfox was not involved in the interviews where stakeholders commented on the ALCES model.

project review and regulatory stages. One interviewee cautioned, however, that public involvement in planning processes might be impeded if the data and scenario modelling in these processes become too complex.

A second set of issues relates to the availability of existing information. Workshop participants and several interviewees argued that much of the information collected by companies, government agencies and regulators, stakeholder groups, Aboriginal organizations, university-based researchers and others is not readily accessible. They noted, for example, that government requires the submission of extensive information for project applications but could do a better job of consolidating and disseminating that information for use by other stakeholders. *One specific suggestion was for leadership from both orders of governments in linking databases and developing standards, data management protocols and communications infrastructure to facilitate information exchange.*[31]

Third, some stakeholders underlined the importance of linking information with actual decision making. One interviewee commented that he only supported research that was directed to specific management issues and where there was a high probability that research results would be incorporated into decision making. Several interviewees and workshop participants underlined *the importance of developing information feedback loops to support adaptive management.* The use of information thus relates to the broader issues of establishing two-way linkages between landscape-level planning with other decision processes that use or generate information (e.g., project review processes, operational monitoring for regulatory compliance).

Finally, several interviewees and workshop participants commented specifically on the need to incorporate traditional land use studies and the traditional ecological knowledge of Aboriginal peoples into decision-making processes. One interviewee noted that it is essential to provide Aboriginal communities not only with the funding and other resources needed to undertake traditional land use studies, but also with assistance in developing the expertise and infrastructure (e.g., geographic information system, or GIS, capacity) needed to use the data from these studies effectively in consultation and planning processes involving industry and government. It was also noted that Aboriginal communities vary considerably in terms of their ability to undertake these studies and make effective use of the results. *Expanding and recording the information base of traditional knowledge and building capacity to use it effectively are essential if Aboriginal values and interests are to be more fully incorporated into decision making directed to conserving natural capital and ensuring sustainable development.*

4.8. Failure to Integrate True Costs and Benefits of Nature

The NRTEE's discussion of this barrier focuses primarily on issues such as the valuation and pricing of natural capital and the fact that the costs and benefits of nature are often inadequately reflected in important public and private decisions regarding land and resource use. These issues are addressed in more detail in Part 3 of this report.

4.9. Lack of Financial Resources to Support Conservation and Partnerships

[31] See also, NRTEE, *supra* note 1, pp. 52–55.

In *Securing Canada's Natural Capital*, the NRTEE concluded that "the resources dedicated to conservation are clearly insufficient" and that governments in Canada "are falling steadily behind other nations, including the United States, in investing in natural capital."[32] Several interviewees and workshop participants commented in detail on the negative effects of cutbacks in the government departments responsible for land and resource management. For example, it appears that staffing levels have generally failed to keep pace with the demands resulting from the increasing pace of resource development in the Al-Pac FMA. One interviewee noted that there was no shortage of innovative ideas for addressing management issues, but that government lacked the staff to develop and implement policy solutions. Another interviewee stated that key departments with conservation mandates are so swamped with project applications and specific regulatory issues that they have few resources to undertake broader policy and planning initiatives. The argument that the pace of development is outstripping the ability to manage it was also raised in the workshop.

The reliance on industry as the primary source of funding for CEMA process was also noted in several interviews. While interviewees from industry and environmental organizations who commented on this issue felt that some industry funding was appropriate, they generally felt that more funding from government was desirable given the broader public interest that CEMA was charged with addressing. Furthermore, several interviewees expressed concern that a lack of financial commitment by government might indicate an overall lack of commitment to support the implementation of the CEMA recommendations. One interviewee noted, however, that direct funding from government was supplemented by in-kind contributions. That person also suggested that the funding for CEMA that is provided by large oil sands companies should be placed in the context of these companies' much larger expenditures on project-specific engineering and environmental assessment studies and the generous tax and royalty treatment that government has provided for their projects.

On the government side, several interviewees commented on the large revenue accruing to the province from resource development and the need to redirect more of that money to support the departments and agencies charged with managing the environmental and social implications of that development. *A more specific suggestion was to ensure that some specific revenue streams related to resource development—such as timber damage payments to the Crown—are dedicated to projects related to sustainable development and the conservation of natural capital rather than being absorbed within general revenue.* Several stakeholders also advocated tax reductions or other fiscal incentives to encourage greater investment by industry in science and technology-related research and development, partnerships and other initiatives that would promote sustainable development and conserve natural capital. Others argued, however, that this type of expenditure should be viewed as a cost of doing business in the boreal forest, paid for by consumers of resource-based products rather than being subsidized by taxpayers.

4.10. Summary of Findings on Cross-Cutting Barriers to Conservation

The interviews and analysis for this case study confirmed the principal barriers to conservation that were identified by the NRTEE in *Securing Canada's Natural Capital*. The case study also identified the lack of integrated decision making and several features of the resource disposition

[32] NRTEE, *supra* note 1, p. 41.

and tenure regimes as areas of concern. While these issues are obviously not unique to the Al-Pac FMA, the case study highlights compelling reasons to focus on the regulatory "fundamentals" in the context of multiple and increasing demands on the land and resource base. *The most important general lesson from the regulatory component of the Al-Pac case study is that conservation of natural capital on this type of working landscape is difficult to achieve without the ability to address cumulative effects through integrated landscape management.*

5. Regulatory Barriers and Policy Options for Specific Management Objectives

This section of the document examines specific regulatory barriers and policy options associated with the management objectives identified in Part 1. These objectives are:

- maintain total forest cover;
- maintain the natural disturbance regime;
- maintain old forest;
- maintain key aquatic and hydrological features;
- recognize and protect areas of traditional Aboriginal use and value;
- establish areas within the managed forest where human impacts are prohibited or severely reduced;
- reduce linear disturbance density and manage human access; and
- maintain terrestrial carbon stocks and sinks.

5.1. Maintain Total Forest Cover

Since much of the natural capital in the Al-Pac FMA is closely related to the forested landscape, maintaining total forest cover is a management objective that would achieve a range of conservation values. From a regulatory perspective, the first steps to achieving this objective would be to formally adopt it at the policy and planning levels and then to incorporate measures to minimize permanent losses of forest cover at all stages of decision making. Monitoring and adaptive management would also be required to track changes in total forest cover over time and respond appropriately. Interviewees and workshop participants identified two broad areas for regulatory initiatives aimed at reducing the industrial footprint in the Al-Pac FMA over space and time.

First, it is evident that reducing the amount of forest that is cleared for industrial operations would contribute to maintaining total forest cover. Several interviewees argued that greater flexibility in regulations governing well sites, for example, would permit companies to reduce the size of their footprint in some circumstances. Losses of forest cover could also be reduced through joint planning of industrial activities, as illustrated by inter-industry cooperation on road

building and on the location of cut blocks, well sites and other facilities. It appears that there has already been considerable progress within the Al-Pac FMA in reducing the amount of forest cleared for seismic operations, although further improvements in this area are likely possible. This topic is examined below in the section on managing linear disturbances. Clearly, a range of fiscal and regulatory tools could be used to reduce the total area of forest cut by industry within the Al-Pac FMA.

The second area for regulatory initiatives is reclamation. Since some removal of forest cover is inevitable on a working landscape, effective reclamation is the key to maintaining total forest cover over the long term. Interviewees and workshop participants identified the following regulatory options for improving reclamation policy and practices within the Al-Pac FMA.

First, *reclamation standards could be strengthened and harmonized across sectors.* For example, several interviewees suggested changing reclamation requirements for oil and gas activities from "revegetation" to reforestation, so that "reclaimed" land grows trees, not grass.

Second, measures could be taken to increase spending on reclamation. One issue that was raised in several interviews was the use of the timber damage assessments (TDAs) that are paid by oil and gas companies to forestry companies and to the provincial government. Interviewees from the oil and gas sector argued that these payments are intended, at least in part, to cover reforestation costs. However, there is clearly a perception that TDAs disappear into "general revenue" and are not systematically used to reclaim disturbed areas once oil and gas operations have been completed. Some interviewees felt that it was unfair to blame the energy sector for the long-term industrial footprint in areas where they have paid for reforestation through TDAs but the forest companies and government land managers have not used these payments for reclamation. *Greater accountability for the use of TDAs was proposed as a means of ensuring that this money is used for reclamation.*

It appears from the interviews, however, that there remains some confusion regarding the appropriate use of TDAs. One interviewee from the forest sector stated categorically that TDAs are intended simply to allow forest companies to replace lost fibre and that these payments should not be viewed as a source of funding for reclamation. Government action to clarify the intended purpose of TDAs would remove a source of contention between the two sectors and establish clearer lines of accountability for the reclamation of forested land that is cleared for oil and gas operations.

Interviewees and workshop participants also identified other regulatory and fiscal mechanisms that could be used to promote reclamation. These options are discussed in Part 3 of this report.

Given the intensity of industrial activity and other land uses in the Al-Pac FMA, it will likely be a challenge to set and achieve targets for maintaining total forest cover over the long term. Furthermore, it appears from some projections that the total forest cover in this area may decline in the future as a result of anthropogenic climate change. Nonetheless, there are clearly policy options available that could promote the conservation of natural capital through the retention of forest cover.

5.2. Maintain the Natural Disturbance Regime

Since fire has an important role in boreal forest ecosystems, maintaining or replicating the landscape patterns that result from natural disturbance due to fire can contribute to conserving natural capital. This regime and its ecological impacts may be altered by forest fire suppression and policies relating to timber salvage on post-fire landscapes. Several interviewees noted that there remains considerable scientific uncertainty regarding the characteristics and effects of fire-based disturbance in the boreal forest and the long-term impact of human activities, such as fire suppression, on this disturbance regime. Furthermore, there is scientific evidence that the natural fire regime in the boreal forest may be significantly altered by global climate change, further complicating efforts to manage resource development in order to maintain or approximate natural disturbance patterns.

Economic and social values clearly underlie human activities that modify natural disturbance patterns. However, Al-Pac and some other forest companies are undertaking research and experimenting with management options that are designed to retain landscape characteristics associated with natural disturbance regimes.[33] Several regulatory options could be used to promote this management objective within the Al-Pac FMA.

One option is to create large protected areas where natural disturbance regimes can operate without human interference. A challenge for this option that was noted earlier in this document is the large area that would be required to accommodate some disturbance events, such as the House River fire in 2002, which covered 250,000 ha.[34] Furthermore, a policy of not suppressing fires within protected areas may conflict with the protection of timber interests and other values on adjacent land. Nonetheless, where large protected areas could be created, they would provide a means of maintaining landscape-level disturbance patterns in the boreal forest.

Second, forestry regulations and practices could be altered to reflect, to the extent possible, the landscape dynamics and patterns associated with natural disturbance regimes. A specific suggestion is to modify policies relating to timber salvage from post-fire stands in order to maintain more of the natural structure. More generally, forestry practices that approximate natural disturbance patterns, to the extent possible, could be encouraged or required. This approach to forestry may require changes to regulatory requirements relating, for example, to the size of cut blocks and the length of rotations. A detailed review of the application of this model of forestry to the boreal forest and its implications for the existing regulatory regime cannot be undertaken for this case study.

5.3. Maintain Old Forest

Given the ecological value of old growth forest, maintaining the amount and distribution of this type of landscape within the range of natural variability is a management objective that could conserve some aspects of natural capital within the Al-Pac FMA. Interviewees identified several obstacles to implementing this objective and suggested possible policy options.

The most general obstacle is that there are no specific regulatory or other mechanisms to accord value to old growth, which hinders decision making regarding land use in this area. This policy

[33] Hebert et al., *supra* note 21, pp. 911–915.
[34] See: www3.gov.ab.ca/srd/whatsnew/features/021206b.html.

gap is an example of the general problem that natural capital is often undervalued, or not valued at all, in market-based and regulatory decision making.

This apparent indifference to the value of old growth within a range of decision-making processes is coupled with what some interviewees characterized as explicit or implicit policy direction to harvest "mature" or "over-mature" stands as a priority. It was noted, for example, that priority harvesting of these stands is implemented through operational-level planning by government managers and forestry companies.

The rationale for this approach, in economic terms, appears to be that the amount of merchantable timber in a stand begins to decline in "over-mature" forests and that maximum fibre supply can therefore be extracted from a given area of forest if the harvest rotation removes stands before they have reached this stage. Old growth stands also tend to have high economic value because of the size of the trees. There is therefore a market incentive to harvest these areas. However, over time this harvest pattern will result in the reduction or elimination of older stands across a broad landscape, with a resulting cost in terms of natural capital (e.g., the biodiversity that depends on old growth). Interviewees suggested various policy options for promoting the conservation of old growth forests within the Al-Pac FMA. Several of these options have been referred to earlier and require only a brief comment here.

First, a combination of land use planning and protected area designation could be used to conserve areas of old growth within the Al-Pac FMA. Both planning and protected area designation are discussed elsewhere in this document. There is obviously a range of planning mechanisms that could be used to reduce the impact of industrial activities on old growth forests within the Al-Pac FMA.

A particular challenge for the use of protected areas to conserve old growth is the highly dynamic nature of forest ecosystems within the Al-Pac FMA. Stands qualifying as "old growth" are not particularly old when compared, for example, with the old growth temperate rain forests of the Pacific coast. Furthermore, the importance of fire in the natural disturbance regime means that large areas of old growth are periodically eliminated. Using protected areas to secure old growth within the natural range of variability could, therefore, require the establishment of very large areas that are off-limits to industrial activity in order to accommodate large-scale natural disturbance over time.

Given the dynamic cycle of aging and regeneration of forests within the Al-Pac FMA, a more flexible land use option could be used for conserving old growth within an integrated planning framework. So-called *floating old growth reserves could be established to ensure that, at any point in time, landscape-level targets for this type of stand are met.* These targets could include not only an age range for old growth, but also variables such as patch size and distribution across the landscape. Target values could also embody the precautionary principle by including a safety margin to buffer the effects of catastrophic disturbance events such as a series of particularly large forest fires. Over time, the size and location of these floating reserves could be adjusted to reflect changing age-class structure at the landscape level and to balance environmental and economic objectives.

Implementing this type of policy could overcome some limitations associated with conventional protected areas and thereby increase the ability to conserve old growth forest over ecologically significant spatial and temporal scales within a sustainable development framework for landscape management. However, it would clearly require a flexible and coordinated approach to planning forestry activities. In addition, maintaining certain features of old growth stands that may be important for their natural capital values—such as lack of fragmentation—would require attention to other land uses that may affect these areas. The benefits from establishing floating old growth reserves through forestry policy might, for example, be undermined if significant oil and gas development were allowed to occur within these areas. Oil and gas resources within floating old growth reserves would not, however, be "locked up" for all time. A major fire or the maturing of stands in other areas would, at some point in time, result in the shifting of reserve status to other stands and the opening of the areas in question for industrial activity.

A second regulatory option is to modify policy that requires or directs forest companies to cut old growth as a priority. Sustained yield and maximizing the economic value of timber production should be explicitly weighed against the value of natural capital for purposes of establishing cut requirements. This change could be linked to a broader reexamination of forest tenure arrangements and operational planning, both of which were addressed above.

5.4. Maintain Key Aquatic and Hydrological Features

The principal obstacles to conserving natural capital associated with aquatic and hydrologic features of the landscape within the Al-Pac FMA are cross-cutting issues that have been addressed above: the lack of an integrated planning framework and the difficulty of managing cumulative effects given fragmented and incremental decision making on land and resource uses. In particular, several interviewees commented on the need for integrated watershed planning and management. A recent joint Alberta Energy Utilities Board–Canadian Environmental Assessment Agency decision also underlined the importance of watershed management, stating that the "panel strongly encourages AENV [Alberta Environment] to work cooperatively with regional stakeholders and water licence holders to evaluate a process and establish a water management plan for the lower Athabasca River."[35]

Cumulative effects issues were also identified by stakeholders for specific types of activities. One interviewee noted that regulatory standards for stream crossings, for example, do not adequately address the management of cumulative effects. Another interviewee commented on the cumulative effects of roads on surface water flows and wetlands within the Al-Pac FMA, noting that linear disturbances can sometimes act as dams that impede natural drainage of surface water and recharge of wetlands. Workshop participants also discussed the significance of cumulative effects for important aquatic features of the landscape.

Possible regulatory responses in this area run the gamut of options discussed elsewhere in this document. Establishing set-aside or protected areas is one means of conserving natural capital associated with wetlands and riparian areas. Regulation of specific land uses could also achieve conservation objectives. One interviewee noted that road construction along moraines is less

[35] *Report of the Joint Review Panel Established by the Alberta Energy and Utilities Board and the Government of Canada*, EUB Decision 2004-009, Shell Canada Limited, Applications for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area, February 5, 2005, p. 31.

disruptive for surface water than construction in glacial out-wash and plains areas. Directing road development in a way that minimizes surface water disruption could be achieved through landscape-level planning and specific initiatives to manage linear disturbances. Interviewees also underlined the importance of riparian areas for natural capital and argued that protected area designation and regulatory requirements should focus on these parts of the landscape. Other techniques to conserve natural capital by minimizing industrial impacts on aquatic and hydrologic features include improved reclamation and coordinated operational planning among industrial operators. Specific thresholds or limits for the disturbance of wetlands could also be established, recognizing that the elimination of these areas is in some cases irreversible.

Most interviewees and workshop participants did not comment in detail on the need for changes to specific regulations relating to water quality and quantity. However, specific concerns among Aboriginal peoples with respect to water quality, toxic contamination of the food chain, fish tainting and related issues are clearly linked to questions about the adequacy of regulatory requirements and monitoring procedures governing industrial discharges into water.

There is also a relatively distinct set of water management issues relating to oil sands development within the Al-Pac FMA. In particular, interviewees stated that constraints on available water supply from the Athabasca River may affect large oil sands projects, and they raised concerns about the risks associated with tailing ponds. These concerns have great local and regional importance, but they are less prevalent across the boreal forest as a whole. For that reason, they are not examined in more detail in this case study.

Finally, the cooperative partnership between Al-Pac and Ducks Unlimited should be mentioned as a best practice noted during this case study.[36] This partnership sets out a vision for conserving natural capital in the form of water quality and quantity and biodiversity within the Al-Pac FMA, focusing particularly on wetlands and riparian areas. The overall approach is to invest heavily in science in order to understand ecological functions and the impacts of human activities, establish ecological benchmark areas to provide a basis for assessing land use practices, and promote watershed management as a "coarse filter" approach to conservation.

5.5. Recognize and Protect Areas of Traditional Aboriginal Use and Value

Aboriginal peoples have an important and unique perspective on the conservation of the natural capital because of the spiritual, cultural and economic importance of traditional lands to their way of life and identity. Their extensive ecological knowledge and land ethic qualify them to play a key role in relation to the conservation of natural capital. In addition, their constitutionally entrenched Aboriginal and treaty rights entitle them to be active participants in decision-making processes that may affect these rights. As noted earlier in this document, interviewees and workshop participants commented on the inadequacy of Aboriginal participation in consultation and decision-making processes.[37] The following principal barriers to the incorporation of Aboriginal perspectives and values into decision making were identified:

[36] For information on this partnership, see: Ducks Unlimited Canada and Alberta-Pacific Forest Industries Inc., *Boreal Conservation Project Al-Pac FMA Area—Annual Progress Report Covering Period 08.27.2002 to 1.29.2004.*

[37] See the section entitled "Key Stewards Are Often Not 'at the Table.'"

- the lack of shared decision making and meaningful consultation involving Aboriginal peoples;

- the lack of accessible information based on traditional land use studies and the lack of funding and support for these studies;

- the absence of an integrated and effective land use planning process that enables information on traditional land use and related Aboriginal values to be integrated into decision making;

- the failure to require systematic consideration of traditional land uses and traditional knowledge at key stages of decision making (e.g., rights issuance, environmental assessment);

- the challenge of reconciling perspectives based on traditional knowledge with those of Western science;

- the lack of funding and capacity building to enable Aboriginal participation in decision making and multi-stakeholder processes; and

- the varying levels of capacity among Aboriginal communities to participate effectively in consultation and decision-making processes.

Some of these barriers relate directly to regulatory requirements for land and resource use, while others raise a broader set of cultural and socio-economic issues. Four principal policy options to address these barriers were noted in the interviews and during the workshop.

First, increased financial and in-kind support from government and industry could be provided for traditional land use studies and for the collection and documentation of traditional knowledge. One interviewee commented that this support is required not only for generating data, traditional land use maps and other relevant information. Support is also required to build capacity within Aboriginal communities so that they can keep this information current and use it effectively in consultations, negotiations and regulatory processes involving government, industry and other stakeholders. Funding could be provided through specific government programs or industry–government–Aboriginal partnerships. It could also be provided in connection with specific decision-making processes (e.g., planning processes). Interviewees indicated that some companies within the Al-Pac FMA have already embarked on useful initiatives in this area but that more support is desirable.

A second policy option is to require the formal incorporation of information on traditional land use and Aboriginal values into all stages of decision making, including land use planning, rights issuance and environmental assessment. For example, project proponents could be required to address Aboriginal land uses and values in operational plans and in the documentation submitted for environmental assessment processes.

Third, policy and regulatory requirements could be enhanced in order to ensure meaningful consultation with Aboriginal peoples at key stages of decision making. Interviewees commented

that the Government of Alberta is currently developing a policy framework for Aboriginal consultation. Since the legal obligation to consult rests primarily with the Crown, certainty regarding government's role in this process is essential. Effective government consultation with Aboriginal peoples would also assist industry in defining responsibilities in this area.

Finally, issues surrounding the nature and extent of Aboriginal involvement in decision making on land and resource use were raised in some interviews and in the workshop. As one interviewee noted, "consultation" means different things to different people, ranging from simply informing Aboriginal peoples of development plans to recognizing an Aboriginal veto in certain situations. Another interviewee drew a distinction between cooperation with Aboriginal peoples on management issues and formal co-management. Workshop participants noted the importance of considering Aboriginal rights and values at various stages in the decision-making process. Moving beyond minimal consultation and toward the co-management end of the spectrum is an option that has potentially significant implications for the entire regulatory regime.

Adjustments to planning processes, rights issuance and tenure regimes, project review processes and regulatory decision making could be required to properly accommodate Aboriginal rights and implement Aboriginal co-management of land and resources. Co-management models exist in various parts of Canada and could be adapted to circumstances in the Al-Pac FMA. Formal co-management could promote conservation of natural capital, although several interviewees commented that some Aboriginal peoples within the Al-Pac FMA are also actively pursuing economic development strategies that could, in some instances, conflict with conservation objectives.

5.6. Establish Areas Within the Managed Forest where Human Impacts Are Prohibited or Severely Reduced

The interviews for this case study suggest widespread agreement that protected areas can be effective tools for conserving natural capital. Several interviewees commented, however, on the limitations of this option for achieving some specific objectives (e.g., retention of a given forest age class distribution in a particular area) in a region where certain ecological attributes of a protected area can be changed significantly by the large forest fires that are part of the natural disturbance regime. It was also noted, however, that post-fire stands have important ecological values that can be conserved through protected area designation.

Many interviewees supported the establishment of additional protected areas within the Al-Pac FMA, either to protect ecological values or to provide ecological benchmarks for evaluating the impacts of industrial activity and the effectiveness of mitigation techniques and reclamation. One interviewee noted that Al-Pac had proposed the protection of the Liege River watershed in the northwestern part of the FMA as a strategy to achieve its goal of sustaining all species within its FMA area, a goal that is consistent with provincial direction to maintain species diversity. This would have added an additional 140,000 ha of protected areas within or adjacent to the FMA. Some interviewees stated, however, that additional protected areas within the Al-Pac FMA are not required and that Alberta has already met its target for protection.

Interviewees identified the following principal barriers to this policy option:

- the high value of extractive resources in the area (e.g., conventional oil and gas, oil sands, timber), which means that the establishment of protected areas often has a high economic opportunity cost;

- the extensive resource tenures and ongoing resource allocation across the case study area, which make it difficult to identify options for establishing protected areas that would not compromise existing resource tenures;[38]

- the requirements for high levels of resource utilization in tenure instruments, which leave little flexibility for reducing the size of the working land base without changes to existing tenure regimes (e.g., the use-it-or-lose-it requirement discussed above in the section on tenure regimes);

- the existence of considerable development (e.g., roads, well sites, pipeline rights of way, cut blocks) that may be inconsistent with protected area designation and with the establishment of undisturbed ecological benchmark areas;

- the absence of a formal policy and process for considering candidate sites for protected areas; and

- the Alberta government's position that it has fulfilled its obligation for protected areas through Special Places 2000, and its resulting lack of interest in permitting or facilitating the surrender of resource tenures by disposition holders in order to establish protected areas and benchmark areas.

All of these barriers relate to policy choices and the (broadly defined) regulatory regime.

Many interviewees noted the difficulty of establishing protected areas once extensive resource rights have been issued and development has occurred. While this situation is a fact of life within the Al-Pac FMA, it serves as a lesson for other areas of the boreal forest. It will be evident from the case study of the Muskwa-Kechika Management Area, for example, that comprehensive land use planning, including the designation of protected and special management areas, is easier to achieve on a land base that is relatively free of industrial dispositions. *Other areas of Canada's boreal forest may provide opportunities that no longer exist within the Al-Pac FMA for addressing the conservation of natural capital before options are narrowed or foreclosed by resource dispositions and development.*

Some interviewees commented on the implications of the case study's geographic boundary for consideration of protected areas. One argument was that protected areas adjacent to or close to the Al-Pac FMA could provide adequate protection for natural capital and serve as ecological benchmarks. Enlarging the geographic focus for protected area designation could increase opportunities for trade-offs, facilitating the development of high-value resources within the Al-Pac FMA while protecting natural capital in areas that have lower economic value for resource development. Another interviewee cautioned, however, that the Al-Pac FMA is primarily within

[38] The extent of existing surface and subsurface dispositions in Alberta was a significant challenge for the Alberta government's protected areas policy, Special Places 2000.

the boreal plain, a relatively flat area that is significantly different from the ecozones represented in surrounding protected areas. This person noted, for example, that while Wood Buffalo National Park is a large protected area close to the Al-Pac FMA, its ecological characteristics differ in important ways from those of the case study area. Furthermore, the significant range of natural variability for certain biophysical features within the Al-Pac FMA suggests that representative ecological benchmarks should be located relatively close to the impacts and reclamation activities that are being assessed.

This debate illustrates an important issue for the use of protected areas to conserve natural capital in the boreal forest. When considering the appropriate size and location of protected areas and the opportunities for trade-offs between protection and development, the geographic frame of reference can be important.

Many interviewees identified the absence of an ongoing protected areas policy in Alberta as the principal regulatory obstacle to implementing this management option. The Alberta government's current position appears to be that the Special Places 2000 program has been completed, protected area targets have been met and this issue is now off the agenda. If this characterization of government policy is accurate, it is not surprising that efforts by Al-Pac and some other stakeholders to promote the establishment of additional protected areas and ecological benchmarks within the Al-Pac FMA have thus far been unsuccessful.

Several interviewees expressed concern about the adequacy of previous protected area processes and targets—notably the extent to which representative examples of natural capital are in fact adequately protected in the Al-Pac FMA and across the boreal forest as a whole. Others noted that the argument for embedding ecological benchmarks within a working landscape reflects an evolution in thinking about sustainable forest management. In particular, several interviewees underlined the need for benchmarks to permit ongoing research on impacts and mitigation measures as the scientific basis for adaptive management. Finally, some interviewees see protected area designation as a prerequisite to meeting the emerging standards for forest certification. *All of these arguments call into question the appropriateness of treating protected area designation as an issue that has been addressed for "once and for all" and is therefore off the table when considering management objectives.*

Several specific policy options could be used to overcome regulatory barriers to the establishment of protected areas (including ecological benchmarks). *An obvious option is to incorporate the ongoing or periodic review of criteria, targets and specific candidate sites for protected areas designation into specific regulatory processes.* For example, protected areas designation could be considered as part of the regular updating of integrated land use plans or during the renewal process for large industrial tenures, particularly area-based tenures such as Al-Pac's forest management agreement.

Mechanisms for establishing ecological benchmark areas could also be embedded in a revised legal and policy regime for forestry that is based on principles of sustainable forest management. Principles such as those set out in the Alberta Forest Conservation Strategy and a commitment to implementing these principles in a transparent manner (perhaps through adherence to forest certification standards such as those developed by the Forest Stewardship Council for the boreal

forest)[39] could be adopted as policy and entrenched in legislation. This approach might include building increased flexibility for the establishment of ecological benchmarks into the tenure system, notably in relation to "full utilization" requirements and the calculation of the annual allowable cut. Effective implementation of this approach through forestry tenure reform would have to be integrated with the regulation of the energy sector and other activities in order to secure effective ecological benchmark areas within the Al-Pac FMA.

Finally, interviewees suggested variations on the conventional approach to establishing protected areas. One person argued that protected area designation should focus on riparian areas because of their importance as habitat and their influence on instream flow and water quality. Another option is the establishment of "floating" reserves to ensure the conservation of certain ecological values on the landscape. This approach is examined elsewhere in this document when discussing the management of linear disturbances and the maintenance of old growth forest on the landscape. Fiscal mechanisms for establishing ecological benchmarks are discussed in Part 3.

5.7. Reduce Linear Disturbance Density and Manage Human Access

Most of the stakeholders who commented on this management objective agreed that the proliferation of linear disturbances such as roads, seismic lines, pipeline rights of way and off-highway vehicle trails within the Al-Pac FMA has an adverse impact on certain aspects of natural capital. For example, interviewees noted that some animals such as caribou are sensitive to linear disturbances and that roadbeds can adversely affect surface water flows and wetlands. There was also broad consensus that managing the extent and density of linear disturbances by reducing the industrial footprint and avoiding duplication in transportation infrastructure often makes sense from both economic and ecological perspectives. Finally, interviewees generally felt that progress in managing linear disturbances has been achieved over the past several decades, but that some important obstacles and corresponding policy options remain.

A significant area of progress is the reduction of impacts from seismic operations. Many interviewees commented on the benefits of "low impact" or "no impact" seismic programs. Techniques include the cutting of very narrow seismic lines, the use of global positioning system (GPS)-guided equipment that moves through the forest along non-linear paths, avoiding large trees and sensitive habitat patches where possible ("avoidance" seismic), limbing trees rather than removing them and mulching to facilitate regeneration. One interviewee indicated that the typical width of seismic lines has decreased progressively from approximately 10 m several decades ago to 8 m, 6 m and now 3 m. While some seismic lines are still in the 5-m to 6-m range, hand-cut lines can be less than 1.5 m in width. Interviewees could not, however, provide accurate estimates regarding the percentage or absolute amounts of seismic activity that currently uses low- or no-impact techniques or the rate at which these techniques are replacing more conventional practices. Several interviewees noted that wider conventional seismic lines are still required for the equipment used in some seismic programs.

The adoption of low- and no-impact seismic techniques in the Al-Pac FMA (and elsewhere) is an example of how technological advances can reduce adverse impacts on natural capital while

[39] Forest Stewardship Council Canada Working Group, *National Boreal Standard*, January 16, 2004 (FSC Canada version), Principle #9 High Conservation Value Forests: www.fsccanada.org/boreal/index.shtml.

permitting industrial activity to continue in the boreal forest. Several interesting points regarding the adoption of this best practice were highlighted in the interviews for this case study.

First, it appears that the principal constraints on the adoption of new seismic technology are the need for research and development and the time and money required to replace the existing capital stock and train seismic crews in the new techniques. This observation highlights an opportunity to use fiscal incentives to promote the rapid development and adoption of technological innovations that conserve natural capital. Options include incentives to encourage R&D and increased depreciation rates for older equipment under the taxation system in order to speed the turnover of capital stock. Interestingly, it appears that the seismic industry has not lobbied for these types of measures, and government has not provided direct fiscal incentives to promote low-impact seismic operations.

One example of a fiscal incentive for low-impact seismic in the Al-Pac FMA is Al-Pac's waiving of timber damage payments for companies whose seismic programs meet certain criteria. All interviewees who discussed this topic were strongly supportive of this corporate policy and felt that it had contributed to changing seismic practices. One interviewee noted that the provincial government offers a rebate of timber damage assessments for companies using low-impact seismic. This change in the cost structure, combined with a general acceptance of the need for change, has apparently encouraged the development of a whole new generation of seismic equipment. As this technology has become more widely adopted, the costs of using it have decreased.

Second, several interviewees commented that relatively small financial incentives could yield significant changes in seismic techniques. Incentives, it was argued, are significant for two reasons: first, they help to create a business case for more conservation-oriented practices and, second, they signal endorsement of a new way of operating. It appears from the interviews that many companies in the energy sector are prepared to adopt new techniques even if they are not fully cost-neutral because of the recognized broader benefits, both for natural capital and for the maintenance of the industry's reputation and "social licence to operate." Several interviewees noted, however, that larger companies are more likely to take this view than are smaller ones, which have narrower profit margins, less expertise and, perhaps, a lower public profile and hence less concern about their reputations.

The third issue raised by interviewees was the potential role of regulation in reducing the environmental impact of seismic operations. Interviewees indicated that there are no formal regulatory requirements or standards for low-impact seismic, although apparently guidelines in certain environmentally sensitive areas (e.g., caribou range) are directed to minimizing disturbance from seismic operations. Some interviewees felt that the use of fiscal incentives and indirect regulatory pressure to reduce impacts was preferable to a command-and-control approach that would set requirements for seismic lines. However, other interviewees stated that a clear signal in the form of regulatory requirements would accelerate the adoption of technology that has already been proven to be a cost-effective way to reduce impacts. In addition, it was noted that a regulatory requirement would prevent some providers of seismic services from achieving a competitive advantage by deferring the adoption of new technology.

Another example of a best practice from the Al-Pac FMA is inter-industry coordination of road building. As with the move to low-impact seismic, it appears from the interviews that progress in this area is largely the result of initiatives taken by industry leaders such as Al-Pac, several of the large energy companies and the Alberta Chamber of Resources through its Integrated Landscape Management Program. The extent to which government is actively encouraging (or requiring) the development of shared infrastructure or facilitating inter-industry cooperation to achieve this end is unclear from the interviews.

Interviewees noted that coordinated infrastructure planning has been shown to produce beneficial outcomes from both economic and environmental perspectives, by reducing capital and maintenance costs for industries that require roads while minimizing environmental impacts. This approach has been most successful, however, when a small number of larger companies with relatively long planning horizons are operating at the same time on a given land base. Not surprisingly, the examples most frequently cited by interviewees involved Al-Pac and oil sands operators. Road sharing is more difficult for conventional oil and gas operations because of their much shorter planning horizons.

Although these two examples of best practices have yielded some tangible benefits in the management of linear disturbance density within the Al-Pac FMA, interviewees also identified the following barriers to progress:

- the lack of integrated, long-term planning for transportation infrastructure to support industrial activity;

- the absence of recognized, science-based “thresholds” and established regulatory limits to provide the basis for determining how much linear disturbance should be permitted;

- the structural obstacles to managing the proliferation and cumulative impacts of linear disturbances that are the result of incremental and sectoral approval processes for roads, seismic programs, pipelines, etc.;

- the short time frames for rights issuance and operational planning in the conventional oil and gas sector, which make it difficult or impossible to coordinate transportation infrastructure with other companies;

- the inability of the companies that create linear disturbances to control the subsequent use of these corridors by the public or to achieve complete decommissioning and reclamation of corridors once industrial operations are complete; and

- deficiencies in the government’s current legislation, policy and land management practices that make it difficult to limit public access to industrial corridors once these corridors have been created.

The reclamation of linear disturbances is, of course, another important determinant of the density of disturbances over time and their accessibility to the public. This issue is examined in the section of this document dealing with maintenance of total forest cover.

Various regulatory and fiscal tools could be used to address these barriers to the better management of linear disturbance density and associated human access. Seven policy options were identified in the interviews and literature review conducted for this case study.

The first option is the design and implementation of an optimal transportation grid for the Al-Pac FMA. Implementing this option would require the establishment by government of a planning process involving the major industrial players, government land managers and regulatory agencies, and other parties with an interest in the social, economic and environmental implications of transportation infrastructure. This process could be complemented by fiscal incentives and regulatory requirements. The objectives of this initiative would include: (1) planning the location and construction timetable for transportation corridors in order to minimize impacts and costs while meeting the needs of the various interested parties, (2) specifying the design and maintenance standards that are appropriate for all users of the infrastructure, (3) allocating construction and maintenance costs among present and future users, and (4) creating incentives or requirements so that industry will, to the extent possible, adapt its operational planning in order to make use of common transportation corridors.

One obvious challenge for this policy option is the lack of full information on some determinants of future land uses, notably the location and extent of oil and gas reserves. Some reserves have yet to be discovered or fully delineated, and technological advances may increase the recovery potential from known reserves. Despite these uncertainties, most interviewees who commented on this issue believe that a proactive approach to anticipating and planning the principal transportation corridors could achieve cost savings and reduce impacts on natural capital over the long term.

A second option is to establish regulatory requirements that companies operating on the same land base coordinate operational planning and share infrastructure. A precedent for this type of regulation is the scrutiny of gas plant applications by the Alberta Energy and Utilities Board in order to prevent the proliferation of facilities.[40] Applicants are required to demonstrate that their gas processing needs cannot be met by existing facilities before new gas plants are approved. The Board also has the power to order owners of existing facilities to process gas from other companies. A similar approach could be adopted when considering applications for new roads, pipeline rights of way and similar linear disturbances.

There were some differences of opinion among interviewees regarding the appropriateness of a regulatory approach. Some interviewees stated that the economic and environmental benefits of sharing infrastructure are so clear that industry laggards in this area should simply be required to follow best practices. Others noted, however, that smaller companies are less able to engage in this type of process; these interviewees felt that leadership by government or fiscal incentives to engage in cooperative planning would be appropriate, given the benefits for broader public values. Effective implementation of this option would, of course, require some attention to aligning the planning time frames of different companies and approval processes. This issue, in turn, raises again the broader cross-cutting questions related to integrated planning and the incentives and requirements embedded in tenure regimes.

[40] Energy Resources Conservation Board (now Energy and Utilities Board), *Applications for Approval of Gas Processing Schemes—Policy on Plant Proliferation*, ERCB Informational Letter IL 91-1, January 29, 1991.

A third option, which could include both fiscal and regulatory components, would be to establish stronger incentives or specific requirements to adopt best practices when creating linear disturbances. The issue of fiscal incentives for low- or no-impact seismic was discussed above. Several interviewees commented that offering expedited approvals and other reductions in regulatory costs for activities that meet best-practice criteria could also provide a strong incentive to minimize linear disturbances. Regulatory options include a blanket requirement to meet specified low-impact standards or a more flexible approach that would, for example, require companies applying for seismic approvals to adopt low-impact techniques unless they can demonstrate that these techniques are unfeasible or would not yield any significant environmental benefit.

A few interviewees cautioned, however, that the adoption of best practices may not, by itself, be sufficient to ensure the conservation of natural capital. Adverse cumulative effects can occur whenever disturbances create discernible impacts. For example, one interviewee noted that the excessive proliferation of stream crossings within a given area is likely to have some negative environmental impacts even if each crossing meets the best-practice standard.

A fourth option is a policy of "no net increase" in linear disturbance density within specified areas. This type of policy could be implemented through a regulatory limit or cap on linear disturbances and the provision of various mechanisms for companies to secure rights to create linear disturbances or to offset proposed development through reclamation. Disturbance rights could be issued or auctioned by government and then traded among companies. For example, an oil and gas company operating in an area might purchase the rights of a forest company to create roads, thereby preventing forestry operations in the area but allowing for energy development. Companies could also be required to reclaim existing linear disturbances before creating any new ones. For this mechanism to work effectively, however, some means for comparing the "value" of disturbed and reclaimed land would be required, and it would also be necessary to ensure, to the extent possible, that reclamation efforts were successful (e.g., that reclaimed roads were not reopened for other industrial or recreational use). Offset or mitigation banking could be used to facilitate offset transactions. This technique would allow government, industry or other land stewards to establish reclamation projects that would then be available through an intermediary (the reclamation bank) to companies in need of offsets for their proposed linear disturbances.

Regulatory requirements to improve reclamation constitute a fifth option for managing linear disturbance density over time. This topic was addressed above in the section addressing the objective of maintaining total forest cover.

A sixth option is the adoption of a "roadless areas policy" that would identify areas with few or no roads or other access corridors and explicitly recognize the ecological value of these areas when making land use decisions. A roadless areas policy could be linked to protected area designation or incorporated into an ILM framework on the working landscape. Although transportation corridors are inevitable on working landscapes, integrated planning could direct resource development to particular areas for a given period of time and provide for the progressive reclamation of roads and other linear disturbances as the geographic focus of industrial activity shifts. This approach could be used to establish "floating" roadless areas (or areas with limited road access) that could be moved over time across a large landscape such as the Al-Pac FMA.

The seventh and final option is to shift the focus to managing the human use of industrial access corridors once they have been created. Restricting the recreational and industrial use of linear disturbances through access management mechanisms other than complete reclamation could address some, but not all, of the adverse effects on natural capital from this type of development. For example, it would address impacts directly related to off-highway vehicle use (e.g., erosion, soil compaction), hunting and fishing (e.g., pressure on sensitive populations) and increased human presence in environmentally sensitive areas (e.g., poaching, displacement of animals from breeding habitat). However, human access management would obviously not address certain other effects of linear disturbances, such as pressure on caribou populations linked to the use of these corridors by wolves. Furthermore, access management policies and practices are unlikely to be completely effective in the face of determined efforts by some people to make use of existing linear disturbances and given the limited government resources currently allocated to monitoring and enforcement.

Interviewees were divided about the appropriateness and likely success of this policy option. Some interviewees felt that pressure from certain segments of the public (e.g., the off-highway vehicle lobby) to maintain and expand access using industrial corridors is so strong—and government resistance to that pressure so weak—that the best strategy for conserving natural capital is to limit the creation of corridors in the first place, rather than attempting to restrict access significantly once they are in place. However, other interviewees argued that recreational access requires attention because linear corridors are needed for resource development. Furthermore, it was argued that the adverse impacts on natural capital of these corridors are magnified significantly by their subsequent use for recreational purposes. From this perspective, managing recreational access should be the priority because it reduces negative impacts on natural capital without unduly impeding the creation of corridors for industrial use.

A complete review of Alberta's legal and policy regime for access management is beyond the scope of this case study.[41] Nonetheless, some interviewees touched on both barriers and policy options in this area. Two principal barriers were identified. First, companies that create linear disturbances are in most circumstances unable to restrict the use of these corridors by recreational users, even when these companies are under pressure from regulators and stakeholders to reduce the direct and indirect impacts of their activities on natural capital. Second, there is a perception that the Government of Alberta lacks the regulatory tools and the political will to implement effective access management.

From a regulatory perspective, government land managers are not powerless in the face of increasing public access associated with industrial development. Access restrictions can be specified for individual industrial dispositions on public land (e.g., licences of occupation for roads). There is also a provision under the Forests Act for establishing Forest Land Use Zones, within which public access is permitted only along designated routes. Reclamation requirements, fish and wildlife regulations and other regulatory tools may also support access management in some circumstances. In appears from the interviews, however, that strong lobbies in support of

[41] For a detailed discussion of access management in Alberta, British Columbia and Saskatchewan, see: Michael M. Wenig and Steven A. Kennett, *The Legal and Policy Framework for Managing Public Access to Oil and Gas Corridors on Public Lands in Alberta, Saskatchewan, and British Columbia*, Report prepared for the Canadian Association of Petroleum Producers (CAPP) by the Canadian Institute of Resources Law, May 11, 2004. Distribution of this report is being handled by Brad Herald, Environmental Advisor, CAPP.

the public's "right" of access to public land have limited the use of these mechanisms in Alberta. Furthermore, once "traditional" access has been established—meaning access along any corridor that is not closed from the time of its development—the Alberta government's policy is to maintain access unless there are exceptional circumstances.[42]

Options for improving access management could take either regional or activity-specific approaches. The most obvious way to balance competing values and manage cumulative effects on a regional basis is access management planning. Alternatively, access issues could be addressed on a disposition-by-disposition basis through direct regulation or by granting resource companies greater authority to manage access on the access corridors that they create. If companies are to play a greater role in access management, however, they may require more protection from liability in the event that people using linear disturbances are injured or suffer property damage as a result of collision with physical access barriers. Finally, government action in support of access management could include public education and enhanced enforcement of access restrictions.

5.8. Maintain Terrestrial Carbon Stocks and Sinks

As noted by one interviewee, anthropogenic climate change is likely to be a major determinant of the fate of Canada's boreal forest over the coming century and beyond. It is not, however, a factor that can be controlled directly by the decision makers charged with land and resource management in the Al-Pac FMA. The emerging international and domestic regimes for limiting net greenhouse gas (GHG) emissions could, however, have important implications for the conservation of natural capital in the boreal forest.

There are considerable stores of terrestrial carbon within the boreal forest, notably in peat bogs, other wetlands, soil and standing timber. Regulatory and fiscal tools to promote the conservation of this type of natural capital could be developed. Furthermore, policies intended to protect terrestrial carbon stocks and sinks in the boreal forest could also yield an array of co-benefits in relation to other type of natural capital. For example, measures to protect peat bogs for their carbon content would also benefit plant and animal species that depend on this type of habitat.

At present, however, there are significant barriers to the implementation of an effective regulatory and fiscal regime for carbon management in the boreal forest. At the international level, it is still not certain that the Kyoto Protocol will enter into force or what type of agreement will replace it if ratification by the required number of countries is not achieved. Even if the Kyoto Protocol does come into force, its effectiveness remains in doubt given the refusal of important industrial countries such as the United States and Australia to sign on. While Canada has ratified this agreement, there is continuing uncertainty about our ability to meet emissions reductions targets. Finally, Canada has yet to establish a domestic regime for promoting biotic carbon sequestration and managing terrestrial carbon stores.

Interviewees who commented on this issue raised a wide variety of questions relating to carbon management but provided few answers. A detailed examination of these questions and the policy options for addressing them is not possible within the time and budget limitations for this case

[42] Government of Alberta, *Motorized Access Management Policy on Industrial Dispositions,* June 8, 1993.

study. Fiscal incentives for maintaining carbon balances on forest lands may have a significant impact on numerous conservation objectives and are discussed in Part 3.

Climate change will remain an important global issue for the foreseeable future, and the management of terrestrial carbon stores is likely to remain one component of the broader strategy that will be required to stabilize atmospheric GHG concentrations. Since the boreal forest is one of the Earth's great storehouses of terrestrial carbon, the emerging regime for carbon management could have important implications for the management of this region over the coming decades.

6. Areas for Additional Research and Analysis

The objective of this case study was to provide a broad overview of issues and a fairly comprehensive menu of policy options for conserving natural capital within the Al-Pac FMA. This approach has precluded a detailed examination of many of the topics touched on in the previous sections—a limitation noted at various points in the report. As the task force for the Boreal Forest program considers the results of the three case studies commissioned for the program and determines the focus of its final report, further research may be warranted to refine recommendations on certain topics. This report should provide some guidance when identifying research needs.

More detailed examination of specific legislation, policies and institutional arrangements may also be warranted. For example, federal legislation such as the Canadian Environmental Assessment Act, the Fisheries Act, the Migratory Birds Convention Act and the new Species at Risk Act may well provide specific regulatory tools for promoting, or requiring, the conservation of natural capital. The limited time and budget for this case study precluded an examination of these statutes, as well as other federal and provincial laws, regulations and policies that may be relevant to the conservation of natural capital. The interview-based methodology used for this case study was also not conducive to a detailed analysis of law and policy, particularly recent initiatives such as the Species at Risk Act, with which stakeholders typically have little or no practical experience.

7. Summary and Conclusions

The analysis of regulatory issues in this case study reflects the fact that numerous activities are contributing to landscape-level changes within the Al-Pac FMA and are thereby affecting natural capital. While sectoral legislation and decision-making processes (e.g., regarding forestry and energy development) have significant implications for the conservation of natural capital, the multiple-use context further complicates the task of decision makers as they attempt to balance a broad range of values and interests, including those relating to conservation.

In order to promote conservation while considering economic activities and other values within the Al-Pac FMA, decision makers must have the institutional capacity to define landscape-level objectives with reasonable precision and to manage cumulative environmental effects over spatial and temporal scales that are meaningful from ecological, social and economic perspectives. This capacity, in turn, requires attention to the regulatory "fundamentals" that are highlighted by the cross-cutting barriers to conservation discussed in this document. In

particular, it requires an integrated approach to land and resource management, which is commonly referred to as integrated landscape management.

In addition to the cross-cutting barriers and corresponding policy options, the discussion has focused on a set of more specific management objectives that could be adopted in order to promote the conservation of natural capital within the Al-Pac FMA. For each of these objectives, regulatory barriers exist and policy options can be identified. The regulatory approaches canvassed in this part of the report could be used in conjunction with the fiscal mechanisms and economic instruments that are examined in Part 3. In many cases, regulatory and fiscal options are closely related.

The findings from this case study are, of course, directly relevant to the Al-Pac FMA itself. This area is significant in its own right from ecological, economic and social perspectives. It is also an area where a variety of stakeholders have devoted considerable effort to processes that are intended to provide guidance on how to achieve an appropriate balance between economic development, social and cultural values, and the conservation of natural capital. This report is intended to provide some specific suggestions for making progress in this complex task.

The intent of this case study is also to inform the discussion of issues and options relating to the conservation of natural capital in the boreal forest as a whole. From this broader perspective, the Al-Pac FMA offers decision makers and stakeholders in other parts of the boreal forest an opportunity to look ahead to a scenario of intense, multiple and sometimes competing land uses and values; they may then adjust their legislation, policies and land use practices if they see fit.

Appendix 1 – List of Interviewees

Kirk Andries
Ursus Public Affairs Group

Randall Barrett
Alberta Environment

Roger Creasey
Shell Canada Limited

Ken Crutchfield
Alberta Sustainable Resource Development

Mike Doyle
Canadian Association of Geophysical Contractors

Christine Found
Alberta Sustainable Resource Development

Bill Gummer
Environment Canada

Brad Herald
Canadian Association of Petroleum Producers

Lisa King
Athabasca Chipewyan First Nation

Peter Kinnear
Canadian Natural Resources Limited

Dennis Kohlman
Petro-Canada Limited

Peter Koning
Conoco-Phillips Limited

Gord Lambert
Suncor Limited

Peter Lee
Global Forest Watch Canada

David Luff
Inukshuk Consulting Inc.

Pat Marcel
Athabasca Chipewyan First Nation

Chief Morris Monias
Heart Lake First Nation

Shira Mulloy
Canadian Association of Petroleum Producers

Bob Nichol
Alberta Pacific Forest Industries Inc.

David Pryce
Canadian Association of Petroleum Producers

Rick Schneider
Canadian Parks and Wilderness Society

Neil Shelley
Alberta Forest Products Association

Paul Short
Alberta Sustainable Resource Development

Gary Stewart
Ducks Unlimited Canada

David Stuart
Petro-Canada Limited

Neil Symington
EnCana Corporation

Shawn Wasel
Alberta Pacific Forest Industries Inc.

Shad Watts
Alberta Energy

Dan Woynillowicz
Pembina Institute

Appendix 2 – Interview Request Letter and Outline of Discussion Points for Interviewees

Dear X

The National Round Table on the Environment and the Economy (NRTEE) has commissioned a case study of the Alberta Pacific Forest Industries (Al-Pac) Forest Management Area as part of its program on the conservation of natural capital in Canada's boreal forest. This case study will identify fiscal and regulatory barriers to conservation and will review policy options and best practices for conserving natural capital, recognizing the importance of resource development and other economic and social values relating to land use in this area.

Interviews with key stakeholders are an important part of the case study. I am therefore writing to ask if you would be available for a one hour telephone interview sometime in April or early May. We are interested in your views on the following general questions:

(1) What are the key conservation objectives that should be promoted in the Al-Pac Forest Management Area?
(2) What landscape characteristics (e.g., indicators) are required to achieve these conservation objectives and how are these characteristics affected by land uses in the area?
(3) What specific management objectives for land-uses in the Al-Pac area could be adopted to promote the conservation of natural capital?
(4) What are the regulatory/fiscal obstacles to achieving these management objectives and what regulatory/fiscal tools could be used to overcome these obstacles and to promote the conservation of natural capital?

Prior to the interview, we will send you with a more detailed list of possible management objectives and policy options as the basis for our discussion.

Our interdisciplinary project team for the case study consists of Steve Kennett and Monique Ross (Canadian Institute of Resources Law), Marian Weber (Alberta Research Council), Brad Stelfox (Forem Technologies) and Daniel Farr (Biota Research). We will be participating in a stakeholder workshop in May and will be submitting our report to the NRTEE in early July.

If you are willing to be interviewed for this project, please contact me by e-mail (kennett@ucalgary.ca) or telephone (403) 220-3972 so that we can set a time. I would also be happy to answer any questions that you may have regarding the project. I look forward to speaking with you.

Yours truly,

Steve Kennett
Research Associate
Canadian Institute of Resources Law

AL-PAC CASE STUDY
OUTLINE OF DISCUSSION POINTS FOR INTERVIEWS

The National Round Table on the Environment and the Economy (NRTEE) has commissioned a case study of the Alberta Pacific Forest Industries (Al-Pac) Forest Management Area for its program on the conservation of natural capital in Canada's boreal forest. This case study will identify fiscal and regulatory barriers to conservation and policy options for conserving natural capital, while recognizing the importance of resource development and other economic and social values for land use in this area.

The purpose of interviews is to obtain stakeholder views on conservation objectives, corresponding management objectives for land and resource use, and the regulatory and fiscal mechanisms that could be used to achieve these objectives. This outline is intended to stimulate thought on these issues, not to prejudge the outcomes of the case study. The project consultants will include the comments of stakeholders in their review and analysis of issues and policy options. Interviewees are encouraged to identify other issues, objectives and policy options that should be addressed in the case study, and should not confine themselves to management objectives and policies that exist under the *status quo*.

The issues directly relevant to the case study are noted below. **The primary focus of the interviews will be issues 3-6.**

1. **What key conservation objectives should be promoted in the Al-Pac area?**

   Examples of **conservation objectives** might include the maintenance of biodiversity, hydrological function and aquatic resources, productive capacity of forest ecosystems, forest contribution to global carbon cycles, etc.

2. **What landscape and aquatic characteristics are desirable for achieving these conservation objectives, and what human activities may adversely affect the retention of these desired characteristics?**

   Examples of **desirable landscape and aquatic characteristics** might include unfragmented habitat (e.g., roadless areas), old growth forest or other key habitat types, undisturbed riparian areas, overall amount of forest cover, instream flows, etc.

   Examples of **human activities** that may adversely affect desired characteristics might include road building, timber harvest, seismic activity and well drilling, human access for recreation (including hunting and fishing), disruption of natural disturbance regimes, and point/non-point source water pollution from mills, etc.

3. **What specific management objectives for land-uses in the Al-Pac area could be adopted to promote the conservation of natural capital?**

   Examples might include the establishment of protected areas, management of linear disturbance density, management of access, maintenance of old growth forest, maintenance

of aquatic features, maintenance of the natural distribution of landscape features (e.g. patch size, age class, stand composition), maintenance of total forest area, and maintenance of terrestrial carbon sinks and stock.

4. **What are the current regulatory and fiscal barriers to achieving these management objectives?**

   The NRTEE has identified the following **general barriers** to the conservation of natural capital in Canada: lack of political will and accountability by governments; lack of conservation planning at a landscape level; key stewards are often not "at the table" (notably Aboriginal peoples); lack of economic benefits and incentives for key stewards; lack of information tools to support decision making; failure to integrate the true costs and benefits of nature; and lack of financial resources to support conservation and partnerships.

   Specific **regulatory and fiscal barriers** to conservation in the Al-Pac area might be related to resource tenures and the disposition system for allocating resources on public lands, inadequate integration of decision-making across resource sectors and land uses, the royalty, tax, and stumpage structure, specific forest management requirements (e.g., the allowable annual cut calculation formula, sustained harvest requirements), etc.

5. **What regulatory and fiscal tools might be used to promote each of the specific conservation-oriented management objectives noted above (#3), and what are some key challenges in implementing these policy options?**

   Regulatory tools might include integrated land-use planning (including zoning – e.g., TRIAD approach), habitat and/or fragmentation thresholds, protected areas designation, improved wildlife management, human access management, regulatory standards that require "best practices", etc.

   Fiscal tools might include charges for non-reclaimed roads, performance bonds, subsidies or tax credits for reclamation, tradable permits, natural resource accounts, and carbon credits/taxes.

   Challenges may include feasibility and costs of monitoring and enforcement, inadequate budgets, equity concerns, reduced competitiveness, lack of public support.

6. **What are some particular concerns or issues related to Aboriginal peoples that need to be considered in designing and implementing conservation objectives?**

EXAMPLES OF ABORIGINAL ISSUES MIGHT INCLUDE UNCERTAINTY REGARDING ABORIGINAL AND TREATY RIGHTS, TRADITIONAL LAND USES, ONGOING LEGAL CHALLENGES, THE LEGAL DUTY TO CONSULT IN RELATION TO LAND AND RESOURCE USES AFFECTING ABORIGINAL RIGHTS, ETC.

Appendix 3 – Workshop Agenda and Issue and Option Outline for Workshop Participants

Development and Conservation in Our Boreal Forest: Reaching a Balance

Multistakeholder Workshop
AlPac Forest Management Area
Holiday Inn, 8200 Franklin Avenue, Fort McMurray, AB

May 3, 2004
8 h 00 à 17 h 00

Agenda

8:00 ***Continental breakfast hosted by NRTEE***

8:30 **Opening remarks**
Harvey Mead, Chair

8:40 **NRTEE Boreal Forest Program**
Bill Borland / Wendy Carter, NRTEE Task Force Co-Chairs

8:55 **Facilitator**

9:00 **Introduction to Al-Pac Case Study**
Presentation by Project Consultants

9:15 Q & A

9:25 **Case study session #1: Conservation Values and Objectives, Land Use in the Al-Pac Forest Management Area, and Possible Management Objectives for Promoting Conservation**
Presentation by Project Consultants

10:00 Q & A

10:15 Break

10:30 Round-table discussions

11:00 Round-table reports

11:15 **Case study session #2: Barriers to Conservation in the Al-Pac Forest Management Area (i.e., barriers to achieving the conservation-oriented management objectives)**
Presentation by Project Consultants

Q & A

11:30 Round-table discussions

12:15 Lunch hosted by NRTEE

1:00 Round-table reports

1:15 **Case study session #3: Policy Options (regulatory and fiscal) for Promoting Conservation in the Al-Pac Forest Management Area (i.e., regulatory and fiscal tools for achieving the conservation-oriented management objectives)**
Presentation by Project Consultants

Q & A

1:30 Round-table discussions

2.30 Round-table reports

2:45 Break

3:00 **Case study session #4: Best Practices and Opportunities at a National Level**
Presentation by Project Consultants

3:15 Round-table discussions

3:45 Round-table reports

4:00 **Final conclusions and advice to the NRTEE**

4:30 **Wrap-up and next steps**

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY – BOREAL FOREST PROGRAM

AL-PAC FOREST MANAGEMENT AREA CASE STUDY

STAKEHOLDER WORKSHOP

May 3, 2004
Fort McMurray

ISSUE AND OPTION OUTLINE FOR WORKSHOP PARTICIPANTS

18 APRIL 2004

The National Round Table on the Environment and the Economy (NRTEE) has commissioned a case study of the Alberta Pacific Forest Industries Forest Management Area (Al-Pac FMA) for its program on the conservation of natural capital in Canada's boreal forest. This case study will identify fiscal and regulatory barriers to conservation and policy options for conserving natural capital, while recognizing the importance of resource development and other economic and social values for land use in this area.

The examination of these issues within the Al-Pac FMA is one of three case studies commissioned by the NRTEE as part of its Boreal Forest program. The goal of this program is "**To advance conservation in balance with economic activity on public lands allocated for resource development in Canada's boreal forest through regulatory and fiscal policy reform.**" The Boreal Forest program builds on the findings, conclusions and recommendations contained in *Securing Canada's Natural Capital: A Vision for Nature Conservation in the 21st Century* (NRTEE 2003).

The focus on conservation of natural capital is consistent within the NRTEE's overall mandate, which is to "play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development."

The purpose of the workshop is to obtain stakeholder views on conservation objectives, corresponding management objectives for land and resource use, and the regulatory and fiscal mechanisms that could be used to achieve these objectives. This outline is designed to assist participants in preparing for the workshop by providing an overview of issues and policy options that have been identified to date by the project consultants and by stakeholders who have been interviewed for the case study.

The issues and options set out below are preliminary and are presented to stimulate discussion, not to prejudge the ultimate findings and conclusions of the case study. Participants are encouraged to identify other issues, objectives and policy options that should be addressed in the case study and should not confine themselves to management objectives and policies that exist under the status quo.

The project consultants will incorporate comments from workshop participants into the case study report. Interviews with individual stakeholders are also being conducted. The case study report will be submitted in early July to the Task Force that is leading the NRTEE's Boreal Forest program. For more information on the NRTEE's Boreal Forest program, please contact Karen Hébert at (613) 943-0399 or hebertk@nrtee-trnee.ca.

This outline includes discussion points for each of the main workshop sessions (see Workshop Agenda). These sessions are structured to encourage a focused and productive discussion of regulatory and fiscal barriers to the conservation of natural capital in the Al-Pac area and policy options (e.g., regulatory and fiscal tools) that could be used to promote conservation within a context where there are often other significant land uses and values. The workshop facilitator will encourage participants to stay focused on these key questions.

Case Study Session #1 – Conservation Values and Objectives, Land Use in the Al-Pac FMA, and Possible Management Objectives for Promoting Conservation

The primary objective of this session is to establish some common ground among workshop participants on a range of management objectives that could be used to promote the conservation of natural capital within the Al-Pac FMA. General agreement on a suite of potential management objectives will provide the basis for the subsequent examination of barriers to achieving these objectives and policy options for promoting them. Participants will not be expected to reach consensus on the relative importance of conservation as compared with other values such as resource development, nor will they be asked to prioritize management objectives.

This session will include a general presentation by the project consultants on land-use patterns and indicator trends within the Al-Pac FMA. This presentation will review the natural capital, resource values and other relevant characteristics of the area, the history of land and resource use, and potential land-use trajectories. The session will provide the overall context for subsequent discussions, but is not designed to achieve consensus on the details of modeling methodology and assumptions or on precise projections of future land use within the Al-Pac FMA.

The specific questions to be examined in this session are:

1. **What key conservation objectives should be promoted in the Al-Pac FMA?**

   Examples of **conservation objectives** might include the maintenance of biodiversity, ecosystem condition and productivity, hydrological function and aquatic resources, contribution to the global carbon cycle, etc.

2. **What are the indicators of natural capital that correspond to these conservation objectives, and what human activities may adversely affect these indicators?**

   Examples of **indicators of natural capital** might include extent of forest cover, extent of wetlands, old growth forest, undisturbed landscapes, persistence of natural disturbance regimes (and resulting landscape characteristics), quantity and quality of surface water, and carbon balance (i.e., GHG emissions and carbon sequestration).

Examples of **human activities** that may affect these indicators might include road building, timber harvest, seismic activity, oil and gas production (e.g., wells, surface mining), human access for recreation (including hunting and fishing), disruption of natural disturbance regimes, point/non-point source water pollution, etc.

3. **What specific management objectives for land-uses in the Al-Pac FMA could be adopted to promote the conservation of natural capital?**

   Examples of management objectives might include:

   - Maintenance of total forest cover;
   - Maintenance of key aquatic and hydrological features (e.g., wetlands, surface water quality and quantity, etc.);
   - Identification of areas of traditional Aboriginal use and value, and the management of human activities (e.g., industrial and recreational activities) in order to respect and accommodate the traditional uses and values;
   - Maintenance of old growth forest within the range of natural variation across the landscape;
   - Establishment of "set-aside" areas where industrial activity is either prohibited or severely restricted (e.g., protected areas, roadless areas, ecological benchmark areas);
   - Management of linear disturbance/access density;
   - Maintenance of the natural disturbance regime (including land-use practices that approximate, to the extent possible, patterns of natural disturbance);
   - Maintenance of terrestrial carbon stocks and sinks.

   Workshop participants will be asked to comment on these options and to identify other possible management objectives. Suggested objectives should be as specific as possible in stating how land and resource uses will be managed so as to minimize their adverse impacts on indicators of natural capital.

Case Study Session #2 – Barriers to Conservation in the Al-Pac FMA (i.e., barriers to achieving the conservation-oriented management objectives)

Workshop participants will be asked to identify and comment on **regulatory and fiscal barriers** to the conservation of natural capital in the Al-Pac FMA. Some barriers may be relevant to several (or all) of the specific management objectives discussed in Session #1, while others may apply to only one objective.

The following list of possible barriers is intended for illustrative purposes and reflects comments obtained through stakeholder interviews. Workshop participants are encouraged to comment on these points and to identify any other barriers that they consider to be important. Barriers to the conservation of natural capital may include:

- Lack of an adequate integrated planning process to establish landscape-level objectives, identify acceptable trade-offs among land and resource uses, and guide subsequent decision making by government, industry and other parties;

- Inadequate integration of decision making (e.g., land-use planning, resource allocation, project review, regulation of projects and activities) across the full range of resource sectors and land uses;

- Absence of a clear institutional focal point within government for accountability on landscape-level issues – such as the conservation of natural capital;

- Inadequate economic benefits and incentives to promote the conservation of natural capital by key stewards;

- Lack of information tools to support decision making, or a failure to use information that is available (e.g., a support system for measuring and managing the cumulative impacts of resource development);

- Absence of policies and processes relating to the establishment of ecological benchmarks and protected areas within the broader working landscape;

- Deficiencies in the multi-stakeholder forums and decision-making processes that are intended to address conservation and other aspects of land and resource use (e.g., key stakeholders/stewards are not "at the table", inadequate participation by key stakeholders, lack of commitment by government to follow through with the implementation of recommendations from these processes, etc.);

- Lack of financial resources to support conservation and partnerships (or excessive reliance on contributions from industry and other non-governmental stakeholders);

- Constraints and incentives created by the disposition and tenure systems for allocating resources on public lands (e.g., overlapping resource tenures, "use it or lose it" requirements for tenure holders, compressed time lines for resource development once tenures have been issued);

- Fiscal incentives relating to the royalty, tax, and stumpage structure that limit conservation options;

- Specific resource management requirements that impede adaptive management and constrain options for conserving natural capital (e.g., the annual allowable cut calculation formula, full utilization requirements, harvesting of old growth forest);

- Approval processes for projects and activities that allow incremental development without adequately addressing cumulative impacts (e.g., approval processes for seismic operations, well sites, pipelines, stream crossings, etc.); and

- Legislation and policy governing public land dispositions (e.g., licences of occupation for roads) and recreational land-use that make it difficult to implement effective access management.

Workshop participants should also consider particular issues or concerns related to Aboriginal peoples that need to be taken into account when designing and implementing measures to conserve natural capital. Examples of **Aboriginal issues** might include uncertainty regarding Aboriginal and treaty rights, lack of information about traditional land uses, ongoing legal challenges, confusion regarding the legal duty to consult in relation to land and resource uses affecting Aboriginal rights, the challenge of incorporating traditional knowledge into decision-making processes, etc.

Given the range of regulatory and fiscal barriers that may be identified, workshop participants will be asked to focus initially on the over-arching barriers that they consider to be the most significant (i.e., barriers that affect the implementation of many or most of the management objectives identified in the previous session). Participants should then identify the principal barriers that are relevant to particular management objectives.

Case Study Session #3 – Policy Options (Regulatory and Fiscal) for Promoting Conservation in the Al-Pac FMA (i.e., regulatory and fiscal tools for achieving the conservation-oriented management objectives)

Workshop participants will be asked to identify regulatory and fiscal policy options for overcoming the principal barriers to the conservation of natural capital that they identified in **Session #2**. Some of these options may address general or over-arching barriers. Participants will also be asked to identify regulatory and fiscal tools for implementing the specific management objectives identified in **Session #1**.

Examples of **regulatory tools** include:

- Integrated land-use planning (including zoning – e.g., TRIAD approach);

- Changes to the resource allocation and tenure regimes (e.g., modification of “use it or lose it” requirements, improved mechanisms for the environmental review of tenure decisions);

- Design and implementation of an effective legal, policy and institutional framework for integrated resource management (IRM);

- Improved legal and policy framework for consultation with Aboriginal peoples regarding resource development and other land uses affecting Aboriginal rights;

- Measures to promote the consideration of Aboriginal interests and values in decision making on land and resource use (e.g., use of traditional land-use studies and traditional knowledge);

- Establishment of a policy and process to consider the designation of ecological benchmark areas and other protected areas within the broader working landscape;

- Alignment of forest management legislation and policy with forest certification requirements and principles of ecosystem-based forestry (e.g., recommendations in the Alberta Forest Conservation Strategy);

- Habitat and/or fragmentation thresholds to address cumulative effects;

- Adoption of "no net loss" requirements for certain indicators of natural capital;

- Improvements to the information base, decision-making tools and enforcement capacity for fish and wildlife management;

- Enhanced reclamation requirements;

- Strengthening and more effective implementation of legal and policy mechanisms for human access management (e.g., designation of Forest Land Use Zones, enhanced education and enforcement activities); and

- Regulatory requirements to coordinate operational planning and share infrastructure (e.g., roads).

Examples of **fiscal tools** include:

- Tax or royalty concessions for improved stewardship;

- Fiscal incentives to promote the development and rapid adoption of improved technology (e.g., low-impact seismic);

- Charges for non-reclaimed roads, well-sites and other disturbances;

- Subsidies, tax credits, reduced surface lease payments or other fiscal incentives for reclamation;

- Reasonable compensation for the surrender of resource tenures to achieve conservation objectives;

- Improved alignment of timber damage assessment with the true private and public (e.g., ecosystem) costs resulting from loss of forest cover;

- User fees to address subsidies that are implicit in some uses of "free" public resources (e.g., water);

- Removal of implicit subsidies in the resource disposition process (e.g., ensure that the full market value of the resource and some non-market values are reflected in the disposition price for public resources – auction price of sub-surface rights, stumpage fees, etc.);

- Fiscal incentives to cluster development and reduce landscape fragmentation (e.g., haul tax);

- Use of performance bonds to increase incentives for compliance and to reduce the risk of unfunded public liabilities;

- Tradable permits and the use of offsets and offset banking (e.g., for linear disturbances, logging of old growth forest, drainage of wetlands, etc.);

- Natural resource accounting that better reflects the value of natural capital; and

- Carbon credits or taxes.

Case Study Session #4 – Best Practices and Opportunities at the National Level

This session will focus on the principal key lessons from the workshop regarding barriers to conservation and opportunities for using regulatory and fiscal policy reform to promote the conservation of natural capital in the Al-Pac FMA. Workshop participants will be asked to reflect on the previous sessions and identify the "best practices" and policy options that have the most potential for application across the boreal forest as a whole.

CONSERVING CANADA'S NATURAL CAPITAL: THE BOREAL FOREST

Al-Pac Case Study Report – Part 3
Fiscal Barriers and Options

Prepared for the

National Round Table on the Environment and the Economy

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EXECUTIVE SUMMARY

This document is Part 3 of a three-part case study report examining conservation issues in the Alberta-Pacific (Al-Pac) Forest Management Area (FMA). In this part, we provide a summary of key fiscal barriers and opportunities that could be pursued to preserve natural capital on the Al-Pac FMA. The case study was commissioned by the National Round Table on the Environment and the Economy (NRTEE) as part of its Conserving Canada's Natural Heritage: The Boreal Forest program.

Natural capital includes resources such as minerals, timber, and oil and gas, which provide the raw materials used in the production of manufactured goods as well as land and water resources that support non-market values such as recreational opportunities, biodiversity and ecosystem services. The methodology for this part of the report consists of three components. First, the economic and policy literature was reviewed to generate a list of fiscal mechanisms that have been applied globally to protect forest lands. The list was then evaluated in order to focus on instruments that would be suitable to the boreal forest context: instruments had to be suitable to the ecological system and relevant sectors, as well as compatible with existing institutions (such as property right systems). Stakeholder interviews were conducted to obtain feedback on challenges facing land managers in managing for conservation values, ideas for policy reform and incentives that would help land managers achieve conservation objectives, and the acceptability of alternative fiscal reforms. Further stakeholder input was obtained from the case study workshop held in Fort McMurray on May 3, 2004.

The main findings of this part of the report are summarized below. Because the provincial government has jurisdiction over most land and resources within the Al-Pac FMA, the report focuses on provincial fiscal barriers and opportunities. Note that many of the opportunities discussed below, such as tradable development rights, are applicable beyond the boundaries of the Al-Pac case study and will also increase protection of existing boreal forest against encroachment by the agricultural fringe.

Barriers

- The Alberta government business planning model promotes the sector-specific mandates of individual departments rather than maximizing the potential value of forest land.

- The tenure and disposition system for allocating resource rights on public lands generates externalities[1] between sectors and does not incorporate the value of natural capital.

- FMA agreements have many restrictions that lead to inefficient use of forest lands and reduce Al-Pac's ability to manage for natural capital. These include stumpage charges, adjacency restrictions, appurtenancy clauses, use-it-or-lose-it requirements,

[1] An externality is a side-effect or consequence that affects other parties without this being reflected in the cost or price of the goods or services received.

and the sustained-yield principle, which underlies calculation of the annual allowable cut.

- Energy sector barriers include taxes and subsidies that accelerate the exploration and development of energy resources, petroleum and natural gas lease requirements, and a lack of charges for access to water.

Opportunities

- Natural resource accounts and a common set of sustainability indicators managed by all government departments could be used to improve the business planning model in Alberta.

- Increased rights to forest resources other than timber would enhance management for non-timber values on public lands.

- Transferable development rights could be used to implement forest or habitat loss thresholds in the boreal forest.

- Carbon credits could maintain carbon balances and reduce loss of forest cover.

- Conservation easements could be used on public lands to maintain habitat.

- Forest investment tax credits could be applied to forest investments by any sector.

- Access and user charges for non-decommisioned roads could reduce forest fragmentation and species interactions related to human access.

1. INTRODUCTION

This document is the third part of a three-part case study report investigating conservation issues within the Alberta-Pacific (Al-Pac) Forest Management Area (FMA) in northeastern Alberta. The case study was commissioned by the National Round Table on the Environment and the Economy (NRTEE) as part of its Conserving Canada's Natural Heritage: The Boreal Forest program. In this part of the case study report, we provide a summary of key fiscal barriers and opportunities that could be pursued to preserve natural capital on the Al-Pac Forest Management Area (FMA).

Natural capital includes resources such as minerals, timber, and oil and gas, which provide the raw materials used in the production of manufactured goods as well as land and water resources that support non-market values such as recreational opportunities, biodiversity and ecosystem services. Like produced capital, natural capital is subject to deterioration, in this case through excessive growth and waste, natural resource extraction and modification of the landscape (Canada West Foundation 2003).The International Institute for Sustainable Development (IISD) defines natural capital as an extension of the economic notion of capital (manufactured means of production) to environmental "goods and services." It refers to a stock (e.g., a forest), which produces a flow of goods (e.g., new trees) and services (e.g., carbon sequestration, erosion control, habitat) (IISD 1997). Part 1 of the case study report describes a number of management objectives for the Al-Pac FMA that would result in the conservation of natural capital. Specific indicators of natural capital include the maintenance of biodiversity, ecosystem function and productivity, soil and water resources, and forest contribution to global systems (such as global climate change).

There are numerous instruments that can be used to conserve natural capital. These include regulatory instruments such as performance standards, limits and quotas; information instruments such as education, labelling and indicator reporting; land use planning instruments including disposition systems; and, finally, economic instruments. Economic instruments include fiscal tax- and subsidy-based instruments, user fees and pollution charges, market instruments such as tradable emissions and tradable quotas, and other financial incentives such as grants, green funds and debt-for-nature swaps (c.f. IISD 1997). Part 2 of the case study report focuses on *regulatory* barriers and options for conserving natural capital on Al-Pac's FMA. In Part 3, we examine *fiscal* barriers and options, although they may be related to the implementation of, or require the support of, regulation. The NRTEE has defined ecological fiscal reform as a strategy that encompasses the use of multiple economic instruments such as public taxes and expenditures, as well as tradable permits, permitting charges and user fees, to provide incentives for producers and consumers to alter their behaviour. The application of economic instruments leads producers and consumers to internalize the environmental costs of their actions and rewards them for more sustainable practices (NRTEE 2002).

Activities on forest lands are determined by the economic incentives (monetary and non-monetary) facing individual decision makers who use the resources and services provided by the landscape. The reward system is determined by the price structure for products and services that flow from the resource base, as well as the policy structure that determines the "rules of the game" for resource exploitation and hence influences the relative values

of resources. Conservation objectives are often not achieved because perverse incentives lead to overuse of the forest for its market rather than its non-market values, and because there are inadequate financial incentives for incorporating the values of non-market goods and services in land management decisions. In this document, we will address economic incentives that create obstacles to managing for conservation objectives in the boreal forest, as well as opportunities for fiscal reform to manage for conservation objectives.

1.1 Methodology

The methodology for this part of the case study consists of three components. First, the economic and policy literature was reviewed to generate a list of fiscal mechanisms that have been applied globally to protect forest lands. The list was then evaluated in order to focus on instruments that would be suitable to the boreal forest context. Instruments had to be suitable to the ecological system and relevant sectors, as well as compatible with existing institutions (such as property right systems). Finally, stakeholder interviews were conducted to obtain feedback on challenges facing land managers in managing for conservation values, ideas for policy reform and incentives that would help land managers achieve conservation objectives, and the acceptability of alternative fiscal reforms.[2] Further stakeholder input was obtained from the case study workshop held in Fort McMurray on May 3, 2004.

1.2 Key Points from Stakeholder Interviews

A summary of key stakeholder comments on fiscal barriers and opportunities is provided below in order to provide a context for the rest of the discussion and the focus on particular instruments and mechanisms discussed in sections 3 and 4 of this document. The points are not attributed to any particular individual or sector and are summaries of what we heard. The following points were selected in part because they were raised by more than one stakeholder. Key stakeholder concerns include:

- lack of accountability for ensuring that the timber damage assessment dues paid by the oil and gas sector to FMA holders are spent on reforestation and reclamation;
- lack of incentives and opportunities for offsetting intensive development activities on the Al-Pac FMA with forest investments in other areas of the boreal or on private lands;
- lack of compensation or incentives for investing in natural capital through maintaining ecological benchmarks and protected areas within the managed landscape;
- lack of opportunity and incentives for developing ecological benchmarks that incorporate non-FMA set-aside and protected areas;
- the intense productive potential of oil sands areas, which requires a larger regional approach to achieve conservation objectives and, potentially, a

[2] The methods for interviewing stakeholders are described in Part 2, and the appendix in Part 2 provides the material sent to interviewees prior to discussion.

zoning approach where Al-Pac's FMA becomes part of an intensive land use zone;

- lack of a mechanism for deciding societally acceptable trade-offs between economic development and conservation.

The stakeholder interviews and the case study workshop emphasized the need for society to evaluate trade-offs between economic growth and conservation. Before reviewing the specific barriers and opportunities, we will discuss the role of economic instruments in managing for natural capital and, in particular, the potential role and limitation of economic instruments in helping society evaluate trade-offs between development and conservation.

The remainder of Part 3 proceeds as follows. Section 2 discusses economic instruments, their role in helping firms internalize some of the environmental costs of their decisions, and their role in evaluating societal trade-offs between land use alternatives. Rather than focusing narrowly on economic instruments, we also consider institutional reform and the planning context in which economic instruments are employed. In Section 3 we discuss barriers to conserving natural capital. The discussion covers overarching and largely institutional barriers, as well as sector-specific fiscal barriers. Overarching barriers include the context for business planning in Alberta and the tenure system. We view the government planning environment as the primary institution in which the rules governing competing interests on the landscape are played out. Thus, incentives to coordinate and integrate multiple uses at the planning level affect the extent to which economic instruments are successful in implementing environmental management objectives. In Section 4, we focus on fiscal opportunities, primarily through improvements to the planning model and the use of economic instruments. Because economic instruments affect the incentive structure of firms, they often achieve many conservation objectives simultaneously. We highlight the linkages between conservation objectives and particular instruments.

2. THE CASE FOR ECONOMIC INSTRUMENTS

In order to understand the role of economic instruments in managing for natural capital, it is necessary to understand the role of economic instruments in the marketplace. Forest lands produce numerous non-market values such as biodiversity that compete with resource extraction activities. However, they are often managed exclusively for extractive resources, rather than for multiple benefits. In a perfectly competitive market, prices for resource-based commodities such as oil, timber and agricultural goods are determined by supply and demand. Consumers purchase commodities as long as their willingness to pay for goods is greater than the price. At the same time, suppliers produce commodities as long as the cost is less than the price they receive. Thus, in theory, the competitive market will allocate goods until the willingness to pay is equal to the cost of production. Therefore market prices reflect both the cost and benefit of production. Problems arise, however, when private costs and benefits are not the same as the public, or social, costs and benefits of production. For example, when firms extract timber they think about the value of timber in the marketplace, but they do not directly account for the value of habitat loss in determining how much timber to produce (although regulations are increasingly forcing firms to incur costs for biodiversity protection). Similarly, consumers do not account for the impacts on society in their consumption choices. For example, recreationists may impose management costs on firms operating in the forest, and their activities may also be detrimental to certain species.

The differences between the private and social costs and benefits of production and consumption decisions are referred to as externalities. When externalities exist, an inefficient mix of goods and services is produced by the market economy relative to what is desirable from society's point of view. In particular, the market produces too many goods that cause environmental damage, and it does not produce enough environmental goods and services. Externalities often arise due to incomplete property rights and a lack of prices for resources. For example, when water is free, there is no "cost" to using water, even though it may be a scarce resource. Many environmental goods and services flowing from forest lands lack appropriate prices, or do not have any prices attached to them at all. Examples include values for carbon and recreation. There are numerous reasons why some goods and services lack prices. First, some non-market goods, such as clean air and water, historically have been viewed as entitlements. These entitlements were not questioned in an era of abundant non-disturbed public lands—an assumption that no longer holds. In addition, many non-market goods and services such as biodiversity are not amenable to pricing, largely due to difficulties in assigning property rights. Often, property rights evolve when goods that previously were considered free because they were abundant become more scarce. However, property rights may also fail to exist because of public good problems.

Public goods are characterized by "non-excludability," which means that individuals, even those who do not pay, cannot be excluded from enjoying the benefits of public goods once they are provided. This leads to free-riding. For example, individuals who do not pay directly for biodiversity protection still enjoy the benefits of biodiversity. The market tends to under-provide environmental goods and services that are subject to free riding, because the true willingness to pay for a good is greater than the value generated

by the marketplace. In general, people lack the correct incentives to reveal their true willingness to pay for public goods that are subject to free-riding.

Market instruments, such as tradable permits, involve creating property rights over public goods. Under such systems, rights to use (i.e., pollute) publicly owned resources such as water or air are capped and then traded between resource users. The creation of property rights over the previously "free" good establishes a pricing mechanism that, in turn, rations use of the resource. This pricing mechanism organizes users of the public good to meet environmental objectives as well as maximize the benefit of resources. Alternatively, governments might tax damaging outputs such as emissions or damaging activities. In theory, appropriately applied taxes will increase the private costs of damaging activities and outputs until they are equal to the social costs, which will lead to a reduction of environmental damage.

It has been argued that if property rights are well defined, then contractual arrangements between individuals will eliminate externalities. This type of bargaining takes place when firms agree to jointly plan activities, share costs or pay parties to reduce impacts, and it is evident in the Al-Pac FMA. For example, oil and gas companies carrying out seismic operations in the Al-Pac FMA must pay timber damage dues to Al-Pac to compensate for damage to the fibre supply. However, Al-Pac forgives these dues when energy companies use low-impact seismic in exploration. Because the contract is entered into voluntarily, we assume that the benefit to Al-Pac in the reduced disruption to its timber supply exceeds the loss of the timber damage payment. At the same time, we can assume that the value of waiving the timber damage assessment outweighs the cost of converting to low-impact seismic. The timber damage assessment results from the conflict between Al-Pac's rights for surface timber resources and energy sector rights to subsurface resources. Al-Pac is granted property rights in the standing timber by virtue of s. 16(2) of the Forest Act, and it is in that capacity as "owner" of the standing timber that an FMA holder is entitled to compensation for damage to timber. The clear definition of Al-Pac's rights produces an atmosphere in which Al-Pac and energy companies can bargain over timber damages until they reach an efficient solution.

In theory, complete property rights would lead to an efficient allocation of all resources and solve the social choice problem facing decision makers in trying to determine how much natural capital to provide. Unfortunately, however, property right solutions tend to be less effective for environmental problems involving public goods, because the rights are difficult to define and enforce due to their non-exclusive characteristics. It is often possible to overcome public good problems by creating, through regulatory means, artificial markets for activities that "consume" air or "biodiversity." This is the role of tradable rights, where the regulator caps the total amount of environmental damage and allows firms to trade rights to this damage. Tradable rights systems also provide a mechanism for the public to increase the provision of the environmental good beyond the cap. However, even when the public can participate in the market, tradable permit systems will not yield the "optimal" level of an environmental good because of the free-riding problem. A key advantage of tradable permit approaches is that they are cost-

effective in the sense that they maximize the value of resource use and give firms incentives to meet management objectives at least cost.

Market instruments can be difficult to implement due to high transaction costs. Firms incur search costs in finding parties to contract with, and parties may be uncertain about the true value of the goods being negotiated. If decisions involve significant risks, or outcomes are uncertain, contractual arrangements are less likely to arise. Similarly, it may be difficult for firms to contract with all possible beneficiaries to an action. For example, if the benefits of protecting the habitat of endangered species are spread across many individuals, and the costs of protection are high, it is unlikely that firms will contract with each beneficiary.

Fiscal instruments such as taxes (subsidies) and charges indirectly affect the provision of environmental goods and services by affecting the profitability associated with damaging activities. These instruments are indirect in the sense that there is no set threshold. Environmental outcomes depend on the responsiveness of firms to the incentive. This responsiveness in turn depends on other factors such as product price, which affects the profitability of the firm's activities. Some fiscal instruments generate revenues that can also be directly earmarked to provide the specific goods or services. For example, user fees and charges can be used by the government for the provision of environmental goods and for monitoring and enforcement efforts. Alternatively, the right to collect fees can be given to third parties who undertake environmental management activities. The willingness to pay for conservation is often related to whether fees are perceived to be earmarked or to be an additional way of collecting taxes.

To summarize, the role of economic instruments in conserving natural capital on Al-Pac's FMA can be explained in terms of market failure resulting from distorted incentives inherent in the economic institutions affecting behaviour on the landscape. Economic instruments can be used both to raise revenues for maintaining natural capital and to change behaviour. By integrating the real costs of environmental degradation and the benefits of environmental improvements directly into the incentive structure of producers and consumers, the allocation of resources will shift toward activities that are both environmentally sound and economically attractive. In addition, economic instruments tend to be cost-effective relative to strict command-and-control regulatory approaches, because they give firms flexibility in achieving environmental objectives in ways that minimize costs.

3. FISCAL BARRIERS

In this section we discuss fiscal barriers and perverse incentives that result in a failure to manage for natural capital on the Al-Pac FMA. These barriers may derive from explicit federal or provincial policies, or they may result from an absence of appropriate prices for environmental resources as discussed above. We begin with a discussion of overarching barriers including Alberta's business planning model and the tenure and public land disposition system. We then discuss sector-specific barriers for the forestry and oil and gas sectors.

3.1 Alberta's Business Planning Model

The Alberta government's business planning model consists of Alberta's vision, a 20-year strategic plan, medium-term strategies that include cross-ministry initiatives, and a 3-year business plan. The government's business plan has 12 goals and a set of performance measures and targets related to each goal. The business plan identifies areas of opportunity over the next 20 years related to natural capital. These are set out below:

- developing and using energy and natural resources wisely and exploiting new technologies to maximize the benefits of all resources;
- implementing a long-term water strategy and completing an effective land use policy that ensures the most appropriate use of these basic resources, while recognizing stewardship obligations with respect to future generations;
- ensuring reliable export markets, including a possible customs union with the United States;
- building on Alberta's economic cornerstones, such as oil and gas, agriculture, forestry and tourism; and
- working with municipal governments to support strong, viable, safe and secure communities.

The business plan also discusses the importance of a clean natural environment and states that it will place a priority on Alberta's natural environment by developing a framework for maintaining existing natural areas, as well as short- and long-term strategies that will ensure a balanced and sustainable approach to growth and industrial and resource development (Government of Alberta 2004).

Individual ministry business plans are published annually and cover a three-year period. The four departments with impacts on natural capital in the Al-Pac FMA include the Department of Energy (DOE), Sustainable Resource Development (SRD), Alberta Environment (AE) and Alberta Agriculture, Food, and Rural Development (AAFRD). We will discuss the roles of only DOE, SRD and AE in this section, although many of the barriers identified here will also be applicable to AAFRD.

The primary drawback of the government's business model is that it reflects the sector-specific mandates of each of its departments.

The energy sector has a significant impact on public lands and on the ability to protect natural capital on public lands. However, the goals of DOE reflect its sector-specific mandate. These include optimizing Albertans' resource revenue share and benefits from the development of their energy and mineral resources over the long term. They also include securing future energy supply and benefits for Albertans within a growing and competitive global energy marketplace. The key strategies in the DOE business plan for delivering these goals include working with other ministries to develop Alberta's natural resources in a sustainable, integrated and environmentally responsible manner through the water strategy and through integrated resource management (IRM) initiatives for the Front Range and Southern Alberta. Other strategies include expanding natural gas

reserves by encouraging exploration in areas that have not received sufficient evaluation to date (Alberta Department of Energy 2004). The Alberta Energy and Utilities Board (AEUB), which is responsible for regulation of the energy sector, also falls under the jurisdiction of DOE. Its goals include prompt and appropriate resolution of landowner, public and industry conflicts through the review and streamlining of existing regulations. This goal is supported by the government's Environment and Resource Development Regulatory Framework, which is intended to make the resource development regulatory system more effective based on the principles of one application, one approval, one regulator, one appeal and clear, transparent accountability.

The goals of Alberta Environment are related to maintaining the quality of air, water and land resources. Although AE's goals are related to maintaining the quality of Alberta's land resources, AE's performance indicators do not relate to land use per se or to the preservation of natural capital on the land base. AE is also the lead department for integrated resource management in the province, which involves multiple departments. As part of its IRM strategy, AE has initiated regional strategies, which are part of Alberta's *Commitment to Sustainable Resource and Environmental Management* (Alberta Environment 1999). The goal of the regional strategies is to establish regional policy direction and priorities tailored to the goals of specific regions within a consistent, province-wide program. The regional strategies are intended to be a process through which stakeholders can begin to understand trade-offs between different types of development options. One difficulty with the strategies that was articulated by stakeholders is that the regions have no authority to implement their vision, thus the stakeholders remain tied to the existing allocation system and business plans of the provincial government. Part of the problem is that the government faces a dilemma in determining which pieces of the regulatory framework for land use can be handled locally and which provincially. There is a trade-off between location specificity and the consistency required for regulatory streamlining across the province. Furthermore, decisions made at the regional scale have spillovers for the general provincial population in terms of forgone revenue opportunities or loss of natural capital. In order for the regional strategies to be successful, mechanisms are required that will facilitate the determination of local versus provincial trade-offs.

Sustainable Resource Development has responsibility for public land management in the forest zone of Alberta, as well as a mandate to integrate public and private values in order to ensure that land use achieves multiple benefits. Key goals stated in the department's business plan include ensuring that the values Albertans receive from public lands are sustained and enhanced for future generations; ensuring that the values Albertans receive from wild species are sustained and enhanced for future generations; and optimizing the long-term benefits (environmental, social and economic) that Albertans receive from public lands through effective, efficient disposition management. The department's strategies to achieve these goals include integrated land use planning, as well as working with communities and industry to ensure fair and reasonable opportunities for participation in the economic opportunities associated with resource development on public lands. SRD's broader mandate is reflected in its performance indicators, which

include healthy, viable wildlife populations, benefits from wild species and landscape integrity (Alberta Sustainable Resource Development 2004).

There are two primary problems with Alberta's business planning model with respect to conservation of natural capital. First, the narrow and often sector-specific mandates of individual departments create jurisdictional spillovers between departments. They also make it difficult to coordinate activities in order to manage for the cumulative impacts of multiple activities on natural capital. For example, the core business of DOE is to increase the production and productivity of energy resources in the province, particularly in new areas where there has been little exploration activity to date. Given the level of activity on Al-Pac's FMA, the objectives of the DOE create constraints for maintaining natural capital. In short, individual departments are focused on designing policy to maximize the productivity of the set of resources within their mandate rather than designing policies to maximize the total value of land for all resources. Therefore, departmental policies and agendas can be in conflict with integrated resource management. Although SRD has responsibility for managing land for multiple values, the policies and activities of other departments hamper its ability to implement a strategy that conserves natural capital, and it lacks the authority to carry out its goals as stated in the business plan.

The second but related problem is that departmental performance indicators are related to the productivity of specific sectors, rather than the productivity of the land base for the production of all goods and services (environmental and non-environmental). In addition, although the performance measures of individual departments are related to the overarching goals stated in the government's business plan, the business plan lacks integrated measures for evaluating the trade-offs among the activities and outputs of individual departments. For example, the 2003 Alberta budget included numerous measures of economic and social performance but not a single measure of natural capital (Canada West Foundation 2003).

3.2 Tenure/Disposition System

Another overarching barrier mentioned repeatedly by stakeholders is the land tenure and public land disposition system. In Alberta, the Crown retains the land base and issues usufructuary rights for resources (tenures) such as FMAs, and oil and gas leases, which confer rights to use resources for a specific purpose, are transferable only under certain conditions and require rent sharing with the province. The "strength" of the property right embedded in the tenure can be measured on the following six characteristics: exclusiveness, duration, transferability, comprehensiveness, benefits conferred and quality of the title.

Exclusiveness refers to the ability to prevent others from accessing resources. For example, a fishing licence in Alberta is non-exclusive because, while it gives individuals the right to fish, it does not give individuals the right to prevent other individuals from fishing in the same lake. In general, the less exclusive the property right, the weaker the incentive to prevent degradation to the resource because individuals cannot safeguard

their investments in protection of the resource. This results in a tragedy of the commons problem.

Duration. The longer the duration of the resource right, the greater the incentive for firms to invest in maintaining the productivity of the resource stock. The 20-year duration of an FMA is the approximate duration of the mill that it is tied to, but it is shorter than the rotation age for a typical stand in the boreal. This decreases incentives for reforestation and management over long time horizons. Therefore the government uses regulation to ensure that companies engage in long-term planning.

Comprehensiveness refers to the number of resources or values the tenure holder has rights to. The rights to land resources in Alberta are not comprehensive. For example, the rights to various species of timber are divided between FMA and quota holders. As a result, FMA and quota holders generate externalities by interfering with the optimal timing of harvest of the individual species. Moreover, opportunities for managing the land base more efficiently in order to satisfy mill requirements are limited. Finally, the mixedwood structure of many stands in Al-Pac's FMA is at risk, as companies re-plant according to prescriptions that suit their industry rather than the natural forest. In general, the more comprehensive the tenure, the more likely it is that firms will consider the impacts of their actions on other resources.

Benefits conferred refers to the ability of firms to retain profits or benefits from their activities. As long as government retains only "excess" profits or rents, then the public collection of benefits from production should not affect the incentive structure or behaviour of the firm. Since it is often difficult for governments to know what the private values are for production of resources, the best way to collect public rents is through auctioning rights. In this case, firms reveal their willingness to pay to extract resources.

Quality of the tenure refers to the legal strength of the property right. FMA holders (not quota holders) have clear property rights to the standing timber they have been granted under tenure. However, a standard clause in FMA agreements reserves the right of government to (1) withdraw from the FMA lands required, for example, for industrial facilities (s. 6 (1)(c) of the FMA) and (2) allow access by other users (e.g., for exploration activities under s. 8 (1)(b) of the FMA), with compensation paid to the FMA holder as specified in both cases. Forest companies with land-based tenures have the right to bargain in return for granting access to subsurface mineral right holders. If parties fail to come to an agreement on the amount of the resulting damages to timber resources, the Surface Rights Board grants a right-of-entry order and awards compensation to the surface right holder. Awards for timber damages are set out in timber damage assessment (TDA) tables and are based on averages of timber values obtained from public timber auctions. The TDA represents a "threat point" in the negotiation process between forestry and oil and gas companies and may bias the negotiations in favour of mineral right holders.

Because the disposition system in Alberta is based on rights for individual resources on the land rather than on comprehensive land rights, activities associated with individual

rights tend to be associated with externalities. This is the basis for the “overlapping tenure” problem that was often cited by stakeholders as one of the primary impediments to efficient land management. Forest company attempts to invest in natural capital, particularly through maintenance of undisturbed habitat, are hampered by the rights of energy exploration companies, which can override any land management plan. Overlapping and shared tenure was one of the most difficult issues identified by the Forest Stewardship Council (FSC) in the development of their certification standards for forest companies. The FSC standard adopted the tenet that where forest use rights are shared with other tenure holders, the applicant must be able to demonstrate that sharing these rights does not preclude meeting the FSC principles and criteria. In particular, the FSC recognized that tenure holders who want to be certified often have minimal influence on other forestry operators and lack of leverage to constrain the activities of companies in other sectors. This creates a difficult situation for Al-Pac, which is currently seeking FSC certification. Whether Al-Pac can be certified will depend largely on the willingness of other companies to enter into contracts that ensure that the relevant criteria, including establishing ecological benchmarks, can be met. In the absence of other incentives or mechanisms for achieving FSC objectives, meeting FSC criteria will require the voluntary compliance of other disposition holders, which will likely occur only if there are already private incentives for joint management for conservation values.

Finally, forest management areas and other land tenures are often not the appropriate scale for ecosystem management. FMA holders, as land stewards, are often required to meet multiple ecological objectives within the boundaries of each FMA. Ecosystem management requires mechanisms to manage across jurisdictions when forest management areas are not of an appropriate scale. Options include the need for offset policies that would allow forest companies to bring other managed public lands, private lands and adjacent park lands into the de facto management area.

3.3 Sector-specific Barriers

In this section we identify a number of sector-specific barriers and perverse incentives for maintaining natural capital. The focus of this section is on the energy and forestry sectors, since these two sectors have the highest impact in the FMA. While there are also perverse incentives associated with the agricultural and other mining sectors, these sectors were not highlighted by stakeholders during the interview process, and a full discussion of these sectors is beyond the scope of this work. We provide a brief summary of each barrier below.

3.3.1 Forest Sector Barriers

Figure 1. Forest Sector Barriers

Policy	Incentive	Potential Impact
Stumpage and TDA	•Undervalue fiber •Not targeted for reforestation	•Increased rate of deforestation
Landbase tied to Mill	Trees not allocated to highest value	Increase rate of deforestation
Adjacency Restrictions etc.	Encourages extensive forestry	Reduced opportunities for TRIAD/Ecological benchmarks.
Sustained Yield Policy	Regulated forest	Forest structure does not reflect natural range of variability

Stumpage

Stumpage is a volume-based charge remitted to government. The rationale of stumpage is to transfer some of the benefits of resources on public lands back to the public and to pay for forest management activities. One problem with volume-based stumpage charges is that they encourage high-grading of the resource: firms take the best and leave the lower quality fibre. High-grading thus leads to disturbance of a larger total area of forest to get the same amount of fibre. Ideally, stumpage rates would be tied to wood quality. In Alberta, stumpage is responsive to end use and also partially responsive to quality. However, it is still volume-based and in theory will lead to inefficient timber use.

Harvest Tied to Mills and Employment Objectives

The government constrains how the harvest is used through appurtenancy standards. Appurtenancy standards require fibre harvested from certain areas to be tied to mills and to fulfill local employment objectives. Therefore the amount of fibre and how it is used are not tied to the true market value of fibre, which may not be allocated to its highest and best use. In addition, FMAs require fibre to be cut, even if it is not economical, in order to meet employment objectives. To the extent that fibre is undervalued, appurtenancy requirements lead to an increase in the harvest levels and an overuse of the land base for timber relative to its economic potential.

Use-It-or-Lose-It Requirement on FMAs

FMA holders are guaranteed rights to their annual allowable cut only if they use them, that is, they must harvest the agreed-upon volumes of timber, for fear of being penalized. The use-it-or-lose-it requirement acts much in the same way as the appurtenancy requirements from an economic point of view. That is, the rate of harvest is not directly related to the economic value of harvest activities. In addition, the use-it-or-lose-it requirement creates uncertainty for land managers in meeting conservation objectives, particularly in setting ecological benchmarks. There is the perception among land managers that the government could challenge their investments in natural capital based on this requirement.

Adjacency Restrictions

Provincial governments regulate harvesting practices through restricting the size of harvesting areas, the spatial distribution of harvests through adjacency requirements, and even the temporal patterns of harvests through variable retention and multiple-pass harvesting requirements. Most of these restrictions have been developed in response to concerns about sustainability in managed areas and for managing visual quality. However, it is not clear that these restrictions actually have any ecological merit. In particular, they encourage extensive rather than intensive management of lands, and they require use of a larger area to obtain the same amount of fibre. They thus reduce opportunities for maintaining ecological benchmarks and ecological outputs that are sensitive to linear disturbance.

Sustained Yield Policy

Sustained yield is the principle used to determine the annual allowable cut (AAC). The objective is to ensure a continuous supply of wood in perpetuity. In order to generate a constant AAC, forests with heterogeneous age class distributions are reduced to “regular” forests with even-aged stands. Regular forests are characterized by an even distribution across age classes of even-aged stands up to the age of rotation. All old stands are harvested as soon as possible, and the land is reinvested into growing stock. The sustained yield principle is in conflict with biodiversity and ecosystem management, which relies on heterogeneity of forest characteristics and maintenance of old growth.

Timber Damage Assessment

Timber damage assessment is applied to timber removed during energy exploration and development, and it is paid to FMA holders or the government for damage to timber resources. Awards for timber damage are set out in TDA tables and are based on averages of timber values obtained from public timber auctions. The TDA is not related to the value of stands as natural capital, nor does it account for the costs arising from reduction in the options available to forest land managers to manage for natural capital. Finally, the TDA does not necessarily capture the loss of AAC and the costs associated with changes to the optimal harvest schedule arising from timber loss. The value of forest management efforts for FMA holders is reduced if the TDA systematically underestimates the value of fibre.

3.3.2 Energy Sector Barriers

Regulations in the energy sector are designed to maximize the value of subsurface resources. At the same time, prices for petroleum and natural gas (PNG) products are determined on world markets and do not reflect environmental trade-offs at a local level. The taxation system is designed to stimulate exploration and maximize public sector revenues, but it does not reflect the damage to surface resources. Below we highlight some key energy sector barriers to the conservation of natural capital.

Figure 2. Energy Sector Barriers

Policy	Incentive	Potential Impact
•Accelerated Depreciation Allowance •Reduced Royalties for Oil Sands Expansion	Decreases current costs of exploration and development	Shifts energy impacts to present – constrains options for desired future forest
•PNG Lease development requirements •Subsurface Rights Stronger the Surface Rights	5 year development requirement	Reduced opportunities for coordination between energy and forestry
TDA	Payment not targeted to reforestation	Increased forest land withdrawals

Accelerated Depreciation and Reduced Royalty Rates for Oil Sands Expansion

Under accelerated write-off programs, oil and gas companies can reduce current taxes by incurring exploration costs and pay higher taxes later when making a "profit." The programs thus create an incentive for companies to continue investments in exploration in order to take advantage of accelerated write-offs, and they artificially accelerate the rate of exploration and development. Shifting future resource development opportunities to the present constrains future opportunities for ecosystem management and encourages increased homogenization of stand ages.

Investments in oil sands receive significant tax concessions, allowing companies to write off all capital costs for a project before they pay any federal income taxes on the profits earned from the project. The benefit of the tax break for firms is $5 million to $40 million for every $1 billion invested. The tax and royalty regime for oil sands is significantly more generous than that for conventional oil and gas. Since the oils sands create three times the level of GHG emissions relative to conventional sources, the differential subsidies also lead to an inefficient mix of non-renewable energy sources (Office of the Auditor General 2000).

Other energy sector subsidies may also create perverse incentives for maintaining natural capital. These include direct investment in companies, loans, remitted taxes and export charges, and the government assumption of potential losses and liabilities. The federal

government has written off $2.8 billion of investments and loans in the non-renewable sector (Office of the Auditor General 2000). These subsidies contribute to an inefficient mix of renewable and non-renewable energy sources, and they also encourage exploration in areas that are economically marginal, which could provide high ecological values.

Timber Damage Assessment

Stakeholders commented that the TDA does not need to be spent on reclamation of the energy sector footprint. There are clauses in the FMA agreements that specify that monetary compensation received by the FMA holder from energy companies "shall only be used to offset damage to improvements such as plantations, roads, bridges or other facilities and to replace lost timber resource" through intensive forest management, purchasing of wood, etc. (see s. 6(8) of the Al-Pac FMA). However, forest companies can also allow part of the energy footprint to be classified as "not sufficiently forested" and withdrawn from the productive land base. The energy sector sees the purpose of the TDA as being to manage the energy sector footprint, while FMA holders see it as being to compensate for fibre loss. The energy sector expressed some concern that the TDA was not earmarked specifically for forest reclamation.

PNG Lease Requirements

Energy dispositions for conventional oil and gas are auctioned by the Alberta government every two weeks. Once the dispositions are granted, energy firms enter into discussions with the FMA holder for surface access. In general, PNG leases must be developed within five years. The lack of pre-tenure planning in issuing energy dispositions and the five-year time horizon for development constrain the ability of forest land managers to incorporate oil and gas activities in their detailed forest management plans in a way that minimizes environmental impacts. In addition, the time constraint may result in development of some leases before it is economically optimal. On the other hand, the five-year requirement prevents firms from holding resources without producing and potentially reduces their competiveness. The actual impact of PNG lease requirements requires further investigation to determine whether modifications in disposition requirements could improve planning for environmental impacts without reducing the competitiveness of the sector.

Access to Water

Processes for removing heavy oil require substantial inputs of water. Water is not priced or traded, and it is currently allocated on a first-in-time, first-in-right basis. As a result, firms have no incentive to conserve water when developing their resources and have an incentive to be first in line to obtain water rights. The allocation system does not provide incentives to protect instream flow needs or to allocate water to its highest and best use.

4. FISCAL OPPORTUNITIES

The literature on ecological fiscal reform is vast in terms of both theory and practice. We selected options for the Al-Pac FMA that both addressed the key concerns raised by stakeholders and were consistent with the policy environment for managing forest lands. Most of the options are "overarching" in the sense that they cover multiple sectors and/or

address multiple conservation objectives. The level of detail provided in the examination of the options below depends on the complexity of the instrument, as well as on the familiarity of the public with the use of the instrument. Some instruments, such as user charges, are straightforward and applied for many purposes. These received limited discussion. In this document, we focus on policies that will lead to an increase in total forest cover and ecological benchmarking, reflecting a "coarse filter" approach to maintaining natural capital. We adopted this approach because there seems to be a fair consensus on the need to reduce forest cover loss in order to maintain natural capital. In addition, policies that emphasize reducing forest cover loss are relatively easy to implement, because there is less focus on sector- and site-specific operations and heterogeneity.

4.1 Natural Resource Accounting.

The adage that what is measured is managed applies to government business planning. Economic and social indicators assess how we are doing, and the frequent measurement of these indicators results in sustained pressure on governments, businesses and non-profit organizations to respond to needs and perceived crises (Canada West Foundation 2003). One option for improving integrated land use planning between sectors and government departments is to require government departments to manage to a common set of indicators and to require forest users to report on and manage activities that impact these indicators.

Natural resource accounts monitor indicators of the physical stock of natural capital. The NRTEE recommends reporting on five natural capital indicators: air quality as measured by exposure to ground-level ozone, freshwater quality, total annual emissions of greenhouse gases, the percentage of total ground area covered by forests and the percentage of total ground area covered by wetlands (NRTEE 2003). One problem with these indicators is that they tend to track current outcomes rather than productivity of the stock of natural capital. Indicators such as percentage of forest cover do not adequately describe the overall performance of the system with respect to its ability to sustain the flow of environmental goods and services from the stock of forest land over time. Nor do they account for the relative value of goods and services produced.

An economic definition of sustainability is the maintenance of social welfare over successive generations through an appropriate mix of consumption and capital investment (including natural capital) over time. Sustainability indicators and natural resource accounts could be used to improve the business planning model in Alberta. Adjusted net national product (NNP) or green account measures are attempts to account for the value of non-market goods and services produced in the economy. These measures provide an opportunity for government and its various departments to manage toward a common aggregate measure of expected "wealth." In particular, the integration of departmental mandates could be facilitated by having all departments manage toward a common set of integrated indicators that account for multiple market and non-market values rather than indicators specific to the productivity of individual sectors. Under this system individual departments would, when evaluating their programs, have to account for the externalities

associated with their policies on other sectors. Similarly, the government's overall performance would be measured on the same basis, which would ensure consistency.

Green NNP requires the integration of both economic and ecological information. Most criteria and indicator systems, such as those put forth by the Canadian Council of Forest Ministers and the Forest Stewardship Council, separate economic and ecological indicators. Economic indicators are often related to employment, production and wages, not to the potential to maintain non-declining welfare through an appropriate mix of consumption and investment. Tracking the condition of these indicators at a specific point in time does not tell us anything about the ability of the capital stock (natural and anthropogenic) to produce a flow of goods and services into the future. Moreover, these measures do not account for the economic benefits created by the non-market goods and services (such as nutrient cycling) provided by the maintenance of natural capital.

Adamowicz (2003) criticizes criteria and indicator systems as attempts to assess the well-being of forest-based communities rather than economies as a whole and argues for a clearer focus on environmentally adjusted economic indicators such as green NNP. Natural resource accounts are necessary in order to develop green NNP or other indicators that integrate economic and ecological elements into an aggregate measure of welfare. However, there are still many challenges with measuring the value of inputs that go into green accounts, such as non-timber benefits and ecological services, as well as depreciating or appreciating capacity for these sectors (Adamowicz 2003).

4.2 Increased Property Rights for Non-Timber Resources

Management for multiple non-timber benefits on public lands can be enhanced by increasing the property rights for non-timber resources. In general, rights to forest resources other than timber (such as water, wildlife and forage) are governed by weak property rights. Management for these values could be improved by assigning stronger rights for fish and wildlife to create incentives for hunters and anglers to manage access and poaching, as well as by increasing the transferability of forest tenures so that FMA holders, and even the general public, could purchase quotas or oil and gas leases.

Co-management agreements offer an opportunity to increase the rights of hunters and anglers to resources while also providing a vehicle for improved management. Co-management is important because the greatest risks facing some boreal species are not caused by linear features per se. Rather, these risks come from the increased human access associated with these features and the resulting poaching and road-kill incidents. Stakeholders voiced concern that existing fish and wildlife regulations are often poorly enforced due to budget restrictions in relevant departments. Co-management agreements with fish and wildlife organizations could alleviate access-related pressures on particular species. In this model, conservation organizations would have the right to allocate fish and wildlife resources. Revenues generated from selling these rights would then be earmarked to fund enforcement of existing regulations and manage access. This would likely be more acceptable to the public than increasing taxes in order to fund government-led enforcement efforts.

A number of changes to Alberta's timber management policy could also be implemented in order to strengthen property rights, including an expansion of provisions for competitive bidding as the means of allocating timber rights. Restrictions on the transferability and divisibility of timber rights impedes competition, promotes industrial concentration and prevents the allocation of fibre to its best use. Furthermore, the lack of transferability of licences reduces opportunities for the spatial and temporal management of harvests and impedes managing for natural capital. Decoupling the land base from the mills, amalgamating forest tenures and increasing transferability will mitigate these problems.

4.3 Transferable Development Rights

Transferable development rights (TDRs) conserve natural and heritage values by creating markets for rights to activities that damage these values. Tradable development rights are assets that are created by government and can be used to compensate disposition holders for non-development or non-exploitation of land. TDRs can be thought of as an approach to environmental management that combines regulation and market forces. As with command-and-control approaches, the governing authority is required to set zones or thresholds for use; however, it also provides a market-like institution for achieving the environmental objective. An important characteristic of TDRs is that they separate ownership of the right to develop land from ownership of the land itself, creating a market in which the development rights can be bought and sold. Therefore, they can be employed irrespective of whether the underlying property right system is public or private. In the conventional model, landowners who sell TDRs permanently preserve their land, while buyers increase the density of development in a less sensitive location. The fact that the underlying title to the land is not altered makes TDRs compatible with existing tenure structures and facilitates their implementation.

There are two means by which a tradable permit system can be implemented. Under a bilateral trading system, the owner of surplus forest land is paid to keep enough forested land to satisfy the buyer's reserve requirements. However, the transaction costs in this case can be high: landowners must take time to find, purchase and administer offsetting properties, and the fact that the buyer's status depends on the seller's compliance increases the risk associated with the transaction. Alternatively, property owners may be assigned development rights equivalent to the number of hectares that can be disturbed up to the conservation threshold, and these can then be traded. Transferable development rights provide incentives for firms to meet thresholds for forest cover loss. TDRs can also be thought of as mechanisms for implementing an offset or no-net-loss system for forest cover or different habitat types. Weber and Adamowicz (2002) discuss in detail how a TDR system could be implemented in Alberta's northeastern boreal forest.

4.4 GHG Emissions Trading and Carbon Credits

The boreal forest plays an important role in the global carbon cycle, and the production of forest products is an energy-intensive activity. Forestry activities have the potential to serve as both a GHG source and sink. GHG sources result from harvesting activities, natural disturbances such as fire, soil disturbance and the decomposition of waste material. Carbon sinks result from the potential of forests to sequester carbon in both

soils and biomass (Nelson and Vertinsky 2003). Carbon management will affect the activities of all sectors and change the distribution of forest characteristics on the landscape. This may result in two potential benefits in addition to reducing net GHGs: an investment in the forest growing stock and an increase in the total amount of forest cover. On the other hand, fire and pest outbreaks are sources of GHG emissions, so carbon policies may also create incentives to manage fire and insects and reduce natural disturbance cycles on the landscape.

Tradable carbon credits are being considered as one means to implement Canada's commitment to GHG reduction under the Kyoto Accord. Firms may consider reducing harvests and production where the relative return from selling carbon credits (through either curtailing production or carbon sequestration) is greater than from expanding production at the margin. For example, in Saskatchewan 200,000 ha of forest have been removed from the harvesting land base and placed in forest carbon reserves. Reductions in harvested area may be offset by more intensive forest management elsewhere. Therefore carbon credits, like TDRs, have the potential to act as a mechanism for creating zones of intensive management. GHG emissions trading may also lead to changes in harvesting practices that reduce emissions at the stand level through selection logging or through extending the harvest rotation length (Nelson and Vertinsky 2003). Thus low-impact harvesting techniques may also change the age class structure of the forest. Nelson and Vertinsky (2003) argue that while we are likely to see an increase in pest management, including selective harvest of stands to prevent outbreaks, it is unlikely that significant additional fire suppression efforts will have much effect on the landscape. This is because the current burned area in the managed forest results almost entirely from the small number of fires that escape containment and become large. Other actions that could negatively affect the function of forest stands include the reduction of fuel loads to reduce the chance of fire and the increased use of post-disturbance salvage for forest products.

One interesting aspect of developing markets for carbon is how these might be achieved within the existing public land–private disposition structure that governs the boreal. The relationship between existing resource tenures, the forest management regime, and the legal and policy framework for biotic carbon sequestration may require clarification. Carbon rights legislation would have to establish specific legal mechanisms for the creation of trading in sequestration potential and sinks-based offsets that could provide investors in offset projects with a secure property right that could be enforced in perpetuity on public lands. The Australian state of New South Wales has addressed security and transferability of carbon rights by enacting legislation that (1) explicitly establishes property rights and (2) grants holders of rights a guarantee of access to the land and ability to block injunctions against land uses with an adverse impact on carbon sequestration. This type of legislation could also be used to enable conservation easement-type arrangements on public lands (see below).

4.5 Conservation Easements on Public Lands

Conservation easements have never been viewed as a mechanism that could be applied on public lands. However, innovative policies for sequestering carbon on public lands provide some insight into innovations for managing for other ecological services.

Conservation easements provide a mechanism whereby private agencies can purchase rights from private landowners and take land out of production in perpetuity. They are thus important mechanisms for enabling the public to reveal its preferences regarding economic development and conservation in a marketplace and for compensating other disposition holders. One difficulty with applying conservation easements on public lands, however, is that the government and the public receive revenues from the lands and thus also have a stake in the future resource potential embedded in particular land parcels. One way to overcome this problem is to require some share of the value of the conservation easement to be transferred to the public in any transaction that neutralizes activities on the land. An interesting variation on the conservation easement model is the "agglomeration bonus," which offers preferential prices for easements based on their "contiguity" (Parkhurst et al. 2002). The agglomeration bonus is designed to generate large, unfragmented core areas of habitat.

4.6 Forest Investment Tax Credits

Forest investment tax credits could be applied to any forest operators (forestry companies, energy companies, etc.) that create investments in natural capital by creating ecological benchmarks or leaving forest undisturbed. Tax credits provide a mechanism for recovering costs from forest investments that reflect non-timber values. Tax credits might also counteract the accelerated depreciation effect in the energy sector. Tax incentives have been employed in Costa Rica, where the government has instituted a "transferable reforestation tax credit" so that small landowners can sell their credits to their wealthy counterparts with higher taxes to offset (Panayotou 1994). Land taxes may also be classified according to land use, with the charge increasing with the level of impact (Panayotou 1994). Tax credits have the advantage of being applicable across all sectors, and they are usually regarded favourably by industry. On the other hand, tax credits might also be perceived as reducing the public benefits from land use and contrary to the polluter-pay principle.

4.7 Certification

Certification is a market incentive for incorporating non-market values in forest prices. It thus provides an incentive for producing a social benefit in output decisions. Specifically, certification creates incentives for firms to manage for natural capital by providing a price premium for products and an increase in market share. The degree to which the criteria required to obtain certification reflect sustainable resource management and investments in natural capital is a question that requires further investigation. Criteria and indicators associated with certification programs are subject to the same criticisms put forth in the previous discussion on natural resource accounts. Al-Pac is currently pursuing FSC certification, which is one of the more stringent certification schemes available. Impediments to Al-Pac's obtaining FSC certification were discussed in the previous section and should be removed in order for this mechanism to be effective.

4.8 Access Charges/User Charges

Non-decommissioned roads that are used for recreation contribute to linear features. Recreationists who use these features free of charge create an externality in that they do not account for the impacts of their decisions on natural capital in the individual decisions. Tolls for non-decommissioned roads would reduce incentives to maintain roads that are not of high value.

5. CONCLUSIONS

This final part of the Al-Pac case study provides an overview of the role for fiscal incentives and economic instruments in maintaining natural capital on Al-Pac's FMA. We provide a summary of current fiscal barriers and potential opportunities for promoting conservation. The choice of instruments described here reflects the outcome of our review of the literature, as well as interviews with stakeholders. We find that the key overarching barriers to managing for natural capital relate to the tenure and disposition system for allocating resource rights on public lands, as well as the Alberta government's business planning environment. We discuss several sector-specific barriers to conserving natural capital for the forestry and oil and gas sectors, including regulatory requirements within the tenure and disposition agreements. Finally, we suggest several opportunities for increasing incentives for environmental management. These include using natural resource accounts and sustainability indicators in the government's business planning model and employing improved and new forms of resource tenures on public lands. New tenures include tradable development rights, carbon credits and conservation easements.

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