Profile of the Lower Athabasca Region

environmental • social • economic

Land-use Framework

Government of Alberta

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Introduction

Alberta's Land-use Framework

In response to Alberta's remarkable growth over the past 10 years, the Government of Alberta commenced a comprehensive initiative to develop a new land-use system for the province. Following consultation from a broad range of Albertans, the government released the Land-use Framework[1] on December 3, 2008.

The *Land-use Framework* is a new approach to managing public and private lands and natural resources to achieve Alberta's long-term economic, environmental and social goals. The framework is intended to provide a blueprint for making decisions that will address Alberta's growth and land management pressures. It is also designed to ensure responsible stewardship of Alberta's lands and resources, so that future generations of Albertans benefit from the province's natural beauty and prosperity, just as we do today.

The framework establishes three desired outcomes:

- A healthy economy supported by our land and natural resources;
- Healthy ecosystems and environment, and;
- People-friendly communities with ample recreational and cultural opportunities.

These outcomes recognize that Alberta's social, economic and environmental goals are highly integrated – how we choose to pursue one set of goals unavoidably affects the others. Achieving our objectives will therefore require decision-making and trade-offs about how, where and when Alberta's lands and resources are used for the benefit of Albertans.

To set out these important decisions, the *Land-use Framework* calls for the development of seven regional land-use plans, based on seven new land-use regions. This regional approach recognizes the great diversity of Alberta's regions, while ensuring a degree of coordination between provincial-level decisions over Crown lands and local land-use decisions.

Each land-use plan will set outcomes for the region. Each plan will also determine how Alberta government priorities and strategies (such as *Water for Life*, the provincial energy strategy and the *Climate Change Strategy*) will align at the regional level. Once approved by Cabinet, each regional land-use plan will become the governing land-use policy for the region; provincial departments, boards and agencies, municipalities and local government bodies within the region will be required to ensure their decisions and plans are consistent with provincial direction.

Due to the rapid growth in northeastern Alberta, the degree of natural resource development currently underway, and the number of future resource projects proposed for that region, the Land-use Framework identified the Lower Athabasca Regional Plan as an immediate priority.

Purpose of this Overview

A Regional Advisory Council is being established for each land-use region. Comprised of a range of stakeholders, the council will provide advice to the Alberta government regarding the development of the regional plan. Councils will also participate in public consultation processes and provide advice on land-use trade-off decisions that need to be addressed for their region.

Land-use decisions need to consider current activities on, and future uses of, both public and private lands. The impact of these uses on air, water, biodiversity, economic development and social development also needs to be examined in an integrated way. To accomplish this, cumulative effects management will be employed. Under this approach, the combined effect of past, present and reasonably foreseeable human activities are anticipated and managed, with the goal of ensuring that we do not exceed the carrying capacity of our natural environment.

This report provides an overview of key social, economic and environmental factors in the Lower Athabasca land-use region that need to be considered in developing a regional plan. The report outlines major land uses currently underway, highlights important trends and identifies additional or changing human activities that can be expected in the region. It also notes where potential land-use conflicts are likely to arise, and the possible trade-offs that may need to be reconciled.

Building on this report, the Lower Athabasca Regional Advisory Council will examine further and more detailed information as it advises the Alberta government on the development of a regional land-use plan.

The Lower Athabasca Land-use Planning Region

The Lower Athabasca Land-use planning region (the "Lower Athabasca") comprises a large section of northeastern Alberta, covering about 93,260 square kilometres.

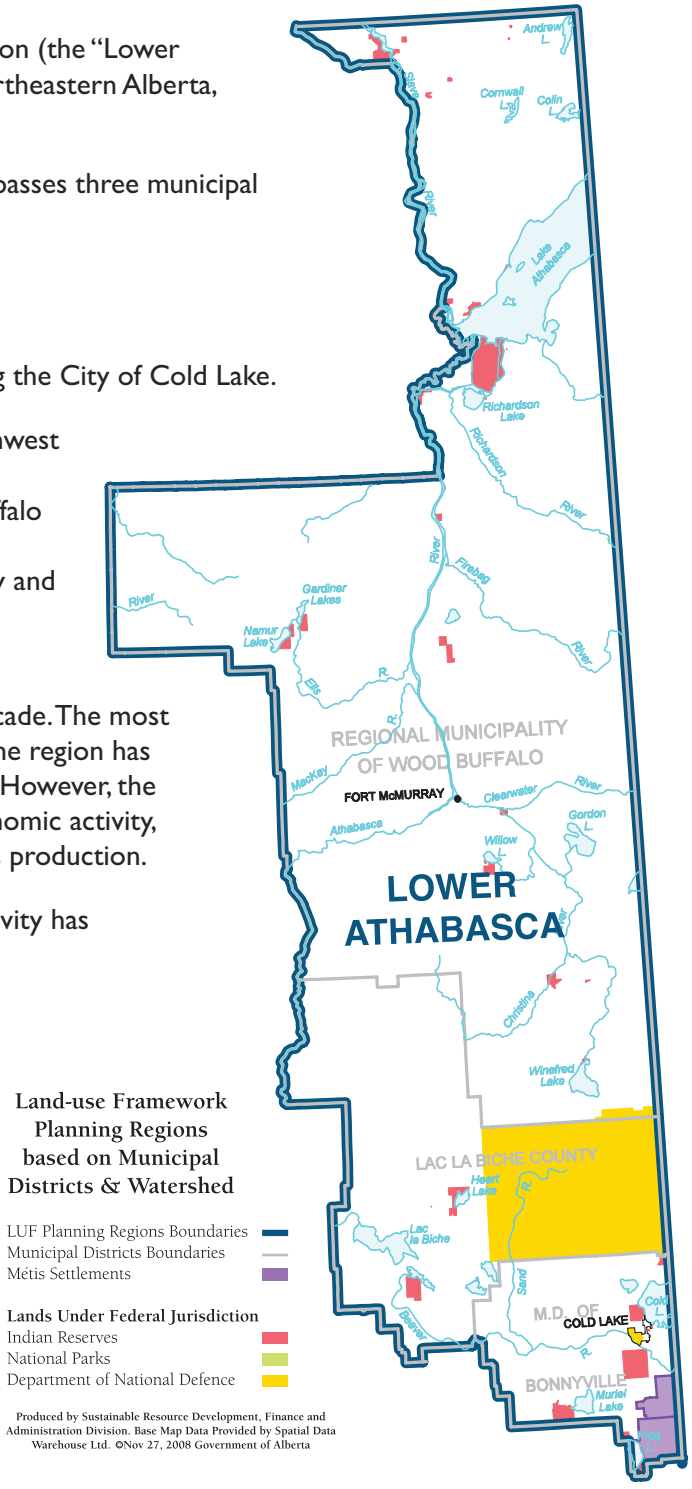
Geographically, the Lower Athabasca encompasses three municipal areas:

- Regional Municipality of Wood Buffalo;
- Lac La Biche County; and
- Municipal District of Bonnyville, including the City of Cold Lake.

The region is bounded by: the Alberta-Northwest Territories border to the north; the Alberta-Saskatchewan border to the east; Wood Buffalo National Park to the west; and the southern municipal boundaries of Lac La Biche County and the Municipal District of Bonnyville.

The Lower Athabasca has experienced rapid development, particularly during the past decade. The most prominent and growing land-use activity in the region has been the development of Alberta's oil sands. However, the Lower Athabasca is also home to other economic activity, including agriculture, forestry and natural gas production.

The expansion of resource development activity has attracted a growing population. The cumulative impact of human activity on the environment is therefore a growing concern in the region.



Regional Municipality of Wood Buffalo

Notable centres:
Fort McMurray, Fort Chipewyan,
Fort MacKay, Anzac

Population (2007):
88,131
(Urban service area – 65,400, including shadow population; rural service area – 22,731)

Major industries:
Bitumen production and upgrading; forestry; hunting and trapping; tourism.

Key features:
Western half of Lake Athabasca; major rivers include Athabasca River, Clearwater River and Slave River. Adjacent to Wood Buffalo National Park. Located in the Athabasca oil sands area.

Source:
2007 Official Population List, Alberta Municipal Affairs

Regional Municipality of Wood Buffalo

The Regional Municipality of Wood Buffalo ("Wood Buffalo") was established in April 1995 following the amalgamation of the City of Fort McMurray with the former Improvement District No. 43.[2] It is structured as a Specialized Municipality, allowing both urban and rural areas to be governed by a single municipal government. It is one of Canada's largest municipalities by area, at 68,454 square kilometres.

The oil sands industry is the dominant industry in Wood Buffalo, with a significant portion of Alberta's oil sands projects located in the municipality. Wood Buffalo is within the Athabasca oil sands area, which contains around 81 per cent of the province's bitumen reserves. Forestry is another significant industry; about 40 per cent of the Lower Athabasca's land area is currently held under a Forest Management Agreement.

The main urban service area of Wood Buffalo is Fort McMurray, which is also the largest community. Other sizeable communities in Wood Buffalo include Fort Chipewyan, Fort MacKay and Anzac.

Fort McMurray is well known to Albertans as the urban centre most impacted by the increase in oil sands development. Job growth related to the oil sands has led to tremendous population growth in Fort McMurray. This has placed pressure on municipal services and community infrastructure.

Fort Chipewyan, the second-largest community in Wood Buffalo, has the distinction of being Alberta's oldest community. It lies 280 kilometres north of Fort McMurray and can be accessed by road only in the winter; it is therefore heavily dependent on air transportation. The community is situated next to Wood Buffalo National Park, which contributes to growing tourism in the area.

Fort MacKay is located 55 kilometres north of Fort McMurray. It is completely surrounded by oil sands developments, which provide the greatest source of employment to the community's residents. Seasonal forestry work and hunting and trapping are also sources of employment.

Anzac is situated 45 kilometres southeast of Fort McMurray. It is a southern hub near Gregoire Lake Provincial park, offering a rural lifestyle for its residents.

Lac La Biche County

Lac La Biche County was formed in August 2007, as a result of the amalgamation of Town of Lac La Biche and Lakeland County. Roughly one-third of the county's residents live in the Hamlet of Lac La Biche.

The county contains a wide range of natural resources, especially bodies of water. Lac La Biche County is situated within both the Athabasca and Beaver River watersheds.

There are more than 150 lakes in Lac La Biche County, with many of Alberta's white sand beaches. Recreational spaces are abundant, including Sir Winston Churchill Provincial Park, Lakeland Provincial Park and Lakeland Recreational Area. These and other recreational areas attract close to 125,000 people each year for camping, fishing, hiking and other outdoor activities.

In addition to growing tourism and recreation, Lac La Biche County enjoys a mix of other economic development. Forestry is a major industry: a significant number of residents are employed by the Alberta-Pacific Forest Industries Ltd. kraft paper mill in Boyle, Alberta. Agriculture is also an important industry in the county: around 13 per cent of the area's population operate farms.

Bitumen and natural gas exploration and production are also main economic activities. The county is positioned in the heart of Alberta's northeastern natural gas fields. Lac La Biche County is also situated within both the Athabasca and Cold Lake oil sands areas. The range of industry has led to stable and steady growth in the county and helped support other businesses in the service industry.

Lac La Biche County

Notable centres:
Hamlet of Lac La Biche;
Village of Plamondon

Population (2007):
9,123
(Lac La Biche – 2,758;
remaining county – 6,365)

Major industries:
Forestry production; agriculture (livestock and crops); bitumen production; natural gas exploration and production; recreation and tourism.

Key features:
Over 150 lakes; numerous recreational areas; large tracts of agricultural land.

Source:
2007 Official Population List, Alberta Municipal Affairs

Municipal District of Bonnyville

Population (2007):
City of Cold Lake – 12,860
Town of Bonnyville – 5,896
Village of Glendon – 483
Summer Village of
Pelican Narrows – 141
Summer Village of
Bonnville Beach – 97
M.D. of Bonnyville
No. 87 – 9,047

Major industries:
Agriculture; bitumen production; natural gas exploration and production; government services (CFB Cold Lake 4-Wing).

Key features:
Several lakes, beaches and tracts of parkland.
Located within Cold Lake oil sands area.
Contains CFB Cold Lake 4-Wing; largest air force base in Canada.

Source: 2007 Official Population List, Alberta Municipal Affairs

Municipal District of Bonnyville

The Municipal District (M.D.) of Bonnyville is also home to large tracts of parkland and numerous lakes and beaches, which attract a large number of recreational users. The largest body of water is Cold Lake, which is used for a variety of water-sports.

The largest urban area in the M.D. is the City of Cold Lake, which was established in 1996 with the amalgamation of the Towns of Cold Lake, Grand Centre and Medley. Other communities in the M.D. include the Town of Bonnyville, the Village of Glendon and the Summer Villages of Bonnyville Beach and Pelican Narrows.

Major economic activity in the M.D. is based around agriculture, bitumen production, natural gas production, and the government/military sector. Canadian Forces Base 4-Wing, which is the Canadian military's largest air force base, is situated within the City of Cold Lake and is the area's largest employer.

The Cold Lake-Bonnyville area has experienced a substantial increase in investment related to the oil sands industry. The area is within the Cold Lake oil sands area, which contains 11.5 per cent of Alberta's bitumen reserves. Approximately one-quarter of Alberta's bitumen production currently comes from leases within the Cold Lake oil sands area. This activity has contributed to steady population growth in these communities.

Community and Social Development

The Lower Athabasca faces growing pressures and challenges as it deals with an influx of population driven by economic development. Alberta is committed to developing strong communities with healthy, educated residents.

Population and Settlement

Population Trends

The entire Lower Athabasca has experienced high population growth over the past 10 years, largely coincident with the expansion of natural resource development activity in the region.

Oil sands developments have comprised the overwhelming majority of economic activity in the Lower Athabasca. Average annual investment in oil sands projects has increased nearly tenfold over the past 12 years. Today in Alberta there are 87 active oil sands projects[3] and approximately 180 approved projects in total. A significant number of projects are located in the Lower Athabasca.

This expansion has directly and indirectly created thousands of new employment opportunities, attracting workers to Wood Buffalo from across Alberta, Canada and the world. The result has been rapid population growth in Wood Buffalo, especially in and around the urban service area of Fort McMurray.

According to Official Population Lists, from Alberta Municipal Affairs, the population of Wood Buffalo has more than doubled between 1999 and 2007, from 42,871 to 88,131.[4] Growth in Fort McMurray has been particularly pronounced, from 36,876 in 1999 to 56,845 in 2007. The population in the rest of Wood Buffalo, outside of Fort McMurray, has more than quadrupled, from 5,995 in 1999 to 25,666 in 2007.

These population figures include the so-called "shadow population" – temporary residents who are employed by industrial and commercial establishments. Capital investments in oil sands developments require large numbers of workers to build the projects. Many of these workers are housed in hotels or temporary camp facilities for the duration of construction. The shadow population has increased not only in Fort

McMurray, but also in areas where in situ oil sands development has grown, such as near Conklin and Lac La Biche.

The size of the shadow population can fluctuate considerably, depending on the level of construction activity and pace of investment in the oil sands. As with the overall level of activity in the resource development industry, the shadow population is strongly influenced by natural resource prices.

The Cold Lake-Bonnyville area has also experienced population growth in recent years, but at a far lower rate than Wood Buffalo. Population growth in this area is tied to a broader range of industries, including bitumen production, natural gas production, agriculture and forestry.

The population of Lac La Biche County has also grown substantially, particularly in the rural areas. This has been driven by economic growth due to its proximity to both the Athabasca and Cold Lake oil sands areas.

Population Growth	2003	2007	Increase
City of Cold Lake	11,595	12,860	10.9%
Town of Bonnyville	5,709	5,896	3.3%
MD of Bonnyville, No. 87	8,399	9,047	7.7%
Lac La Biche County[5]	8,077	9,123	13.2%

Source: 2003 and 2007 Official Population Lists, Alberta Municipal Affairs

Future Growth

Alberta's economic prospects are closely tied to further development of Alberta's energy industry, including bitumen and natural gas production. A significant portion of this activity occurs in Wood Buffalo. Estimates suggest that bitumen production from the oil sands will increase, comprising 80 per cent of Alberta's total production by 2011.[6]

However, like the rest of Alberta, the Lower Athabasca is facing a shortage of skilled workers. Successful expansion of the oil sands industry will depend on successfully attracting more skilled workers to the area. This, in turn, will depend on the area's ability to accommodate a higher population.

In June 2008, the Alberta government announced that it was commencing a process to develop 4,000 acres of land in the Wood Buffalo urban service area, in Parsons Creek and on the Saline Creek Plateau.[7] This expansion is expected to provide housing and community facilities for an additional 40,000 residents.[8]

Over the longer term, further development of the urban service area may be necessary to accommodate population growth associated with greater expansion of the oil sands industry.

The Cold Lake-Bonnyville area and Lac La Biche County also expect to realize greater economic development. Cold Lake is working to foster the development of an aerospace industry by leveraging its position and expertise relative to CFB Cold Lake. Bonnyville is encouraging a range of development by marketing itself as a "multi-business, multi-natural environment" with a diversified economic base.[9] Lac La Biche County is using its strategic location as an incentive to attract a range of new business.

To successfully achieve these objectives, these areas will also need to attract more skilled workers to their communities. As with Wood Buffalo, these communities will need to accommodate growing populations in the future.

In addition to expanding housing, communities will need to ensure other municipal infrastructure – such as water and wastewater treatment plants and solid waste facilities – can absorb future growth.

The final report of the Oil Sands Ministerial Strategy Committee, *Investing in our Future: Responding to the Rapid Growth of Oil Sands Development*,[10] outlined the status of water treatment, wastewater treatment and solid waste facilities in the communities most impacted by oil sands growth pressures.

The report indicated that by 2011 the water and wastewater treatment facilities in Cold Lake and Bonnyville will still have sufficient capacity to absorb growth. However, these communities are examining the feasibility of developing regional water and wastewater treatment facilities for the future (2012 – 2015).

Bonnyville's solid waste facility can also absorb future growth; Cold Lake's solid waste facility is nearing capacity and will require expansion in the short term.

Almost all waste and treatment facilities in Wood Buffalo, however, were reported as currently "over capacity," and all facilities were expected to be "severely over capacity" by 2011. In response, the Alberta government has committed funding to upgrade water and wastewater treatment and collection facilities in Wood Buffalo and to develop a new regional landfill.[11]

Alberta's strategic plan for the oil sands, *Responsible Actions*,[12] sets objectives for planning and developing healthy communities in Alberta's oil sands areas. Under *Responsible Actions*, the regional impacts of growth from oil sands development will be considered, including: social and public infrastructure needs; the size of shadow populations; and the creation of affordable housing.

Aboriginal Communities

A number of First Nations and two Métis Settlements fall within the Lower Athabasca. Another two Métis Settlements, Kikino and Buffalo Lake, do not fall within the boundaries of the Lower Athabasca but are immediately adjacent to Lac La Biche County.

First Nations lands are vested in the Crown and administered by the federal government. The Métis Settlements, and their unique form of government, were established by Alberta legislation. Alberta is the only province in Canada that has passed legislation specifically for Métis people.[13]

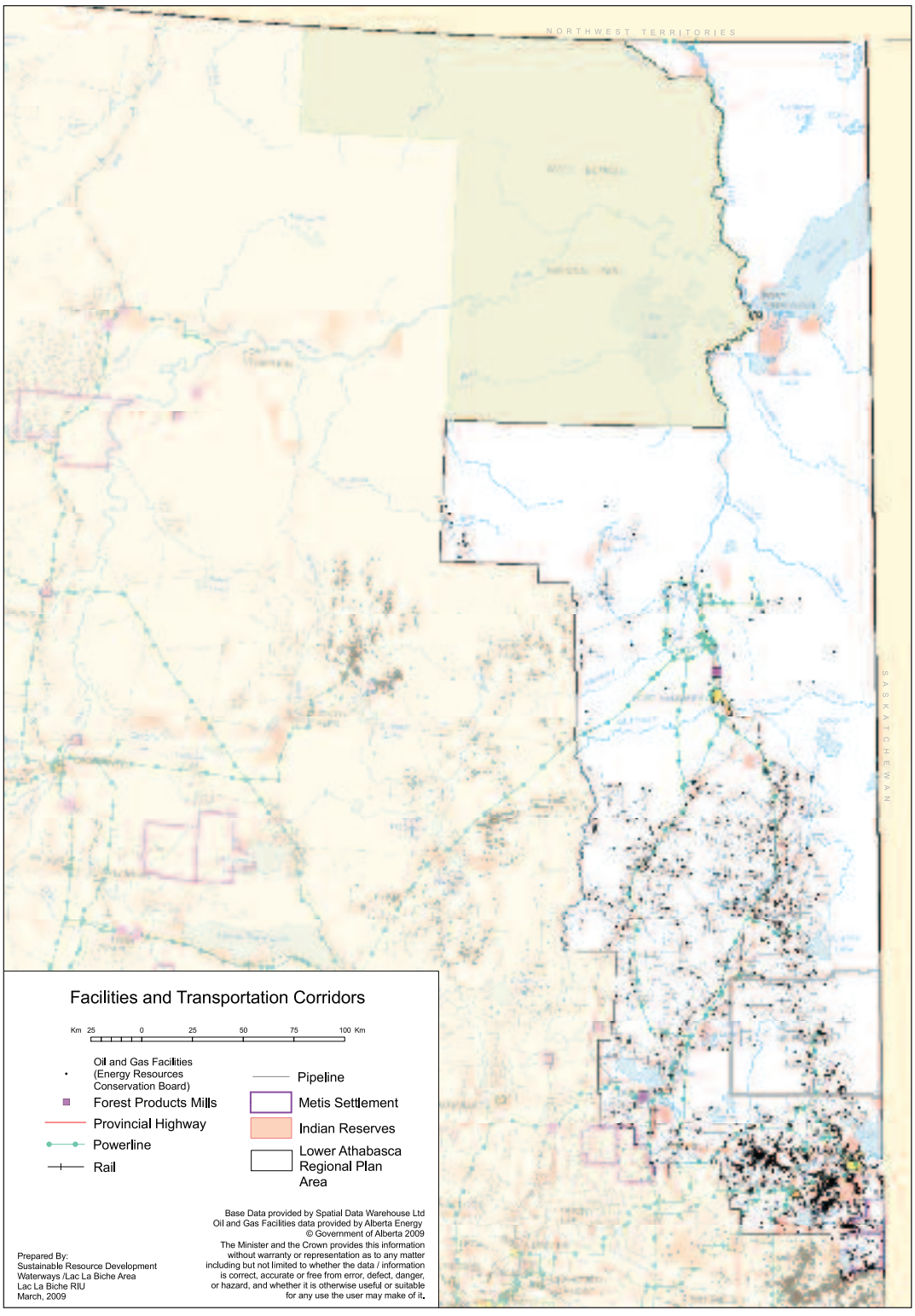
First Nations	Population	Area (hectares)
Athabasca Chipewyan First Nation	835	21,205.1
Chipewyan Prairie First Nation	689	3,079.7
Fort McKay First Nation	630	8,830.6
Fort McMurray First Nation	597	3,223.4
Mikisew Cree First Nation	2,488	3,790.0
Smith's Landing First Nation	308	9,037.2
Beaver Lake Cree Nation	914	6,145.3
Cold Lake First Nations	2,329	21,717.6
Heart Lake First Nation	293	4,504.5
Métis Settlements		
Buffalo Lake*	1,353	35,356
Fishing Lake	784	38,556
Elizabeth	982	26,156
Kikino*	1,295	45,416

*Outside Lower Athabasca boundary but immediately adjacent.

Sources: Métis Settlements General Council census;
Indian Register, 2007

Highways

As resource development and population have increased in the Lower Athabasca, so too has usage of the provincial highway network in the region. Traffic count data collected by Alberta Transportation shows that annual average daily traffic has increased for most highways in the Lower Athabasca.



The Alberta government is continuing to work with local authorities and other interested stakeholders, including industry, to address transportation issues in the region.

The most notable case is Highway 63, the primary highway that connects Fort McMurray to the rest of the province. In addition to high passenger traffic, Highway 63 also has realized an increase in commercial and industrial transportation. Many large components associated with oil sands construction are fabricated elsewhere and transported to Fort McMurray. Highway 63 therefore sees an unusually high amount of over-dimensional loads, which often travel at speeds of less than 35 kilometres per hour. This can exacerbate traffic congestion, particularly during peak periods associated with shift changes.

Highway 881, which functions as an alternative route between Lac La Biche and the Fort McMurray area, has also seen an increase in traffic as oil sands development has expanded. Major connecting highways around and between Lac La Biche and the Cold-Lake Bonnyville area have also experienced increased traffic as economic activity in the Lower Athabasca has increased.

In light of this heavy demand, the Alberta government has undertaken significant investments aimed at improving transportation in the region.

Highway 63 has been twinned northward from Suncor to Mildred Lake and south of Fort McMurray between Highway 69 and Highway 881. Twinning of Highway 63 between Highway 55 and Highway 881 is proceeding. As part of twinning work, the outside lane of the highway is being widened to accommodate over-dimensional loads, allowing traffic to use the inside lane to pass safely. Rest areas and truck staging areas are also being constructed.

A number of improvements have been made to Highway 63 within the urban service area. A west bypass road around Fort McMurray is under consideration.

Highway 881 has recently been paved. Alberta Transportation is committed to making further improvements to Highway 881 in its Three Year Construction Program, including overlay work and sideslope improvements. This work will be set in relation to other provincial priorities.

Changes in traffic volumes in the Lower Athabasca are strongly linked to development activity in the region. Traffic volumes are likely to moderate in the near future, as the pace of oil sands development stabilizes. The Alberta government is continuing to work with local authorities and other interested stakeholders, including industry, to address transportation issues in the region.

The Government of Alberta is also developing strategies to assist in managing safety and accessibility concerns on the region's highways. These challenges are significant, particularly when it is recognized that many of the safety concerns are directly related to driver error.

Expanding development may require the construction of new roads in the Lower Athabasca in the years ahead. As noted in the Alberta

government's Capital Plan, the extraction of natural resources is critical to the province's economy. Investment in roads will be needed to support all-weather access to resources and to connect Albertans with employment opportunities in the resource sector. [14]

A proposed road project in the Lower Athabasca is a new west-east highway to connect Fort McMurray and Peace River. Highways currently exist that connect these major centres with southern parts of the province; however there is no major east-west corridor to allow easy access between the two. The Alberta government's Capital Plan identifies the extension of Highway 686 between Fort McMurray and Peace River as a medium-term priority.[15]

To meet this initiative, the Government of Alberta is currently undertaking some preliminary engineering work to identify the possible location of the road.

Another project is the construction of an all-weather road between La Loche, Saskatchewan and the Fort McMurray area. Currently a winter road exists, but the Alberta and Saskatchewan governments agreed in 2005 to construct a permanent, all-season connection. Upgrading this road will enable residents of northern Saskatchewan to more easily access employment and recreational opportunities in the region and provide residents of Wood Buffalo with easier access to recreational opportunities in northern Saskatchewan.

The Government of Alberta contributes to the development of roads in the Lower Athabasca through many means, including financial and regulatory. Other stakeholders, including industry, are encouraged to participate in road building initiatives if required for their private sector endeavours.

Airports

There are a number of airports and airstrips located in the Lower Athabasca. The largest is the Fort McMurray Airport, which is a full-service facility that includes a modern terminal and a single runway. Many major carriers use the airport.

Originally designed to handle 70,000 passengers per year, the Fort McMurray Airport has experienced growth in traffic as a result of expanding economic activity. Plans have been finalized to expand the airport, which will triple the size of the facility and add a second runway.

Cold Lake and Bonnyville are both serviced by regional airports. Bonnyville's airport is unmanned and consists of a single runway. Cold Lake's regional airport also consists of a single runway; some passenger traffic into the Cold Lake area is serviced by the runways of CFB Cold Lake. Cold Lake's regional airport may need to be expanded in the future to support demand.

In addition to airports, there are several current and proposed airstrips in the Fort McMurray area. Companies typically use these airstrips to fly workers in and out of their sites from locations across Canada.

Rail

Canadian National Railway (CNR) operates a 325-kilometre-long rail line between Fort McMurray and Boyle, Alberta, where it interconnects with the rest of the CNR network. In 2007, CNR announced its acquisition of the line and plans to upgrade the line over three years to enable greater shipments of construction materials and machinery.

CNR has integrated the line with its network and markets the line's access to oil sands projects in the Athabasca and Cold Lake oil sands areas. This provides an alternative to Highway 63 for the transportation of heavy goods.

Recently, CNR announced a "Pipeline on Rails" strategy that would facilitate the use of rail to deliver oil sands production to Canada's west coast ports or the Gulf of Mexico. The scaleable nature of the concept could enable millions of barrels of oil sands production to be transported this way in the future.

Parks, Recreation and Trails

Parks are an essential public good because of the role they play in conservation, outdoor recreation and tourism.

Approximately 6.7 per cent (6,321 square kilometres) of the Lower Athabasca Region land base is designated as parks, administered by Alberta Tourism, Parks and Recreation.

Alberta has adopted the natural regions landscape classification system to describe its environmental diversity. Key landscapes in the Lower Athabasca are all represented within the provincial park system, with the exception of Dry Mixedwood, located in the southern portion of the region.

Overall, Albertans and visitors have many opportunities for outdoor recreation in the Lower Athabasca region. Compared to other populated areas of the region, population growth in Fort McMurray area has put increasing pressure on outdoor recreational opportunities such as camping, picnic and day use areas or trail-based recreation (e.g., hiking, biking).

Outdoor Recreation and Tourism

Public lands host a variety of public, commercial and not-for-profit recreation opportunities and tourism developments. A growing, prosperous and mobile population is increasing access to public land and leading to pressures on the land. These pressures have led to greater environmental degradation, public safety issues, conflict between public land users/industry and a loss of the benefits associated with recreation.

Planning, policies, legislation and infrastructure (i.e. trails) are used to ensure sustainable recreational use of public land. Existing recreation resource sites on public lands are managed by Alberta Sustainable Resource Development. These include remote recreation campgrounds, water access points, group campgrounds, public access/staging areas and structural developments.

Some of these recreation resource sites have either closed or have limited active management. Other recreation sites and trails exist on the public land base and have been authorized by public land dispositions for not-for-profit (community and/or association), public, commercial and personal use. These include recreational campsites, golf courses, boat launches, shooting ranges, hunting and fishing lodges, recreational cottages, trails (hiking, cross-country skiing and snowmobiling), doglots, horse holding areas and associated shelters and infrastructure.

Trails

Trails offer opportunities for users to increase physical activity, improve health and wellness, and appreciate the natural and human history of the region. Trails also provide opportunities for economic development, rural diversification, tourism and economic retention.

Population growth in the Lower Athabasca has contributed to increased demand for trail development, greater use of trails and an increase in the type and number of recreational vehicles and related gear. Authorized trails in the southern portion of the Lower Athabasca have been inventoried and mapped through the Northeast Alberta Trails mapping project led by Alberta TrailNet.

The major trail networks include:

- Iron Horse Trail – A 300 kilometre-long former railroad right-of-way connecting many municipalities, varied natural areas and tourist attractions. The 88 kilometres section between Cold Lake and Abilene Junction passes through the Lower Athabasca. Trail activities include walking, hiking, off-highway vehicles, snowmobiling, biking, horse riding, wildlife viewing, fishing and hunting. This trail is also on the northern leg of the Trans Canada Trail through this region, and most communities have trail head staging areas.

- Trans Canadian Snowmobile Trail – A 1,547 kilometre-long winter trail across Alberta, which follows the routing of the Iron Horse Trail for 100 kilometres in several areas and has connector trails to a number of nearby communities. This trail is groomed regularly during the winter months by local snowmobile clubs who have connected their own trail networks to the main trail.
- Lakeland Provincial Park and Lakeland Recreation Area – These offer a wide variety of trail opportunities over a varied landscape. Approved uses on designated trails include off-highway vehicles, snowmobiles, bicycling, hiking and cross-country skiing. Over 10 kilometres of groomed trails are set in the wooded areas of the park to accommodate all skill levels.
- Other Provincial Parks – Whitney Lakes Provincial Park, Cold Lake Provincial Park, Moose Lake Provincial Park, Sir Winston Churchill Provincial Park and Gregoire Lake Provincial Park all have non-motorized recreation trails which receive extensive use all year round.
- Informal trails – Extensive informal trails exist in the Richardson Backcountry area, the Wandering River area and north of Fort McMurray.

- Formally designated trails – These include the May Lake Trail, Telegraph Trail, Vista Ridge, Anzac, Thickwood and Stoney Mountain Snowmobile Trails. These trails are operated and maintained by local trail groups.

Lac La Biche – Cold Lake – Bonnyville Area

This area is characterized by numerous accessible lakes, beaches, the Athabasca River, Boreal forest and well drained upland areas. These features are readily accessible, due to the road and linear networks provided by forestry and energy development and the proximity to Edmonton.

The Lakeland area and Athabasca River are provincially significant for recreation and tourism opportunities, while also being sensitive to landscape changes and industrial and commercial developments. The area's rich fur trading and settlement history also provide cultural and heritage tourism opportunities (e.g., abandoned towns, cabin sites).

Water-based recreation and tourism (boating, paddling, swimming, fishing), motorized recreation, random camping, and public and commercial fishing and hunting are the most popular activities on public land in this area. The use of lake shoreland for recreation has increased considerably in the past decade, in step with the growing population of Edmonton and area.

This region is particularly desirable since Alberta has limited opportunities for lake-based recreation and tourism. The shorelands are under increasing pressure for cottage development and recreation. Increasingly, industrial land-use needs to consider the rising value of these areas and community expectations to retain aesthetic and

natural features on and near these lakes. The increased demand for cottages and horseholding areas may affect municipal services and subdivisions that are specifically planned for these uses on private lands.

Public lands adjacent to urban areas such as Lac La Biche, Cold Lake and Bonnyville and north along main transportation corridors (such as the road to Conklin) provide popular family camping and quadding sites that are routinely visited throughout each summer season.

The current supply of managed outdoor recreational opportunities does not meet the current demands of the growing population in the Fort McMurray area.

Wood Buffalo

Existing and planned development of the oil sands and related population growth will continue to place elevated recreation pressures on public lands adjacent to the city, as well as Gregoire Lake, Namur Lake, Clearwater River, Athabasca River and the Richardson Backcountry. The current supply of managed outdoor recreational opportunities does not meet the current demands of the growing population in the Fort McMurray area.

Many provincial campgrounds are filled with local workers who can not find housing. This often displaces recreational users (and other workers) into situations where they are random camping or using public land without authority. This includes the unauthorized use of trapline cabins and other lease areas.

The distance and costs associated with travelling to the area are deterrents to enhanced tourism opportunities. However, if visitors travel to the area, they will typically stay longer.

The proposed development of an all-weather road to Fort Chipewyan will open public access to public lands that are currently inaccessible; this may result in further recreation pressures on public lands.

The most prominent physical recreation features include: the Peace-Athabasca Delta, which is an internationally significant wetland; Wood Buffalo National Park, which is the largest national park in the world; the Richardson sand dunes complex; the Clearwater and Athabasca Rivers; lakes and sandy beaches in the Precambrian shield area; and the Gypsy/Birch Lakes.

Accessibility for many of these features is good. Others are less accessible or may only be accessible by off-highway vehicle or air. The Richardson sand dunes complex is provincially unique and provides opportunity for more remote motorized recreation, fishing and hunting opportunities.

Motorized recreation, public and commercial hunting and fishing, random camping and river-based recreation are the most popular activities in this portion of the region. The Clearwater and Christina rivers west of Fort McMurray are part of a designated Canadian Heritage River and provide some water-based recreation opportunities. The Clearwater and Athabasca rivers' history as key fur

trading routes also provides opportunities for cultural and heritage tourism.

Fort Chipewyan is Alberta's oldest community, tracing its roots to a NorthWest Trading Company outpost in 1788.

Culture and Cultural Heritage

Local culture plays a key role in sustaining local government, fostering development and improving social outcomes. Culture provides a sense of common identity for local communities and residents.

Research suggests that participating in cultural activities also reduces stress, promotes increased health, reduces mortality in populations and strengthens communities.

Population growth in the Lower Athabasca has created new demands for cultural opportunities, facilities and services. The region is culturally diverse, featuring some of Alberta's oldest and most historic communities. Economic development has attracted many new Albertans to the region, enriching the region's blend of older and newer cultural resources.

Wood Buffalo

While an indigenous population of Chipewyan and Beaver are native to the Wood Buffalo region, by the 1870s the Cree, Métis and Euro-Canadians also made their homes in the area.

Fort McMurray, located at the junction of the Athabasca and Clearwater rivers, was a Hudson's Bay Company post during the time of the fur trade. It served as the hub for services and supplies. Fort McMurray Heritage Park, a 6.6 acre area, now provides visitors with a glimpse of the area in the first half-century.

Fort Chipewyan is Alberta's oldest community, tracing its roots to a NorthWest Trading Company outpost in 1788. This post was considered to be essential to the fur trade, second in importance only to Fort William on Lake Superior. It also saw the arrival of Christian missionaries and ecclesiastical institutions.

Today, the Fort Chipewyan Bicentennial Museum is dedicated to the preservation of more than 200 years of cultural history and knowledge. The area is also home to historic churches from the period.

The focus of Wood Buffalo has changed since technologists discovered a method of separating oil from bitumen, leading to an industrial boom. The Oil Sands Discovery Centre today captures the history, science and technology of the oil sands industry.

Wood Buffalo today is home to a range of cultures. Many residents have come from other parts of Canada and other countries, enticed by economic opportunity.

A large portion of residents of Wood Buffalo call Atlantic Canada home. The McMurray Newfoundlanders Club features members with a Newfoundland and Labrador ancestry. Many residents have also come from countries in Asia and South America, including India, Pakistan, the Philippines, Venezuela and China.

Other arts and culture activities in Wood Buffalo include the *Keyano Theatre*, which is the cornerstone of live entertainment; the *InterPLAY* festival, which celebrates visual and performing arts each year; and *Winterfest*, hosted in the community of Anzac, which features winter activities and competitions.

Lac La Biche Area

Lac La Biche is one of Alberta's oldest communities, also dating back to the fur trade. Explorer David Thompson founded Portage La Biche in 1798, which connected Canada's Churchill Basin to the Athabasca – McKenzie Basin. This became a critical link in Canada's first transcontinental fur trade route.

French-Canadian missionaries also arrived in this area to serve the Métis, First Nations, and Euro-Canadians population. The Lac La Biche Mission Site still exists today. This mission acted as the heart of the missionaries' territory in north Alberta. In addition to its religious significance, this site was the source of pioneering educational, agricultural and technological developments and achievements in Alberta's history. These include the first printing press, one of the first commercial wheat operations, the first water-powered gristmill and the first water-powered sawmill.

Lac La Biche County is steeped in generations of multiculturalism. The area is home to many cultures, including White Russian Old Believers, French, Italian, Lebanese, Aboriginal and Ukrainian.

It is also home to the Alkareem Mosque, built in 1958. There are deep Muslim roots in the area, largely of Lebanese origin. In fact, Lac La Biche currently has the highest population of Lebanese people per capita in North America.

The hamlet of Plamondon also has cultural significance. It was settled by French settlers who left Quebec and later were attracted to the area as part of the Canadian government's policy to promote development in the west. Métis who were already in the region shared their knowledge of hunting and trapping with the settlers, helping the community survive and grow. Today the Plamondon Museum offers a link to those early days.

Today many cultural activities reflect the region's diversity and remain true to its outdoor, pioneering spirit. These include the Western Canadian Ice Race Championship; the Lac La Biche Pow-Wow Days & Fish Derby; the Kak ki Yaw Cultural Camp; and the Plamondon Motor Sports Club Mud Bog.

Lac La Biche is one of Alberta's oldest communities, also dating back to the fur trade. Explorer David Thompson founded Portage La Biche in 1798.

Bonnyville-Cold Lake Area

The Bonnyville area was also influenced by the fur trade and the arrival of missionaries. Three orders of nuns were involved in Bonnyville's history. A mix of Aboriginal, French and Ukrainian cultures were instrumental in forming Bonnyville. The Bonnyville and District Museum interprets the development and settling of the Bonnyville region.

Cold Lake has been heavily influenced by Canadian military aviation since its founding. The Cold Lake Air Force Museum reflects the role that Canadian military aviation has played since 1918 and, in particular, the military aviation activities associated with Cold Lake since its inception in 1954.

Annual events in Cold Lake include Taste of the Lakeland, the Silver Buckle Stampede and the Call of the Wild Horn Music Festival.

Today, the City of Cold Lake plays host to air forces from around the world in an annual event called Maple Flag. The cultural activities of the area are also influenced by the area's recreational strengths as Alberta's "Lakeland District". Annual events include Taste of the Lakeland, the Silver Buckle Stampede and the Call of the Wild Horn Music Festival.

Volunteerism

Many organizations that enrich and celebrate the culture of the Lower Athabasca region often depend on volunteers. Volunteer centres around the province are dedicated to supporting the needs of volunteers, and the organizations that require volunteer help. There are 25 volunteer centres in Alberta today. Three are located in the Lower Athabasca: Volunteer Wood Buffalo; Lac La Biche and Lakeland County Volunteer Action Centre; and Volunteer Cold Lake.

Key Issues

As Alberta communities grow, they face greater demands on their arts, cultural, sports and recreation facilities. Consequently, communities are increasingly seeking ways to re-invest in this infrastructure. Communities in the Lower Athabasca are no exception, particularly in light of their rapid growth.

A number of Alberta government agencies and initiatives foster, promote and preserve cultural activities and cultural heritage:

- Various foundations offer funding and grant assistance to a range of cultural organizations, including the arts, heritage, sport and recreation and the natural environment.
- The *Historical Resources Act*[16] controls and lessens the impact of resource development on historical resources, such as archeological and paleontological sites, historic buildings, aboriginal traditional use sites and unique works of nature.

- In January 2008, Alberta Culture and Community Spirit released *The Spirit of Alberta: Alberta's Cultural Policy*,[17] reflecting months of consultation with Albertans.

Community Health

As of May 15, 2008, the Alberta Health Services Board is responsible for health services delivery for the entire province. Prior to this change, the Northern Lights and Aspen Regional Health Authorities were responsible for health services in the Lower Athabasca; Northern Lights served Wood Buffalo, whereas Aspen served Lac La Biche County and the M.D. of Bonnyville. For the purposes of this report, regional health information is referenced with respect to these former authorities.

The health status of Albertans and their communities reflects the importance of considering social, economic and environmental impacts of land-use. Health status is influenced by a variety of factors, including levels of physical activity, education, income and employment.

Health Trends

The Northern Lights and Aspen authorities served geographic areas broader than the Lower Athabasca. However, some trends from 2007 provide a general idea of the health of residents of the Lower Athabasca:[18]

- Residents of Aspen were less likely than residents of other regions to self-report their health as being very good or excellent, relative to the provincial average, while Northern Lights had average rates of reporting.
- Northern Lights had the highest rates of smoking out of all health regions; Aspen was among regions reporting higher-than-average rates of smoking.
- Aspen and Northern Lights, respectively, had the third and fourth highest proportion of their populations with body weights in the overweight and obese categories.
- Northern Lights had the lowest proportion of individuals indicating they consumed five or more servings of fruits and vegetables per day.
- Northern Lights had a lower proportion of residents reporting activity limitations as a result of a long-term physical or mental condition or other health problem.
- Northern Lights had the highest rate of heavy drinking of alcohol in the province, whereas Aspen had an average rate.
- Northern Lights had the lowest percentage of "active" or "moderately active" individuals in the province, whereas Aspen had an average percentage.

Income

According to data from the 2006 census, the median after-tax household incomes for residents in the Lower Athabasca were mostly at or above the provincewide median. This reflects the strength of local economies, largely fuelled by resource development in the region.

Community (2005)	2005 Median Income (Household, after-tax)
Regional Municipality of Wood Buffalo	$96,883
Town of Lac La Biche	$43,250
Lac La Biche County (formerly Lakeland County)	$53,065
City of Cold Lake	$64,874
Town of Bonnyville	$52,170
Municipal District of Bonnyville No. 87	$58,224
All Alberta	**$55,199**

Source: Statistics Canada, 2006 Census

Education

Education levels are a determinant of health levels in Alberta communities. Higher levels of education generally translate into higher levels of knowledge and income, providing a greater sense of security and satisfaction. A key measure of education levels is the proportion of residents who do not successfully complete at least a high school certificate, as reported by the 2006 census.

With the exception of Wood Buffalo and the City of Cold Lake, communities in the Lower Athabasca reported higher proportions of residents who had not attained a high school certificate, diploma or degree, relative to the provincial average. This is the case for all residents aged 15 and over, and for those residents aged 25 to 34. The lower rates in Cold Lake and Wood Buffalo likely reflect the large number of educated workers who have moved to these communities to take advantage of employment opportunities.

Highest Educational Attainment – No Certificate, Diploma or Degree

Community (2005)	% of those aged 25-34	% Total aged 15 and over
Regional Municipality of Wood Buffalo	11.2	19.8
Town of Lac La Biche	35.2	33.3
Lac La Biche County (formerly Lakeland County)	33.3	38.4
City of Cold Lake	9.7	19.0
Town of Bonnyville	14.5	33.7
Municipal District of Bonnyville NO. 87	22.3	32.5
All Alberta	**13.6**	**23.4**

Source: Statistics Canada, 2006 Census

The area now comprising Lac La Biche County reports the highest proportion of residents without a high school diploma. Lac La Biche County also does not reflect the provincewide trend of greater educational attainment among younger population groups.

Workforce Participation

Labour force data are significant, since unemployment and under-employment negatively impact the health status of residents and communities.

According to the 2006 census, labour force activity in the Lower Athabasca is comparable to or greater than the provincial average. This is not surprising, given the level of economic growth the Lower Athabasca has experienced.

The City of Cold Lake and Wood Buffalo reported lower unemployment rates and higher labour force participation rates. This reflects strong employment growth due to increased oil sands investment activity in these areas.

According to the 2006 census, labour force activity in the Lower Athabasca is comparable to or greater than the provincial average.

Labour Force Activity – Total Population Aged 15 and Over

Community (2005)	Unemployment Rate (%)	Participation Rate (%)
Regional Municipality of Wood Buffalo	4.0	82.3
Town of Lac La Biche	4.2	70.6
Lac La Biche County	4.8	71.2
City of Cold Lake	3.5	80.0
Town of Bonnyville	4.4	71.5
Municipal District of Bonnyville NO. 87	4.8	74.7
All Alberta	**4.3**	**74.0**

Source: Statistics Canada, 2006 Census

Higher Education

Two public board-governed community colleges are located within the Lower Athabasca: Portage College and Keyano College. Both colleges offer distance education to students located in smaller communities in the region.

Portage College's main campus is in Lac La Biche, with a number of community campuses throughout Lac La Biche County, the Municipal District of Bonnyville, the City of Cold Lake and Métis Settlements. Portage College takes a special interest in educational programs and services for Aboriginal people.

An important emphasis of Portage College is on programs that help students upgrade their credentials, so they can meet admission requirements for programs at other post-secondary institutions. The College also offers a number of certificate and diploma level programs relating to skill-oriented careers, in areas such as health, social services, Native culture, business, trades and technical, apprenticeship and vocational training. These programs are aimed at the needs of business, industry and communities within the region.

Portage College engages in many community partnerships to create educational opportunities for its students. Recently, the college completed construction of its Cold Lake campus in conjunction with the City of Cold Lake. Located at the Cold Lake Energy Centre, the new campus has state-of-the-art classrooms and encompasses 2,365 square metres.

Keyano College is a comprehensive college located in Fort McMurray. It offers a range of programming from academic upgrading, to university studies, to trades and heavy industrial training. Keyano College has three major campuses, including one in Fort Chipewyan, as well as satellite campuses in Edmonton, Anzac, Janvier and Conklin.

Many pre-professional university transfer programs are offered, including the areas of dentistry, law, medicine and pharmacy. The college also offers collaborative degree programs in association with the University of Alberta, University of Calgary and Athabasca University.

Lying at the heart of resource development activity in the region, Keyano college offers a wide array of apprenticeship trade and technical programs. Keyano also provides a number of community education programs relating to Aboriginal communities, including an Aboriginal Entrepreneurship Certificate Program that helps students acquire skills to start their own businesses.

Keyano College's Arts Centre acts as the community hub for arts and culture in Wood Buffalo. It includes the Keyano Theatre and the Keyano Art Gallery.

With its hard-working culture, residents actively volunteer their time and take advantage of leisure opportunities.

Community Lifestyle

Resource development activities in the Lower Athabasca have had an impact on the pace of community life.

This has particularly been the case in Wood Buffalo during the last few years of strong resource prices. Significant investment in oil sands projects combined with a tight labour market has contributed to an atmosphere tilted strongly towards work, with scarce time for play. As oil prices have moderated, the pace of life has become more balanced.

Wood Buffalo is a young community, with workers from all over the world. With its hard-working culture, residents actively volunteer their time and take advantage of leisure opportunities.

Borealis Urban Park is the focus of Fort McMurray's park system, linking residential communities. During winter months, residents enjoy Vista Ridge ski hill in addition to the local outdoors. The Fort McMurray Oil Barons hockey team, part of the Alberta Junior Hockey League, calls the Thickwood Heights Arena home ice. Hockey and skating are also found at Frank Lacroix Minor Hockey Arena and the MacDonald Island Recreation Complex.

Both the MacDonald Island Recreation Complex and the YMCA of Wood Buffalo provide a mix of fitness and recreation activities. Local golf courses provide summer recreation for residents.

The southern part of Lower Athabasca is home to the Lakeland District of the province. Residents in these areas work hard and play hard, enjoying the natural beauty of the area's many lakes, white sand beaches and outdoor spaces.

Water sports and activities are a favourite during the summer, with back country canoeing, sailing, fishing, swimming and water skiing among the many favourites. The atmosphere is energized further by an influx of summer visitors each year, who fill area campgrounds and accommodations.

In Cold Lake, residents enjoy the Kinosoo Ridge Snow Resort in the winter, and recreation facilities including the JJ Parr Sports Centre. Over the longer term, Imperial Park will be developed into playing fields and recreation facilities.

All major communities in the Lower Athabasca are enriched by libraries, community groups, religious organizations and charities.

Economic Development and Prosperity

The Lower Athabasca has seen a remarkable increase in economic development, fuelling the prosperity of Alberta and helping fund important programs and services for Albertans. The region's abundant resource potential means it will have continued economic importance for Alberta in the future.

However, since the economy of the Lower Athabasca is strongly tied to natural resources, it is also subject to periodic economic volatility. This creates unique challenges in conducting long-range land-use planning.

Rapid changes in commodity prices can result in sudden shifts in the region's economic outlook, the expected growth in development activities and the resulting cumulative effects of development on the environment. The regional land-use plan for the Lower Athabasca will need to account for the inevitability of these changes and accommodate various growth scenarios.

Oil Sands

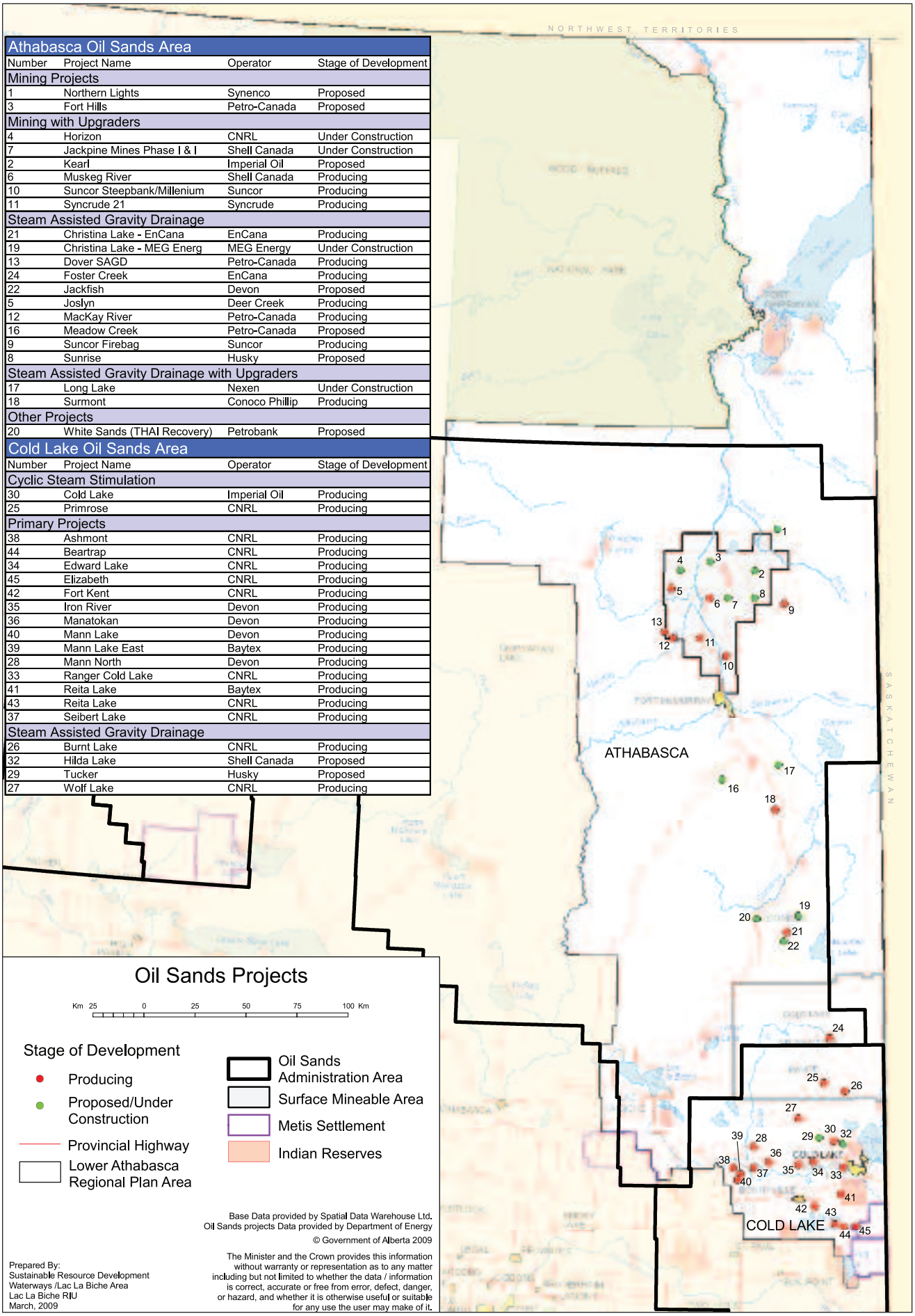
Oil Sands Development

Development of Alberta's oil sands represents by far the largest share of economic activity in the Lower Athabasca, with much of the development occurring in the past 10 years. Alberta's oil sands resource is extensive, with proven reserves of 173 billion barrels of economically recoverable crude bitumen. This gives Alberta the distinction of having the second-highest volume of proven oil reserves in the world, next to Saudi Arabia.

Oil sands are a mixture of sand, water, clay and bitumen. They sit beneath approximately 140,000 square kilometres of land, located in three areas across northern Alberta – the Athabasca, Cold Lake and Peace River oil sands areas. The Peace River oil sands area is not located in the Lower Athabasca; the other two oil sands areas span the Lower Athabasca and adjacent land-use planning regions. In terms of land, about 61 per cent of the Athabasca oil sands area, and about 58 per cent of the Cold Lake oil sands area, is situated within the Lower Athabasca.

Athabasca Oil Sands Area			
Number	Project Name	Operator	Stage of Development
Mining Projects			
1	Northern Lights	Synenco	Proposed
3	Fort Hills	Petro-Canada	Proposed
Mining with Upgraders			
4	Horizon	CNRL	Under Construction
7	Jackpine Mines Phase I & I	Shell Canada	Under Construction
2	Kearl	Imperial Oil	Proposed
6	Muskeg River	Shell Canada	Producing
10	Suncor Steepbank/Millenium	Suncor	Producing
11	Syncrude 21	Syncrude	Producing
Steam Assisted Gravity Drainage			
21	Christina Lake - EnCana	EnCana	Producing
19	Christina Lake - MEG Energ	MEG Energy	Under Construction
13	Dover SAGD	Petro-Canada	Producing
24	Foster Creek	EnCana	Producing
22	Jackfish	Devon	Proposed
5	Joslyn	Deer Creek	Producing
12	MacKay River	Petro-Canada	Producing
16	Meadow Creek	Petro-Canada	Proposed
9	Suncor Firebag	Suncor	Producing
8	Sunrise	Husky	Proposed
Steam Assisted Gravity Drainage with Upgraders			
17	Long Lake	Nexen	Under Construction
18	Surmont	Conoco Phillip	Producing
Other Projects			
20	White Sands (THAI Recovery)	Petrobank	Proposed

Cold Lake Oil Sands Area			
Number	Project Name	Operator	Stage of Development
Cyclic Steam Stimulation			
30	Cold Lake	Imperial Oil	Producing
25	Primrose	CNRL	Producing
Primary Projects			
38	Ashmont	CNRL	Producing
44	Beartrap	CNRL	Producing
34	Edward Lake	CNRL	Producing
45	Elizabeth	CNRL	Producing
42	Fort Kent	CNRL	Producing
35	Iron River	Devon	Producing
36	Manatokan	Devon	Producing
40	Mann Lake	Devon	Producing
39	Mann Lake East	Baytex	Producing
28	Mann North	Devon	Producing
33	Ranger Cold Lake	CNRL	Producing
41	Reita Lake	Baytex	Producing
43	Reita Lake	CNRL	Producing
37	Seibert Lake	CNRL	Producing
Steam Assisted Gravity Drainage			
26	Burnt Lake	CNRL	Producing
32	Hilda Lake	Shell Canada	Proposed
29	Tucker	Husky	Proposed
27	Wolf Lake	CNRL	Producing



Oil Sands Projects

Km 25 0 25 50 75 100 Km

Stage of Development

- Producing
- Proposed/Under Construction
- Provincial Highway
- Lower Athabasca Regional Plan Area

- Oil Sands Administration Area
- Surface Mineable Area
- Metis Settlement
- Indian Reserves

Base Data provided by Spatial Data Warehouse Ltd.
Oil Sands projects Data provided by Department of Energy

Prepared By:
Sustainable Resource Development
Waterways /Lac La Biche Area
Lac La Biche RIU
March, 2009

Primary oil sands extraction involves the recovery of bitumen. There are two main methods used in bitumen recovery: surface mining and in situ development.

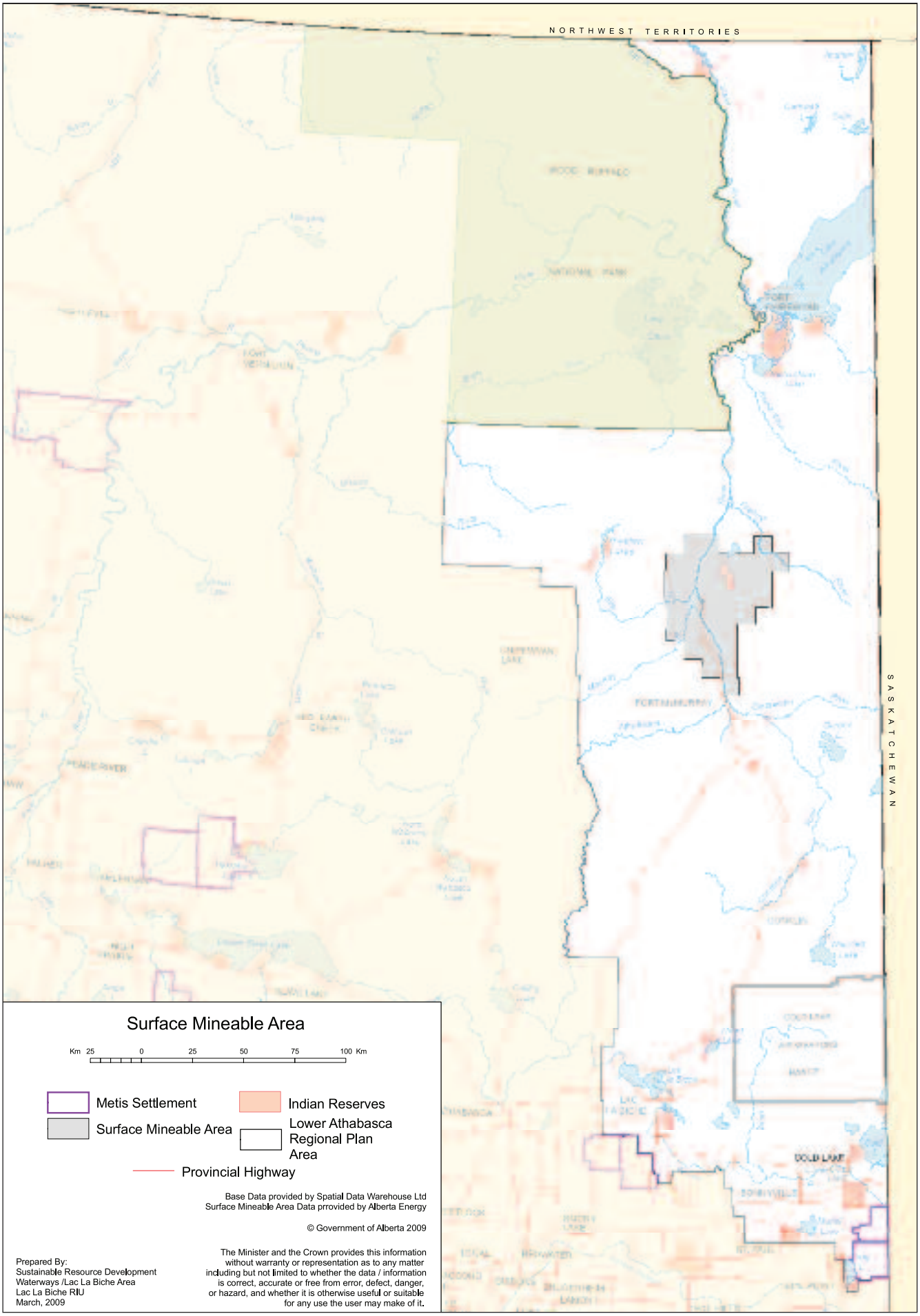
- Surface mining – Oil sands located near the surface of land are mined and moved to processing facilities; there, the sand is mixed with warm water to separate the bitumen. Surface mining operations are only occurring in the Athabasca oil sands area. They occur within the Surface Mineable Area, an administrative boundary defined by the Energy Resources Conservation Board.
- *In situ* – In this method, bitumen is recovered from the sand underground, "in place" (literally, *in situ)* using wells. One common approach is to inject steam to heat the bitumen to a point where it flows more easily and can be pumped to the surface, similar to conventional oil and gas production. These operations have significantly smaller land footprints than surface mining methods.

Surface mining operations have come to be closely identified with the oil sands. However, only three of Alberta's approved oil sands projects use surface mining; the remainder use various in situ methods.

About 82 per cent of Alberta's oil sands reserves are recoverable by in situ methods; the balance is recoverable via mining. The mineable oil sands are covered by about 3,500 square kilometres of land. To date, only 530 square kilometres of land have been disturbed by oil sands mining operations, representing less than one per cent of total land in the Lower Athabasca.

Oil Sands Land-use	Area (km^2)	Approx. % of LAR area
Total area of the Lower Athabasca (LAR)	93,260 km^2	100%
Portion of Athabasca oil sands area in the LAR	57,300 km^2	61%
Portion of Cold Lake oil sands area in the LAR	10,300 km^2	11%
Total oil sands mineable area	3,500 km^2	4%
Total land disturbed by oil sands mining	530 km^2	< 1%

Total oil sands production in 2007 was 482 million barrels of crude bitumen, or more than 1.32 million barrels per day.[19] However, this level of production represents a small fraction of the ultimate oil sands resource. Since commercial oil sands production began in 1967, only 3.3 per cent of established bitumen reserves have been extracted.


NORTHWEST TERRITORIES
SASKATCHEWAN
Surface Mineable Area
Km 25 0 25 50 75 100 Km
Metis Settlement
Surface Mineable Area
Indian Reserves
Lower Athabasca Regional Plan Area
Provincial Highway
Base Data provided by Spatial Data Warehouse Ltd
Surface Mineable Area Data prrovided by Alberta Energy
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Prepared By:
Sustainable Resource Development
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March, 2009

Production from the oil sands has considerable room to expand and grow, and Alberta is committed to responsibly developing the resource. Forecasts indicate that bitumen production could more than double in the future.[20]

Economic Impact

Strong energy prices, rising worldwide demand for oil and policy choices of the Alberta government have helped fuel the growth of Alberta's oil sands industry. The industry is now, and will continue to be, an important cornerstone of the Albertan and Canadian economy. At the same time, the nature of non-renewable resource prices means that energy production is a cyclical business. This reality is shared by the oil sands industry. Low energy prices will affect the economic and employment impacts of the industry.

Oil sands developments create demand for materials, products and services from businesses and individuals, and drive employment growth across the country. They also contribute revenue to the federal government through federal taxes and to the Alberta Treasury through provincial taxes, bonus payments and royalties. These revenues help fund government investments in programs, services and infrastructure for Albertans and other Canadians.

- Between 1988 and 2007, cumulative investment in the oil sands was $70.6 billion.[21]
- Another $10 billion of investment in Alberta's oil sands is forecasted for 2009.[22]
- Industry anticipates investing up to $15 billion annually for maintenance and operations in the oil sands.[23]
- For the 2007-2008 fiscal year, the oil sands contributed almost $3 billion in royalties to Alberta.[24]

Oil sands development has contributed to growth in jobs and wages for Albertans. One in six Albertans is employed directly or indirectly in the energy sector; many more jobs are spurred in manufacturing, retail and other sectors.

Future Development

The substantial size of Alberta's oil sands deposits means that oil sands production will comprise an increasing share of Alberta's energy production. Alberta's energy strategy[25] identifies the oil sands industry as a key component of Alberta's energy mix. It also describes a vision for Alberta's energy development that raises a number of challenges relating to the oil sands:

- Reducing greenhouse gas emissions – The expansion of the oil sands industry stands to further increase Alberta's greenhouse gas (GHG) emissions. Pursuit of new technologies and processes, such as the implementation of gasification and carbon capture and

storage, will help reduce the carbon impact of the industry. These may require new rights-of-way on land or the allocation of additional Crown land to industrial use.

- Reducing reliance on natural gas – Most oil sands projects involve the combustion of natural gas to generate the steam and other thermal energies required to extract bitumen. This generates GHG emissions and reduces the amount of natural gas available for value-added industries. Alberta will actively examine how other energy sources could be used by oil sands projects instead of natural gas.
- Alternative fuels for power generation – The use of alternative fuels for electrical generation will also be explored, such as the combustion of bitumen, biofuels from wood waste and the potential for hydroelectric power on the Peace or Slave Rivers. This would help achieve Alberta's environmental and value-added objectives, but will likely necessitate greater industrial use of land in the Lower Athabasca (for example, the construction of new electrical transmission lines, or new power plants).
- Integrating oil sands with other energy production – Growing development of the oil sands offers the opportunity to foster more value-added industry. This includes upgrading, refining and petrochemical facilities. This will require integrating future oil sands projects with other energy-related developments. As with any new development activity in any economic sector, each new project located in the Lower Athabasca will have cumulative social and environmental impacts.

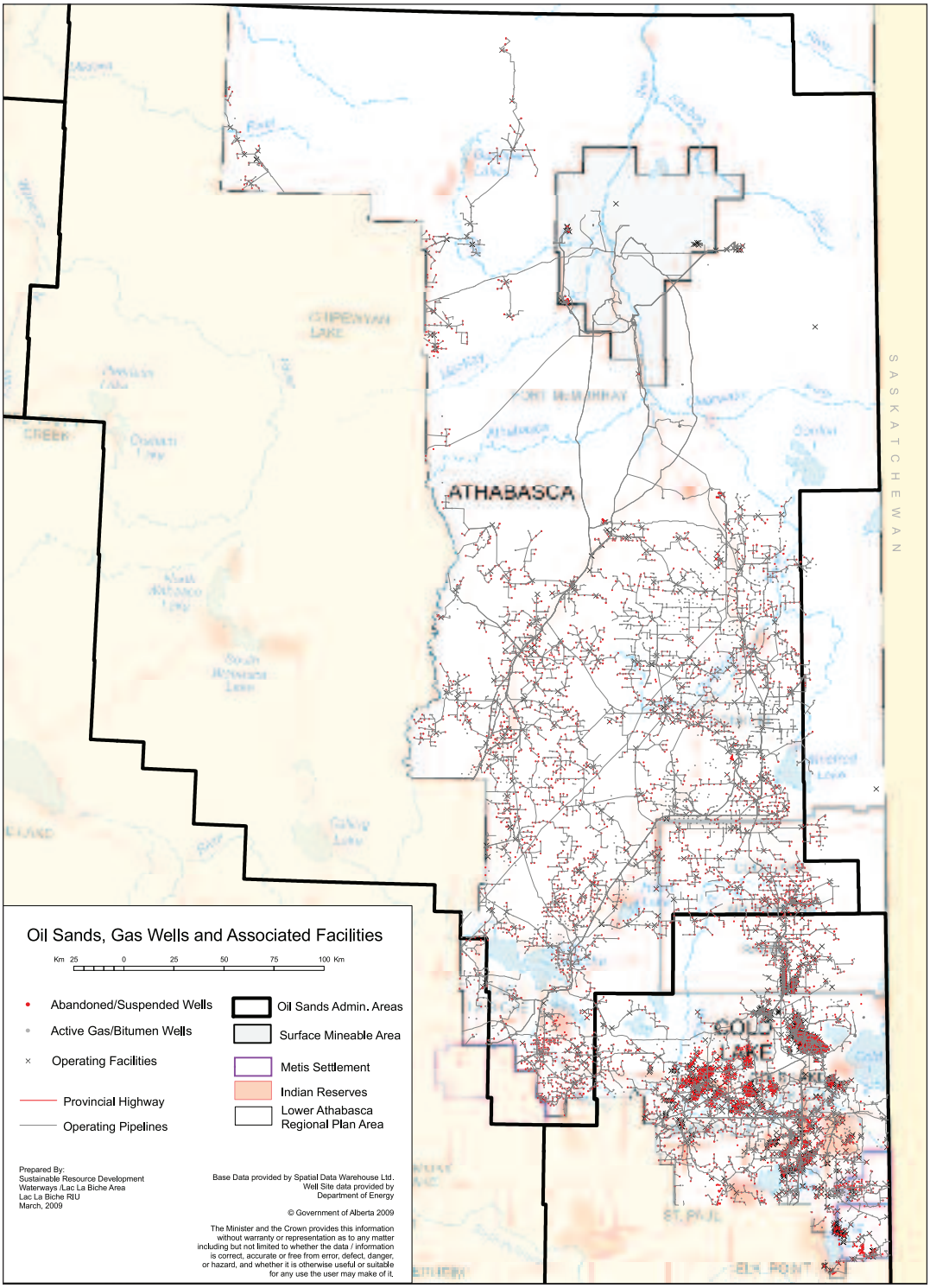
To guide future development of the oil sands resource, the Alberta government has developed a 20-year strategic plan: *Responsible Actions – A Plan for Alberta's Oil Sands*.[26] The plan sets out six broad strategies aimed at making Alberta "a global leader in the innovative, responsible and collaborative development of the oil sands":

- Developing Alberta's oil sands in an environmentally responsible way;
- Promoting healthy communities and a quality of life that attracts and retains individuals, families and businesses;
- Maximizing long-term value for all Albertans through economic growth, stability and resource optimization;
- Strengthening Alberta's proactive approach to aboriginal consultation with a view to reconciling interests;
- Maximizing research and innovation to support sustainable development and unlock the potential of Alberta's oil sands; and
- Increasing available information, developing measurement systems, and enhancing accountability in the management of the oil sands.

An implementation plan for *Responsible Actions* is currently being developed. The plan will be coordinated with other provincial initiatives, including the provincial energy strategy. It will also provide guidance to the Alberta government in the development of the Lower Athabasca Regional Plan.

Current Activity

Although oil sands development constitutes the vast majority of energy development in the Lower Athabasca, the region is also home to conventional natural gas production. The Lower Athabasca has a long history of natural gas production.



The natural gas produced in the Lower Athabasca is typically gathered and sent to gas processing plants to remove impurities. From there, natural gas enters the "Alberta Hub," Alberta's extensive network of 392,000 kilometres in energy-related pipelines. The Alberta Hub efficiently transports approximately 15 billion cubic feet per day of natural gas to markets throughout North America.

One of the major consumers of natural gas in the Lower Athabasca is the oil sands industry. Many oil sands projects use natural gas to generate steam and other thermal energies required in the bitumen extraction process. A number of projects use natural gas in cogeneration facilities, which also generate electricity.

The long history of natural gas exploration and development in the Lower Athabasca has led to scattered land-use throughout natural gas production areas. This includes numerous well-sites and linear features such as seismic lines, roads and pipeline rights-of-way.

Some natural gas areas in the Lower Athabasca overlap with the Athabasca and Cold Lake oil sands areas, bringing natural gas into contact with some of the highest quality bitumen resources in the province. This has led to resource conservation issues that the Energy Resources Conservation Board (formerly the Energy and Utilities Board)[27] has addressed.

In November 2005, the Board ruled that production from 917 natural gas wells in the Wabiskaw-McMurray area would have to be capped in order to preserve underground pressure necessary for producing bitumen.[28] The decision was based on technical, geological and other relevant evidence on bitumen conservation heard by an Energy and Utilities Board panel in 2005.[29]

The decision will conserve about 4.05 billion cubic metres (25.5 billion barrels) of recoverable bitumen in the Wabiskaw-McMurray area, which represents 14.6 per cent of Alberta's remaining bitumen reserves. The energy content of the bitumen reserves conserved through the decision is about 500 times greater than that of the shut-in gas production.[30]

Economic Impact

In addition to creating employment opportunities in the Lower Athabasca, particularly in the Lac La Biche and Cold Lake-Bonnyville areas, natural gas development is a very important industry for all of Alberta.

- About 80 per cent of Canada's natural gas production is from Alberta. The province produces about five trillion cubic feet of natural gas per year.[31]
- Natural gas is an important contributor to provincial non-renewable resource revenues. In 2007-2008, the Alberta government received roughly $5 billion in revenues from natural gas and byproducts.[32]

- Owing to Alberta's huge volumes of natural gas, Albertans benefit from lower natural gas prices compared to the rest of Canada.[33]
- In 2007, there were 9,220 successful conventional natural gas wells drilled in Alberta.[34]
- In 2007, Alberta exported 1,151 billion cubic feet of natural gas to the rest of Canada, and 2,482 billion cubic feet of natural gas to the U.S.[35]

Future Role

Natural gas production will continue to be an important industry for the province. Although conventional natural gas production in Alberta peaked in 2001, it is estimated that Alberta has a remaining ultimate potential of 1,112 billion cubic metres of conventional natural gas.[36]

Under Alberta's energy strategy, natural gas will play a key role in fostering value-added industry in the province. Alberta will actively support replacing the use of natural gas in the oil sands with other substitutes. This will free up volumes of natural gas which can be used as feedstock for higher-value industries such as petrochemical plants and higher-end products, creating greater employment and economic opportunities for Albertans.

Natural gas development in the Lower Athabasca is likely to continue for the medium to long term. In addition to gradual draw-down of gas that is recoverable by current methods, future technology improvements are likely to increase the volume of gas that is ultimately recoverable. Gas in the oil sands areas that has been ordered shut-in will also likely be developed once bitumen extraction in those areas is complete.

Forestry

Current Activity

Forestry is also a significant industry in the Lower Athabasca. The Boreal forest, which is the largest ecosystem in the Lower Athabasca, provides a mix of deciduous and coniferous stands. Aspen and balsam poplar are the most common deciduous species; white spruce, jack pine and black spruce are the most common coniferous species.

Alberta uses three types of tenure systems to ensure that Alberta's forest resources are managed in a sustainable way while providing value for Albertans – timber permits, timber quotas and forest management agreements.

The most significant are Forest Management Agreements (FMA). These are agreements between the Crown and forest companies, typically 20 years in length, which give companies the right to harvest, remove and grow timber in a specified area. Under an FMA, the forest company takes on obligations for forest management planning. The company

must manage forest resources within the FMA area in keeping with the principles of sustainable forest management, meaning the company must consider a range of social, economic and environmental factors (e.g., watershed, wildlife habitat).

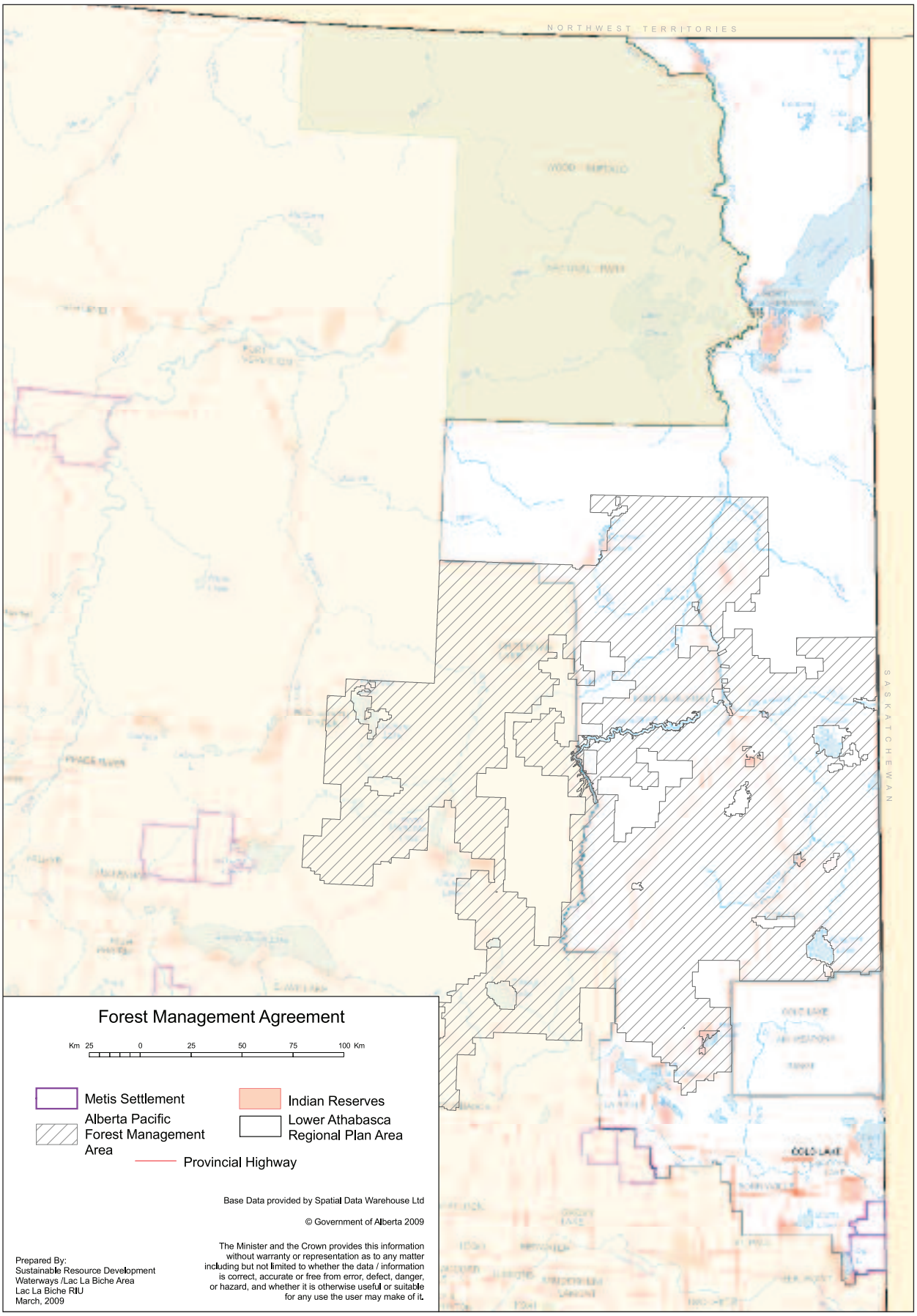
Currently in the Lower Athabasca there is only one FMA holder, Alberta Pacific Forest Products Incorporated (Alberta Pacific). Alberta Pacific has held the FMA since 1991. Alberta Pacific's FMA covers a great deal of the Lower Athabasca's forest resources, and extends beyond the Lower Athabasca into adjacent land-use planning regions. Despite its large area, only one-third of Alberta Pacific's FMA is productive forest land base that sees timber harvesting.

Aspen and jack pine species make up over half the available timber supply in the Lower Athabasca. These species were not utilized commercially until the construction of Alberta Pacific's kraft pulp mill in the early 1990s, which is located just outside the region. Most of the timber in the Lower Athabasca supplies the Alberta Pacific mill, which is one of the world's largest. Timber from the Lower Athabasca also supplies other major sawmills, including Northlands Forest Products Ltd. and Millar Western (Boyle) Forest Products Ltd., which produce dimensional lumber.

Allocation Volumes in Forest Management Units lying partially or entirely within the Lower Athabasca

Forest Management Unit (FMU)	Coniferous Species (m^3)	Deciduous Species (m^3)	Species Total (m^3)
A10	12,800		12,800
A14	286,842	223,365	510,207
A15	540,650	710,348	1,250,998
A9	23,298	18,670	41,968
L1	87,461	177,403	264,864
L3	171,912	98,099	270,011
L8	39,528	65,751	105,279
S22	182,008	376,721	558,729
FMU Totals	1,563,047	2,057,594	3,620,641

Alberta Pacific employs a sustainable forest management approach in its operations, as required by the Alberta government. This means that the amount of timber harvesting is controlled to ensure it does not exceed a sustainable level. Reforestation must take place in all areas where timber is harvested.


NORTHWEST TERRITORIES
SASKATCHEWAN
COLD LAKE
Forest Management Agreement
Km 25 0 25 50 75 100 Km
Metis Settlement
Alberta Pacific Forest Management Area
Provincial Highway
Indian Reserves
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Economic Impact

The forest industry is of economic importance to Alberta. Forestry operations in the Lower Athabasca provide employment opportunities for local residents and are significant contributors to local tax bases. In addition to primary production, the forest industry also contributes to secondary manufacturing in Alberta, including cabinetry, engineered building components and millwork.

- In 2007, total forest product exports from Alberta were valued at $2.4 billion. Major markets for Alberta forest products include the United States, Japan, South Korea and China.[37]
- In 2007, in the Athabasca-Fort McMurray region, primary and secondary employment stood at 2,600 direct, indirect and induced jobs.[38]
- The industry in the Athabasca-Fort McMurray region was responsible for $68.6 million in corporate, personal and local taxes in 2007.[39]

Future Role

A number of recent trends have affected the forest industry's competitiveness.

The forest industry is competing with other sectors for labour and services such as trucking. Operators are facing higher labour and energy costs, and are limited in their ability to pass these costs on to customers. The slowdown in the American housing market has resulted in lower demand for forest products, depressing prices. Although international demand for pulp products remains strong, Alberta producers face rising competition from lower-cost jurisdictions.

Forest companies also face transportation-related barriers. Many forest companies are concerned about the availability of rail service and increasing rail costs due to lack of rail alternatives. In some cases, municipalities that are having difficulty affording road maintenance costs are placing new constraints on roads or insisting that forest companies maintain the roads.

The expansion of the oil sands industry in the Lower Athabasca has also created a growing challenge for forest companies. The two industries have engaged in integrated land management in an effort to coordinate their operations and minimize the industrial footprint (for example, sharing roads to reduce the number of linear features on the landscape). However, the pace of development of both industries has made it increasingly difficult to integrate these different uses.

To address this situation, the Alberta government appointed a Forest Industry Sustainability Committee that submitted a report with 49 recommendations to enhance the industry's competitiveness; government accepted 43 in full or in principle.

The seven strategies contained in the recommendations include planning and management, tenure, strategic costs, infrastructure, energy and the bio-economy, diversification and communication and branding.

The accepted recommendations will support a more competitive business environment that makes the most of timber resources and helps diversify products and markets. They will align legislation, regulations and policy across government to clarify roles and responsibilities; support integrated planning; and lower strategic costs like transportation and energy that affect all industries.

The government's responses involve carrying on with new initiatives already underway, such as the Land-use Framework. They also involve co-ordinated actions by eight Alberta government ministries, which include refining and extending existing policies and practices. The recommendations will help strengthen the livelihoods of the forest industry, the communities they operate in and Albertans who work in the sector.

A growing portion of timber for the region's mills now comes from salvage connected to oil sands and other non-renewable resource developments. Nearly one-third of feedstock to Alberta Pacific's mill will come from salvage operations this year. From a forest management perspective, this timber is out of sequence and can have an impact on fibre quality and costs, labour planning and sustainable management of the forest.

In some cases, reforestation requirements have been waived in areas of the FMA where oil sands extraction operations will take place. This also impacts sustainable forest management. Reclamation of oil sands areas also occurs over a long time horizon, affecting the rate at which reforestation can take place.

Agriculture

Current Activity

Approximately one-third of land in Alberta is used or owned by the province's farmers and ranchers. According to the 2006 Census of Agriculture, farm area in the Lower Athabasca was 452,927 hectares, comprising only five per cent of the region's total land area. The vast majority of this land is located in the southern part of the region; nearly 70 per cent is located in the M.D. of Bonnyville, with the balance largely located in Lac La Biche County (formerly Lakeland County).

There are only 11 farms located in Wood Buffalo. Statistics Canada consolidates farm statistics from Wood Buffalo with those of Lac La Biche County since the representative farm area in Wood Buffalo is so small. The percentage of farm area used for crops is largely consistent

throughout the Lower Athabasca, at around 30 per cent. Approximately 65 per cent of farms in the Lower Athabasca raise livestock, mostly cattle and calves.

	Lac La Biche County & Wood Buffalo	M.D. of Bonnyville No. 87	Total
Total area of farms (hectares)	141,646	311,281	452,927
Total number of farms	349	853	1,202
Avg. area of farms (hectares)	406	365	377
Land in crops (hectares)	41,619	99,656	141,275
Crops as % of total farm area	29.4	32.0	31.2
Total cattle and calves	35,606	94,119	129,725
Total pigs	182	1,162	1,344
Total bison	1,110	3,221	4,331

Source: Statistics Canada, 2006 Census of Agriculture

Farm Finance

While the provincewide trend is towards fewer, larger farms, the Lower Athabasca appears to be resisting this trend. Farming in the Lower Athabasca appears to be characterized by a higher proportion of small- to medium-sized operations. According to the 2006 Census of Agriculture, about 95 per cent of farms in Census Division No. 12[40] reported gross farm receipts of less than $250,000, versus 85 per cent of farms in the rest of Alberta.

Although Alberta's agriculture industry has faced challenges over the past decade, the market value of farm capital in the region has increased. The most significant increases have been in the value of land and buildings, which has nearly doubled in the past ten years. However, the amount of money paid by farms to wages and salaries has decreased. As a share of gross farm receipts, farms in the region have also faced growing operating expenses.

Agricultural activity accounts for approximately two per cent of Alberta's gross domestic product, and the province is a major exporter of agricultural products. Alberta's exports from the agriculture and food and beverage manufacturing sectors in 2007 were valued at $6.6 billion. Wheat, canola seed, beef and live cattle were the largest exports.[41]

Farm Business Trends – Census Division No. 12

	1996	2001	2006
Total farm capital – market value	1,278,302,038	1,754,085,045	2,259,730,798
Total gross farm receipts* – excluding forest products	187,192,075	244,079,976	229,147,608
Total gross farm receipts* – sales of forest products	855,297	519,023	550,827
Total operating expenses in current dollars*	165,506,132	222,154,493	217,287,327
Expenses as % of overall gross farm receipts*	88.4	90.8	94.6
Total wages and salaries paid to all persons*	8,389,448	11,205,734	10,952,400

*For calendar year prior to that census.
Source: Statistics Canada, 1996, 2001, and 2006 Censuses of Agriculture

Future Role

Agriculture is expected to remain a prominent and important land-use in the Lower Athabasca for the foreseeable future.

Over time the number of farms in the region has been slowly decreasing. According to the Census of Agriculture, the number of farms in the Lower Athabasca fell by three per cent between 2001 and 2006. However, the decrease is small compared to the provincewide trend; the total number of farms in Alberta fell by nearly eight per cent over the same time period.

	1996	2001	2006
Total number of farms in LAR	1,349	1,345	1,202
Lac La Biche County	402	373	349
Regional Municipality of Wood Buffalo	*	14	11
MD of Bonnyville No. 87	947	958	853
Total number of farms in Alberta	59,023	53,652	49,431

*Number amalgamated with Lac La Biche County due to confidentiality restraints.
Source: Statistics Canada, 1996, 2001, and 2006 Censuses of Agriculture

The total area of land on farms in the Lower Athabasca has also gradually decreased over time, falling about 10 per cent between 2001 and 2006 – an average of two per cent per year. However, the average farm in the Lower Athabasca has also decreased in size, bucking the provincewide trend towards fewer, larger farms.

	1996	2001	2006
Total number of farms (hectares) in LAR	455,640	502,691	452,927
Lac La Biche County and Wood Buffalo	149,926	156,020	141,646
MD of Bonnyville No. 87	305,714	346,671	311,281
Average area of farms (hectares) in LAR	338	374	376
Lac La Biche County and Wood Buffalo	373	403	406
MD of Bonnyville No. 87	323	362	365

Source: Statistics Canada, 1996, 2001, and 2006 Censuses of Agriculture

The use of farm land in the Lower Athabasca appears to be gradually changing. The shares of farm area used for growing crops or as natural land for pasture have decreased, while the share of farm area used for woodlots and wetlands has been increasing. The total number of pigs and bison raised in the Lower Athabasca has fallen, while cattle and calves have remained relatively steady.

Agriculture Trends – Census Division No. 12

	1996	2001	2006
Total area of farms (hectares)	969,132	1,053,981	996,568
Land in crops (hectares)	360,167	391,685	354,059
As % of total farm area	37.2	37.2	35.5
Natural land area for pasture (hectares)	353,246	382,971	335,670
As % of total farm area	36.4	36.3	33.4
Other including Christmas tree area, woodlands and wetlands (hectares)	103,758	95,942	128,758
As % of total farm area	10.7	9.1	12.9
Total cattle and calves	244,503	294,903	296,023
Total pigs	52,523	26,806	12,710
Total bison	2,687	7,657	5,386

Source: Statistics Canada, Census of Agriculture

Current Activity

Tourism in the Lower Athabasca is primarily based on the many natural attractions within the area including lakes, rivers, forests and natural areas. These natural attractions provide for a range of both guided and unguided tourism activities in the region, including hunting, fishing, ecotourism and other low-impact adventure-based activities.

The natural attractions are enhanced by the various provincial parks and recreation areas located in the Lower Athabasca. These parks and recreation areas provide important staging areas for residents and visitors to explore the region and engage in a range of recreational and ecotourism activities.

Other notable attractions in the area include the Oil Sands Discovery Centre, Fort Chipewyan Bicentennial Museum, the Cold Lake Air Force Museum and a host of other historic sites and museums. In addition, the Lower Athabasca hosts a range of cultural and sporting events.

In recent years, Northern Light tours in the northern part of the Lower Athabasca have been marketed to groups from Asia, as part of a broader provincial travel itinerary. As well, a number of First Nations communities, such as the Mikisew Cree First Nation, have been working to more fully develop their tourism industry potential.

A range of tourism services exists throughout the Lower Athabasca, including hotels, motels, campgrounds, restaurants and automotive and retail services. Hotel operators and other service businesses have benefited from business-related tourism activity, fuelled by resource development industries. Similar to other parts of the province, the region's tourism operators are comprised of many small and medium sized business enterprises.

The accommodation profile indicates there are over 2,800 lodging rooms in the region. These are occupied extensively by workers in the energy sector. If a portion of this inventory was made available on weekends, it would address some of the unmet tourist demand for accommodation during peak seasons.

Economic Impact

Tourism is a leading economic sector in Alberta, generating more than $5 billion annually for Alberta communities and employing 111,000 Albertans across the province.

- Direct visitor expenditures from all tourists (resident and non-residents) in Alberta exceeded $5.16 billion in 2006. These expenditures contributed to a net economic impact (value-added) of $5.52 billion province-wide.

- A total of 111,000 full time equivalent jobs were sustained province-wide in 2006.
- Approximately $2.09 billion in taxation revenues accrued to governments in 2006. This included $1.31 billion to the federal government, $626 million to the Alberta government, and $152 million to municipal governments provicewide.
- Direct visitor expenditures from all tourists (resident and non-residents) attributed to the Lower Athabasca region were estimated at $60.3 million in 2007. These expenditures sustained a provincewide economic impact of $62.1 million, of which $31.5 million was retained in the Lower Athabasca region.
- A total of 725 jobs provincewide were attributed to visitor expenditures in the Lower Athabasca, of which 404 jobs were retained in the Lower Athabasca region.

Future Role

The region's rivers and lakes, and its range of provincial parks and recreation areas, could help the Lower Athabasca develop its tourism potential and diversity its economy.

Land-locked Alberta has fewer quality water-based recreation and tourism than its growing population wants and demands. For example, Edmonton's recent strong growth has increased demand for lake-based destinations with overnight fixed-roof accommodation and camping facilities. The proximity of Lower Athabasca's southern portion to growing population centres like Edmonton means this region is of growing tourism and recreational importance.

Developing the tourism potential of the Lower Athabasca region will help the province reach its target for tourism revenues of $6 million in the next several years.

Other Industry

Electricity

Electrical generation sources in Alberta include coal, natural gas (conventional and cogeneration), fuel oil and renewable (hydro, wind, biomass). The total installed capacity from all these sources is approximately 12,000 megawatts.[42]

There are 14 generation stations in the Lower Athabasca, all of which are thermal electric stations.[43] Most of these facilities have taken advantage of the efficiency gains associated with the use of co-generation technology.

As Alberta moves towards meeting its current and future energy demands and reducing its carbon footprint, renewable energy will encompass a larger portion of energy supply in the province.

The Lower Athabasca has large potential for hydroelectric power. There may also be potential for bioenergy power generation associated with the forest industry, and for geothermal power generation associated with bitumen extraction and conventional natural gas production.

Industrial Minerals

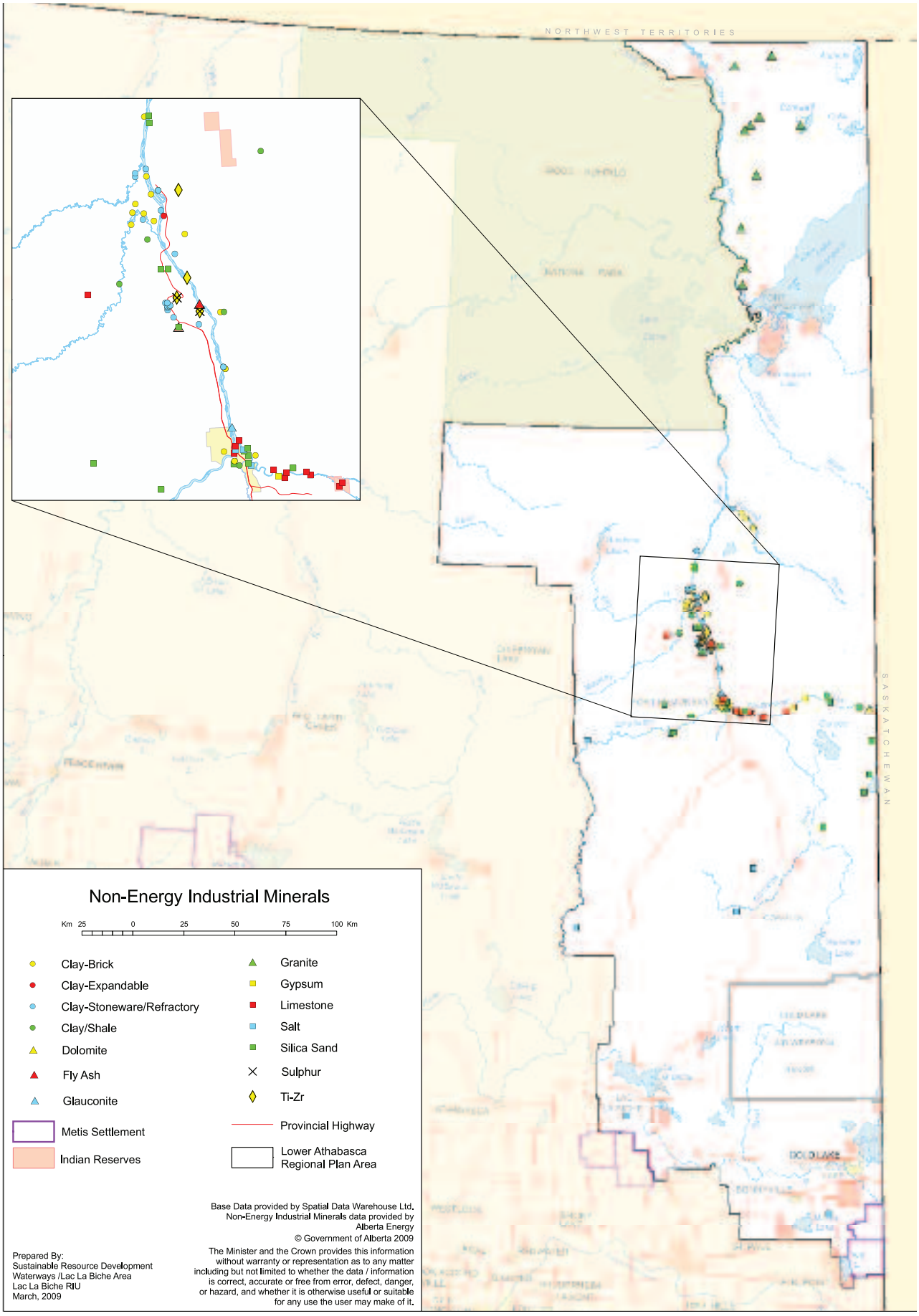
Industrial materials include building stones such as limestone, sandstone and granite; and minerals such as gypsum, salt and sulphur. They are used in agriculture, the natural resource sector, manufacturing and chemical processes. As resource development increases across Alberta, industrial minerals are expected to be in greater demand.

In the Lower Athabasca there is currently one quarry of limestone, located near Fort MacKay, which opened in December 2005. An average of one million tonnes of limestone is extracted each year. Another proposed limestone quarry sits immediately south of the existing quarry and is expected to produce six million tonnes of limestone each year.

Aggregate Mining

Aggregate includes sand, gravel and crushed stone, clay and shale. These products are used to make a variety of ceramic products, such as bentonite clay used by the oil and gas sector for drilling mud. Aggregate products are also used in road and building construction.

A variety of sand and gravel deposits are located in the Lower Athabasca. Development of these sources is expected to increase as Alberta's economy grows.


NORTHWEST TERRITORIES
SASKATCHEWAN
Non-Energy Industrial Minerals
Km 25 0 25 50 75 100 Km
Clay-Brick
Clay-Expandable
Clay-Stoneware/Refractory
Clay/Shale
Dolomite
Fly Ash
Glauconite
Granite
Gypsum
Limestone
Salt
Silica Sand
Sulphur
Ti-Zr
Metis Settlement
Indian Reserves
Provincial Highway
Lower Athabasca Regional Plan Area
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Waterways /Lac La Biche Area
Lac La Biche RIU
March, 2009

Ecosystems and Environment

Almost entirely covered by Boreal forest, the Lower Athabasca is characterized by large tracts of forest, vast water sources and a range of fish and wildlife. This natural capital contributes to the health and social wellness of Albertans.

Minimizing the environmental impacts of population growth and economic growth will be an ongoing challenge as the Lower Athabasca realizes further development in the future.

Ecosystems

Natural Regions and Natural Subregions are the broadest levels of ecological classification of Canada's complex landscape. They define areas that have similar qualities and attributes. This does not mean, however, that conditions within a region or subregion are identical throughout. Each is home to diverse species and landscape conditions.

The Lower Athabasca spans two natural regions: the Boreal forest and the Canadian Shield.

Boreal Forest Natural Region

The vast majority of the Lower Athabasca is within the Boreal forest, which is characterized by deciduous, mixedwood and coniferous forests interspersed with extensive wetlands, lakes and streams. The Boreal forest Natural Region sees long, cold winters and relatively short summers. It is Alberta's largest natural region, covering 58 per cent of the province, and it includes eight diverse natural subregions. Each natural subregion is generally characterized by distinctions in vegetation, climate, elevation and physical geography.

Within the Lower Athabasca, seven of the eight boreal natural subregions are represented. These range from the warm Dry Mixedwood Subregion in the southern part of the Lower Athabasca, with aspen-dominated forests and cultivated areas; to the remote and very cold Northern Mixedwood Subregion by the Alberta-Northwest Territories border, which is home to wetlands and permafrost.

The Peace-Athabasca Delta is a notable subregion of the Boreal forest. The Peace-Athabasca Delta is the largest boreal freshwater delta in the world and an important nesting and staging area for many waterfowl.

Boreal Forest Natural Region

Subregions:
Athabasca Plain
Central Mixedwood
Peace-Athabasca Delta
Upper Boreal Highlands
Lower Boreal Highlands
Northern Mixedwood
Dry Mixedwood

Canadian Shield Natural Region

The Canadian Shield extends into the Lower Athabasca in the far northeast corner of the province. It covers only 1.5 per cent of the total area of the province, with an average elevation of 275 metres. This limited area represents the westernmost edge of the vast Canadian Shield, and includes only a single natural subregion known as the Kazan Uplands.

The Kazan Uplands are largely characterized by rocky exposures and coarse glacial deposits. Sixty per cent of the landscape is exposed Precambrian bedrock. There are dozens of small lakes and some stands of jack pine, aspen and birch trees in places where there is sufficiently deep soil. Influenced by polar weather systems, this is the coldest natural subregion in Alberta; it experiences long winters and snowfall accounts for 40 per cent of annual precipitation.

Canadian Shield Natural Region

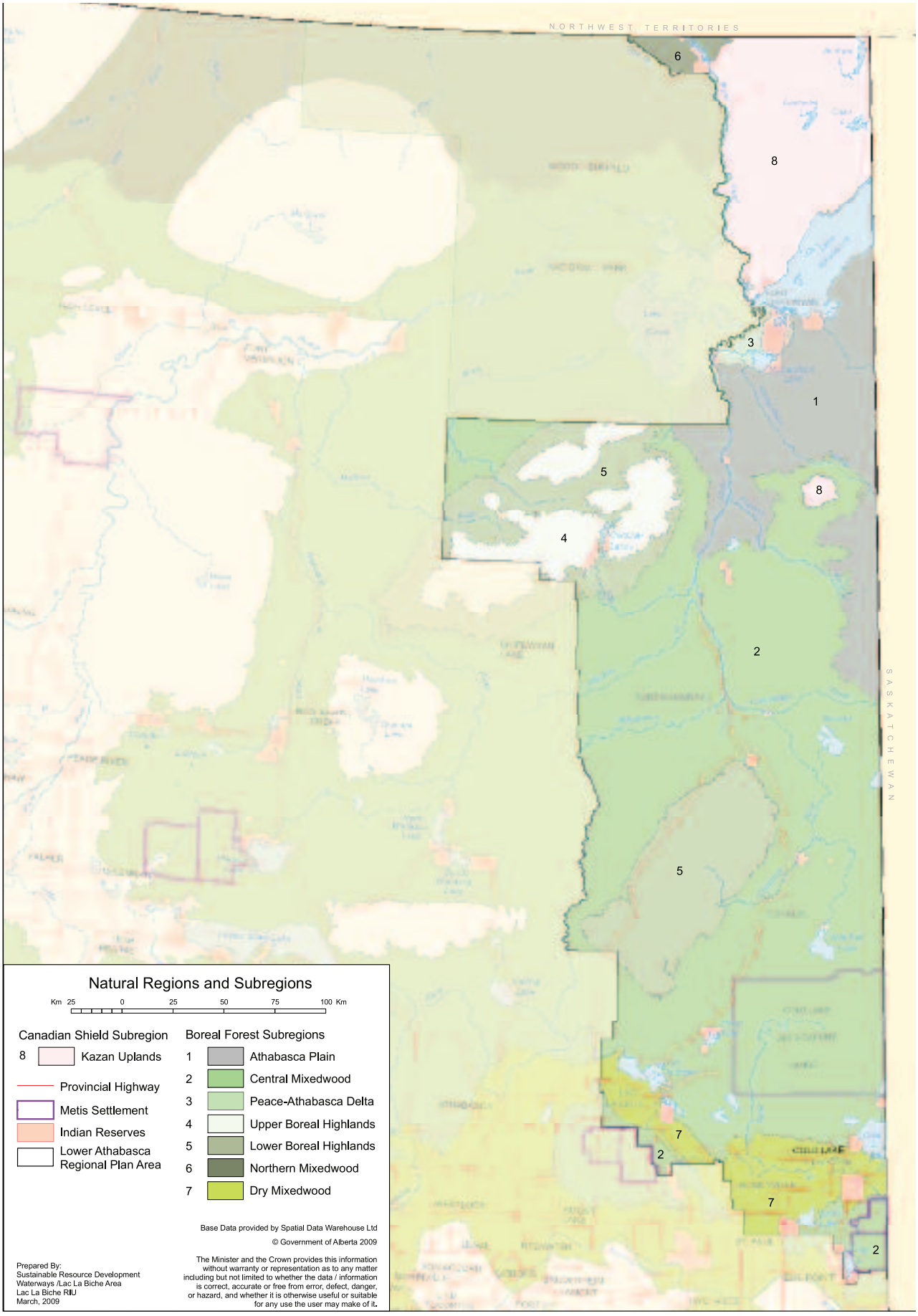
Subregions:
Kazan Uplands

Water

Watersheds

Alberta is divided into seven major river basins. The Lower Athabasca spans the catchment areas for three of these basins

- Athabasca River Basin – This basin comprises most of the land area of the Lower Athabasca. Originating from the Rocky Mountains, the Athabasca River flows northeast through the province, running a total length of 1,400 kilometres. The basin includes the McLeod, Pembina and Clearwater rivers. Flows from the basin eventually make their way to the Arctic Ocean. In the Lower Athabasca, it flows past Fort McMurray prior to emptying into Lake Athabasca. Oil sands developments are the largest industrial pressure on this basin; other pressures include forestry and municipal uses.
- Beaver River Basin – This basin is one of the smallest in the province, and the Alberta portion of the basin lies entirely within the southern part of the Lower Athabasca. The Beaver River originates in the Lower Athabasca at Beaver Lake and flows through the urban areas of Bonnyville and Cold Lake. The basin and river both extend east across the provinces of Saskatchewan and Manitoba, eventually emptying into Hudson's Bay. The Cold Lake Area Weapons Range comprises the majority of the northern part of the basin. Major pressures on the basin include: the oil sands, forestry and agriculture industries; municipal use; and recreation.


NORTHWEST TERRITORIES
SASKATCHEWAN
6
8
3
1
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8
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5
7
2
7
2
Natural Regions and Subregions
Km 25 0 25 50 75 100 Km
Canadian Shield Subregion
8 Kazan Uplands
Provincial Highway
Metis Settlement
Indian Reserves
Lower Athabasca Regional Plan Area
Boreal Forest Subregions
1 Athabasca Plain
2 Central Mixedwood
3 Peace-Athabasca Delta
4 Upper Boreal Highlands
5 Lower Boreal Highlands
6 Northern Mixedwood
7 Dry Mixedwood
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- Peace/Slave River Basin – The Peace River originates in British Columbia and flows 2,357 kilometres through British Columbia and Alberta, emptying into the Slave River. Only a portion of the overall basin is located in the Lower Athabasca. Water uses of this basin in the Lower Athabasca are negligible.[44]

Water Management

Under Alberta's *Water Act*,[45] the use of surface water and groundwater is regulated through a system of water licences issued by Alberta Environment. Municipalities, private companies, individuals and others can apply for permission to use water for drinking, irrigation, industrial processes or other uses. Under the terms of the licence, the user is allocated a maximum volume of water that can be used.

Licence allocations only indicate maximum water volumes allowed for a specific use. They do not measure the water actually used (often less than allocated), or water recycled back into the basin. Water allocations are a general measure of the degree of pressure being placed on a water basin.

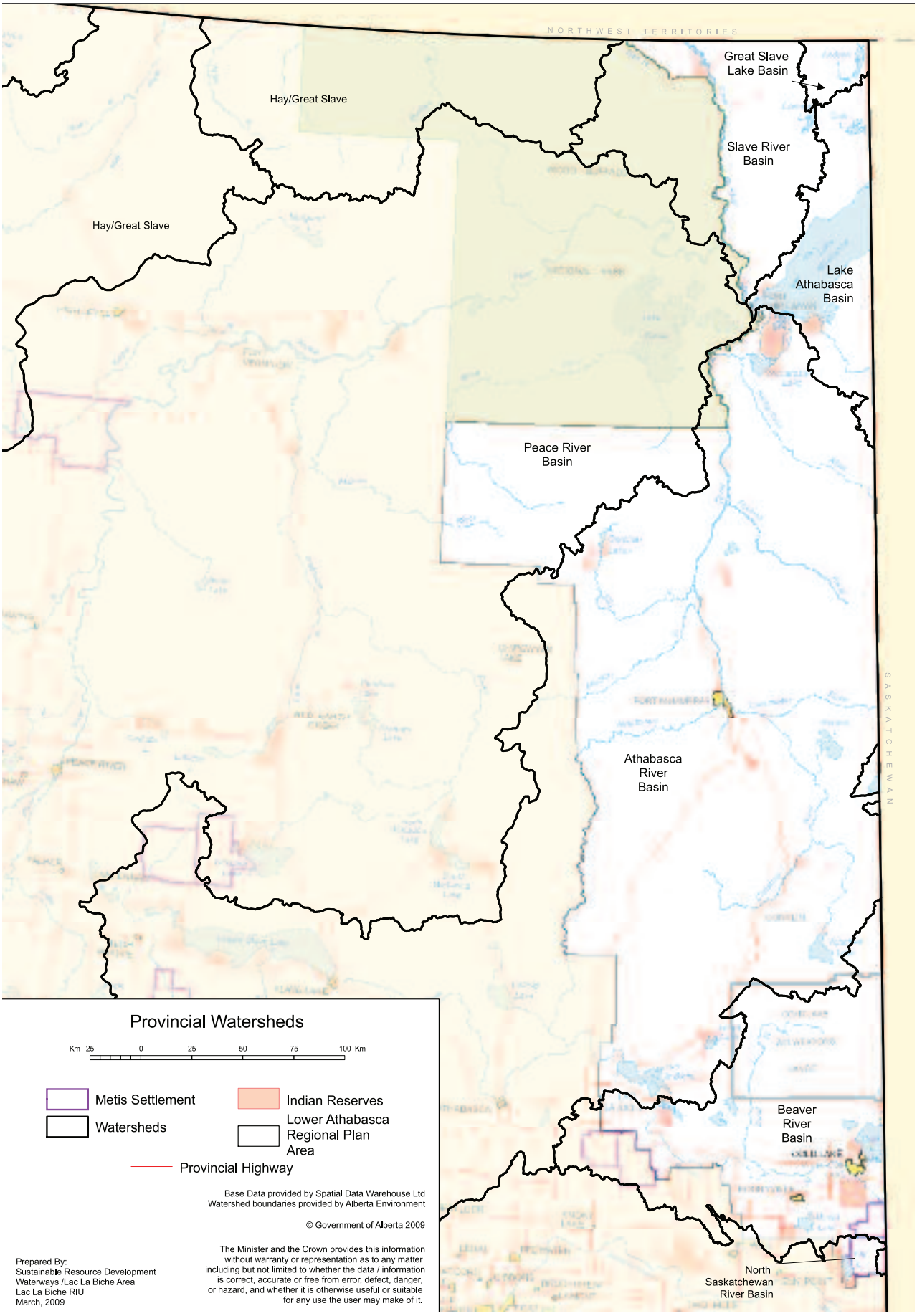
Despite growing use, the Athabasca River Basin is one of Alberta's least-used water basins. As of 2006, 3.9 per cent of the average natural supply of water in the basin had been allocated, including all allocations to oil sands projects and other industrial users.

Allocations of the Athabasca River Basin grew steadily until 2000, but have accelerated in recent years. This is mostly due to licences granted in connection with oil sands development.

A greater portion of the Beaver River Basin is allocated. Since 1990, allocations to the oil and gas sector increased, and all allocations have increased gradually since 2000.[46] Today, 10.5 per cent of the basin's water is allocated.

While growing water allocations reflect the increase in the number of oil and gas projects, the volume of fresh water actually used per project is declining. Oil sands facilities have been working to reduce their use of fresh water, and today many oil sands projects recycle up to 90 per cent of the water they use.[47]

Growth in water allocations for other sectors has also occurred in both basins. Allocations for municipal uses have notably increased in the Athabasca River Basin, reflecting population growth.


NORTHWEST TERRITORIES
Great Slave Lake Basin
Hay/Great Slave
Slave River Basin
Hay/Great Slave
Lake Athabasca Basin
Peace River Basin
SASKATCHEWAN
Athabasca River Basin
Beaver River Basin
North Saskatchewan River Basin
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Water Quality

The Athabasca River runs through a portion of the province known for its natural bitumen (oil sands) deposits. These deposits result in a natural presence of several metals, hydrocarbons and polycyclic aromatic hydrocarbons in the river's water and sediments. Current data show these levels are similar to historic data,[48] showing that oil sands activities have had no measurable impact on water quality. In fact, water quality of the Athabasca River has recently been assessed as excellent.[49, 50]

In a number of tributaries to the Athabasca River, the concentrations of metals, hydrocarbons and PAHs occasionally exceed sediment guidelines. However, these are also considered naturally occurring.[52] There have also been no overall changes in the water chemistry of lakes in the Wood Buffalo oil sands area.[53]

Water quality of the Beaver River is considered fair, due to high metal and nutrient levels and low dissolved oxygen levels.[54] Low dissolved oxygen levels have been documented during periods of ice cover and are likely the result of natural conditions. Wastewater effluent appears responsible for some instances in which metals exceeded recommended levels. Increased agricultural activity and fertilizer application[55] appear to have increased the nutrient concentrations of the river and several lakes. Wastewater effluents also enrich surface waters, but improved treatment appears to be reversing this impact.[56]

An initial qualitative assessment has ranked the quality of the Slave River as fair.[57] The flows of the Slave River are influenced by those of the Peace River, which have been changed by the Bennett Dam in British Columbia. The Slave River's winter low flows have increased, and its spring and summer peak flows have decreased. This has increased the natural sediment load of the river.

Pressures on Water

A number of factors place pressure on the quality and quantity of surface water and groundwater sources in the Lower Athabasca. Aside from the pressures associated with direct use of water, pressures placed on wetlands, riparian areas and air quality can have effects on water. For example, pollutants sent into the air fall as acidic deposits into rivers, lakes and wetlands.

Riparian areas and wetlands stabilize stream banks and shores of lakes, helping prevent erosion. They also provide valuable wildlife habitat and serve as valuable filters, trapping sediment and nutrients in ways that improve water quality. Pressures on riparian areas can therefore affect water quality.

Various activities exert these pressures:

- Energy – Oil sands developments continue to lower their fresh water use, through recycling and by shifting to water from deep

saline formations that are otherwise unusable. However, surface water and groundwater remain important sources for these operations. Increased withdrawals from small streams and water bodies during winter months have the potential to impact resident fish. In some cases, mine-based projects may re-route creeks and streams, change drainage patterns and remove wetlands. Seismic exploration and construction of oil sands-related infrastructure can also increase erosion, impacting water habitats.

- Municipal development – Most of the surface water and groundwater withdrawn for domestic use is returned to the basin, but is not always of the same quality or returned to the same place. Wastewater effluent is higher in temperature, organic material, nutrients and bacteria than the original water withdrawn.
- Forestry – Forests efficiently cycle water; streams that drain from undisturbed forest generally have high water quality. Forestry operations can increase runoff and result in higher concentrations of nutrients in streams and lakes. Stream crossings related to timber harvesting can increase the risk of soil erosion. Timber harvesting near streams can raise the temperature of the streams due to removal of the forest canopy, affecting aquatic life. For these reasons, current timber harvesting regulations require that a protecting buffer of treed vegetation be kept.
- Agriculture – Land clearing for agriculture can lead to soil erosion and higher sediment due to surface runoff. In the Lower Athabasca, direct seeding and a high percentage of woodlots and grasslands for forage reduce the risks to soil erosion and sediment runoff. Agriculture operations also withdraw water for stock watering and irrigation, with little water return.
- Climate change – Longer ice-free periods in winter and less snow available for melting and runoff can contribute to more variable hydrology in the water basins and may lead to higher agriculture capability for this region in the future. The average annual flow of the Beaver River and the water levels of several lakes have fallen; these changes appear to be mostly due to climate change.

Water Policies

Since 2003, *Water for Life: Alberta's Strategy for Sustainability* was the vehicle for managing Alberta's water resources. In the renewed 2008 strategy, *Water for Life: A Renewal*, the Government of Alberta reaffirms its commitment to the *Water for Life* approach of wisely managing Alberta's water quantity and quality for the benefit of Albertans now and in the future. It also reaffirms three goals: safe, secure drinking water supply, healthy aquatic ecosystems, and reliable quality water supplies for a sustainable economy.

The renewed strategy accelerates action to safeguard Alberta's water sources, ensuring integration of watershed planning with regional planning under the *Land-use Framework*. It sets clear direction and action for improved watershed management in Alberta, and it outlines the need to take action on a number of fronts, including:

- regional drinking water and wastewater solutions;
- aquatic ecosystem health;
- viable governance system that supports sustainable management of surface and groundwater; and
- water monitoring, evaluation and public reporting.

A detailed action plan will be released in 2009.

Water for Life includes water conservation objectives for all water basins in Alberta. It sets a medium-term goal of ensuring that by 2015, overall efficiency and productivity of water use in Alberta improves by 30 per cent from 2005 levels.

In response to growing oil sands activity in the Lower Athabasca, Alberta Environment has also put in place the *Athabasca River Water Management Framework*. Developed in conjunction with industry, First Nations, environmental groups and other stakeholders, the framework sets maximum amounts of water that can be withdrawn from the Athabasca River.

Under the framework, all oil sands operators – whether new or existing – must work together to share the water resources of the Athabasca River within prescribed limits. Water restrictions are set weekly to accommodate changes in the river's flow. During periods of low river flow, Alberta Environment restricts the total amount of water that may be used by oil sands facilities.

Another key water framework is the *Cold Lake-Beaver River Water Management Plan*, originally adopted in 1985 and updated in 2006. It is an authorized water management plan under the *Water Act* and provides management guidelines and recommendations to guide day-to-day decision-making under the *Water Act* and the *Environmental Protection and Enhancement Act*.[58] Recommendations are made on three main themes: water supply and demand; surface and groundwater quality; and strategies for the protection of aquatic resources. Some of the recommendations are regulatory, whereas others are related to best management practices.

Alberta's strategic plan for the oil sands, *Responsible Actions*, sets an objective of maximizing water conservation, efficiency and productivity in the mineable oil sands sector to the lowest water use achievable.[59] It also calls for the amount of fresh and saline groundwater available in the oil sands regions to be identified, in order to ensure water supplies are managed in a sustainable way.[60]

Biodiversity

Biodiversity refers to the variability among living organisms. It is the foundation of healthy ecosystems, serving important functions such as the production of oxygen, control of flooding and erosion, natural pest control and pollination. Without biodiversity, humans could not survive.

Alberta is home to more than 80,000 species. The vast majority are arthropods (e.g., insects, arachnids and others), fungi and algae. Less than two per cent are vertebrates such as fish and wildlife. Though all species play important roles in ecosystem function, vertebrates are also the most publicly visible and therefore typically the species that are assessed and legally designated.

Fish and Wildlife

There are 28 species of fish in the Lower Athabasca — a mix of cool-water species such as walleye and northern pike and cold-water species such as lake trout. The major water basins in the Lower Athabasca are important over-wintering, spawning and rearing grounds for fish in the region.

Wildlife in the Lower Athabasca includes a wide range of game species and resident and migratory birds. The region plays a vital role for Alberta wildlife, serving as breeding grounds and staging areas during migration and over-wintering. The relative inaccessibility that has historically characterized the Lower Athabasca has also made it home to several species that are particularly sensitive to human disturbance.

The region has also played an historic role in hunting and trapping activities, by aboriginal people and European settlers alike. Today at least six mammal and 22 bird species are hunted and another 22 mammals are trapped in the region. At least 14 mammal species in the Lower Athabasca have pelts considered valuable as fur.

Plant Biodiversity

More than 500 species of vascular plants can be found in the Lower Athabasca area, along with numerous species of mosses, lichens and fungi that are distinctive to the Boreal forest. Extensive peatland areas are characterized by abundant mosses that accumulate over many years; this leads to the creation of a carbon sink that covers the forest floor in much of the wetter and more open forests. Vegetation supplies important food sources for numerous wildlife species as well as food and medicines for First Nations residents.

Aside from the typical tree species of the Boreal forest (which are referenced under the Forestry resource section), there are numerous shrub species which contribute to structural diversity of the forests. Notably, willow and alder species, dwarf birch, common wild rose, red-osier dogwood, wild red raspberry, high and low-bush cranberries

Major mammals and game birds in the Lower Athabasca

Mammals

American Marten
Beaver
Black Bear
Canada Lynx
Coyote
Fisher
Grey Wolf
Mink
Moose
Muskrat
Mule Deer
Northern River Otter
White-tailed Deer

Game birds

American Coot
Canada Goose
Duck (various species)
Greater White-fronted Goose
Ross's Goose
Snow Goose
Wilson's Snipe

and common Labrador tea are familiar to naturalists and other visitors to the forests. Some species of lesser physical stature, yet important to the forest ecology, include twinflower, bunchberry, common fireweed, horsetail, northern green bog orchid, Solomon's seal, bog cranberry, common cloudberry, sedges and grasses.

The variety of plant species support a substantial invertebrate community that in turn fertilizes many plants and feeds the frogs and birds as part of their role in sustaining a dynamic forest landscape. The insects and other invertebrates also participate with the fungi as important decomposers of the old wood of expired trees.

Federally designated species at risk that occur in the Lower Athabasca

Canada Warbler
Threatened

Common Nighthawk
Threatened

Olive-sided Flycatcher
Threatened

Shortjaw Cisco
Threatened

Wood Bison
Threatened

Woodland Caribou
Threatened

Whooping Crane
Endangered

Piping Plover
Endangered

Species at Risk

When a species is lost, biodiversity as a whole is affected and ecosystem function is disrupted. The federal government, under the *Species at Risk Act*, and the Alberta government, under the *Wildlife Act* and the Accord for the Protection of Species at Risk, both play roles in preventing the extirpation or extinction of species and providing for the recovery of species that are extirpated, endangered or threatened.

A species that is **extirpated** is considered to no longer exist in the wild in Canada, but exists in the wild elsewhere. An **endangered** species is one that is facing imminent extirpation or extinction. A designation of **threatened** means that a species is likely to become endangered if nothing is done to reverse the factors leading to its decline in numbers.

At the federal level, species are assessed by the Committee on the Status of Endangered Wildlife. This committee has designated two endangered species and six threatened species that occur in the Lower Athabasca.

At the provincial level, the Endangered Species Conservation Committee provides advice to the Minister of Sustainable Resource Development about species at risk. This includes recommendations on legal designations and the implementation of recovery programs.

As of 2007, eight species were legally designated under Alberta's Wildlife Act as threatened or endangered. In addition to these, Alberta has also denoted several species as "May Be At Risk"; these species may face extirpation or extinction and are candidates for detailed risk assessment.

Alberta has also denoted several species as "Sensitive." These species are not facing extirpation or extinction, but may require protection to avoid becoming a species at risk. As of 2005, 17 of these species had significant portions of their ranges within the Lower Athabasca.

Alberta's approach to species at risk planning and recovery uses scientific expertise and input from land owners, managers and users to determine the best approach for ensuring species-specific recovery plans are relevant and practical.

Recovery plans for species at risk are designed, in part, to curtail activities that are detrimental to the species. As part of implementing recovery plans, certain uses of land may be limited, reduced or subject to new conditions. It is therefore in the interests of all land users to ensure their activities do not negatively impact biodiversity.

Pressures on Biodiversity

Major pressures on biodiversity include natural and human-related factors. Each can individually have a negative impact on species diversity. The cumulative effects of these factors can greatly alter ecosystem function.

- Natural disturbances – Wildfires, extreme weather and outbreaks of insect pests can affect forest structure, creating variability in habitats and landscapes. Species have evolved in ways that enable them to recover from natural disturbances. Human disturbances, however, may place species in positions where they are less likely to recover.
- Habitat alteration – The greatest threat to species are disturbances that damage or alter their natural habitats, forcing them outside of their normal range of variability. Fragmentation of the landscape can be caused by resource development, forestry, agriculture and urban development.
- Hunting, trapping and fishing – These are historically important cultural and trade-related activities in Canada. However, the growth of linear features from economic development, combined with population growth, has facilitated easier access and an increase in these activities.
- Pollution – Releases of toxic substances can originate from activities by industry, agriculture and even the general public. Pollutants that enter the air or water can be more broadly dispersed, affecting species over large geographic areas.
- Non-native species – Invasive species not native to the regional ecosystem often have few natural predators or parasites. They can become superior competitors over native species for space, food, nutrients and water.
- Climate change – The effects of climate change are not yet fully known, but they have the potential to affect biodiversity. Climate change may accentuate human-related disturbances.

Alberta's strategic plan for the oil sands, *Responsible Actions*, addresses the need for increased conservation and protected areas to maintain biodiversity in the oil sands areas.[63] The plan calls for the review and establishment of protected areas that allow for multiple uses and the establishment of a conservation offset program to secure high-value conservation lands.[64]

Provincially designated species at risk that occur in the Lower Athabasca

Northern Leopard Frog
Threatened

Peregrine Falcon
Threatened

Trumpeter Swan
Threatened

Shortjaw Cisco
Threatened

Woodland Caribou
Threatened

Whooping Crane
Endangered

Piping Plover
Endangered

Biodiversity Monitoring

To address the challenge of determining whether biodiversity is being sustained, a group of scientists, land-managers and government officials began developing the Alberta Biodiversity Monitoring Institue (ABMI) in 1997. Today, the ABMI is the most rigorous and broadly supported biodiversity monitoring program in the world.

Between 2003 and 2006, the ABMI conducted field testing of biodiversity monitoring protocols. Since 2007, the ABMI has been monitoring Alberta's biodiversity. The ABMI collects a wide range of data across Alberta, including information on terrestrial and aquatic habitats, physical structures and individual species. Using a rigorous and impartial scientific approach to evaluate this data, the ABMI will help inform policy makers and resource managers about the cumulative effects that various impacts are having on the province's biodiversity.

Air and Emissions

Air Quality

In Alberta, air quality is monitored by a comprehensive network of stations operated by Alberta Environment, air quality management zones, Environment Canada and industry stations.[65] The air quality management zones, or airsheds, in the Lower Athabasca include the Wood Buffalo Environmental Association and the Lakeland Industry and Community Association.

From a human and ecological health standpoint, the primary air pollutants of concern are sulphur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ground-level ozone, hydrogen sulphide (H_2S), fine particulate matter, metals and polycyclic aromatic hydrocarbons (PAHs).

Above certain exposure thresholds, these substances can adversely affect human and ecological receptors and even disrupt ecological processes and systems. Impact pathways can be direct (e.g., inhalation) or indirect. For example, SO_2 and NO_x contribute to acid rain, which then acidifies soil and surface water; high levels of NO_x and VOCs contribute to the production of ozone, a major component of smog. Effects range considerably from nuisance odours (e.g., H_2S) to increased risk of cancer (e.g., PAHs).

The Air Quality Index (AQI) provides a measure of outdoor air quality. The AQI is calculated from ambient measurements of carbon monoxide, fine particulate matter, nitrogen dioxide, ozone and sulphur dioxide. Under the AQI, air quality is rated as good, fair, poor or very poor.

Between 1997 and 2008, the AQI has been rated "good" more than 95 per cent of the time, based on monitoring in Fort Chipewyan, Fort McMurray, Fort MacKay, Anzac, Cold Lake and the Syncrude oil sands site.

Air pollutant levels measured at all monitoring stations in the Lower Athabasca have all remained below annual average Alberta Ambient Air Quality Objective (AAAQO) levels. However, some pollutants have exceeded their one-hour or 24-hour AAAQO levels.

Hydrogen Sulphide

The ambient air quality monitoring for hydrogen sulphide/total reduced sulphur saw many exceedances of the AAAQO levels in the last couple of years, at both industry monitoring stations[66] and community stations.[67] In 2007, Alberta Environment issued Environmental Protection Orders to both Suncor Energy Inc. and Syncrude Canada due to ground-level concentrations of H_2S being exceeded, as well as complaints of odours related to H_2S and ammonia. The Alberta government is working with these operators to resolve these air quality issues.

In the Regional Municipality of Wood Buffalo, there have been very few statistically significant trends observed in annual ambient air quality averages. Annual average hydrogen sulphide (H_2S) levels show no statistically significant trends even though there was a rise in H_2S levels in 2006 over previous years.

The Alberta government will undertake enforcement activity when ground level concentrations of H_2S exceed accepted hourly and 24-hour levels. This has included issuing environmental protection orders in order to reduce emissions of H_2S, after hourly and 24-hour levels were exceeded at monitoring sites near oil sands upgraders and mines.

The Alberta government has been monitoring annual ambient air quality averages in the Cold Lake and Lac La Biche areas for two years, so there is not yet enough information to analyze trends.

Ozone

Annual average ozone levels show no significant trends. Levels of ozone are higher at Fort Chipewyan than the other sites, which is most likely due to the lower NO_x levels resulting in less removal of ozone from the air.[68]

There are provincial frameworks in place to manage air quality, including the *Alberta Acid Deposition Management Framework*, and the *Particulate Matter and Ozone Management Framework*. The Cumulative Environmental Management Association in Wood Buffalo has also developed regional frameworks related to management of ozone, acid deposition and trace metals, which have been accepted by the Government of Alberta.

Greenhouse Gas Emissions (GHG)

The Lower Athabasca represents the province's fastest growing regional source of GHG emissions. In 2008, industrial facilities in the Lower Athabasca were responsible for approximately 43.4 megatonnes of emissions, accounting for about 15 per cent of the province's total GHG emissions.

This is largely due to the growth in oil sands development in the Lower Athabasca. Bitumen extraction operations use large amounts of thermal energies, such as steam, to separate bitumen from sand. Natural gas is combusted in boilers, cogeneration and other facilities to generate this thermal energy, resulting in GHG emissions. Upgraders in the Lower Athabasca also generate GHG emissions.

Currently, the largest source of GHG emissions in the province is coal-fired electrical generation facilities. However, if forecast expansion in oil sands development occurs, then under a business-as-usual scenario (i.e., without step changes in technologies) the oil sands industry will become the largest source of Alberta emissions in the next 10 to 15 years.

It is important to note, however, that the oil sands industry has dramatically reduced its GHG emissions intensity – that is, the level of emissions per unit of production. Per barrel of bitumen, carbon dioxide emissions from the oil sands have been reduced approximately 45 per cent since 1990.

Oil sands companies, along with the Alberta government, are also investing heavily in research and development aimed at further reducing emissions through technological improvements.

Climate Change Strategy

Alberta has been a leader in addressing climate change. Alberta was the first province in Canada with a comprehensive climate change action plan in 2002. In 2007, Alberta became the first jurisdiction in North America to legislate GHG reductions on large industrial facilities, including oil sands facilities. In the first compliance period (July 2007 to December 2007), companies made 2.6 million tonnes in actual reductions.

Alberta updated its *Climate Change Strategy* in 2008.[69] The updated strategy sets a goal of reducing Alberta's total emissions by 200 megatonnes by 2050. The plan is based on three pillars of action:

- Improving energy conservation and efficiency to reduce the amount of carbon Albertans use;
- Producing energy in greener ways, through technology improvements and the development of energy alternatives; and
- Implementing carbon capture and storage (CCS) to prevent the release of greenhouse gas emissions into the atmosphere.

Of the overall 200 megatonne reduction target, it is expected that CCS will account for 139 megatonnes of reductions. Much of this reduction is expected to come from the application of this technology to oil sands development, including upgrading and refining.

Work on CCS is ongoing. The Alberta government has appointed an Alberta Carbon Capture and Storage Development Council, comprised of members from government, industry and the scientific community, to guide the implementation of CCS. The government has also committed $2 billion of investments to encourage construction of Alberta's first large-scale CCS projects.

Land

Reclamation

Under *Alberta's Environmental Protection and Enhancement Act* and associated regulations, operators are required to conserve or reclaim specified land in accordance with standards set by the Alberta government. Alberta was the first province in Canada to legislate mandatory land reclamation.

The purpose of conservation and reclamation is to return specified land to an equivalent land capability.[70] This means returning the land to a state that is capable of supporting the same types of uses as prior to disturbance. All areas in Alberta that have been disturbed by industrial development must be reclaimed.

In the Lower Athabasca, oil sands and natural gas development activities have disturbed the land to varying degrees. The long time horizons of resource development projects mean that reclamation activities will take place over the medium- to long-term. Companies are expected to reclaim land as operations proceed, so as to minimize their industrial footprints.

On a province wide basis, about 65 square kilometres of land disturbed by oil sands mining was undergoing reclamation as of 2006. Most of this reclamation has been undertaken by Suncor Energy Inc. and Syncrude Canada Ltd.; both of these operations are located in the Lower Athabasca. Over time, the amount of area undergoing reclamation by oil sands mining companies has been growing.

The use of land for oil sands developments has also been growing as new projects have been constructed. About 530 square kilometres of land has been disturbed by oil sands mining. By law, all of this area will ultimately be reclaimed, enabling it to be used for other purposes including conservation or recreation.

A major land reclamation issue in the Lower Athabasca concerns oil sands tailings, which are a byproduct of oil sands mining. Tailings are generally composed of water, sands, silt, clay and residual bitumen.

In February 2009, the Energy Resources Conservation Board issued a directive setting out new requirements regarding the management of oil sands tailings.[71] Under the new directive, oil sands operators must prepare tailings plans and report on tailings ponds annually and are expected to reduce the accumulation of fluid tailings.

The directive also requires operators to specify dates for construction, use and closure of fluid tailings ponds deposits and file these dates with the Energy Resources Conservation Board by September 30, 2009.

Alberta's strategic plan for the oil sands, *Responsible Actions*, also sets out objectives regarding the reclamation of oil sands projects, including:[72]

- A requirement that tailings be reclaimed at the same rate or faster than the production of new tailings, on a regional basis;
- A requirement that land disturbed by oil sands projects be reclaimed and certified in a timely manner;
- A requirement that project reclamation milestones and requirements be met as condition of further oil sands development; and
- The enhancement of oil sands mining liability management programs, to further protect Albertans from financial liabilities of reclamation.

Companies, research institutions and the Alberta government are all participating in research aimed at improving reclamation outcomes, including tailings research and wetlands reclamation.

Historical Resources

Historical Resources Act

Alberta Culture and Community Spirit administers the *Historical Resources Act*,[73] which applies to all lands within provincial jurisdiction, both publicly and privately owned. Among its provisions are Ministerial powers to protect historic resources from adverse effects as a result of land development. Historical resources include archeological and paleontological sites, traditional aboriginal cultural use locations, built heritage and other significant localities.

Analogous to the environmental impact assessment process, the Minister of Culture and Community Spirit has the power to require that any proposed activity likely to threaten the integrity of a historic resource be preceded by a Historic Resources Impact Assessment. Once an assessment has been submitted to Alberta Culture and Community Spirit, the Minister may require avoidance of the threatened historic resource or allow the historic resource to be

destroyed after sufficient study. The proposed activity may proceed only after the Minister has issued clearance under the *Historical Resources Act*.

Designated Historical Resources

The highest level of protection under the *Historical Resources Act* is Provincial Historical Resource designation. Several sites within the Lower Athabasca have been so designated. These include:

- several fur-trade or religious mission properties associated with the Portage La Biche and Lac La Biche Trail;
- the Frog Lake historic site;
- two churches and a fur trade post near Fort Chipewyan;
- three highly significant archeological sites; and
- Bitumount, an early oil sands extraction plant site in use from the 1920s to the 1950s, near Fort McKay.

Provisions within the *Historical Resources Act* enable municipalities to designate and preserve resources of regional significance as Municipal Historic Resources. Alberta Culture and Community Spirit's Municipal Heritage Partnership Program provides advice and cost-shared support to Alberta municipalities to aid them in the protection and conservation of locally significant historic places.

Sites that are candidates for either Provincial or Municipal Historical Resource designation can be designated as Registered Historical Resources. The Destrubé House near Bonnyville is a Registered Historical Resource representing the early homesteading period of that area.

Archeological Sites

Approximately 25 highly significant archeological sites are found in the Lower Athabasca, including the Quarry of the Ancestors, a quarry for suitable stone tool-making material exploited most intensely between 6,000 and 10,000 years ago. This site is in the final stages of designation as a Provincial Historical Resource.

Largely as a result of impact assessments carried out in advance of oil sands development within the Lower Athabasca, more than 700 archeological sites have been recorded that have significant cultural deposits and will require avoidance or further scientific investigation.

Almost 1,500 more have been discovered, evaluated and determined to have no further scientific value beyond that gleaned by evaluation and by their distribution on the landscape as it relates to ancient settlement patterns. The impressive numbers of sites notwithstanding, only a very small fraction of the Lower Athabasca has actually been investigated by archeologists.

Significant fossils finds have been found where the rivers in the Lower Athabasca cut deep, exposing ancient rock. These include the Athabasca, Clearwater, Beaver and Christina rivers. In addition to exposures caused by nature, plesiosaur skeletons have been salvaged from oil sands mines. These have been studied and put on display at the Oil Sands Discovery Centre in Fort McMurray.

Since 2005, Alberta has committed to consulting with aboriginal groups to safeguard their Treaty and aboriginal rights. Alberta Culture and Community Spirit works with aboriginal communities toward protecting traditional use locations of cultural and spiritual significance. These places can be determined to be historic resources and therefore subject to protection under the *Historical Resources Act*. There are currently 145 traditional use locations within the Lower Athabasca that are known to Alberta Culture and Community Spirit.

End Notes

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[9] Town of Bonnyville website; http://town.bonnyville.ab.ca/business/

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[16] *Historical Resources Act*, RSA 2000, c. H-9.

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[22] *Responsible Actions – A Plan for Alberta's Oil Sands*, Alberta Treasury Board (2009).

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[54] *Ibid*.

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[57] North/South Consultants et al. (2007)

[58] *Environmental Protection and Enhancement Act*, RSA 2000, c. E-12.

[59] *Responsible Actions – A Plan for Alberta's Oil Sands*, Alberta Treasury Board (2009).

[60] Ibid.

[61] *Species at Risk Act,* S.C. 2002, c. 29.

[62] *Wildlife Act*, RSA 2000, c. W-10.

[63] *Responsible Actions – A Plan for Alberta's Oil Sands*, Alberta Treasury Board (2009).

[64] *Ibid*.

[65] Clean Air Strategic Alliance, http://www.casadata.org/index.asp

[66] Mildred Lake, Mannix, Lower Camp, Buffalo Viewpoint and Millenium

[67] Anzac1 and Fort McKay; investigation of H2S/TRS exceedences at Anzac in 2007 showed they were the result of a non-industrial source near the monitoring site (WBEA 2007 Annual report).

[68] NO_x "scavenging" can occur at night in polluted atmospheres (e.g. in industrial or urban areas) when the sunlight is no longer driving the chemical creation of ozone, and nitric oxide (NO) in the air can remove ozone through chemical reactions by creating NO_2. Scavenging can also occur in the daylight when NO levels are high and VOC levels are relatively low. In rural areas NO is generally too low to result in much scavenging. (Health Canada, 1999)

[69] Government of Alberta (2008), *Alberta's 2008 Climate Change Strategy*. Edmonton: Alberta Environment; available at http://environment.gov.ab.ca/info/library/7894.pdf

[70] *Conservation and Reclamation Regulation*, A.R. 115/93.

[71] Energy Resources Conservation Board (2009). *Directive 074 - Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*. Published February 3, 2009.

[72] *Responsible Actions – A Plan for Alberta's Oil Sands*, Alberta Treasury Board (2009).

[73] *Historical Resources Act*, RSA 2000, c. H-9.