



Forest sustainability in the province of Alberta, Canada

Client:

Engie - Electrabel
boulevard Simon Bolívar
B-1000 Bruxelles

Project No.: 130373

November 2018

CONTENTS

1. Introduction.....	4
2. Alberta forests overview	4
2.1. Location and distribution	4
2.2. Ecological zones	7
2.3. Forest ownership.....	10
2.4. Competent authorities	11
2.5. Overview of wood-related industry.....	13
3. Sustainability of Alberta forest.....	14
3.1. Evolution of forest area and risk of conversion	14
3.2. Standing trees volumes and removals.....	16
3.3. Protection of ecosystems and biodiversity.....	18
3.4. Protection of water	21
3.5. Protection of soils	22
3.6. Protection of carbon stocks.....	23
3.7. Protection of air quality.....	24
3.8. Illegal logging	25
3.9. Civil rights and traditional rights	26
3.10. Forest certification	27
4. Conclusions	29

FIGURES

Figure 1: General map of Alberta	5
Figure 2 : Alberta's Green and White Area.....	6
Figure 3 : Relative proportion of total Green Area.....	7
Figure 4: Natural Regions of Alberta	9
Figure 5 : Map of the Forest Management Agreements (left) and the Land-use Framework (right) ..	12
Figure 6 : Alberta exports of wood products.....	13
Figure 7 : Annual forest conversion Canada per end land use (1990-2015)	15
Figure 8 : Percentage of harvested area reforested on public land by method	16
Figure 9 : Annual Allowable Cut in the Green Area (2005-2015).....	17
Figure 10 : Allowable annual cuts and actual levels of harvesting as a five-year rolling average (2000-2014)	18
Figure 11 : Provincial and National Parks in Alberta	21
Figure 12 : Forest carbon stocks in Canada for the period 1989-2011.....	24
Figure 13 : Number of wildfire and areas affected (2006-2015).....	25
Figure 14 : Extent of the certified areas by type.....	28

TABLES

Table 1 : Alberta's growing stock on Non-reserved land (2001)	10
Table 2 : Alberta's forest ownership	10
Table 3 : Overview of the wood manufacturing revenues 2012-2016 (1000 \$CAD).....	14
Table 4: Estimated area (millions of hectares) of forest in Canada	14
Table 5 : Harvested and reforested areas in Alberta (2008-2015).....	16
Table 6 : Lands under protection status in Alberta.....	18
Table 7 : Certified forest land in Alberta (2017).....	27

1. Introduction

The combustion of wood for energy purpose is not considered to contribute to the augmentation of greenhouse gases concentration in the atmosphere, as long as the CO₂ emissions released during the combustion of wood are balanced by the growth of new trees. It is therefore essential to investigate if the forests in the region where the wood used for energy purpose are managed in a sustainable way, avoiding resources associated with overexploitation of forests, land use change, depletion of carbon stocks, etc...

In this framework, literature research was carried out to produce a summary of forest management in Alberta, including general condition, management and sustainability assessment.

2. Alberta forests overview

2.1. Location and distribution

Alberta is a western province of Canada, and covers a total surface area of 661 848 km².

The US state of Montana borders Alberta to the south while the Canadian provinces of British Columbia, Northwest Territories and Saskatchewan border the province to the west, the north and the east respectively.

Figure 1: General map of Alberta



Source: www.infoplease.com

In total, the boreal forest covers about 38,1 million ha in Alberta, which represents about 57% of the (total) state surface.¹ Since 1948, Alberta has been divided into two main areas (see Figure 2):

- the Green Area to the North, which is the forested portion and includes most of northern Alberta as well as the mountain and foothills areas along the province's western boundary.
- the White Area, to the South, which consists of the populated central, southern and Peace River areas of the province.²

In the Green Area, public lands are managed for timber production, watershed, fish and wildlife, recreation, energy development, and other uses. Agricultural use is limited to grazing where it is compatible with other uses.

¹ <https://albertawilderness.ca/issues/wildlands/forests/boreal-forest/>

² Sustainable Forest Management – 2015 Facts & Statistics – General Boundary Information, 2017, Ministry of Agriculture and Forestry

The majority (75%) of the White Area land is privately owned with the remaining being public land. Public lands in the White Area are managed for various uses including agriculture, recreation, soil and water conservation, and fish and wildlife habitat. Some parts of the province have large tracts of public land while other parts have very few scattered parcels. Forested public land in the White Area may also be managed for timber on a sustainable basis.³

Figure 2 : Alberta's Green and White Area

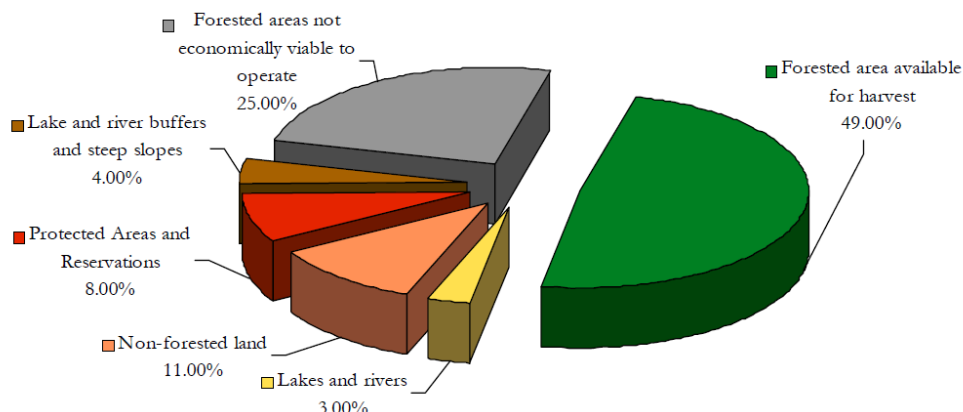


Source: Sustainable Forest Management – 2015 Facts & Statistics – General Boundary Information, 2017, Ministry of Agriculture and Forestry

It is estimated that about half of the Green Area is unavailable for harvesting because these areas are not economically viable to operate (25%), they are not forested (11%), they are protected and reservation areas (8%), they are lake and rivers (3%) or lake and river buffers and steep slopes (4%).⁴ This distribution is illustrated in Figure 3.

³ Sustainable Forest Management – 2015 Facts & Statistics – General Boundary Information, 2017, Ministry of Agriculture and Forestry

⁴ Sustainable Forest Management – 2015 Facts & Statistics – Area Available for Timber Harvest, 2017, Ministry of Agriculture and Forestry

Figure 3 : Relative proportion of total Green Area

Source: Sustainable Forest Management – 2015 Facts & Statistics – Area Available for Timber Harvest, 2017, Ministry of Agriculture and Forestry

2.2. Ecological zones

Alberta enjoys a wealth of natural features that can be seen in the diversity of its landscapes. They vary from hot, dry badlands to vast, unbroken forests, to alpine tundra and massive ice fields.⁵ Alberta's highest point, in the Rocky Mountains peaks at 3350 m. A narrow foothill zone flanks the mountains to the east. Beyond that, the interior plains fall from over 900 m in the southwest to below 300 m in the northeast. Alberta has a continental climate. Winters are dry, sunny, and cold though in the south the Chinook winds, which occur when warm, dry air of Pacific origin descends the eastern slopes of the Rockies, can raise temperatures by 22 °C in an hour or less. Summers are warm and wetter, with occasional destructive hailstorms and tornadoes. Temperatures in Edmonton ranges from -14°C to -51°C in January and from 16°C to 35°C in July. Annual precipitation averages 460mm in Edmonton, 300mm in the dry southeast and more than 1270 mm in the mountains.⁶

Alberta includes 6 terrestrial “natural regions” which are divided in 21 subregions. These regions are mapped on Figure 4 and their description is given hereunder⁷:

Grassland Natural Region

The Grassland Natural Region: includes the Dry Mixedgrass, Mixedgrass, Foothills Fescue and Northern Fescue Natural Subregions. Flat-to gently rolling plain with a few major hill systems. It is at the northwestern edge of the North American Great Plains.

⁵ <https://www.albertaparks.ca/media/6256258/natural-regions-subregions-of-alberta-a-framework-for-albertas-parks-booklet.pdf>

⁶ <https://www.britannica.com/place/Alberta-province>

⁷ www.albertapcf.org/about-prairies/alberta-natural-areas

Parkland Natural Region

The Parkland Natural Region: includes the Foothills Parkland, Central Parkland and Peace River Parkland Natural Subregions. Broad transition between the grasslands to the south and the forests to the north. In its native state, it is a mosaic of grasslands and aspen forests.

Foothills Natural Region

The Foothills Natural Region: includes the Lower and Upper Foothills Natural Subregions. Extends along the eastern edge of the Rocky Mountains in a gradually widening belt northward. It also includes several outlying hill masses. It is characterized by extensive forests, most commonly lodgepole pine on the uplands, especially following fire. The Foothills Natural Region is further divided into the Lower and Upper Foothills.

Rocky Mountain Natural Region

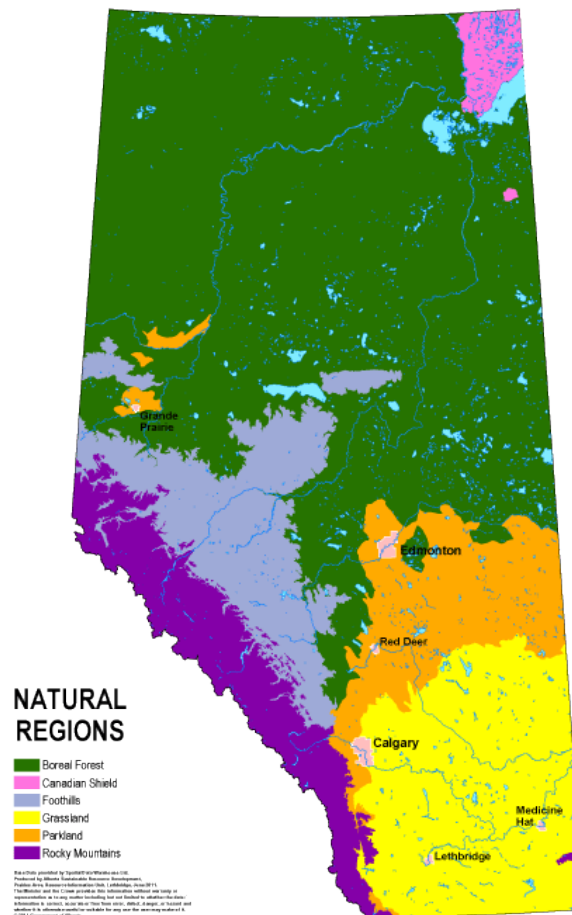
The Rocky Mountain Natural Region: includes the Alpine, Subalpine and Montane Natural Subregions within and adjacent to the Front Ranges and Main Ranges of the Rocky Mountains which reflect changes in environmental conditions associated with differences in altitude. The Montane Subregion is characterized by a pattern of open forests and grasslands occurring at low elevations in southwestern Alberta. Occurring at higher elevations, the Subalpine is characterized by closed forests. The Alpine includes vegetated areas, bare rock, and glaciers above tree line.

Boreal Forest Natural Region

The Boreal Forest Natural Region: includes the Dry Mixedwood, Central Mixedwood, Lower Boreal Highlands, Upper Boreal Highlands, Athabasca Plain, Peace–Athabasca Delta, Northern Mixedwood, and Boreal Subarctic Natural Subregions. It occupies most of northern Alberta, and extends south almost to Calgary. Besides great expanses of forests comprised of white spruce, balsam fir, aspen, balsam poplar or jack pine, there are extensive wetlands.

Canadian Shield Natural Region

The Canadian Shield Natural Region/Kazan Upland Natural Subregion: The Canadian Shield Natural Region has only one Natural Subregion, the Kazan Upland. Extends only peripherally into the far northeast corner of Alberta. Characterized by outcroppings of Precambrian granitic bedrock and open forests of jack pine with black spruce in wet areas.

Figure 4: Natural Regions of Alberta

Source : www.albertapcf.org/about-prairies/alberta-natural-areas

Forests are present in most of northern Alberta as well as the mountain and foothills areas along the province's western boundary. The forest area is estimated to be between 35.2 and 38 million ha (depending on the methodology)^{8,9,10}.

Table 1 shows the different tree species found in Alberta and their growing stock on non-reserved land in 2001. Conifers predominate in Alberta and account for the great majority of all forest species. Spruce and pine account for about 60% of the growing stock. Broadleaf trees such as aspen/poplar account for about one third of the growing stock.

⁸Sustainable Forest Management – 2015 Facts & Statistics – General Boundary Information, 2017, Ministry of Agriculture and Forestry

⁹ <https://albertawilderness.ca/issues/wildlands/forests/boreal-forest/>

¹⁰ FP Innovations, 2011, Wood market statistics Alberta <https://fpinnovations.ca/products-and-services/market-and-economics/Documents/2011-wood-market-statistics-in-alberta.pdf>

Table 1 : Alberta's growing stock on Non-reserved land (2001)

		Volume			
		Million m ³	%	Million m ³	%
Softwood	Spruce	821	35.4%	1,426	61.5%
	Pine	549	23.7%		
	Fir	38	1.6%		
	Cedar & other softwood	10	0.4%		
	Douglas-fir	4	0.2%		
	Larch	4	0.2%		
Hardwood	Aspen/poplar	816	35.2%	893	38.5%
	Birch	32	1.4%		
	Other hardwoods	45	1.9%		

Source: FP Innovations, 2011, Wood market statistics Alberta

Since 2005, a Mountain Pine Beetle (MPB) outbreak was declared in Alberta and large inflight of beetles over the Rocky Mountains in 2006 and 2009 infested millions of trees in northern Alberta.¹¹

2.3. Forest ownership

The entire Green Area is public land managed by the Province. The forest land subject to Forest Management Agreements (FMA's) represent 23.4 million ha and land outside FMA's with timber dispositions account for 4.0 million ha.¹² Close to 97% of the forest land in Alberta is publicly owned, while the remaining area is operated by private owners.¹³

Table 2 : Alberta's forest ownership

	Proportion	hectares
Provincial	89%	24,669,020
Federal	8%	2,217,440
Private	3%	831,540
Total	100%	36,388,000

Source: FP Innovations, 2011, Wood market statistics Alberta

¹¹ <https://esrd.maps.arcgis.com/apps/Cascade/index.html?appid=b81dbef8d02344e6bb734087669626db>

¹² https://www.sfmcanada.org/images/Publications/EN/AB_info_Provinces_and_territories_EN.pdf

¹³ FP Innovations, 2011, Wood market statistics Alberta <https://fpinnovations.ca/products-and-services/market-and-economics/Documents/2011-wood-market-statistics-in-alberta.pdf>

2.4. Competent authorities

Forest management in Canada is essentially at the level of the provinces. At the federal level, the authorities in charge in each province cooperate in the Canadian Council of Forest Ministers, which is more a discussion platform than a decision-making entity. The decision power is at the level of the provinces.

In Alberta, the public forests are managed by the Ministry of Agriculture and Forestry. *The ministry is responsible for the policies, legislation, regulations and services necessary for Alberta's agriculture, food and forest sectors to grow, prosper and diversify; inspires public confidence in wildfire and forest management and the quality and safety of food; supports environmentally sustainable resource management practices; and leads collaboration that enables safe and resilient rural communities.*¹⁴

The Ministry, following the *Forest Act*, is responsible for *managing timber on forested public land within the Green Area. This land, as well as some adjacent areas in the White Area, is administered using administrative units, called Forest Management Units (FMUs). A forest tenure system is used to allocate timber harvesting rights in the FMUs to companies and individuals.*

There are three forest tenure types: 1. Forest Management Agreement (FMA), 2. Timber Quota, and 3. Timber Permit. The forest tenure specifies details, such as the term of the agreement, tree species, the location, and the responsibilities for reforestation and forest management planning.

FMA holders prepare Forest Management Plans for the FMU areas the company has rights to operate. The Alberta government prepares Forest Management Plans for non-FMA FMUs.

Forest Management Plans are prepared every ten years using a collaborative planning process that involves the public, First Nations, the forest industry, other resource users and various provincial government agencies.

*Forest Management Plans document how the forests are proposed to be managed over a 200 year planning horizon. This includes details of where, when and how trees will be regenerated following harvesting, as well as forested areas excluded from harvesting. The plans also evaluate forest biodiversity information, and the history and risk of natural disturbance (e.g., wildfire, and insect or disease outbreaks).*¹⁵

In 2008, the Alberta government released the Land-use Framework. *The framework is a comprehensive strategy to help manage public and private lands and natural resources to achieve Alberta's long-term economic, environmental and social goals. The framework provides a blueprint for land-use management and decision-making that addresses Alberta's growth pressures.*

*The Land-use Framework establishes seven planning regions based on watersheds, municipal boundaries and the natural regions.*¹⁶

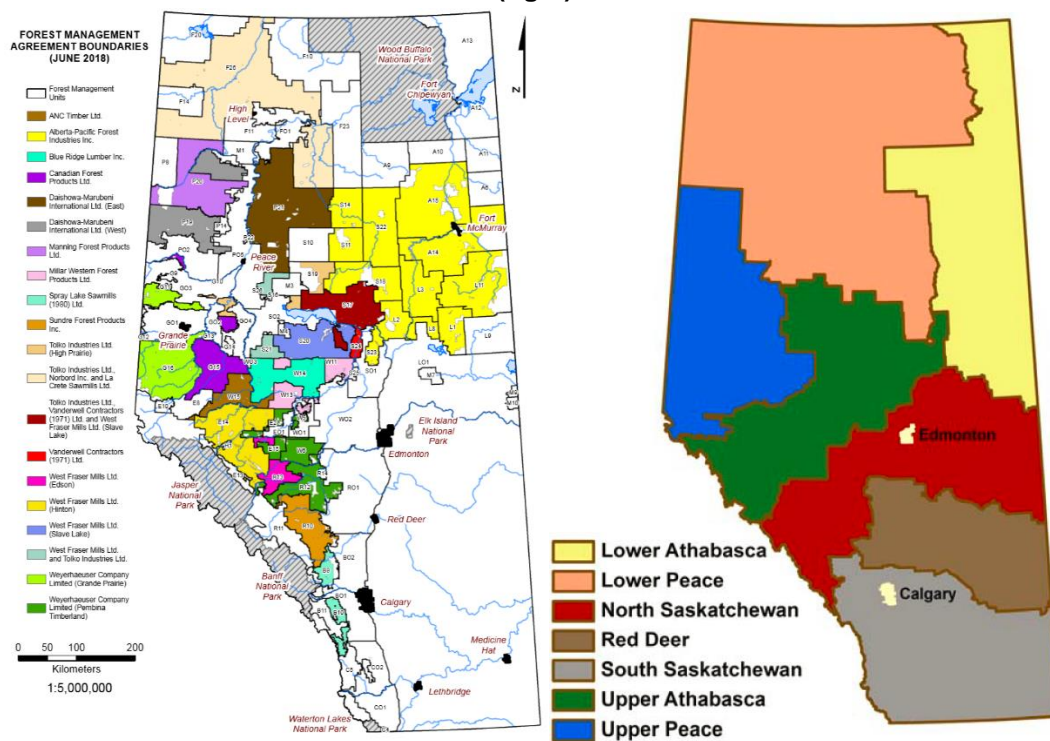
Figure 5 shows the Land-use Framework Planning Regions.

¹⁴ <https://www.agric.gov.ab.ca/app21/ministrypage>

¹⁵ Sustainable Forest Management – 2015 Facts & Statistics – Forest Management Plans, 2017, Ministry of Agriculture and Forestry

¹⁶ Sustainable Forest Management – 2015 Facts & Statistics – General Boundary Information, 2017, Ministry of Agriculture and Forestry

Figure 5 : Map of the Forest Management Agreements (left) and the Land-use Framework (right)



Source: Sustainable Forest Management – 2015 Facts & Statistics, 2017, Ministry of Agriculture and Forestry

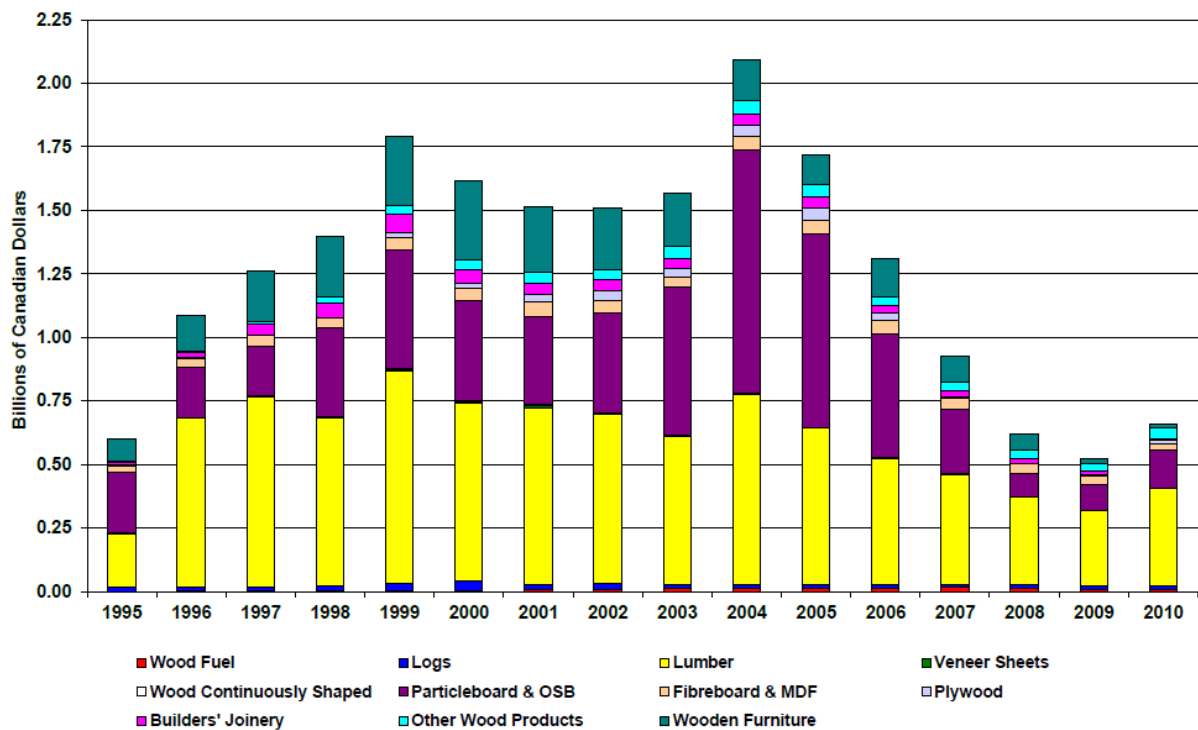
2.5. Overview of wood-related industry

According to the Alberta's Economic Development and Trade Ministry, the contribution of the Agriculture and Forestry sector to Alberta's Gross Domestic Product in 2016 was 1.6%.¹⁷

The total sales value of wood products in 2016 was 5.7 billion CAD (Canadian dollars), including 2.9 billion CAD for the export of wood products. The export destinations include mostly USA and increasingly Asia.

Figure 6 shows the evolution of the exports in million CAD from 1995-2010. The wood industry was hit hard by the 2008 recession but has since then recovered¹⁸ and continues to grow as can be seen in Table 3.

Figure 6 : Alberta exports of wood products



Source: FP Innovations, 2011, Wood market statistics Alberta

The direct employment in forest industry in 2017 was estimated to be 15 020 jobs.¹⁹

¹⁷ www.albertacanada.com/business/statistics/economic-highlights.aspx

¹⁸ <https://www.cbc.ca/news/canada/calgary/alberta-forestry-recovery-economy-1.3587001>

¹⁹ cfs.nrcan.gc.ca

Table 3 : Overview of the wood manufacturing revenues 2012-2016 (1000 \$CAD)

		2012	2013	2014	2015	2016
Logging industry		850,368	816,119	851,102	909,723	920,081
Pulp and paper product manufacturing industry	Converted paper product manufacturing	1,716,303	1,656,720	1,752,933	1,915,678	1,636,050
	Pulp, paper and paperboard mills					
Wood product manufacturing industry	Veneer, plywood and engineered wood product manufacturing	730,759	907,996	858,403	1,685,194	976,883
	Sawmills and wood preservation	1,218,324	1,578,241	1,669,881	1,685,194	1,932,452
	Other wood product manufacturing	924,540	1,120,772	1,057,221	780,422	739,288
Total Wood product manufacturing industry		2,873,624	3,607,010	3,585,505	3,289,921	3,648,623
Total revenue from goods manufactured		5,440,295	6,079,849	6,189,540	6,115,322	6,204,754

Source: cfs.nrcan.gc.ca

3. Sustainability of Alberta forest

3.1. Evolution of forest area and risk of conversion

Over the past 25 years, the forest area in Canada has remained stable, losing only 1.2 million ha (0,34%). The main cause for this decrease is the clearing of forest land for new, non-forest land uses, for example: agriculture, road and hydroelectric developments.

Table 4: Estimated area (millions of hectares) of forest in Canada

Year	1990	1995	2000	2005	2010	2015
Forest area	348.3	348.0	347.8	347.6	347.3	347.1

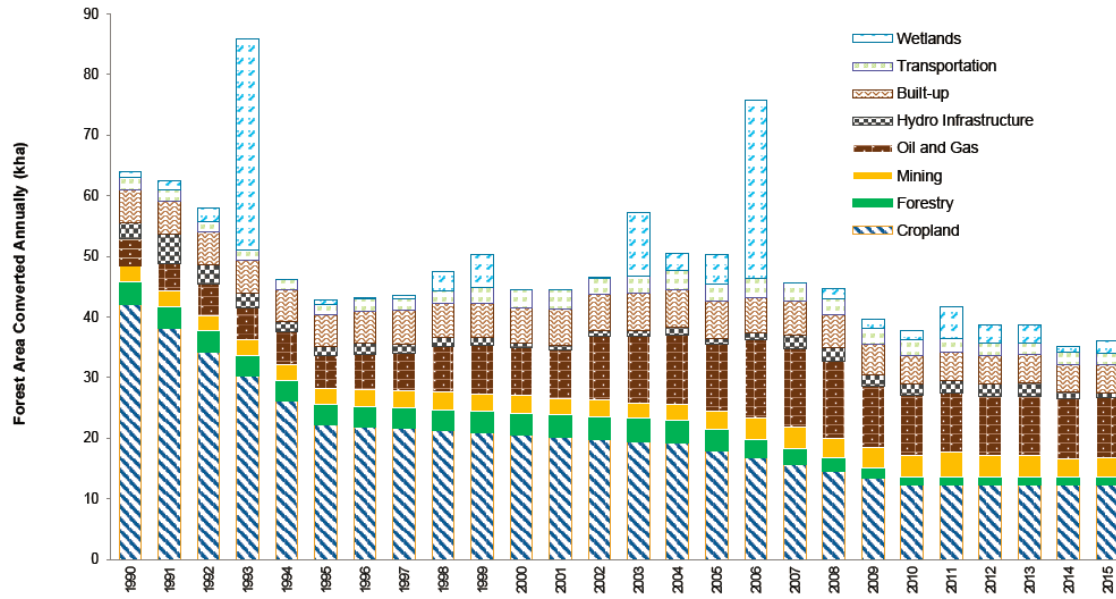
Source: The state of Canada's Forests – Annual Report 2017

On Figure 7 hereunder, we can see the estimated forest conversion per year between 1990 and 2015, with indication of the new land use after conversion, for Canada as whole. In this period, the yearly forest areas lost to other land uses was between 35,000 and 85,000 ha per year: that is between 0.010% and 0.025% of Canada's huge forest areas. Some of those conversions has been partially compensated by the plantation of new forests (in particular at the expense of marginal agricultural

land), as some provinces have an active afforestation policy. Note that 2006 and 1993 have seen a particularly large forest area converted to wetlands, because of the creation of large reservoirs.

Unfortunately, similar statistics in terms of forest conversion are not available specifically for Alberta.

Figure 7 : Annual forest conversion Canada per end land use (1990-2015)



Source : National Inventory Report 1990–2015: Greenhouse Gas Sources and Sinks in Canada

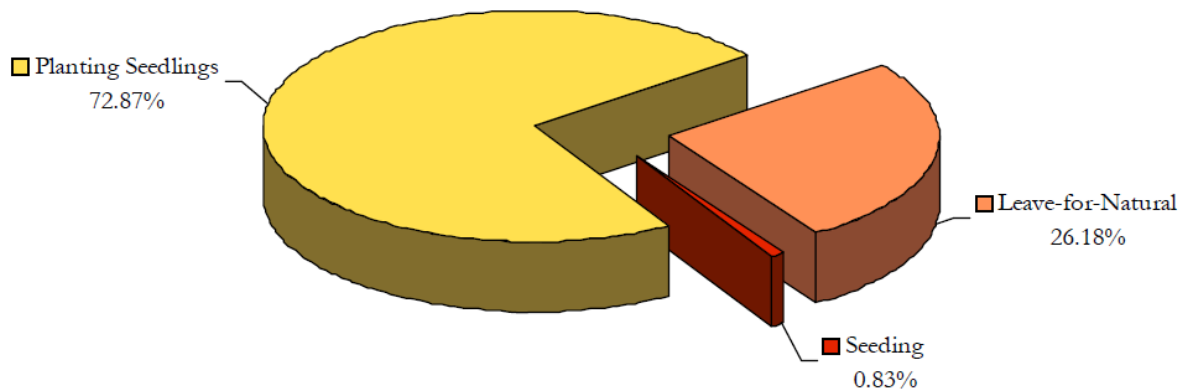
It does not seem to be any systematic assessment of the forest land area year by year in Alberta. However, there are regular assessments and estimations of the surfaces concerned by deforestation and afforestation, which give an idea of the evolution and the risk of conversion. We can see in Table 5 that the harvested land in the period 2008-2014 was 533,645 ha, while 544,465 ha were concerned with either of the reforestation methods (natural, planted or seeded). There are inevitably always slight differences between the harvested surfaces and the reforested surfaces since reforestation since there can be some time interval in between. But anyhow, Table 5 shows us that over a long period of time (7 years) about 2% more land was reforested than harvested, which shows overall a positive evolution of the forest surfaces in the province. The ongoing afforestation programmes in Alberta (including in particular conversion of former agricultural land into forests) probably plays a role in those statistics.

On Figure 8 hereunder we can see that planting seedling is the preferred method of reforestation.

Table 5 : Harvested and reforested areas in Alberta (2008-2015)

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Total
Harvested	65,036	69,627	75,903	76,899	79,720	82,675	83,785	533,645
Planted and seeded	56,548	51,929	56,027	59,735	59,136	73,525	58,357	415,257
Leave-for-Natural	14,229	13,224	19,139	20,193	17,874	23,856	20,693	129,208

Source: Sustainable Forest Management – 2015 Facts & Statistics – Reforesting Harvested Areas & Area Harvested, 2017, Ministry of Agriculture and Forestry

Figure 8 : Percentage of harvested area reforested on public land by method

Source: Sustainable Forest Management – 2015 Facts & Statistics – Reforesting Harvested Areas, 2017, Ministry of Agriculture and Forestry

The FSC risk assessment platform (www.globalforestregistry.org) considers that Canada (as a whole) is at unspecified risk in terms of conversion of forest to other land uses, because the following criterion is verified at the country level:

- There is no net loss AND no significant rate of loss (> 0.5% per year) of natural forests and other naturally wooded ecosystems such as savannahs taking place in the eco-region in question.

3.2. Standing trees volumes and removals

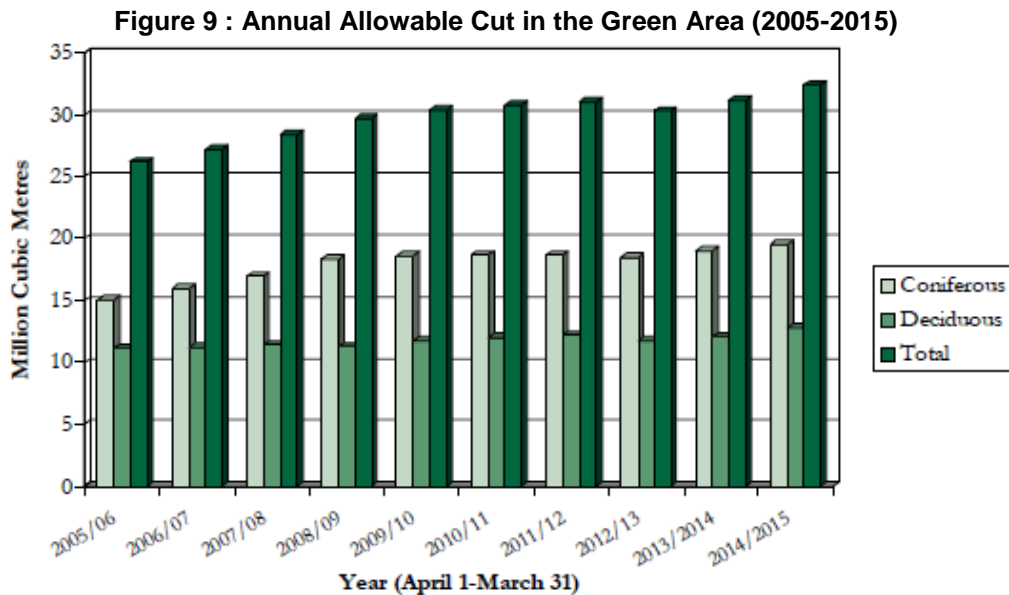
It does not seem to be any systematic assessment of the volumes of standing trees in Alberta. According to the CanFI 2001 report, Alberta has a growing stock of 2.32 billion cubic meters on its forest land. The annual growth of all inventoried forested land within the Green Area is estimated to be 44.5 million cubic meters.²⁰

²⁰ FP Innovations, 2011, Wood market statistics Alberta <https://fpinnovations.ca/products-and-services/market-and-economics/Documents/2011-wood-market-statistics-in-alberta.pdf>

In terms of harvested volumes, there is a specific system in place to plan and monitor the activities. At provincial level, the government sets an Allowable Annual Cut (AAC) for each Forest Management Unit.²¹ As of April 30, 2015, the AAC within the Green Area was 32.4 million cubic meters.

Individual yearly harvest levels may be greater than the AAC. However, the total harvest level over a five-year period will not exceed the total allowable cut for the five-year period.

The AAC was increased from 2005/06 to 2011/12. This was a result of new management strategies that aim to reduce the area of pine trees at greater risk of insect infestation (especially the mountain pine beetle) and of catastrophic wildfires. The 2012/13 AAC was decreased to account for estimated reductions due to wildfires impacts and Lower Athabasca Regional Plan land withdrawals.²² These variations are illustrated in Figure 9.



Source: Sustainable Forest Management – 2015 Facts & Statistics –Annual Allowable Cut, 2017, Ministry of Agriculture and Forestry

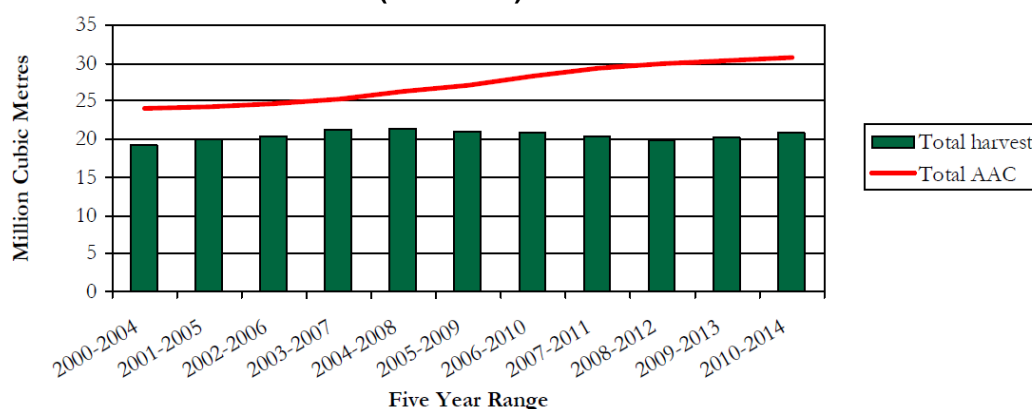
As a five-year rolling average, the volume of harvested wood between 2001 and 2014 ranged between 19.8 to 21.35 million cubic metres.

Figure 10 shows that while the total AAC gradually increased, the total harvest remained below the total AAC.

²¹ Sustainable Forest Management – 2015 Facts & Statistics –Annual Allowable Cut, 2017, Ministry of Agriculture and Forestry

²² Sustainable Forest Management – 2015 Facts & Statistics –Annual Allowable Cut, 2017, Ministry of Agriculture and Forestry

Figure 10 : Allowable annual cuts and actual levels of harvesting as a five-year rolling average (2000-2014)



Source: Sustainable Forest Management – 2015 Facts & Statistics –Annual Allowable Cut, 2017, Ministry of Agriculture and Forestry

3.3. Protection of ecosystems and biodiversity

As shown on Table 6, the conservation lands in Alberta cover 4 235 649 ha, which represent about 6.4% of the land area of Alberta.²³ The protected areas are managed by the Ministry of Environment and Parks.

Table 6 : Lands under protection status in Alberta

Designation	Number	Area (ha)
Wilmore Wilderness Park	1	459,671.04
Provincial Parks	76	246,797.89
Wildland Provincial Parks	33	3,171,506.29
Provincial Recreation Areas	204	88,602.86
Wilderness Area	3	100,988.79
Ecological Reserves	15	26,843.34
Natural Areas	138	129,228.98
Heritage Rangelands	2	12,010.47
Total	472	4,235,649.66

Source: <https://www.albertaparks.ca/albertaparksca/management-land-use/parks-system/>

The different types of conservation status are described hereunder²⁴:

- **Wilderness areas** are established under the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act; preserve and protect natural heritage while providing opportunities for non-consumptive, nature-based outdoor recreation; are among the most strictly protected areas in Canada. No developments of any kind are permitted; Collecting, destroying and removing plant and animal material, fossils and other objects of geological, ethnological, historical

²³ Calculated with the total surface area from point 2.1

²⁴ <https://www.albertaparks.ca/albertaparksca/management-land-use/legislation-regulations/#hr>

and scientific interest are prohibited; Travel in wilderness areas is by foot only; Hunting, fishing and the use of horses are not permitted in wilderness areas; Wilderness areas provide limited opportunities for nature-based recreation such as backcountry hiking, wildlife viewing and mountain climbing.

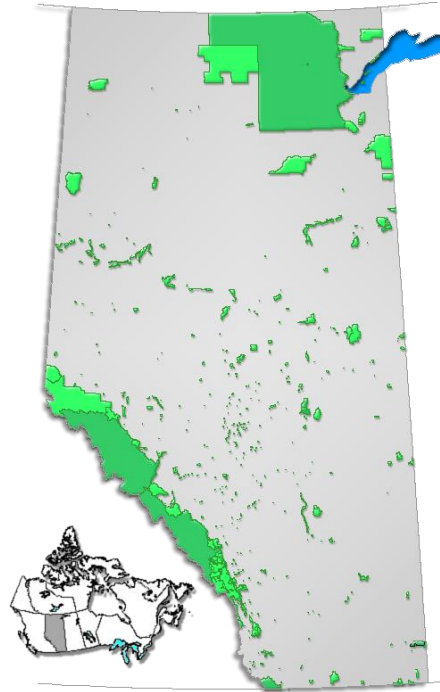
- **Ecological Reserves** are established under the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act; preserve and protect natural heritage in an undisturbed state for scientific research and education; contain representative, rare and fragile landscapes, plants, animals and geological features. Their primary intent is strict preservation of natural ecosystems, habitats and features and associated biodiversity; serve as outdoor laboratories and classrooms for scientific studies related to the natural environment; Public access to ecological reserves is by foot only. Public roads and other facilities do not normally exist and will not be developed; Most ecological reserves are open to the public for low-impact activities such as photography and wildlife viewing.
- **Wildland Provincial Parks** are established under the Provincial Parks Act; are a type of provincial park specifically established to preserve and protect natural heritage and provide opportunities for backcountry recreation; are large, undeveloped natural landscapes that retain their primeval character; Trails and primitive backcountry campsites are provided in some wildland parks to minimize visitor impacts on natural heritage values; Some wildland parks provide significant opportunities for eco-tourism and adventure activities such as backpacking, backcountry camping, wildlife viewing, mountain climbing and trail riding; Designated trails for off-highway vehicle riding and snowmobiling are provided in some wildland parks.
- **Heritage Rangelands** are designated under the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act; preserve and protect natural features that are representative of Alberta's prairies. Grazing is used to maintain the grassland ecology; Carefully managed cattle grazing has contributed to the ecological integrity of large tracts of the continent's finest remaining prairies. Heritage rangelands ensure ongoing protection while continuing the traditional grazing approach that has preserved these grasslands; Limited opportunities may be provided for outdoor recreation; however, recreational activities must be compatible with preservation of natural values and grazing management.
- **Provincial Parks** are established under the Provincial Parks Act; play a key role in preserving Alberta's natural heritage. They support outdoor recreation, heritage tourism and natural heritage appreciation activities that depend on and are compatible with the natural environment; protect both natural and cultural landscapes and features; are distinguished from wildland parks by the greater range of facilities and the extent of road access; offer a variety of outdoor recreation opportunities and support facilities. Outdoor recreation activities that promote appreciation of a park's natural heritage and cultural features are encouraged; Interpretive and educational programs are offered in some provincial parks. These programs enhance visitor understanding and appreciation of and respect for Alberta's natural heritage and must be conducted without damaging natural heritage values. These programs are designed to serve visitors of diverse interests, ages, physical capabilities and outdoor skills.
- **Provincial Recreation Areas** are established under Provincial Parks Act; support outdoor recreation and tourism. They often provide access to lakes, rivers, reservoirs and adjacent Crown land; support a range of outdoor activities in natural, modified and man-made settings; are managed with outdoor recreation as the primary objective; Some areas are intensively developed while others remain largely undeveloped; Many recreation areas play a significant role in management of adjacent Crown lands and waters, serving as staging areas to provide access to a range of outdoor recreation opportunities on adjacent lands and water bodies.
- **Natural Areas** are established under the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act; preserve and protect sites of local significance while providing opportunities for low-impact recreation and nature appreciation activities; include natural and near-

natural landscapes of regional and local importance for nature-based recreation and heritage appreciation; are typically quite small, although some are quite large; have no facilities. Facilities that do exist are minimal, consisting mainly of parking areas and trails.

- **Willmore Wilderness Park** is a unique area. It was established in 1959 and is managed under its own legislation, the Willmore Wilderness Park Act; is the second largest park in the Alberta parks system; represents some of the best habitat for a number of wildlife species. It is estimated that 20% of Alberta's mountain goats and bighorn sheep are found in Willmore. Other species include grizzly bear, mountain caribou, cougars and wolves. The windswept front ranges in the eastern part of Willmore are critical winter habitat for ungulates; is similar in intent to wildland provincial parks.

The location of the protected areas is presented on Figure 11. Darker green areas correspond to National Parks.

Figure 11 : Provincial and National Parks in Alberta



Source: By QYD, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=933485>

3.4. Protection of water

In Alberta, several legal provisions aim to ensure that the quality of surface water and groundwater is appropriately protected: the provincial *Water Act* and *Environmental Protection and Enhancement Act*. In 2003, the Government of Alberta released its *Water for life* strategy, a policy to guide water management. The strategy contained the following three goals and outcomes:

- *Safe, secure drinking water supply*
- *Healthy aquatic ecosystems*
- *Reliable, quality water supplies for a sustainable economy*

Water for Life sets a 30% conservation target that all licensed water-using sectors in Alberta will strive to achieve. This includes, but is not limited to, the following sectors:

- *Oil and Gas and Oil Sands Mining*
- *Irrigation*
- *Forestry*
- *Urban Municipal*
- *Power Generation*
- *Downstream Petroleum Products*
- *Chemical Producers*

These sectors are required to develop a CEP (Conservation, Efficiency and Productivity) plan.

The only licensed water-users in the forestry sector are those engaged in the manufacturing of forest products, specifically pulp and paper. These sectors have therefore developed a CEP plan. The CEP outcomes are:

- *Demand for water (surface and groundwater) is reduced.*
- *Water use productivity is increased.*
- *Resources are conserved to maintain healthy aquatic ecosystems.*
- *Water quality is maintained or enhanced.*

Harvesting activities do not generally involve the use of water and forest operations around water bodies are well regulated. Setback distances around lakes and streams ensure waterbodies are not disturbed by harvest activities or affected negatively by erosion that may impact aquatic ecosystem health. The forestry sector is also guided by regulations for stream-crossings, road-building, and other activities that may potentially impact the environment.²⁵

The government (and in particular the Ministry of Agriculture and Forestry) is responsible to enforce the legal requirements on Crown land. Therefore, *the Alberta Government monitors compliance by conducting planned and random audits of forest operations and timber production and by conducting field inspections. There is also self-reporting by forest companies and individuals.²⁶* However, no statistics about the level of compliance established during those audits have been published.

3.5. Protection of soils

The Timber Harvest Planning and Operating Ground Rules²⁷ provide direction to forest companies and government for planning, implementing and monitoring timber harvesting operations on timber disposition areas in Alberta.

Ground rules are the practices used in planning and conducting timber harvesting operations which constitute the methods used to implement decisions made in the FMP and other higher level plans such as Integrated Resource Plans (IRP). In the event that these strategic plans do not exist, the ground rules shall establish practices that minimize the chance of negative impacts from roads, timber harvesting and forest management operations and activities. The ground rules for the protection of soils are the following:

- *Pre-harvesting planning:*
 - *Areas susceptible to rutting, puddling or compaction shall be avoided when planning temporary roads, decks, landings and skidding patterns*
 - *Areas susceptible to rutting, puddling or compaction shall be harvested during dry or frozen conditions (when soil condition is not susceptible to degradation e.g. blocks*

²⁵ Alberta's Forest Sector Water CEP Plan: A Journey towards Sustainable Water Management, 2011, AFPA

²⁶ <https://www.agric.gov.ab.ca>

²⁷ Alberta Timber Harvest Planning and Operating Ground Rules Framework for Renewal, 2016, Alberta Government

with predominantly imperfectly-poorly drained soils, soils exceeding field capacity).

- *Harvesting:*
 - *The total area covered by temporary roads, processing areas, and displaced soil, created by timber harvesting operations shall not exceed five percent of each harvest area unless the company has an approved silvicultural strategy for their roads.*
 - *Operations shall not occur during heavy rainfall or when soil conditions are above field capacity (saturated).*
 - *Minimize the machine traffic on sensitive areas, depending on soil susceptibility to disturbance according to the results of a hand test.*
 - *Operations shall cease when instances of multiple ruts in a limited area are created that are clearly related to operations during unfavourable ground conditions.*
 - *Erosion and soil disturbance must be limited, with effort made to retain organic matter and soil nutrients.*
- *Pre-harvest reclamation/reformation*
 - *Roads within harvest areas that are no longer required shall be reclaimed and reforested. Treatments acceptable to Alberta are required on compacted soils. Acceptable treatments may be decompaction if required, roll back of debris, and planting.*

3.6. Protection of carbon stocks

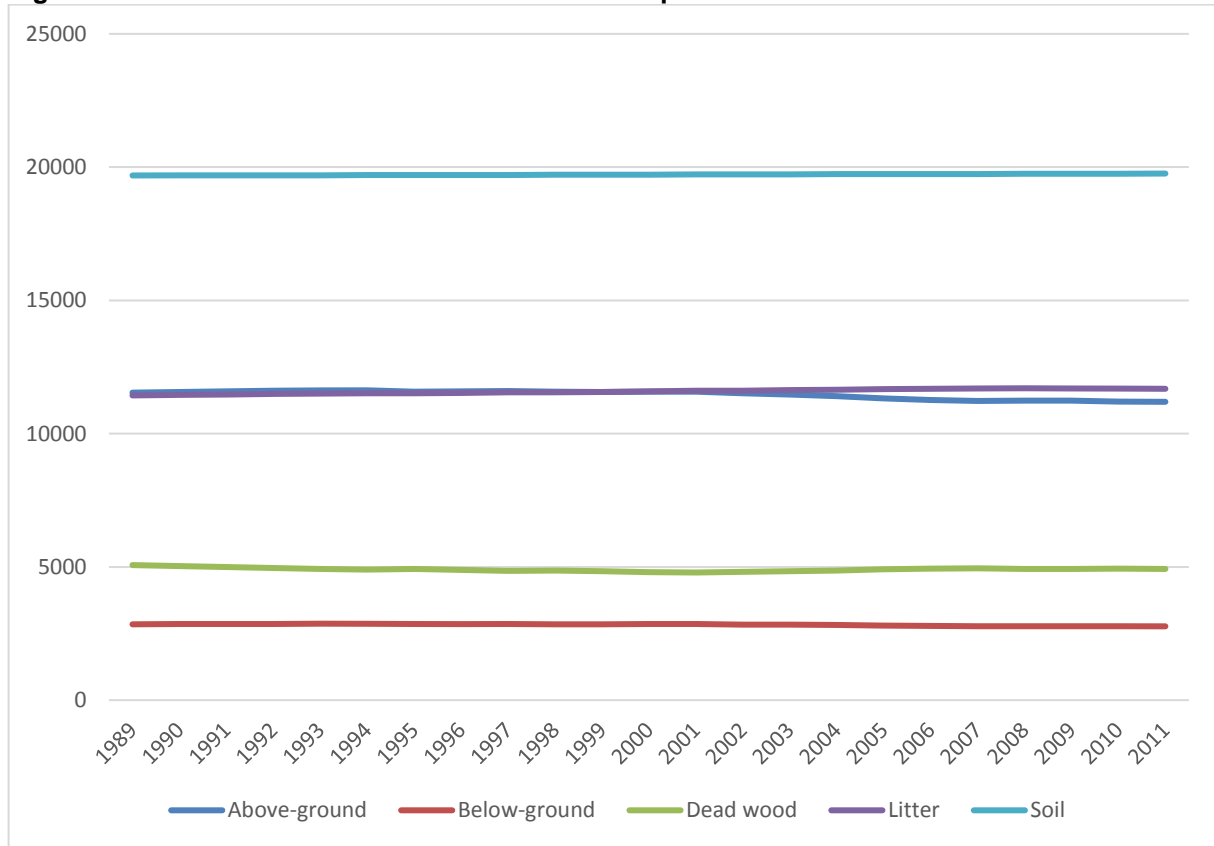
In forest land, the carbon stocks mainly include:

- living above ground and below ground woody biomass,
- soil organic carbon,
- carbon in litter.

It does not seem to be any carbon stock assessment for Alberta forest including this level of details. According to the “Modelling Ecosystem Dynamics in Alberta” report, forest carbon in Alberta has steadily declined from 5 billion tonnes (pre-industrial) to 4.3 billion tonnes (1960) and 4.1 billion tonnes (2010). It is expected to decline further to 3.8 billion tonnes by 2060 under business as usual conditions.²⁸ This might be partially balanced by afforestation programmes, so the net balance remains uncertain.

In Canada as a whole such estimations have been assessed in the framework of the Kyoto protocol though. An estimation is provided for the period 1989 to 2011 on Figure 12.

²⁸ Modelling Ecosystem Dynamics in Alberta: an integrative approach, N. Rider, M. Carlson and B. Stelfox, 2016

Figure 12 : Forest carbon stocks in Canada for the period 1989-2011

We can see on Figure 12 that the carbon stock in forest has been quite stable during this period in each of the respective compartments. The carbon in above-ground biomass, below ground biomass and dead wood is thought to have decreased by about 3%. At the same time the estimated carbon stock in litter has increased by 3% and the estimated carbon stock in soil, the largest compartment, has increased by 0.4%. In total, there is a loss of carbon stock of 0.5% between 1989 and 2011, as the total carbon stock decreased from 50.57 billion tons C, down to 50.32 billion tons C. Even though it is a tiny proportion of the total stocks, it represents in average a yearly release of 11 million tons CO₂ over a period of 22 years.

3.7. Protection of air quality

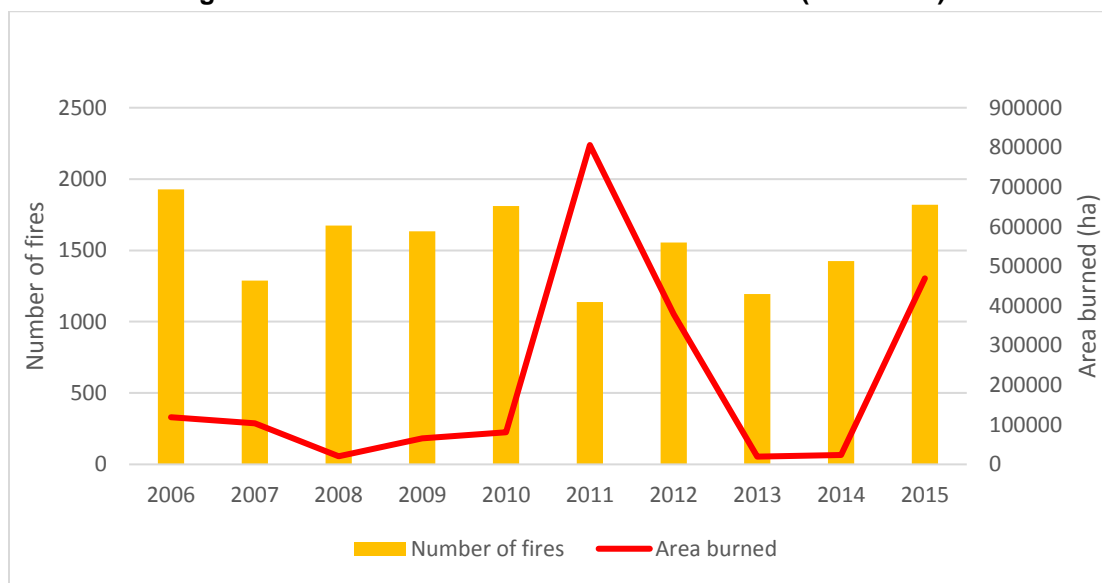
The main impact of forestry on air quality relates to fire. It includes wild fire (which are unintended) and prescribed fire (which is used as part of forest management under controlled conditions).

The objectives of prescribed fire can include pest management, site preparation before replanting or regeneration, preventing wild fire... The use of prescribed fire declined at the end of the 20th century, but interest has grown again after 2000, especially as a tool for ecological management.

These fires are applied under select weather conditions and managed in such a way as to minimize the emission of smoke and maximize the benefits to the site.²⁹

The province experienced a record year in 2011 (see Figure 13). This led to the redaction of the Flat Top Complex Wildfire Committee report that suggests that wildfire is a natural part of the life cycle of the boreal forest – the dominant forest region in Canada – as many of the vegetation species, including trees, are well adapted to large, intense wildfires. Before major wildfire suppression programs, boreal forests historically burned on an average cycle ranging from 50 to 200 years as a result of lightning and human-caused wildfires. Wildfire suppression has significantly reduced the area burned in Alberta's boreal forest. This led to the aging of the province's forests, which ultimately changes ecosystems and is beginning to increase the risk of large and potentially costly catastrophic wildfires.³⁰ This report included 21 recommendations that the government of Alberta has fully met.³¹

Figure 13 : Number of wildfire and areas affected (2006-2015)



Source: wildfire.alberta.ca

3.8. Illegal logging

The FSC risk assessment platform (www.globalforestregistry.org) considers that Canada is at low risk in terms of illegal logging, because the following criteria are all verified:

1.1 Evidence of enforcement of logging related laws in the district ³²

²⁹ <http://wildfire.alberta.ca/prevention/prescribed-fire/default.aspx>

³⁰ Flat Top Complex Wildfire Review Committee. 2012. Flat Top Complex Wildfire Review Committee report

³¹ <http://wildfire.alberta.ca/resources/reviews/2011-flat-top-complex.aspx>

³² www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

- 1.2 There is evidence in the district demonstrating the legality of harvests and wood purchases that includes robust and effective system for granting licenses and harvest permits ³³
- 1.3 There is little or no evidence or reporting of illegal harvesting in the district of origin³⁴
- 1.4 There is a low perception of corruption related to the granting or issuing of harvesting permits and other areas of law enforcement related to harvesting and wood trade.³⁵

3.9. Civil rights and traditional rights

The FSC risk assessment platform (www.globalforestregistry.org) considers that Canada is at low risk in terms of violation of civil and traditional rights, because the following criteria are all verified:

- There is no UN Security Council ban on timber exports from the country concerned
- The country or district is not designated a source of conflict timber (e.g. USAID Type 1 conflict)
- There is no evidence of child labor or violation of ILO Fundamental Principles and Rights at work taking place in forest areas in the district concerned
- There are recognized and equitable processes in place to resolve conflicts of substantial magnitude pertaining to traditional rights including use rights, cultural interests or traditional cultural identity in the district concerned
- There is no evidence of violation of the ILO Convention 169 on Indigenous and Tribal Peoples taking place in the forest areas in the district concerned

³³ www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

³⁴ www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

³⁵ <http://www.transparency.org/cpi2012/results>

3.10. Forest certification

The main forest certification schemes used in Alberta are:

- CSA (Canadian Standards Association - Group Sustainable Forest Management System³⁶) which is endorsed by PEFC (Programme for the Endorsement of Forest Certification)
- SFI (Sustainable Forestry Initiative³⁷), which is endorsed by PEFC (Programme for the Endorsement of Forest Certification)
- FSC (Forest Stewardship Council³⁸), which is specifically suitable for small private owners

The certified forest area under each of those schemes as for 2017 is presented in the table here under:

Table 7 : Certified forest land in Alberta (2017)

	CSA	SFI	FSC	Total certified
Area certified (millions ha)	4,15	16,50	5,91	23,06
Percentage forests	12%	47%	17%	66%

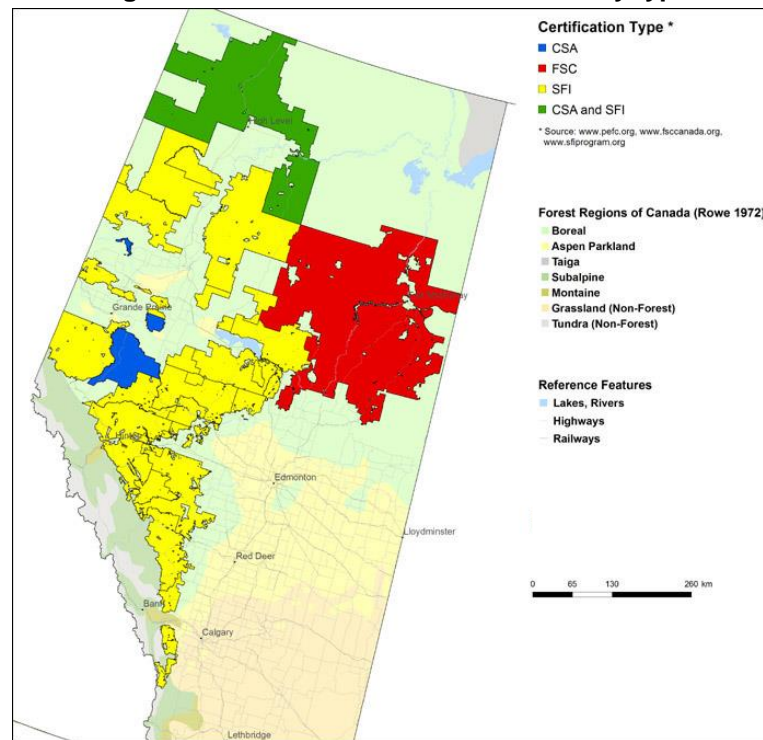
Source: calculated from Forest Products Association of Canada. 2018. Forest Management Certification in Canada – 2017 Year-end status report Alberta <http://certificationcanada.org/wp-content/uploads/2018/03/2017-Yearend-SFM-Certification-Detailed-Report-AB.pdf> The percentages have been calculated in comparison with the total Green Area

The extent of certified forests is illustrated in Figure 14.

³⁶ <http://www.csasfmforests.ca/>

³⁷ <http://www.sfi-program.org>

³⁸ www.fsc.org

Figure 14 : Extent of the certified areas by type

Source: <http://certificationcanada.org/index.php/maps-en/provincial/ab>

4. Conclusions

Alberta has very large forest land (35.2 to 38.1 million ha, depending on the methodology and the definition of forests), which represents about 57% of the province's land area. About half of the forest land (the Green Area) is considered potentially available for harvest the rest is not economically viable to operate, protected areas, lake and river buffers, steep slopes, etc. The province is very diverse in terms of ecological conditions, and the forest is present in most of northern Alberta as well as the mountain and foothills areas along the province's western boundary.

Approximately 97% of Alberta's forest land area is publicly-owned (mostly Crown land administered by the provincial Ministry of Agriculture and Forestry). Private ownerships accounts for the remaining 3%. Forest exploitation is organized through a system of license granted by the province to private management and logging companies.

Conifers predominate in Alberta and account for the great majority of all forest species. Spruce, pine and fir account for two thirds of the growing stock. Broadleaf account for the remaining third. A massive outbreak of the mountain pine beetle started after year 2005 and impacted millions of pines.

The forest area Alberta is not systematically monitored in terms of surface on a yearly basis. However, there are yearly statistics about harvested areas and reforested areas (by various methods including natural regeneration, plantation or seeds). Despite yearly discrepancies due to the interval period between harvesting and reforestation, figures gathered over a long period of time (7 years) clearly indicate that about 2% more land was reforested than harvested, which shows overall a positive evolution of the forest surfaces in the province. The ongoing afforestation programmes in Alberta (including in particular conversion of former agricultural land into forests) probably plays a role in those statistics.

The volume of harvested wood as a five-year rolling average ranged between 19.8 and 21.35 million cubic metre per year in the period 2001 to 2014. The mountain pine beetle outbreak led the authorities to raise the levels of Allowable Annual Cuts (AAC) from 2005/06 to 2011/12 as part of the effort to salvage timber and control pest propagation. However, the total levels of harvesting always remained stable and never exceeded the AAC.

The standing trees volume is not regularly assessed at the provincial level. Nevertheless, it is anticipated that this volume is currently depleting because of the wildfires affecting the province as well as the mountain pine beetle outbreak (for which emergency clearcutting is used as a rescue measure to contain the damage and recover some diseased wood). One of the consequences is also a decrease of the carbon stock associated to the forest carbon. This might be partially balanced by afforestation programmes, so the net balance remains uncertain.

Protected forest areas, mostly provincial parks, cover 4.2 million hectares, which is about 12% of the Green Area, the forested area of Alberta.

The protection of water in Alberta relies on Alberta's *Water Act* and *Environmental Protection and Enhancement Act*. The protection of soils relies on the *Timber Harvest Planning and Operating Ground*

Rules which are used implement decisions made in the Forest Management Plans (FMP) and other higher level plans.

Even though controlled fires are regularly used in forest management practices in Alberta, the use of fire is subject to permit and carefully monitored in order to preserve air quality. After several severe wildfires in the years 2011-2012, efforts have been made to avoid any excessive accumulation of fuel in the forests.

The FSC risk assessment platform considers that Canada is at low risk in terms of violation of illegal logging and in terms of violation of traditional and civil rights.

The forest certification systems cover 66 % of the Green Area certified under one of the three systems (CSA, SFI and FSC). SFI is the most important system, with 72% of the certified forests.

Disclaimer

Unless otherwise agreed, all orders and documents are executed and issued in accordance with our General Conditions. Upon simple request the conditions will again be sent to you. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects SGS' findings at the time of its intervention only and within the limits of client's instructions, if any. SGS' sole responsibility is to its client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law