

# forests & climate change

## Current Forest Issues

### Background

#### Climate Change 101

Most scientists around the world agree that global climates are changing. The last 100 years have been the warmest ever recorded and global temperatures continue to rise. These same scientists agree that human activity, especially burning fossil fuels for energy, has been a major contributor to our current situation.

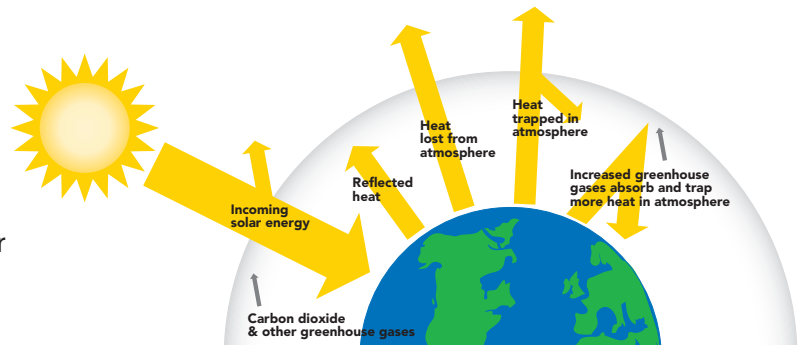
You have probably heard about the “greenhouse effect,” and how it is a bad thing. In fact, without the greenhouse effect the Earth would be too cold for us to live. Our atmosphere traps heat from the sun, preventing it from simply reflecting off the Earth’s surface and out into space. Gases like carbon dioxide, ozone, methane and water vapour - called “greenhouse gases” - help trap this heat.

Scientists tell us we are intensifying the atmosphere’s greenhouse effect. When we burn fossil fuels for transportation, heat and electricity, we put more greenhouse gases – especially carbon dioxide – into the atmosphere. This is resulting in an increase in temperatures around the world. Sometimes we call this ‘global warming’. What we are most concerned with is the changing of climates.

### The Role of Forests

Forests are an essential part of the system that keeps Earth’s atmosphere functioning smoothly. In the process of *photosynthesis*, trees and shrubs take in carbon dioxide (CO<sub>2</sub>), store carbon and release oxygen and water vapour. By doing this, trees help reduce the amount of CO<sub>2</sub> in the atmosphere, including some of the CO<sub>2</sub> caused by burning fossil fuels.

While forests can certainly help reduce the impact of climate change, scientists tell us the rate we are putting CO<sub>2</sub> into the atmosphere is more than our forests and oceans (*phytoplankton and bacteria* also carry out photosynthesis) can handle.



The Greenhouse Effect

The United Nations estimates that by the year 2100, the Earth’s average temperature will increase between 1.4 °C and 5.8 °C. They believe countries located furthest from the equator, like Canada, will experience the greatest change. At the current rate of increase, Canada’s temperatures could increase anywhere between 5 °C and 10 °C. Even if temperatures increased just 1 °C over several hundred years, it would have a significant impact on the makeup and location of our forests and everything that relies on them.

### Impacts on Forests

As forests play a role in helping prevent climate change, they are also likely to be affected by climate change. Impacts may include:

- Longer growing seasons for plants
- More insect and disease outbreaks – native and exotic
- More frequent and severe forest fires
- Adaptation of plant and animal species to new areas
- Precipitation changes – some areas becoming too wet, others too dry
- More catastrophic weather – tornadoes and floods
- Loss of wetlands – resulting in a loss of flood protection, water filtration and wildlife habitat

## Climate Change, Insects and Fire

While people discuss and debate the impact climate change may have on our planet, our forests are already being affected. Typically, fire and insects play an important function in the forest cycle by removing weak or old trees, and replacing them with new ones. As trees die and decompose, nutrients are recycled back into the soil. With a changing climate, these natural cycles are changing and are expected to continue to change even more.

### Insects

As part of the natural forest cycle, many different insects have an effect on the forest. Some eat the leaves, others the bark, and still others, the inside of the tree. Some insects kill the tree, others slow its growth. A changing climate will likely mean these insects become more widespread and more successful, leading to widespread loss of forests.

Insects are cold blooded, reproduce and travel easily, which helps them adapt to changes in climate. The *mountain pine beetle* is one insect that is taking advantage of the changing climate. Normally these beetles are controlled by cold winter temperatures. In the past, Alberta's cold winters have prevented the mountain pine beetle from moving outside the southwest corner of the province. But these tiny beetles — which have caused huge damage to the forests in British Columbia — have now moved into Alberta in large numbers. Warmer winters mean the natural "anti-freeze" these insects have is even more effective. The normal winter-kill of the mountain pine beetle is reduced, increasing the population by the hundreds of thousands, even millions!

Forest scientists, foresters and land managers are very concerned that insects like mountain pine beetle can and will do serious damage. Millions of trees are already affected and millions more are vulnerable, something to consider when we have a milder than normal winter.



Millions of trees have already been killed by the mountain pine beetle and millions more are vulnerable.



Climate change may increase how often and how severely forest fires will occur.

### Forest Fires

Fire also plays an essential role in the forest cycle. Forests are specially adapted to deal with natural forest fires. After a large forest fire, older forests, sometimes weakened by disease, are cleared out and insects in the area are controlled. Many of our trees, lodgepole pine, jack pine and aspen poplar, are well adapted to grow back quickly after a fire.

Climate change may increase how often and how severely forest fires will happen, and, in this case, it would be too much of a good thing. In recent years, the area of forests burned by fires has increased. This is likely due to warmer weather in the summer and reduced snow pack in the winter, making an area that is already very dry, even drier.

It's estimated that the average area burned by forest fires could increase 50 % in the next 50 years. On top of the impact on the forest, the impact on the atmosphere would also be serious. Forest fires already account for up to 45 per cent of Canada's greenhouse gas emissions – this is expected to rise as fires become even more frequent and intense.



# Case Study:

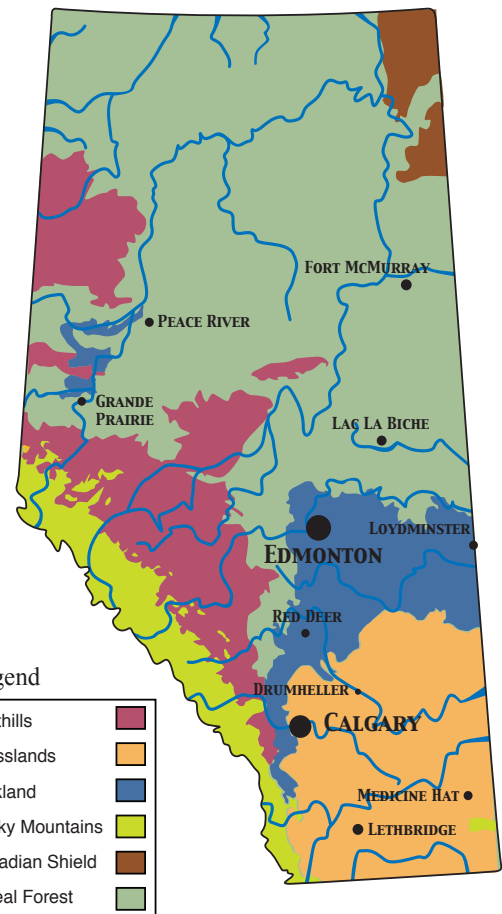
## What about the plants and animals?

The plants and animals we see in Alberta today have been here since the last ice age – (over 10,000 years ago). Since that time, receding glaciers have carved out much of the landscape that we know today. Our forests, soil, rivers, streams and wetlands have all been shaped over this time. The plants and animals that rely on this environment have adapted over these years to give us the wide variety of species we expect in Alberta's ecosystems. We know Alberta by the Rocky Mountain big horn sheep, Alberta's provincial mammal; by the lodgepole pine, our provincial tree; by the bull trout, our provincial fish; and many more species.

As our climate changes, these plants and animals are seriously threatened. In Western Canada, grasslands, aspen parkland and boreal forest may shift further north and to higher elevations. The climate we expect today in places like Calgary and Edmonton might become more common in Fort McMurray, Fort Chipewyan and even the Northwest Territories.

Sounds pretty good, right? Not so cold in the winter, warmer weather in the summer...what could be wrong with that? For our ecosystems, there is a lot wrong with that. The soil and moisture conditions in these regions are best for growing the plants that are already found there, not plants growing further south. The boreal forest is supposed to be boreal forest, not parkland or grassland. The wildlife and the people living in these areas expect boreal forest, not something different.

People that depend on the land for their livelihood may be affected, as well. Whether it's farmers in our grasslands; companies producing lumber in Alberta; or trappers in northern Alberta depending on wildlife species populating their traplines, Albertans have always lived from the land. Although change is natural, living organisms require time to adapt. A changing landscape resulting from a rapidly changing climate will impact us all.



### Legend

Foothills	
Grasslands	
Parkland	
Rocky Mountains	
Canadian Shield	
Boreal Forest	

Alberta's natural regions. Climate change may affect the the look of Alberta's landscape.



Rocky Mountain big horn sheep



lodgepole pine



bull trout

## Glossary

**Biodiversity** – the variety of life in an area or ecosystem.

**Carbon Sink** – the natural ability of trees, plants, oceans and other organisms to store carbon on a temporary basis.

**Greenhouse effect** – the trapping of the sun’s heat energy by the earth’s atmosphere.

**Greenhouse gas** – naturally occurring gases existing in the Earth’s atmosphere that help trap the sun’s heat energy, warming the Earth. Greenhouse gases include: water vapor, carbon dioxide, methane, nitrous oxide and ozone.

**Photosynthesis** – the process in which plants use light energy from the sun and CO<sub>2</sub> from the atmosphere to make their food. Oxygen is released by plants during photosynthesis.

## Discussion Questions

1. Alberta’s natural resources are very important to our economy. Many families make their living from the land. Using the map from the case study, on the previous page determine which natural region you live in. If there’s a shift in natural regions northward or to higher elevations, how would your community be different than it is today? (Think about plants/animals, recreation activities, and industry activity overall.)
2. If forest fires are part of the natural forest cycle, why do you think people are so aggressive in fighting them?
3. Thinking specifically about the forest, what sorts of things can your class do at home or school to reduce your role in climate change?

## Webquest

### Government of Alberta Climate Change

[www3.environmentalberta.ca/1319.html#555](http://www3.environmentalberta.ca/1319.html#555)

### Government of Canada Green Lane

[www.ec.gc.ca/climate/overview\\_science-e.html](http://www.ec.gc.ca/climate/overview_science-e.html)

### One Less Tonne

[www.onelesstonne.ca](http://www.onelesstonne.ca)

### One Simple Act

[www.onesimpleact.alberta.ca](http://www.onesimpleact.alberta.ca)

### Green Learning

[www.greenlearning.ca](http://www.greenlearning.ca)

### United States Environmental Protection Agency – Climate Change for Kids

[www.epa.gov/climatechange/kids](http://www.epa.gov/climatechange/kids)