forest changes

Background

We often think forests are fairly unchanging systems – they don't seem to be doing all that much. Sure the wind rustles the leaves and forest creatures are busy living their lives. But the forest doesn't seem to be particularly active. While that might be true for an instant in time, forests are continually changing. In fact forests need to change. There are a variety of ways a forest changes, some natural, some human-caused.

The major types of natural changes in Alberta's forests – forest fire, insects and disease – can have both positive and negative impacts on forest health.

Forest Fire

Fire has always played a big role in shaping what we see in Alberta's forests today. In fact, certian plant and animal species in our forests have special adaptations that enable them to live with natural forest fire.

Lodgepole pine trees are specially adapted to handle forest fires. Its seeds are sealed inside cones by a wax-like coating. When the cone gets very hot, such as during a forest fire, the cone opens up and seeds are released, usually into a nutrient-rich seed bed. The forest changes as fire destroys old, sometimes diseased or insect-infested trees, and creates ideal conditions for young trees to grow.

But what about the animals? Deer and moose, for example, have the ability to leave a forest fire. Often they will move to areas with new grasses, shrubs and young trees and return again when the burnt areas have new vegetation.

It would seem then, if the forest needs to change, forest fires would be a useful way for this to happen, especially if animals aren't at much risk.

Each year about 60% of the forest fires that burn Alberta's forests are caused by nature such as lightning hitting trees. Humans, usually acting irresponsibly, cause the other 40%.

Part of the natural forest cycle, fire destroys old, vulnerable trees....

...and creates conditions for new growth.

People have been working very hard for many years to prevent human-caused forest fires. When forest fires begin, the Government of Alberta springs into action, investing time and effort into fighting forest fires as quickly as possible. There are even people whose job it is to watch the forest. From the towers where they live they keep their eye on the forest. Any sign of natural or human-caused forest fire is reported immediately, and an attack force goes to work.

If fire is part of the natural forest cycle, and the forest wants to change and needs to change, why do we spend so much effort and money to fight forest fires?

There are many explanations for this:

- Many Albertans live in and around the forest. The main concern in fighting forest fires is protecting people and their property.
- Many Albertans work within forests. A loss of trees would affect forest products companies, tourism, recreation and other things we appreciate from our forest.
- Forest fires can be very unpredictable. If we decide to let a wildfire burn itself out, there is a chance it might get out of control.

You can see that there are some hard questions when we think about fire in the forest. Can any forest fire be good? When? Even if fire is a good thing, should we still fight them everywhere every time?

Forest Insects and Disease

Like the human body, a forest contains a number of parasites and organisms. Parasitic plants, fungi and insects are part of the natural life cycle of the forest. But if they are left unchecked they can impact the valuable benefits of the forest for humans and animals alike. Alberta's forests are home to a number of these pests:

Forests will always be home to a wide variety of organisms and experience change. Diversity is essential to the health of the forest. But it's also important to manage that diversity to maintain balance in the forest. Forest managers have to determine the environmental and economic impact of doing something versus letting nature take its course. They must consider a number of control options specific to each pest:

1. **Biological** – use of natural predators, parasites or disease to control a population.
2. **Behavioural** – use of pheromones (hormones) to alter insect behaviour.
3. **Chemical** – use of pesticides to control a pest population.
4. **Physical** – harvesting trees in areas where insects exist or in areas where it is expected these insects will travel.
5. **Prescribed fires** – forest fires deliberately set and controlled (as much as possible) by forest managers can remove vulnerable trees meaning, a larger forest fires or insect outbreak may become less likely.

Dwarf mistletoe is a parasitic plant that makes its home in lodgepole and jack pine trees. The plant digs its roots into tree tissue, making it difficult for the tree to get essential water and nutrients. This leaves the host tree vulnerable to disease and infection and causes branches to grow in dense clumps called witches' brooms. (After 10-15 years, a tree affected by dwarf mistletoe will usually die.) On the positive side these clumps are often used as nesting sites and cover for birds.

Dutch elm disease is a tree disease that could seriously harm Alberta's urban or "city" forests. So far, Alberta has been fortunate to avoid this devastating disease, though the elm bark beetles that carry the disease-causing fungus have been found in the province. Edmonton is home to one of the largest populations of uninfected elm tree populations in the world. Should Dutch elm disease take hold in Edmonton, it is possible that thousands of elm trees, the trees that line many neighbourhoods, will die.

Case Study:
Mountain Pine Beetle (MPB)

The mountain pine beetle *(Dendroctonus ponderosae)* is a black beetle approximately 5mm long, or about the size of a grain of rice. This bark beetle is normally found in the southern Rocky Mountains and in areas west of the Continental Divide under the bark of pine trees 80 years or older. In British Columbia and Alberta this mostly means lodgepole pine trees. Until recently it had not survived in areas northeast of the Rocky Mountains.

mountain pine beetle

Normally, the mountain pine beetle plays an important role in the forest ecosystem. Over the course of their 1-2 year life cycle, the beetles, acting as parasites, kill old or weakened trees, creating the conditions necessary for new trees to grow.

In mid-summer, large numbers of adult female beetles bore into a new host pine tree, creating vertical galleries in the phloem tissue of the tree. Here, they mate and deposit their eggs. The larvae hatch over winter in the tree, feeding on the tree tissue, and boring out of the tree the following spring to begin the cycle all over again.

While in the host, the mountain pine beetle weakens the tree's natural defense system by introducing a blue-stain fungus. The fungus spreads rapidly, killing tree cells and preventing the flow of sap that would normally flush the beetles out of the tree. It is the combination of the galleries and the fungus that cuts off the flow of water and nutrients, resulting in the tree's death.

Unusually hot, dry summers and mild winters in B.C. during the last few years, along with forests filled with mature lodgepole pine, have led to an epidemic of MPB. In 2006, high winds blew the beetles across the Rocky Mountains into Alberta where conditions similar to those in B.C. caused an infestation of our own, affecting 300,000 - 1.5 million trees.

The number of infested trees is expected to grow quickly. Our steadily warming climate means the cold temperature (a steady dose of -40 $^{\circ}$C at certain times of the year) needed to hold back pine beetle population growth doesn't come around very often.

Lessons learned in Alberta from our neighbours in B.C. tell us that the impact on Alberta's forest products and tourism could have serious effects on Alberta's economy and thousands of families who depend on the forest to make their living.

As well, it's possible that the MPB could travel across all of Canada's boreal forest. The beetle could adapt and start infesting jack pine trees, which cover Canada's boreal forest from coast to coast.

The Government of Canada (in national parks) and Government of Alberta (in other regions of Alberta's forest) monitor beetle populations and try to keep infestations under control by cutting and burning infected trees, cutting and peeling the bark, or turning the wood of infected trees into forest products.

Even though the forest will regenerate itself in time (faster with help from humans), the possible impacts of MPB are serious. New strategies, ideas and approaches for Alberta will need to be taken to help protect our forest resource and help prevent the beetle's spread eastward.

While this insect needs to be carefully studied and monitored, it's important to remember that it is just one of dozens of forest insects and disease which need to be considered. Not all pests cause the damage that the MPB does. Others play an important role in the ecosystem. They're all part of a complex system of lives, organisms, intertwined into a complex thing we call "the forest."

Edmonton

Calgary

● Confirmed MPB Location

Map Created November 21 2007
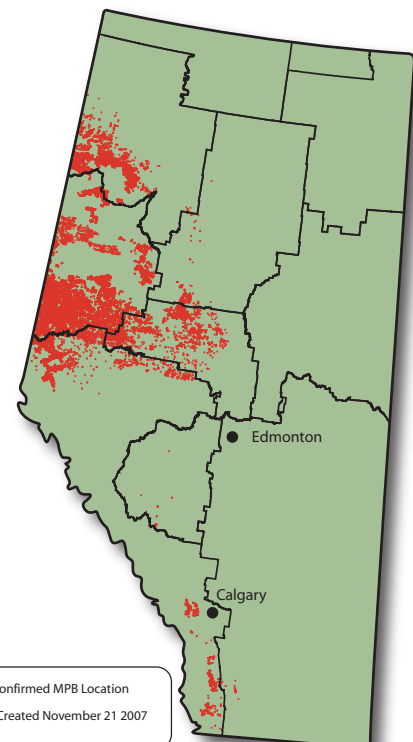
2007 MPB Aerial Survey Sites
By 2013, it is predicted that 80 percent of the Western Province's mature trees will be killed off.

Trees attacked by mountain pine beetle are easy to spot:

1. Reddish coloured needles and bark
2. Visible tubes of pitch (sap) where the tree tried to flush out the beetles
3. Sawdust at the base of the tree from beetle boring holes
4. 'J'-shaped pattern under bark ("galleries")
5. Blue-grey sapwood

Call the Alberta Government Hotline 310-BUGS if you see evidence of beetles.

Glossary

Diversity – the variety of life within a particular ecosystem.

Epidemic – a temporary large scale outbreak. High populations give an organism the ability to infest almost all the hosts in an area.

Infestation – a large-scale, temporary increase in the numbers in a given location, where the cause and its damage are noticeable.

Phloem – the food conducting tissue of the tree: part of the inner bark.

Prescribed Fire – fires deliberately set by forest managers for a specific purpose. Usually this means removing old vulnerable areas of the forest, or areas that have a buildup of fire-susceptible plant matter.

Urban forests – forests that are found within the limits of cities or towns.

Discussion Questions

1. Imagine you are an Alberta government forest manager. Your job is to decide whether to fight a forest fire in a specific area of the province. What sorts of things would you consider and what would you do if the fire occurs:
   a) near Canmore, AB?
   b) near Wood Buffalo National Park?
   c) in Banff National Park?
   d) near Whitecourt, AB?
   e) in Bragg Creek, AB?

   You may need to use a map, an atlas or the internet to find out the location of these places.

2. What do you think makes an insect, plant, or disease in the forest a "pest"?

3. When should prescribed burns be used to control insect epidemics?
   • When should they not?   • What are the alternatives?

4. What can you, as an Albertan, do to help reduce the impact and spread of mountain pine beetle? Is the mountain pine beetle issue more of an environmental of an economic issue? Why?

Webquest

Alberta Forest Products Association
www.albertaforestproducts.ca/resources/PineBeetle.aspx

Alberta Wilderness Association
www.albertawilderness.ca - Search for "mountain pine beetle"

City of Edmonton
www.edmonton.ca - Search for "Dutch elm disease"

Government of Alberta
www.srd.gov.ab.ca/forests/health

Parks Canada
www.pc.gc.ca - Search for "mountain pine beetle"

Your Forest
www.yourforest.org