

Spirits

Aboriginal people who made the boreal forest their home saw themselves as part of a world imbued with spirits.

The animals, the trees, even the lakes and skies, possessed spirits that were akin and yet distinct from their own. Thus the religions of the Innu, Cree, Ojibwa and other Algonkians in the east, and the Dene (or Athapaskans) in the west shared the belief that the people should seek the guidance of these spirits for success on earth.

Animals provided food and skins for clothing. But if the animals' remains were not treated with respect, their spirits not appeased, they would not reveal themselves to the hunter in future. So, the Innu were painted caribou skin coats to please the animals' spirits and make the hunt successful.



Among the favourite folk tales of French-Canadian voyageurs was that of *chasse-galerie*, the great canoe that the devil himself, for the mere price of a few souls, would guide through the sky, carrying homesick voyageurs back for their New Year's welcome.

With its hard climate and thin soil, the boreal regions remained only sparsely settled, and human influence on the land (until the loggers arrived) was minimal. The forest stayed, as Robert W. Service wrote in "The Spell of the Yukon." "Plum-full of hush to the brim." It embodied Bliss Carman's belief that "The greatest joy in nature is the absence of man."

It was this wilderness, this "large and lonely land" as Manitoba poet Thomas Saunders called it in "Beyond the Lakes," that drew painters north in the 1910s and 1920s, artists bent on seeing a Canadian landscape without peering through European filters.

For the whole nation, it seems, there was a northern consciousness. "I have never been to James Bay," Stephen Leacock wrote in 1936, "I never got to it; I never shall. But somehow I'd feel lonely without it."

Grey Owl, the Englishman who masqueraded as an Indian, touched many with his similar thought: "Give me a good canoe, a pair of libby snowshoes, my beaver, my family and 10,000 square miles of wilderness and I am happy."

Wade Hemsworth, a veteran of northern survey crews in the 1950s, has written songs that capture both the haunting loveliness of the boreal forest, and its deomonial side.

Black Tobey fell to swearin'; the work went slow.
The state of our morale was a-gettin' pretty low.
The flies swarmed heavy; it was hard to catch a breath
As you staggered up and down the trail talkin' to yourself.
And the blackflies, the little blackflies,
Always the blackfly no matter where you go.
I'll die with the blackfly a-pickin' my bones
In North Ontario-o-i-o, in North Ontario-o.



Biting insects such as the black fly and mosquito can make human life uncomfortable, but these insects play a vital role in the boreal forest chain. Many species of fish and birds — including a number of migratory — depend on the forest — depend on these insects for food. They are also important pollinators of plants at ground level.

But then in "The Wild Goose" . . .
I've worked in the bush and spent money in town;
I'd like to get married, but I can't settle down.
At the last portage, when I'll pack no more
Let me fly with the wild goose high over north shore
With the wild goose,
The wild goose,
High over the north shore
And I'm going home.

It seems that spirits still linger in the boreal forest.

Spirits are alive in the works of native artists who came to prominence in the 1960s and 1970s, including Norval Morrisseau, an Ojibwa from the Lake Nipigon area. They drew their inspiration from traditional stories and art styles, including pictographs and petroglyphs, and painted mythological figures in a style both modern and ancient.

These images remind us that there is more to the boreal forest than trees and other living creatures. They reflect the roots of our culture.

To contact the spirits directly was not for most people most of the time. It was in dreams or visions that the barriers between people and the spirit world vanished, or perhaps through the intercession of shamans. Pictographs (red ochre fingerprinting) and petroglyphs (figures carved in rock), created over the millennia throughout the boreal region (and beyond), are associated with shamanism and the quest for spiritual guidance.

roots of old trees, even if those trees are charred, so fire ensures them a vigorous life. Similarly, black spruce and lodgepole pine can keep live seeds in their cones for years, seeds that are released when fire kills the trees themselves.

All trees in the boreal forest, in one way or another, depend on fire. It starts a new life succession (the aply normal fireweed is generally first to grow on the charred land), using the nutrients produced by the fire from the litter of the forest floor.

There are about 9,000 forest fires recorded annually in Canada. Most are small, burning just a few hectares. Some are huge, raging for weeks and consuming 100,000 hectares or more. An average of 2.8 million hectares is burned every year, virtually all in the boreal forest (eastern hardwoods and the west coast rain forest are not as susceptible to fire).

About a third of the area lost is in Canada's commercial forest. To compare, about 800,000 hectares of forest are cut every year.

Forest fires vary. They can smoulder underground, or burn just the surface growth and litter. At their most dangerous and spectacular, they can consume the whole forest, spreading from crown to crown faster than a person can run.

Wind is the ally of fire. It can fan the flames and carry sparks over vast areas, turning a small fire into a great blaze in a matter of hours. Wind is one reason fires are generally worse during the day than at night — winds are stronger, temperatures are higher, and there is less humidity.

When mining and lumber towns grew up in the boreal forest in the late 19th century, they found themselves in harm's way. A forest fire near Timmins, Ont. in 1911 burned 200,000 hectares and killed 73 people. Another in the same region in 1916 destroyed several towns and killed 244 people. In 1922, fire destroyed 6,000 homes and 43 people died.

Not surprisingly, forest fire detection and suppression evolved. Lookout towers were built, portable pumps and other firefighting supplies were stockpiled, and communications systems improved. The 1920s saw the beginning of fire detection by aircraft, which by the late 1960s had replaced lookout towers. In the 1920s as well, a Forest Fire Weather Index was created which links weather and forest conditions to provide daily ratings of local forest fire risk.

Surveys have identified lightning-prone areas, and the behaviour of fires has been studied to discover how fire in given areas will catch or spread.

Still, the job of controlling forest fires comes down to people doing hot, dangerous work on the ground. In a direct attack, firefighters with shovels, portable pumps, hoses and bulldozers try to extinguish the flames on the spot. If the fire is too hot or is spreading too quickly, crews use the indirect approach of a backfire or burnout. A strip of forest downwind of the fire is lit by hand-held torches or charges are dropped by helicopter. The hope is that the approaching main fire will die out when it hits the burned line.

Rain remains the firefighter's best friend. But perhaps the next best is the water bomber, particularly an aircraft that can scoop up water while skimming a lake. The Canadair CL-215, introduced in 1967, is the only plane specifically designed for this. It can collect more than 5,000 litres of water in 10 seconds, and drop it over a fire in one second.

Flames ravage the boreal forest regularly, leaving a landscape of burnt trees and blackened earth. But from this charred ground, new life emerges, plants suited to the scorched terrain, trees more robust than the aged ones they replace. Fire means renewal in the boreal forest, a central part of the life cycle as ancient as the forest itself.

For most of the 20th century, people hoped to eliminate fire from the forest. Distressed by the loss of valuable timber, governments and lumber companies fought every accessible forest fire in every possible way and educated the public about the danger. Now, the firefighter's priorities have become the protection of human life and property and the preservation of the commercially valuable stands. In remote regions, or accessible areas where forest renewal is overdue, fire is allowed to take its course.

The boreal forest is a patchwork of different tree populations, and they burn naturally at different intervals. Some jack pine stands may in the past have burned every 15 to 35 years; certain spruce forests may have been hit by every 50 or 100 years; and some red or white pine stands may have burned only every two centuries. Prairie grass fires consume bordering aspen groves as often as every three to 15 years. New aspen grows from the roots of old trees, even if those trees are charred, so fire ensures them a vigorous life. Similarly, black spruce and lodgepole pine can keep live seeds in their cones for years, seeds that are released when fire kills the trees themselves.

Protected areas and commercial forest land

Lightning accounts for about 85 percent of the 2.8 million hectares of forest burned annually. People, including careless campers and smokers, cause the rest. The fires caused by people are more numerous, but burn a smaller area than those ignited by lightning.



Managing the forest for the future

Canada's boreal forest is a resilient ecosystem, a survivor in the face of numerous challenges. But its interlinked life forms are under pressure, and maintaining its health is the goal of Canadians and their governments.

Until the late 1800s, the only disturbances to Canada's boreal region had been fire, insects, climate, high winds and other natural forces.

During the 1890s, however, loggers appeared in the North, and with them the forces of industry. The new forces were strong, and over the succeeding century the necessity to manage the forest became apparent. And the forest was not limitless, as the loggers found out as they had to go farther and farther north to find suitable timber.

Much is being done to understand the boreal ecosystem and to prevent damage to it. Public awareness is growing about the value of the boreal forest and the harm that can befall it.

Sustainable forest management has long-term payoffs

Each province and territory has their own regulations and legislation. However, they have, along with the federal government and the forest community, developed a National Forest Strategy to support sustainable forest management, nation-wide. As well, when Canadians plan their forest activities, they have an obligation to honour international agreements such as the UN's Convention on Biological Diversity.

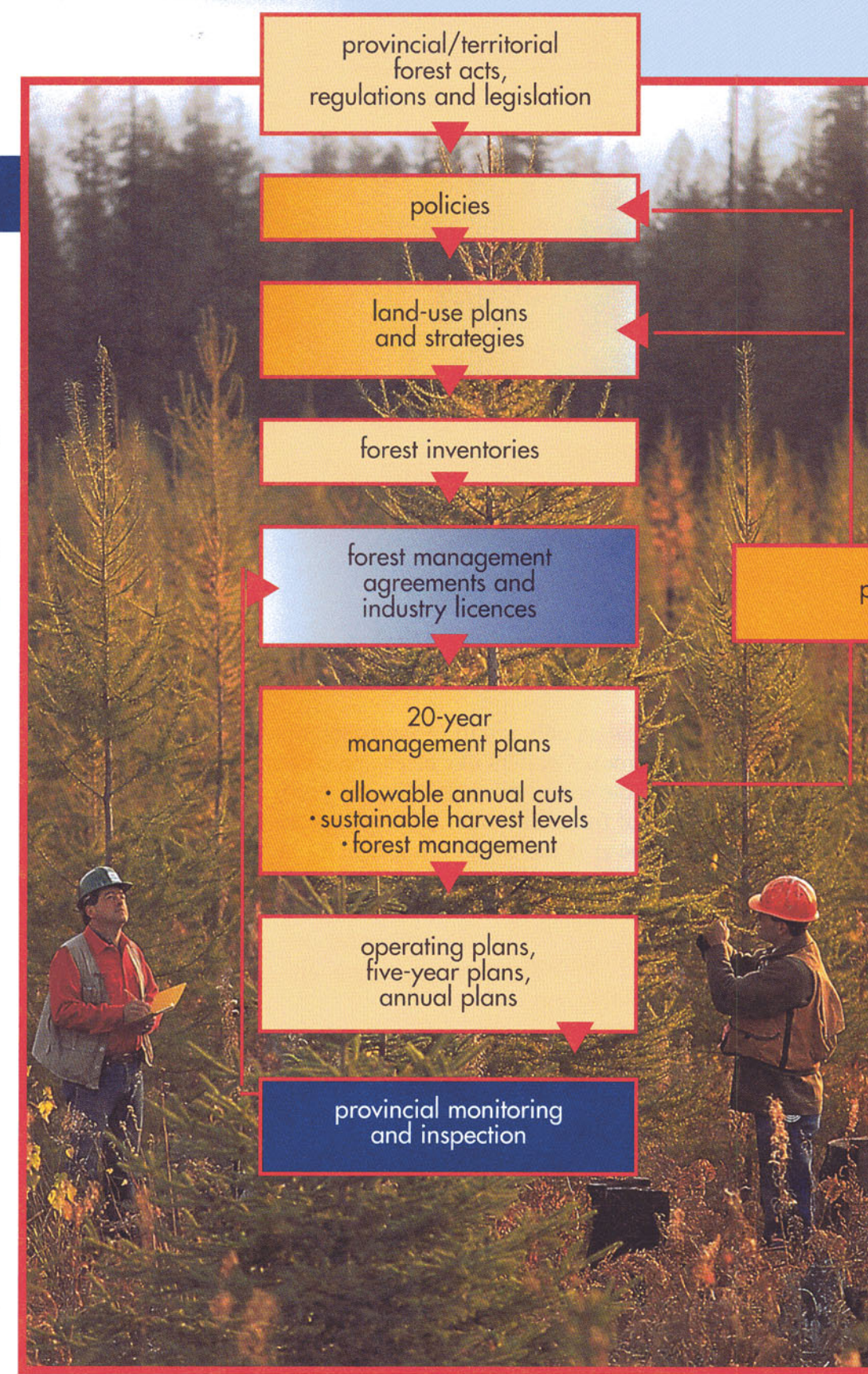
The aim of the strategy is a sustained supply of timber, healthy forests and watersheds and a guaranteed future for their animals and fish. While governments own 92 percent of the boreal forest, there are competing interests in how the land is used. Governments, industry, private cottagers, hunters, recreationists, and Aboriginal communities all have interests, and in some cases legal or traditional rights, in how the forests are managed, and the purpose for which they are used.

Companies with long-term licences to forest land pay cutting fees to the government, plan and carry out sustainable management in return for harvesting timber. Canadian use of public forests starts by looking at the forest as a number of ecological units with distinct land-forms, climate, soil and vegetation.

The goal of the National Forest Strategy is to maintain healthy forest ecosystems.

Regularly updated forest management plans identify sites for silviculture using what is called a landscape-level approach. This means industry concentrates on one area, so that 50 years from now there will be a block of mature forest. Silviculture means harvesting trees, promoting natural regeneration, preparing for tree planting, controlling vegetation that competes with valuable tree species and thinning overly dense stands.

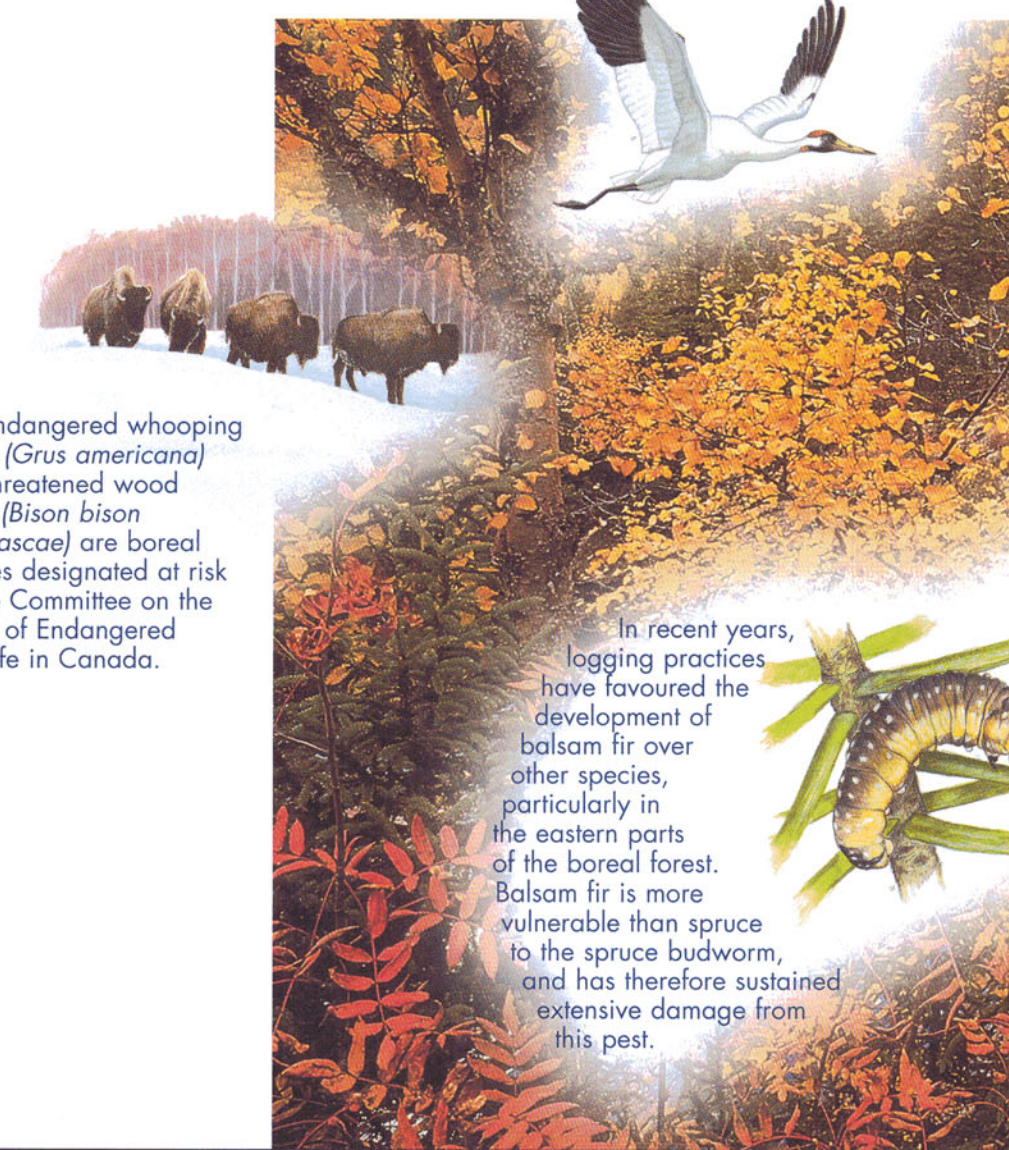
Natural regeneration often provides ample commercial species in the boreal forest. When it doesn't, foresters may supplement the natural process with some planted trees, or establish and maintain whole forest plantations. There is widespread agreement to avoid using chemicals against destructive insects wherever possible, replacing them with biological controls and an integrated approach to the control of harmful forest insects. Among other things, this means early detection so an infestation can be precisely located, a good mixture of tree species, and insects that prey upon one another.



There are guidelines for road construction, stream crossings and how to use machinery. Construction sites are inspected to make sure nobody leaves behind oil drums, containers emptied of their seedlings or other industrial garbage.

Management of the boreal forest has to be flexible because the forest itself is so diverse.

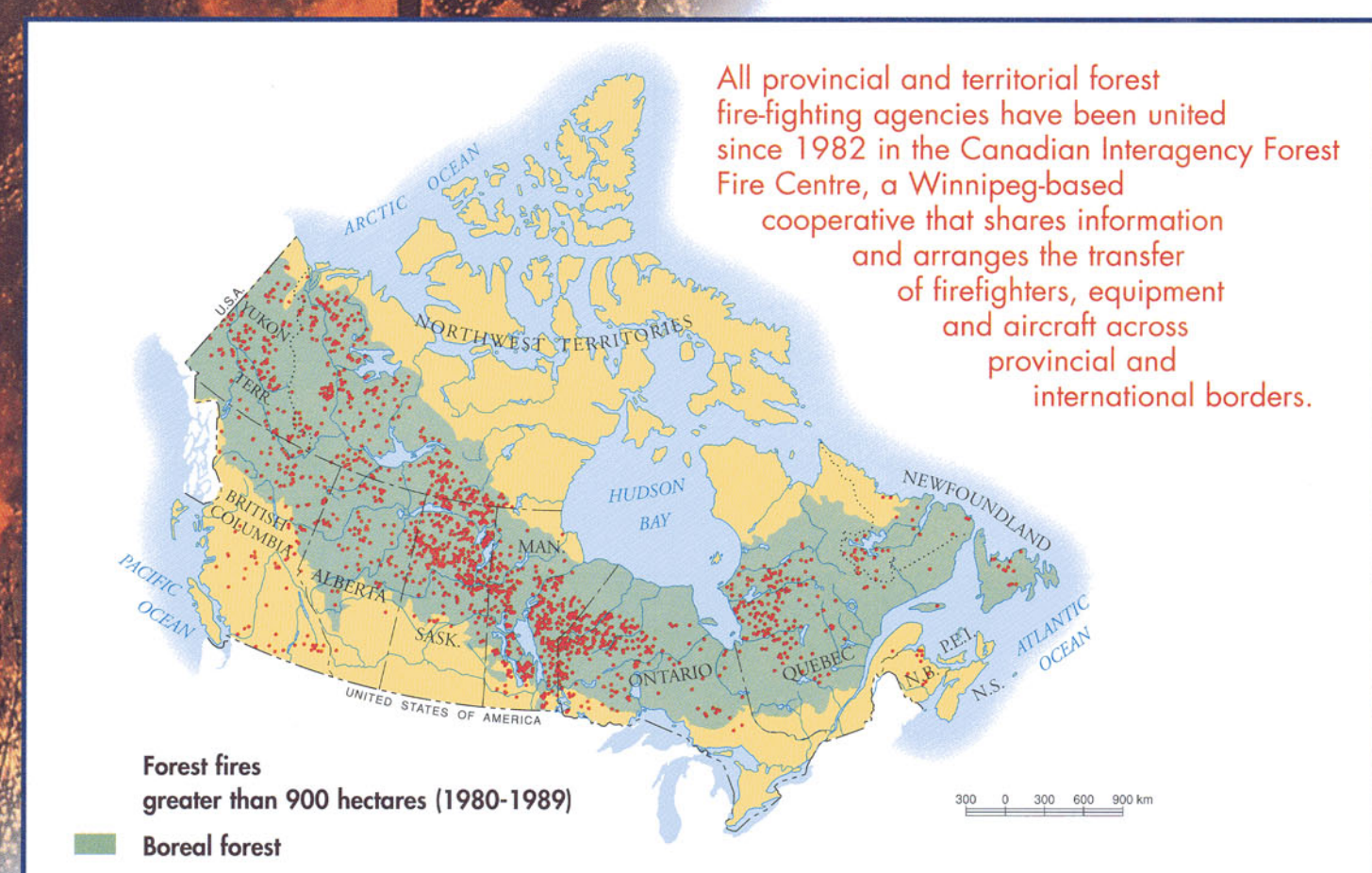
There are universal standards, but action must be local. Local managers keep track of the harvest and note the growth rates of different tree species. They also watch for fires, insect outbreaks and tree diseases, and monitor the condition of the soil and watersheds. They keep track of what it costs and respond to any threats to "their" forest. Such a long-term resource doesn't come cheaply.



The endangered whooping crane (*Grus americana*) and threatened wood bison (*Bison bison athabascensis*) are boreal species designated at risk by the Committee on the Status of Endangered Wildlife in Canada.

In recent years, logging practices have favoured the development of balsam fir over other species, particularly in the eastern parts of the boreal forest. Balsam fir is more vulnerable than spruce to the spruce budworm, and has therefore sustained extensive damage from this pest.

The boreal forest is destroyed by fire, and created by it.



Distribution of large forest fires over a decade

Sustainable forests: A Canadian commitment (Canada Forest Accord, 1992)
 Our goal is to maintain and enhance the long-term health of our forest ecosystems, for the benefit of all living things both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations.

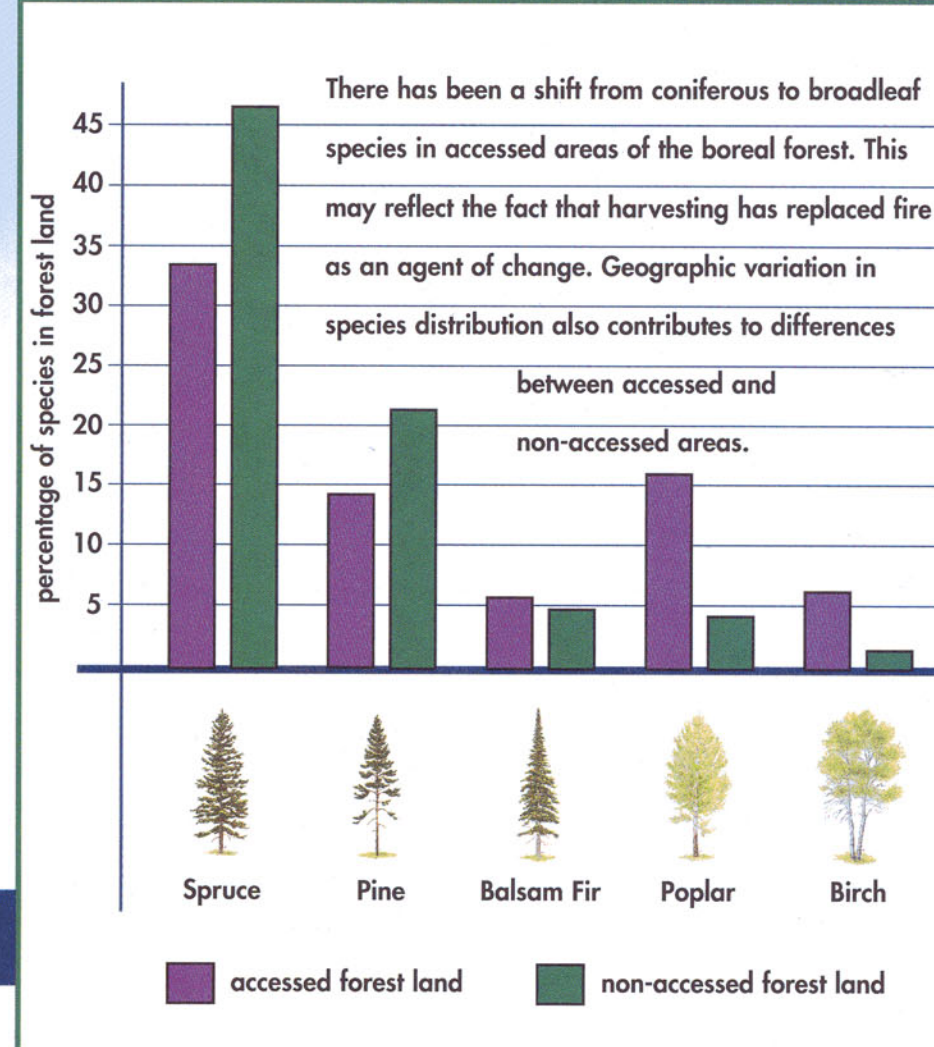
During the past three million years, boreal trees were driven again and again to the edges of what is now Canada as ice sheets invaded the continent. When the glaciers retreated the last time, to the arctic islands and mountain tops, the plants and trees of the boreal forest recolonized the newly exposed land.
 This is the backdrop to change in the forest that goes on in cycles ranging from seasonal to those that take millennia. In the last change from glacier to forest, the northernmost species brought life swiftly in wind-blown or water-borne seeds. These were white spruce, black spruce, tamarack, poplar, alder and willows. Jack pine is a relative newcomer, absent from the northern boreal forest as well as eastern Quebec and Labrador.

Viewed from an aircraft, the boreal landscape is a patchwork of even-aged stands that developed following fires or insect outbreaks.

Rivers, lakes and wetlands add to the effect as do land-forms left over from the glaciers, lake eskers, moraines and outwash plains. Ancient lake bottoms, or clay beds, are zones of fertility in the meagre soils of the boreal shield. Permafrost further complicates forest and tundra.

Two great transcontinental bands of approximately equal width distinguish this "great green scarf." In the south, there is a continuous or closed-canopy forest. In the north is the little known open lichen woodland.
 Lichen woodland is a feast for the eye but unfamiliar because it has few settlements or roads and a plague of black flies. Upland stands of scattered spruce and jack pine form attractive "parks" carpeted with yellow, green and light grey lichens. Recently burned areas are covered with birch, blueberries and evergreen dwarf shrubs. Tamarack is common in wet fens, while shallow-rooted black spruce colonizes frozen and uplifted bogs known as "peat plateaus." Along the arctic edge of the lichen wood

Species distribution in accessed and non-accessed areas of boreal ecozones



land, where the ground is permanently frozen, patches of stunted forest grow between tundra-covered hills.

The southern, continuous boreal forest has taller trees which form canopies to allow moss, herbs and shrubs to thrive at ground level. This is the mainstream forest that feeds the mills. Frequent fires have left behind aspen, jack pine, birch and black spruce that take over in the charred soil. Fire is less frequent in the moister forests to the east, where balsam fir — slow to colonize burned land — becomes a larger part of the forest mix.

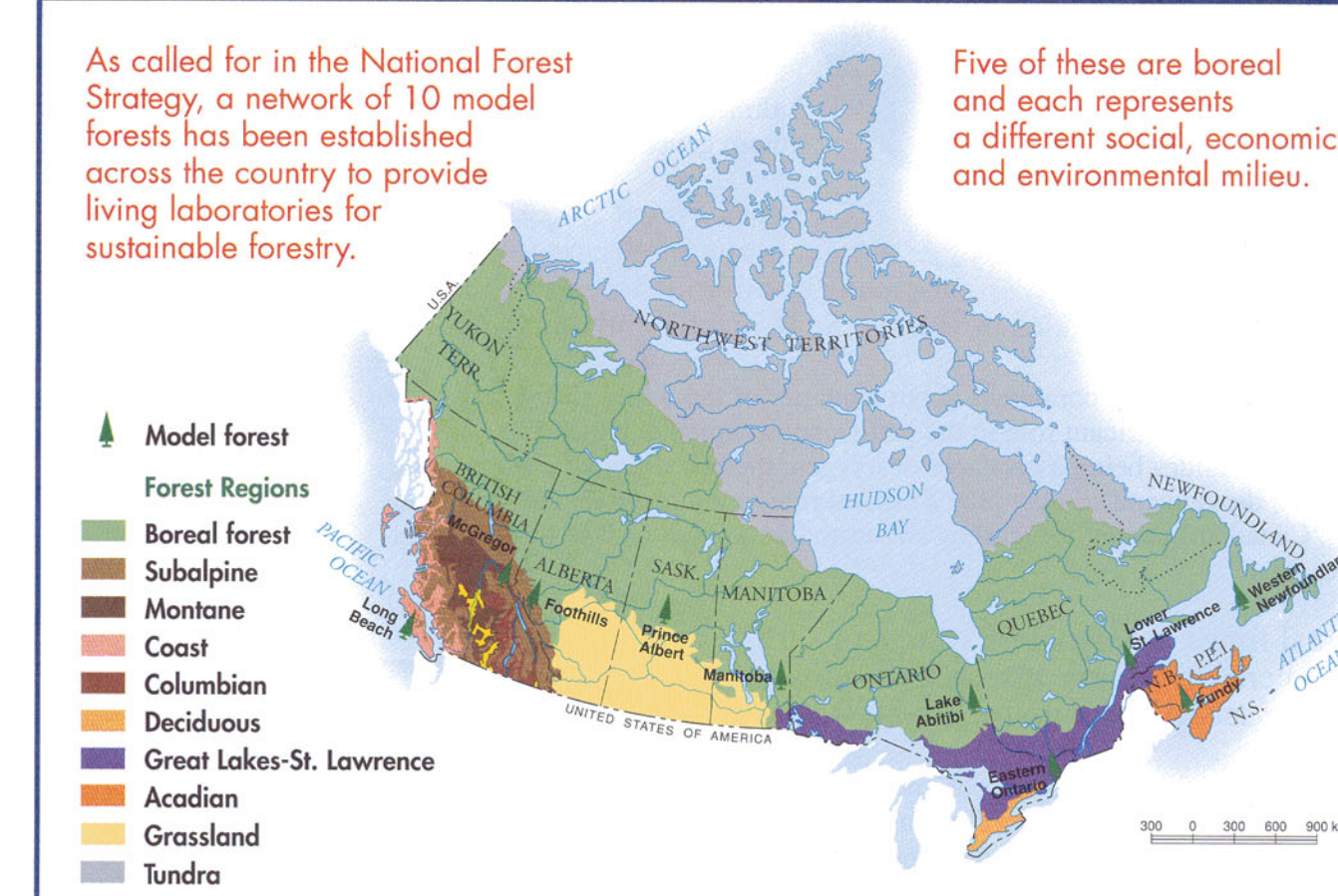
The western boreal forest adjoins the foothills of the Rockies. Here, Engelmann spruce, lodgepole pine and alpine fir replace their close eastern relatives: white spruce, jack pine and balsam fir. Where the boreal forest meets the Prairies, it changes to stands of almost pure aspen, grading into parks dotted with grassy openings.

This dominance of a single species contrasts sharply with the broadleaved trees that invade the southern margins of the boreal shield in Ontario and Quebec. Here loggers and campers see sugar maple, red maple, beech, yellow birch, red oak, black ash, basswood, red and white pine and white cedar.

Winter is a challenge. Animals can hibernate beneath the snow, but trees get the full force of icy winds. If water freezes inside its cells, a plant dies. Some fill their cells with fluid similar to anti-freeze, but this works only if temperatures are above -40 C. True boreal species live through even lower temperatures by withdrawing water into the spaces between cells, where it freezes harmlessly.

Aspen and birch are pioneer species, well adapted to areas disturbed by people. A major shift from coniferous to mixed and broadleaf stands is occurring in cut-over portions of the boreal forest. New technology makes it easy to convert aspen into pulp, waterboard and other products. So maintaining boreal conifer forests is a tough task.

A greater threat is the change in the climate largely due to human activities, mostly the burning of fossil fuels and changes in how the land is used. Potential effects of global warming could include more fires and insects. Some scientists predict that Canada's boreal forest could largely be replaced by grasslands in the west and mixed forest in the east if carbon dioxide increases to twice its current level in the atmosphere.



Canada's forest regions and model forests

As called for in the National Forest Strategy, a network of 10 model forests has been established across the country to provide living laboratories for sustainable forestry.

Five of these are boreal and each represents a different social, economic and environmental milieu.