

TEACHING KIT

CANADA'S BOREAL FOREST

Tradition and Transition



Volume 8: Canada's Boreal Forest



National Forest Week 2007: September 23 to 29

Canada is recognized around the world as a forested nation. Forestry is the founding industry of Canada and as such, exists as both a historical legacy and a continuing tradition.

The tales of the squared timber era in eastern Canada and clearing of forested land for farming are colourful and integral parts of this country's past.

However, our forests, our forest industry and our outlook toward Canada's natural forest resources are all undergoing transition. The theme of National Forest Week 2007 "Canada's Forests: Tradition and Transition" reflects both historical viewpoints and new ideas. We understand that the forest reaches back to antiquity and that it has nurtured all life on our land. We are aware that our forest heritage continues to be honoured in Aboriginal cultures, and since European settlement, has supported the exploits of pioneering timber barons and their employees. We understand the forest sector in Canada has evolved over the years and decades as a sustainable and innovative industry, which continues to support the needs of Canadians from all walks of life. We understand that the forest industry and all stakeholders in forested land use and management are dedicated to continuous improvement.

In keeping with this year's theme of tradition and transition, we invite you to join the Canadian Forestry Association in celebrating Canada's forests — in September and year-round. Plant a tree, walk through a forest or learn about forest management. Your local forestry association and land stewardship groups can provide more ideas, teaching materials and information about forest activities in your area. If you are planning a National Forest Week event — large or small — be sure to submit it to the CFA's on-line calendar at www.canadianforestry.com.

Barry Waito
Chairman and CEO,
Canadian Forestry Association



The Forest Capital of Canada 2007 ~ Oakville, Ontario

Recognizing leadership is an important way to inspire ongoing dedication and innovation in any domain. To honour those who demonstrate leadership in understanding the valuable role forests play in the socio-economic and environmental health of Canadian communities — past, present and future — the Canadian Forestry Association instituted the Forest Capital of Canada program in 1979.

For over 25 years, the CFA has recognized a community or region demonstrating the passion, stewardship and sound practices that result in sustainable forest development, management and conservation. These range from communities surrounded by forest and directly dependent on the forest industry to communities in urban and rural areas that understand the important function of forests in our daily lives. Wherever they live, people across Canada increasingly understand our collective dependence on forest products, and the myriad of ways forests are valued — in terms of economic benefits, cultural traditions, social ties, recreational pursuits and spirituality.

This year, the Town of Oakville, Ontario has been recognized as the 2007 Forest Capital of Canada — for its urban forest planning and management, for the beauty and integrity of its street trees, parks, woodlots and trails, and for the importance its leaders and everyday citizens place on conservation of natural areas. This honour nicely underscores special activities as Oakville celebrates its sesqui-centennial in 2007.

Oakville was the first lower-tier municipality in Canada to achieve a Certified Forest designation from the internationally recognized Forest Stewardship Council of Canada — for Iroquois Shoreline Woods Park. Oakville was also the first community in Ontario to complete a community-wide Urban Forest Effects Model Analysis. The Town implements Official Plan policies that support the present and future of its urban forest. We congratulate the citizens of Oakville in adding a Forest Capital of Canada designation to their list of forest-related achievements.

If you would like to nominate a region or community for Forest Capital of Canada or have comments on the program, please contact us at www.canadianforestry.com

Contents

The Canada's Forests teaching kit Volume 8 continues the exploration of Canada's vast boreal forest, including the critical significance of its habitat to all living things and the vital connections between the natural resources it contains and our modern lifestyles.

Canada's Boreal Forest: Tradition and Transition focuses attention on the dependence of Canadians on forest resources, and the specific values we place on the boreal forest in terms of income, spirituality, recreational pursuits and cultural traditions, as well as the ecological and intrinsic value of intact natural habitat.

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The lessons contained in this teaching kit are designed to provide young Canadians with a wide variety of learning opportunities in many subject areas. They are suitable for many age levels in every classroom, from special needs to gifted to ESL (English as a second language) students. Lesson topics encompass Science, World Issues, Geography, Visual Arts, Math and Language Arts. Also contained in this kit are two full-colour posters, one on migratory birds from Environment Canada "The Boreal Forest is More than Trees" and one promoting the theme of National Forest Week "Canada's Forests: Tradition and Transition" from Natural Resources Canada, Canadian Forest Service.

The Canadian Forestry Association, established in 1900, is Canada's oldest conservation organization. The CFA is dedicated to the wise use and conservation of Canada's forest, water and wildlife resources through enhanced public awareness and education programs. The Canada's Forests teaching kit series provides educators with the tools to help young people better understand the importance of our forest resources to all Canadians, and the importance of sustainable resource management to ensure continued viability for the benefit of future generations.

The CFA has made every effort to provide a balanced perspective on the interests and activities of forest professionals, biologists, landowners, Aboriginal people, rural and urban citizens, various industries, and environmental groups in order to meet a common goal: the judicious conservation of Canada's forest resources. The Canadian Forestry Association appreciates and acknowledges the thoughtful, dedicated and often under-recognized ground level management of our forests, conducted by professional foresters, biologists, technicians, technologists and everyday people.

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Using This Teaching Kit

This teaching kit, the eighth in the Canada's Forests series, is designed for nationwide use by classroom educators and youth leaders. It is available in English and French, in print and in electronic format on the CFA website: www.canadianforestry.com. The activities in this volume are primarily targeting students in grades five to eight, as they represent a crucial age range in which to build interest in forest biology, forest issues and forest-related careers. However, there are also several lessons specifically for senior students. Please note that some lessons can be used with more than one age group.

The background information provided in this kit relates to topics presented in the nine lessons. Extensive print, web and video resources on the boreal can be found in teaching kit Volume 7, *The Boreal Forest, a Global Legacy*.

Target Audience

Canada's provinces and territories use various grade specifications and sometimes even different terminology for levels (such as primary and intermediate) so we have indicated only broad age groups for which the lessons and activities apply.

Instruction Key



group discussion



Hands-on



Presentation/performance



Writing/recording



Research-based



While the CFA grants permission for the photocopying of this entire publication, the pages marked with the photocopier icon are designed specifically as student worksheets.

Curriculum Links

The lessons in this Kit are designed to meet the curricula of many different grades, subjects and courses taught across Canada, including Science, Geography, Math, Civics, World Issues, Language Arts and Visual Arts. We have included one broad Expectation/Outcome for each lesson, which describes what students will demonstrate during the activity. These outcomes can be easily expanded to fit specific curriculum needs.

Flexible and Easy-To-Use Activities

To stimulate teacher and student creativity and engagement in the learning process, we have included various hooks – attention-grabbing lesson openers – and extension options and ideas for additional activities.

Accessing Canada's Forests Teaching Kits On-line

The entire Canada's Forests teaching kit series is available on-line at the Canadian Forestry Association website www.canadianforestry.com. You will find teaching kits Volumes 1 to 8 in English and French in html and PDF format. The kits cover a wide variety of forest-related topics – from forest heritage and climate change to species at risk and water and wetlands. Individual lessons or entire kits can be downloaded and printed at your convenience.

Contact Us

To order printed copies of teaching kits, to provide feedback, or to enquire about how to fit lessons into your curriculum, please contact the Canadian Forestry Association at 1-866-441-4006 or send an email message to cfa@canadianforestry.com. We look forward to hearing from you.

Additional Teaching Resources

Volume 7 of the Canada's Forests teaching kit series, *The Boreal Forest, A Global Legacy*, contains additional background information and other lessons, as well as links to various websites, books, lesson plans, maps and videos all related to Canada's boreal forest.

Canada's Boreal Forest: Tradition and Transition

These are important times for Earth's boreal forest. Global awareness of the human impact on the environment is growing, and so is the recognition of the importance of the boreal forest in terms of its unique diversity of species and habitats, and the wealth of natural resources it contains.

Canada's boreal forest is increasingly being recognized nationally and internationally as one of the last opportunities on the planet to carefully manage large-scale ecosystems in a truly sustainable way. Both protected areas and best practices for the development of the forest landscape can make important conservation contributions. In 2004, the World Conservation Union called for greater protection of the boreal forest, while recognizing that governments, Aboriginal communities, local communities and environmental organizations have contributed significantly to global boreal forest conservation. They cited examples such as the Canadian and International Model Forest Networks, national forestry programs, sustainable forest management policies and practices, park expansion and protected area strategies, often developed with, and sometimes prompted by, the participation of Aboriginal people. Another example is the Boreal Forest Conservation Framework, which aims to protect at least half of the region in large interconnected protected areas, and which supports world-class sustainable development in the remaining areas.

A balance must be struck between the interests of many, including conservation organizations, Aboriginal and other communities whose culture and livelihood are reliant on extraction and processing of natural resources, industry stakeholders in the mining, oil and gas, tourism, agriculture and forestry sectors, those who rely on the products made from boreal resources (all Canadians), and the multitude of non-human species (birds, animals, insects, plants, etc.) that call the boreal forest home.

Why is the Boreal Forest Important?

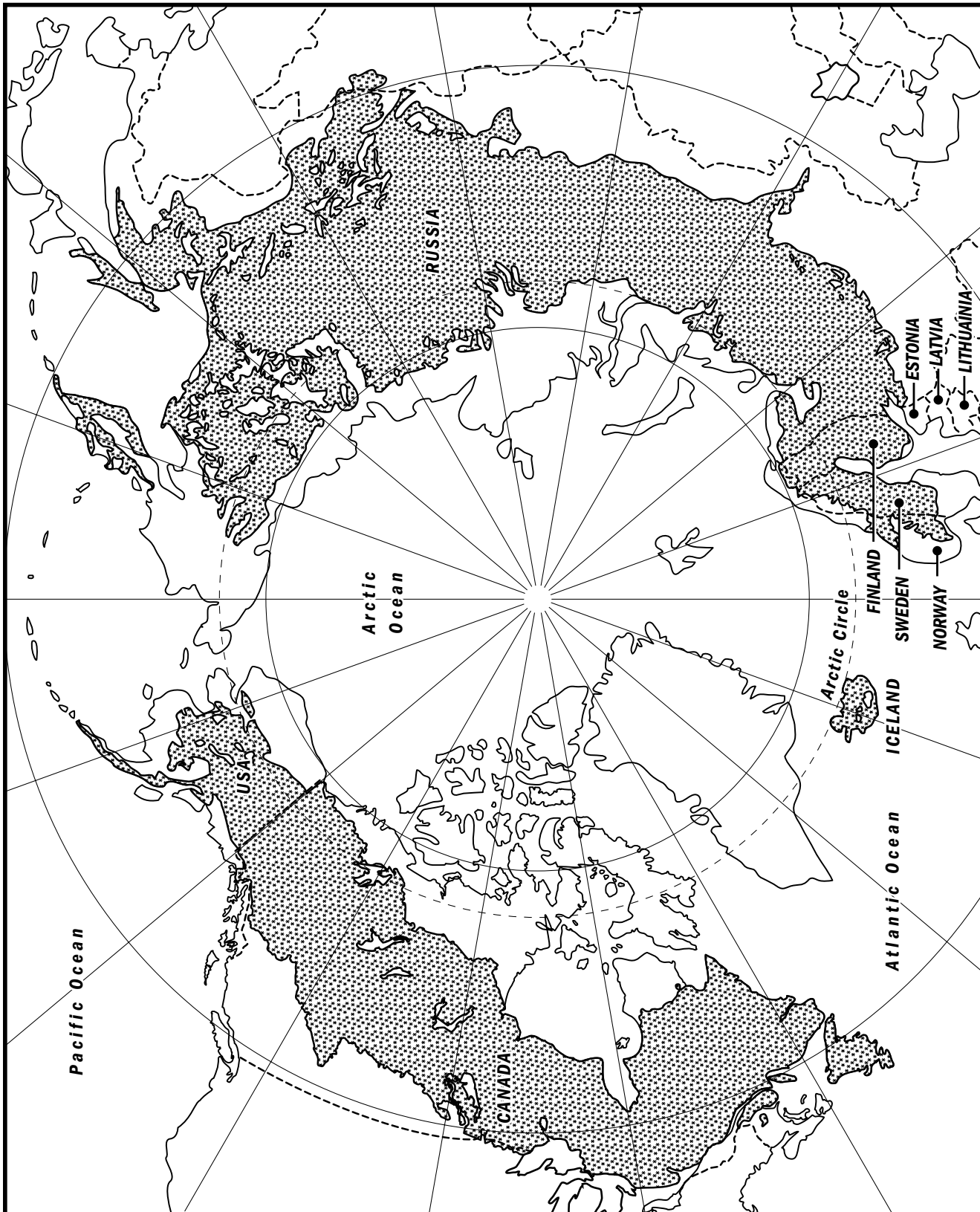
The boreal forest is highly valued worldwide for its economic potential, extensive recreational opportunities, wildlife habitat and breathtaking natural beauty. In Canada alone, the boreal region provides petroleum products, peat, hydro-electricity, tourism dollars, and sustains over 7000 forestry-related businesses and more than 400 000 forestry-related jobs. Twenty-five percent of Canada's forests, including the boreal, are managed for commercial use, and only one-quarter of one percent is harvested annually. As mandated by law, all harvested areas are regenerated.

For centuries, people from all walks of life have lived and worked in Canada's boreal communities. The natural wealth of this region continues to help sustain the traditional lifestyle and to provide income for many of Canada's Aboriginal people.

In terms of wildlife, the size, remoteness and variety of landscapes in Canada's boreal forest provides habitat to abundant numbers of some of the continent's largest species, including caribou, moose, bears and wolves, and billions of its smallest, such as migratory birds and butterflies.

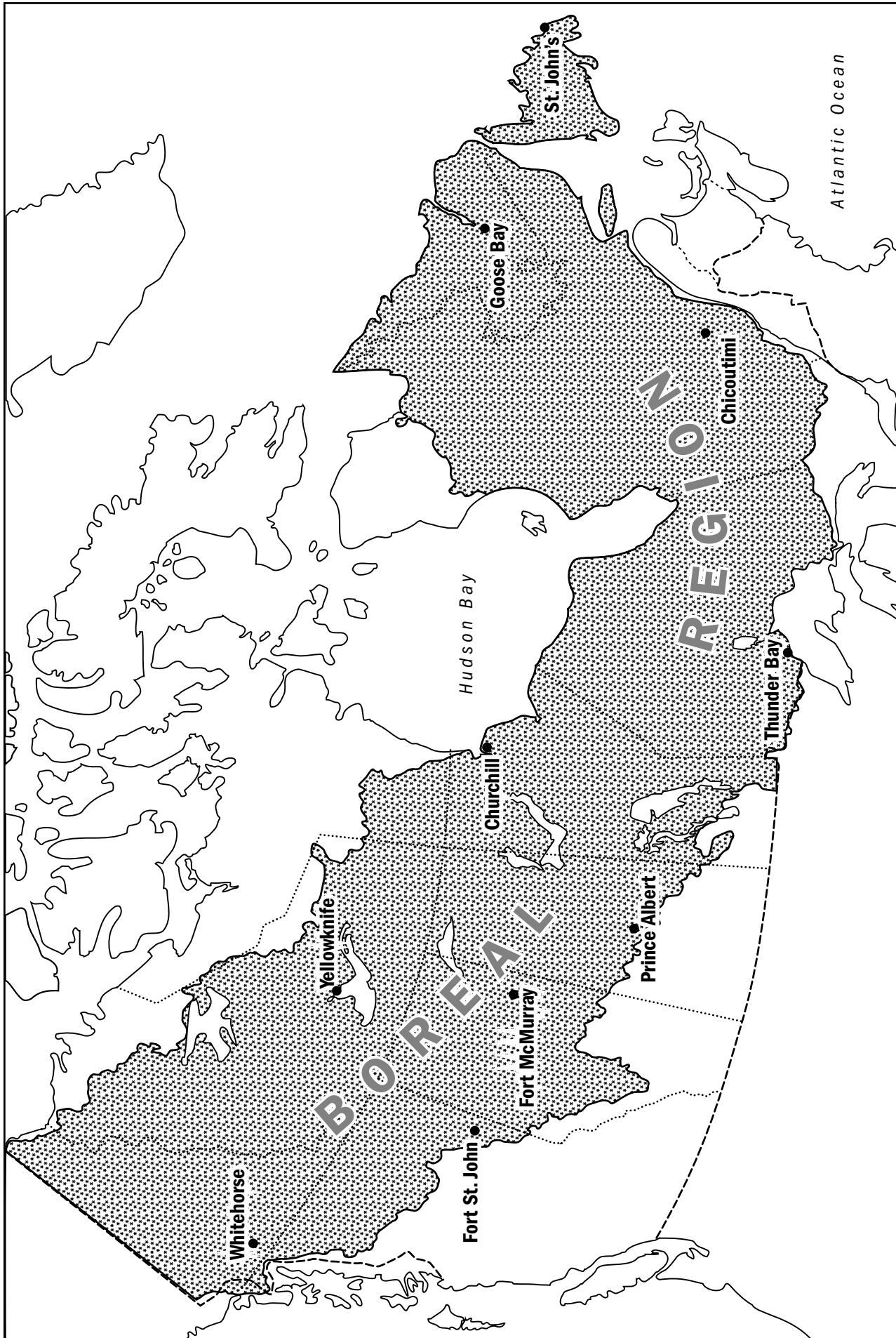
The lakes, rivers and wetlands within Canada's boreal forest hold more fresh water than any other place on Earth, and is critical habitat for tens of millions of breeding waterfowl and shorebirds. Up to three billion warblers, thrushes, sparrows, hawks and other land birds migrate to Canada's boreal region to nest each spring. As well, during dry years on the southern prairie breeding grounds, the boreal wetlands also act as a refugium for waterfowl populations displaced by drought.

The boreal forest plays a vital role in the regeneration of natural resources and in helping to mitigate climate change; benefits to both wildlife and humans. It filters millions of litres of water daily, stores massive amounts of carbon, produces oxygen, rebuilds soils, and restores nutrients.



The Global Boreal Forest





Canada's Boreal Forest

The Boreal Forest: Nursery of the North

The boreal forest region provides critical breeding habitat for enormous numbers of waterfowl, shorebirds, waterbirds and landbirds. Of all the North American waterfowl species, 75 percent rely on Canada's boreal wetlands and forests for breeding, staging or moulting, and about 50 percent of the breeding populations of at least 96 species occur within this area.

Nearly 100 percent of the global populations of the tree-nesting Bonaparte's Gull, the bog-inhabiting Palm Warbler, and the elusive Short-billed Dowitcher nest within the boreal forest region. Over 80 percent of the populations of the coastal wintering White-winged Scoter, the rapidly disappearing Rusty Blackbird, and the massive Great Gray Owl nest there as well. About 300 species in all regularly use the boreal forest region, including loons, grebes, swans, ducks, hawks, sandpipers, gulls, owls, vireos, flycatchers, warblers, and sparrows.

In terms of total bird numbers, the Canadian Boreal Initiative estimates that between 1.65 and 3 billion birds breed each year in North America's boreal forest region, with landbirds accounting for 97 percent. Approximately 30 percent of all landbirds (1-3 billion) and 30 percent of all shorebirds (7 million) that breed in the United States and Canada, do so within the boreal forest region. An estimated 38 percent (26 million) of all of the waterfowl in Canada and the United States also breed in the boreal forest region.

There are several reasons why so many birds breed in the boreal forest, but simply put, it is because the boreal forest is vast and largely intact – one of the few remaining places where an entire ecosystem functions. Another reason is that the boreal forest contains more water in its lakes, wetlands and rivers than almost any other place on Earth.

Migration

Many species of songbirds, shorebirds, waterbirds and waterfowl migrate north each summer to the boreal forest region because of its excellent breeding habitat. The Canadian Boreal Initiative reports that nearly all species of boreal nesting birds also make use of parts of the boreal forest region during migration. However, some birds rely more on the boreal forest region for migratory stopover habitat than for breeding. Bird banding continues to be critical for providing information about migration routes and timing of migration.

Migration is a behavioural adaptation that boosts an individual's overall chance of survival and successful reproduction. Migration is useful because it provides access to new food sources and to favourable living and breeding conditions in certain areas, at certain times of the year.

However, migration also presents risks. It takes a great deal of energy to migrate, and animals must be able to find food and rest stops along the way in order to avoid exhaustion and complete the rigorous journey. Dangers such as storms and predators pose significant threats. Human-introduced obstacles such as roads, communities, mines, gas lines, and power corridors can further compound the challenges as they can contribute to fragmentation of natural habitat and habitat loss, increase the risk of vehicle collisions, disease and attack from domestic animals.

Some animals migrate longer distances than others, and some species (like the American robin) will decide to migrate or not each year, depending upon the abundance of available food as the season becomes colder.

In addition to birds, many other species migrate through or within the boreal region, including the Monarch butterfly, bighorn sheep and caribou. It is believed that migratory species use different methods, or a combination of methods, to navigate their way. These include the position of the sun, landmarks and the Earth's magnetic field.

Migratory birds are adapted to feed on different foods in the areas where they travel, which can be influenced by such things as foraging behaviour and beak shape. Bird feathering is also related to different migratory strategies. For example, warblers migrate vast distances and often have small, fragile feathers. They moult all of their feathers annually, with fresh re-growth to maximize their flight efficiency. Woodpeckers, on the other hand, are not required to migrate as far, so they moult their flight feathers slowly, often over the course of four years, and maintain their energy for other purposes.

Land Use Planning in Canada's Boreal Forest

Approximately 3.5 million people live in Canada's boreal forest, in communities that range from small villages such as Long Lac, Ontario and Leaf Rapids, Manitoba to large cities such as Prince Albert, Saskatchewan and Thunder Bay, Ontario and over 600 Aboriginal communities such as Poplar River, Manitoba and Pessamit, Quebec. Canada's boreal forest sustains over 400 000 forestry-related jobs, in addition to jobs in the mining, oil and gas, tourism, agriculture and other sectors.

All Canadians are the everyday end-users of products containing boreal forest resources. These include wood products such as paper, pencils, furniture and building materials, as well as products produced from oil and gas, minerals and metals, medicinal plants, animals and much more. Enjoyment of our modern lifestyles is possible because of the people who extract, gather, transport, process and market forest resources and associated products. Policies that promote wise decision-making with respect to the boreal forest are inextricably linked to our interdependence on each other, and on these forest resources.

Because over 90 percent of Canada's boreal forest is publicly owned, governments are the primary land use decision-makers. Provincial governments are primarily responsible for the southern boreal forest. In the Yukon, Nunavut and Northwest Territories, many Aboriginal land claim negotiations continue, along with negotiations over responsibilities held by the federal versus territorial governments. Responsibility for land use planning, industrial regulation and wildlife management in those regions will continue to be shared among territorial, Aboriginal and federal governments, and the role and influence of Aboriginal governments can be expected to grow.

Land use planning processes underway now and over the next few years in boreal provinces and territories will determine what will occur in the decades – and even centuries – to come. The collective wisdom of all citizens is needed to put sound long-term management plans in place, building on the regeneration policies and decision-making of the past. Canadians have the democratic right to provide their input to government on the management of the economic, environmental and cultural aspects of the boreal forest.

While there are many ways to carry out effective ecosystem-based land use planning and methods, and they vary widely among jurisdictions, some concepts are becoming more common. For example, the use of Traditional Knowledge (see Glossary) is being used increasingly in parallel with modern scientific forestry methods.

Traditional Knowledge is occurring as part of a larger shift in thinking about how land is used. Instead of proceeding with development in a given area (e.g., mining, timber harvest or oil extraction) and focusing on how much land can be conserved afterwards, there is a growing movement towards a planning process that takes into account information on ecology and geology, but also the historical, social, cultural and spiritual values of an intact area, with an eye to how much development should be permitted and in what context. With regards to forestry, current forest land management practices emphasize the use of harvesting and regeneration methods that emulate vital natural disturbances, such as forest fires.



Who Travels the Farthest?

Age range: 10-14

Time: 75-90 minutes

Subjects: Science, Geography

Resources: Class photocopied sets of handouts *Who Travels the Farthest?* *The Great Migration Map* and *Boreal Forest Migration Match-up*, pencil crayons

Learning Outcome

Students will investigate the importance of Canada's boreal forest habitats by mapping the farthest points of migration for 10 bird species that use the boreal forest as a nesting ground.

Hook: How Far Have You Roamed?

Have students share with the class the farthest distance they have ever travelled. Then, record why students made these journeys (vacation, to visit family, to immigrate, family moved due to career choices made by their parents.)

Have students share the methods by which they travelled and how they found their way (maps, verbal directions).

Introduce the concept of migration (see page 6 Migration).

Next, show maps of the boreal forest (pages 4 and 5) and explain why the boreal forest is a highly suitable breeding habitat for many hundreds of bird species. (See page 6 The Boreal Forest: Nursery of the North). You may also use the Hinterland Who's Who handout on the boreal forest:

<http://www.hww.ca/hww2.asp?id=354>

Procedure

1 Pass out the handouts *Who Travels the Farthest?* and *The Great Migration Map*. As directed on the handout, students will hypothesize about which bird species migrate the farthest from the boreal forest and the reasoning behind their hypothesis. Students then plot the farthest points of migration for the bird species listed and reflect on how the real data compare to their hypothesis. Explain that each point on the map is an approximation of where most of the birds are found at that point in the year. Animals of any migratory species are spread out at any given time.

2 Pass out the handout *Boreal Forest Migration Match-up* and have students complete it.

Answers

Handout *Who Travels the Farthest?*

4. FARTHEST:

Arctic Tern	.....	pack ice off Antarctica
Hudsonian Godwit	.....	Southern tip of South America
Blackpoll Warbler	.....	northern South America
Yellow-bellied Sapsucker	.....	Panama
Sharp-shinned Hawk	.....	Honduras/Nicaragua
Ring-necked Duck	.....	Nicaragua
Ruby-throated Hummingbird	...	Nicaragua/Costa Rica
Bonaparte's Gull	.....	Caribbean Islands
White-throated Sparrow	.....	Mexico
Whooping Crane	.....	Texas

5. c) No, size of bird does not relate to distance travelled. Birds of various sizes travel similar distances.

Handout Boreal Forest Migration Match-Up

1. I	4. B	7. J	10. E
2. G	5. L	8. D	11. A
3. K	6. H	9. C	12. F

Name: _____ Date: _____



Handout: Who Travels the Farthest?

1. Place the 10 boreal nesting bird species listed below in the order of the species that you think travels farthest to least far in its migration from boreal forest nesting grounds to its wintering grounds each year.



Blackpoll Warbler



Arctic Tern



Ruby-throated Hummingbird



Hudsonian Godwit



Ring-necked Duck



Bonaparte's Gull



Whooping Crane



White-throated Sparrow



Sharp-shinned Hawk



Yellow-bellied Sapsucker

MY HYPOTHESIS:

Migrates the **farthest** distance from the boreal forest: _____

Migrates the **least** distance from the boreal forest: _____

2. Using the information in the table below, label the points on your map that represent how far south each species migrates.

Bird Species	Point of Farthest Migration to the South
Ruby-throated Hummingbird	9, half way between E and F
Ring-necked Duck	8.5, between F and G (toward the F)
White-throated Sparrow	9.5, D
Whooping Crane	10.5, halfway between D and E
Blackpoll Warbler	8.5, H
Hudsonian Godwit	1.5, between G and H (on land)
Arctic Tern	0.5, G (on floating pack ice)
Yellow-bellied Sapsucker	8.5, between F and G (almost to G)
Sharp-shinned Hawk	8.5, halfway between F and G
Bonaparte's Gull	10, G



Name: _____ Date: _____



3. Examine your map. Keep in mind that each bird species has different migration routes – some travel over land and some over water for part of their journey. Isn't it amazing that these birds travel from the boreal forest to their wintering grounds over a period of a few days, or within about two weeks? Keep in mind that some of the species that you are studying breed in the southern boreal forest and some in the more northern parts.

4. Using your completed map, list the birds in the spaces below that in reality migrate the farthest:

Migrates the **farthest distance** from the boreal forest: _____

Migrates the **least distance** from the boreal forest: _____

5. a) How close was your hypothesis to the real data?

b) Are you surprised at which bird species migrates the farthest? Give two reasons why.

c) Does size of bird relate to how far it is able to migrate? (Hint: Consider how far the ruby-throated hummingbird travels!)



Name: _____ Date: _____




Blackpoll Warbler


Arctic Tern


Ruby-throated Hummingbird


Hudsonian Godwit


Ring-necked Duck

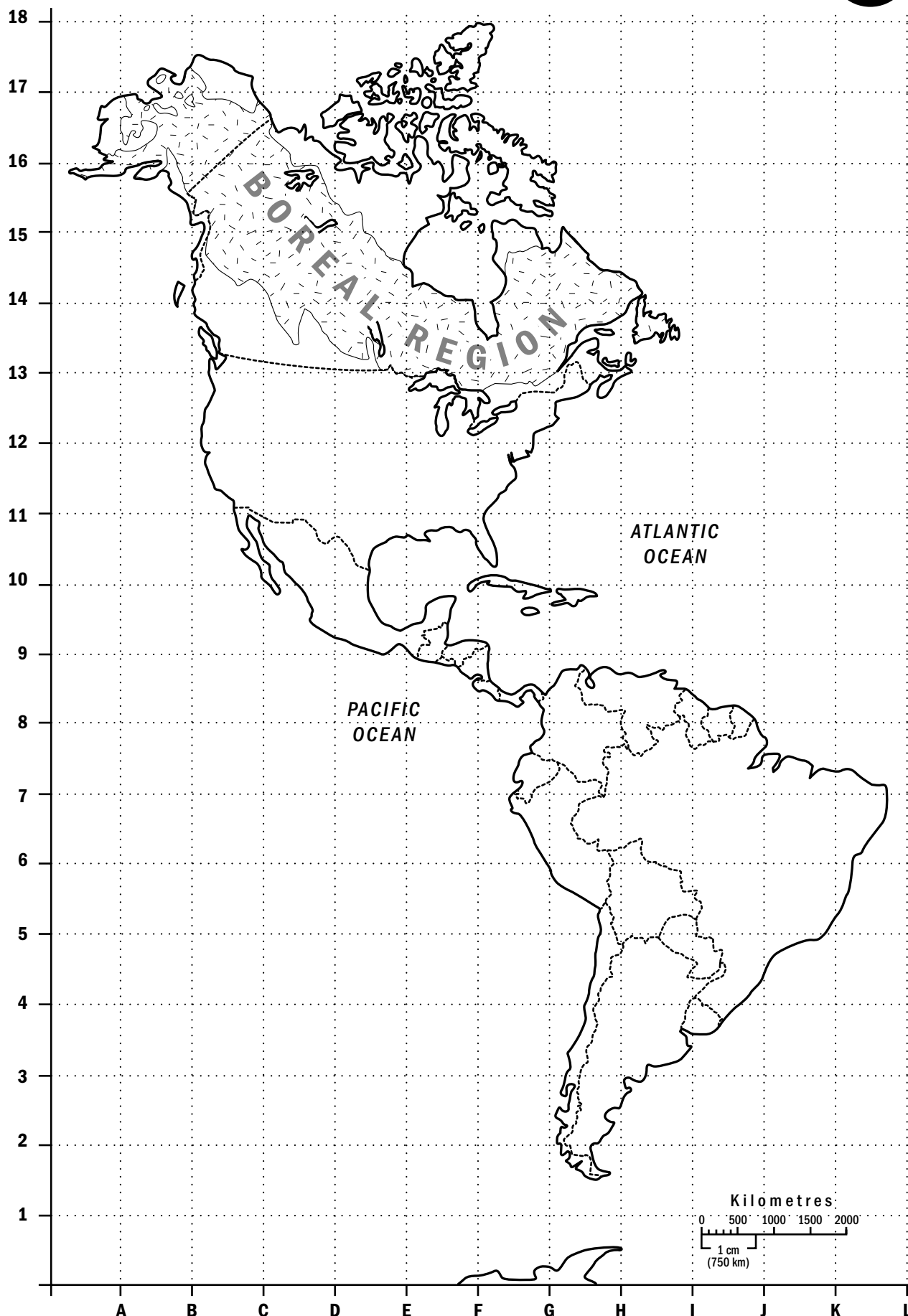

Bonaparte's Gull


Whooping Crane


White-throated Sparrow


Sharp-shinned Hawk


Yellow-bellied Sapsucker



Name: _____ Date: _____



Boreal Forest Migration Match-Up

.....

- | | |
|---|---|
| 1. _____ This is the altitude (distance above the Earth) at which most birds migrate. | A. Fly at night |
| 2. _____ These features of the wings of migratory birds makes migrating easier. | B. Fat |
| 3. _____ These features of a bird's body allow efficient flight. | C. 21 |
| 4. _____ In preparation for migration, a bird eats lots of food in order to store this. | D. Ruby-throated Hummingbird |
| 5. _____ This bird makes an astounding yearly migration of 30 000 km from its Arctic breeding grounds to the seas and ice of Antarctica. | E. Berries and other fruits |
| 6. _____ Some birds fly in _____, a strategy that reduces energy use. | F. Blackpoll Warbler |
| 7. _____ Many bird species will do this just prior to migration in order to avoid predators, find others and orient themselves for the trip. | G. Migrating birds have longer and more pointy wings |
| 8. _____ This tiny bird flies north for 24 hours straight to cross the Gulf of Mexico (1000 km) every spring! | H. Formation |
| 9. _____ A typical Blackpoll Warbler almost doubles its weight in preparation for fall migration south, going from 11 grams to about _____ grams. | I. 500-2000 m above the Earth |
| 10. _____ In order to gain as much weight as they can before migration, birds which ordinarily eat insects will switch to this food, which is readily available in early fall. | J. Flock together |
| 11. _____ Many birds do this during migration in order to reduce the threat of overheating, dehydration and predator attack. This also allows a greater chance of using favourable winds. | K. Large lungs and heart, air sacs, rapid heartbeat, large chest muscles, high body temperature, hollow bones, streamlined body shape |
| 12. _____ This bird's over-water flight from the United States to South America keeps it in the air for 80 or 90 hours straight! | L. Arctic Tern |

Source of information: Have Wings, Will Travel: Avian Adaptations to Migration by Mary Deinlein, Smithsonian Migratory Bird Centre, National Zoo, Washington, DC, USA <http://nationalzoo.si.edu>





Fly Away Home

Lesson Two

Age range: 10-14

Time: 90 minutes

Subjects: Science, Geography, Math

Resources: Class photocopies of handouts: *Fly Away Home* and *Boreal Forest Migration Map*, two differently coloured writing utensils, pencil crayon

Learning Outcome

Students will investigate the importance of Canada's boreal forest habitats by mapping the migratory movements of two bird species that use the boreal forest as a nesting ground.

Hook: Choosing Where to Have Offspring

In small groups, students will brainstorm factors involved in deciding where to raise children. What is important when choosing a place to raise a child? Remind students that future parents may consider a location among Canada's provinces or territories, a city versus a rural area, or even a different country, where one of the parents might have grown up or where the parents may wish to work for a few years.

Answers could include: a place where crime rates are low, where there are lots of opportunities, a place close to the arts, recreational pursuits, nature and/or family, a place where the children can experience life where their parents grew up, and/or experience a certain culture, etc.

Next, show maps of the boreal forest (pages 4 and 5) and explain why the boreal forest is a highly suitable breeding habitat for many hundreds of bird species and how birds migrate. (See page 6). You may also use the Hinterland Who's Who handout on the boreal forest:

<http://www.hww.ca/hww2.asp?id=354>

Procedure

- 1 Using the handouts, students plot the seasonal migration of the two bird species listed (using different colours) and answer the questions.

Extensions

Teaching kit Volume 7 features another exciting boreal migration activity entitled *Following the Caribou*.

Given a copy of the background material on page 6, students could create a poster 'advertising' the boreal forest as an excellent breeding habitat for birds.

Students could take on the personas of migrating birds and keep a diary of what is happening in their lives as they migrate and breed. For more information on the Broad-winged Hawk, visit a website such as <http://www.birding.com/topbirds/784bwh.asp>. For more information on the Lesser Scaup, visit a site such as <http://www.ducks.org/hunting/waterfowlGallery/11/index.html>

Answers

1. a) About 16 000 to 17 000 km yearly in total.
b) About 10 000 km yearly in total.
c) About 4 weeks in spring, 6 weeks in winter - isn't that incredible?
2. Each point on the map is an approximation of where most of the birds are found at that point in the year. Animals of any migratory species are spread out at any given time.
3. We can minimize forest fragmentation, which is to say we can leave large areas of forests and wetlands relatively undisturbed, so that migrating species have intact natural areas at which to stop and refuel along the way.
4. Birds are adapted to migration by being able to store energy and fly without eating for long distances, although there is some refuelling along the way. Although research on navigation is not conclusive, it is believed that birds navigate by using landmarks, the position of the sun and the Earth's magnetic field.
5. The boreal forest contains a wide variety of relatively undisturbed forest and wetland habitats that contain rich food sources that birds feed to their young.
6. Resident species are adapted for the cold both structurally and physiologically. For example, the arteries in their legs, which carry warm blood from the heart, are positioned against their veins, which carry colder blood coming upwards from the feet. The heat from the arterial blood continuously warms the returning colder blood. Also, resident species have adapted to eat the foods that are available in the boreal forest during the winter.

Name: _____ Date: _____



Fly Away Home – Migrating to the Boreal Forest’s Nursery of the North

The Broad-winged Hawk is a stout and compact bird of prey that lives in the forest of the eastern United States and the southern boreal forest of Canada. At the peak of this bird’s spring and fall migrations, large flocks (in the tens of thousands of birds) can be seen. Forest fragmentation (when the forest is cut up by roads and other developments) threatens this species in some areas, but they appear to be expanding their breeding range westward, especially in Canada.

The Lesser Scaup The majority of these birds migrates to wintering areas along the Gulf of Mexico and coastal Florida. Tens of thousands of these birds feed and rest at each of several major stopover sites on the lower Great Lakes during spring and fall. The population of this waterfowl species has declined since the mid-1980s. Contaminants and changes in breeding habitat or food resources are thought to be the primary factors contributing to their decline.

Mapping activity: After you have placed the points for each species on your map as outlined in the chart below, use a different colour for each bird to join the points together. Label the points with the time of year.

Time of Year	Corresponding Location of Broad-winged Hawk (<i>Buteo platypterus</i>)	Time of Year	Corresponding Location of Lesser Scaup (<i>Aythya affinis</i>)
Mid May-August	15, E (but breeds all over boreal forest)	May-September	15, E (but breeds all over boreal forest)
Mid-September	6, H	Mid-October	12, H
November	5, M	Mid-November	11.5, I
Dec/Jan/Feb	2, L	Dec/Jan/Feb	7.3, K (on islands)
March	4, L	March	9.5, halfway between I and J
Late-April	5, (halfway between K and L)	April	11.5, I
Early May	8, G	Mid-May	12.5, H

Questions:

- a) Using the graph’s scale of 1 cm: 500 km (1 cm on your sheet equals a distance of 500 km), calculate the total approximate distance travelled one way by the Broad-winged Hawk throughout the year. Double this amount to determine the total annual migration distance traveled.

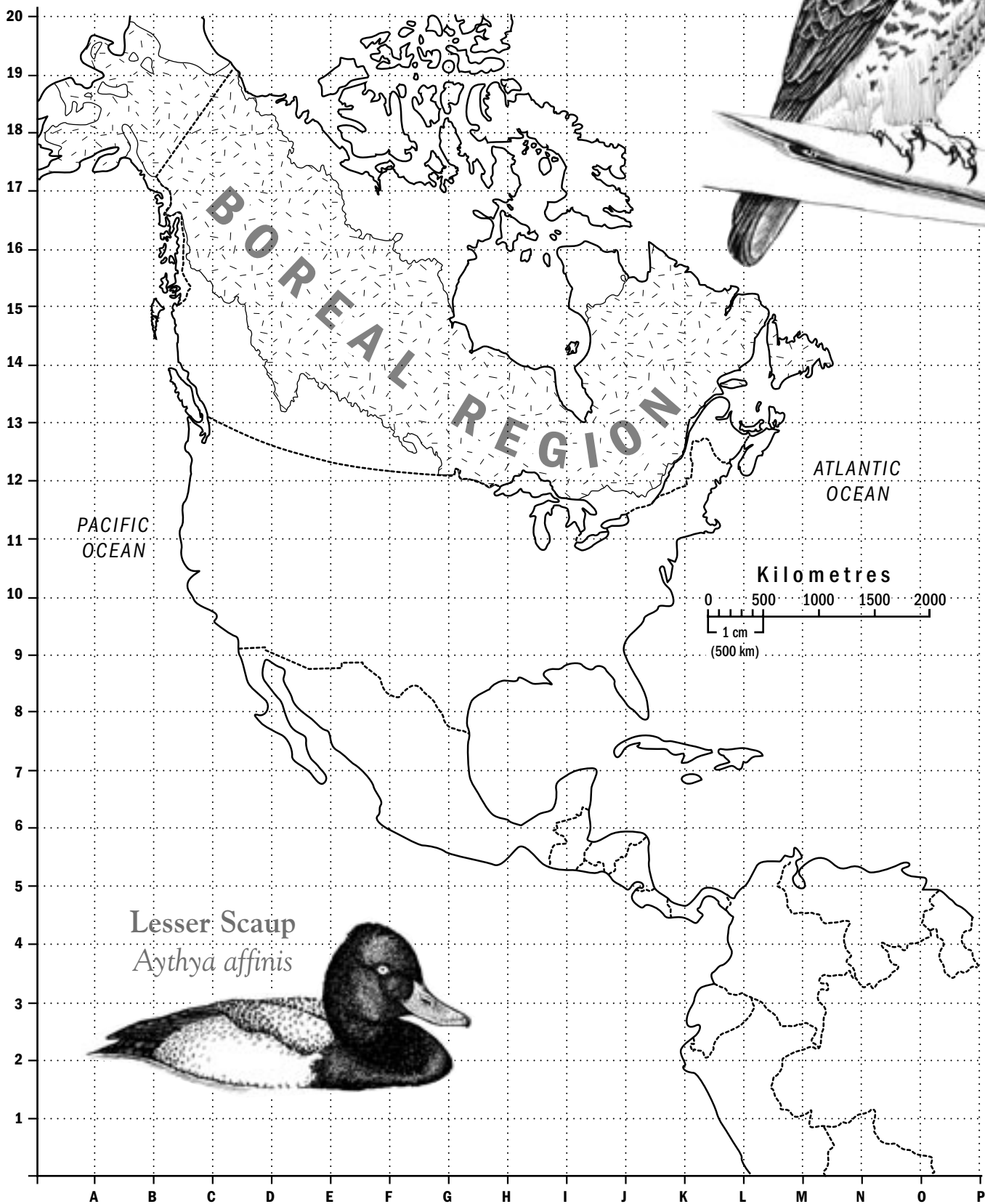
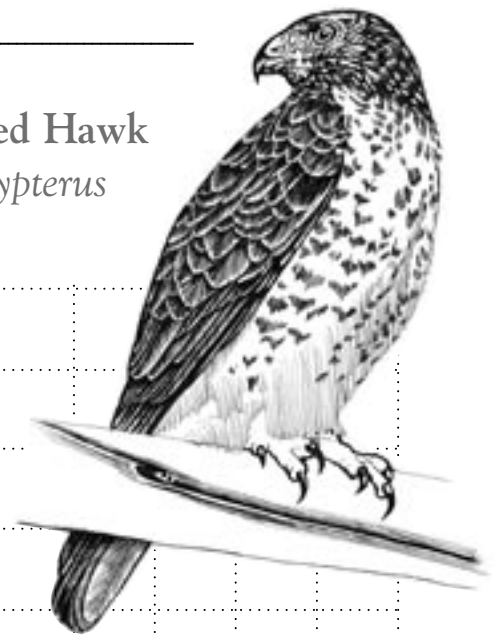
b) Do the same for the Lesser Scaup.

c) Take a guess: how long does it take the Broad-winged Hawk to migrate in September (south) and April (north) every year?
- Why are your points on the map not a completely accurate representation of the movement of the entire species at any given time of the year? (Hint: think about how large a group of birds we are talking about!)
- What can we do to reduce the human-created obstacles and/or human activities that can make it difficult for animals during their migration? (Consider obstacles such as towns and other developments, snowmobile and vehicle traffic.)
- How are birds able to migrate over long distances and find their way, besides having the ability to fly?
- Why is Canada’s vast boreal forest so suitable and important as a nesting ground?
- Why are some birds ‘resident’ species? (This means they stay in the boreal forest all year round.)
- Locate the outline of the boreal forest on your map. Colour it in lightly and label it with the words:
“Nursery of the North” – Canada’s boreal forest provides a vast and largely undisturbed area for birds to raise their young. It contains more water in its lakes, wetlands and rivers than almost any other place on Earth.”



Name: _____ Date: _____

Broad-winged Hawk *Buteo platypterus*



Lesser Scaup *Aythya affinis*





New Challenges in a New Climate

Lesson Three

Age range: 16-18

Time: Two 75-minute periods

Subjects: Science, World Issues, Geography

Resources: Class set of handout:
New Changes in a New Climate

Learning Outcomes

Students will investigate the extensive adaptation of a chosen species found in Canada's boreal forest by conducting Internet and print research. Then, given a description of the future conditions that might exist in Canada due to global climate change, they will hypothesize about how the species they researched may be able to adapt in future, while recognizing the limitations of the activity in terms of evolutionary science (see Procedure).

Hook: Types of Adaptations

This hook will introduce students to the differences between structural, behavioural and physiological adaptations to various environments, so that they will be prepared to do a thorough job when presented with the main activity, which focuses on various species in the North American boreal forest.

Divide students into small groups, and have each group describe on paper as many adaptations (structural, behavioural, physiological) as possible for some or all of the following organisms (possible answers provided below). Share results. Go over the difference between the types of adaptations.

Cactus – Desert

Structural: thick and waxy coating prevents moisture loss, shallow and widespread roots to absorb scarce rain, spines to protect them from being eaten

Physiological: slow growing, ceases transpiration during hot part of the day

Camel – Desert

Structural: special eyelids protect them from sandstorms, light coat colour keeps them cool, wide-spread feet for walking on sand

Physiological: storage of water in fat found in the hump

Behavioural: rests during hottest part of day

Seal – Shorelines, Cold Water

Physiological: large fat stores, excretion of oil into coat to prevent cold water from reaching skin, ability to hold breath a long time

Structural: nose closure when diving, flippers and tail for agile swimming

Behavioural: various hunting techniques, some migrate to follow food sources, bradycardia (slowed heart rate during diving)

Procedure

1 Go over *Handout New Changes in a New Climate* and assign (or have students choose) boreal species to research (in pairs or individually).

2 Discuss with students that because natural selection is a very slow process, the climate in Canada's boreal forest may change too fast to allow any large organisms to evolve structural or physiological adaptations that will help them to survive. This means that some of the species that make up the present day boreal forest (animals, trees, other plants) may have difficulty surviving if the climate changes too dramatically, and too quickly, in an evolutionary sense. However, others will survive and even thrive. These changes in the composition of all species and in the abundance of specific species are known as **ecosystem level adaptation**.

Large mammals and birds would likely show mainly behavioural adaptations (not adaptations in the evolutionary sense) to the conditions caused by climate change that are anticipated in the next century or so. The vast majority of organisms that we might expect to truly evolve adaptations in this timeframe are those with short lifecycles and high intrinsic variability, such as insects, bacteria and viruses. (Intrinsic variability means that there is considerable variability in traits between members of the same species.) However, for the sake of this exercise, we will pretend that boreal animals and birds are able to quickly evolve adaptations (over many hundreds of imaginary generations) to new conditions being brought on by global warming.

3 Next, introduce the boreal forest using maps from pages 4 and 5 and the Hinterland Who's Who handout found at: <http://www.hww.ca/hww2.asp?id=354>. See the Teaching Resources section in teaching kit Volume 7 for more options.

4 As outlined on the handout, students will research their species, read the description of how conditions could change in Canada's boreal forest due to global climate change, and hypothesize on how their species could adapt behaviourally, and which physiological and structural adaptations they might evolve. (That is, which changes in physiological processes or in body structure would give members of the species possessing these differences an 'edge' over others, making them more likely to survive and reproduce, passing on genes relating to favourable traits.) Students may present their work to the class.

Extension

Have a class discussion, or have students write a summary paragraph, reflecting on how climate change may allow some species to thrive and how it might affect others negatively.

Example Answer

1. Black bear
2. Habitat – in summer, forests and riparian areas; in winter, hibernates in the northern part of its range (Canada).
3. **Physiological:** true hibernation (recycling of urine, lowering of metabolic rate, long-term unconsciousness), produce small number of young well-spaced in time, regulates body temperature in hot and cold temperatures
Behavioural: various hunting techniques (digging, scavenging, roaming, swimming), hibernates, stands upright to view habitat and reach for food, takes snacks into den for winter
Structural: thick coat protects hibernating bear from cold, large deposits of fat allow bear to survive hibernation, long claws for digging up insects, etc., large muscles for pushing aside rocks and stumps, long snout to sniff out food, excellent eyesight and hearing, tough paw pads for walking over rough terrain
5. Due to Climate Change:
Behavioural: will eat more of the beetles and other insects that will flourish due to climate change, will most likely have shorter or no hibernation (similar to present day members of the species found in the southern part of its range), eating of plants and other organisms that flourish after forest fires
Structural: thinner coat so animal does not overheat
Physiological: ability to resist diseases that may result from global warming, more young, shorter or no hibernation

Name: _____ Date: _____



New Changes in a New Climate

1. **Choose a boreal species to research:** woodland caribou, snowshoe hare, dragonfly, beaver, river otter, lynx, gray wolf, black bear, Sharp-shinned Hawk, spruce budworm, Bufflehead duck, lemming, eastern garter snake, tamarack, snapping turtle, wood bison, moose, black spruce, white admiral butterfly, little brown bat, blue spotted salamander, wood frog, mosquito, blackfly, mountain pine beetle, carpenter ant, Pileated woodpecker, Ruffed grouse, Osprey, Northern hawk owl, cricket, hornet etc.
Use website searches to sites like www.hww.ca, and encyclopedias for your research.

2. **Describe the habitat(s) and climate** to which this species is adapted (in all seasons):

Winter: _____

Spring: _____

Summer: _____

Fall: _____

3. **Present day adaptations to the habitat and climate** (consider how the animal is adapted to travel, find food, store food, eat, grasp things, find a mate, reproduce, handle temperature extremes and other seasonal factors, sense its environment and avoid being eaten or attacked, etc.)

Physiological adaptations (four or more): _____

Behavioural adaptations (four or more): _____

Structural adaptations (four or more): _____



4. Read the following description of how scientists believe climate change will affect Canada's boreal forest:



With increased carbon dioxide and warmer, wetter weather, the boreal forest will most likely become more productive. Diseases such as West Nile Virus and Lyme disease will become much more common.

At the same time, there could be more drought in drier regions due to the warmer temperatures that drive evaporation from lakes, soils and vegetation. Forest fires will most likely increase in frequency, intensity and severity. The mountain pine beetle, which has decimated the lodgepole pine species in British Columbia and in some areas of Alberta, could continue its spread eastward. Because of this, other tree species, such as aspen or white spruce, could become more common. The forest will slowly shift northward into areas that are presently tundra. At the southern edge, hardwood forests will likely expand, bringing species such as oak, maple and beech into areas once occupied by the boreal forest. In drier regions, the forest may give way to grasslands (similar to those that once covered the southern portions of the Prairie Provinces).

5. From the description above, what conditions will affect your species? _____

6. Hypothesize how your chosen species could evolve and adapt to these conditions:

Four behavioural adaptations: (Reminder: These are the most likely adaptations you would expect to see in birds and animals in the next century or so, as global warming continues to affect Canada's boreal forest): _____

Four eventual possible physiological adaptations: _____

Four eventual possible structural adaptations: _____





Interdependent Me

Lesson Four

Age range: 8-12 years

Time: 60 minutes

Subjects: Science, Geography

Resources: Handouts: *Interdependent Me* (one copy, cut ahead of time) and *Forest Resources* (class set), class set of scissors and glue

Learning Outcomes

Students will understand our dependence on forests and our economic interdependence on each other relating to forest resources by participating in a class game and a cut-and-paste summary activity.

Hook: The Life of the Lowly Pencil

Have students point out all examples of wood products in the classroom and record them on the chalkboard. (These include paper, rulers, desks, pencils, particle board wall displays or countertops, etc.).

Ask students to consider their pencils for a moment. As you explain that wood (or timber) is the forest raw material in this case, and that they are the end-users of the product made from this forest resource, write the words 'Forest resource – wood - 1' at one end of the chalkboard and 'End-users – students - 4' at the other end. Then ask the class to list as many people (jobs) as possible involved in getting a pencil from forest to end-user while you fill in the chalkboard as follows:

Forest resource – wood - 1	Gatherers-extractors of the resource - 2	Processors and sellers of resource - 3	End-users – students - 4
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Under the 'Gatherer-extractors' heading, students may list foresters, technicians, tree planters, heavy equipment operators, or loggers. Under the 'Processors-sellers' heading, students may list all processing jobs related to making a pencil (drivers to transport the logs, factory workers to run the machinery to make the pencils, fill them with graphite and put on the finishing touches, transporters to bring the pencils to a warehouse or store, store owners or clerks to sell the pencils.)

Then, discuss our interdependence upon one another to be able to access forest resources and related products – as end-users, extractors, processors and sellers. Ask students if they are surprised at the number of people (jobs) involved in the creation and delivery of a pencil.

Tell students they are about to discover other interesting products made out of wood and many other forest resources, as well as who gathers, processes, sells and uses these resources and products.

Note that some students may not be aware of the term "wood grain" (the pattern exposed in cut wood) and the fact that wood grain and colour make some woods more attractive than others.

Procedure

1 Give each pair of student (or group of three, depending on class size) four randomly selected squares Handout: *Interdependent Me*, **one from each column**, cut out ahead of time.

2 Students should read each of their four squares, but focus on their 'Forest Resource' square (these are labelled with a '1'). Note that each group keeps its "Forest Resource" square.

Explain to students that the object of the game is to gather the three squares (similar to what the class just put on the chalkboard relating to pencils) relating to their 'Forest Resource' square. Each group will move around the room and approach other groups in order to find and collect the three other squares (each numbered 2, 3 and 4) that contain appropriate clues and match up with their 'Forest Resource' square. In other words, they must find the squares that best describe the gatherer/extractor of their resource (labelled with a 2), the processor/seller of the resource (labelled with a 3) and the end-user (labelled with a 4). The key is to look for matching clues and keywords on each square that match those on their 'Forest Resource' square.

3 **In turn, each group will give up** their squares numbered 2, 3 and 4 to those groups with the 'Forest Resource' square that best matches. Groups are to help each other.

4 **Students then complete the cut-and-paste summary activity** as explained on the handout *Forest Resources*. (The answer is found on handout *Interdependent Me*.)

Extensions

Students bring in forest resource products from home and create a display for the whole school to view (maple syrup bottles or cans, wild fruit jam jars, wood products such as pencils, paper, pieces of lumber, house trim, particle board, plywood, heating pellets for pellet stoves, peat moss, dried edible wild mushrooms, wood-related crafts and carvings etc.). They could also take pictures for the display of canoes, paddles and other items that are too large to bring in.

Students 12-16 will enjoy "Boreal Medicine and More" found in Teaching Kit Volume 7.

Interdependent Me – Teacher page to cut out for Procedure Step 1

FOREST RESOURCES (1)	GATHERER OR EXTRACTOR OF RESOURCE (2)	RESOURCE PROCESSOR OR RETAILER (3)	END-USER OF RESOURCE (4)
Many types of softwood such as pine, balsam and spruce 1	Foresters, loggers, heavy equipment operators, tree planters 2	Sawmill operators and construction workers 3	A family purchases a newly built house 4
Wild mushrooms such as chanterelles and morels 1	A collector of mushrooms carefully harvests where it is appropriate 2	A chef makes gourmet mushroom sauces and salads 3	A couple goes to a restaurant for pasta with mushroom sauce 4
The sugary liquid that travels from roots of birch or maple trees in spring 1	Owner of a woodlot with birch and maple trees extracts this liquid 2	Gift shop owner who offers many specialty natural food products 3	A large family gathers at Grandma's for pancakes and French toast 4
Oil and gas deposits 1	Drill operators and gas pipeline installers 2	Salesperson for gas company 3	A family decides to switch to natural gas heating for their house 4
Minerals such as nickel, iron and gold 1	Miners, engineers heavy equipment operators 2	Jewellery designer, jewellery store clerk 3	A child saves up to buy a gold bracelet for mother 4
Large rivers 1	Hydro-electric dam operator 2	Electricity workers who manage power lines 3	Anyone who turns on a light 4
Plants such as Sweet Coltsfoot and Labrador Tea 1	Aboriginal person who collects traditional medicinal plants 2	Aboriginal person who makes teas and medicines from plants 3	People with stomach ailments or problems with asthma can drink a tea made with these 4
Peat moss (a spongy substance that holds water) 1	Person who collects peat moss 2	Worker sterilizes and packages peat moss 3	A person uses materials to keep his or her garden moist 4
Spruce wood, which contain long fibres suitable for paper 1	Foresters, loggers, heavy equipment operators, tree planters 2	Workers in a pulp and paper mill 3	A student prints out research documents to use in an assignment 4
Hardwood trees like ash and hickory 1	Foresters, loggers, heavy equipment operators, tree planters 2	Workers run machines that turn ash and hickory wood into sports equipment 3	Children (and players in the Major Leagues) play baseball using wooden bats 4
Birch bark for making baskets and other crafts 1	Person selectively gathers birch bark to make something 2	Person weaves decorative baskets and crafts out of bark 3	A person buys a basket to hold magazines in her living room 3
Blueberries, raspberries and other berries 1	People who know where to go to pick wild berries 2	Person who makes jams and jellies 3	A person receives delicious home-made jam on a special holiday 4
Many types of trees with attractive grains and colours of wood 1	Foresters, loggers, heavy equipment operators, tree planters 2	A furniture maker selects attractive woods in his/her work 3	A young couple buy a new hand-made wooden coffee table 4
Hardwood species suitable for making charcoal 1	Foresters, loggers, heavy equipment operators, tree planters 2	Workers make charcoal by burning wood under certain conditions 3	A family gathers for a BBQ using charcoal briquettes 4



Name: _____ Date: _____

Forest Resources – who gathers, processes and uses them?

FOREST RESOURCES	GATHERER OF RESOURCE	PROCESSOR OR RETAILER	END-USER OF RESOURCE
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Cut out all the squares below. Then, cut out the heading above as one piece. Glue the heading to a blank piece of paper. Place the squares that go together across the page under the headings and glue when certain.

A couple goes to their favourite restaurant for pasta with mushroom sauce	People with stomach ailments or problems with asthma drink a tea made with these	Many types of trees with attractive grains and colours of wood	Workers run machines that turn ash and hickory wood into sports equipment
Aboriginal person who makes teas and medicines from plants	A family decides on natural gas heating for their house	Foresters, loggers, heavy equipment operators, tree planters	Many types of softwood such as pine, balsam and spruce
A large family gathers at Grandma's for a breakfast of pancakes and French toast	Children (and players in the Major Leagues) play baseball using ash and hickory wooden bats	Birch bark for making baskets and other crafts	The sugary liquid that travels up from the roots in birch or maple trees in spring
Person who makes jams and jellies	Worker sterilizes and packages peat moss	Minerals such as nickel, iron and gold	A collector of mushrooms carefully harvests where appropriate
Salesperson for a gas company	Miners, engineers, heavy equipment operators	Blueberries, raspberries and other berries	People who know where to go to pick wild berries
Workers in a pulp and paper mill	Person receives delicious home-made jam as a gift	Person who collects peat moss	Hardwood trees like ash and hickory
A young couple buy a new hand-made wooden coffee table	A person uses materials to keep his or her garden moist	Wild mushrooms such as chanterelles and morels	Foresters, loggers, heavy equipment operators and tree planters
A furniture maker selects attractive woods in his/her work	Electricity workers who manage power lines	Drill operators and gas pipeline installers	Aboriginal person who collects traditional medicinal plants
A family gathers for a BBQ using charcoal briquettes	A chef makes gourmet mushroom sauces and salads	Large rivers	Foresters, loggers, heavy equipment operators and tree planters
Anyone who turns on a light	Foresters, loggers, heavy equipment operators and tree planters	A family purchases a newly built house	Owner of a woodlot with birch and maple trees uses buckets to extract this
Gift shop owner who offers many specialty natural food products	A person buys a basket to hold magazines in her living room	Hardwood species suitable for charcoal making	Person selectively gathers birch bark to make things
Jewellery designer, jewellery store clerk	A child saves up to buy a gold bracelet for mother	Oil and gas deposits	Hydro-electric dam operator
Sawmill operators and construction workers	Workers make charcoal by burning wood under certain conditions	Peat moss (a spongy substance that holds water)	Plants such as Sweet Coltsfoot and Labrador Tea
Person weaves decorative baskets and crafts out of bark	A student prints out research to use in an assignment	Foresters, loggers, heavy equipment operators, tree planters	Spruce wood, which contain long fibres suitable for paper



Creating Your Own Conservation Group



Lesson Five

Age range: 12-16

Time: Three 75-minute periods

Subjects: Science, Geography, Social Studies, World Issues, Civics, Computers

Resources: Handout and chart: *Creating your Own Conservation Group* (class set, double-sided), access to Internet, pamphlets etc. for Hook, blank paper and pencil crayons.

Learning Outcomes

Students will understand forest biodiversity, habitat and conservation by researching two conservation groups relating to forests, migratory birds and biodiversity. They will then create their own conservation group, and design their organization's website (either on paper or on the computer).

Hook: What is a Non-governmental Organization (NGO)?

Pass around pamphlets, calendars, ads, letters, posters, etc. from as many different types of non-governmental organizations (NGOs) as possible (e.g., the Humane Society, Doctors Without Borders, Ducks Unlimited, Rotary Club, Kinettes, Canadian Cancer Society). Discuss why these groups exist and how they are separate from government agencies and industry groups. Explain that, although these groups may have different goals and methods, they share much in common in that they are composed of people who are working together. (Also ensure that students understand that government agencies, industry and individuals can work separately and together to reach specific goals.) Ask students if any of them belong to, or have family members who belong to, groups such as these, and how many students' families give money or volunteer for these groups.

Then, using the maps (pages 4 and 5) introduce the boreal forest and its importance as a bird breeding ground (see page 6). You may also use the Hinterland Who's Who handout on the boreal forest as a reference: <http://www.hww.ca/hww2.asp?id=354>. See the Teaching Resources section of teaching kit Volume 7 for other options.

Tell students that they are going to investigate some NGOs that focus on the conservation of the boreal forest and they will then create their own organization.

Procedure

- 1 Select an NGO as an example and fill out the chart as a class on the chalkboard. Ensure that students understand what each heading means.
- 2 Using the handouts provided and the Internet, students will research various aspects of two conservation groups and then create their own conservation group.
- 3 Students will then organize their conservation group's information by creating its website homepage and additional pages on paper (or on the computer, if ability and time allow).
- 4 Share conservation group descriptions with the class.

Extensions

Students could come up with a school conservation group that addresses a local habitat or resource issue.

Creating Your Own Conservation Group

Name: _____

Date: _____

NGO name and location of head office	Basic purposes and goals	Main and secondary activities (What does this group do to accomplish their goals?)	Fundraising activities	Government lobbying priorities (For example, what laws would this group like to see passed?)	Scope: local, provincial/territorial, national?	Government, NGO or industry partnerships
Researched NGO #1: _____ _____ Location: _____ _____						
Researched NGO #2: _____ _____ Location: _____ _____						
Your own NGO _____ _____ Location: _____ _____						



Name: _____ Date: _____



Creating your own Conservation Group

1. Using the Internet, research and fill in your chart for two of the following environmental conservation groups (also called non-governmental organizations or NGOs) that have some focus on Canada's boreal forest. Keep in mind that some of the information in the categories on your chart might not be presented clearly on the group's websites; you may have to look for similar key words and interpret what is presented in order to fill out your chart. Ask your teacher for assistance if you need it.

Great Lakes United www.glu.org

Canadian Water Network www.cwn-rce.ca

Ducks Unlimited www.ducks.ca

NatureWatch www.naturewatch.ca (Also on this website: Icewatch, Wormwatch, Plantwatch and Frogwatch)

Canadian Forestry Association www.canadianforestry.com

Nature Conservancy www.natureconservancy.ca

Sierra Club www.sierraclub.ca

World Wildlife Fund www.wwfcanada.org

Greenpeace Canada www.greenpeace.ca

North American Wetland Conservation Council www.terreshumidescanada.org

First Nations Environmental Network www.fnen.org

Canadian Wildlife Federation www.cwf-fcf.org

Canadian Boreal Initiative www.borealcanada.ca

Canadian Parks and Wilderness Society www.cpaws.ca

Global Forest Watch www.globalforestwatch.org

Nature Canada www.naturecanada.ca

Birds Studies Canada www.bsc-eoc.org

2. To fill in the bottom row of your chart (your own group), first go to www.borealcanada.ca. At the right, select Research and then select Reports. Then select The Boreal Forest Region: North America's Bird Nursery. Read pages 3 and 4. Also examine the boreal forest resource material that your teacher has provided to you. Considering this information, fill in the bottom row of your chart, creating a conservation group that focuses on conserving boreal forest habitats, especially for migratory birds.
3. Using several blank sheets of paper and pencil crayons, design the home page and other 'side' pages for your group.





Minimizing Forest Fragmentation

Lesson Six

Age range: 8-14 (can be used as a main activity for younger students or a quick activity for older students)

Time: 20 or 60 minutes, depending on student age

Subjects: Science, Geography, Social Studies

Resources: Class handouts: *Boreal Forest Area, Sources of Fragmentation and Forest Fragmentation: What Have we learned?*
Maps of the boreal forest from pages 4 and 5 (photocopied for class or shown on overhead), scissors, glue

Learning Outcomes

Students will understand the importance of intact habitat to biodiversity by cutting out and arranging images representing various sources of fragmentation on a forest landscape page (as they are occurring in Canada's forests, especially the boreal forest). Through their placement of the items, students will understand how fragmentation can be minimized by grouping developments together, or by limiting development.

Hook: Your Playing Field — Fragmented

On the chalkboard, draw a large rectangle to represent a soccer playing field with nets at either end. Have a student go up to the board and place a play area at the edge of the field, about one tenth the size of the field. Have another student place a walking path that meanders through the field lengthwise with a couple of people and a dog on the path. Place two small square horseshoe pits inside the field and make a walking path to the pits.

Ask the class if they can still play soccer on the field (yes...but it is more difficult and dangerous). Discuss the fact that most of the field is indeed still available for play, but the other items that have been added

have destroyed its integrity; it has been **fragmented for other uses** even though most of the field is still intact.

Introduce the similar concept of forest fragmentation and how important it is for an animal to have intact habitat (see below). Have students brainstorm some of the possible developments that may fragment a forest (logging roads, dams, farming, pipelines, mines, gas and oil extraction, etc.) Note that although forest product companies require roads to harvest timber and that trees take time to re-grow, forest companies encourage both artificial (tree-planting) and natural regeneration of forests.

Note

Intact forest is forest that has not been negatively impacted by humans. It does not contain roads or other developments and the human activity occurring within it has a low impact (e.g., hunting, fishing, hiking, birdwatching, etc.). Canada's boreal forest has some of the largest intact forest area in the world (show students the maps from pages 4 and 5). Intact boreal forest is important for millions of birds that migrate there each year to raise their young. They depend on undisturbed nesting sites, although predators are always lurking and natural disturbances such as storms can also have a negative effect on breeding success. Animals are adapted to live in certain habitats that can vary in terms of climate, food sources and many other factors. They cannot simply move to another place to live, like humans can.

In addition, intact forest is important to many other birds and animals that have permanent territories within the forest. For example, predators like black bears, hawks and wolves require large spaces in order to catch enough food for themselves and their young. If the forest is split up into little patches, it may not be good habitat for these species. Furthermore, to be able to successfully breed and raise their young, members of a species must be able to access each other in order to mate. If territories of large mammals are fragmented and no longer overlap, they can become cut off from each other. Population numbers can start to drop if an animal's territory has become too fragmented by too many highways, pipelines, urban areas and other human disturbances. Fragmentation can also make it easier for predators, such as wolves, to find prey, such as caribou, because they can move faster and more easily through the landscape (for example, along roads). However, those same roads may put the wolves at risk of a collision. Fragmentation encompasses the effect of habitat edges, which may allow predators or invasive species from non-forested habitat easier access into the forest.

Habitat loss is a separate concept from fragmentation and represents the overall loss of habitat (rather than the fragmenting or breaking up of a given area). Overall habitat loss is currently a more serious threat to bird populations in boreal forests than habitat fragmentation.

Land use planning is about the balance (and inevitable trade-offs) between accessing resources that support our modern lifestyles and protection of wild spaces. (See "Land Use Planning" on page 7 for more on this balance.)

Procedure

1 Go over the handout: *Boreal Forest Area*.

2 Have students cut out and arrange the items from handout: *Sources of Forest Fragmentation* onto their *Boreal Forest Area sheet*. (They should try to minimize fragmentation by grouping developments together.) Students will then glue their items onto the sheet.

3 Students may answer and discuss the questions below.

1. Why is **intact forest important** for plants, birds and animals?
2. What is **forest fragmentation**?
3. What are the **possible sources of fragmentation** that could continue to affect the boreal forest? (Hint: you just arranged and glued these development items on the forest sheet.)
4. List **three negative effects** of fragmentation on mammals, reptiles, birds and other creatures. (Hint: think about how human developments can be a hazard to animals as they migrate, try to find food, stay away from predators, find a mate and raise young.)
5. What are two ways forest fragmentation can be minimized?
6. Are you surprised at how many resources (such as wood products, oil and gas, minerals, hydro-electric power, etc.) exist in forests? Why or why not?
7. What is the connection between our modern Canadian lifestyles (for example, we drive long distances, eat food transported from far away, enjoy many modern conveniences, use lots of electricity and hot water) and the need for extracting resources from our forests?

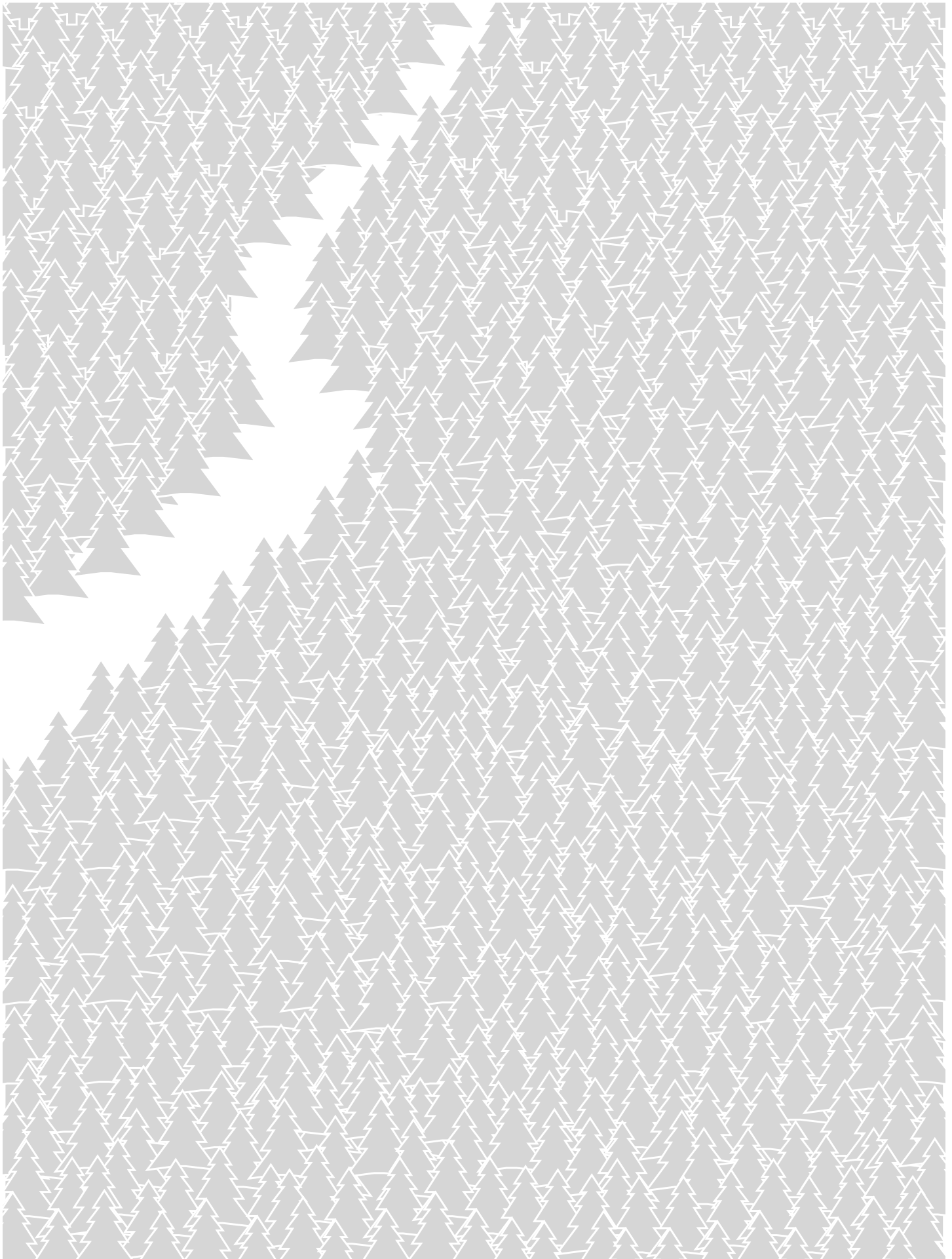
✳ Extensions

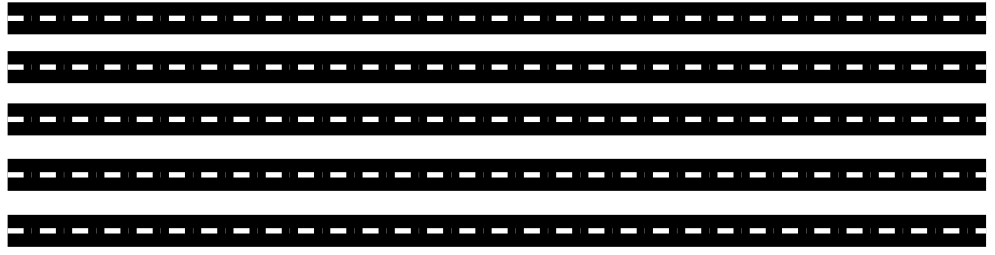
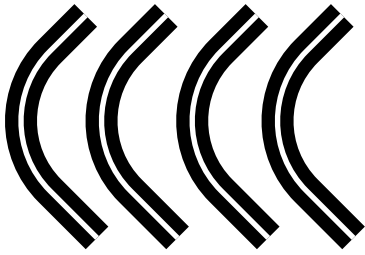
Students present their sheets to the class, explaining why they placed items where they did.

This lesson could involve the same concept produced in a 3-D diorama scene.

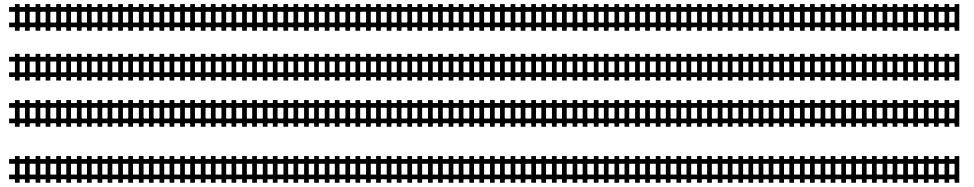
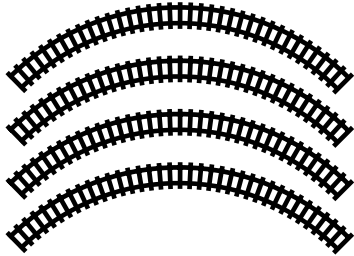
✔ Answers:

1. It is important because most species depend on undisturbed areas to raise their young, find food etc.
2. It is the 'cutting up' of intact forest to provide access to resources and resource extraction.
3. Sources of fragmentation include mines, wells and pipelines for oil, gas and minerals, roads, forestry operations (temporary fragmentation), railways, dams, communities (resorts, houses, farms), electricity transmission corridors, etc.
4. Although in certain specific instances forest fragmentation can provide benefits to certain species (e.g., by making it easier to find prey; roads and railways can provide an energy efficient way to travel), human developments generally make it harder for all animals to find a mate, find food, and safely raise young. They also generally increase risk of death from such things as vehicle collisions.
5. Placing developments together and restricting some developments.
6. Personal answer.
7. If we want to experience our modern lifestyles, we require resources found in the forests of Canada, such as hydro-electric power, oil and gas, wood products, minerals, etc. However, the forest holds value in a myriad of other ways, some of which conflict with certain situations of resource extraction. See Page 7 for more details on the balance required in land use planning in Canada's boreal forest.

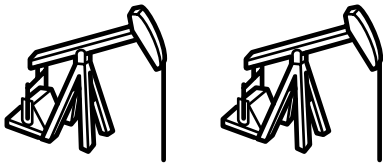




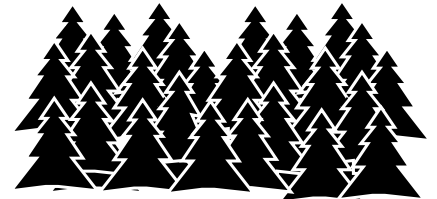
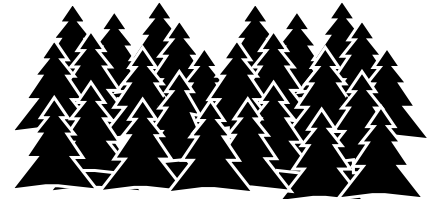
roads



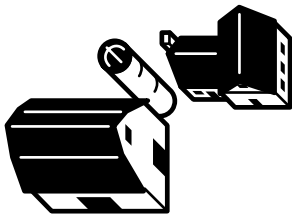
rails



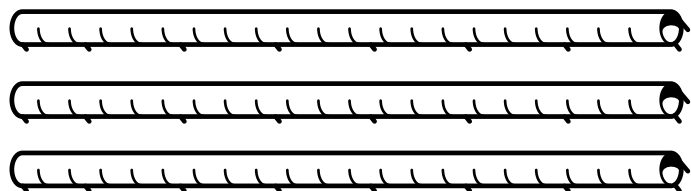
oil and gas wells



Area to be logged by forest products company



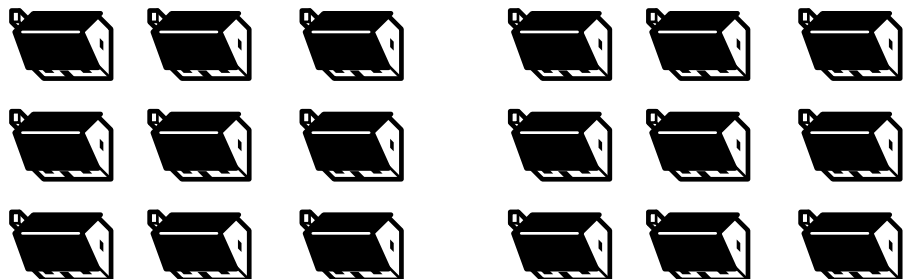
farm



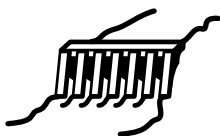
pipelines



resort



subdivisions



hydroelectric dam





Lesson Seven

The Canada Forest Accord

Age range: 16-18 (senior)

Time: 75 minutes

Subjects: Geography, Anthropology, World Issues, Civics, Science

Resources: Handout

Learning Outcomes

By analyzing the Canada Forest Accord students will understand the various values placed on Canada's forests as well as our dependence upon them, and our interdependence on each other in relation to forest products.

🔗 Hook: National and International Agreements

Have students brainstorm and list as many national and international waters, agreements to safeguard the freedom and security of its member countries by political and military means, such as NATO (North Atlantic Treaty Organization), trade agreements such as NAFTA (North American Free Trade Agreement), and agreements on the treatment of civilians and prisoners of war during a conflict, such as the Geneva Conventions. Within countries, there are treaties between Aboriginal People and governments, agreements between provinces over electricity sharing, and agreements between federal and provincial/territorial governments. Within various fields, there are voluntary agreements on best practices, which companies and individuals agree to comply with (e.g., livestock farming standards) and non-voluntary codes of conduct for professionals (e.g., doctors, biologists, nurses, engineers etc.).

Discuss how agreements are created (an issue needs to be addressed), and what the disadvantages and advantages are in terms of signing or not signing a particular agreement (e.g., the Kyoto Accord). While agreements may take a long time to create, and do not hold much meaning if they are not respected, they are a vital part of the democratic process.

Procedure

1 Hand out copies of the Canada Forest Accord, created by the National Forest Strategy Coalition. Go to http://nfsc.forest.ca/index_e.htm and select *Canada Forest Accord*. Explain the purpose of this agreement and go over the list of signatories.

2 Students analyze this agreement using handout: *The Canada Forest Accord: Would You Sign?*

3 Take up and discuss answers.

✳️ Extension

In 2008, the Canada Forest Accord will be renewed under its regular five-year review process. As part of this lesson, the class could come to a consensus about how they would like to see the Accord changed and their teacher, who is over 18 years of age, can submit it on their behalf to the National Forest Strategy Coalition (via the NFSC website).



The Canada Forest Accord: Would You Sign?

Section: “Our Forest”

1. Give as many concrete examples as possible about how “the forest is fundamental to our environment, economy, culture, traditions and history – and to our future.”
2. How do Canadian forests matter “to all citizens of the world?”
3. Give two or three interpretations of the following statement “It is critical to realizing our aspirations as a society and as a nation.”

Section: “Our Vision”

4. What does the phrase “long-term health of Canada’s forest” mean to you?
5. Describe the types of activities that are involved in keeping Canada’s forests “maintained and enhanced.”
6. Do you believe that the health of the forest can or even should be “maintained and enhanced for the benefit of all living things”? Consider invasive pests such as Asian long-horned beetle, Dutch Elm disease, as well as predators like bears and wolves. Is this goal possible? Is it desirable?

Section: “Our Principles”

7. This section states “Forest management must therefore sustain ecosystem health while meeting expectations of social well-being as well as continued environmental services and economic activity.” How could this be contradictory?
8. Explain the six boxed principles in your own words.

Section: “Our Commitment”

9. Read over the 10 commitments. Do you agree with them?
10. What do the phrases “ecosystem-based approach” and “community sustainability” mean to you?
11. How can Canadians be “actively engaged” “in being stewards of the entire forest”?

Overall:

12. Would you sign the Canada Forest Accord as it is now? Give three reasons why or why not.
13. Describe at least two sections that you would change and how you would change them.
14. Describe at least one sentence/concept/idea that you would like to see added.





The Forest Times

Age range: 14-16

Time: Five 75-minute periods

Subjects: English, Media, Science, Geography

Resources: several newspapers, class set of handouts: *The Forest Times* and *Article Guide*, computer access

Learning Outcomes

Students will understand the values placed on our forest by creating a class newspaper featuring forest-related articles and illustrations. (Students require some experience with newspapers to complete this activity.)

Hook: What's in a Newspaper?

Hand out several newspapers to students in small groups. Have them examine the style of the headlines (short, almost point-form, attention-grabbing) and the way 'who, what, when, where, why and how' are covered in the first few sentences of every article.

Procedure

1 Introduce the boreal forest using maps from pages 4 and 5, Background material (pages 3, 6 and 7) and the Hinterland Who's Who handout on the boreal forest: <http://www.hww.ca/hww2.asp?id=354> See the Teaching Resources section in teaching kit Volume 7 for other options.

2 Each pair of students will research and contribute one article (perhaps by interviewing forest professionals; through exchanges with students in other jurisdictions, such as urban and rural areas; through Internet research), one comic and one advertisement.

Extension

Copies of the class's complete Forest Times can be submitted to another class or to the entire school in order to raise awareness of boreal forest issues.



The Forest Times

.....

For your page of The Forest Times, you will select or be assigned a topic from the list below. You can organize your page through Microsoft Publisher, Microsoft Word or any other suitable program. Your page must contain:

1. **A news story**, presenting who, what, where, when, why and how in the first few lines and then expanding on this information in the rest of the article. To do this, go to websites provided or use other sources as directed by your teacher.
When you have found suitable sources, take point form handwritten notes on the handout *Article Guide*. Then use these notes to write your story. (This will help prevent plagiarism.) Your story should be around four paragraphs long. As you do your Internet research, keep an eye out for ideas for a comic and an advertisement related to your topic (see below).
2. **A comic** related to the topic. It could be an amusing comic or the start of a story that would be continued in each issue of The Forest Times.
3. **An advertisement** for something related to the topic (e.g., an ad for a sale of a wood product, an ad for an event in the forest, etc.).
4. Once everything is completed in rough copy, finalize it by typing up your story, creating the final version of your ad and comic and formatting your page using an appropriate computer program.

Topic List/Headlines:

Mountain pine beetle: a menace to our forests http://www.pfc.forestry.ca/entomology/mpb/index_e.html

Forest-related careers: yours to discover (Go to <http://www.oforest.on.ca/> Select *Programs*, then *Forest Careers Awareness*. Under 'Forest Career Resources,' select Career Information and Statistics and under 'Forest Education Resources,' select *Post-secondary Education*

Non-timber forest products: what are they? <http://www.royalroads.net/ntfp/casestudies/>

Global climate change and our forests: how will they be affected? Go to www.macleans.ca and use the Search button to find an article "Nicer wines, a bit of malaria" by Alexandra Shimo, Feb 15, 2007 – see section on Forests

What's new with value-added wood products (Go to <http://www.cwc.ca> Select Products)

Forest fires: a good thing? (Go to <http://affm.mnr.gov.on.ca/> Select *Forest Fire Management*. Under "About Forest Fires," select *The Science of Fire* and then, *Fire Ecology*.

Biomass: Energy from the forest http://www.canren.gc.ca/resou_asse/index.asp?CaID=53&PgID=57 <http://www.centreforenergy.com/silos/biomass/biomassOverview06.asp>

Do you know the Forest Capitals of Canada? (www.canadianforestry.com See *Community Outreach*)

National Forest Week – everything you need to know (www.canadianforestry.com See *Community Outreach*)

Sawmills: an inside look (Take the virtual tours at www.learnforestry.com Select *Resources* and choose a virtual mill tour at bottom)

Getting to know Canada's boreal forest (<http://www.borealcanada.ca/>)

Canada's boreal forest – who, who, who calls it home <http://www.borealbirds.org/>

Effect of oil and gas exploration in the boreal forest <http://www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/2001/08/19/MN105493.DTL>



Name: _____ Date: _____



Article Guide – The Forest Times

Topic: _____

Headline: _____

Who? _____

Details: _____

What? _____

Details: _____

Where? _____

Details: _____

When? _____

Details: _____

Why? _____

Details: _____

How? _____

Details: _____

Comic ideas: _____

Ad ideas: _____



Forest Resource Management: A New Era



Lesson Nine

Age range: 16-18

Time: Three 75-minute periods

Subjects: Science, Geography, World Issues, Anthropology

Resources: Maps of the boreal forest from pages 4 and 5 (photocopied for class or shown on overhead), handouts: *Forest Resource Management: A New Era - Section A and Section B* (half a class set of each), class set of handout: *Summary - Current Forest Resources and Land Management Concepts*, Internet access for first two classes

Learning Outcomes

Students will understand concepts integral to current boreal forest resource management and the increasing involvement of Canadian Aboriginal people in land use planning by investigating the concepts of Traditional Knowledge and the management of timber harvests to emulate natural processes such as forest fires.

Hook:

Using the maps of the boreal forest (either on the overhead or photocopied) ask students to brainstorm and name as many forest resources and forest products as possible. Examples include wood products such as paper, pencils, furniture, building materials and crafts, oil and gas products, mineral and precious metal goods, medicinal plant products, food products and others.

Discuss values placed on the forest relating to income, recreation, spirituality, culture, and intrinsic value as habitat for all living things. Also discuss the fact that all Canadians are the everyday end-users of products containing boreal forest resources.

Enjoyment of our modern lifestyles is possible because of the people who extract,

gather, transport, process and market forest resources and associated products. The protection and conservation of the boreal forest is inextricably linked to our interdependence on each other and on these forest resources. In addition, boreal forest habitats support cultural and biological diversity, which depend on intact forest to survive. Aboriginal people view the boreal forest as a 'home' system, a cultural landscape that is critical to their survival.

Ask students how decisions are made about managing human activity within forested landscapes (land use planning). That is, how forested land is managed in a given area with regard to how much is left intact and how much is subject to development. This activity investigates some of the latest concepts being put into practice today.

Procedure

1 Go over the handout *Forest Resource Management: A New Era*. Divide the class in half. One half will do Section A, and the other Section B. Students will do Internet research as directed on the handout.

2 The next day, Section A students meet to discuss their research and come up with a detailed agreed-upon definition of their assigned topic along with five points/facts/concepts central to the topic. The other half of the class (Section B) does the same. The two halves then present the central concepts to each other in groups or in one main presentation.

Extensions

Senior students will also enjoy *Fire: Agent of Change* in teaching kit Volume 7 (Science/Math prescribed burn activity)



Forest Resource Management – A New Era

Section A - Traditional Knowledge

1. In small groups, go over the information below. Underline key words and passages.
2. Visit the websites provided and read the material. After you have absorbed the basics, list 10 to 15 important points central to the topic of Traditional Knowledge. Use examples to illustrate, where appropriate.
3. In class tomorrow, gather with other Section A students and come to consensus about five important central points and how to word them. Place these on your Summary sheet.
4. Present these points to the other half of the class in small groups or in one presentation.
5. Listen to the other presentation and take notes on your Summary sheet.

All Canadians are the everyday end-users of products containing boreal forest resources. These products include wood products such as paper, pencils, furniture, building materials and crafts, oil and gas products, mineral and precious metal goods, medicinal plant products, food products and much more. Enjoyment of our modern lifestyles is possible because of the people who extract, gather, transport, process and market forest resources and associated products. Conservation of the boreal forest is inextricably linked to our interdependence on each other and on these forest resources. Forests also support social, cultural, recreational, spiritual and other values. In addition, the cultural and biological diversity found in forests depends on intact forest to survive.

Land use planning is a process where decisions are made about the management of human activities on a certain area of land. The collective wisdom of all people is needed to put sound long-term management plans in place, building on the regeneration policies and decision-making of the past.

While there are many ways to carry out effective ecosystem-based land use planning, and these methods vary widely among jurisdictions (federal, provincial/territorial, Aboriginal), some growing trends exist. One trend involves the use of Traditional Knowledge, or TK, in parallel with modern scientific forestry methods. Traditional Knowledge is knowledge held and gathered by Aboriginal people to sustain their social roles and responsibilities, cultural values, and rights in relation to traditional land use and livelihoods. Aboriginal people (Elders and other knowledge holders) contribute knowledge on such topics as natural resource use (e.g., hunting, fishing and trapping sites), burial grounds, natural resource observations over time (e.g., water levels, species numbers) and cultural and spiritual sites. Use of TK, in concert with the inclusion of TK holders in planning and decision-making processes, ensures that local Aboriginal interests and perspectives are well represented in the land use planning process.

The use of Traditional Knowledge is occurring as part of a larger shift in thinking about land use. Instead of proceeding with development in a given area (e.g., mining, timber harvest or oil extraction) with a focus on how much land can be conserved afterwards, there is movement towards a planning process wherein all knowledge and information on the ecology, geology, history, cultural and social values of an intact area is considered, with an eye to how much development should be permitted and in what context. The focus is on what to leave, not what to take, in order to keep ecosystems at all scales fully functional over time (known as Ecosystem-Based Management).

With regards to forestry, current forest land use management practices emphasize the use of methods that emulate vital natural disturbances, such as forest fires.

Websites:

http://www.sfmnetwork.ca/docs/e/SR_200405stevensonmtrad_en.pdf (pages 5-10)
<http://www.innovationalberta.com/article.php?articleid=129> (also available in audio)
<http://www.innovationalberta.com/article.php?articleid=207> (also available in audio)

Examples:

<http://www.kfrsc.ca/> - On left side, select Kaska Traditional Knowledge and Planning Tools
http://www.dehcholands.org/about_land_use_planning.htm
http://www.cpaws-sask.org/boreal_forest/athabasca_lup.html





Forest Resource Management – A New Era

Section B - Forestry practices that emulate natural disturbances

1. In small groups, go over the information below. Underline important passages.
2. Visit the websites provided and read the material. After you have absorbed the basics, list 10 to 15 important points central to the topic. Use examples to illustrate these points where appropriate.
3. In class tomorrow, gather with other Section B students and come to consensus about five important central points and how to word them. Place these on your Summary sheet.
4. Present these points to the other half of the class in small groups or in one presentation.
5. Listen to the other presentation and take notes on your Summary sheet.

All Canadians are the everyday end-users of products containing boreal forest resources. These include wood products such as paper, pencils, furniture, building materials and crafts, oil and gas products, mineral and precious metal goods, medicinal plant products, food products and others. Enjoyment of our modern lifestyles is possible because of the people who extract, gather, transport, process and market forest resources and associated products. The protection and wise use of the boreal forest is inextricably linked to our interdependence on each other and on these resources. However, forests also support social, cultural, spiritual, recreational and other values. In addition, the cultural and biological diversity found in forests depends on intact forest to survive.

Land use planning is a process where decisions are made about the management of human activities with respect to a certain area of land. The collective wisdom of all people is needed to put sound long-term management plans in place, building on the regeneration policies and decision-making of the past.

While there are many ways to carry out effective ecosystem-based land use planning and methods vary widely among jurisdictions (federal, provincial/territorial, Aboriginal), some growing trends exist. One of these trends is implementing forestry practices that emulate natural disturbances, such as forest fire, insect attacks, flooding and wind. While forest management practices will never exactly replicate these disturbances, techniques are available that emulate disturbance processes. The use of techniques that emulate fire, such as deliberate controlled burns (known as prescribed burns) creation of irregularly-shaped clearings, and leaving live and dead standing and downed trees and coarse woody debris behind, leaves the harvested forest habitat in a state that is similar in some respects to what would be observed after a natural disturbance had occurred. By recognizing the patterns that fires and other natural disturbances create, and the fact that they leave large undisturbed areas, these techniques help to attain sustainability of resources and biodiversity.

The use of forestry methods that emulate natural disturbances such as forest fires, are occurring as part of a larger shift in thinking about land use. Instead of proceeding with development in a given area (e.g., mining, timber harvest or oil extraction) with a focus on how much land can be conserved afterwards, there is movement towards a planning process wherein all information on the ecology, geology, history, cultural and social values of an intact area are considered, with an eye to how much development should be permitted and in what context. The consideration of Traditional Knowledge in planning and decision-making processes is part of this trend. Traditional Knowledge includes knowledge about natural resource use (e.g., hunting, fishing and trapping sites), burial grounds, natural resource observations over time (e.g., water levels, species numbers) and cultural and spiritual sites. The inclusion of TK and TK knowledge holders in land use planning ensures that the cultural and biological diversity of Canada's forested landscapes is preserved. Aboriginal rights, roles and responsibilities must be considered in planning and management of the boreal forest.

General information about forest management that emulates natural processes:

<http://www.sfmnetwork.ca/docs/e/Lauzon%20et.al.%20Fire%20Cycles.pdf> (6-16)

[http://www.sfmnetwork.ca/docs/f/SD-FR-Lauzon et al Fire Cycles.pdf](http://www.sfmnetwork.ca/docs/f/SD-FR-Lauzon%20et%20al%20Fire%20Cycles.pdf)http://www.sfmnetwork.ca/docs/e/SP_kneeshaw_en.pdf (pages 7 and 8, 13)

Prescribed burns:

<http://bcwildfire.ca/>

<http://www.se.gov.sk.ca/fire/insect-disease/FACT5.htm>



Traditional Knowledge	Forest Management by Emulating Natural Disturbances (e.g., fire)
<p>Definition:</p>	<p>Definition:</p>
<p>Central Ideas:</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p>	<p>Central Ideas:</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p>

Teacher Answer Guide

Note: The “answers” presented below represent possible definitions and key points that students may present. Student answers will differ.

Traditional Knowledge	Forest Management by Emulating Natural Disturbances (e.g., fire)
<p>Definition: Knowledge and values have been acquired by Aboriginal people, through experience, observation, from the land, from spiritual teachings, and passed down from one generation to another. This knowledge and these values sustain social roles and responsibilities, cultural values, and rights in relation to land use and livelihoods. It includes the knowledge of Elders and other knowledge holders on such topics as natural resource use (e.g., hunting, fishing and trapping sites), burial grounds, natural resource observations over time (e.g., water levels, species and population numbers) and cultural and spiritual sites.</p>	<p>Definition: A sustainable forest management practice that strives—through timber removal patterns, leaving woody debris, and other methods – to emulate forest conditions after timber harvest that are similar to those observed in forests after a natural disturbance. The aim is to minimize the impacts of forestry on all forest-dwelling organisms. It recognizes that the ecosystem and the species within it are adapted to the range of natural disturbances experienced over millennia.</p>
<p>Central Ideas:</p> <ol style="list-style-type: none"> 1. TK is collective. Everyone’s experiences and observations from a wide variety of sources and time periods are included and valued equally. 2. It is cumulative in that much of the information has been collected and passed down for many generations – in some cases, over many thousands of years – and often through oral transmission. 3. TK is locally based. The observations and knowledge apply to a specific place. 4. It is grounded in spiritual and traditional values such as respect for the land, a long-term perspective, etc. 5. It is a way of relating to and managing the land (including timber, water and other resources) as “home” with a respect for and inclusion of cultural, spiritual and natural ecological knowledge. 	<p>Central Ideas:</p> <ol style="list-style-type: none"> 1. Instead of aiming to maintain the characteristics of the stand as it appeared before harvest, the aim is to leave the area in a similar manner to how it would be after a natural disturbance (such as fire) occurred. 2. Timber harvesting practices try to emulate a natural disturbance through timber harvesting practices such as the size and shape of the cutblock (larger areas with non-linear boundaries that look like a burn), and retention of live and dead (standing or downed) trees emulating fire ‘skips’ or unburned areas within the cutblock. 3. Harvesting cannot emulate all aspects of a natural disturbance. For example, fire does not remove as many trees from the stand and the burned timber itself is valuable habitat for many insects, birds and plants. 4. Monitoring the success of the practices above is important. Indicators of success relate to elements of ecosystems affected by forestry practices, including the maintenance of soil fertility, the establishment and development of timber stands, conservation of aquatic resources and the maintenance of biodiversity. Potential indicators may be age and composition of forest (species of trees, etc.), diversity of bird populations, etc. 5. Focusing on developing timber stock and forest composition objectives at the landscape level, and not stand by stand.

Glossary

adaptations: traits (changes in behaviour, physiological processes or body structure) that have given individuals of a species possessing these traits an 'edge' over other individuals, making them more likely to survive and reproduce, hence passing on the genes relating to the favourable traits.

breeding habitat: habitat that provides the conditions (food, water and shelter) conducive to successful breeding.

carbon sink: a place where carbon accumulates, such as forests, which convert carbon dioxide from the air into carbon-containing sugars and plant fibre.

climate: a combination of information about how weather behaves and how it changes for a given place, and over a long period of time.

climate change: a long-term shift (warming or cooling) in climate. It occurs as a result of natural factors as well as from human activity. Natural factors that cause climate change include major volcanic eruptions, interactions between the atmosphere and oceans, changes in the sunlight intensity caused by very long-term changes in Earth's orbit around the sun, and changes in the radiation emitted by the sun. Human factors include local air pollution, landscape changes, and changes to greenhouse gas concentrations.

conservation: the study, protection, sustainable utilization, restoration and enhancement of natural resources with a long-term perspective.

COSEWIC: the Committee on the Status of Endangered Wildlife in Canada, an independent group of experts funded by the government that conducts research and designates which wild species are in danger of disappearing from Canada. This information is used by the Government of Canada to determine which species will be listed in the Species at Risk Act.

deforestation: clearing an area of forest for another long-term use, such as roads, buildings, golf courses and parking lots.

forest fragmentation: the process of breaking up a large, once-intact forest into smaller, and often isolated fragments, usually as a result of logging, agriculture, mining, pipelines, roads and other developments.

habitat: the arrangement of food, water, shelter and space in a given area.

intact forest: forest that exists in a natural state and has not been negatively impacted by humans.

interdependence: dependence on each other.

invasive species: a non-native species that has arrived in an area due to migration or to the direct or indirect effects of human activity; can cause problems for native species.

land use planning: a decision-making process used to guide human activity in a given area. A variety of methods are used in various jurisdictions.

management: careful planning and decision-making that goes into the conservation of natural resources such as forests, fresh water and fisheries. This could include harvest levels, protected areas, and policies on use.

migration: a behavioural adaptation or strategy that involves movement from one location to another in order to boost an individual's chance of survival and successful reproduction overall, although it also presents risks for the same individual. Migration is a useful strategy in many species' life cycle because it allows them to access new food sources when nearby sources get used up, and it provides access to more favourable living and breeding conditions in certain areas at certain times of year.

native species: a species normally found in an area.

non-renewable resources: naturally occurring assets such as oil, gas and minerals that exist in finite amounts.

organism: a living thing.

renewable resource: a natural resource that replenishes naturally such as trees, fish, plants and wildlife.

resident species: a species that does not migrate, but lives in basically one location year-round.

riparian zone: a distinct area between land and water (excluding ocean) featuring specific types of water-tolerant vegetation. Trees and plants here are important for wildlife habitat and food, sediment control and prevention of erosion.

SARA: Canada's Species at Risk Act

species at risk: a species that is of special concern, threatened, endangered (facing imminent extinction) or extirpated (extinct in certain areas of previous inhabitation).

stakeholder: a person or organization that has an investment and concern in a particular item or endeavour. Stakeholders wish to be included in the sharing of information and contribute to decision-making.

sustainable: used to describe practices that allow for controlled consumption so that a renewable resource remains at basically the same level for use by future generations.

Traditional Knowledge: knowledge and values that have been acquired by Aboriginal people through experience, observation, from the land or from spiritual teachings, and handed down through generations. This knowledge and these values sustain social roles and responsibilities, cultural values, and rights in relation to land use and livelihoods. Traditional Knowledge includes the knowledge of Elders and other knowledge holders on such topics as natural resource use (e.g., hunting, fishing and trapping sites), burial grounds, natural resource observations over time (e.g., water levels, species and population numbers) and cultural and spiritual sites.

wetland: a distinct wet area of habitat featuring varying degrees of water and specific types of vegetation and soil, including swamps, bogs, fens and marshes. Spruce bogs are very common in the boreal forest.

CFA Programs

Forest Capital of Canada – Celebrating Forest Communities

Established in 1979, the Forest Capital of Canada program highlights the valuable role forests play in the socioeconomic and environmental health of our communities – past, present and future.

Each year the CFA designates a community or region to host a celebration of its forest resources. Traditionally, provincial forestry associations or other forest agencies invite and relay proposals from communities or regions in their province/territory that demonstrate the capacity to mount a successful 12 to 24-month celebration. Interested communities may also submit proposals directly to the CFA.

National Forest Week

National Forest Week is sponsored across Canada by the CFA and regionally by various provincial forestry associations, corporations, agencies and individuals.

Established circa 1920 as Forest Fire Prevention Week, the intention was to encourage greater public awareness towards Canada's forests. At the time, there was no apparent shortage of trees for industrial expansion – the greatest threat came from forest fires, due mainly to human causes.

Since then, National Forest Week (as it was renamed in 1967) has evolved to encompass the many and varied human and environmental aspects of Canada's forest resources.

Although special activities are promoted across Canada, National Forest Week remains first and foremost a challenge to individual Canadians to learn more about their forest heritage and support greater recognition of this valuable resource.

National Forest Week is observed annually during the last week of September, Sunday through Saturday.

How to Participate

- Arrange a tree planting activity at your school; contact: www.treecanada.ca
- Take a walk in a forested area near the school; learn about a forest, close up!
- Identify all the things in your classroom that come from the forest.
- Learn about forest related organizations that demonstrate excellence in sustainable forest land management.
- Have students adopt a tree: care for a newly planted or a neglected tree, and learn about the species.
- Contact your provincial forestry association for more teaching activities and ideas.

Envirothon Canada



The CFA is the national agency for Envirothon Canada, which works in partnership with conservation groups, forestry associations, educators and cooperating natural resource agencies to organize and conduct competitions at the local, regional and provincial levels. Winning teams at the provincial level compete at the Canon Envirothon.

The Canon Envirothon is North America's largest secondary school environmental education competition. Reaching more than 500 000 students across North America annually, Envirothon succeeds in its mission to develop knowledgeable, skilled and dedicated citizens who are willing and prepared to work towards achieving a balance between quality of life and quality of the environment.

Program

- promotes environmental education-based on teamwork, collaboration and competition
- school-based learning guided by a set of expectations and key references
- combines in-class curriculum and hands-on field experiences
- supplements environmental education inside and outside the traditional classroom

Benefits

- secondary students explore environmental issues with peers, natural resource professionals and community leaders
- students gain valuable knowledge and training in ecology and natural resource management principles and practices
- students get excited about pursuing careers in environmental studies, environmental law, natural sciences and natural resource management
- communities benefit from the involvement of young people in local environmental issues
- society benefits from a citizenry educated in the principles of environmental stewardship.

For more information about these and other CFA

Programs visit:

www.canadianforestry.com

CFA Partner Agencies

Newfoundland & Labrador Forest Protection Association

Box 500
Grand Falls-Windsor NL A2A 2K1
T: (709) 292-3167 F: (709) 489-7493
jim_evans@abitibiconsolidated.com
www.nlfpa.nfol.ca

Nova Scotia Forestry Association

Box 6901
Port Hawkesbury NS B9A 2W2
T: (902) 625-2935 F: (902) 625-3045
contact@nsfa.ca www.nsfa.ca

PEI Forest Improvement Association

Covehead Road, RR1, York
Covehead PE COA 1P0
T/F: (902) 672-2114
fia@pei.sympatico.ca
www.forestimprovement.ca

The Tree House / Canadian Forestry

Association of New Brunswick
1350 Regent Street
Maritime College of Forest Technology, Rm 248
Fredericton NB E3C 2G6
T: (506) 452-1339 F: (506) 452-7950
treehouse@nb.aibn.com
www.nbtreeshouse.ca

Association forestière des Cantons de l'Est

138, rue Wellington Nord - bureau 100
Sherbrooke QC J1H 5C5
T: (819) 562-3388 F: (819) 562-2433
info@afce.qc.ca
www.afce.qc.ca

Ontario Ministry of Natural Resources

70 Foster Drive, Suite 400
Sault Ste. Marie ON P6A 6V5
T: (705) 945-5854 F: (705) 945-6667
erik.wainio@ontario.ca

Ontario Forestry Association

200 Consumers Road, Suite 107
North York ON M2J 4R4
T: (416) 493-4565 F: (416) 493-4608
forestry@oforest.on.ca
www.oforest.on.ca

Manitoba Forestry Association

900 Corydon Avenue
Winnipeg MB R3M 0Y4
T: (204) 453-3182 F: (204) 477-5765
mfainc@mts.net
www.mbforestryassoc.ca

Saskatchewan Forestry Association

137-1061 Central Avenue
Prince Albert SK S6V 4V4
T: (306) 763-2189 F: (306) 764-7463
info@whitebirch.ca www.whitebirch.ca

Inside Education (formerly FEESA)

600, 10707 - 100 Avenue
Edmonton AB T5J 3M1
T: (780) 421-1497 F: (780) 425-4506
info@insideeducation.ca
www.insideeducation.ca

FORED BC Society

4438 West 10th Avenue, Suite 213
Vancouver BC V6R 4R8
T: (604) 737-8555 F: (604) 737-8598
info@foredbc.org www.landscapesmag.com

Canadian Institute of Forestry - Klondike Section

Greg Cowman
Government of the Yukon
Box 2703 (K918)
Whitehorse YT Y1A 2C6
T: (867) 456-3805
greg.cowman@gov.yk.ca

Canadian Model Forest Network



c/o Eastern Ontario Model Forest
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Kemptville, Ontario K0G 1J0
T: (613) 258-8241
F: (613) 258-8363
modelforest@nrcan.gc.ca
www.modelforest.net

Western Newfoundland Model Forest

Box 68
Corner Brook NL A2H 6C3
T: (709) 637-7300 F: (709) 634-0255
lindaskinner@wnmf.com www.wnmf.com

Fundy Model Forest

701 Main Street, Suite 2
Sussex, NB E4E 7H7
T: (506) 432-7575 F: (506) 432-7562
info@FundyModelForest.net
www.FundyModelForest.net

Nova Forest Alliance

285 George Street, Box 208
Stewiacke NS B0N 2J0
T: (902) 639-2921 F: (902) 639-2981
info@novaforestalliance.com
www.novaforestalliance.com

Bas-Saint-Laurent Model Forest

300 allée des Ursulines
Bureau J-463
Rimouski QC G5L 3A1
T: (418) 722-7211 F: (418) 721-5630
foretmodele@fmodbsl.qc.ca
http://www.foret.fmodbsl.qc.ca/

Waswanipi Cree Model Forest

Waswanipi QC J0Y 3C0
T: (819) 753-2900 F: (819) 753-2904

Eastern Ontario Model Forest

10 Campus Drive, PO Bag 2111
Kemptville ON K0G 1J0
T: (613) 258-8241 F: (613) 258-8363
modelforest@eomf.on.ca
www.eomf.on.ca

Lake Abitibi Model Forest

143 3rd Street, Box 129
Cochrane ON POL 1C0
T: (705) 272-7800 F: (705) 272-2744
wally@lamf.net www.lamf.net

Manitoba Model Forest

Box 6500
Pine Falls MB R0E 1M0
T: (204) 367-5232 F: (204) 367-8897
dube@manitobamodelforest.net
www.manitobamodelforest.net

Prince Albert Model Forest

Box 2406
Prince Albert SK S6V 7G3
T: (306) 922-1944 F: (306) 763-6456
pamf@sasktel.net
www.pamodelforest.sk.ca

Foothills Model Forest

Box 6330
Hinton AB T7V 1X6
T: (780) 865-8330 F: (780) 865-8331
fmf@fmf.ab.ca www.fmf.ca

McGregor Model Forest

333 Becott Place, Box 2640
Prince George BC V2N 4T5
T: (250) 612-5840 F: (250) 612-5848
dan.adamson@mcgregor.bc.ca
www.mcgregor.bc.ca

CFA Sponsors in Forest Education

Canadian Boreal Initiative

The Canadian Boreal Initiative was created in response to both opportunities and threats facing Canada's boreal region. Based in Ottawa, the CBI brings together a wide range of conservation organizations, First Nations, industry leaders and others to create new solutions for boreal conservation and sustainable development. It supports scientific research to advance thinking on conservation-based planning for the boreal region, and acts as a catalyst by supporting a variety of on-the-ground efforts across the boreal forest by conservation groups, First Nations and others.

In 2003, the CBI convened the Boreal Leadership Council, an extraordinary group of conservation organizations, First Nations and resource companies. In concert with members of the Council, the CBI created and launched the Boreal Forest Conservation Framework – a vision for the protection and sustainable development of Canada's entire boreal ecosystem.

Natural Resources Canada, Canadian Forest Service

Natural Resources Canada, Canadian Forest Service, one of five sectors of Natural Resources Canada, works to ensure that Canada's forest resources are used wisely by advancing the science and policy that assists forest managers in practising sustainable development. Canada is steward of more than one-third of the world's boreal forest, one-fifth of the world's temperate rainforest, and one-tenth of the total global forest cover. This is a responsibility the Canadian Forest Service takes to heart. Its innovative programs, policies, science and technology are key to Canada's global leadership and critical to safeguarding the environmental, economic, and social values that Canadians place on their forests – now and for the future.

Ducks Unlimited Canada

Ducks Unlimited Canada (DUC) is a national, private, nonprofit organization and is known as Canada's Conservation Company. DUC has been committed to wetland conservation for more than 67 years and has positively influenced nearly 25 million hectares of habitat in 7139 locations across Canada. Despite this, wetland loss continues across Canada. As much as 70 percent of Canada's original wetlands have been lost in some areas of the country. DUC's conservation efforts take many forms. On-the-ground work is guided by the wetland and environmental research of DUC's scientists. DUC works to change policy in favour of wetland and habitat conservation. DUC also delivers wetland and environmental education programs to teach Canadians about wetlands and the need to conserve them. As a non-profit organization, DUC relies on the support of over 150 000

Canadians from across the country. DUC's 8200 dedicated volunteers work very hard to help DUC in achieving its conservation mission and vision.

Forest Products Association of Canada

The Forest Products Association of Canada (FPAC) is the voice of Canada's wood, pulp, and paper producers nationally and internationally in government, trade, and environmental affairs. Canada's forest industry represents 3 percent of Canada's gross domestic product (GDP) and exports \$45 billion annually. The industry is one of Canada's largest employers, operating in hundreds of Canadian communities and providing over 900 000 direct and indirect jobs across the country. With the help of member companies, FPAC designs programs to promote Canada's leadership in trade and economic matters, sustainable forest management and environmental stewardship.

Environment Canada

Environment Canada's mission is to protect and conserve the environment for the benefit and prosperity of current and future generations of Canadians. The Western Boreal Conservation Initiative (WBCI) is a multi-partner initiative that contributes to Environment Canada's mission by supporting sustainable development of natural resources and the conservation of boreal biodiversity. WBCI envisions a healthy and intact boreal forest ecosystem in Canada that maintains its natural range of biodiversity, and supports forest-dependent communities. Building on strengths in migratory bird management, WBCI focuses on the delivery of science and science expertise, and partners widely with organizations that share its conservation mandate.

Louisiana Pacific

Louisiana Pacific is a premiere supplier of building products, delivering innovative, high quality commodity and specialty products to retail, wholesale, homebuilding and industrial customers. LP operates 31 mills (20 in the United States, 10 in Canada and one in Chile) and has more than 6000 employees.

LP was founded in 1972 as a spin-off of Georgia-Pacific Corporation and became an independent corporation on January 5, 1973. Building on a strong presence in lumber and plywood, LP pioneered the U.S. production of oriented strand board (OSB) panels in 1982. Today, LP is the world's largest producer of OSB, which continues to replace plywood in residential building. Other products manufactured by LP include LP WeatherBest composite decking, LP SmartSide composite siding

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and Engineered Wood Products, including LVL and LP I-joists.

LP's centralized Technology Center in Franklin, TN is designed to rapidly turn new concepts into new products.

The facility also focuses on improving product quality and raw material utilization in the manufacturing process.

LP is traded publicly on the New York Stock Exchange under the LPX ticker symbol. Net sales in 2004 reached \$2.8 billion.

LP is dedicated to investing in communities where our employees live and work. The company provides funding, product and volunteers to support public schools and nonprofit organizations. Contributions are focused in areas of shelter, education, social services and the environment.

Ontario Ministry of Natural Resources (OMNR) - Forests Division

Ontario is a recognized world leader in its forest and forest fire management programs and practices. The OMNR Forests Division is committed to sustainable forest management – healthy forests providing balanced environmental, social and economic benefits now and for the future. Sustainable forest management is critical to a dynamic provincial economy. Our mission is to ensure excellence in the management and protection of Ontario's forests and the provision of specialty resource management services.

Weyerhaeuser

Weyerhaeuser's business starts with the forests. By growing and managing this precious renewable resource, they manufacture products that meet basic human needs for shelter, communications and a host of other uses. Their goal is to be the industry leader in stewardship of public and private forest lands in Canada, while holding themselves to the highest standards of ethical conduct and environmental responsibility, and communicating openly with their employees, customers, communities and shareholders. That's their commitment now and for future generations.

Weyerhaeuser Company is one of the world's largest integrated forest products companies; incorporated in 1900. In 2003, sales were \$27.8 billion. They have offices or operations in 18 countries, with customers worldwide. Weyerhaeuser is principally engaged in the growing and harvesting of timber; the manufacture, distribution and sale of forest products; and real estate construction, development and related activities.

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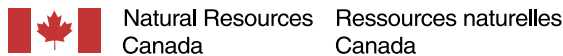
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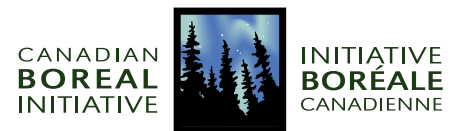
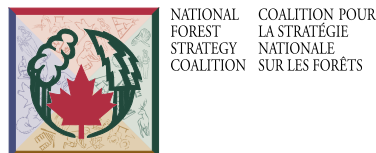
Rick Wishart, *Ducks Unlimited Canada*

The Canadian Forest Service has, for many years, been a strong supporter of the Canadian Forestry Association, working with it on projects of mutual interest and benefit. In addition to providing a substantial share of the CFA's annual core funding, CFS provides scientific expertise and guidance to products such as the Canada's Forests teaching kit series. While the CFA remains an independent arms-length organization, its mission dovetails with the objective of the CFS to develop and showcase Canada's world-leading advances in forest science and forestry practices.

Supporting Forest Education



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Canadian Forestry Association
Association forestière canadienne

To order all volumes of the CFA Teaching Kit contact:
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E: teachingkits@canadianforestry.com

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