A TEACHING KIT

Canada's Forests

All Things Big and Small

Volume Three: Biodiversity

Welcome to Canada's Forests Teaching Kit, published by the Canadian Association Forestry Association (CFA).

The CFA is dedicated to the wise use and conservation of Canada's forest resources through enhanced public awareness and education programs. The CFA Teaching Kit Series provides educators with the tools required to help our children understand the value of forests and the importance of protecting and conserving them.

Healthy forest ecosystems depend on a complex relationship of soils, water, plant communities, wildlife and climate. We offer Canadians an opportunity to learn more about forest ecosystems and the important role they play in the economic and environmental health of our country and the planet.

For more information on the CFA see the list of our programs on page 40 of this teaching kit, or visit our Web site: www.canadianforestry.com

You Can Help

The CFA is a non-profit organization with over 100 years of history, and a rich legacy of bringing information about forest ecosystems to Canadians. We achieve our goals through partnerships with government and industry, and with the help of individuals and organizations who contribute voluntarily to our efforts.

As an individual citizen, educator, community organization, small business or major corporation, you can help by making a financial contribution to the CFA Forest Education Program.

Contact us at:

Canadian Forestry Association
185 Somerset Street West, Suite 203
Ottawa, ON K2P 0J2
T: (613) 232-1815
www.canadianforestry.com

Canadian Forestry Association
forestière canadienne
since · depuis 1900

Membership

The CFA was established in 1900 as a voice for Canada's forests, with a mandate to promote long-term forest health. Our efforts are as important now as they were 100 years ago. We believe we can maintain the ecological integrity, physical health and natural beauty of Canadian forests. You can help us in this forest conservation effort by becoming a member of our organization.

For more information visit our Web site: www.canadianforestry.com

Newfoundland Forest Protection
Box 728 Mount Pearl, NF A1N 2C2
T: 709-729-1012 F: 709-368-2740
E:nlfpa@nfld.com

Nova Scotia Forestry Association
Box 1113
Truro, NS B2N 5G9
T: 902-893-4653 F: 902-893-1197
E: debbie.totten@ns.sympatico.ca

PEI Forest Improvement Association
Covehead Road, RR1, York
Covehead, PE COA 1 PO
T/F: 902-672-2114
E: wm.hemphill@pei.sympatico.ca

Canadian Forestry Association of New Brunswick (The Tree House)
124 St John Street
Fredericton, NB E3B 4A7
T: 506-452-1339 F: 506-452-7950
E: treehouse@fundy.net

Regroupement des associations forestières régionales du Québec
138, rue Wellington Nord - bureau 100
Sherbrooke, QC J1H 5C5
T: 819-562-3388 F: 819-562-2433
E: afce@afce.arbre.foret.org

Ontario Forestry Association
200 Consumers Road, Suite 307
North York, ON M2J 4R4
T: 416-493-4565 F: 416-493-4608
E: forestry@oforest.on.ca

Manitoba Forestry Association
900 Corydon Avenue
Winnipeg, MB R3M OY4
T: 204-453-3182 F: 204-477-5765
E: mfainc@sympatico.ca

Saskatchewan Forestry Association
Box 400
Prince Albert, SK S6V 5R7
T: 306-763-2189 F: 306-764-7463
E: forestry@inet2OOO.com

Forest Education British Columbia
1505 West Second Avenue, Suite 503
Vancouver, BC V6H 3Y4
T: 604-737-8555 F: 604-737-8598
E: info@fored.com

Contents

Canada's Forests – All Things Big and Small looks at biodiversity, the vast and complex array of life forms that make up a forest environment, and explores how all those elements fit together.

The lessons in this teaching kit will help students better appreciate the complexity of the natural world, learn how they can affect it, and understand how they can help to preserve and maintain its diversity.

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Using This Teaching Kit

What's Inside

This teaching kit is a complete set of tools designed to help teachers engage students in the topic of biodiversity in our forests. The kit includes an overview of the current science and knowledge on biodiversity and a series of eight activity-based lessons that can be delivered inside or outside the classroom.

Curriculum Links

We have designed this teaching kit so you can use the lessons, ideas and activities to celebrate the forest environment with your students, and address your curriculum requirements at the same time.

The teaching kit includes the key biodiversity-related learning outcomes within the Pan-Canadian Science Framework, a nationally recognized curriculum document designed to guide the development of science curriculum across Canada. The lessons in this kit address the learning outcomes of this framework, for student skills, knowledge and attitudes.

Each lesson can be easily adapted to reflect specific regional or provincial curriculum requirements and enhance basic science learning. Within the activities there are opportunities for you and your students to take direct action to conserve and maintain biodiversity in your own community as part of the learning experience.

Grade Levels

The kit meets specific learning outcomes on biodiversity-related topics in Grades 4, 6 and 7. But the information and the lessons can easily be applied with students in Grades 1 to 7.

You will also find that the lessons complement social studies learning, offer links to language arts for expression and communications skills, and provide extensions that touch on a variety of curriculum expectations.

Why a Teacher Should Use This Kit

The kit is a full set of teaching tools designed to help you achieve specific learning outcomes, while exploring biodiversity and related critical environmental issues with your students.

In each of the lessons you will find:

- **Summary:** an introduction to the topic and the type of activity
- **Activity Information:** suggested grade level, subject, estimated duration and suggested materials
- **Learning Outcomes:** curriculum expectations
- **Teacher Background:** information on the lesson topic
- **Procedure:** detailed instructions required to teach the activity
- **Extensions:** variations to the lessons to help explore biodiversity in depth

We have also included links to Web sites in some of the lesson plans for either your needs or your students' research.

Instruction Key

The icons and symbols in this teaching kit will allow you to quickly identify lessons that have:


a group or discussion activity


a performing activity


a writing and recording activity


field investigation


extensions

Biodiversity Basics

Imagine for a moment that you are looking at a hand-made quilt made of individual patches with contrasting colours, textures, shapes and sizes. They are smoothly stitched together to present a beautiful, complex and unique quilt.

You can think about the forest environment in the same way. The patches of the quilt represent the diversity of life found in the forest. Removing one patch will not destroy the quilt, but it will take away some of its strength and beauty. Remove too many patches and the quilt will fall apart.

Nature's quilt design is stitched together by a series of complex and overlapping relationships and interactions that are constantly changing in time and space. Its patches are trees, mice, voles, fungus, water lilies, eagles – the diversity of life that makes up the biodiversity of our earth. Remove one patch, and you damage this biodiversity. Remove too many patches, and you risk destroying the forest environment.

Canadian Biodiversity Information Network
http://www.cbin.ec.gc.ca/

This teaching kit will explore some of the many ways we risk unravelling the delicate quilt of biodiversity – things like habitat fragmentation, invasive species and climate change.

Biodiversity at a Glance

Biodiversity combines two terms – biology and diversity. Put simply, it refers to the variety and complexity of all living things and the way they interact within ecosystems.

Technically speaking, however, biodiversity is a lot more complex. It refers to the totality of genes, species, and ecosystems in a region, and the interactions between those genes, species and ecosystems.

We cannot maintain an assortment of species without ecosystem diversity, the ecosystem cannot function as well if it loses a species, and a broad genetic base is needed to help species adapt to changing conditions.

Let's consider as an example a species that we may not especially appreciate, like the mosquito. As we cover ourselves with repellent or anti-itch creams, we may dream of a world without mosquitoes.

But a world without mosquitoes may also be a world without some species of birds, fish or amphibians that dine on these pesky insects.

We can never know the outcome if a species like the mosquito disappeared tomorrow. It could turn out that they had a vital role in maintaining another species or the integrity of an entire ecosystem.

On top of that, our knowledge and understanding of forest ecosystems is not complete. Aldo Leopold, considered the father of wildlife ecology, warned of the dangers involved in tinkering with a system you do not fully understand. It is far wiser to keep all the parts because they may be more important than we yet appreciate or understand.

Biodiversity World Map
www.nhm.ac.uk/science/projects/worldmap/

Why is Biodiversity Important to Canadians?

While most Canadians live and work in or near urban centres, we still hold a special appreciation for our natural environment. It is vital that we find ways to encourage children and youth to realize the critical role nature and the natural environment play in maintaining life on earth.

Helping students understand biodiversity close to home makes them better equipped to appreciate how it affects them as individuals, and how they can affect it – locally and globally.

Canada's First National Report to the Conference of the Parties to the Convention on Biological Diversity, entitled *Caring for Canada's Biodiversity*, pointed out that there are many biodiversity-related challenges facing Canadians:

"A few ecosystems have almost been completely lost as a result of human development and settlement patterns. In some instances, harvest rates have exceeded the capacity of stocks to regenerate themselves. Each year, the number of threatened and endangered species in Canada grows."

Virtual Exhibit on Amphibians
http://collections.ic.gc.ca/amphibians/

Who is Responsible for Maintaining Biodiversity?

Far from being bystanders to biodiversity, humans are part of all of earth's ecosystems. We have a special responsibility to maintain and, if possible, enhance biodiversity. Our role can be as simple as reducing our consumption of non-renewable resources or as complex as helping to ensure the survival of a species at risk.

After endorsing the United Nations Convention on Biological Diversity in 1992, Canada developed its own biodiversity strategy.

The Canadian Biodiversity Strategy outlines the roles and responsibilities of each jurisdiction in the country and recognizes the critical role of non-governmental organizations and individuals.

Canadian Biodiversity Strategy
www.eman-rese.ca/eman/reports/publications/rt_biostrat/intro.html

Engaging Canadians in Planning and Decision Making

If we can help Canadians understand the importance of maintaining and enhancing biodiversity, we may be able to make positive changes in the protection our natural environment.

Encourage your students to explore how individuals and groups can make a difference. Enrich your school grounds by planting some native trees or shrubs. Start a recycling program or reduce the amount of electricity used in your school.

There are many government and non-government organizations carrying out important work that benefits Canada's forests, such as Canada's Model Forest Network. You can help make a difference by working with these groups. And don't forget that environmental activities are important to both rural and urban environments.

BioBlitz
www.biodiversityonline.ca/BioBlitz/intro.htm

Canada's Forests and Biodiversity

Forest biodiversity is more than a collection of different ecosystems, species and genes. It involves a complex interrelationship of all these things across landscapes and over time. Renowned U.S. naturalist John Muir put it well: "When you try to change any single thing, you find it hitched to everything else in the universe."

The connections that hitch everything together in the forest are like the stitching in the quilt we discussed earlier. It includes the bacteria in the soil, the birds nesting in the highest canopy, and everything all around them.

Forests change naturally over time through ecological processes involving fire, insect infestations, disease and climate change. We can conserve native forest biodiversity only by conserving a diversity of forest types, age structure, functions and patterns across the landscape.

Canadian Forest Service
www.nrcan-rncan.gc.ca/cfs-scf/national/portals/index_e.html

Biodiversity Themes

We have identified seven biodiversity themes, and have used these as the basis for the lessons in this teaching kit. There are eight lessons – one introducing biodiversity and seven more based on the themes.

1) Introduction to Biodiversity

We are only just beginning to understand how complex, multi-layered and amazing our natural environments are, and how we must all help to conserve biodiversity. Our conservation efforts start when we integrate our activities with the natural processes and natural changes in the landscape.

Most Canadians live in or around urban areas so their ideas about biodiversity often reflect their interactions with wild species found in urban ecosystems. Students can learn the basics of biodiversity by studying the arrangement of wild species, both flora and fauna, in their schoolyard, and at the same time understand why it is important to live in a way that maintains the greatest variety of species.

2) Science and Technology/ Biotechnology

Biotechnology is a short term for biological technology – techniques that allow us to analyze and use living things, such as plants, fungi or bacteria, in ways that have the potential to benefit humans or the environment. People involved with biotechnology know it is important to conserve endangered habitats and species to avoid losing genetic resources.

Genetic diversity comes from the natural processes of changing and exchanging DNA, the genetic blueprint for life. New species emerge when nature blends DNA sequences, altering and recombining DNA from living species. This process of evolving genetic diversity is an important part of biodiversity.

Biotechnology is both amazing and simple. An example that most people are familiar with is the breeding of purebred dogs. Breeders choose to breed dogs that are most likely to exhibit popular features. Like biotechnology, this means combining the best genes with the goal of creating an exceptional species.

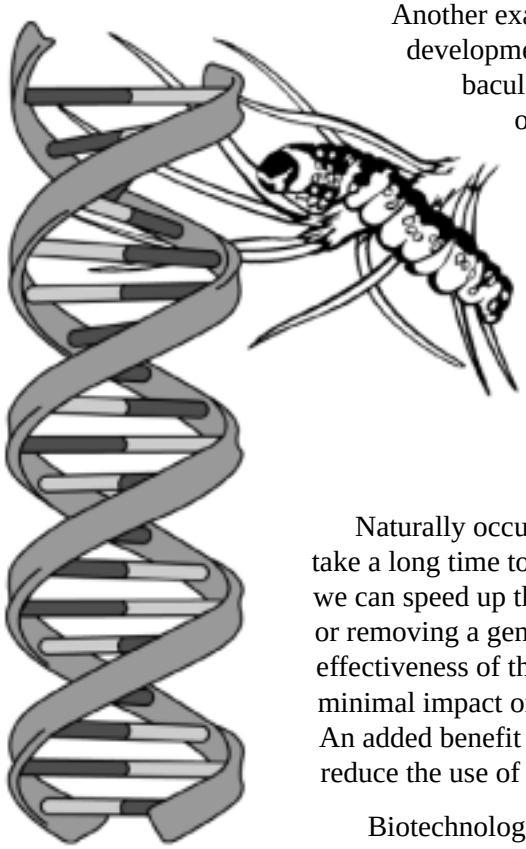
An example of how biotechnology is used in our forest is DNA fingerprinting, a biotechnological tool used to measure genetic variation between individuals of a species and among populations of a species. In the forest, DNA fingerprinting can be used to nab tree thieves, measure genetic diversity in trees, including species at risk and identify disease and insect resistant trees.

Canada's Model Forest Network

Initiated in 1992 by the Canadian Forest Service, Canada's network of model forests stretches from the temperate rainforests of British Columbia to the boreal forests of Newfoundland and Labrador. There are 11 model forests covering over 22 million acres of land and representing all of Canada's forest regions:

- Long Beach Model Forest, BC
- McGregor Model Forest, BC
- Foothills Model Forest, AB
- Prince Albert Model Forest, SK
- Manitoba Model Forest, MB
- Lake Abitibi Model Forest, ON
- Eastern Ontario Model Forest, ON
- Waswanipi Cree Model Forest, QC
- Bas-Saint-Laurent Model Forest, QC
- Fundy Model Forest and Nova Forest Alliance, NB/NS
- Western Newfoundland Model Forest, NF

www.modelforest.net



Another example is the development and use of baculoviruses, viruses that occur naturally and sometimes attack certain insects. One virus kills spruce budworm by spreading in the insect's tissue. Eventually the insect becomes sick, stops feeding and dies.

Naturally occurring baculoviruses take a long time to stop the budworm. If we can speed up the process by adding or removing a gene, we can increase the effectiveness of the natural virus, with minimal impact on other forest species. An added benefit is that we can also reduce the use of chemical pesticides.

Biotechnology is giving us science-based tools that can help us conserve biodiversity and promote sustainable development. But in developing and using this technology, we need to maintain a connection with and respect for the natural processes that make it possible.

Natural Resources Canada
www.nrcan-rncan.gc.ca/cfs-scf/science/

3) Pests – Natural and Introduced

Natural forest pests such as the spruce budworm are part of the complex quilt of biodiversity. While they sometimes present problems that must be managed, they are a natural part of the ecosystem.

Invasive or introduced species such as the zebra mussel or purple loosestrife are a different story altogether. Native species often have no defence against them, which allows intruders to spread quickly.

For example, the brown spruce long horn beetle, which is native to Europe, made its first appearance in North America in Halifax's Point Pleasant Park, probably arriving in wood-packing material on ships. The beetle began to attack red spruce trees in the park, which have no natural defence against this alien species.

Brown Spruce Long Horn Beetle
www.atl.cfs.nrcan.gc.ca/index-e/what-e/publications-e/afcpublications-e/s_twatch-e/december2000-e.html

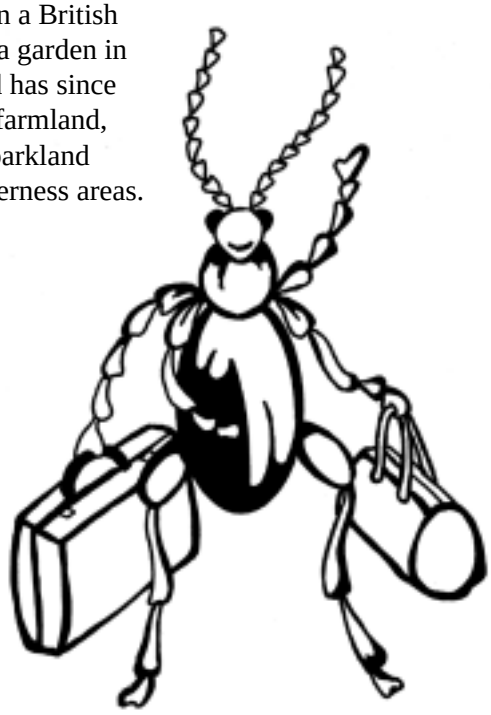
Compare this with a natural infestation. British Columbia's interior is currently in the midst of the biggest mountain pine beetle infestation in its history. The infestation is due primarily to a series of mild winters that allowed the beetle population to explode. Two extremely cold winters in a row should stop the infestation in its tracks.

Mountain Pine Beetle
http://www.for.gov.bc.ca/hfp/bark_beetles/

There are many examples of introduced species creating serious problems, including American tent caterpillar, gypsy moth, starlings, purple loosestrife and Scotch broom.

The first outbreak of the American forest tent caterpillar, which defoliates hardwoods such as sugar maple, oak, black gum and aspen, occurred in the late 1700s. Outbreaks typically occur every six to 16 years, and last from three to as many as six years, depending on weather conditions, food supply and natural enemies.

Scotch broom, a shrub native to the Mediterranean region, was first planted in a British Columbia garden in 1850 and has since invaded farmland, forests, parkland and wilderness areas.

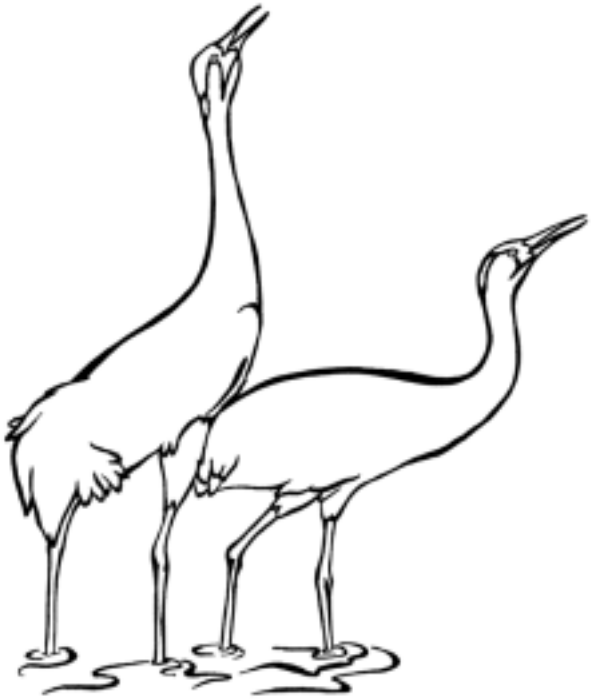


The National Forest Week Biodiversity Poster included with this kit features some of the insects of Canadian forests, such as the mountain pine beetle and spruce budworm.

Forest Pests
www.nrcan-rncan.gc.ca/cfs-scf/science/prodserv/pests/pests_e.html

4) Species at Risk

The diversity of life that makes up each ecosystem includes individual species – plant or animal – with their own ecological niches, places where they live, eat, breed and flourish. If their environment is altered, some species cannot adapt fast enough and their numbers decline to a point where their survival is threatened.



Habitat loss and fragmentation are major contributors in putting some species at risk. Climate change, disease, environmental contamination, over harvesting, and invasive species can also create problems.

The Committee on the Status of Endangered Wildlife in Canada, or COSEWIC, has been advising governments on the status of wildlife species in Canada for 23 years.

COSEWIC's role is to assess the level of risk of extinction for wildlife species, using the best science, information and knowledge available, including traditional knowledge from Aboriginal peoples.

The COSEWIC Web site provides updates on the status of species at risk in Canada.

COSEWIC Web site
www.cosewic.gc.ca

In 1987, COSEWIC formally designated the American chestnut as a threatened species. American chestnut was a dominant forest tree species in northeastern North America before populations were devastated by the introduction in 1904 of a fungal disease which causes chestnut blight. American chestnut still survives in small populations. In 2000, a recovery plan was developed through COSEWIC with the goal of restoring American chestnut to self-sustaining populations throughout its range in Canada.

There have been some successes in helping listed species recover, including the wood bison, swift fox and whooping crane.

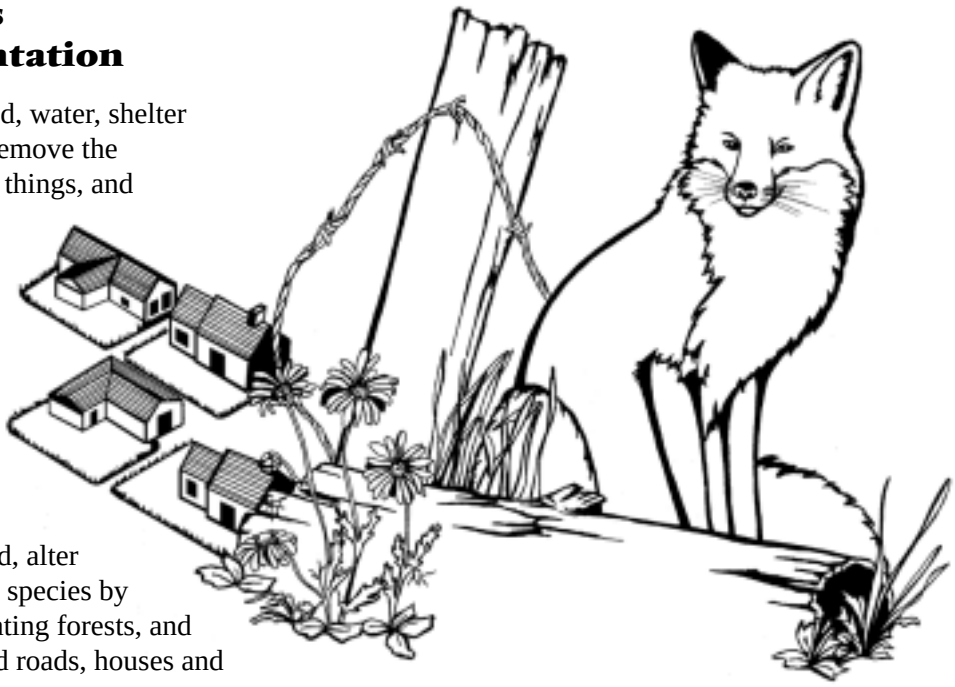
Whooping cranes were designated as endangered in 1978. Although their populations were never large, they had been widespread in central and western North America. Numbers began to decrease in the early 1900s due to over-hunting, egg collection, and habitat disturbance including draining of large, isolated marshes. In 1941, there were 21 wild and two captive birds left.

The recovery plan has involved protecting habitat, establishing a captive breeding program, conducting research into new reintroduction sites, and teaching the captive-raised birds to migrate with the use of guide birds and ultra-light aircraft.

The swift fox disappeared from Canada in the early 1900s as a result of habitat destruction, strychnine poisoning and trapping in predator control programs. COSEWIC designated the fox as an extirpated species in 1978. This means it was extinct in the wild in Canada but occurred elsewhere. Captive breeding programs initiated since then have been successful. The swift fox was down-listed from extirpated to endangered in 1998.

Species at Risk
www.speciesatrisk.gc.ca

5) Habitat Loss and Fragmentation



A species needs food, water, shelter and space to survive. Remove the habitat that offers these things, and you risk losing the species, which in turn limits and threatens the biodiversity of the region.

People affect habitats in a number of ways. We turn forests and grasslands into farmland, alter the distribution of plant species by harvesting and regenerating forests, and we fill wetlands to build roads, houses and factories.

Habitat fragmentation involves breaking a habitat into small pieces. This can occur naturally as a result of forest fires, insect infestations or floods, but it also occurs as a result of human activities. Logging roads, electrical power lines, and pipelines can fragment habitats, creating distances between populations and disrupting interactions among species.

Habitat fragmentation also creates new forest edges. While this may at first appear to increase the diversity of an ecosystem, it can also accelerate natural processes, leading to more predation, parasitism and competition within and along the edge of the habitat fragments.

National Atlas of Canada
http://atlas.gc.ca/site/english/maps/freshwater/distribution/wetlands

6) Protected Areas

We need to do many things to maintain biodiversity. An important part of those efforts involves protecting representative ecosystems so we can guarantee habitat and minimize interference for as many species as possible.

Canada's system of national parks and marine conservation areas offer excellent protection for many biotic and abiotic ecosystem components.

Parks Canada
http://parkscanada.pch.gc.ca/

Provincial parks, conservation areas, wildlife management areas and other specially managed landscapes all provide different levels of protection and use.

One example is Ontario's Living Legacy program established in 1999. Living Legacy is the most comprehensive, long-term program of natural heritage protection in Ontario's history, involving the establishment of 378 new parks and protected areas. One of the primary objectives in establishing these new protected areas is to measure, monitor and protect biodiversity.

Ontario's Living Legacy
www.ontarioslivinglegacy.com/

Private stewardship activities also supplement the public networks of protected areas. Ducks Unlimited, the North American

Waterfowl Management Plan, and other initiatives provide care for thousands of hectares of wetlands and other special ecosystems.

Ducks Unlimited
www.ducks.ca/

North American Waterfowl Management Plan
www.nawmp.ca/

We need to protect large representative parts of ecosystems ensuring habitat supply for a wide range of species, which will help us maintain and preserve biodiversity. We must also consider the importance of protecting smaller areas that are critical in maintaining habitat for species at risk.

7) Climate Change

Most people are aware of terms such as global warming, the greenhouse effect and ozone depletion. These are just a sample of things that may influence climate. The rate of global climate change over the long term has many implications for natural ecosystems and biodiversity.

The Earth's natural climate is always changing, however, activities such as burning fossil fuels are speeding up this change. As we continue to adopt increasingly sophisticated and mechanized lifestyles, we put more and more heat-trapping greenhouse gases into the atmosphere.

Climate change is an overall change in weather patterns, including temperature, precipitation and wind. The rate and intensity of climate change is not the same throughout the world. As a northern nation, Canada will experience a greater degree of warming than countries closer to the equator. According to experts, temperatures in Canada could increase an average of 5 to 10 C over the next 100 years.

Climate Change Site
www.climatechange.gc.ca

Climate change could lead to more forest fires, more severe insect infestations, loss of habitat, and changes in the distribution of species including types of trees.

For more information on climate change see our 2001 Climate Change Teaching Kit *A Breath of Fresh Air*.

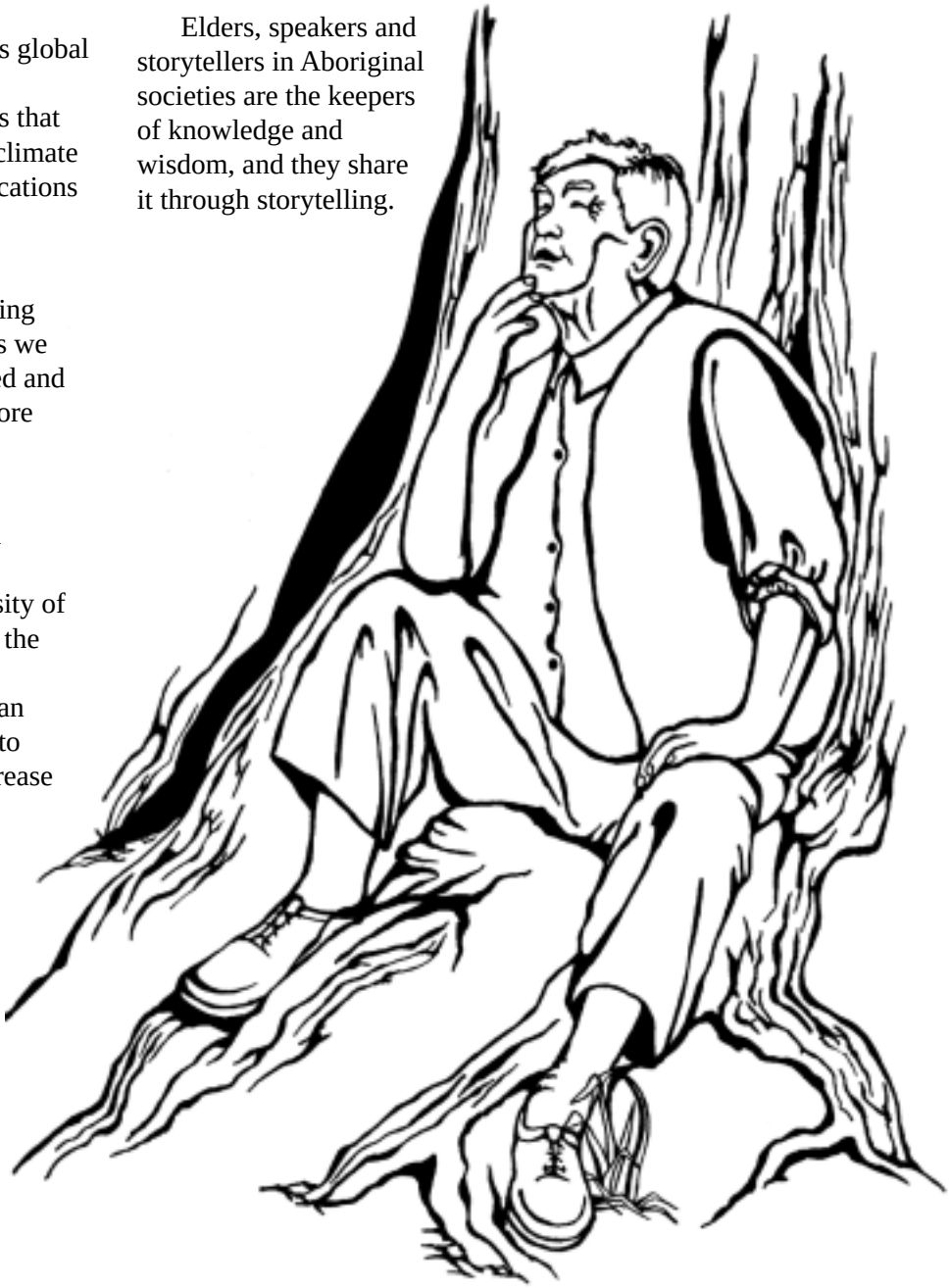
CFA Teaching Kits
www.canadianforestry.com/html/education/cfa_kits

8) Traditional and Indigenous Knowledge

When an Elder Dies, a Library Burns.

Patricia Longley Cochran, executive director of the Alaska Native Science Commission, once wrote an article entitled *When an Elder Dies, a Library Burns*. The article's title is an eloquent way to acknowledge the oral tradition of First Nations learning.

Elders, speakers and storytellers in Aboriginal societies are the keepers of knowledge and wisdom, and they share it through storytelling.



Traditional knowledge about the environment is known as traditional ecological knowledge. It can be described as a collective body of knowledge, beliefs and observations, handed down generation to generation by oral, cultural transmission. It is based upon hundreds and even thousands of years of knowledge that is transmitted by way of legends and stories. It revolves around the relationship of living species with one another and with the environment.

Traditional native cultures survived through their close symbiotic relationship with the Earth, achieving their needs through simple but effective practices and technologies. There is no reason why we cannot learn many of these practices and apply them to our own relationship with the natural world.

In fact, native appreciation for the web of life, the inter-relatedness of all things, can help as we care for the forest environment and its biodiversity. This approach is broader than the science of ecology because of its spiritual component. It teaches respect for and sharing with other animals, plants and beings.

Traditional Knowledge
www.carc.org/pubs/v20no1/science.htm

What You and Your Students Can Do to Help Biodiversity

There are many ways that Canadians can make a difference in conserving biodiversity in Canada.

The best place to start is right at home. It doesn't matter where you live. You can use the lessons in this kit to show your students the wonders of biodiversity if you are located in urban Halifax, next to the grasslands of Saskatchewan, in the heart of the boreal forest that stretches from Newfoundland and Labrador to the Yukon, or anywhere else in Canada.

Naturescape BC is a partnership program, which targets biodiversity conservation in backyards

The Evergreen Foundation and the Tree Canada Foundation both have programs designed to naturalize a schoolyard or urban area. These hands-on experiences help young people understand biodiversity basics and provide a strong motivation for larger-scale initiatives.

Other activities involve collecting scientific data for biodiversity conservation. The Nova Scotia Museum of Natural History's Frog Watch involves the public in monitoring amphibian populations during the spring and summer.

The Breeding Bird Survey, an initiative of Environment Canada, is designed to detect and measure changes in breeding bird populations.

Naturescape BC
http://wlapwww.gov.bc.ca/hctf/naturescape/about.htm

Breeding Bird Survey
www.cws-scf.ec.gc.ca/nwrc-cnrf/migb/01_1_2_e.cfm

Nova Scotia Frogwatch
www.naturewatch.ca/english/frogwatch/ns/intro.html

Greening School Grounds
www.greengrounds.org

Tree Canada Federation
www.treecanada.ca

Evergreen Foundation
www.evergreen.ca

Go For Green
www.goforgreen.ca/asrts

Destination Conservation
www.dcplanet.org

Pre-Lesson Activities

We have prepared two fun, pre-lesson activities to help your students begin their exploration of biodiversity:

- A Biodiversity Scramble (Grades 4 to 6)
- A Biodiversity Crossword (Grades 6 and 7)

The Biodiversity Scramble

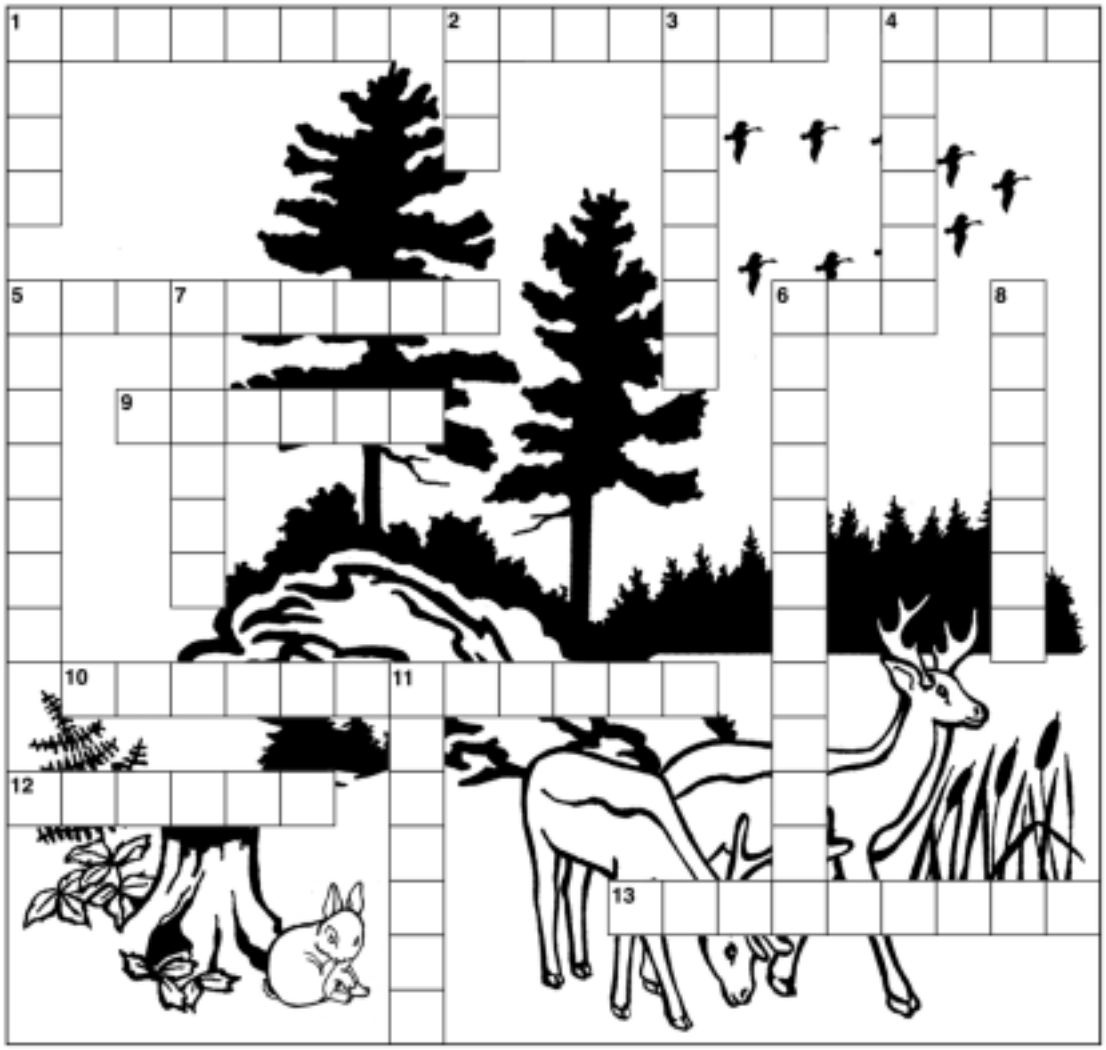
(Grades 4 to 6)

ABIATTH	
TEER	
KOA	
DETWANL	
NIPE	
DOOF HINCA	
FELA	
CHEIN	
TOOR	
RIELSUQR	
SHUOMROM	
RAPK	

Each of these words is related to biodiversity and forests. Create a story using at least six of the words. (Answers on page 39)

Biodiversity Crossword Puzzle

(Grades 6 and 7)



ACROSS

1. A snake is a type of _____.
2. The short form for the Committee on the Status of Endangered Wildlife in Canada.
4. Eaten by another species.
5. A _____ is a type of species that only eats plants.
6. The short form for the Canadian Forest Service.
9. A group of trees is also called a _____.
10. Banff or Kejimkujik are examples of a _____.
12. A deer and a raccoon are examples of this type of species.
13. A _____ is a type of species that eats meat.

DOWN

1. The swift fox is an example of a species at _____ .
2. The short form for the Canadian Forestry Association.
3. A _____ is a type of habitat that sometimes has cat tails, water, reeds, etc.
4. A herbivore eats _____.
5. A _____ is a place where a species lives.
6. The Canadian Forestry Association is an example of a _____ and environmental education organization.
7. ___ is another word for “living” species.
8. The passenger pigeon is an example of an _____ species.
11. Non-living things.

(Answers on page 39)

It's What's Inside That Counts

Lesson 1

Summary

This lesson provides a general introduction to the concepts of biodiversity. Students will conduct an outdoor experiment exploring different habitats in the school ground.

Activity Info

Level: Grade 4

Subject: Life Science, Habitats and Communities

Estimated duration: 45 to 60 minutes for activity, 20 minutes for wrap up

Materials: yarn or string cut and tied into 3 m lengths or individual hula hoops, loose leaf paper, pencils

NOTE: Depending upon the season and weather, you might consider doing the entire lesson outside.

Learning Outcomes

Students will:

- Explore the link between meeting basic needs and habitat.
- Recognize that structural and behavioural adaptations make organisms well-suited to a particular habitat, but not to another.
- Explore the dependency of organisms on their habitat as well as on the relationships within that habitat.

Teacher Background

Biodiversity is all around us. We can find it in the forests of western Alberta, in the clear Margaree River in Cape Breton, and in the high tundra of the Yukon. Each of these natural wonders holds a vast wealth of life, both plant and animal.

But we can find biodiversity right under our noses. For example, downtown Toronto, with its tall buildings, is an ideal habitat for pigeons. The presence of pigeons makes it attractive habitat for peregrine falcon.

Even looking at the cracks in a sidewalk, you may find grass springing through and lady bugs and ants living there.

In this lesson, students will explore the biodiversity of three different sites in their school ground. They will first predict what plants and animals they will find on those sites. Then they will carry out a simple field investigation.

Your students may be surprised at the complexity of life in these apparently simple places.

Procedure

Step 1

Begin an informal class discussion about habitat, asking your students questions such as:

- What is habitat?
- What makes up a habitat (food, water, shelter, space)?
- What are the differences between living and non-living things?

Have them look in the school ground for examples of living things (such as squirrels, ants, birds, grass, bushes) and non-living things (such as a flag pole, cars, a basketball hoop, pavement).

Explain that different plants and animals live in different environments and have different habitat requirements. Ask your students to compare the habitat of a few plants (hint: some plants may need shade while others need sunlight) or animals they might find in the school ground.

Step 2

Introduce the concept of biodiversity by asking your students where they would expect to find the greatest variety of life in

their school ground. Biodiversity is simply that variety of plants and animals.

Step 3

Divide the class into groups of three or four students and let them know that they will become Diversity Investigators for their school ground. Explain that they will be investigating three different areas or habitats around the school for evidence of a variety of plants and animals (biodiversity). The students can take on roles such as Chief Investigator, Chief Recorder, Chief Reporter and Field Investigators.

Step 4

With your students, select three habitat sites in the school ground that they will investigate (such as asphalt, soccer field, forest, garden). They will be recording their habitat observations on their Diversity Investigator Evidence Log.

Step 5

Have each Investigation Team make up an Evidence Log (using the example provided). Ask students to think about the three sites chosen and predict what they will find on each. Have them record their predictions on their Evidence Log.

Step 6

Explain how the outdoor part of the activity will work. Each team will visit each habitat site, place their string on the ground defining the area of the study, and then write down everything they find inside that area.

Step 7

Hand out a piece of string to each team. Take the teams outside and assign them their first habitat site. Rotate the teams through each of the three locations, spending approximately five minutes at each habitat site recording their observations.

Step 8

When the students have completed their investigations, bring the class together and have the Reporters share their group's investigation observations. You may wish to record the results on a flip chart or on the board.

Diversity Investigator Evidence Log

	Site 1	Site 2	Site 3
Predictions			
Non-Living			
Living			
Observations			
Non-Living			
Living			

Step 9

Discuss the students' key discoveries by asking such questions as:

- What did you find at each habitat site?
- Were your predictions the same as what you actually found and saw?
- Where did you find the greatest biodiversity?
- Was there more life on the asphalt or on the lawn?
- How could the class increase the variety of life in the school grounds?

- Biodiversity is critical to the survival of the planet. Ask the students to give suggestions for increasing biodiversity in their school ground (for example planting native plants, or building bird feeders). If you are interested in taking this activity further you might refer to the Green Teacher Magazine 2001 Fall/ Winter publication for an article on school yard trees. *Greening School Grounds – Creating Habitats for Learning*, is a compendium of school yard greening articles and activities also available from Green Teacher.

Extension

- Journal writing is an important component of the curriculum. Have the students use creative writing skills to write a poem or story about one of the three habitats they observed. They can describe what may have been there 100 years ago, what is there now and what might be there 100 years from now.

Too Hot... Too Cold... Just Right!

Lesson 2

Summary

This lesson focuses on climate change and the effects that it may have on different species of plants and animals and on biodiversity. Students will participate in an activity where they will add clothing to illustrate how climate change may impact habitats and species adaptations.

Activity Info

Level: Grade 4

Subject: Life Science, Habitats and Communities

Estimated Duration: 45 minutes for activity, 45 minutes for follow up and extension opportunities

Materials: extra clothing such as mittens, scarves, sweaters, hats for each child in the class

Learning Outcomes

Students will:

- Recognize that structural and behavioural adaptations make organisms well-suited to a particular habitat, but not to another.
- Understand the dependency of organisms on their habitat as well as on the relationships within that habitat.
- Understand how various human behaviours and natural events have had an impact on habitats and populations, both positively and negatively.

Teacher Background

Climate change is a tremendously important issue that has the potential to affect every species of plant and animal on the planet, including humans. It may be the most significant environmental problem we face today.

Climate change has been defined as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (United Nations Framework Convention on Climate Change).

In other words, climate change is an overall change in weather patterns resulting from human activities such as burning fossil fuels.

Burning fossil fuels releases greenhouse gases into the atmosphere. These gases, such as carbon dioxide (CO_2), methane and nitrous oxide, build up in the atmosphere capturing heat and warming the air, which leads to rising temperatures and climate change.

It is important to remember that some level of change in climate is natural and has been experienced many times over the life of our planet. The problem today is that the climate appears to be changing dramatically, very quickly and on a large scale.

Changes in regional climate patterns may have positive and negative effects on important ecosystems and resources. Several sectors of the Canadian economy are based on the natural resources that have the potential to be affected by climate change. Consider some of these potential impacts:

- **Longer growing seasons** allow productive agriculture to move further north. At the same time, there will be risks to agriculture such as drought, pests, disease and fires.
- **Changes in water levels** in our lakes may threaten valuable shoreline and wetland habitats and have an impact on shipping, fisheries and shoreline property values.
- **Changes in temperature and precipitation** may increase in insect-borne diseases such as Lyme disease and malaria.
- **Changes in water cycle patterns** could threaten wetland areas that are important habitat for migrating birds and other species.

Procedure

Step 1

Introduce the concept of climate change to your students. Explain that weather is the day to day change of temperature, snowfall and rainfall that takes place in a particular location. Climate is the average weather that occurs in a given place over a long period of time.

Explain that burning fossil fuels (such as the gas and oil we use to power our vehicles) creates greenhouse gases, which in turn raise the Earth's temperature.

Step 2

Divide your classroom into three areas and assign each area a biome representing different climates. The northern biome represents the Arctic where it is cold all year around. The central biome represents mid-latitude regions with four distinct seasons. The southern biome represents a tropical climate with lots of warm weather and seasonal dry and rainy periods.

Clearly define the boundaries of your areas (suggested size 10 m by 10 m).

Step 3

Begin a discussion with your students to describe each biome, asking:

- What is the climate there?
- What animals live there and what are their characteristics (do they have fur)?
- What plants live there and what are their characteristics?

Put the answers on the board so the students can see what kind of animals and plants live there.

Step 4

Select one student to be a Driver. This student will represent the cars that burn fossil fuels, releasing greenhouse gases into the atmosphere, causing the temperature to rise. While the rest of the students move to Step 5, the Driver can create his/her character (possibly develop a costume or sign signifying their role).

Step 5

Divide the students into three working groups. Assign each group to a biome.

Ask each student in each group to select a species (animal or plant) to represent in their biome. Ask them to think about and record their habitat needs (food water, shelter and space).

NOTE: Ensure that at least two students in each group assume the role of a plant in their biome.

Step 6

When everyone is ready, ask the students who represent animals to move around their own biome, pretending to gather their food and water. Those students who are plants can remain still.

Step 7

Ask the students how they are feeling right now. Are they feeling comfortable, full, happy or just right?

Step 8

Ask the Driver to drive through the classroom. Then explain to the students that due to human activity, we have raised the level of greenhouse gasses in the atmosphere, causing the temperature to increase. Have the students put on a jacket or sweatshirt.

Step 9

Ask the students in all three groups to move around for another two minutes. Then have the Driver pass through the three biomes again. Ask each group how they are feeling. Is everyone beginning to feel a little warm, or even hot? How do they think this affects their species? The answers you want to help your students find are that some animals will

migrate to cooler regions, while others will adapt to their new climate. Still others will not be able to adapt and will die. Most plants will likely die.

Step 10

Have the students add one more layer of clothing and move around a final time. Then ask how they are feeling. You can anticipate that they are starting to feel quite warm!

Ask the students what happens when they begin to feel warmer and more uncomfortable in their habitat. What are they going to do – migrate, adapt or die? If they decide they will migrate to a cooler biome, some questions you can ask them might be:

- Will they be cooler?
- Will they be more comfortable?
- Do they think they may become overcrowded?
- Do they believe there will be enough food, water, shelter and space for all inhabitants including the new ones?
- What do they think is happening in their old biome?

Step 11

Ask the students to write a short story on one of the following topics:

- Explain what kind of species you were. What it was like to be in a zone when it was just right? How did you feel as the temperature increased? What did you do, and what were the consequences that you had to face?
- What would happen to the southern biome as the temperature increases? What happens to the plants that cannot migrate. What about those animals that need colder environments to survive?
- What happens in the northern and central biomes as new species migrate in? Is there enough habitat for all the new plants and animals?

Extension

- Have your students complete the activity as if they were all plants. What would happen to the vegetation in each climate biome? Ask them to describe how the plants could adapt over time to deal with increased temperatures and reduced water availability.
- Ask your students to make a list of some potential positive effects of climate change. They can think about those effects by taking on a role of a particular animal, plant, farmers, tourist operators or a specific category of people who might be impacted by a long term temperature change.

What Our Elders Say...

Lesson 3

Summary

This lesson links the traditional ecological knowledge of Aboriginal peoples with the study of biodiversity, incorporating environmental learning and drama through a traditional Iroquoian legend.

Activity Info


Level: Grade 4

Subject: Life Science, Habitats and Communities, Drama, Language Arts

Estimated Duration: 45 to 60 minutes for story and discussion, 90 minutes for rehearsal and performance

Materials: paper, cardboard, markers, poster paints

Learning Outcomes

Students will:

- Explore the link between meeting basic needs and habitat.
- Explore the dependency of organisms on their habitat as well as on the relationships within that habitat.
- Describe adaptations of plants and animals that demonstrate a response of living things to their environment.

Teacher Background

The traditional teachings and oral history of Aboriginal peoples in Canada include many stories that can be used to teach people about biodiversity, ecology and symbiotic relationships (how species rely upon one another). In fact, for thousands of years, Native people have taught their children and their communities many of life's basic survival skills and lessons learned through observing and living with nature. Their traditional way of life involves a very close relationship with the natural environment which gives them an intimate understanding of biodiversity, ecology and symbiotic relationships between species.

Native people often use natural metaphors to teach human lessons. For example, turtles teach people to slow down so they can see everything along life's path. Running like a rabbit through life means missing many important gifts and opportunities along the way. The otter teaches people to be playful and to find humour and fun in all of life's challenges. The wolf teaches about family, loyalty and working together. The birch tree teaches humbleness and beauty while the oak tree shows inner strength.

Native people understand how plant and animal species depend on each other (symbiosis). They have learned how predator and prey relationships keep populations in balance. For example, when the groundhog populations increase, so does the coyote's. But when the groundhog numbers decrease, there is less food for the coyote, so their numbers decrease as well.

They understand that some tree species, such as jack pine and lodgepole pine, are the trees that grow in after a forest fire (the cones of these pine trees need the heat from a fire to release seeds from their cones).

Many of these traditional teachings were passed down through the generations in stories and legends. One such story is *The Legend of the Sky Sisters.*

Procedure

Step 1

Read *The Legend of the Sky Sisters* to your class. If possible, have the students sit on the floor in a circle to encourage sharing of their ideas after the story is complete.

Step 2

Ask students what they believe is the lesson shared in the story. Students will most likely explain that the three plants need each other

to survive. Explore notions and concepts, such as:

- **Symbiosis** – each plant needs the other to provide something that they need. Are there other plants or animals that might depend on these three species?
- **Habitat and Niche** – each plant has similar habitat requirements but there are a few simple differences. What are the similar and different requirements (soil, climate, etc.) for corn, bean and squash?
- **Interdependence** – each plant can survive, but they are inextricably linked to one another. What happens if one of the plants disappears? How does it affect the other plants? Does it affect the community?

Step 3

Explain to the students that they will be putting on a five-minute skit of the story. Write a list of all the roles on the board. Consider the following: The three Sky Sisters, one person to plant seeds, village people, a director and perhaps a narrator.

Step 4

Lead a discussion about the parts of the play. Have the students describe what they will need to do to act out the play:

- **Introduction** – village people starving, arguing, stealing food
- **Sky Sisters Arrive** – each is planted, each depends upon the other
- **Village is Happy** – what is the lesson learned?

Step 5

Divide the students into groups so that there are five to seven students per group. The Director will make the decisions about what will be acted out and will make sure that the environmental lesson is clearly described to the audience.

Step 6

Ask the students to consider what kinds of props they will need to create or build for their play. Provide each group with paper, cardboard, markers, tape and poster paint, along with any other simple prop making materials.

Step 7

Have each group perform their version of the play. It is important that each of their presentations incorporate an environmental message to illustrate their understanding of the story.

Extensions

- Go for a nature hike. Ask students to find an environmental lesson that could be described in a story like *The Legend of the Sky Sisters.* Have the students write their own legend.
- Have students create other stories to explain ecological concepts. Consider the following:
  - **Habitat:** Explain why each species has its own specific habitat requirements.
  - **Biodiversity:** Why is it so important?
  - **Species at Risk:** Explain how or why some plants or animals may be at risk.
- A number of Canadian Model Forests integrate Aboriginal peoples' knowledge and perspectives into forest management planning. Have your students visit several Model Forest Web sites and describe the different ways that traditional knowledge is being used.

Model Forest Network
www.modelforest.net.

Refer to these books for more traditional stories:

Caduto, Michael J. *Keepers of the Animals,* Fulcrum Publishing; Colorado, 1991. (ISBN 0920029881)

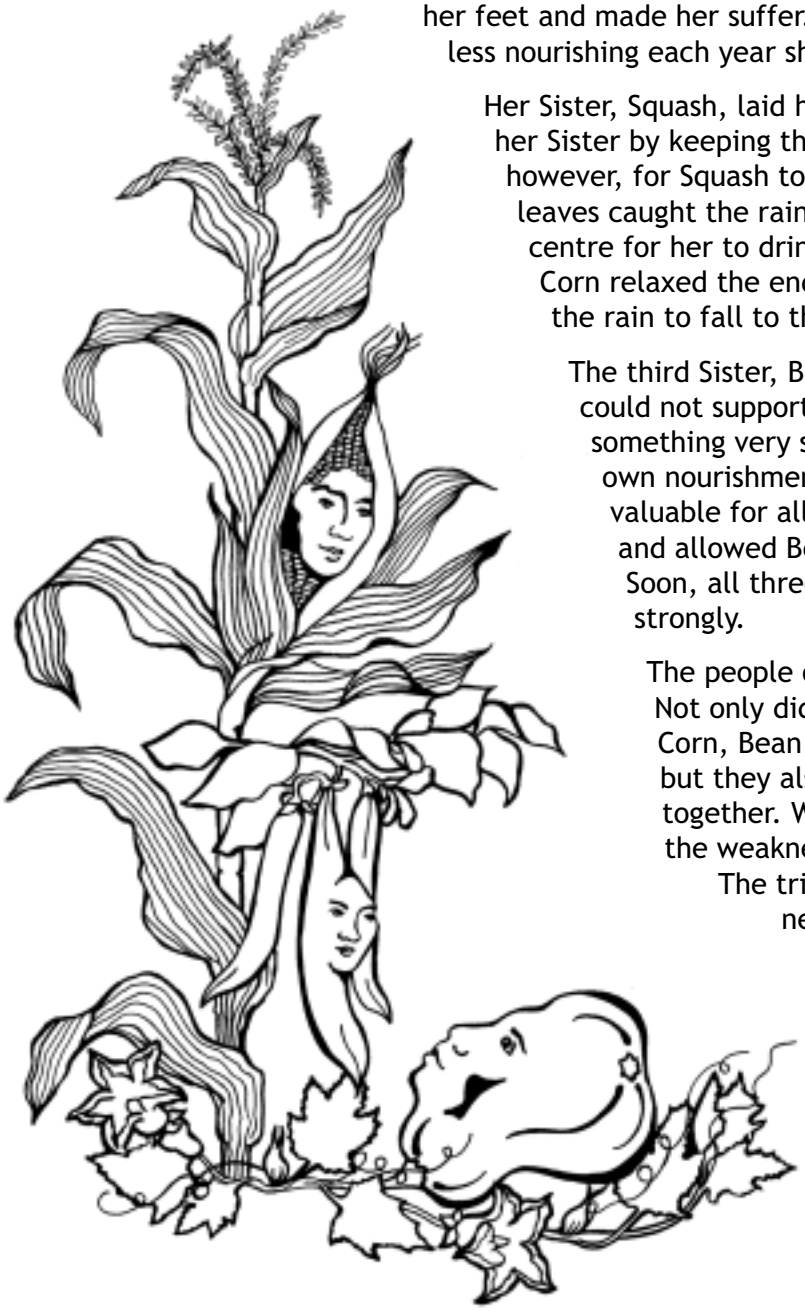
Caduto, Michael J. *Keepers of Life,* Fifth House Publishers; Saskatoon, 1994. (ISBN 1895618487)

The Legend of the Sky Sisters

A Traditional Iroquoian Legend

Many moons ago, the Native people of this land were starving. The reason was not only lack of food but also because they could not work together for the little food that was available. Brothers would argue and steal from one another in order to provide for their own families. They would cheat, ignore one another's pain and refuse to help in times of danger.

Three Sky Sisters came down to live with the tribe. The first Sister's name was Corn. She stood tall and straight in the fields around the village, but the hot sun dried her feet and made her suffer. In addition to that, the earth grew less nourishing each year she stood there.



Her Sister, Squash, laid herself at Corn's feet and protected her Sister by keeping the soil cool and moist. It was difficult, however, for Squash to receive any moisture. Corn's straight leaves caught the rain and funnelled the rainfall to the centre for her to drink. In order to help her Sister Squash, Corn relaxed the ends of her leaves to allow a portion of the rain to fall to the ground.

The third Sister, Bean, was so weak and thin that she could not support herself, at all. She could do something very special, however. She could make her own nourishment in the soil, and this food became valuable for all three of the Sisters. Corn stood tall and allowed Bean to grow up towards the sun. Soon, all three of the Sisters were growing strongly.

The people of the village saw that it was good. Not only did they have plenty of food because Corn, Bean and Squash were growing so strongly, but they also saw what it meant to work together. When each Sister helped the others, the weakness of each was no longer important. The tribe recognized that this was a necessary lesson for their people.

To this day, the Native people of this land place the seeds of the corn, squash and bean together in the same soil, remembering the lesson that the Sky Sisters brought to the earth.

Barriers to Biodiversity

Lesson 4

Summary

This lesson focuses on habitat loss and habitat fragmentation. Students will predict the impacts on a particular species and its habitat as a result of some form of human influence.

Activity Info

Level: Grades 6 and 7

Subject: Life Science, Diversity of Life, Interactions Within Ecosystems

Estimated Duration: 30 minutes discussion, 30 minutes small group work, 50 minutes presentations, 10 minutes wrap-up

Materials: paper and pencils or pens

Learning Outcomes

Students will:

- Understand the interactions in an ecosystem and identify human factors that affect the balance among the components of an ecosystem focusing on one species.
- Understand ways in which natural communities within ecosystems can change, and explain how such changes can affect animal and plant populations.
- Demonstrate an understanding of the effects of human activities and technological innovations.

Teacher Background

All species have their own requirements for survival (food, water, space and shelter). Areas that provide these requirements are called habitat.

Engage your students in a discussion about their habitat. What is it? Where is it? No doubt it includes the grocery store where they buy their favourite food and drink, their homes, and enough space to live.

The thing that makes human habitat different from animal habitat is that we don't go out into the environment to find our habitat. We change the environment by building our habitat on a very large scale. Our cities, our schools, our highways and our shopping malls, are all human habitat that has been built in places that were once forests, and wetlands and prairies. When we build our habitat, we take habitat away from the plants and animals living there. This is habitat loss.

Habitat fragmentation, also caused by human activities, involves the breaking of natural habitat into small, disconnected pieces. We fragment habitat when we build a highway through a wetland, or install a pipeline across the tundra, or run an electric power line through a forest. Although the entire habitat has not been lost, we have drawn a line through it that can create problems for some species. Animals that get hit by cars on our highways are only trying to get from one part of their fragmented habitat to another.

Some examples of activities causing habitat loss or fragmentation are:

- Housing developments and urbanization have increased urban sprawl in many areas across Canada. This development continues to consume important habitat and natural areas at a tremendous rate.
- Roads, pipelines and electrical power lines open up previously difficult-to-access areas. Pipeline development has had an impact on caribou migration.
- The conversion of prairie and forest areas to intensive agriculture removes nesting cover and habitat for many prairie bird species.
- Tree harvesting and regeneration can change the pattern of habitat distribution on a landscape.
- Aggregate extraction (gravel pits) changes the landscape and can permanently alter the habitat of a wide variety of plant and animal species.

- New golf courses and other large recreational developments can cause habitat loss and fragmentation. Excavating equipment changes the shape of the original landscape, removing all of the natural plant species, perhaps leaving a few trees. Pesticides and herbicides are often used to eliminate undesirable plants and bugs. The heavy watering of fairways can alter the local water table.

Procedure

Step 1

As a class, review ecosystems and the essential components of habitat (food, water, shelter, space).

You may want to explain ecosystems this way: An ecosystem, such as a wetland, provides habitat for many different species. For example you will see red-winged black birds on the tops of cattails in a wetland. Look down and you may see a turtle in the weeds, in the water, or basking on a rock in the sun.

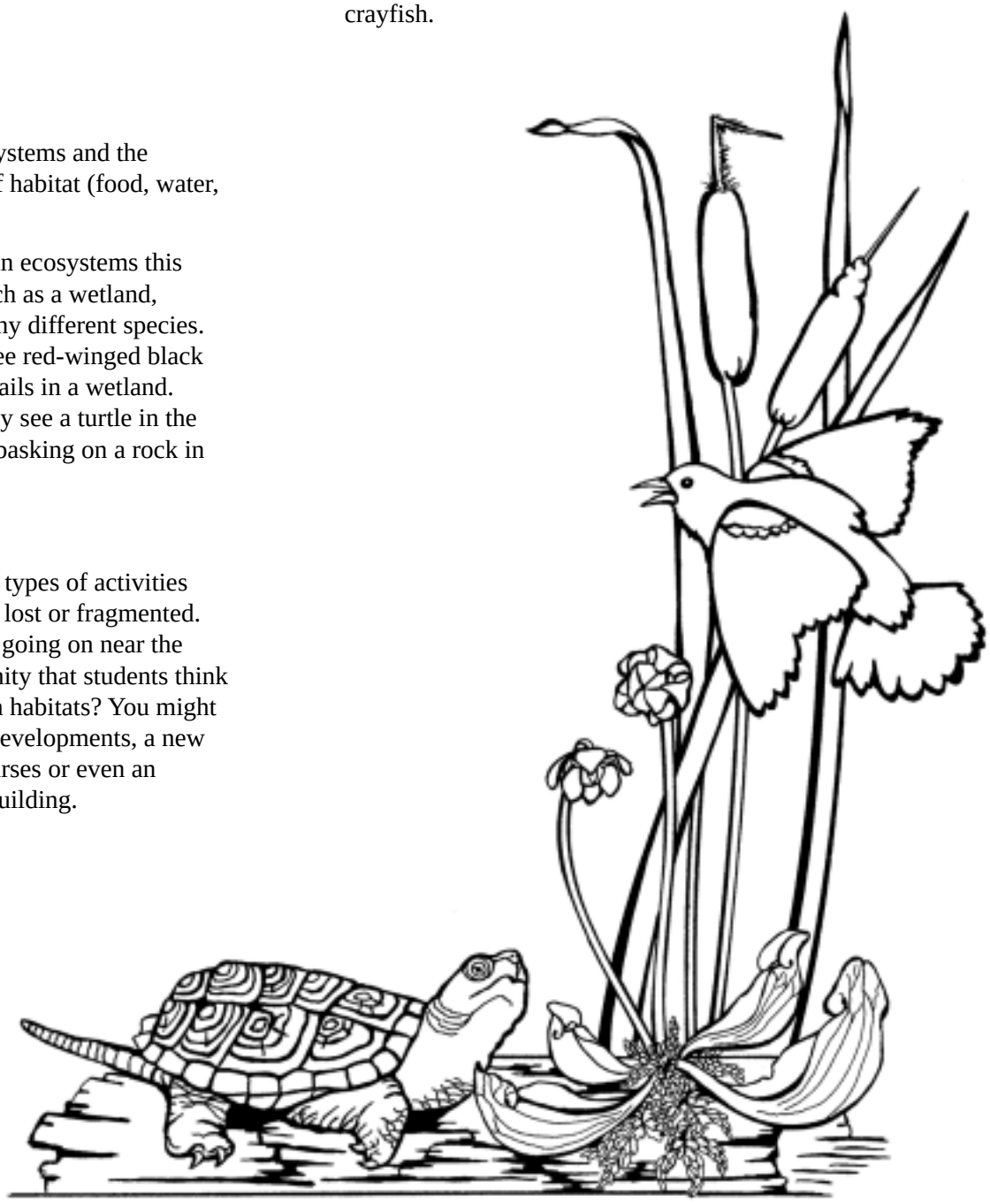
Step 2

Ask your students what types of activities may cause habitat to be lost or fragmented. Are there any activities going on near the school or local community that students think are having an impact on habitats? You might consider new housing developments, a new gravel pit, new golf courses or even an addition to the school building.

Step 3

Select one of the above examples and have a brief discussion with your class about potential environmental impacts. For example, some of the habitat changes resulting from housing developments in a wetland ecosystem:

- Loss of wetland tree species (affecting the habitat for song birds and small mammals).
- Dredging and filling wetlands removes habitat for cattails (and therefore red-winged blackbirds and turtles).
- Loss of water removes habitat for aquatic species such as salamander, tadpoles and crayfish.



Step 4

Create a chart on the board with three categories:

What If?	Ecosystem	Species

Begin by asking students to think of potential habitat-damaging activities in any ecosystem. List their suggestions in the what-if column. Some examples might be the construction of a pipeline, shopping mall, golf course or new highway.

Step 5

Continue by having the students provide suggestions for different ecosystems in the *Ecosystem* column. Examples might include a wetland, hardwood forest, prairie, tundra or field.

Step 6

Complete the chart by asking the students to suggest several plants and animals that might inhabit their ecosystem examples. Some examples include a duck, tree, raccoon or salamander.

Step 7

Divide the class into four or five working groups. Ask each group to choose one item from each category. Check them off as they are selected so there is no duplication.

Step 8

In their small groups, ask the students to discuss the ecosystem and habitat needs of the species they have selected. Ask them to prepare the story of what happens to their plant or animal if the what-if actually happens. They can prepare their story using rough note outlines. Then they will prepare a presentation of that story to share with the rest of the class. They can present a skit, a poster, a public service announcement, a slide show on the computer, or any other creative presentation technique they decide.

Step 9

Have each group then present the results of their small group discussions and deliver their presentation.

Extension

- Propose and defend a course of action students could take to protect the local habitat of the species they selected or another species of their choice.
- Ask your students to research a local issue (such as a new highway bypass) and prepare a formal letter to local council giving their perspectives on whether or not the planned activity should take place.

Off Limits

Lesson 5

Summary

This lesson focuses on the role of protected areas in helping maintain biodiversity. Students will explore the social, economic and environmental impacts of protected areas by researching and preparing a newsletter about a locally protected area.

Activity Info

Level: Grades 6 and 7

Subject: Life Sciences, Diversity of Life, Interactions within Ecosystems, Geography, Natural Resources, Computer Science

Estimated Duration: 20 to 40 minutes discussion and planning, 90 to 100 minutes newsletter development and writing

Materials: paper, pencils, pens, markers

Learning Outcomes

Students will:

- Identify and explain economic, environmental and social factors that should be considered in the management and preservation of habitats.
- Describe the potential impact of use by humans of regional natural resources.
- Demonstrate how human activities affect people and the environment.

Teacher Background

Protected areas are landscapes in which human activities are carefully managed and certain activities that harm ecological processes are heavily controlled or completely prohibited.

The conservation of biodiversity is a key management objective in these protected areas. By protecting a part of the landscape from potentially harmful human activities, we are protecting the integrity of ecosystems and helping maintain biodiversity.

The International Union for the Conservation of Nature (IUCN) defines a protected area as: *an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.*

There are numerous types of protected areas across Canada such as parks, wildlife reserves or conservation areas. Environment Canada's State of the Environment Report includes protected area definitions such as:

- **Nature Reserves** (protected for scientific reasons). An area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species. It is protected for scientific research and/or environmental monitoring.
- **Wilderness Area** (for wilderness protection). A large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
- **National Park** (ecosystem protection and recreation). A natural area of land and/or sea, designated to protect the ecological integrity of one or more ecosystems for present and future generations; to provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
- **Habitat/Species Management Area** (for conservation through management intervention). An area of land and/or sea subject to active resource management to ensure the maintenance of habitats and/or to meet the requirements of specific species.

- **Protected Landscape/Seascape** (for landscape/seascape conservation and recreation). An area of land, with coast and sea, where the interaction of people and nature over time has produced an area with significant aesthetic, ecological and/or cultural value, and often with high biological diversity.
- **Managed Resource Protected Area** (for the sustainable use of natural ecosystems). An area containing natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing a sustainable flow of natural products and services to meet community needs.

Non-government organizations and individuals also have an important role to play in protecting ecosystems. Organizations such as Ducks Unlimited, the World Wildlife Fund and numerous naturalist clubs and other environmental groups have various fund raising and educational activities with the goal of protecting significant landscapes and protected biodiversity. For example, Oak Hammock is a large wetland in Manitoba protected and maintained by Ducks Unlimited for waterfowl conservation.

Oak Hammock
www.ducks.ca/ohmic/

Motorized vehicles are allowed in some national parks, but are banned in others. Some protected areas may permit less-intensive activities such as bird watching or hiking, but ban mountain biking.

This activity introduces you to a variety of protected areas in Canada and their different levels of protection and management objectives. There are numerous activities that may be permitted in protected areas.

Procedure

Step 1

Ask your students what they know about protected areas (record their responses on the board). You might consider some of the following questions:

- What do protected areas protect (biodiversity, habitat, mammals, reptiles, trees)?
- Do protected areas have social, economic and environmental impacts or value?
- What are some different types of protected areas (conservation area, provincial park)?
- What are some activities that you do in a protected area?

Step 2

As a class, choose either a national park or a locally protected area (something that your students will be familiar with). Discuss the plants, animals, landscapes, water, etc. You might consider some of the following questions:

- Why is the area protected?
- Is the area used for tourism and/or recreation?
- Are there any endangered species?
- What makes it special?
- How many people are employed there?
- What activities take place, or are permitted?
- Is the local economy dependant upon it?

Step 3

Explain to the class that they will creating a newsletter about the local protected area. Tell them that their primary audience will be for their school and their parents.

Step 4

Challenge your students to come up with some possible topics for articles and other content for the newsletter. Create a list on the board. Here are some possibilities:

- Why are protected areas important?
- What do we protect?
- Who uses protected area, and what types of activities are they involved in?
- Hard (mountain biking) vs. soft (bird watching) uses.
- How can a protected area be damaged?
- What can we as individuals do to care for protected areas?
- An editorial about restricting access to a protected area?
- Activity (word search, word jumble, maze).
- Drawings or cartoons.
- Graphics (you might suggest digital photos of the protected area). Some might be available on the Internet.
- List of informative Web sites.

Step 5

Once you have a list, begin assigning tasks. You may have two students per task. In addition, you will need two students to work on layout and design. You should take on the role of newsletter editor in chief, but you may have associate editors.

Step 6

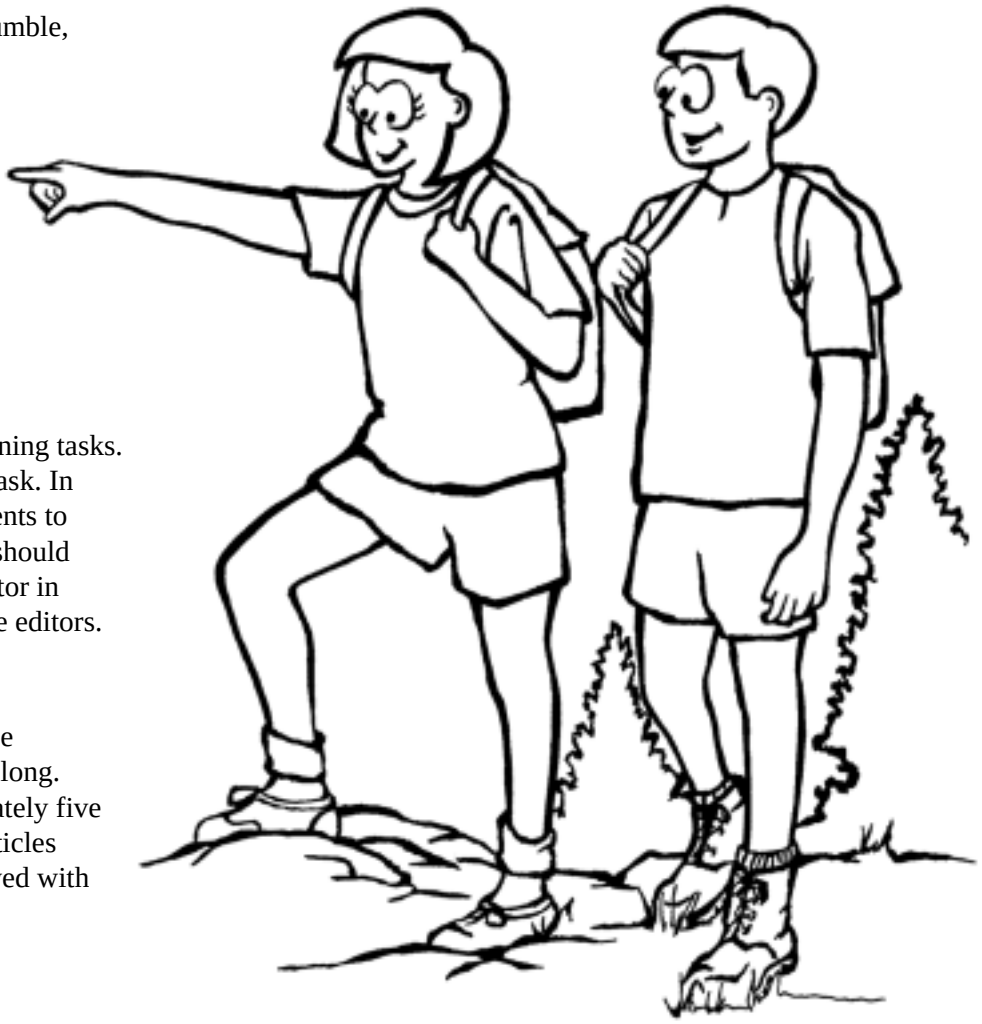
Explain that the newsletter will be approximately two to four pages long. Each article should be approximately five to seven paragraphs long. The articles and other content must be reviewed with the editor prior to layout.

Extensions

- Prepare a public service announcement (PSA) using one of the articles/messages from the newsletter
- Model Forests in Canada do research about habitat, wildlife management and biodiversity. Similar to protected areas, they permitted certain activities. Ask your students to visit the Model Forest Web site and find an example of human activity on a Model Forest (hint: the Foothills Model Forest in Alberta has looked at providing camping opportunities).

  Model Forest Network
  www.modelforest.net

- Submit your newsletter to the protected area.



To Be or Not to Be?

Lesson 6

Summary

This lesson explores species at risk in Canada. Students will discuss the different designations for species at risk and create a game using species at risk as the main theme.

Activity Info

Level: Grades 6 and 7

Subject: Diversity of Life, Interactions within Ecosystems

Estimated Duration: 30 minutes discussion, 30 minutes group planning, 60 minutes prepare game

Materials: pencils, paper, markers

Learning Outcomes

Students will:

- Describe the potential impact of the use by humans of regional natural resources.
- Identify populations of organisms within an ecosystem and the factors that contribute to their survival in that ecosystem.
- Use appropriate vocabulary including correct science and technology terminology to communicate ideas, procedures and results, in the form of a game.

Teacher Background

Can you believe it? Almost all of the species that have ever lived on Earth are now extinct. Think of the dinosaurs and many of the other animal and plant species that existed long ago. They have all become extinct through natural processes.

In Canada, as of 2000, 173 species, subspecies, or populations of wild plants and animals were listed as threatened or endangered, and 153 were considered of special concern. The number of species at risk in Canada is updated regularly and continues to climb.

Humans, with our need for cities, highways and farmland, and our insensitivity to the needs of other species, are a major factor in the risk of extinction today. But we also have the power to lower that risk or even eliminate it by changing the way we do things.

Some of the things that can put a species at risk include:

- habitat change or modification
- over exploitation of resources
- unregulated or poorly regulated commercial harvest
- disruption of migration routes and breeding behaviours
- contamination of habitat
- introduction of exotic species

There are five designations for species at risk:

Extinct
A species that no longer exists anywhere on the planet (such as the passenger pigeon and the Labrador duck).

Extirpated
A species that no longer exists in one area, but occurs elsewhere (such as the grizzly bear in the Prairies, the grey whale in the Atlantic, and the pygmy short-horned lizard in British Columbia).

Endangered
Species that are facing imminent extinction or extirpation (such as the drooping trillium, the leatherback turtle, the mudpuppy mussel, and the whooping crane).

Threatened
Species that are likely to become endangered in Canada if limiting factors are not reversed (such as the barn owl, the dense blazing star plant, the eastern massasauga rattlesnake, the killer whale, and the water-pennywort plant).

Special Concern (formerly Vulnerable)
Species that have characteristics making them particularly sensitive to human activities or natural events (such as the Atlantic cod, the beluga whale, buffalograss, and the eastern prairie fringed orchid).

Procedure

Step 1

Begin by writing *Species at Risk* on the board. Introduce and explain the five designations: extinct, extirpated, endangered, threatened and special concern. Ask the class if they understand the differences between them. Can they can give examples of any species at risk (plant, animal, bird, reptile)? Do they know of any local, regional or provincial species at risk?

Step 2

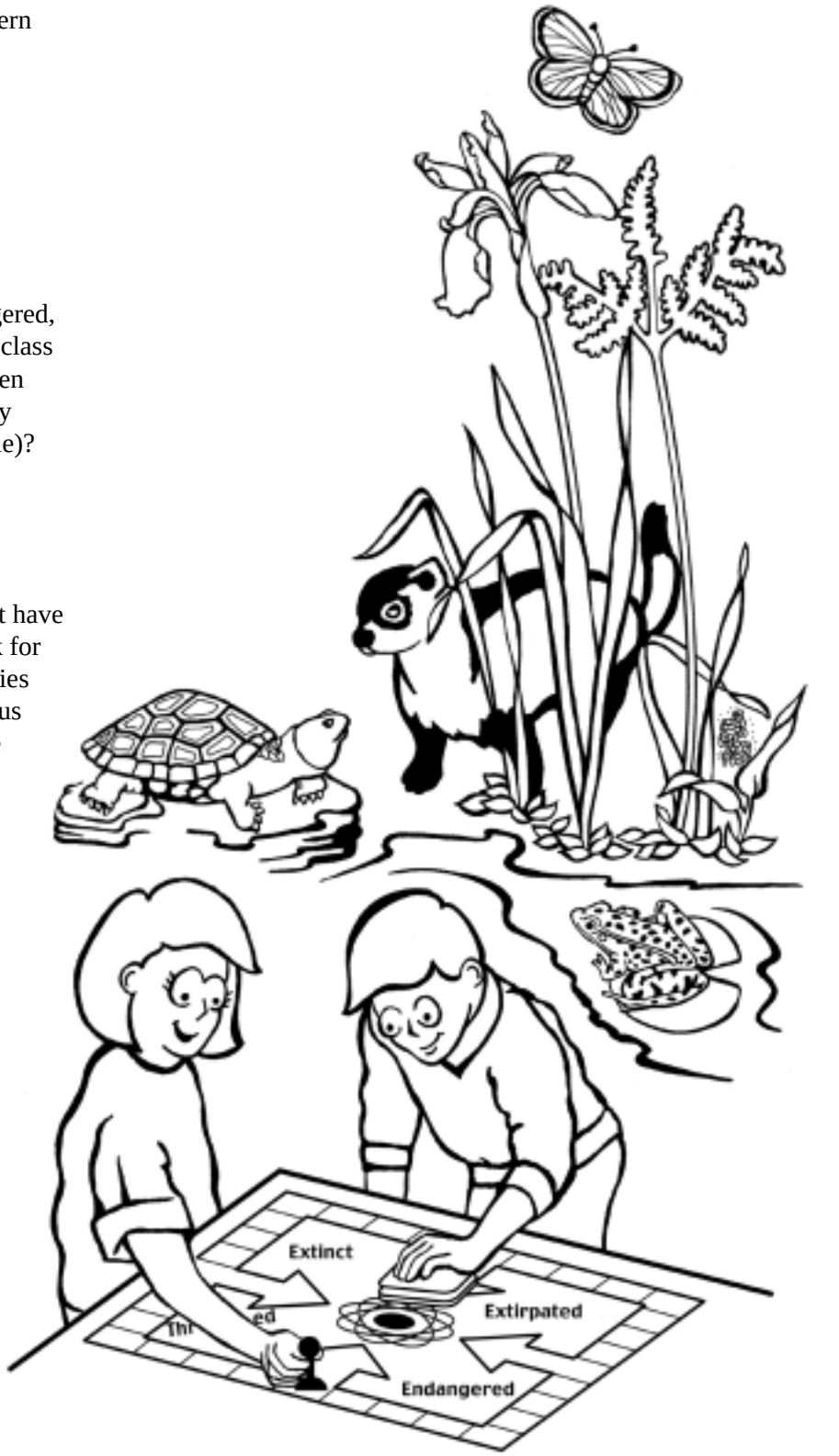
Ask your students what they think might have put these species at risk. Help them look for things that might be common to all species at risk. Encourage them to discuss various human impacts. Consider things like the illegal harvest of animals, exotic pet trade, land development, and other activities where people either damage the habitat or threaten the survival of the species in some way.

Step 3

Move to a discussion about different types of board games. Ask your class questions such as:

- What are some different kinds of games that they like to play? (Monopoly, Trivia games, Snakes & Ladders, Clue)
- What do they like or dislike about various kinds of games?

Discuss the different parts of a board game – dice, question/answer cards, markers, etc.



Step 4

Explain that they will be creating a game based on species at risk. Their design could be a board game, or an activity like Red Light, Green Light. Encourage creative thinking and problem solving to help them include as many concepts and variables as possible.

Step 5

Divide the class into four or five working groups.

Step 6

Explain to the class that their game must consider some of the following:

- It should have a start and a finish.
- It should include different types of habitats (for example a forest, wetland or field).
- It could include Pause and Reflect squares where people do some action that may impact negatively or positively on a species at risk (for example you littered, move back three spaces or, you tried to save a wetland, move forward four spaces).
- Explore various concepts associated with species at risk, such as what causes the risk and the different levels of risk. This could be incorporated into a Question and Answer card or a consequence square on the board (for example your level of risk has been increased from threatened to endangered, move back four spaces).
- Incorporate various human causes of species at risk:
  - Road construction
  - Housing development
  - Introduction of exotic species
- Include at least four questions and answers, created by each student in the group.
- The game should not take more than half an hour to play.
- It should have a creative name.
- It must have rules or instructions.

Step 7

Ask each group to prepare a brief game proposal that must be reviewed and approved by the teacher before each group initiates work on their game. The proposal should include: proposed name, brief description of game and the materials needed. This proposal can be a written proposal, or simply a conversation with the teacher.

Step 8

Once the game proposal has been approved, the group can prepare their game.

Step 9

Depending upon time constraints, ask each group to play another group's game.

Extensions

- Prepare a presentation for Grade 4 students about species at risk.
- Have each student create a brochure or television commercial promoting their game.
- Play the games with other classes or grades.

Unwelcome Guests

Lesson 7

Summary

This lesson focuses on exotic and invasive species and their presence in Canada. The activity involves developing a Futures Wheel, a tool you can use to explore the environmental, social, cultural and economic impacts of introducing an exotic pest or invasive species.

Note: A Futures Wheel is a graphic description of the interrelationships and impacts of a single decision or event.

Activity Info

Level: Grade 7

Subject: Life Science, Interaction within Ecosystems, Sustainability of Ecosystems

Estimated Duration: 120 minutes

Materials: pencil, paper (for large Futures Wheel diagram)

Learning Outcomes

- Students will identify beneficial and harmful effects of a wide variety of organisms in their world.
- Students will learn to work as a member of a team in addressing problems, and apply the skills and conventions of science in communicating information and ideas and in assessing results.
- Students will evaluate relationships that affect the biodiversity and sustainability within the biosphere.

Teacher Background

Invasive species can be defined as those species that are not naturally found in an area. They have either been introduced by some means or they invaded on their own.

Canada has been invaded by many of these species over the years. Some well known examples are purple loosestrife, forest tent caterpillar, starling, zebra mussel, brown spruce long horn beetle and the Asian long horn beetle.

Purple loosestrife came to Canada over 100 years ago. It may have been carried in the wool of sheep being shipped across the sea, or perhaps an well-intentioned gardener brought this lovely purple plant to Canada.

It is the type of plant that grows prolifically in moist areas, where it chokes out the native vegetation. The end result is reduced biodiversity and a serious loss of habitat for native species.

The brown spruce long horn beetle is a recent example of an invasive species that has arrived in Canada. It has been found in Halifax, Nova Scotia, most likely imported into a nearby port in wood packing material. It is a wood-boring species that attacks dead and dying trees. The beetle was found in Point Pleasant Park in Halifax attacking living, healthy red spruce and other spruce species. There were many opinions about how to deal with the infestation, but the Canadian Food Inspection Agency decided to remove and burn the infested spruce trees to stop the pest from spreading beyond the park boundaries.

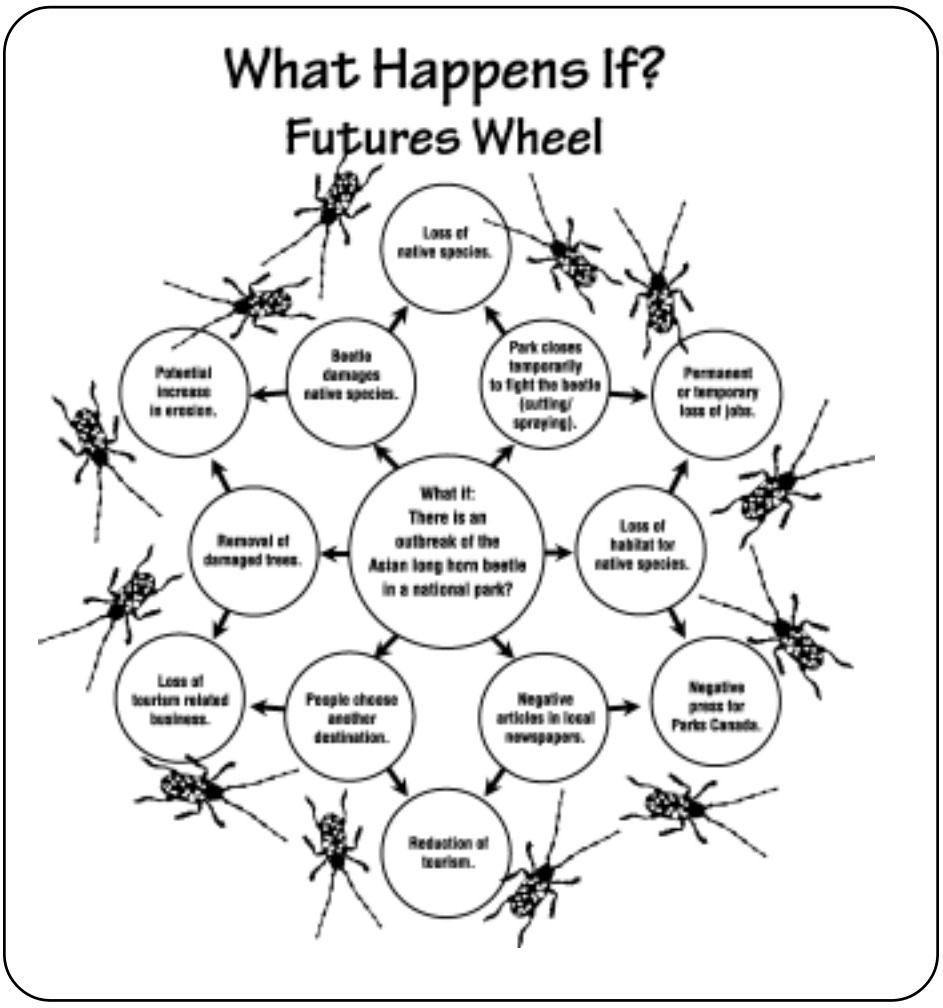
Procedure

Step 1

Discuss with your students the idea that introducing change to an ecosystem can cause unexpected results. You may be able to demonstrate this using examples of possible changes in their world (the closing of a local ice rink or the building of a large new shopping mall at the end of their street). Draw those causes and effects on a blackboard or flip chart in the form of a Futures Wheel.

Step 2

Ask your students if they are familiar with any invasive species in Canada or worldwide. Have they heard of purple loosestrife, zebra mussels and the Asian long horn beetle? Can



they explain how invasive species can damage a fragile ecosystem?

Step 3

Work with your students to develop a series of what-if questions on the impacts of the brown spruce long horn beetle. Put their questions on the board.

The following are some examples you may wish to use to get them started:

- What might happen if only the affected trees were cut?
- What might happen if no trees were cut?
- What would be some of the impacts if the beetle spread throughout the province of Nova Scotia?
- What if the beetle killed all of the trees within the park?
- What might happen if the park was permanently closed because of the beetle infestation?

Step 4

Divide the class into four working teams. Ask each team to carry out research on the brown spruce long horn beetle and create an Invasive Species File. This file must include some basic factual information they can collect from the Internet. Include the following file headings: name, preferred habitat, where it originated, length of time in Canada, and how it is being managed.

Canadian Forest Service
http://www.nrcan-rncan.gc.ca

Step 5

The Invasive Species File will also include their version of a Futures Wheel. Each working team will choose one of the what-if questions or create their own. Make sure each group addresses a different question.

Step 6

Each team must list at least four first level implications of their issue (four circles outside the initial question), and project out at least three levels of implications. Have each team create a poster sized illustration of their Futures Wheel for a presentation to the rest of the class.

Step 7

Have each team present their completed Invasive Species File and Futures Wheel to the class. The teams should be prepared to add to, question or complement those findings with their own.

Extensions

- Have your students go to the Canadian Forest Service Web site and research another Canadian unwelcome guest. You may ask them to prepare a five to 10 minute report.

Canadian Forest Service
http://www.nrcan-rncan.gc.ca

- ## National Forest Week Poster

This lesson extension allows students to work with the National Forest Week poster provided with this teaching kit. Take a few minutes with your students to review the forest pest species on the back of the poster before starting the activity.

Students can work individually or in teams of two.

Step 1

Have each student or team select a forest pest species from the poster.

Step 2

Have each student or team research their forest pest. They can start with the Canadian Forest Service Web sites that will assist them in their research.

http://www.nrcan-rncan.gc.ca

Have the students consider:

- insect's life cycle (pupae, larva, adult)
- habitat, including their preferred host(s)
- population outbreaks
- concrete evidence of its presence (defoliation, wood boring, bark damage, etc.)
- the impacts (ecological, economic, social, etc.) of population outbreaks

Step 3

Ask your students to predict what would happen to a local forest ecosystem if an outbreak of the insect occurred.

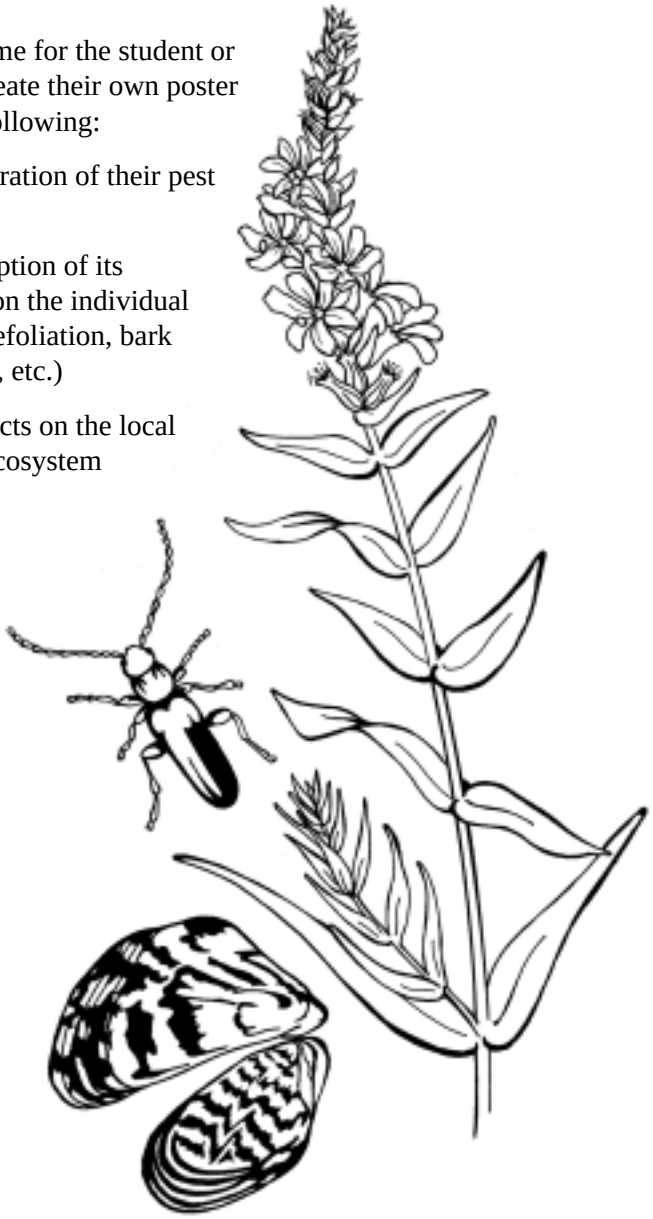
Step 4

In a presentation, have each student or team describe in detail the short and long term changes they will expect to find in the forest environment after the outbreak.

Step 5

Provide time for the student or team to create their own poster with the following:

- an illustration of their pest species
- a description of its effects on the individual trees (defoliation, bark damage, etc.)
- its impacts on the local forest ecosystem



Timberfind

Lesson 8

Summary

This lesson focuses on how biotechnology is being used in our forests today. Using a timber-theft crime story and additional information, students will complete a profile to assist them in understanding how biotechnology techniques can be used.

Through this role-play activity you and your class will see how biotechnology can be used as a tool to help maintain forest biodiversity.

Activity Info

Level: Grade 7

Subject: Life Science, Interactions with Ecosystems, Geography, Natural Resources

Estimated Duration: 30 minutes discussion, 30 minutes CSI Form and Profile, 30 minutes wrap-up

Materials: paper, pencils/pens, activity worksheets, story.

Learning Outcomes

Students will:

- Identify some positive and negative effects and intended and unintended consequences of a particular scientific or technological development.
- Describe the science underlying particular technologies designed to explore natural phenomena, extend human capabilities, or solve practical problems.
- Identify the importance of plants on the Canadian economy and describe the impact of the industrial use of plants on the environment.

Teacher Background

Biotechnology is the short form for biological technology. It involves the use of living organisms, or parts of living organisms, to provide new methods of production, make new products and to find new ways to improve our quality of life.

Scientists with the Canadian Forest Service are researching many forms of biotechnology that may have the potential to improve our forest communities. Biotechnology researchers can identify different trees that are resistant to insect pests and disease. For example scientists can identify spruce trees that have a natural resistance to the spruce weevil. Understanding this natural resistance may give us another tool in protecting forests from insect infestations.

Scientists are also using biotechnology to identify disease-stricken trees. By using a highly sensitive deoxyribonucleic acid (DNA) amplification technique, researchers can detect a single infected seedling among a thousand healthy seedlings. By removing the sick seedling, the disease is unable to spread, and the other seedlings stay healthy.

Current research in forest science focuses on improving trees through genetic engineering, protecting forests with biological pest control methods and assessing the environmental impacts of biotechnology-derived products.

Biotechnology is even being used to catch thieves. Scientists are developing a way to match the DNA in suspected stolen logs with the DNA from the stumps of illegally cut trees. Before the development of this technology foresters had to look at the physical characteristics of the logs and stumps, trying to match growth rings and tree diameter, to catch the thieves.

Western red cedar is an important species in British Columbia's coastal forest. In fact, it has been the cornerstone of the northwest coast Aboriginal culture and is British Columbia's provincial tree. Traditionally, western red cedar was used to make canoes, totem poles, clothing, mats, baskets, nets and medicine. Today it is used for outdoor furniture, house siding, decking, shingles and fencing.

Many wildlife species are dependent upon British Columbia's western red cedar forests such

as pileated woodpecker, stellar jay, bald eagle, peregrine falcon, grizzly bears, black bears, mink, fox, spotted owl, Roosevelt elk and the western mountain cougar.

Harvesting western red cedar is common in certain areas of British Columbia, but quotas are strictly enforced. The chief forester sets harvest levels by completing detailed technical reviews which consider conservation, jobs, forest growth rates and more. To help conserve important wildlife habitat and biodiversity, harvesting restrictions and no-harvest zones are designated when necessary.

Procedure

Step 1

Explain to the class that they will become Bio-Detectives, role-playing an investigation of a forestry-related crime.

Step 2

Begin by discussing with your students how they think detectives solve crimes. You can help them by asking questions such as:

- What information do detectives need to gather to investigate and solve a crime (fingerprints, footprints, tire tracks or physical evidence)?
- What tools do detectives use to help them solve these crimes (interview suspects and witnesses, look for corroborating evidence)?

Step 3

Divide the class into five Bio-Detective teams.

Step 4

Hand out copies of the *Western Red Cedar Caper,* and the Crime Scene Investigation and Victim Profile sheets.

Step 5

Ask one of your students to read the *Western Red Cedar Caper* out loud to the class. Have each Bio-Detective team work together to complete the Crime Scene Investigation sheet and answer the questions on the Victim Profile sheet.

Step 6

Once the groups have completed the Victim Profile sheets, bring the class together and review the results.

- Did everyone discover the same things?
- What was different?
- What were some of the key factors needed to solve the crime?

Step 7

Discuss with the class ways that biotechnology is improving or helping our forests and our way of life. Do they have an opinion on the usefulness of biotechnology?

Extensions

- There have been media reports about incidents of tree theft in British Columbia. Ask your students to find an example and relay their news story to their classmates.
- The Model Forests of Canada are continually doing research on harvesting techniques that attempt to do as little damage to habitat as possible (they call it sustainable forest management). Ask your students to search the Web site and complete a one page report on an interesting project being completed on a Model Forest.

Model Forest Network
www.modelforest.com

Biotechnology in Canada
hwww.nrcan-rncan.gc.ca/cfs-scf/science/biotechnology/

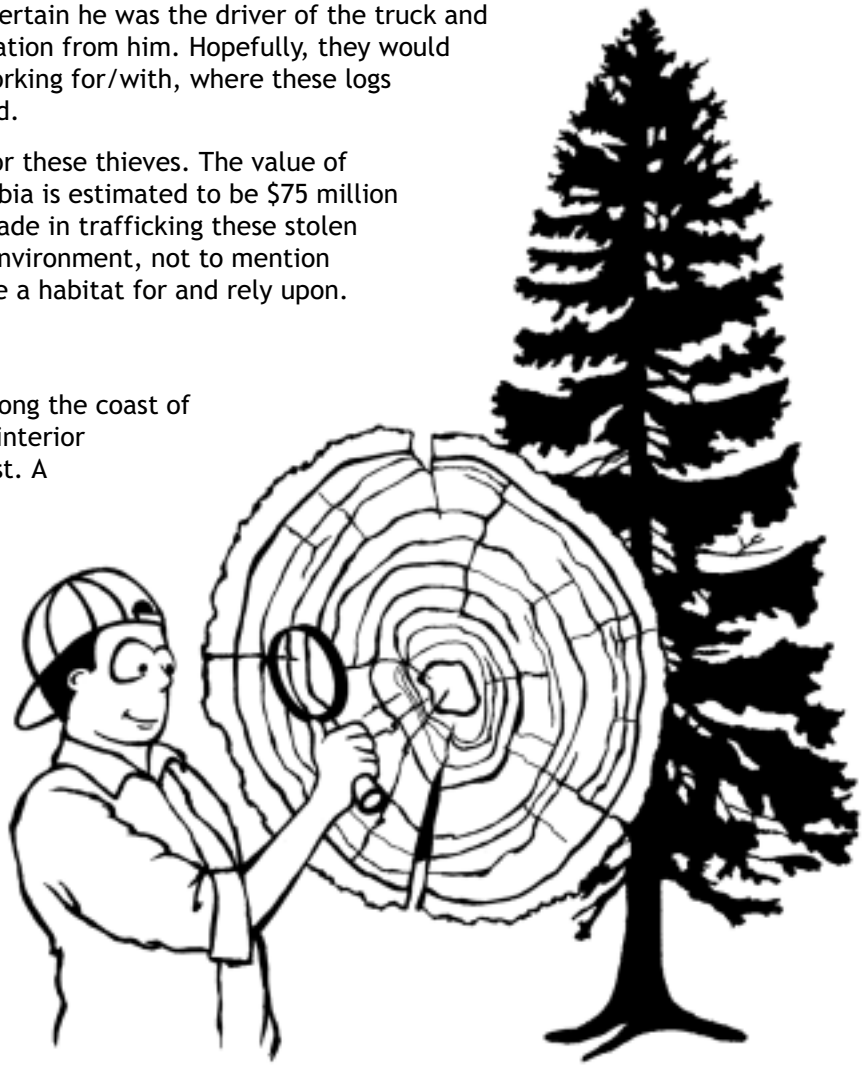
The Western Red Cedar Caper

It was the third Tuesday in November of 2000, when my partner and I got the call. I remember it well, as we had just left our favourite coffee spot and I was complaining about the weather. It was raining again! It had been raining for the last week now and I was already tired of the damp, overcast season that was upon us. Winter in Vancouver, British Columbia is always overcast, rainy and cool, and that day was the worst yet. At only 10 C, the rain seemed to go right through my bones.

Another suspicious load of timber had been found abandoned, still on the truck bed, on a south-bound pull-off area, on Hwy 99, about 30 km south of Squamish. We arrived at the scene at 4:15 a.m. and there were a number of people milling about. My partner and I have seen this too many times. Our hearts sank as we looked at the victims –
10 huge western red cedar logs. Based on the average diameter of these logs (50 cm) these trees would have been between 50 to 60 meters in height. Harvesting B.C.'s western red cedar forests is highly regulated and these trees had been illegally taken.

The RCMP had picked up an individual who was walking down the highway close to where the logs were found. They were certain he was the driver of the truck and were in the process of collecting information from him. Hopefully, they would obtain information about who he was working for/with, where these logs came from, and where they were headed.

There is no question about the motive for these thieves. The value of timber stolen each year in British Columbia is estimated to be $75 million to $150 million. There is money to be made in trafficking these stolen goods, but at an incredible cost to our environment, not to mention
2 the wildlife species these trees provide a habitat for and rely upon.



Western red cedar are typically found along the coast of British Columbia, in the wet belt of the interior where the climate is cool, mild and moist. A mature red cedar can reach 60 meters in height with a trunk that can spread out quite wide at the base. The bark is grayish and stringy, and tears off in long strips on mature trees.

When my partner and I returned to the office, we did a Web search and discovered that the Department of Forestry had located a fresh 40 acre cut of an old growth stand. The location was about 100 km directly south of Bella Coola and approximately 40 km east of the coastline.

Now we had to match the victims to the crime scene.

Crime Scene Investigation Sheet

Name of Investigators: _____

Date of Crime: _____ Time of Investigation: _____ a.m. p.m.

Environmental Factors: Weather (circle one) sunny, partial cloudy, overcast

Temperature: _____ Precipitation: _____

Location & Description of Crime Scene: _____

_____

_____

Location of Victim(s) (if different from the crime scene): _____

_____

Collecting evidence:

1. What steps or procedures can we use to connect the victim(s) to the crime scene? List at least four examples (Hint: think of what detectives use today to solve any type of theft crimes):

a. _____

b. _____

c. _____

d. _____

2. Why do you think the crime happened? What was the motive? _____

_____

3. How will this crime affect plants and animals left behind in the habitat? _____

_____

4. Explain why this event is considered a crime. How it is different than regular logging practices?

_____

_____

_____

_____

Victim Profile

Name of Victim(s): _____

Number of Victims: _____

Description of Victim(s): height: _____ diameter: _____

Colour of Bark: _____ Texture of Bark: _____

Age: _____ (approximately)

Habitat/Home (description, location): _____

_____

What other species in this forest depend on the victim(s) for their survival?
Explain how those species are dependent on the Victim(s):

Birds: _____

_____

_____

_____

Mammals: _____

_____

_____

_____

Plants: _____

_____

_____

_____

Insects: _____

_____

_____

_____

Glossary of Terms

abiotic: non-living elements in an environment; for example rocks, sand, water; the opposite of biotic

baculoviruses: naturally occurring viruses often used in controlled eradication of insect pests

biodiversity: the variety of life on earth, different species, genetic variability within species and the variety of ecosystems in which they live

biome: an environment or region of the planet made up of many ecosystems, such as the Arctic tundra or the North American prairie

biotechnology: a word combining the concepts of biology and technology, research into and the use of techniques involving DNA and living things such as fungi or bacteria

biotic: living elements in an environment; plants and animals; the opposite of abiotic

conservation: the study, protection and wise use of natural resources, conserving for the future, over the long term

COSEWIC: Committee of the Status of Endangered Wildlife in Canada, assesses the level of risk of extinction for wildlife species in Canada

DNA: the short form for deoxyribonucleic acid, a double-stranded helix which carries genetic information

ecology: the study of the relationships between organisms and their environment

ecosystem: an interdependent system of living organisms and their physical and geographic environment

edges: the transition areas where two vegetation types come together, such as a meadow and a forest; edges are important habitat for many species and play an important role in many ecosystems

endangered: a species at risk designation; a species that is facing imminent extirpation or extinction

extinct: a species at risk designation; a species that no longer exists anywhere in the world

extirpated: a species at risk designation; an indigenous species no longer known to exist in one area but exists elsewhere

food chain: the transfer of food energy between living things; for example the sun makes the grass grow, the mouse eats the grass seeds, the owl eats the mouse

genes: a length of DNA that directs the synthesis of a protein

greenhouse effect: the role that various gases in the Earth's atmosphere play in insulating and warming the Earth's surface

greenhouse gases: carbon dioxide ($C0_2$), methane (CH_4), nitrous oxide (N_20) and water vapour (H_20), occur naturally in the Earth's atmosphere, trap the heat of the sun

habitat: the arrangement of food, water, shelter and space suitable for species survival

habitat fragmentation: the breaking of habitats into smaller pieces; can occur naturally but often caused by human activity such as road or pipeline construction

invasive species: a species not native to an area; imported or migrated species that can cause problems for native species and their habitat

ozone depletion: the loss of ozone from the upper layers of the Earth's atmosphere

parasitism: a relationship in which an organism lives or feeds on another plant or animal

predation: the act of preying upon another species, such as when hawks prey on (eat) mice

protected areas: places such as national parks where there is some protection for the integrity of the environment and ecological processes

regenerating forests: promoting new forest growth, particularly after tree harvesting operations

special concern: a species at risk designation; a species that is particularly sensitive to human activities or natural events, formerly known as vulnerable

species at risk: the designation of five categories of risk for species – extinct, extirpated, endangered, threatened and special concern

stewardship: responsible care and management of natural resources, emphasizing responsibility and concern for future generations

sustainable development: development that ensures the protection and conservation of resources for future generations

threatened: a species at risk designation; a species that is likely to become endangered if conditions that threaten the species do not change

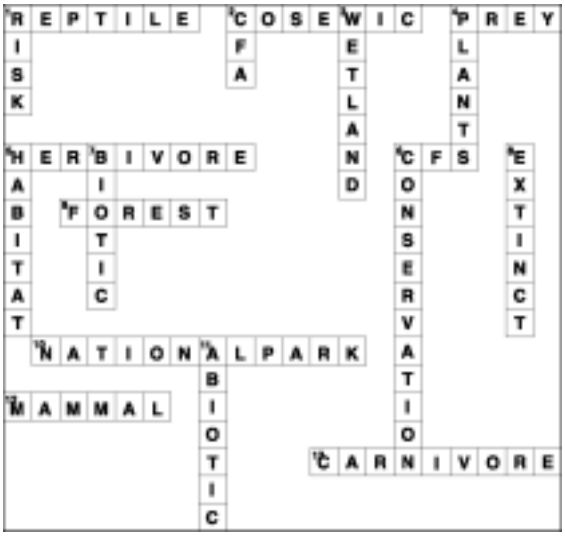
traditional ecological knowledge: ecological information and knowledge, handed down from generation to generation through beliefs, legends and stories, particularly among Aboriginal peoples

wildlife conservation: the study, protection and wise use of wildlife and wildlife resources, conserving for the future, over the long term

Answers to The Biodiversity Scramble

ABIATTH	HABITAT
TEER	TREE
KOA	OAK
DETWANL	WETLAND
NIPE	PINE
DOOF HINCA	FOOD CHAIN
FELA	LEAF
CHEIN	NICHE
TOOR	ROOT
RIELSUQR	SQUIRREL
SHUOMROM	MUSHROOM
RAPK	PARK

Answers to Biodiversity Crossword Puzzle



CFA Programs www.canadianforestry.com

National Forest Week

The CFA has been the sponsoring agency for National Forest Week in Canada for over 70 years. National Forest Week allows the CFA to work with partners across the country to raise awareness of forest issues.

The CFA and the provincial forestry associations work together to set a theme for the week. The theme then becomes the focus for a series of educational and public information campaigns and activities across Canada.

The federal and provincial governments, forest industry, regional and community organizations, and educational institutions take part in National Forest Week activities.

Smokey Bear and the National Fire Education Program

Fire remains an important element of the CFA's public awareness program. The CFA is Smokey Bear's home in Canada. Smokey has been carrying the flag for forest fire prevention since 1940, and his message is as important now as it has ever been. A large number of forest fires are still caused by human carelessness.

CFA's Smokey Bear program allows us to get that important forest fire prevention message out to school children, but it also provides an opportunity to talk about the critical and positive role of fire in some forest ecosystems.

The CFA distributes a large and very popular selection of promotional items under the Smokey Bear program. Contact our Ottawa Office for information.

Forest Capital of Canada

Each year, the Canadian Forestry Association designates one community in Canada as the Forest Capital of Canada. The Forest Capital community then becomes the focal point for a series of forest education and public information activities, programs and events.

The Forest Capital of Canada program allows the CFA to bring municipalities, industry, and community organizations together to build understanding of forest issues at the local level. It also allows communities to highlight and celebrate their rich forest heritage on a national level.

Poster Contest

Every year the CFA and our partners in the provincial forestry associations across the country sponsor a poster contest for students in Grades 4 to 10. Students are asked to create a poster based on the National Forest Week theme for the year. The 2002 theme is All Things Big and Small - Biodiversity.

For more information on the Poster Contest visit our Web site: www.canadianforestry.com/eng/poster

Partners in Forest Education

The Canadian Forestry Association gratefully acknowledges the following organizations for their assistance in the development, production and distribution of the Canada's Forests Teaching Kit series.

Alberta Environment

Bank of Montreal

Canadian Council for Geographic Education

Domtar

Ducks Unlimited

John Deere

Model Forest Network

National Forest Strategy Coalition

Natural Resources Canada, Canadian Forest Service

Province of Ontario, Ministry of Natural Resources

Royal Bank of Canada Foundation

Royal Canadian Geographical Society

TD Canada Trust Financial Group

Tembec

Tree Canada Foundation

Weyerhaeuser

CFA Teaching Kits

The CFA's Canada's Forest Teaching Kit series is a popular set of tools for Canadian educators. Each volume of the series deals with a specific topic important to the health of Canadian Forests. Our Teaching Kits are developed by professional curriculum writers and reviewed by teachers and science experts. Please contact the CFA or visit our Web site for copies of:

Volume 1: Learning From the Past, Building for the Future (Forest Practices)

Volume 2: A Breath of Fresh Air (Climate Change)

Volume 3: All Things Big and Small (Biodiversity)

www.canadianforestry.com/html/education/cfa_kits_e.html

Canadian Forestry
Association
since 1900

The CFA is Canada's
oldest conservation organization,
with a rich legacy
of public education and advocacy,
promoting the wise use
of Canadian forest resources.
