

Species and Spaces: At Risk, At Home



Lesson Seven

This lesson is taken from Special Places: Eco-lessons from the National Parks in Atlantic Canada, a Parks Canada educational initiative.

Summary

Students will investigate species at risk within the context of Canadian biomes and ecological land classification, focusing on Atlantic Canadian ecoregions.

Activity Information

Level: Grades 11 (sec. IV)

Subjects: Sustainability of Ecosystems, Interaction Among Living Things, Science, Geography, Resource Management

Estimated Duration: Two 60-minute class periods of teacher presentation and discussion, sufficient time for independent research and preparation, one 60-minute period for student presentations.

Materials: large classroom map of Canada, large classroom map of Atlantic Canada, access to Internet, library and electronic research tools, Descriptive Analysis Guideline handout (see page 34).

Learning Outcomes

Sustainability of Ecosystems

State a prediction and a hypothesis based on available evidence and background information (e.g., predict the impact of fishing or harvesting resources such as seaweed, after examining an aquatic ecosystem; predict the impact on an ecosystem of supplying an excess of food for a particular organism).

Explain various ways in which natural populations are kept in equilibrium and relate this equilibrium to the resource limits of an ecosystem.

Interaction Among Living Things

Describe and apply classification systems and nomenclature used in the sciences (e.g., review the ecological hierarchy of an organization of living systems, from the individual to the biosphere).

Compare Canadian biomes in terms of climate, vegetation, physical geography and location.

Teacher Background

A biome is defined as a large geographic area with somewhat uniform climatic conditions; a complex arrangement of communities characterized by a distinctive type of vegetation and maintained under the climatic conditions of the region. Typical large-scale Canadian biomes include the boreal forest, taiga, tundra, grassland, eastern deciduous forest, and desert. In this lesson, a biome is a broad spectrum term that refers to a large geographic area and is not necessarily broken down into sub-components.

In contrast to biomes, ecosystems vary tremendously and can be arranged in multiple scales where smaller ecosystems are included in larger ones. Ecosystems can also range from natural systems to systems that are heavily modified by human activities. A particular biome may be representative of a prairie, but that biome includes a variety of smaller ecosystems.

Ecological land classification has been described as a process of delineating and classifying those ecologically distinctive areas of the Earth's surface by exploring the "layers" within ecosystems. Each layer or area can be viewed as a discrete system resulting from an interplay of the geology, landform, soil, vegetation, climate, wildlife, water and human factors that may be present.

Ecological land classification is based on the following principles:

- It incorporates all major components of ecosystems: air, water, land and biota;
- The number and relative importance of factors helpful in delineating ecological units varies from one area to another;
- It is based on a hierarchy, with ecosystems nested within ecosystems; and
- It recognizes that ecosystems are interactive and that characteristics of one ecosystem can be similar to those of another.

The Canadian Committee on Ecological Land classification has identified four hierarchical generalized categories: ecozone, ecoregion, ecodistricts and ecoprovince. Three are of importance for this activity and are described below.

Ecozone Is an area of the Earth's surface representative of large and much generalized units characterized by interactive and adjusting abiotic and biotic factors. It is at the top of the ecological hierarchy. It defines (on a subcontinental scale) the broad mosaics formed by the interaction of climate, human activity, wildlife, vegetation, soils, and geological and physiographic features of the country.

Ecoregions They are the subdivisions of the ecozone characterized by distinctive large order landforms, micro-climates, vegetation, soils, water, and regional human activity patterns and uses. The ecoregions are the bridge between the subcontinental scale ecozones and the more localized ecodistricts. The Maritime Barrens ecoregion is one of the nine ecoregions in the Newfoundland ecoprovince.

Ecodistricts Found within ecoregions, ecodistricts are characterized by distinctive arrangements of landform, relief, surficial geologic material, soil, water bodies, vegetation, and land uses. The Jeddore Lake ecodistrict is one of the five within the Maritime Barrens ecoregion.

Species at Risk

In Canada, COSEWIC (the Committee on the Status of Endangered Wildlife in Canada) assesses the level of risk of extinction for wildlife species. These assessments are based on the best available scientific, Aboriginal traditional, and community knowledge on the status of each species. As of November 2003, there are 441 species designated at risk according to COSEWIC in Canada. Please visit the species at risk Web site to learn more about those species: www.speciesatrisk.gc.ca

There are five categories of species at risk, along with key Web sites and legislation information, listed in the Species at Risk Teacher Resources listed on page 9.

Parks Canada has identified the Blanding's turtle (Nova Scotia population) and water-pennywort, found in Kejimikujik National Park, as priority species for national recovery efforts.

In Atlantic Canada, there are more than 70 species at risk designated by COSEWIC and/or provincial legislation as endangered, threatened or of special concern. Although these species occur throughout the Atlantic region, their distribution is not uniform. Some species require highly specific habitat that is limited in distribution, occurring at only a few sites. It is important to remember that landscapes outside national parks and protected areas also represent critical habitat for species at risk, and need to be considered when managing for those species.

National Parks have existed in Canada for well over a century. They play an important role in the protection and study of species at risk. National Parks and National Marine Conservation Areas protect living examples of ecological diversity. They are protected for public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations. Each park and area offers a legacy of protection, living laboratories and centres for research about the natural world and how it functions.

This lesson uses ecological land classification criteria linked to the unique characteristics of each Atlantic National Park and its surrounding region, as a context to study species at risk.

Procedure

1 **Begin this lesson by giving your students a general introduction** to the Ecological Classification of Canada. Include an explanation of how to classify ecologically distinctive areas of the Earth. Explore the major ecological composition of ecozones and the linkages between the various biotic and abiotic components within an ecosystem. www.ec.gc.ca/soer-ree/English/Vignettes/intro.cfm
www.cfl.scf.rncan.gc.ca/ecosys/classif/intro_eco_e.htm

2 **Discuss with your students the differences and similarities** between the biomes and the ecozones and ecoregion classification systems. (Use a large map of Canada to identify the various biomes and ecoregions that will be studied.) Use the Environment Canada Narrative Descriptions of Terrestrial Ecozones and Ecoregions of Canada. www.ec.gc.ca/soer-ree/English/Framework/NarDesc/Canada_e.cfm

3 **Discuss and emphasize that all living things and their population size and growth, are impacted upon and influenced by the abiotic and biotic realities of an ecoregion.** For example, soil type determines (to a certain extent) the kind of plant life; wind and cold temperatures do the same. Soil moisture (bogs and wetlands) mean that plant life has adapted to survive in moist conditions, etc. You may choose to prepare a chart in order to show some of the significant factors that affect or influence population growth within the ecoregion. Your chart could look like this example:

.....

Biotic and Abiotic Factors that Affect and Influence Population Growth within an Ecoregion

BIOTIC	ABIOTIC
Plants (flora) (type of species, variety and arrangement of species, etc.)	Wind speed
Wildlife (fauna) (predator/prey ratios)	Amount of precipitation
Trees (conifers and/or deciduous)	Temperature
Photoperiod	Human activities impacting on habitat (forestry, tourism, mining)
Presence of decomposers	Length of growing season
Photosynthesis activities	Depth of soil
Evapo-transpiration	Soil moisture
Symbiotic relationships	Fire

4 Select the Atlantic Maritime and Boreal Shield ecozones to compare obvious biotic and abiotic differences. You may wish to prepare a chart showing and comparing the physical geography (soils, landforms), wildlife and location (see sample on page 32).

5 Identify those ecozones within Atlantic Canada: the Atlantic Maritime, Arctic Cordillera, Taiga Shield and Boreal Shield. Inventory the climate, vegetation, physical geography and location. Identify some general biotic and abiotic differences between ecoregions in each ecozone. Again, you may wish to prepare a chart to differentiate and compare the ecoregions (see sample on page 33).

6 Introduce and discuss the importance of national parks as representative examples of natural areas of Canadian significance, with particular biotic and abiotic characteristics. By law they are protected for public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations. One of their critical roles is to provide protection for species at risk in Canada.

7 Introduce the concept of species at risk in Canada and COSEWIC's role in identifying species populations that are at risk (www.cosewic.gc.ca). Discuss the different levels of risk (extinct, extirpated, endangered, threatened, special concern) and those factors that threaten their populations: destruction of habitat, genetic and reproductive isolation, suppression of natural events (e.g., fire) environmental contamination, over harvesting and excessive trade, climate change, disease and presence of invasive species.

8 Visit Canada's Species at Risk Website and read the information sheets on the:

Blanding's turtle:

www.speciesatrisk.gc.ca/search/species/Details_e.cfm?SpeciesID=276

Water-pennywort:

www.speciesatrisk.gc.ca/search/species/Details_e.cfm?SpeciesID=198

Both of these are found within Kejimikujik National Park. Discuss the factors that regulate the population size of these species in the national park, for example:

Blanding's turtle: nest flooding, raccoon predation, park facility development near nest sites, habitat fragmentation.

Water-pennywort: stabilization of water levels, recreational activities and vehicular damage, land development.

Student Application Activity

In order to do a nationally focused activity, you can visit Parks Canada's Web site and research other national parks in Canada: www.pc.gc.ca.

1. Divide the class into working teams of two to three students. Explain that they will be carrying out research and preparing a presentation on a species at risk in a national park and describing the ecoregion in which the species resides.

Explain that they can design any form of presentation, such as: bulletin board display, brochure, booklet, PowerPoint™ presentation, global information system (GIS) project, video news broadcast or informational video, 3-D model, or any other similar creative format.

-
2. Have working teams select a species at risk that resides in a national park in Atlantic Canada (if adventurous, students can adapt to another region of Canada). Encourage working teams to select different ecoregions and/or different species at risk.
 3. Hand out the Descriptive Analysis Guideline to each group (see page 34).
 4. Working teams will carry out a descriptive analysis of their species at risk in the selected ecoregion using the guideline document to steer their research.
 5. Working teams will then deliver the results of their descriptive analysis to the class, or school at large, using a creative, interactive format of their choice.

Extensions

Justify whether or not your species at risk could survive in another ecoregion. Use one of the example ecoregions that was presented by another group of students.

Categorize the reasons why species are at risk, comparing natural, versus unnatural reasons. Discuss and debate whether we should intervene when the reasons are natural.

Introduce a change to the system (e.g., global warming with an increase of three to five degrees Celsius in the next 100 years) and identify what affect that would have on the species studied.

Compare population growth of species at risk within and outside a national park. Consider: competition, environmental quality, disease, parasitism, predation, human activities.

Reference Material

Environment Canada Species at Risk

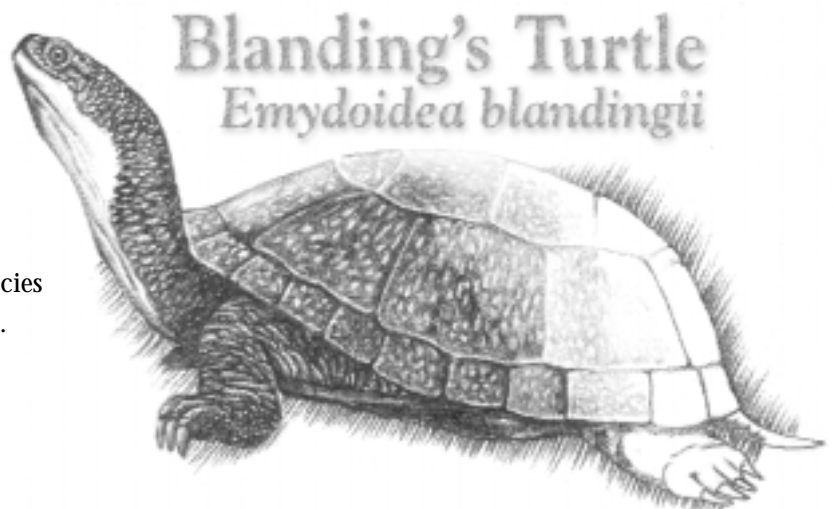
www.speciesatrisk.gc.ca

Parks Canada Species at Risk

www.pc.gc.ca/nature/eep-sar/index_E.asp

See page 9 for additional resource Web sites.

Consider working directly with the school librarian to set up for students a list of reference Web sites relevant to species at risk, land classification and other pertinent information.



Biotic and Abiotic Comparisons of the Atlantic Maritime and Boreal Shield Ecozones

	Atlantic Maritime		Boreal Shield	
	Abiotic	Biotic	Abiotic	Biotic
Physical Geography	Frequent showers Cloud cover/fog Coastal lowland Rough upland Wetland Shallow, stony soils, and outcrops composed of granite, gneiss, and other hard, crystalline rocks	Mixed coniferous- deciduous forests	Precambrian Shield Rocks Gravel Glacial deposits Lakes, ponds, wetlands Relatively high levels of precipitation to much of the area, from 400 mm in the west to 1000 mm in the east	Boreal forest Wetland plants
Wildlife		Blue whale, eastern bluebird, moose, beaver, black bear		Skunk, blue jay, loon, great blue heron, woodland caribou
Location	Appalachian Mountains Northumberland Plain Atlantic Highlands	Ecozone includes the following national parks: Cape Breton Highlands Prince Edward Island Fundy Kejimikujik Kouchibouguac Forillon	Athabasca Plains Lake Melville Paradise River	Ecozone includes the following national parks: Terra Nova La Mauricie Pukaskwa Gros Morne Mingan Archipelago



.....

Biotic and Abiotic Differences Between Ecoregions

	Biotic Factors	Abiotic Factors	
Ecoregions within the Atlantic Maritime Ecozone	Prince Edward Island (PEINP)	Dwarf conifers Marram grass	Glacial till Summers are warm and winters mild and snowy Coastal and salt marsh habitat for shorebirds and seabirds
	Southwest Nova Scotia Uplands (Keji NP)	White-tailed deer, snowshoe hare, porcupine, raccoon	Warm summers and mild, snowy winters Extensive wetland and rock barrens
	Cape Breton Highlands (CBHNP)	Lynx	Cool, wet summers and long winters severe winds
	Maritime Lowlands (Kouch NP)	Eastern white cedar	Stony, loamy glacial tills.
	Nova Scotia Highlands (CBHNP)	Sugar and red maple, yellow birch, red and white spruce, and balsam fir	Warm, rainy summers and mild to cold, snowy winters
	Southern New Brunswick Uplands (Fundy NP)	Ruffed grouse, bobcat	Soil moisture
Ecoregions within the Boreal Shield Ecozone	Central Newfoundland (Terra Nova NP)	Moose, lynx, black bear, red fox and caribou	Mixture of crystalline Palaeozoic strata Rugged and rocky uplands where stream erosion has cut deeply, rolling terrain of low relief elsewhere
	Maritime Barrens (Terra Nova NP)	Moose, black bear, Kalmia, sphagnum moss, tamarack, red fox, caribou	Sandy, moraine deposits
	Southwestern Newfoundland (Gros Morne NP)	Moose, black bear, caribou, marten, red fox, and lynx are typical wildlife	Cool summers and snowy, cold winters, unique geological formations

Descriptive Analysis Guideline

Your working team is responsible for carrying out a research project on a species at risk living in a national park. If you collect information under each of the headings listed below, you will better understand where the species fits into its ecoregion, and will have sufficient information to prepare a presentation to share with your class.

Note: The numbers in the second column represent the total mark that can be achieved for each activity.

ECOZONE

MARK

Identify and describe the ecozone in which your ecoregion lies	5
Identify and describe the ecoregion including climate (temperature, wind, precipitation, photoperiod), vegetation, wildlife, physical geography	5

SPECIES AT RISK

Describe your species at risk using these categories: physical description, natural history, population and distribution, threats, protection, recovery efforts	5
Explain why your species at risk thrives and survives in this particular ecoregion	5
Identify and describe the primary reasons your species is at risk. Consider ecological (e.g., habitat loss, climate change, etc.), social (e.g., recreational activities, etc.) and economic factors (e.g., land development, fur trapping industry, etc.)	10

RECOMMENDATIONS

Develop a series of six recommendations that would improve the population status of your species at risk	15
--	----

PRESENTATION

Present your findings, demonstrating understanding of facts, terms, concepts and relationships	20
Use support visuals effectively	5
Deliver your presentation in an organized fashion	5
Encourage class interest and participation in your topic	5

