The Connected Planet

Looking at Biodiversity

Balance

Support

Process

Steward

Interact

Sustain

Benefit

Life

Environment Canada Environnement Canada

Canada

The Connected Planet

Looking at Biodiversity

Mountains, prairies, forests, lakes, oceans, and wetlands are habitat to some 70,000 known species of plants and animals in Canada. But people sometimes forget that wildlife can also be found in suburban neighbourhoods, industrial spaces, and city centres. In this way, people often view the natural world as a separate existence from their own. But the truth is, humans are as much a part of nature as any plant or animal, with just as much dependency on biological diversity to survive.

Biological diversity, commonly called "biodiversity," refers to the variety of species and ecosystems on earth and the ecological processes of which they are a part. Simply put, biodiversity describes the variety of and relationships between all life.

Biodiversity is valuable because it is the foundation that supports complex natural ecological systems – like plant pollination, oxygen production, and water filtration – that allow plants, animals and humans to adapt and survive.

We are all in it together — and we all have a role to play in the conservation of biodiversity.

1. American Ginseng*
2. American Badger*
3. Black Bear
4. Dense Blazing Star*
5. Butternut*
6. Catfish
7. Cattails
8. Cerulean Warbler*
9. Crayfish
10. Dragonfly
11. Garter Snake
12. Great Blue Heron
13. Maple Tree
14. Milkweed
15. Minnows
16. Monarch*
17. River Otter
18. Ostrich Ferns
19. Peregrine Falcon*
20. Pine Tree
21. Red-headed Woodpecker
22. Wood Turtle

* Species at risk in Canada

For more information please visit: *www.speciesatrisk.gc.ca*

From Here to the Biosphere

Healthy ecosystems...what's in it for us?

The clean air we breathe...
the clean water we drink.

Biodiversity is measured on different scales. From the tiniest chromosome to the entire biosphere, we can examine the variety and abundance of species and environments.


Walter B. Fechner

Boreal Forest


Walter B. Fechner

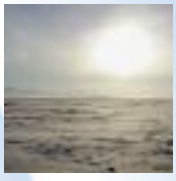
Carolinian Forest


Jukka Jantunen

Woodland Caribou


John Mitchell

Wood Frog


U.S. Fish and Wildlife Service

Tundra

DNA


Konrad Schmidt

Orange Spotted Sunfish


John Mitchell

Wetland

Three ways to examine biodiversity:

1 Ecosystem Diversity

- the abundance of differences *among* ecosystems (e.g., rivers, forests, wetlands, grasslands, deserts, alpine meadows, oceans)
- ecosystem components like soil, air, water, plants, and animals interact to provide ecological functions and services (e.g., waste decomposition, nutrient cycling)

2 Species Diversity

- the abundance of differences *among* species (e.g., plants, amphibians, fish, reptiles, mammals, birds, insects, micro-organisms)
- scientists have identified about 1.75 million species with an estimated 5-10 million more to be discovered

3 Genetic Diversity

- differences at the genetic level *within* species and individual plants or animals (e.g., Wood Bison are taller and darker than their Plains Bison cousins)
- species living at the edge of their geographical range may be genetically different from the rest of the population
- genetic characteristics may determine whether an individual or limited population survives disease or disaster when others do not

Intercontinental connections The three populations of Monarchs — western, central and eastern — have distinctive migration patterns. The eastern population stretches across Canada from the Rocky Mountains and accounts for most of the Canadian population. As winter approaches, these insects, estimated in the tens of millions, travel from southern Canada to just 12 sites, high in the forested mountains of Mexico. Come spring, the butterflies travel to regions along the Gulf of Mexico to breed. As older Monarchs die along the way, new generations pick up the migration pattern and continue north to Canada in search of milkweed. This generational migration allows the species to produce many broods of offspring each year.

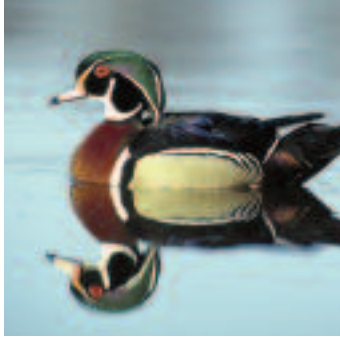
The Monarch's migration illustrates how ecosystems that are geographically far apart, play a key role in the lifecycle and ultimate survival of this butterfly. In this way, the meadow in Canada and mountains in Mexico, and all habitats in between, are connected.

Monarch butterflies go hand-in-hand with milkweed plants. Mature butterflies will only lay eggs on milkweed and young larvae are entirely dependent on the plant for food.

Monarchs are protected by Canada's *Species at Risk Act*.

Learn more online: *www.speciesatrisk.gc.ca*
(Search Monarch)

The *Connected Planet*



Ducks Unlimited Canada

Wood Duck

Healthy ecosystems...what's in it for us?

Birds and insects to pollinate plants... including the ones we eat.

Greg Grabas

Dragonfly

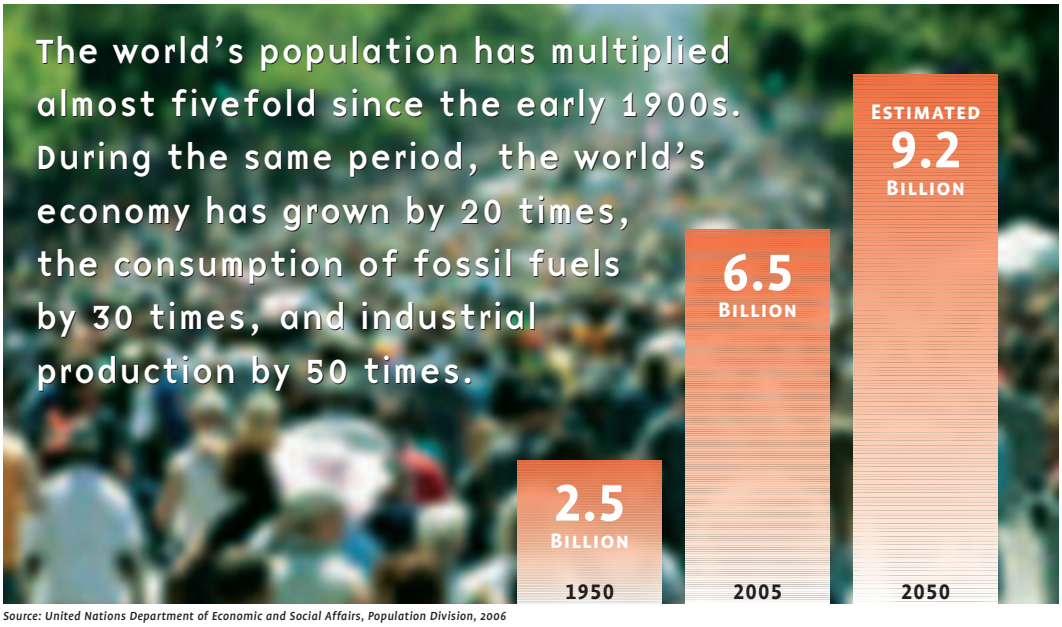
Think of biodiversity as an intricate machine with all sorts of stationary and moving parts. In a machine, shafts, cogs, gears and belts connect parts in relatively simple linkages. In an ecosystem, linkages range from the subtle — nitrogen is sucked in through the roots of plants, people transport seeds on their shoes — to the grand — forest fires convert plants back to carbon for future forest growth, warblers pluck worms from the earth to feed a new generation.

Removing parts or severing connections in a machine reduces the quality of the end product. Just like machines, a decrease in biodiversity reduces the production of food, energy and shelter needed to stay alive.

There are more than six billion people in the world — and you are one of them. The surge in human consumption and higher overall standard of living has caused more biodiversity to be lost in the last 50 years than at any other time in recorded history.

Explore the land or water around you *and* the plants and animals that live there. How do they interact? What part do you have to play in the ecosystem?

Eric Dresser



Source: United Nations Department of Economic and Social Affairs, Population Division, 2006

Are You up to the Challenge?

Healthy ecosystems...what's in it for us?

A robust gene pool for adaptability... and for medicines we need.

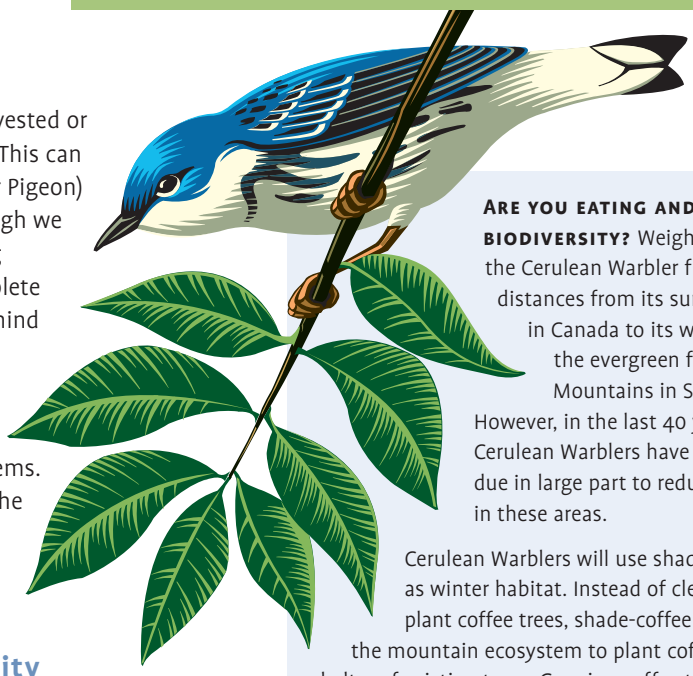
John Mitchell

The loss of biodiversity means *much* more than having fewer birds at your backyard feeder. Natural resources are the foundation of our society's health and wealth. Our challenge is to utilize the earth's resources wisely, fairly, and in a sustainable manner to balance the needs of ecosystems and human growth.

Almost 50 percent of the world's forests have been harvested or destroyed.

Unsustainable use is when a resource is harvested or consumed faster than nature can replace it. This can happen to individual species (e.g., Passenger Pigeon) or entire ecosystems (e.g., coral reef). Although we need products derived from mining, farming and fishing, unsustainable practices can deplete ecosystems of vital components, leaving behind unhealthy and even poisoned ecosystems.

As a result, it is necessary to investigate the impacts that natural resource extraction and other human activities have on ecosystems. The "ecosystem approach" is a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way.



Convention on Biological Diversity

In 1992, the United Nations Conference on Environment and Development – also known as the Earth Summit – was held in Rio de Janeiro, Brazil. The focus of this international meeting was sustainable development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

189 countries, including Canada, are Parties to the **Convention on Biological Diversity**, a global environmental treaty signed in Rio. Each has agreed to take action to meet the Convention's three objectives of conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

Learn more about the Convention online: *www.cbd.int*
To read *Canada's Biodiversity Strategy* please visit:
www.cbin.ec.gc.ca/strategy/default.cfm?lang=e

Are you eating and drinking your biodiversity? Weighing just 10 grams, the Cerulean Warbler flies amazing distances from its summer nesting sites in Canada to its winter habitat in the evergreen forests of the Andes Mountains in South America. However, in the last 40 years, numbers of Cerulean Warblers have declined sharply due in large part to reduced forest habitats in these areas.

Cerulean Warblers will use shade-coffee plantations as winter habitat. Instead of clearing forests to plant coffee trees, shade-coffee farmers work *within* the mountain ecosystem to plant coffee trees under the shelter of existing trees. Growing coffee this way protects mountain habitats for songbirds like the Cerulean Warbler.

Farms around the world often provide necessary food and shelter for wildlife. Look at the food cupboards in your home and school. Try to connect some of these food products with their natural sources. Learn about the kinds of habitats needed to grow or manufacture the products you eat. Is the food grown or manufactured in a sustainable way (e.g., organic, fair-trade, shade-grown?) Are there environmentally friendly alternatives available?

Cerulean Warblers are protected by Canada's *Species at Risk Act*.

Learn more online: *www.speciesatrisk.gc.ca* (Search Cerulean)

Get In the EcoZONE!

ATLANTIC WALRUS

WOLVERINE

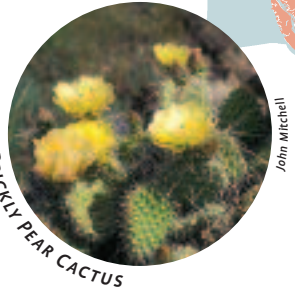
SOCKEYE SALMON

From coast, to coast, to coast...

Explore the diverse wildlife and ecosystems that make Canada unique. Discover challenges that biodiversity faces in each ecozone.

SPINY SOFTSHELL TURTLE

PURPLE SEA STAR



PRICKLY PEAR CACTUS

COMMON LOON

Twenty different large geographic areas, called ecozones, have been identified in Canada and classified according to similarities in climate, soil composition, and vegetation.

Pacific and Western Mountains Ecozones

From open tundra to closed forests, these ecozones are rich in diversity. Some ecosystems in these ecozones are stressed by recreation, urbanization, and resource-based industries, particularly forestry. There are more than 800 protected areas in these ecozones.

- Pacific Maritime
- Montane Cordillera
- Boreal Cordillera
- Taiga Cordillera
- Pacific Marine

Central Plains Ecozones

Ninety percent of the original grasslands in this ecozone have been converted to agriculture, but farmers are adopting sustainable practices to reduce water consumption and the loss of soil caused by wind erosion. Road and railway development for oil exploration threatens habitats in the northern portion of these ecozones.

- Boreal Plain
- Prairie

Boreal Shield Ecozone

An extensive network of hydroelectric dams, mining operations and forestry initiatives threaten the health of the Boreal forest, the main ecosystem in Canada's largest ecozone. Integrated resource management procedures mitigate some negative environmental impacts.

- Boreal Shield

Mixedwood Plains Ecozone

Surrounding the Great Lakes, the Mixedwood Plains is Canada's smallest ecozone, but contains approximately half of Canada's population and species at risk. Habitat loss, invasive species, dredging, and water pollution threaten this ecozone. Contamination from toxic substances in the Great Lakes and St. Lawrence River have been reduced and some species at risk like the Peregrine Falcon can now be found in areas where they were once extirpated.

- Mixedwood Plains

Atlantic Ecozones

Over-fishing has caused some fish populations to decline by nearly two thirds of their original population. The natural beauty of the interior and proximity to the ocean supports an important tourism industry. Rocky coastline hosts a variety of seabirds.

- Atlantic Maritime
- Atlantic Marine
- Northwest Atlantic Marine

Taiga Ecozones

The ground in these ecozones is covered with patchy permafrost and contains numerous lakes, rivers, and one of the world's largest wetlands. Sparsely populated, with about 60 percent Aboriginal inhabitants, traditional resource use is the norm, but there are notable mining and hydroelectric developments.

- Taiga Plain
- Taiga Shield
- Hudson Plain

Arctic Ecozones

Land cover ranges from Arctic tundra, with small plants and vast wetlands, to rocky, barren land, with extremely sparse or no vegetation. Atmospheric circulation, ocean currents, and migrating species deposit contaminants from around the world that threaten human and wildlife health.

- Arctic Archipelago Marine
- Arctic Basin Marine
- Southern Arctic
- Northern Arctic
- Arctic Cordillera

Threats to Biodiversity...

Healthy ecosystems...what's in it for us?

Forests to walk in...and to provide wood for paper, furniture, and buildings.

Habitat Loss

Habitat loss and degradation is the leading cause for biodiversity loss. Habitat destruction is widespread in many parts of southern Canada where most Canadians live. Natural habitats that are necessary for species to flourish are converted to roads, building sites, and for industrial or agricultural use. In less populated areas, resource extraction for mining, energy, or forestry may leave behind poorly functioning ecosystems. In these cases, habitats may be fragmented, which leaves wildlife open to predators and unable to reach feeding and breeding sites. This fragmentation makes it difficult for species to adapt and survive.

Bowmanville Marsh

Environment Canada

Climate Change

Climate change affects every Canadian ecozone, but rising temperatures are causing particularly visible damage to arctic environments. When permafrost melts, the ground loses its supporting network of ice crystals. This can destabilize the land and make animal habitat and human infrastructure vulnerable. The warming conditions in the Arctic may force various arctic species to migrate further north in order to survive. They may have to do this at a quicker rate than they are able. It is estimated species will have to move about one kilometre a year to survive. However, plants such as lichen, an important food source for caribou, are limited in their ability to spread. The inability of plants to adjust quickly could have detrimental effects on the animals that rely on them as a food source. The loss of arctic species may be as high as 20 percent. With this potential reduction of species, many benefits of bio-diversity are threatened.

U.S. Fish and Wildlife Service

Non-native Invasive Species

Plants can be aggressive and ruthless. Non-native invasive plants are species that are not indigenous to regions, but have been transported there by human activity or natural occurrences. They are able to thrive in these new areas because they have no natural insect predators or diseases. Non-native species can damage native environments by altering habitat, competing for resources, causing disease, or by hybridization — inter-breeding and altering the gene pool. All these elements throw the ecosystem out of balance and reduce the environment's ability to cope with change. Plants like Lily-of-the-Valley, English Ivy, Periwinkle, Purple Loosestrife, and the Common Lilac tree were all introduced to Canada from Europe and Asia.

Purple Loosestrife

Walter B. Fechner

Pollution

Dumping products like paint, detergents, and oil down the drain pollutes waters and can kill fish, amphibians, and aquatic plants. Proper removal of toxic liquid and other materials like batteries, computers, medications, and electronics should be done with care. Municipalities usually provide special depots for these materials to ensure that they are disposed of safely.

U.S. Fish and Wildlife Service, Alice Lawrence

For more information on your city's waste program please visit your hometown or region's Web site.

To explore the medicine disposal issue:
www.hc-sc.gc.ca/iyh-vsv/med/disposal-defaire_e.html

...How We Are Fighting For Healthy Ecosystems

Healthy ecosystems...what's in it for us?

Trees and plants mitigate extreme weather...by helping reduce greenhouse gases and moderate climate.

Courtney Price

Role of Government

The Canadian government has made strides in helping to protect and conserve biodiversity. Several federal wildlife protection laws and strategies have been enacted to ensure that wildlife and the natural environment are preserved and protected for future generations.

To see a list of acts, agreements, and regulations to which Environment Canada is party, please visit: *www.ec.gc.ca* (click on Acts, Regulations and Agreements on the left hand toolbar)

Protected Areas

To preserve Canada's natural heritage of diverse habitats and unique wildlife, the federal government has established a network of protected areas including 92 Migratory Bird Sanctuaries, 51 National Wildlife Areas, 42 National Parks, 5 Marine Wildlife Areas, and 3 Marine Conservation Areas. These areas have been classified as containing the necessary habitats and wildlife, that will help a variety of species survive. Some areas encourage visitors and even have special facilities like viewing towers, walking trails and guides to assist in wildlife watching.

For more information about protected areas, including which ones allow visitors, see: *www.hww.ca* (Search Protected Areas)

Environment Canada

St. Clair National Wildlife Area

Working Globally

The federal government can't act alone in conservation. As a signatory of the international Convention on Biological Diversity, Canada created a national strategy and through intergovernmental agreements and strategies, the Government of Canada is working to ensure that biodiversity is protected nationally and worldwide.

UNESCO Man and the Biosphere
www.biosphere-canada.ca

Great Lakes Water Quality Agreement
www.on.ec.gc.ca/greatlakes

Arctic Council and the Arctic Environmental Protection Strategy (AEPS)
www.arctic-council.org

Convention on the International Trade in Endangered Species (CITES)
www.cites.org

Working Locally

But biodiversity cannot be conserved with just laws and strategies. Everyone's help is needed to ensure that healthy ecosystems and diverse wildlife are protected and conserved for the benefit and enjoyment of Canadians. Partnerships with citizens, volunteers, industry, scientists, and not-for-profit agencies have led to successful habitat and wildlife conservation projects across Canada.

Students take on the Thames

The Thames River and its many tributaries are bursting with diverse aquatic life. Like many southern Ontario watersheds, the Thames River is surrounded by a highly developed landscape. Local students, with the help of the local conservation authority, planted over 1000 trees and shrubs to improve the aquatic habitat for Thames River species. Also, a one-day clean up event saw close to 2000 volunteers and corporate sponsors remove garbage from nearly 200 kilometres along the river.

For more information on similar volunteer opportunities contact your local conservation authority or environmental organization: *www.conservation-ontario.on.ca*

Resources

Walter B. Fechner

Meadow Ecosystem

Healthy ecosystems...what's in it for us?

Discover Web sites, tools, and real activities to protect Canada's biodiversity

Curriculum links

This poster has been designed to complement the Pan-Canadian curriculum. A few links to curricula are listed below.

- Sustainability of Ecosystems
- Interactions Among Living Things
- Human-Environment Interactions

Courtney Price

Intertidal Zone

Biodiversity Information

- Biodiversity Hot Spots, Conservation International: *www.biodiversityhotspots.org*
- Canada's Biodiversity Strategy: *www.eman-rese.ca/eman/reports/publications/rt_biostrat/intro.html*
- Canadian Biodiversity Information Network: *www.cbin.ec.gc.ca*
- Canadian Biodiversity Web site, The Redpath Museum, McGill University: *www.canadianbiodiversity.mcgill.ca*
- Canadian Council on Ecological Areas: *www.ccea.org*
- Canadian Wildlife Service: *www.cws-scf.ec.gc.ca*
- Center for Biodiversity and Conservation, American Museum of Natural History: *http://cbc.amnh.org*
- Convention on Biological Diversity's Youth site: *www.cbd.int/youth*
- Ecological Monitoring and Assessment Network: *www.eman-rese.ca*
- United Nations Environment Program: *www.unep-wcmc.org/biodiversity*

Species Information

- Canada's Species at Risk: *www.speciesatrisk.gc.ca*
- Canada's Wild Species: *www.wildspecies.ca*
- Climate Change and Wildlife: *www.on.ec.gc.ca/wildlife/wildweek/pdf/ccwild-e.pdf*
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC): *www.cosewic.gc.ca*
- eBird: *www.ebird.org*
- The World Conservation Union Red List of Threatened Species: *www.iucnredlist.org*

Actions: What you can do

- Action Now for Life on Earth, Convention on Biological Diversity: *www.cbd.int/videos*
- The Daversity Code: *www.daversitycode.com*
- Environment Canada – What You Can Do: *www.ec.gc.ca/education*
- Hinterland Who's Who – How to Save a Habitat: *www.hww.ca/hww2.asp?id=202*
- Nature Watch – Wildlife Volunteer Monitors: *www.naturewatch.ca*
- Youth Action Centre: *www.youthactioncentre.ca*

Contact

Environment Canada
Canadian Wildlife Service (Ontario)
4905 Dufferin Street
Toronto, Ontario
M3H 5T4
Tel: **416-739-5830**
Fax: **416-739-5845**
E-mail: **Wildlife.Ontario@ec.gc.ca**
Web: **www.on.ec.gc.ca/wildlife**

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Waterless Printing. Naturally.

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Regard sur la biodiversité