Wetlands

Wet, Wild and Essential...

and they need our help!

- Protect
- Integrate
- Inspire
- Play
- Explore
- Restore
- Respond
- Filter
- Nurture
- Provide

Canada

Ducks Unlimited Canada
Canada's Conservation Company

Wetlands

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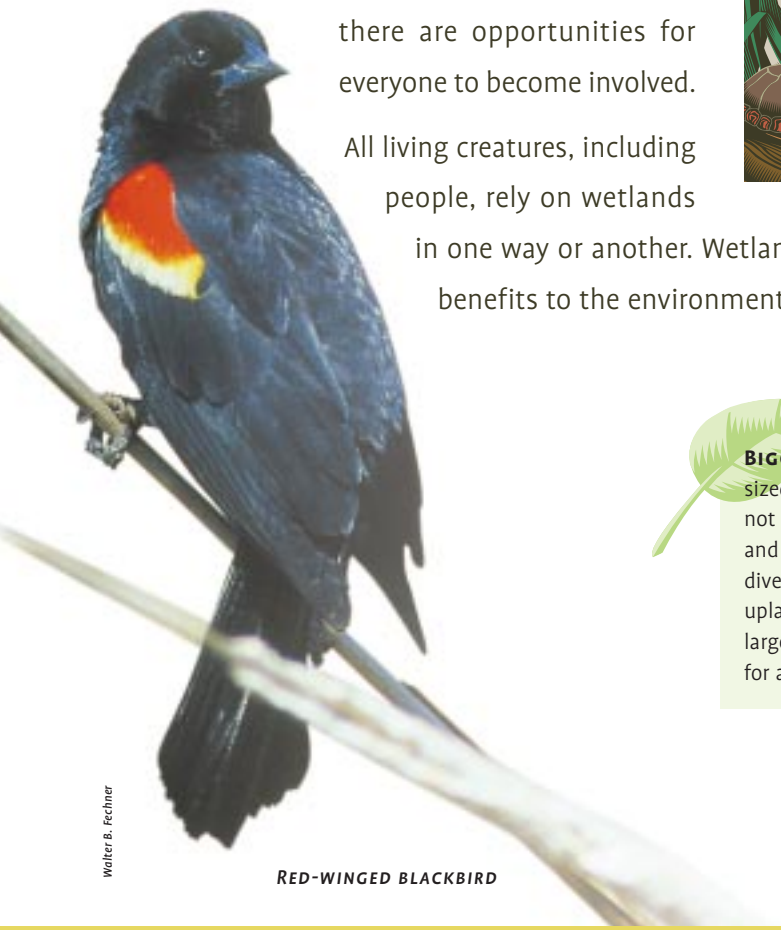
Twenty-five percent of the world's wetlands are right here in Canada. **Estimates suggest that about 70 percent have already been lost or destroyed in many settled areas of the country.** Often undervalued, wetlands may appear to be wasteland. But look closer and it becomes clear that wetland ecosystems are essential to the overall health of the environment.

Many wetlands are under stress or directly threatened, by urban, industrial or agricultural development. At the same time, more people are gaining appreciation for the functions and values of wetlands. Interest in these fragile ecosystems has led to a remarkable range of wetland rehabilitation and stewardship projects. From students to scientists, there are opportunities for everyone to become involved.

All living creatures, including people, rely on wetlands in one way or another. Wetlands are hard-working ecosystems that provide many valuable benefits to the environment, wildlife and people.

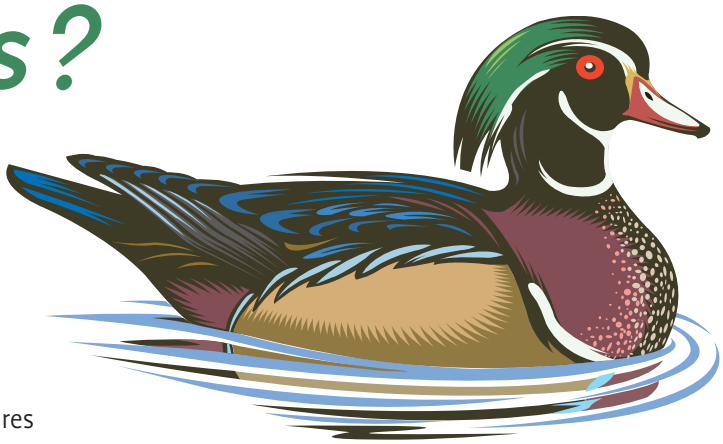


Walter B. Fechner

Red-winged blackbird

Bigger can be better Different species of wildlife require different sized wetlands. Some bird species, such as Red-winged Blackbirds, do not need much area (approximately 0.10 hectares) for nesting, breeding and feeding. Others, such as Mallard ducks, require specific plant diversity interspersed with pockets of open water and undisturbed upland for nesting. These requirements lead to the need for much larger wetland areas (> 20 hectares) to ensure habitat availability for adults and their offspring.

What are wetlands?



These complex ecosystems are areas that are seasonally or permanently covered in water, or where the water table is at or very close to the surface. The presence of water results in the formation of hydric (wet) soils and allows specific plants that grow in water to thrive.

Wetlands are not all the same. Each type has a unique set of features and resulting functions. Vegetation-based classifications of swamp, marsh, bog and fen are important to identify differences in hydrologic functions and habitat type for wildlife.

John Mitchell

Canadian Wildlife Service

Canadian Wildlife Service

Ontario Ministry of Natural Resources

Swamps are wetlands dominated by trees and shrubs, with standing water, limited drainage, and often neutral or slightly acidic soils. Swamps are home to many mammals (e.g., deer, beaver and raccoon) and many wetland bird species use swamps for nesting (e.g., Wood Duck) and feeding (e.g., Short-eared Owl).

Marshes are characterized by a mixture of cattails, bulrushes and other types of emergent aquatic vegetation. They may be seasonal or permanent and are used by a large number of birds, fish, amphibians, reptiles and mammals due to the diversity of vegetation, high food availability and nutrient-rich waters.

Bogs are peat-accumulating wetlands which trap precipitation as their only water source. They typically have acidic soils and water and often contain *Sphagnum* mosses. Bogs are common in the north and rare in southern Canada. They are commonly zones of groundwater recharge and are low in nutrients required for plant growth. Bogs provide habitat for moose and some species of seed-eating birds.

Fens are peat-accumulating wetlands with groundwater as their dominant water source. They support a variety of specialized plant species, including orchids, sedges and grasses. Fens provide ideal habitat for the Massasauga Rattlesnake, a threatened species in Canada.

Nature needs space to grow Ideally, all wetlands would be adjacent to other natural areas. Isolated wetlands in urban or agricultural areas are valuable to wildlife; however, their value increases significantly if there are connections to natural areas, such as forests or other wetlands. These natural areas provide wildlife with cover, which reduces predation and disturbance. Studies have shown that some waterfowl nest up to one kilometre from a marsh, while turtles nest and hibernate up to 275 metres from a marsh. The Northern Harrier nests near marshes, but requires a total area of over 250 hectares of adjacent land for hunting territory.

Eric Dresser

What have wetlands *done for you* lately?

The role of a wetland in the natural environment is determined by the combination of its soils, hydrology, position in the landscape, size, shape and plant community. Wetlands perform many important functions, which produce results that people highly value. *"Functions"* and *"values"* are terms in wetland science that are often used interchangeably, but they have very different meanings.

Most valued player: water quality A clean water supply is essential for life – as drinking water for humans and as habitat for wildlife. Wetlands improve water quality by filtering sediment from watershed runoff and by assisting nutrient cycling. Chemical conditions in the soils and water allow excess nutrients, in moderate amounts, to be cycled into forms that can be used by plants for growth or safely released into the atmosphere. Too much nitrogen or phosphorus from agricultural runoff or sewage can lead to excessive algal growth, oxygen depletion and vegetation die off. This process is known as eutrophication and can reduce habitat and water quality.

Canadian Wildlife Service

Canadian Wildlife Service

Functions

Functions include biological, chemical and physical processes that occur naturally within a wetland, such as:

- Habitat for hundreds of species of plants and wildlife, including many species at risk
- Migratory bird stopover sites as they travel to and from breeding grounds
- Cycling and storage of sediment, contaminants and nutrients *(e.g., nitrogen, phosphorus, carbon)*
- Recharge for groundwater and maintenance of stream baseflow
- Food webs, energy production and export

Values

Values are estimates of the worth or importance of wetland functions to humans, such as:

- Enhanced water quality and quantity
- Protection of lake shores and stream banks from erosion
- Storage of flood waters
- Low impact recreation *(e.g., bird watching, nature study, photography)*
- Sport opportunities *(e.g., hunting, fishing)*
- Economic production *(e.g., cranberries, wild rice, trapping)*

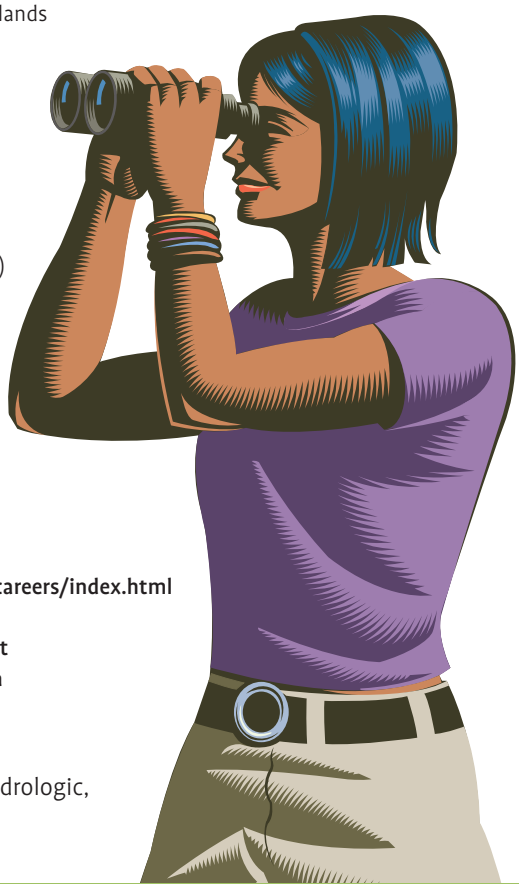
Careers

There are many different ways that an interest in wetlands can be translated into a fulfilling career. Below are some of the jobs that can turn environmental passion into full time employment.

- Biologist
- Communication or Outreach Specialist
- Conservation Officer
- Ecologist
- Educator (elementary, secondary or post-secondary)
- Engineer
- Environmental Assessment Officer
- Environmental Planner
- Fish and Wildlife Technician
- GIS and Information Technology Specialist
- Hydrologist
- Research Scientist

Learn more on-line

- Career Awareness: **www.hrdc.gc.ca/career**
- Ducks Unlimited Canada/Careers: **www.ducks.ca/careers/index.html**
- EnviroEmployment: **www.cchrei.ca**
- Environment Canada Careers: **www.ec.gc.ca/recruit**
- Ontario Ministry of Education: **www.edu.gov.on.ca**



Important terms Baseflow, Erosion, Eutrophication, Food web, Geomorphic, Groundwater, Hydrologic, Hydrology, Interspersion, Peat, Recharge, Runoff, Sediment, Species at risk

Alert! Stressed-out ecosystem ahead!

All living things experience stress. The health effects of too much stress are well known, but stress can also be positive. Wetlands depend on a certain amount of stress to maintain plant and animal diversity. Biologists refer to the pressures that change wetlands as stressors, which can be either natural or human-induced.

Water level fluctuations

The most important positive stressor that wetlands experience is variability in water levels. This natural cycle allows exposure and germination of seeds during periods of low water and thinning of dense vegetation during high water. Permanent changes to hydrology causing too much or too little water will usually reduce wetland biodiversity over time. (hydrologic stressor)

Invasive and non-native species

Alien invaders have arrived. Not from outer space but from other countries and continents. Transported by water, air and land, non-native invasive plants and animals can have devastating impacts by out-competing native species for space and other resources. Examples include purple loosestrife, common carp and Mute Swans. (biological stressor)

Physical alteration

Ranging from vegetation removal to filling or draining a wetland, physical alteration is the most common wetland stressor. Urban and industrial encroachment on natural areas and increased agricultural intensity has had devastating effects on wetlands. For example, in southern Ontario up to 66 percent of wetland area has been lost. (physical stressor)

Pollution

Nutrients, sediments and toxic chemicals are major problems for wetlands. The addition of nutrients (such as phosphorus and nitrates from agricultural and residential surface runoff) and sewage discharge are widespread problems that often result in eutrophication. Sediment-laden runoff from croplands and roads via storm sewers is a major cause of elevated water turbidity and is a carrier of toxic chemicals. (water quality stressor)

Parks Canada

Canadian Wildlife Service

Canadian Wildlife Service

Canadian Wildlife Service

Alien invasion The common carp is a freshwater fish first imported from Eurasia in the 1800s as a potential food fish. While feeding on aquatic insects, worms, algae, plants and seeds, carp suck in and expel water, mud and debris, which causes uprooting of plants, release of nutrients, and resuspension of sediments. Water turbidity increases and can reduce aquatic plant growth by limiting light penetration through the water column. Carp have been successfully excluded from some wetlands by blocking points of entry with fish ladders designed to allow passage of all fish into and out of the wetland, except for carp.

Canadian Wildlife Service

Chemicals: caught in the food web Wildlife in wetlands are susceptible to contamination from toxic chemicals in waterways. Bioaccumulation is a term for the uptake of a chemical from the environment by wildlife. Species at the top of the food chain have increased risk since many chemicals increase in concentration with each trophic level. This increase is called biomagnification.

Important terms Bioaccumulation, Biomagnification, Turbidity

Wetlands: essential for *biodiversity*

Walter B. Fechner

Least Bittern

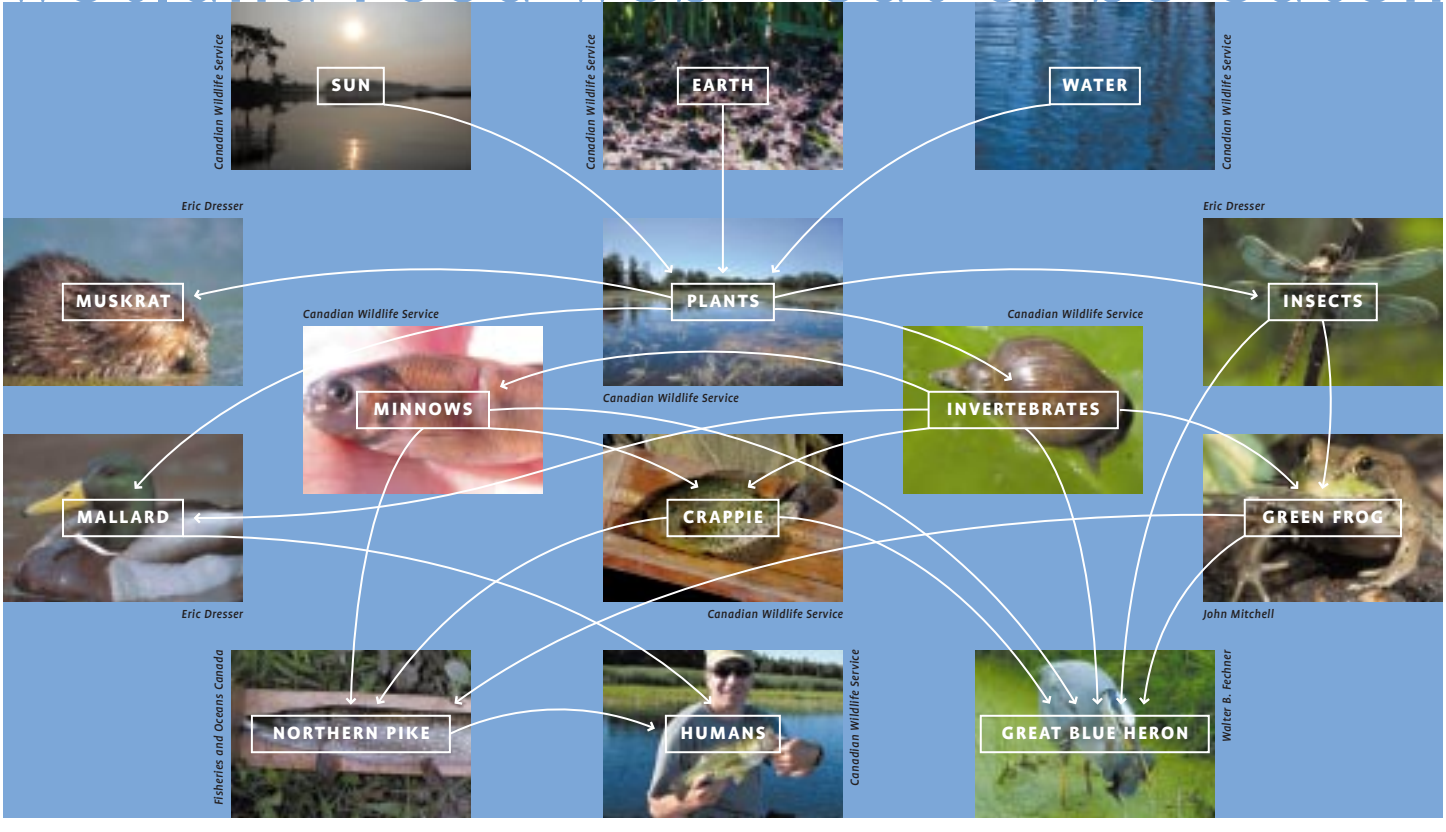
The wildlife habitat that wetlands provide is essential for maintaining biodiversity within Canada's borders and well beyond. Wetlands are among the most ecologically diverse and productive ecosystems on the planet, providing habitat for thousands of species of flora and fauna.

Wetlands provide wildlife with:

- *shelter and protection;*
- *breeding, staging, nesting and nursery sites; and,*
- *feeding, drinking and cooling spaces.*

When wetlands are put under stress, important functions are impaired and biodiversity is reduced. A decrease in wetland area or quality means that there is less food and shelter available for dependent wildlife. As a result, they must move or adapt. However, similar habitats are not always available and displaced animals are more vulnerable, resulting in population decline and the potential for putting species at risk of endangerment.

Wetland Food Web – eat or be eaten



Plants and animals in a wetland are interconnected through a complex food web – each species depending on another as a source of food to survive. Any change in the wetland that affects one species of plant or animal will have ripple effects throughout the ecosystem.

Plants and animals in wetlands can be producers, consumers or decomposers. Plants use the sun's energy and are eaten by herbivores. Carnivores eat other animals and omnivores may eat either plants or animals. As plants and animals die, their remains may be eaten by scavengers or settle on the bottom of the wetland and provide food for bacteria, invertebrates and other decomposers.

Important terms Biodiversity, Consumer, Decomposer, Ecosystem, Flora, Fauna, Food web, Habitat, Producer

What is being done to *protect and restore* wetlands?

Wetland protection, restoration and research efforts are increasing as people realize the essential functions and values wetlands provide. There are many participants – from governments to environmental organizations, corporations and community groups, and from private wetland owners to concerned individuals who enjoy spending time in wetlands. To be effective, all stakeholders need to communicate and, where possible, collaborate so that efforts on behalf of wetlands can be more effective and efficient.

Matt Young

Legislation - Ontario (provincial)

Conservation Authorities Act

Environmental Assessment Act

Fish and Wildlife Conservation Act

Lakes and Rivers Improvement Act

Natural Heritage Policies under the *Planning Act*

Water Resources Act

Legislation - Canada (federal)

Canada Wildlife Act

Canadian Environmental Assessment Act

Ecological Gifts Program under the *Income Tax Act*

Fisheries Act

Migratory Birds Convention Act

Species at Risk Act

Polices and programs

Canada-United States Great Lakes Water Quality Agreement

Federal Policy on Wetland Conservation

Great Lakes Wetlands Conservation Action Plan

International Convention on Biological Diversity

International Ramsar Convention on Wetlands

North American Bird Conservation Initiative

North American Waterfowl Management Plan and Eastern Habitat Joint Venture

National Wildlife Areas programs

Wetland policy and related laws

Ideally, wetlands would be left to function in a pristine environment and restoration would never be required. However, many wetlands have already been lost and most of those remaining have been impacted. In some cases, careful planning by landowners and governments can help prevent or mitigate stress on wetlands through:

- Implementing best management practices that reduce the impact of landuse on wetlands;
- Ensuring environmental assessment planning occurs prior to the development of proposed buildings, roads, power lines and pipelines; and,
- Enforcing legislation and penalties, and offering incentives to protect wetlands.

Currently, there is no specific federal or provincial legislation for wetlands. Most often, wetlands are protected through policies and agreements. While certainly valuable, these vehicles do not have the same clout as acts and laws. To the left are examples of international agreements, government legislation, policies and programs that work together to directly or indirectly protect wetlands.

Wetland restoration

When wetland protection is not possible, restoration and stewardship activities may be required to restore the hydrological, biological and water quality functions of wetlands. These activities are usually done by or in cooperation with landowners.

Hydrological

Wetlands rely on natural water level variability to provide productive and biologically diverse habitats. Techniques to enhance or restore wetland hydrology include:

- Creating earthen plugs to block drainage ditches and use of ditches or pumps to restore water to a dewatered wetland.
- Building dykes and bypass ditches to protect wetlands from artificially high water.
- Installing dams or control structures to provide water management and drawdown/ flood up capability.

Encouraging a healthy diversity of aquatic vegetation is an important part of restoring a wetland.

Canadian Wildlife Service

Important terms Buffer zone, Drawdown, Dyke, Hydrology, Level ditching, Minimum till farming, Mitigation, Restoration, Stewardship, Watershed

Canadian Wildlife Service

Biological

Biological restoration often uses the following three approaches to improve wetland biodiversity and productivity:

- Changing the physical conditions. For example, improve the percentage of open water to vegetation (interspersion) to encourage biodiversity through cutting, level ditching, burning or drawdown management.
- Removing exotic and invasive species (e.g., common carp and purple loosestrife).
- Introducing beneficial species for food or cover (e.g., cattail, bulrush or pondweeds).

Water quality

The best way to restore water quality in a wetland for the long term is through watershed stewardship, which may include the following activities:

- Eliminating the pollution source where possible.
- Improving water clarity by planting green cover on erosion-prone lands, fencing livestock out of water sources and reducing cultivation through use of fall seeded crops and minimum till farming.
- Encouraging farmers to adopt environmental farm plans to manage herbicides, fertilizers, fossil fuels and manure.
- Encouraging erosion, sewage and stormwater control from municipal areas.
- Providing education and best management practice demonstration programs for landowners.

Wetland science goes high-tech

Geographic information systems and remote sensing technologies have changed the way that biologists, hydrologists, urban planners and cartographers do their jobs. A geographic information system (GIS) is a computer-based tool for mapping and managing spatial data. Such data have a location associated with each entry, such as a latitude and longitude. A GIS stores information as a collection of thematic layers that can be linked together by location in a database. For example, a GIS for a municipality would store data in many individual layers such as roads, schools, natural areas, industrial areas, farmlands, and bodies of water.

Remote sensing is the process of acquiring information about the Earth's surface without actually being in contact with it. Aerial photography is the earliest example and is very commonly used today. Satellite imagery is the other dominant source of remotely sensed data and is often required for larger scale research projects. Learn more at *www.ccrs.nrcan.gc.ca/ccrs/learn/learn_e.html*.

Technology at work on Lake Ontario As part of a current study, researchers are using aerial photography from the 1930s to the present to track wetland vegetation changes in Lake Ontario coastal wetlands over time. For each year, vegetation communities are digitally outlined and stored as a data layer in a GIS. The analysis features of the GIS then allow researchers to quantify how the vegetation has changed over time in response to the known record of lake level variation and patterns of changing land use. Understanding vegetation response to stressors assists in defining conservation and management priorities for wetland species and their habitats.

Important terms Geographic information system, Remote sensing, Satellite imagery, Spatial data

Remote sensing and GIS are being used to track changes in vegetation over time in Great Lakes wetlands. A series of photographs of Lynde Creek Marsh in Whitby on Lake Ontario are shown here. From top: aerial photograph (1927); colour infrared aerial photograph (2002); GIS layer showing vegetation communities (2002); aerial oblique photograph (2002).

And what have *you done* for wetlands lately?

Wetlands in cyberspace

There are many wetland resources available on-line. This list provides a starting point that leads to countless Web sites and electronic tools and documents.

- Ducks Unlimited Canada: **www.ducks.ca**
- Green Street: **www.green-street.ca**
- Wetkit: **www.wetkit.net**
- Canadian Wildlife Service: **www.on.ec.gc.ca/wetlands**

Curriculum links

This poster has been designed to complement the Ontario and Pan-Canadian curriculum in the Grade 10 Science course, specifically the Biology portion – Sustainability of Ecosystems. There are links to other secondary school courses and a few are listed below.

- **Grade 10 Academic Science:** Sustainability of Ecosystems
- **Grade 10 Applied Science:** Ecosystems and Human Activity
- **Grade 11 Academic Biology:** Diversity of Living Things
- **Grade 9 Academic Geography:** Human-Environment Interactions, Space and Systems, Understanding and Managing Change, Methods of Geographic Inquiry
- **Pan-Canadian Science Curriculum Project**

SWAMP: Student Wetland Action & Monitoring Projects

Wetland clean-up: Litter and garbage around wetlands contribute to perceptions that they are wastelands. A wetland clean-up day can act to rally your community to care for these sensitive habitats.

Wetland evaluation: Students can investigate a local wetland using provincial guidelines. Your data can increase understanding of wetlands and help to protect them if new land use plans for the area are submitted by developers.

Wetland monitoring: Monitoring key wetland characteristics can be invaluable in assessing the effect of environmental impacts over time. Students can start their own monitoring project or join an existing program such as those listed below.

- Adopt-A-Pond: *www.torontozoo.com/adoptapond*
- Ecological Monitoring and Assessment Network: *www.eman-rese.ca/eman/program/involve.html*
- FrogWatch: *www.frogwatch.ca*
- Marsh Monitoring Program: *www.bsc-eoc.org/mmpmain.html*
- Volunteer for Nature: *www.ontarionature.org/action/index.html*
- Wildlife Watchers: *www.on.ec.gc.ca/wildlife/newsletters/watchers-projects-e.html*

Wetland education: Educating others about the importance of wetlands can be valuable in changing attitudes in your community.

- Start a wetland education program to provide wetland field trips and mentoring for younger students. Learn more at *www.ducks.ca/greenwing/adopt.html* and *www.green-street.ca*.
- Develop interpretative signs or brochures for a local wetland so that others can learn. Reach even more people with a wetland community newsletter, in print or on-line.

Habitat enhancement: There are many ways to improve wetland habitat for wildlife. Plant appropriate vegetation in and around wetlands, or start a nest box program for species like wrens, Tree Swallows, Screech Owls, bats, Bluebirds or Wood Ducks.

Invasive species control: Purple loosestrife is an invasive plant that out-competes native wetland species like cattails, reducing food and shelter for wildlife. Students can contribute by pulling out or cutting this plant in a local wetland or roadside ditch. To learn more about purple loosestrife control visit *www.ducks.ca/purple/*.

For more information about activities that students can do to help conserve wetlands, contact Ducks Unlimited Canada at 1-800-665-DUCK ext 254.

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Aussi disponible en français sous le titre : *Les terres humides : des milieux naturels et essentiels... et ils ont besoin de votre aide*

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FSC

Waterless Printing Process

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