BIODIVERSITY EDUCATION FACTSHEET

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Biodiversity offers a rich palette from which teachers can draw to teach students in, about, and for the environment and engage in the Ontario EcoSchools program. By engaging in a real-world context and addressing issues of biodiversity loss, as well as using local outdoor environments, students not only learn about biodiversity but, through experience, deepen their connection to it.

In this factsheet you will find:

- Why teach about biodiversity?
- 6 great biodiversity learning activities
- Ontario EcoSchools links to biodiversity
- Biodiversity backgrounder and resources
- Top 5 activities your schools can do for biodiversity

What is biodiversity?

Simply put, biodiversity is **the variety of life**, with over 14 million species found from mountaintop to deep-sea vent. In reality, it is much more than that. Species engage in complex interactions within a diverse array of habitats creating functioning ecosystems. Biodiversity provides ecological services such as: oxygen production, pollination, water filtration and storage, pest control, food production, carbon storage and erosion control. Biodiversity drives much of our economy and without biodiversity, nature's life support system would fail. Our survival depends upon biodiversity.

Why teach about biodiversity?

- **We are all part of biodiversity:** What affects biodiversity affects humans. Conserving and creating awareness about biodiversity supports the health of ecosystems that directly and indirectly support humans.
- **System and critical thinking skills:** Understanding biodiversity helps students make connections between the many parts and processes of ecosystems, developing their skills in systems thinking. Critical thinking skills are developed as students explore and evaluate the interactions and outcomes of ecosystems activities.
- **Real-world contexts:** Biodiversity, or lack of, can be found everywhere. Students can be encouraged to take action to improve biodiversity in their local communities or take part in activities on regional, national, and international scales. Such opportunities build tangible connections between students and their environment.
- **Strong links to the Ontario Curriculum** (see table below)

ELEMENTARY – SCIENCE AND TECHNOLOGY	SECONDARY - SCIENCE
Kindergarten: Overall expectation A, B, C	Grade 9: Sustainable Ecosystems
Grade 1: Needs and Characteristics of Living Things; Daily and Seasonal Changes	Grade 10: Climate Change; Earth's Dynamic Climate
Grade 2: Growth and Changes in Animals	Grade 11 Biology: Diversity of Living Things; Evolution; Genetic Processes; Plants; Microbiology; Genetics;
Grade 3: Growth and Changes in Plants; Soils in the Environment	Grade 11 Environmental Science: Human Impact on the Environment; Natural Resource Science and Management;
Grade 4: Habitats and Communities	Grade 12 Biology: Population Dynamics
Grade 5: Conservation of Energy and Resources	Grade 12 Science: Biotechnology
Grade 6: Biodiversity	
Grade 7: Interactions in the Environment	
Grade 8: Water Systems	

BIODIVERSITY AND ECOSCHOOLS

There are many ways that schools, students, and teachers can incorporate biodiversity into their emerging or existing Ontario EcoSchools program. Below are examples of opportunities that link to the Ontario EcoSchools program. Below are some examples that link biodiversity to all six Ontario EcoSchools sections.

**Please be sure to check the Certification Guide for the current year to ensure you meet specific criteria for the Certification program.*

ACTION	DESCRIPTION	EXAMPLE/RESOURCE	ONTARIO ECOSCHOOLS PROGRAM LINK
Teach lessons	Teach lessons on biodiversity over 2 periods	See page 4 of factsheet	Curriculum
Visit local ecosystems	Connect to a local park or conservation area and visit the area multiple times in the year to study biodiversity over time	See page 3 of factsheet	Curriculum
Monitor biodiversity	Engage your class in citizen science, a program that assesses and monitors species and ecosystems	See page 3 of factsheet	Curriculum
Plant native species	Plant native trees or plants in your school ground greening project	See page 3 of factsheet	School Ground Greening
Green your school grounds	Plan to green school ground asphalt areas to increase habitat and biodiversity	Ontario EcoSchools School Ground Greening guide (pg. 46)	School Ground Greening
Create new habitats	Increase the diversity of planted material and built structures to create new habitats	Ontario EcoSchools School Ground Greening guide (pg. 60-62)	School Ground Greening
Engage your school in a campaign	Engage your whole school in an environmental campaign linked to learning about and taking action for biodiversity	See page 3 of factsheet	Environmental Stewardship
Advocate for local biodiversity	Engage your whole school in letter writing to city, municipal, or provincial government about the importance of protecting local biodiversity	Write about land-use policies in your neighbourhood that affect local habitat	Environmental Stewardship
Reduce waste production and energy use	Develop whole school campaigns to target school practices to reduce the school's ecological footprint. Draw connections between individual actions and impacts on the environment/biodiversity	See page 3 of factsheet	Waste Minimization and Energy Conservation
Invite a presenter on biodiversity	Present a whole-school or divisional assembly with outside speakers focused on biodiversity awareness/education	Seek out local experts, school programs, species at risk speakers who can attend your assembly	Teamwork and Leadership

TOP 5 ACTIVITIES YOUR SCHOOL CAN DO TO IMPROVE BIODIVERSITY

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1 Plant native trees

Trees offer many benefits to both students and biodiversity. Be sure to plant native trees that will thrive in your area. Make sure you have a maintenance plan set up to care for the health of these new members of your community.

A Tree for each class: Create an arboretum by planting a different native tree species for each class in your school. Each year as students progress through different classes they care for and become familiar with another native species of tree.

2 Monitor local biodiversity by participating in citizen science

Engage in a programs that observe and report on nature: For example, FrogWatch, PlantWatch, WormWatch, and Project Nest Box.

Host a BioBlitz, a short, intense one-day event to discover as many different life forms as possible in one location.

3 Engage your whole school in a biodiversity awareness campaign

Organize a campaign that combines both *learning* about biodiversity (e.g., species at risk, threats to biodiversity, International Day for Biological Diversity) and *taking action* for biodiversity (e.g., letter writing campaign, fundraise to protect an endangered habitat, host a BioBlitz, etc).

4 Get outside and help protect a locally biologically diverse areas

Conservation volunteering: Many environmental organizations offer volunteer opportunities to learn about and help conserve biodiversity through hands on activities (e.g., tree planting, stream and river clean ups, invasive species removal, and habitat restoration).

TIP! Connect with local Conservation Authorities, Community Stewardship Councils or environmental organizations for opportunities in your area.

Connect with local biodiversity: Plan a hike, design a neighbourhood walk, or create a nature guide for your school yard and invite students and teachers to take part.

5 Reduce your school's ecological footprint

Target school practices: Schools have a large impact on the environment. By assessing daily energy and waste practices, students can work to reduce their ecofootprint. practices in the use of energy and the production of waste, students can work to change practices to reduce their school's ecofootprint. Monitoring and evaluating target practices are an important part of ensuring success, as well as informing the whole school of your goals and celebrating milestones along the way.

Change a personal habit: Invite students to make a personal pledge to help biodiversity. This could include making choices that reduce waste (waste-free lunch, reusable water bottles), reducing energy use (turning off lights, unplugging electronics when not in use) or protecting habitat (not littering, planting native species).

6 GREAT BIODIVERSITY LEARNING ACTIVITIES

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Connecting with Habitats: Home Sweet Home

1

Grade: *1-3 (adapt for 4-6)*

Time: *45 min*

Curriculum links: *Science and Technology; Social Studies*

Source: *Ontario EcoSchools www.ontarioecoschools.org Making Connections Curriculum Resource Guide*

Description: The activities in this session will give students an understanding of the concept of habitat, what animals need to survive, and the importance of preserving habitat. The first activity is a quick game of Animal Charades to spark students' knowledge of animals and where those animals live. "What's that, habitat?" will introduce students to the basic needs of all animals. Finally, a round of Habitat Lap Sit will illustrate the connections among all of the components (air, food, water, and space) that together make up a healthy habitat.

What Does Biodiversity have to do with the Food We Eat?

2

Grade: *4, 5, 6*

Time: *Two 1.5hrs in class and three 30 min. at home*

Curriculum links: *Science and Technology; Mathematics*

Source: *Earth Day Canada EcoKids www.ecokids.ca*

Description: Students keep a daily food log for three days. After, they investigate how their food consumption depends on genetic and species diversity.

Learning Goals: By the end of the activity, students will:

- Link the different foods they eat to biodiversity
- Explain three reasons why species and genetic diversity is important for agriculture and for people
- Create graphic organizers for data
- Understand the bigger picture (systems thinking)

Pulling for Biodiversity: Managing Invasive Species in Ontario

3

Grade: *3, 4, 5, 6*

Time: *5 activities 30-45 min. each*

Curriculum links: *Science and Technology; Mathematics*

Source: *BEAN www.biodiversityeducation.ca*

Description: This unit is comprised of 5 individual lessons that introduce students to the issue of invasive species. Hands-on activities explore why invasive species are so destructive to native biodiversity, ecosystems and our economy, and identify what can be done about them. The unit focuses on 2 major invasive species in Ontario: Garlic Mustard and Rusty Crayfish.

Activities: 1) What Are Invasive Species? 2) Musical Mussels 3) Crayfish Conundrum 4) Garlic Mustard Invasion 5) Managing Invasive Species

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Schoolyard Biodiversity

4

Grade: *6*

Time: *1 hour outside, 1 hour in class*

Curriculum links: *Science and Technology; Mathematics*

Source: *Back to Nature Network www.back2nature.ca*

Description: Through this hands-on outdoor activity, students conduct a quadrant study to identify plant species in a managed and a natural area. Through observations and classroom discussions, students consider the positive and negative effects of human activity on biodiversity, learn how to use a field guide and discuss the human management of plant diversity.

Learning Goals: At the end of this lesson, students will:

- Recognize, identify and classify different plant groups
- Estimate percent of an area and extrapolate data using ratios
- Use area and perimeter measurements
- Understand differences in plant diversity in different areas and consider implications

Give Me Back My School: A Back to Basics Approach to Ecological Restoration

5

Grade: *9*

Time: *This project should be conducted over the school year, depending on your resources.*

Curriculum links: *Geography (Academic)*

Source: *Evergreen www.evergreen.ca*

Description: In this lesson students learn about the geography of the area in which their school is situated in order to create a biologically diverse school ground. Students will analyze local soil, average weather patterns for their area, topography and local precipitation and temperature graphs in order to develop a feasible method of small-scale land reclamation.

Learning Goals: At the end of this lesson, students will:

- Demonstrate an understanding of how human activities affect the environment
- Explain how the effects of urban growth alter the natural environment
- Research and report on ways of improving the balance between human needs and natural systems
- Analyze and evaluate local waste management methods

Ready, Set, Fish

6

Grade: *9-12*

Time: *1 period*

Curriculum links: *Grade 9 Science (Academic), Grade 11, 12 Biology (University), Environmental Science*

Source: *BEAN www.biodiversity education.ca*

Description: The goal of sustainable fisheries is to balance the harvest of fish in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs. Canada has the potential to be a world leader in sustainability but is not there yet. In this simulation game, students will examine the conflicts in creating a sustainable fishery – balancing the economic needs of people with the health of the ocean.

Learning Goals: At the end of this lesson, students will:

- Learn that sustainability is the ability to balance the needs of the present without compromising the ability of future generations to meet their own needs
- Assess the impact of overfishing and its impact on sustainability in an aquatic ecosystem
- Identify major contemporary environmental challenges, and explain their causes

BIODIVERSITY BACKGROUNDER

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Levels of Biodiversity

Genetic diversity: Genes are responsible for the variability among individuals within a species (e.g., colour, size) and it's this diversity that helps species adapt and evolve to changes in the environment.

Species diversity: The different types of living things found in a certain habitat, ecosystem or area. In Ontario, over 30,000 species have been identified.

Ecosystem diversity: The variety of ecosystems within a landscape or region (e.g., boreal region consists of wetlands, forest, mixed-forest, marshlands, grassland and meadow ecosystems).

Benefits of biodiversity

Greater biodiversity leads to greater:

- Productivity in plant communities
- Nutrient retention in ecosystems
- Ecosystem stability (i.e., ability to survive stressors)
- Resistance to invasion by non-native species
- Resistance to disease
- Stability rather than fluctuations brought on by seasonal change (Tilman, 2000; McCann, 2000)

"At least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources."

The Convention about Life on Earth
(UN Convention on Biodiversity)

Threats to Biodiversity (Beware of the **HIPPO(C)**!)

Habitat loss: Alteration and fragmentation of habitat directly affects the species that rely on the habitat that is being changed.

Invasive species: Free from predation and competition that would normally limit their distribution, invasive species reproduce prolifically and displace or destroy native species or ecosystems (e.g., emerald ash borer, purple loostrife, zebra mussels) inflicting significant ecological and economic damage.

Pollution: There are thousands of pollutants circulating through the Earth's ecosystems, and many of these materials have significant, large-scale impacts on biodiversity (e.g., acid rain, ozone depletion).

Population growth: Human population growth escalates all the other causes of biodiversity loss, because more people require more space and more resources.

Over-consumption: The harvest of a species at a rate higher than can be sustained by the natural reproductive capacity of the population being harvested (e.g., over-fishing cod, clear-cutting old growth forests).

Cumulative impact and Climate Change: The cumulative impacts of HIPPO place many ecosystems at risk. The effects of climate change (e.g., severe weather, rapidly warming temperatures) disrupt habitat functioning and food sources for species.

RESOURCES

Ontario EcoSchools: www.ontarioecoschools.org
Biodiversity and Education Awareness Network (BEAN): www.biodiversityeducation.ca
Back to Nature Network: www.back2nature.ca
Natural Curiosity: www.naturalcuriosity.ca
Connecting with Nature: www.davidsuzuki.org
Evergreen School Ground Greening resources: www.evergreen.ca
Ontario's Biodiversity Council: www.ontariobiodiversitycouncil.ca
Step Outside Guide: http://r4r.ca/en/step-outside