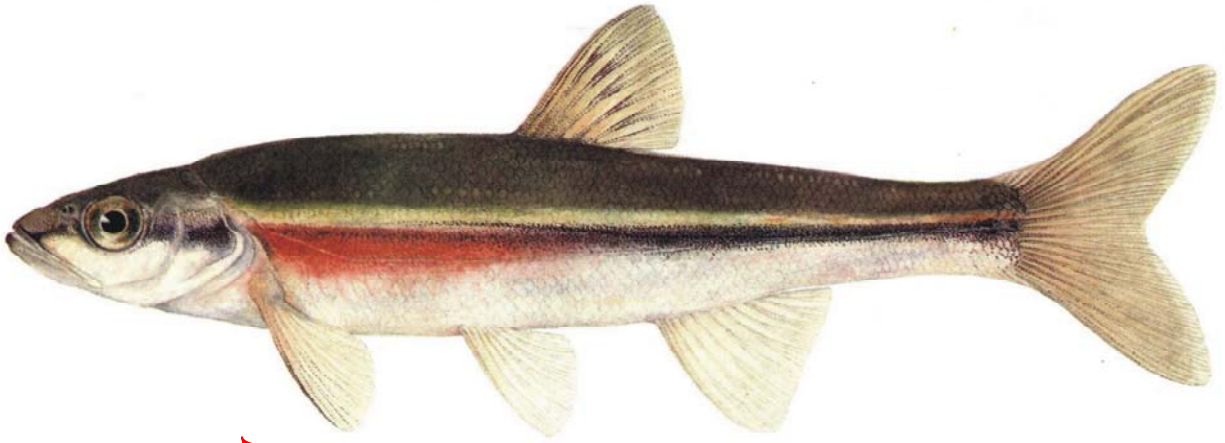
Lessons for Life in a Stream

Life Systems: Grade Seven
Interactions Within Ecosystems

Lessons for the Ministry of Education and Training
The Ontario Curriculum, Science and Technology



Featuring Ontario's Redside Dace

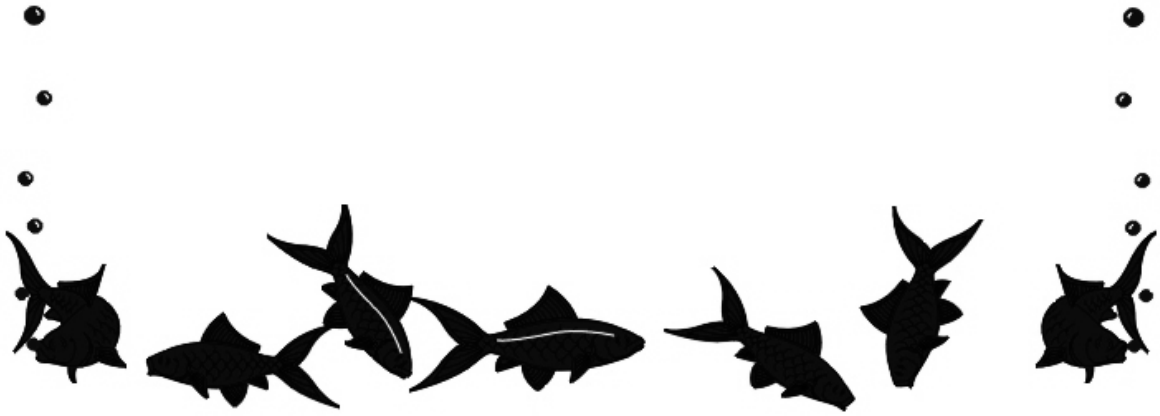
TorontoZoo

In partnership with: Conservation Authorities of Ontario, Department of Fisheries and Oceans, Environment Canada, Ontario Ministry of Natural Resources, Ontario Streams, Rouge Park Alliance, Royal Ontario Museum

Interactions Within Ecosystems

Table of Contents

CONTENTS PAGE NUMBER



Curriculum Guide
Life Systems: Grade 7
Interactions Within Ecosystems

Grade 7

Subjects Environmental Science, Language, and Art

Goals The study of ecosystems is an introduction to the study of ecology and involves investigation of the complex interactions between all types of organisms and their environment. Students will learn that ecosystems consist of communities of plants and animals that are dependant on each other as well as the non-living parts of the environment. In investigating ecosystems, students will develop research and critical thinking skills while investigating the long-term effects of losing natural habitats, natural resources and biodiversity. Students will learn how sustainable management protects species and their habitats in Canada, and how individuals can contribute to these conservation efforts.

Basic Concepts

Students will:

- Understand the importance of biodiversity.
- Identify factors affecting the balance of an ecosystem.
- Understand the effects of human activities on aquatic ecosystems by investigating a local threatened fish species, the redside dace.
- Study conservation efforts of government agencies, action groups and local communities.

Teacher Guide

Lesson One
"Imagine a World Without Fishes"
Class time: 30 min

Basic Concept:

- Understanding the importance of maintaining biodiversity by identifying factors affecting the balance of an ecosystem.

Keywords: biodiversity, extinct, habitat, natural resource, species.

Materials: Student worksheet, "**Imagine a World Without Fishes**" (for each student).

Student Activity

1. Imagine a world without fishes. Propose a "what if" scenario. Suppose a developer built a housing community within a natural forested area with a stream — disruption to the area would destroy habitats and kill many species including fish. This would reduce the biodiversity of the area and remove potential natural resources. Think of all the ways you interact with fish. Who and what would be affected? (See **Glossary p. 10 & 11** and refer to the student worksheet: "**Imagine a World Without Fishes**" **p. 5**)

2. As a class make a list on the blackboard of the potential effects of losing fishes on the world. After the discussion, photocopy and hand out the student worksheet (**p. 5**).

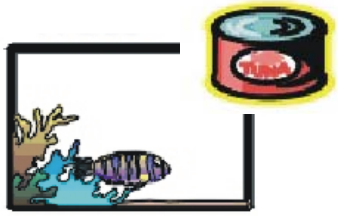
Optional Lesson: Student Worksheet

Imagine a World Without Fishes:

A Loss of Biodiversity

How are humans affected?

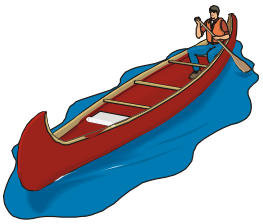
LESS
pet and aquarium trade



LESS
food sources for people and domestic animals (for example: livestock supplements)

LESS
fish by-product industries

LESS
jobs, trade or tourism



LESS
commercial and sport fishing

Food Chains
loss of beauty and biodiversity; fewer items to eat

Missing Links
disrupted food web

wetlands & watersheds disrupted!

Fewer indicators of water pollution

Imbalanced numbers in plants & animals

How are ecosystems affected?

Teacher Guide
Lesson Two
Redside Dace Display!
Class time: Over 1 week (5 x 30 minutes)

Basic Concept:

- Understand how human activities impact on aquatic ecosystems by investigating a local threatened fish species, the redside dace.
- Study the conservation efforts of government agencies, action groups and local communities.

Keywords: biodiversity, captive breeding, conservation, ecosystem, endangered, environment, habitat, habitat rehabilitation, pollution, sustainable management, species, threatened, watershed

Materials: The Internet, printer, disk or hard-drive file, paper, pen, 1 large piece and 5 smaller (1/5 size of large piece) pieces of cardboard, markers, rulers, scissors, glue and various other creative materials to be used for mural construction.

Teacher Instructions

To understand how human activities impact on aquatic ecosystems and the biodiversity of Canada's wildlife, we suggest that your students research a watershed that is local to them. The Rouge River is an example of a watershed in Southern Ontario and living in it is a threatened fish called the redside dace. Define watershed if the students are not already familiar with this term. See **Glossary (p.10 & 11).**

1. As a class, students will design a display (mural with additional information) of the redside dace in the Rouge River watershed. Divide the students into 5 groups. Each group will research one of the following topics on the redside dace:

- REDSIDE DACE BIOLOGY
- NEEDS AND HABITAT
- POSITIVE ACTIONS FOR THR FISH (ie. by community groups)
- NEGATIVE ACTIONS AGAINST THE FISH (ie. Road salting, fertilizers, etc.)
- WHAT YOU CAN DO TO KEEP CLEAN RIVERS & STREAMS CLEAN

For information on these topics you may refer to the Redside Dace Fact Sheet (p. 8 &9). A useful start for the students' research is www.redsidedace.com. Other useful references are listed on page 7 and in Appendix III.

2. Obtain 1 large piece of cardboard and 5 smaller pieces (1/5 the size of your large piece) of cardboard. Give each group of students a small piece of board to design their own separate display that will, together with the other small display boards of the other groups, be placed on the larger board to create the class mural.

Student Activity

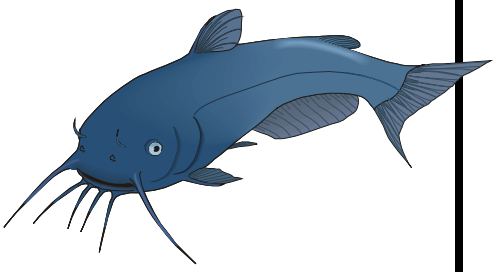
Students Groups Will:

1. Research their topic and type out a summary along with other creative ideas, related to their topic, to add to the display (students make pictures, maps, graphs, drawings, paintings, collages or other types of art suitable for the mural).

2. Upon completion of the displays, the class arranges them together on the large piece of cardboard to create one large display on the redside dace.

Option: You may want students to gain a greater perspective on the number of endangered species in Ontario by having them research more than one endangered species. Each group would then research all of the headings for one species. For example, 5 groups of students would research 5 different species on their BIOLOGY, HABITAT, POSITIVE ACTIONS, NEGATIVE ACTIONS, and WHAT YOU CAN DO TO KEEP THE ENVIRONMENT CLEAN.

3. Some helpful references include:



   - **Redside Dace Fact Sheet (p. 8 & 9)**
   - http://www.redsidedace.com
   - http://www.speciesatrisk.gc.ca
   - http://www.cosewic.gc.ca
   - http://www.mnr.gov.on.ca/MNR/nhic/nhic.cfm
   - http://www.rougepark.com/search.php

4. Compose a follow-up report describing their personal views on the decline of Canada's biodiversity and answer the following questions:

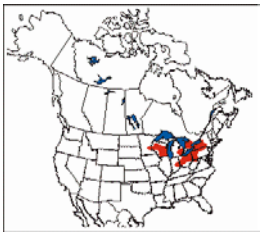
   - What is biodiversity?
   - Are we as individuals or as a nation contributing to the effective protection and conservation of our wildlife and wild spaces?
   - How will protecting one species, such as the redside dace, make a difference?
   - How do you feel about conserving biodiversity—do you think it's important? Why?
   - How can individuals contribute to conservation efforts—will it make a difference?

Appendix I
Redside Dace Fact Sheet

SCIENTIFIC NAME: *Clinostomus elongatus*
DESCRIPTION:
Length of body: Between 7.5-11 cm.
Colour: There are blue, green, purple and violet reflections on the side of the dace; the colour red is brighter in males than on females and intensifies during ***spawning***, in May.

Key Characteristics:
- Lifespan: 4 years
- A red band along the side (WHERE IT GETS ITS NAME!).
- A large upturned mouth to catch flying insects.

DISTRIBUTION:
- In Canada, isolated populations in Southern Ontario.



FOOD:
- Flying insects (danceflies, mayflies, and dragonflies) that emerge and fly over water.
- Redside dace have large, upturned mouths to catch flying insects.
- The dace can leap 10 cm out of the water to feed.

Appendix I Continued

DACE HABITAT:

- Prefer clear, cool (16^0-24^0C), shallow flowing water.
- Gravel or stony bottom.
- In-stream pools of rivers and streams
- Use rocks and fallen woody debris as shelter.
- Dace are sensitive to cloudy and polluted waters.

STATUS:

- For redside dace conservation Toronto Zoo and its conservation partners take part in;

1. Habitat rehabilitation-local streams and rivers.
2. Research and monitoring species.
3. Construction of fish ladder on Zoo property on Morningside Tributary.
4. Public awareness and education materials for the dace.
5. Member of the redside dace Recovery Team comprised of aquatic biologists. Partners include: Ontario Streams, Rouge Park Alliance, Ontario Ministry of Natural Resources, Fisheries & Oceans and Conservation Authorities of Ontario.

THREATS TO SURVIVAL:

- An estimated 50%-90% decline in native Canadian range led to the designation as a species of ***"Special Concern"*** by ***COSEWIC*** and ***"Threatened"*** by ***COSSARO*** (provincial authority) respectively.
- Redside dace are vulnerable to increases in water temperature and cloudy water, both of which are made worse with urban development (cities, farms, factories, dams, roads, and pollution).
- The main factors that have affected redside dace populations, are destruction and degradation of habitat through ***siltation***; removal of shoreline vegetation (like trees); urban development, decreases in water quality; and introduction of foreign aquatic species.

Appendix II
Glossary: (Keywords, Bold, and Italic Words)

Abiotic: a term applied to non-living (physical, chemical, or non-organic) things in the environment; for example air, water, the climate, and soil are abiotic.

Biodiversity: the variability among living organisms on earth, including the variability within and between species and within and between ecosystems.

Biotic: organic or living component parts that make up the environment such as aquatic plants, fishes, birds, and frogs.

Captive Breeding: organisms breed and produce young in captivity; sometimes used to enhance wild populations.

Community: a group of organisms living together in a habitat. They have an effect on each other and are linked by a food web.

Conservation: the planned management of a natural resource or of a particular ecosystem to prevent exploitation, pollution, destruction, or neglect, and to ensure Biodiversity and/or the future usability of the resource.

COSEWIC: Committee on the Status of Endangered Wildlife in Canada.

COSSARO: Committee on the Status of Species at Risk in Ontario.

Ecosystem: all the interacting parts of a biological community and its environment, for example, a stream.

Endangered: any species at risk of extinction or extirpation throughout all or most of its range.

Environment: the prevailing conditions that reflect the combined influence of climate, soil, topography and biology (other plants and animals) present in an area. Environmental factors are extremely important in determining how well a particular species will live in a given area.

Extinct: any species that no longer exists.

Extirpated: any species that no longer exists in the wild but exists elsewhere.

Habitat: the type of place where a plant or animal naturally lives or grows, for example, a streamside pool of water.

Habitat Rehabilitation: an attempt to restore a degraded habitat to its natural state; as it was prior to disturbance.

Habitat Stewardship: voluntary actions that individuals take to care for the environment. Citizen involvement includes monitoring and conserving wildlife species and their habitats, and to protect and improve the quality of all natural resources.

Invertebrate: an animal, such as an insect or mollusc, which lacks a backbone or spinal column.

Natural Resource: naturally occurring exploitable material, for example, trees.

Niche: the role or characteristic activity that is undertaken by an organism in an ecosystem; one organism may fill several different niches.

Organism: any type of living creature.

Pollution: a collective term for different types of harmful materials that are released into the environment through human activities.

Glossary Continued

Population: all the organisms that constitute a specific group or occur in a specified habitat.

Recovery Team: In Canada, a multi-disciplinary group of biologists and experts working to help populations of endangered species by saving habitat, breeding programs and public awareness programs.

Siltation: to choke, fill, cover, or obstruct with silt or mud.

Spawning: the act of mating by fishes, often involving the release of eggs and sperm (milt), to fertilize the eggs.

Special Concern/Vulnerable: any native species that is sensitive to human activities or natural events, but does not include extirpated, endangered or threatened species.

Species: a narrow classification grouping for organisms; e.g., a wolf is the species *Canis lupus,* while a dog is the species *Canis familiaris*.

Sustainable Management: meeting the needs of the present yet sustaining growth for the future.

Threatened: any native species that is a risk of becoming endangered throughout Ontario or Canada if nothing is done to reverse the factors leading to its extirpation or extinction.

Water Cycle: the patterns and processes of global water distribution. It is a closed system that circulates water through the biosphere. The water cycle consists of evaporation, transpiration, condensation, and precipitation.

Watershed: the region draining into a river, river system, lake or other body of water.

Wetland: is a term used to describe areas, which are neither fully terrestrial nor fully aquatic. They include marshes, swamps, peatlands (including bogs and fens), flood meadows, lakes and ponds, rivers and streams, estuaries and other coastal waters (including salt marshes, mangroves and even coral reefs). These areas range in character from the majestic cypress swamps to shallow depressions, which hold water at most only a few weeks out of the year

Appendix III
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