

Sensitive Salamanders

A mini lesson for grade 11

Time required:

- 2 class periods (45 minutes)

Materials:

- Resources to use for research (i.e. books, computers)

Species in Ontario:

- Allegheny Mountain Dusky Salamander
- Blue-spotted Salamander
- Central Newt
- Eastern Red-backed Salamander
- Eastern Tiger Salamander
- Four-toed Salamander
- Jefferson Salamander
- Mudpuppy
- Northern Dusky Salamander
- Northern Two-lined Salamander
- Red-spotted Newt
- Small-mouthed Salamander
- Spotted Salamander

Curriculum Connections:

Grade 11 Environmental Science: Plants in the natural world (SBI3C)

F1.2 assess the positive and negative impact of human activities on the natural balance of plants (e.g., the use of fertilizers and herbicides)

Grade 11 Chemistry: Chemical reactions (SCH3U)

C1 analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment

C3.1 identify various types of chemical reactions, including synthesis, decomposition, single displacement, double displacement, and combustion

E1 analyse the origins and effects of water pollution, and a variety of economic, social, and environmental issues related to drinking water

E1.1 analyse the origins and cumulative effects of pollutants that enter our water systems (e.g., landfill leachates, agricultural run-off, industrial effluents, chemical spills), and explain how these pollutants affect water quality

Background:

Spring is a very special time of year, because that means vernal pools! What are vernal pools you ask? Vernal pools, or sometimes called ephemeral pools are seasonal pools of water that provide habitat for distinctive plants and animals. Check out BEAN's "[Water & Biodiversity: Cleaning up our act](#)" lesson plan to learn more about vernal pools. Vernal pools provide a temporary habitat for salamanders to mate and lay their eggs. Amphibians are important to our ecosystems for a variety of reasons, mainly because of their place in the food web. They act as both predator and prey, eating multiple insect species and are prey for important predator species like snakes and birds. Salamanders are also **indicator species**, these are species that presence or absence that reflects the health of the ecosystem. Through understanding what amphibians do for our ecosystem and their importance in the food web, students can get a better understanding of these elusive animals.

Learning about salamander ecology and biology can help to understand why salamanders are more susceptible to water contamination and pollution than most other animals. Since salamanders breathe through their skin, which is very porous and allows for gas exchange, they are directly affected by pollutants in the water. In this activity, students will learn about different salamander species we have in Ontario and the different threats, specifically water contaminants they face, and will develop a recovery strategy to help the population thrive with action plans for the future.

Activity 1 - Indicator Species & Keystone Species

Indicator species and keystone species are critical for understanding the health of an ecosystem. As a class, learn about indicator species in your area, why they are important and different examples that can be used for terrestrial and aquatic environments. Once an indicator species is selected, groups could create a scenario of what could happen if that indicator species was removed from the ecosystem.

Example: The indicator species is an aquatic insect (or macroinvertebrate) a Mayfly larvae, it is an indicator species because they have external gills which makes them very vulnerable to pollution in the water. If these species were removed from the water the fish species that eat them would have to find another food source and the algae that is eaten by the Mayfly would become over populated. Thus the entire food chain would be affected.

Activity 2 - Choose your salamander species

Have students select and research an amphibian species from the provided list. Students should understand the risks and major threats this species faces. Threats can include physical (e.g., predation and road mortality) to chemical threats (e.g., pharmaceuticals in the water).

Encourage students to specifically look at not just the threat as a whole but specific details about the threat and exactly what it does to the salamander and which lifestage it affects (e.g., road mortality of adults in mating season affects the adult stage). After learning about the threats to this animal, students can rate the threats from greatest concern to least concern and justify why.

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Activity 3 - Choose a contaminant

Students should now understand the reasons salamanders are so susceptible to water pollution. By choosing a contaminant found in waterways that is harmful to amphibians, they can narrow down the effects this contaminant has and ways to mitigate its impact. Have students assess how this contaminant affects the different life stages of the salamander and other wildlife. Since all contaminants behave differently in the environment, ensure students have a solid understanding of the way the contaminant acts and how the chemical changes in different conditions. Types of contaminants that could be focused on include pesticides, fertilizers, components of sewage, pharmaceuticals, etc. However, encourage students to find specific compounds that contaminate water (e.g., atrazine, potassium sulphate, glyphosate, etc), the sources and effects.

Activity 4 - Restoration Plan

After understanding the impacts of certain contaminants, have students develop a restoration strategy for removing the contaminant from the water or mitigating its effects. Through research of other restoration projects in Ontario, students will discuss why its important to protect these species and develop a recovery strategy including how many people are required, a time line for the project, materials required and the cost of the project, and what other wildlife species the project would help. Students could pick a local area to focus on or another habitat in Ontario that would be home to salamanders.

The restoration plan should include:

- Species common name
- Scientific name
- Description
- Diet
- Ideal habitat
- Threats
- Mitigation strategies
- Cost of restoration plan
- Future actions to be taken to help the species in the future

Extension Activities:

- Students could then find funding for their project by researching grant opportunities or developing a strategy for a fundraising event.
- Students can create a presentation of their recovery strategies to deliver to the class, with a discussion to follow about pros and cons of the students plan.
- Thinking about the importance of biodiversity, assess how your recovery strategy would help multiple organisms in the ecosystem and which steps of the recovery project assist the different species (terrestrial and aquatic) and how the overall water quality will improve.

A case study on Jefferson salamander in Halton region can be found in BEANs resource "[Water & Biodiversity: Cleaning up our act](#)". This document can be used for a restoration project example.

