



SCIENTIST IN RESIDENCE PROGRAM

Science Unit **Biodiversity and Resilience**

Lesson 2 ***Wetland Biodiversity Study***

Summary In this lesson, students learn about how biodiversity contributes to wetland ecosystem resilience in three parts: 1) a STEAM-based poster study; 2) classroom

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Grade level	3-4, appropriate for grades 3-7
Class time needed	Two 1-1.5 hour lessons and a field trip to Burnaby Lake
Delivery date	April 5 th , April 9 th , and May 30 th , 2019

1	• To learn about the connection between biodiversity and resilience
2	• To gain a deeper understanding of wetland ecosystems
3	• To appreciate the interdependency of plants, animals and non-living features.

LEARNING OBJECTIVES

SUPPLIES

- *Wetlands* poster by Larry Duke
- Cards describing the plants and animals in the *Wetlands* poster
- Worksheets and field trip journal to record observations
- Diversity/resilience tree activity cards

BACKGROUND INFORMATION

Biological diversity, also known as biodiversity, is a measure of nature's variety. It is a combination of the diversity of ecosystems, species and genes. The more biodiverse an ecosystem, the more likely it will survive stress, such as disease or wildfire. For example, an ecosystem with lots of different species is more likely to have the same task performed by many species, such as a variety of pollinators, decomposers or air purifiers. Or at the gene level, a population of one species that has greater gene diversity is more likely to survive a pest infestation than a population with less genetic diversity. Biological diversity makes an ecosystem more resilient and it is also more beautiful and interesting to study.

The relationships between species also affects the resilience and interdependency an ecosystem. Being aware of these relationships can add to a student's appreciation and wonder of ecosystems. It draws attention to the valuable functions or services that organisms perform that benefit other species, the ecosystem and people too. In this lesson we look closely at a wetland ecosystem to appreciate both the biological diversity but also to notice the relationships between the living and non-living features of a wetland on the Pacific coast and the unique functions the organisms perform.

LESSON 1 – STEAM-BASED POSTER STUDY

Pre-lesson	Assess background knowledge about wetlands, introduce students to what wetlands are and compare with other types of ecosystems.
The Hook	<ol style="list-style-type: none"> 1. Observe the wetland poster together. What do you notice? Record student observations. 2. Move like each of the birds in the poster. As a group emulate the movement of a dabbling duck, diving duck, gliding raptor, flitting songbird, stalking heron, and diving kingfisher.
Hands-on Activities	<p>Poster study</p> <ul style="list-style-type: none"> • Give each pair of students one plant and one animal card have an obvious interconnection (i.e. Western swallowtail and hardhack). Cards are attached to this lesson plan. • Provide students with the attached sheet to record their observations and answer the questions.
Wrap Up	<ul style="list-style-type: none"> • Gather as a group to share learning. What plants and animals did you see? What functions did you notice? What relationships did you see? • Draw special attention to the beaver and describe how the beaver is both an ecosystem engineer and a keystone species.

LESSON 2 –CLASSROOM GAMES & ACTIVITIES

The Hook	<ul style="list-style-type: none"> • Ask students to describe some of the relationships between the plants and animals in the poster. What functions do the animals and plants perform? • Introduce the word resilience (What does it mean? Why is it important?)
Hands-on Activities	<p>Activity 1: Web of life</p> <p>Gather in a circle. Give each student one of the plant or animal cards used in Part A. Also include the sun, water, mud and oxygen cards. Allow time for each student to read their card. Then each person holds their card so everyone can see what they are. Give a ball of string or yarn to the sun. Have them hold the end of the yarn, say who they are, who they are connected and then gently toss the ball while holding on to the end of the yarn to that living or non-living object. That person then repeats the steps above with an object that hasn't been connected with yet. Once everyone is part of the web, discuss how everything is connected. Note if you pull on the string everything moves. What happens if we lose one water filtering plant? What if you lose them all?</p>

LESSON 2 – continued

<p>Hands-on Activities</p>	<p>Activity 2: Resilience & biodiversity Demonstrate the interconnection between biodiversity and resilience with the classroom activity by Lori Knasiak on Better Lesson. Print the Douglas-fir cards cards and diverse set of tree cards provided. Play the monoculture version and then the biodiverse version to show how a biodiverse forest is more resilient to the Douglas-fir engraver beetle than a monoculture tree farm.</p> <p><i>Monoculture version</i> Give all students a Douglas-fir card. Ask each student to bump elbows with five other students and to write their names down. Gather in a circle. The teacher, a Douglas-fir engraver beetle, bumps elbows with one student. This student sits down and reads aloud the name of their list of students. These students also sit down and read aloud their list of names. Soon everyone is sitting. They've all been infected by the Douglas-fir engraver beetle. Gather the Douglas-fir cards.</p> <p><i>Biodiverse version</i> Repeat the activity above but this time with the diverse set of tree cards, include six Douglas-fir cards in the deck. Ask each student to bump elbows with five other students and to write their names down. Gather in a circle. The teacher, a Douglas-fir engraver beetle, bumps elbows with one "Douglas-fir" student. This student sits down and reads aloud the name of their list of students. Only those students who hear their name AND are a Douglas-fir sit down. These students then read their list of names. Again, only those students who hear their name AND are a Douglas-fir sit down. Most students will remain standing/won't be infected by the beetle.</p>
<p>Wrap Up</p>	<p>Discuss how and why biodiversity increases the resilience of an ecosystem to disease or other stresses.</p>

LESSON 3 – FIELD TRIP TO BURNABY LAKE

<p>Pre-lesson</p>	<p>To enhance the field trip, before you go study:</p> <ul style="list-style-type: none"> • The history of and current day Burnaby Lake. • The plants, birds and other animals you might see in the attached list.
<p>Hands-on Activities</p>	<p>Nature Observation at Piper Spit Use pages 1, 2 and 3 of the attached field journal to guide student observations of birds, mammals and wetland plants on Piper Spit.</p>

LESSON 3 – continued

Hands-on Activities <i>continued</i>	<p>Biodiversity Survey beside trails near Burnaby Lake Nature House</p> <p>Use pages 4 and 5 of the attached field journal to complete a biodiversity survey. Break students into groups of 2-4. Each group finds a place beside the trail to place their hula hoops then record the types and number of plants they find in their quadrant. Back in the classroom students can graph and compare their data.</p>
Wrap Up	<ul style="list-style-type: none"> • Gather as a group to share learning through the activity: A Rock and A Stick. What rocked today? What will stick?

VOCABULARY

Biodiversity	The variety of life in the world or in a particular habitat or ecosystem.
Ecosystem	A biological community of organisms interacting with each other and their physical environment.
Ecosystem engineer	A species that effects the availability of resources of other species by maintaining, modifying or creating habitat.
Functions	An activity or purpose natural to or intended for a person or thing.
Habitat	The home or environment of an animal, plant, or other organism. A habitat provides everything a living organism needs: food, water, shelter, and space.
Interconnection	A mutual link between two or more objects.
Keystone species	A species that has a disproportionately large effect on its natural environment relative to its abundance. Without it the ecosystem would drastically change.
Monoculture	The cultivation of a single crop in a given area.
Relationships	The way in which two or more objects are connected.
Roles	The job or function an animal, plant or other organism plays in an ecosystem.
Symbiotic	A mutually beneficial interaction between two different organisms.

LESSON EXTENSION

1. Take a virtual field trip (e.g. ecology, animals) through:
<https://education.microsoft.com/skype-in-the-classroom/virtual-field-trips>
2. Watch the Ted lesson: Why is biodiversity so important?
<https://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff#watch>
3. Create an imaginary creature based on the features of an imaginary habitat. Two resources to get you started:
 - a. Province of British Columbia. 2015. Grade 3 Makerspace Creature Challenge Comprehensive Lesson Plan.
<https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/contributed-resources/Biodiversity.pdf>
 - b. Use the attached worksheet to guide students before they draw their creature.

RECOMMENDED BOOKS

- [What do you do with a tail like this?](#) by Steve Jenkins and Robin Page
- [Strange beginnings](#) by Karen Merrie Needham
- [Water habitats](#) by Molly Aloian, Bobbie Kalman
- [We Are All Connected: Métis, Wetlands and Mallards](#) by Brenda Boreham, Leah Marie Dorion, Terri Mack
- [We Are All Connected: Nisga'a, Ponds and Leopard Frogs](#) by Brenda Boreham, Terri Mack, Charmaine Pea
- [Be A Pond Detective. Solving the Mysteries of Lakes, Swamps, and Pools](#) by Kochanoff, Peggy
- [Song of the Water Boatman & Other Pond Poems](#) by Sidman, Joyce
- [What do you find in a pond?](#) by Megan Kopp
- [Over and under the pond](#) by Kate Messner
- [A wetland habitat](#) by Bobbie Kalmna
- [The lifecycle of a beaver](#) by Bobbie Kalman
- [Welcome to the World of Beavers](#) by Diane Swanson
- [We Are All Connected: The Earth, Our Home](#) by Brenda Boreman
- [We Are All Connected: The Earth, We Share](#) by Brenda Boreman

Mackinnon, A., Pojar, J., & Alaback, P. B. 1994. *Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska*. Richmond, Wash: Lone Pine Publishing.

LINKS TO WETLAND FLORA AND FAUNA, RESILIENCE ACTIVITY, AND BURNABY LAKE websites accessed March 2019

Wetlands poster flora and fauna

Wetlands poster classroom activity guide
Strickwerda, Christa. 2003. Wetlands are home. A guide to Washington's wetlands poster. Washington State Department of Ecology. <https://fortress.wa.gov/ecy/publications/documents/0306033.pdf>

Common green darner
BugGuide. <https://bugguide.net/node/view/585>

Common rush
Biodiversity of the Central Coast.
<https://www.centralcoastbiodiversity.org/common-rush-bull-juncus-effusus.html>
E-Flora BC: Electronic Atlas of the Flora of British Columbia
<http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Juncus%20effusus&redblue=Both&lifeform=6>

Muskrat

Hinterland Who's Who. Canadian Wildlife Federation.
<http://www.hww.ca/en/wildlife/mammals/muskrat.html>

Northern red-legged frog

Environment Canada. 2016. Management Plan for the Northern Red-legged Frog (*Rana aurora*) in Canada [Proposed]. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. 4 pp.+ Annex. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_northern_red-legged_frog_e_proposed.pdf

Olympic mudminnow

USGS. <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=976>

River otter

Animal Web Diversity.
https://animaldiversity.org/accounts/Lontra_canadensis/
National Wildlife Federation.
<https://www.nwf.org/Educational-Resources/Wildlife-Guide/Mammals/North-American-River-Otter>

Round-leaf sundew

Biodiversity of the Central Coast.
<https://www.centralcoastbiodiversity.org/round-leaved-sundew-bull-drosera-rotundifolia.html>

Signal crayfish

E-Fauna BC: Electronic Atlas of the Fauna of British Columbia.
<http://linnet.geog.ubc.ca/efauna/Atlas/Atlas.aspx?sciname=Pacifastacus%20leniusculus>

Skunk cabbage

Richard Hebda. Skunk Cabbage: A British Columbia plant reaches across the Pacific. Royal BC Museum.
<https://curious.royalbcmuseum.bc.ca/skunk-cabbage-a-british-columbia-plant-reaches-across-the-pacific/>

Toe-biter bug

Insect Identification for the Casual Observer. Giant Water Bug.
<https://www.insectidentification.org/insect-description.asp?identification=Giant-Water-Bug>

Western painted turtle

The Reptiles of BC. BC Ministry of Environment.
<https://www.bcreptiles.ca/turtles/westernpaint.htm>

Western tiger swallowtail

Canadian Biodiversity Information Facility. Government of Canada.
<http://www.cbif.gc.ca/eng/species-bank/butterflies-of-canada/canadian-tiger-swallowtail/?id=1370403265567>

White bog orchid

MPG North. <http://mpgnorth.com/field-guide/orchidaceae/white-bog-orchid>

Yellow-pond lily

E-Flora BC: Electronic Atlas of the Flora of British Columbia.
<http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Nuphar%20variegata>

Resilience Activity

Knasiak, L. Biodiversity: What's the big deal? Better Lesson.

<https://betterlesson.com/lesson/631664/biodiversity-what-s-the-big-deal?from=search>

<https://betterlesson.com/lesson/resource/3184901/douglas-fir-card-template>

<https://betterlesson.com/lesson/resource/3184902/variety-tree-card-template>

Burnaby Lake

The Cornell Lab of Ornithology All About Birds: <https://www.allaboutbirds.org/>

Burnaby Lake Park Association website: <http://burnabylakepark.ca/>

Now in Bloom posts from the Burnaby Lake Park Association:

<https://www.instagram.com/burnabylakepark/?hl=en>