Making a difference...together

BIODIVERSITY HEROES

Educators Guide

Program at a Glance

On this engaging program, we'll discover the positive difference we can make in preserving the biodiversity of our coastal Douglas-fir forests. We begin by exploring the trail and learning about native species in the park and the vital roles they play in sustaining healthy ecosystems. We'll enjoy games and activities to discover what an invasive species is, what impacts they have on the environment, and why biodiversity is important. We'll then roll up our sleeves and participate in ecological restoration by removing invasive English ivy from the park. With guidance and a demonstration from an experienced Regional Parks Conservation Technician, we'll become 'biodiversity heroes' and make a lasting positive impact on our local environment!

In this program, your students will...

- Observe and enjoy a coastal Douglas-fir ecosystem
- Identify an interesting diversity of local native plants
- Discover what an invasive species is and what impacts they have on the local environment
- Discover the value and importance of biodiversity
- Become active stewards of the park by participating in an invasive species removal session

Curriculum Connections

Our place-based school programs directly relate to the K-5 science curricula. Below you will find some big ideas, curricular competencies and content that will be addressed on your program.

Big Ideas from BC Curriculum:

- All living things sense and respond to their environment (Gr 4)
- Multicellular organisms have organ systems that enable them to survive and interact with their environment (Gr 5)

Curricular Competencies from BC Curriculum:

- Demonstrate curiosity about the world (Gr 4)
- Observe objects and events in familiar contexts (Gr 4)
- Make predictions based on prior knowledge (Gr 4)
- Make observations about living and non-living things in the local environment (Gr 4)
- Make simple inferences based on their results and prior knowledge (Gr 4)
- Identify some simple environmental implications of their and others' actions (Gr 4)
- Experience and interpret the local environment (Gr 4 & 5)
- Identify First Peoples perspectives and knowledge as sources of information (Gr 4 & 5)
- Transfer and apply learning to new situations (Gr 4 & 5)
- Contribute to care for self, others, school, and neighbourhood through individual or collaborative approaches (Gr 4 & 5)
- Express and reflect on personal or shared experiences of place (Gr 4 & 5)
- Make observations in familiar or unfamiliar contexts (Gr 5)
- Demonstrate an openness to new ideas and consideration of alternatives (Gr 5)

Content from BC Curriculum:

- Sensing and responding: humans, other animals, and plants (Gr 4)
- Biomes as large regions with similar environmental features (Gr 4)
- The nature of sustainable practices around BC's resources (Gr 5)
- First Peoples concepts of interconnectedness in the environment (Gr 5)
- First Peoples knowledge of sustainable practices (Gr 5)

Suggested Pre-Trip Activities

- On the classroom bulletin board, have students draw pictures of the field trip topic or write predictions about what they might see.
- Create a K-W-L chart (what I **k**now, what I **w**ant to know, and what I **l**earned), and fill out the first two categories as they relate to the plant life you might see on the fieldtrip. Have students develop questions they would like to investigate.
- Show photographs of some of Vancouver Island's native plants such as Douglas-fir, arbutus, western red cedar, salal, Oregon grape, ocean spray, Nootka rose, etc.
- Show photographs of some native animals such as woodpeckers, owls, and squirrels. Make a list of what native plants each animal needs for food and habitat to survive.
- Show photographs of some common invasive plant species that you might see on your field

trip such as Himalayan blackberry, English ivy, English holly, Scotch broom, daphne (also called spurge-laurel), and yellow flag iris.

- Make a large class diagram of the seasonal lifecycles of native plants (e.g. flowers bloom in spring, berries ripen in summer, leaves fall and salmon come back to rivers in fall, etc.). What native animals rely on each resource?
- Go out on the school grounds to see what plants are there; make drawings or take photographs of them and identify them if you can. Sort them into two categories: native or invasive. (If you don't know what they are, that is OK! Categorize them and make up your own names for them until an expert can help you to identify them.) You can use free apps like 'iNaturalist' or 'Seek' to help.
- Check out the Invasive Species Council of British Columbia's learning resources including pre/post trip learning resources, virtual class visits, and more at https://bcinvasives.ca/education/
- Check out Nature Kids BC learning resources under the 'Powerful Plants' tab at Educational Resources – NatureKidsBC

Follow-up Activities

- Return to the class bulletin board to make changes in their drawings or predictions based on their new knowledge gained from the field trip.
- Revisit the K-W-L chart and fill in the "L" (What I learned). Discuss answers to their investigative questions.
- Trace food chains and webs involving the various plants they have seen (e.g. plant-mouse-owl; plant-insect-bird). Investigate how these might be disrupted by invasive species (e.g. unchecked English ivy growing up a tree trunk could kill the tree, who can no longer produce seeds eaten by squirrels and birds. Or a mat of English ivy on the ground could prevent seedlings from sprouting. When the older trees die naturally, there will be no young ones to take their place).
- Have each student choose a local invasive plant to research and write about. What environments does it colonize? What are some effects it has on local plants and animals?
- Have the class make a field guide to some of the native or invasive plants in your schoolyard. Give plant walk tours of your schoolyard to other classes.
- Discuss and learn about how First Peoples' land management practices using Traditional Ecological Knowledge help sustain and protect biodiversity: PUBLICATION-61496-Science-First-Peoples-2016-Full-F-WEB.pdf (fnesc.ca)

Background Information

Biodiversity is essential to maintain the processes that support all life on earth, including humans. We need many different plants, animals, and microorganisms to create healthy ecosystems that provide us with clean air, water, and food. Plants produce much of the Earth's oxygen, move water from the soil into the atmosphere, provide habitats for other life, and are food for many animals. We either eat plants or eat animals that eat plants. Plants also provide many of the material resources and medicines that humans depend upon.

Animals keep nutrients flowing in their ecosystems as either herbivores, decomposers or predators and the balance of predator and prey ensures that plant populations don't get decimated by herbivores or insects. Pollinators like birds, bees and other insects play a crucial role in helping plants to reproduce and survive. Many animals that eat fruit play an important role in spreading plant seeds in their scat, helping plants colonize new areas. Microorganisms like bacteria and fungi are vital for breaking materials down, creating soil, and liberating nutrients that plants need to grow.

There are many threats to biodiversity including land and sea use by human beings, species overexploitation, invasive species, disease, pollution, and climate change.

Keywords

- Biodiversity ('biological diversity'): the variety of types of living beings in the world or in a particular place, including:
    - Microorganisms, like bacteria and fungi
    - Plants, like trees, flowers, and grasses
    - Animals, like birds, fish, reptiles, insects, and mammals – including humans.
- Ecosystem: system created by the interaction of living beings with each other and with their environment.
- Native species: a species whose presence in an area is the result of only local natural evolution.
- Exotic species: a species that is non-native to an area, meaning it was introduced (either deliberately or accidentally) to an area where it doesn't occur naturally.
- Invasive species: a species that is non-native to an area and whose introduction causes, or is likely to cause, economic or environmental harm, or harm to human health.
- Ecological restoration: the process of repairing sites in nature that have been degraded

or destroyed.

- Volunteering: doing something without receiving monetary compensation in return
- Indigenous peoples: culturally distinct ethnic groups who are the earliest known inhabitants of an area and who predate European colonization.
- First Nations peoples: this term is used to describe Indigenous peoples in Canada who are distinct from Métis or Inuit.
- Traditional Ecological Knowledge: the accumulation of local knowledge Indigenous peoples have about the natural world found in their traditional environment that is acquired over hundreds or thousands of years and based in relationship to place.
- Stewardship: the job of supervising or taking care of something, like a piece of land.

Coastal Douglas-fir Ecosystems

British Columbia has been divided into 14 "biogeographic zones" based on similarities in vegetation, soils and climate. The smallest and most geographically restricted of these zones is the Coastal Douglas-fir ecosystem, which is found primarily on southeastern Vancouver Island (including at Elk/Beaver Lake and Francis/King regional parks and other areas within the Capital Regional District), as well as on the southern Gulf Islands and a narrow strip of the Sunshine Coast.

The Coastal Douglas-fir zone is in the rain shadow of Vancouver Island and Washington's Olympic Mountains. Consequently, the summers are warm and dry, and the winters are mild and wet, although drier than most other BC coastal zones. This Mediterranean-type climate creates a unique set of conditions, allowing for a diverse group of plants and animals. Within the Coastal Douglas-fir zone, Garry oak ecosystems occur in sites characterized by particularly shallow, dry and/or rocky soils. Some Garry oak meadows were maintained with controlled fire by First Nations, a practice that promoted and maintained biodiversity.

Coastal Douglas-fir ecosystems are among the most imperiled coastal ecosystems. Since they occur along the coast in regions favoured by people, they were some of the first forest types targeted for logging and cleared for urban and agricultural development. Today, very few older forest ecosystems remain in the Coastal Douglas-fir zone, and those that do are highly fragmented. In other words, they exist as isolated "islands" among a landscape altered by human development.

Coastal Douglas-fir ecosystems help to maintain biodiversity, store and sequester large amounts of carbon dioxide, help to prevent flooding by soaking up rainwater, filter contaminants in runoff, purify the air, provide forestry jobs and revenue, and provide natural areas for research, recreation and aesthetic enjoyment. Particularly near urban areas, forests are valuable for providing spongy soil and organic matter that allows rainwater to soak into the ground, where it replenishes groundwater and is naturally decontaminated as it filters through rock, soil and plant roots. Regional Parks protect some fine examples of Coastal Douglas-fir ecosystems and offer valuable opportunities to explore and learn about these habitats.

What Native Species Live in Coastal Douglas-fir Ecosystems?

About 100 species of plants are found in Coastal Douglas-fir ecosystems. Some of the common species that we may see and learn about in the Regional Parks School Program include:

- Trees such as Douglas-fir, western red cedar, grand fir, bigleaf maple, Garry oak and arbutus
- Shrubs such as salal, dull Oregon grape, huckleberry, Nootka rose, salmonberry, snowberry and ocean spray
- Herbaceous plants such as western trillium, starflower and vanilla Leaf
- Mosses such as Oregon beaked moss and electrified cat's tail
- Ferns: such as licorice fern, sword fern and bracken fern

These plants, along with fungi and the associated soil microorganisms form the structure of the forest and provide habitat and food for the great diversity of animals that live in the Coastal Douglas-fir ecosystem.

Some of the native animals found in the Coastal Douglas-fir ecosystems include:

- Large mammals such as black tailed deer; black bear and cougar, although they are often excluded from urbanized areas
- Birds, including the Pileated Woodpecker, Yellow-bellied Sapsucker, Hairy Woodpecker, Downy Woodpecker, Steller's Jay, Raven, Chestnut-backed Chickadee, Brown Creeper, Winter Wren, and Varied Thrush, all of which eat conifer seeds or wood-boring insects. Owls, swallows and chickadees also nest in cavities made by woodpeckers, while Bald Eagles rely on Douglas-fir trees to support their enormous nests
- Red squirrels, which nest in cavities created by woodpeckers, and harvest Douglas-fir cones
- Many species of bats, which roost in the spaces behind Douglas-fir bark

- Hundreds to thousands of species of insects and invertebrates, which live among the forest canopy and/or near ground level. One highly noticeable resident is the large banana slug
- Amphibians, including the western toad, Pacific tree frog, western red-backed salamander, ensatina salamander and northwestern salamander
- Ten provincially rare and endangered animal species, including the Marbled Murrelet and the sharp-tailed snake.

What Are Some Examples of Invasive Plant Species Commonly Found Here?

Himalayan blackberry *(Rubus armeniacus)* **Origin:** Armenia and Northern Iran **Description:** Up to 5m tall with canes up to 12m long that root where they touch the ground. Square, reddish stems with large thorns. Small, whitish flowers with 5 petals. Leaves grow in groups of five. **Seeds:** Up to 7,000-13,000 seeds per m^2 **Effects:** Crowds out low-growing plants and can restrict movement of large animals.	
Scotch broom *(Cytisus scoparius)* **Origin:** Europe **Description:** 1-3m tall with woody stems and small leaves. Bright yellow pea-like flowers that sometimes have patches of red in the middle. **Seeds:** Can survive up to 30 years in the soil **Effects:** Can increase intensity of wildfires, obstruct sightlines on roads, and crowd out native plants that animals depend on. Toxic to livestock.	

English ivy *(Hedera helix)* **Origin:** Europe **Description:** Long vines with waxy star-shaped leaves. Clusters of small white or yellow-green flowers that turn to black shiny fruit. **Seeds:** Spread by birds. Can also grow from pieces of stem, leaf, or root. **Effects:** Can grow as a dense mat that blocks light and suppresses native plant growth, or climbs up trees, reducing the tree's lifespan and making them more susceptible to wind damage.	
English holly (*Ilex aquifolium)* **Origin:** Europe **Description:** Tree that grows 7-10m tall with spiky, glossy dark green leaves. **Seeds:** Female trees produce bunches of red berries spread by birds (but toxic to people). **Effects:** Crowds out native plants and monopolizes water resources. Evergreen leaves don't contribute to the soil formation processes like local deciduous trees.	

Daphne/Spurge-Laurel *(Daphne laureola)* **Origin:** Europe, small region in Northern Africa **Description:** Up to 1.5m tall. Dark green, glossy, oval leaves in spiral pattern at stem top. Small clusters of fragrant yellow flowers turn to black berries. **Seeds:** Berries eaten and spread by birds but also spreads vegetatively. **Effects:** Does well in forest understories, outcompeting natives and can disrupt forest succession by preventing new tree growth. Warning: Toxic sap can cause skin rashes, nausea, swelling of the tongue, and coma.	
Yellow flag iris *(Iris pseudacorus)* **Origin:** Europe, Asia, Northern Africa **Description:** Aquatic plant that grows 1-1.5m tall on a smooth green stem. Yellow flowers with brown spots or purple veins. **Seeds:** Float on the water to help spread. Also reproduces through horizontal root systems and when pieces of root break off. **Effects:** Thick root mats can damage wildlife habitat, reduce water flow, and crowd out other vegetation. Warning: Can be toxic to humans and animals and cause human skin irritations.	

What Can We Do to Help?

Learning about invasive species and their impacts and spreading awareness about this topic is an important first step and there are many ways we can continue to help:

1) Make sure not to buy and plant invasive species in your back yards or communities. You can use the Invasive Species Council of BC's 'Grow Me Instead' campaign to help: Grow

Me Instead - Invasive Species Council of British Columbia (bcinvasives.ca)

2) Report invasive plant and animal species that you see on the Province of British Columbia's free app: Reporting invasive species - Province of British Columbia (gov.bc.ca)
3) Look out for future opportunities to participate in invasive species removal in your local community or in your school yard.

Resources

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