



Making a difference...together

# PLANT POWER

## Educators Guide

### Program at a Glance

Living things need plants to survive. By examining local plants, students discover why plants are vital in our forest ecosystems and to us. We begin with a fun and engaging introduction that teaches students the parts of a plant and their functions. Our outside plant exploration starts with a photosynthesis “magic” trick. In smaller groups, students will participate in an interactive “teaching train” to identify some of the common plants found in our local



Coastal Douglas-fir ecosystem and discover the important uses they have to humans and other animals. We will consider how we can be good stewards and help protect local plants and the animals that depend on them.

### In this program, your students will...

- Observe and enjoy a Coastal Douglas-fir ecosystem
- Identify an interesting diversity of local plants
- Explore local plants and understand how they are vital to us and other animals
- Discover the unique value that plants have in the forest ecosystem
- Evaluate the impact of our actions on plants and the animals that depend on them

### 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:

- Plants and animals have observable features (K)
- Living things are diverse, can be grouped, and interact in their ecosystems (grade 3)
- Energy can be transformed (grade 4)

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

### **Curricular Competencies from BC Curriculum:**

- Demonstrate curiosity and sense of wonder about the world
- Observe objects and events in familiar or unfamiliar contexts
- Make predictions based on prior knowledge
- Safely use appropriate tools to make observations and measurements
- Make and record simple measurements using informal or non-standard methods
- Make observations about living and non-living things in the local environment
- Experience and interpret the local environment
- Transfer and apply learning to new situations
- Make simple inferences based on their results and prior knowledge
- Identify some simple environmental implications of their and others' actions
- Represent and communicate ideas and findings in a variety of ways
- Express and reflect on personal or shared experiences of place

### **Content from BC Curriculum:**

- Biodiversity in the local environment (grade 3)
- Energy is needed for life (grade 3)
- The ways organisms in ecosystems sense and respond to their environment (grade 4)
- Biomes as large regions with similar environmental features (grade 4)

## **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 know, what I want to know, and what I learned), and fill out the first two categories as they relate to the plant life at Elk/Beaver Lake or Francis/King regional parks. Have students develop questions they would like to investigate.
- Show photographs of some of Vancouver Island's Coastal Douglas-fir forest plants that you might see on the field trip such as Douglas-fir, Arbutus, Western Red Cedar, salal, Oregon Grape, Ocean spray, Nootka rose, etc.

- Make a large class diagram of plant and flower parts and make labels of its parts (include the keywords listed in the previous sections). Have students match the labels to the parts. Play a game where a blindfolded student tries to put a plant part in the correct position, like pin the tail on the donkey (e.g. “pin the stamens to the flower”).
- 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. (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.)

## 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)
- Make a mobile of the Coastal Douglas-fir ecosystem, showing the plants and the animals found there.
- Have each student choose a local native plant to research and write about.
- Have the class make a field guide to some of the common plants in your schoolyard. Give plant walk tours of your schoolyard to other classes.

## Background Information on Plants

Life on earth depends on plants. We simply could not exist without them. 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.

There are approximately 422,000 described species of plants on Earth. Fossil evidence indicates that land plants evolved more than 450 million years ago; simple aquatic (marine and freshwater) plants were present even earlier.

Plants have the following basic traits, which distinguish them from animals:

- Plants contain chlorophyll, a green pigment found in specialized cells (chloroplasts). Chlorophyll enables plants to produce their own food- carbohydrates- by absorbing sunlight in a chemical process called photosynthesis (see below for more on photosynthesis).
- Plants have cell walls, which are made sturdy by a material called cellulose. Animals lack cell walls.
- Plants are generally rooted in one place and do not move on their own.
- Unlike animals, plants lack a developed sensory and nervous system and have no/a limited ability to sense.

### Parts of a Plant: Keywords

**Roots:** Roots originate from the lower portion of a plant and they are in the soil. They absorb nutrients and moisture, anchor the plant in the soil, support the stem, and store food. In some plants, they can be used for propagation. Carrots are just one big orange root.

**Stems:** The stem is the upper part of the plant and bears branches, leaves, flowers and fruits. The stem is generally green when young and in some plants it may later become woody and dark brown. Stems conduct water and minerals from the root to the leaves. Celery is a stem that we eat.

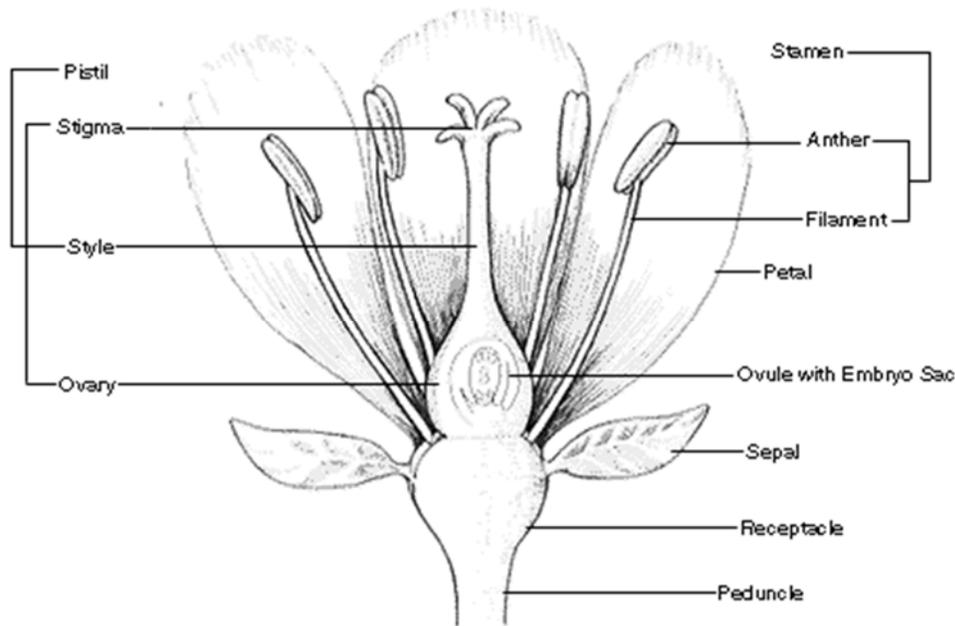
**Leaves:** Leaves are used by a plant to gather sunlight and turn it into food energy through photosynthesis. Leaves also produce the oxygen in the air that we breathe. Lettuce is a leaf that we eat.

**Flowers:** Flowers are generally the showiest part of a plant. Their colour and fragrance attract pollinators, such as insects or birds, and play an important role in the plant's reproduction. Cauliflower and broccoli are flowers that we eat.

**Fruit:** Most people think of fruits as the fleshy, edible part of a plant, such as grapes, apples, oranges and cherries. But botanically, a fruit is the seed-bearing structure of a flowering plant that is formed from the ovary after the flower is pollinated. All plants that form flowers produce fruits. Fruits include things we often term "vegetables", such as tomatoes and squash. Other fruits include nuts, the seed pods of peas (the peas are actually the seeds), and the "helicopters" of maple trees. Non-flowering plants, such as pines and ferns, do not produce fruits and instead have other structures, such as cones or spores.

**Seeds:** Seeds are found inside the fruit of a flowering plant (or inside the cone of conifers). Seeds are the reproductive unit of a plant—once they germinate they will grow into a new plant. They store energy and nutrients needed for growth.

### Parts of a Flower: Diagram and Keywords



American Museum of Natural History., "The Parts of a Flower",  
[https://www.amnh.org/learn/biodiversity\\_counts/ident\\_help/Parts\\_Plants/parts\\_of\\_flower.htm](https://www.amnh.org/learn/biodiversity_counts/ident_help/Parts_Plants/parts_of_flower.htm)

**Petals:** Modified leaves that surround the reproductive parts of a flower. They are often brightly colored or shaped in a way that attracts pollinators.

**Sepals:** The whorl of modified green leaves beneath the petals on a flower. Sepals protect the flower bud before it opens.

**stamen** – the male, pollen-producing parts of a flower. The stamen includes the anthers, which produce pollen, and the elongated portion below the anther, called the filament.

**pistil** – the female part of the flower, which receives pollen and produces seeds. The pistil consists of the stigma, style and ovary. The stigma traps pollen grains which travel through the tubular

style to the ovary, which contains the egg cells. When fertilized by the pollen, the eggs produce seeds inside the ovary.

## **Photosynthesis**

The word photosynthesis is formed from “photo”, meaning light, and “synthesis”, meaning putting together. Photosynthesis is the process by which plants produce their food- sugars (glucose) from sunlight. To make food, plants need carbon dioxide, water and sunlight. Photosynthesis occurs in the leaves of green plants. Water is absorbed by the roots and is carried by xylem tissue in the stems up to the leaves. Carbon dioxide and sunlight enter the leaves through small openings called stomata. The green pigment, chlorophyll, found in the chloroplast cells of the leaf, is uniquely capable of converting the active energy of light into a latent form that can be stored as food and used when needed. A byproduct of photosynthesis is oxygen, which is released by the leaves of the plant back into the atmosphere.

## **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 rainshadow 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 also maintained with controlled fire by First Nations.

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, 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 Lives 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, Big leaf maple, Garry oak and Arbutus
- **Shrubs** such as Salal, Dull Oregon Grape, Huckleberry, Nootka rose, Salmonberry, Snowberry and Ocean spray
- **Herbaceous plants** such as Twinflower, 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 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 animals species**, including the Marbled Murrelet and the sharptail snake.

## Resources

### Teacher References

Cannings, Richard and Sydney Cannings. British Columbia: A Natural History of its Origins, Ecology, and Diversity, with a New Look at Climate Change. Greystone Books, 2015.

Nightingale, Ann and Claudia Copley (Editors), Victoria Natural History Society. Nature Guide to the Victoria Region. Royal BC Museum Publishing. Victoria, 2012.

Penn, Briony. A Year on the Wild Side. Touchwood Editions, 1997.

Pojar, J. And A. MacKinnon. Plants of Coastal British Columbia, Including Washington, Oregon and Alaska. Lone Pine Publishing, 1994.

Suzuki, David, and Wayne Grady. The Tree: A Life Story. Greystone Books, 2007.

Turner, Nancy. Food Plants of the Coastal First Peoples. Royal BC Museum. 2011

### Student References and Storybooks

Arnosky, Jim. Crinkleroot's Guide to Knowing the Trees. Bradbury Press, Macmillan Publishing Company, 1992.

Lyons, Dana. The Tree. Illumination Arts, 2002.

Bast, Barbara. Ancient Ones: The World of the Old Growth Douglas Fir. Sierra Club, 1994.

Burnie, David. Eyewitness Books: Plant. DK Children Publications, 2011.