VanDusen BOTANICAL GARDEN | Bloedel CONSERVATORY | Vancouver Botanical Gardens Association

Ecosystem Explorers
Guided Program for Grades 3-6

Pre-trip Information for Teachers

Program Description

Within the tranquil beauty of VanDusen exists a complex and intimately-connected ecosystem. Investigate how native plants interact with other organisms in BC's environment, exploring interdependence hands-on with focused observation and basic tools. Students unearth the vital role decomposers play during a soil search, as well as collaborate to construct a food web.

Learning Objectives

Students will:

1. Recognize how different components of an ecosystem are interconnected
2. Document observations and data on ecosystem interactions
3. Observe the biodiversity and complexity found within VanDusen Garden's local environment

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Curriculum Connections

Grade 3

BIG IDEAS

- Living things are diverse, can be grouped, and interact in their ecosystems

CURRICULAR COMPETENCIES

- Make observations about living and non-living things in the local environmental
- Experience and interpret the local environment
- Demonstrate curiosity about the natural world
- Make predictions based on prior knowledge
- Collect simple data
- Safely use appropriate tools to make observations and measurements

CONTENT

- Biodiversity in the local environment
- Energy is needed for life

Grade 4

BIG IDEAS

- All living things and their environment are interdependent

CURRICULAR COMPETENCIES

- Make observations about living and non-living things in the local environment
- Experience and interpret the local environment
- Demonstrate curiosity about the natural world
- Make predictions based on prior knowledge
- Collect simple data
- Safely use appropriate tools to make observations and measurements

CONTENT

- The ways organisms in ecosystems sense and respond to their environment
- Features of biomes

Grade 5

CURRICULAR COMPETENCIES

- Make observations in familiar or unfamiliar contexts
- Identify questions to answer or problems to solve through scientific inquiry
- Make predictions about the findings of their inquiry

- Choose appropriate data to collect to answer their questions
- Observe, measure, and record data, using appropriate tools, including digital technologies
- Experience and interpret the local environment
- Express and reflect on personal, shared, or others' experiences of place

CONTENT

- Interconnectedness in the environment

Grade 6

CURRICULAR COMPETENCIES

- Make observations in familiar or unfamiliar contexts
- Identify questions to answer or problems to solve through scientific inquiry
- Make predictions about the findings of their inquiry
- Choose appropriate data to collect to answer their questions
- Observe, measure, and record data, using appropriate tools, including digital technologies
- Experience and interpret the local environment
- Express and reflect on personal, shared, or others' experiences of place

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Preparing Students for their Visit to a Botanical Garden

Visiting a botanical garden
A botanical garden is a place of beauty, where students will get to see and learn about a variety of plants. Have a discussion about what the students think a botanical garden is and what they might be able to see at a botanical garden. Please refer to our General Pre-visit Information Package for more.

Garden Code of Conduct
Refer to the Code of Conduct in the General Pre-visit Information Package and discuss with your students why it is important not to pick any living plants in the Garden:

- If you pick a living plant, it can no longer grow or be enjoyed by other visitors to the Garden
- Plants and parts of plants, such as seeds, cones and leaves are all food sources for wildlife or a home for insects.

Background Information

The Producers

Producers are the beginning of a simple food chain, as they are able to produce their own food using the sun's energy. Through the process of **photosynthesis**, plants make simple sugars, which can be modified into starches, proteins, fats and other compounds in plants.

There are also photosynthetic protists that start food chains. You might find them floating on the surface of the ocean acting as food for small unicellular animals.

The Consumers

Consumers are the next link in a food chain.

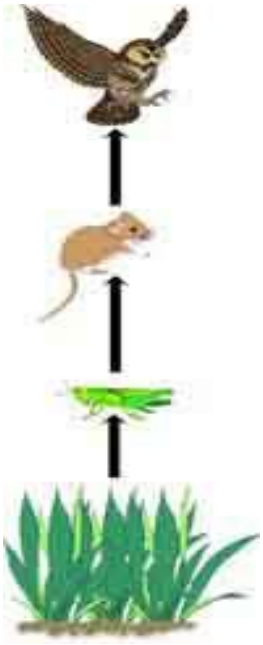
- **Primary consumers** (also called **herbivores)** eat plants.
- **Secondary consumers** (also called **carnivores)** eat the primary consumers. Carnivore means "meat eater."
- **Tertiary consumer** (that means third level). These are consumers that eat the secondary and primary consumers. A tertiary consumer could be an owl that eats a mouse.
- There are also consumers called **omnivores**. Omnivores can either be secondary or tertiary consumers. Humans and bears are considered omnivores: we eat meat, plants, and just about anything.

The Decomposers

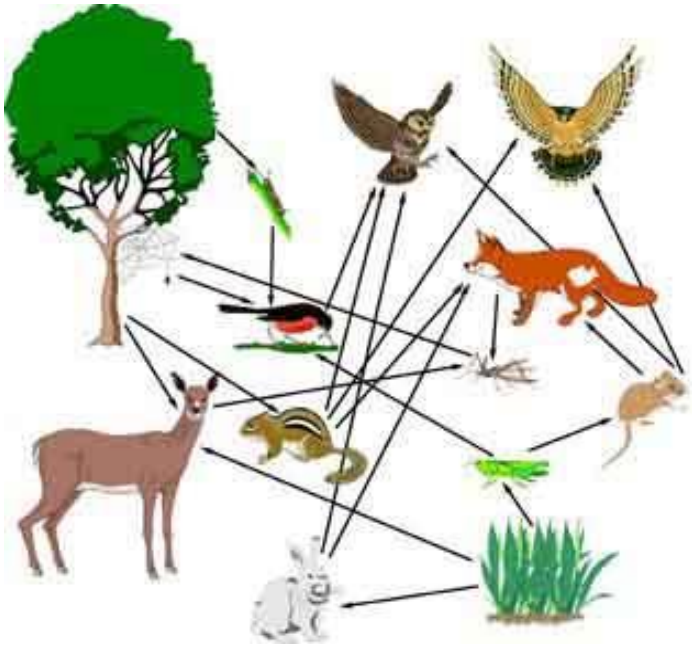
The last links in the chain are the **decomposers**. When plants or animals die (or drop leaves or waste), decomposers break down the dead 'stuff' and return the nutrients to the soil. They are the ultimate recyclers, making those nutrients available for plants to use again. Decomposers include the FBI (fungi, bacteria, and insects)

Food Chains and Food Webs

- All life depends on the ability of green plants to use the energy from the sun to synthesize simple sugars from carbon dioxide and water (**photosynthesis**)
- **food chain:** a simplified way of showing energy transfer between organisms in an ecosystem
- **food web:** describes interconnection of food chains in an ecosystem - gives a clearer picture of how plants and animals are related to each other



FOOD CHAIN
(just one path of energy)



FOOD WEB
(everything is connected!)

Vocabulary

Biodiversity – bio = life, and diversity = variety. Biodiversity is the variety of living organisms in the world or a specific region or ecosystem. This encompasses habitat diversity, species diversity and genetic diversity.

Carnivore - an animal that eats other animals

Consumer - any organism that cannot produce its own food and must get its energy by eating (consuming) other organisms

Deciduous – a plant having leaves/foliage that fall off seasonally, as a way to survive weather conditions such as cold or drought

Decomposer - organisms such as fungi, bacteria and insects that feed on dead material causing the chemical breakdown of the material

Detrivore - organisms that recycle detritus (decomposing organic material), returning it into the food chain. Earthworms are well-known detrivores, eating rotting plant leaves and other debris

Ecosystem - a community of plants, animals, and microorganisms that interact with each other and with the physical environment

Evergreen – plants and shrubs that hold their leaves throughout the year

Food Chain - the sequence of organisms in which each is food for the next organism in the sequence (ie, grass-mouse-snake-hawk)

Food Web –the complex and interlocking series of food chains

Habitat - the natural home of a plant or animal

Herbivore - an animal that eats only plant material

Native species- A plant or animal that is part of the balance of nature that has developed over hundreds of thousands of years in a particular region or ecosystem.

Omnivore - an animal that eats both plants and other animals

Photosynthesis - the process of using energy in sunlight to convert water and carbon dioxide into carbohydrates and oxygen

Predator - an animal that eats another animal for food

Prey - an animal that is hunted or consumed for food by another animal

Producer - any organism that is capable of producing its own food, usually through photosynthesis

Pre-visit activities to prepare your students for the program

These interdisciplinary activities are designed to integrate, science, language arts and art in preparation or as a follow-up to your visit to VanDusen.

RADICAL RESEARCH

- Review internet research guidelines (if necessary) - i.e.: What are reliable sources for information? Some suggested sites are:
    - WHAT EATS? A food web website for kids: http://www.whateats.com
    - National Geographic for Kids: http://kids.nationalgeographic.com
- Assign research subjects to students individually or in pairs. These are some of the plants and animals they will talk about during their field trip:
    - Douglas-fir, vine maple, salal, salmonberry, oceanspray, yellow-spotted millipede, garden centipede, sow bug/woodlouse, spring tail, Pacific banana slug, red earthworm, swallowtail butterfly, spotted towhee, Anna's hummingbird, dark-eyed junco, black-capped chickadee, sharp-shinned hawk, barred owl, Northwestern deermouse, red squirrel, raccoon, coyote, black bear.
- Give each student an index card for their facts
    - a) students should first write the information they discover in a notebook or other piece of paper
    - b) then write it in their own words on the index card
- Students present the research to the class: Have all students with the same subject go up to the front at the same time. Alternate telling the class their facts. Any questions from the class?

Extension ideas:

- include an illustration
- have each student create an info sheet for their subject. Put all the sheets together, and bring them on your field trip at VanDusen for reference
- more detailed research project on the ecology of their chosen subject.

SMARTboard LESSONS

Do you use an interactive whiteboard? If so, here are some SMARTboard lessons that can be downloaded and used in the classroom in order to introduce or reinforce specific terms and concepts that students will come across during their visit to VanDusen.

Energy in the food chain

http://exchange.smarttech.com/details.html?id=53a3c98c-287c-439c-acb0-da23fe904bfb

- This lesson introduces and discusses the components of an ecosystem through the use of interactive activities. It additionally touches upon the flow of energy through a food chain, as well as how this all relates back to humans.

Ecosystem – Food chain

http://exchange.smarttech.com/details.html?id=46fe0c66-055e-4c72-a6d2-62aff8944a9b

- This resource is broken down into two sections: food chains and food webs. It provides students with a variety of different matching and sorting activities, and promotes students to think critically about the consequences of an organism being removed from an ecosystem.

Habitats
http://exchange.smarttech.com/details.html?id=595d80ba-cb09-4e2a-bed3-ce62a7c5aa58

- This lesson focuses on the definitions and roles of decomposers, producers, and consumers, and encourages students to test their understanding through two activities.

FOREST FLORA AND FAUNA ALPHABET

Learning Objectives
Students will identify non-living (abiotic) and living (biotic) features that commonly occur in a forest ecosystem, and create a forest mural.

Procedure
Students can do this activity individually, in pairs, or as a whole class. Ask the class to name a forest feature for each letter in the alphabet. Prompt them by reminding them of categories such as plants, animals, birds, abiotic components. Examples:

A alder, ants, air, animals, aphids, algae
B birch, bullfrog, butterfly, bog, beaver
C cedar, chickadee, caterpillar, consumers, cattail
D deer, duck, dam (beaver), decomposers
E eggs, elk, earth, earwig, evergreen
F fawn, fish, frogs, fox, fungi
G groundhog, geese, grass
H heron, honeybee, hornet
I icicles, ice, insects
J jackrabbit, juniper, jay
K kingfisher, killdeer, knot, kinglet
L light, lily pad, leaf, logs, lake, lichen
M mice, minnow, maple, mushroom, marsh
N nuthatch, nest, nettle, nurse log
O oak, oceanspray, owl, otter
P pine, poplar, pond, porcupine, producers
Q quacking ducks, quail
R rock, rain, river, roots, robin
S stream, sun, salamander, snake, sap, soil
T trees, thrush, toad, trout
U ungulate, underwater
V vole, valley, vine, vixen, vultures,
W water, wind, worms, woodpeckers, web, woodbugs
X xylem, xeric, xerophyte
Y yellow warbler, yellow cedar
Z zebra mussel, zoobenthos, zones

FOREST FLORA AND FAUNA ACTIVITY EXTENSIONS

Giant Forest Mural

1. **Create a forest habitat by making a giant mural.**
   Each student will make individual features, glue them on, and label them. Tape enough mural paper to the wall so that students can comfortably fit plants, animals and other features onto the habitat.

2. **Students should label their features** by using a strip of white paper and gluing it on the feature. Quick students can make more than one feature.

3. **Once features and labels are ready**, have students tack them in different locations before everyone glues them into final position. Near completion, stop the activity and have students analyze the mural. Discuss if anything from the list is not represented or under-represented, and observe the great variety of life displayed.

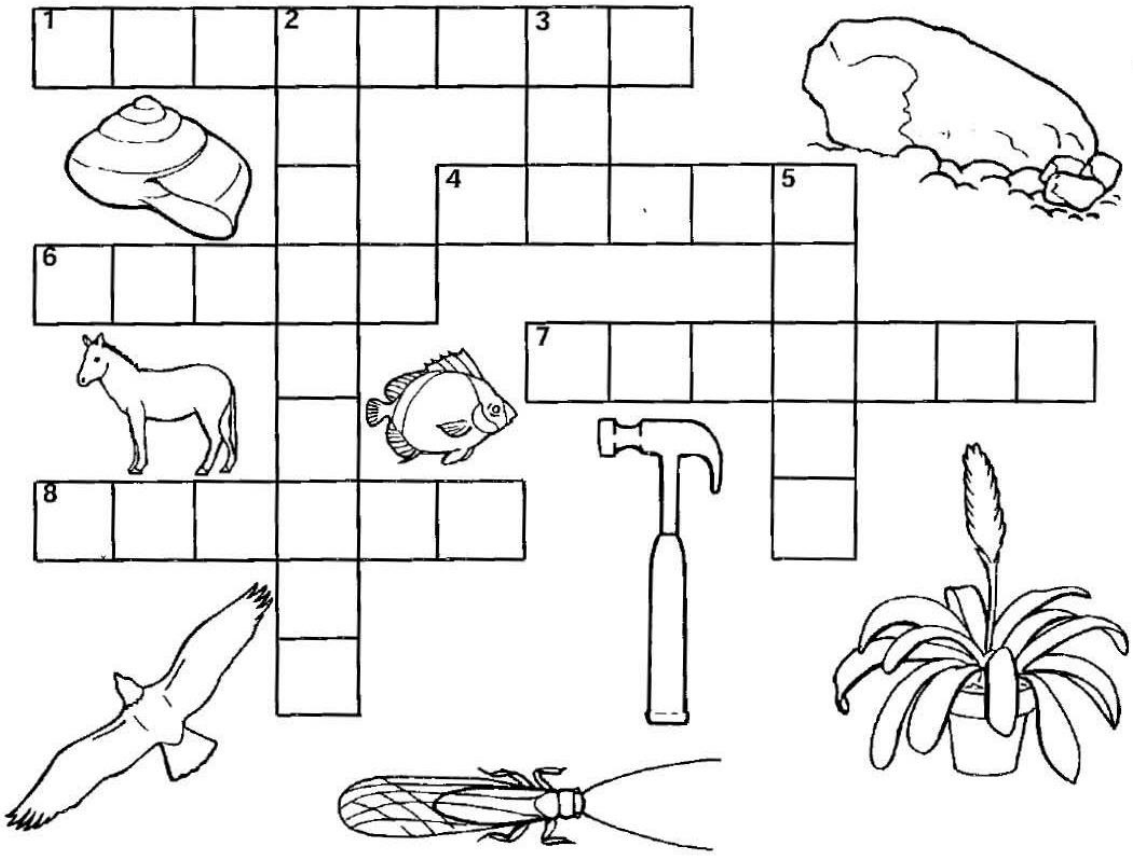
Extended Discussion

How do the worlds' forests affect me? How do I affect them?

In groups, or as a class, have students discuss how they knowingly—and unknowingly—interact with forest ecosystems. For example, forests can provide opportunities for recreation, inspiration, and employment, and many items we use every day are manufactured using wood materials.

• *What would it be like if there were no trees or forests? How would our lives be different?*
• *In what ways do we depend on forest ecosystems?*

REVIEW OF LIVING AND NONLIVING THINGS



solid
grows
liquid
structure
biology
air
physical
group

ACROSS

1. Rocks are nonliving, _____ forms of matter.
4. A living thing _____ during its lifetime.
6. You _____ things when you classify them.
7. The science of living things
8. Matter that takes the shape of its container—it flows

DOWN

2. The arrangement of parts of an organism
3. A mixture of gases needed by plants and animals
5. Anything that has a definite shape or form.

Credit: Discover! Classification, Milliken Publishing Company, 2000

Name: _____

Producers and Consumers

A **producer** is a living thing that makes its own food from sunlight, air, and soil. Green plants are producers who make food in their leaves.

A **consumer** is a living thing that cannot make its own food. Consumers get their energy by eating food. All animals are consumers.

A **decomposer** is a living thing that gets energy by breaking down dead plants and animals. Fungi and bacteria are the most common decomposers.

Tell whether each living thing below is a *producer*, *consumer*, or *decomposer*.

a. apple tree - _____

b. hawk - _____

c. mushroom - _____

d. carrot - _____

e. dragonfly - _____

f. bamboo - _____

g. cougar - _____

h. bacteria - _____

i. daffodil - _____

j. pigeon - _____

k. snake - _____

l. catfish - _____

ANSWER KEY

Producers and Consumers

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g. cougar - **consumer**

h. bacteria - **decomposer**

i. daffodil - **producer**

j. pigeon - **consumer**

k. snake - **consumer**

l. catfish - **consumer**

Additional Resources

Books:

- *Food Chains and Webs: From Producers to Decomposers (2004)* by Louise & Richard Spilsbury
- *Pass the Energy, Please! (1999)* by Barbara Shaw McKinney
- *The Wolves Are Back (2008)* by Jean Craighead George

Videos:

- "Ecosystems": http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/ecosystems.htm
- "Food Webs": http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/food-webs.htm
- "The Dirt on Decomposers": https://www.youtube.com/watch?v=uB61rfeeAsM

Websites:

- "Canadian Geographic"**:** http://www.canadiangeographic.ca/kids
- "Biodiversity of BC": http://ibis.geog.ubc.ca/biodiversity/

Flash Games:

- "Food Webs": http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/line_experiment14.swf

- "Producers, Consumers, Decomposers Game": http://www.sheppardsoftware.com/content/animals/kidscorner/games/producersconsumersgame.swf

- "Make a Mangrove: Ecosystem Game" http://www.pbslearningmedia.org/resource/plum14.sci.life.makemangrove/make-a-mangrove-an-ecosystem-game/

- "Food Chains": http://www.iknowthat.com/ScienceIllustrations/foodchains/science_desk.swf