Science Unit: ***Growing Plants***

Lesson 5: ***Contrasting Landscapes, UBC Farm Field Trip***

School Year:	2007/2008
Developed for:	Charles Dickens Elementary School, Vancouver School District
Developed by:	Shona Ellis (scientist), Paula Naylor and Susan Garber (teachers)
Grade level:	Presented to grades 3, 4, 5; appropriate for grades 2 – 7 with age appropriate modifications.
Duration of lesson:	6 hours
Notes:	This is a day-long fieldtrip to UBC Farm (South Campus of the University of British Columbia). Forty students can be broken into two groups and can alternate between the two sites: UBC Farm and the adjoining Agroforestry Trail (morning and afternoon). UBC Farm staff do the agricultural component (school program). Appropriate clothing is to be worn.

Objectives

Elementary school students and teachers explore agricultural and forest landscapes. They will dirty their hands in the soil, find out where our food comes from and how it is grown, be introduced to basic plant structure, meet the organisms that live in our local forest, and investigate and compare the ecology of these landscapes.

Background Information

One 2 hour session will be agriculture-based activities (UBC Farm coordinates this portion). The other session is done in the Agroforestry trail of the UBC Farm. The students will have the opportunity to see how crops are grown. The importance of soil development, . Other activities include chickens, bees, composting etc.

Farm Component: Activity/game stations will be set up around UBCFarm for small groups. Examples include: how food is grown, parts of plants we eat, what it means to be organic, soils (importance of structure, texture, worms, compost, and pests), interactive reading of life-cycle book based on a pumpkin, source to product, bees and pollination, chickens, picking a salad, etc

Forest Component: After lunch the class will meet at the trail-head. There will be a short discussion as a class about what the students did and saw at the farm. The class will be broken down into groups of 8-10. One group at a time (10 minute intervals) will head down the trail. The leaders of the groups waiting to begin will continue the discussion on the agricultural landscape vs. the forest and the organisms that live there. There are stations along the trail. If there are enough volunteers then each station (or a set of stations) can have a designated guide. Otherwise the group leader will give the station lesson. The station topics will depend on when you visit. The trail should be visited a few days before the field trip.

Vocabulary

agriculture	Production of food through farming.
apiary	A place where bee hives are maintained.
bark	The outer layer of woody stems and roots.
biodiversity	The diversity of all life from the genetic level to global.
carnivore	An organism that gains it nutrition from animals.
commensalism	Symbiotic interaction where one organism benefits and the other is unaffected.

compost	Decaying organic material (decomposition often facilitated by worms).
cone	In conifers, a structure which contains pollen and eggs.
conifer	A type of gymnosperm that bears cones. Most have either needle- or scale-like leaves and are evergreen.
epiphyte	A plant that lives on another plant and derives moisture and nutrients from the air.
fern	A spore-producing rhizomatous plant that has leaves that develop from fiddleheads.
flower	The reproductive structure of flowering plants that is made up of sepals, petals, stamens, and pistil(s).
flowering plant	A plant that produces its seeds inside an ovary.
frond	The leaf of a fern.
forest	An ecosystem that consists of a dense growth of trees with other plants.
fungus	A heterotrophic spore-producing organism that is an important decomposer.
hebivore	An animal that gains its nutrition from plants.
lichen	A symbiotic association between fungi and either a green alga or a blue-green bacterium.
moss	A spore producing plant with a dominant gametophyte generation and spirally arranged leaves.
mutualism	A symbiosis where both symbionts benefit.
omnivore	An animal that gains nutrients from plants and animals.
parasitism	A type of symbiosis in which one symbiont benefits to the detriment of the other.
pollen cone	A cone that produces pollen.
pollination	Pollen transfer from anther to stigma.
rhizome	Underground (or horizontal) stem.
seed cone	A cone that produces eggs and then seeds
soil	Top layer of much of the earth's surface made up of eroded rock, organic material, fungi, and bacteria.

Materials

- handlenses
- exercise book (blank pages for drawing and journaling)
- pencils

In the Field

Introductory Discussion

1. General Introduction:
    - Leaders from UBC Farm will introduce themselves and the UBC Farm
2. Explain the day to the students
    - Farm activities in the morning
    - Lunch

- Forest activities in the afternoon

3. Safety guidelines:
   - Students must stay together; if they need to use the washroom, must be accompanied by adult
   - Care must be taken on trails (brambles are sharp).

Science Activity:

Part 1 – Farm
- UBC Farm staff have a ready-made program for elementary school students

Part 2 – Forest

Introduction at Trail Head (with scientist and group of science undergraduate student volunteers)
- Discuss how the farm differs from the forest
- What did the land look like before it became a farm?
- Do they think that there will be more or less types of organisms in the woods?
- What are some impacts of agriculture to the land? (May discuss agricultural practices – depends on what comes up duing Farm component)
- What do they expect to see?

Station1 : Bracken Fern (*Pteridium aquilinum*)– review general fern structure and reproduction
- world's most widespread fern

Structure:
- rhizome = underground stem
- leaf – gigantic!
- Can you see any other species of ferns?

Reproduction
– spores – ask the kids if the spores they plated last session are doing anything
- remind them that they will grow into a teensy little plant that will produce the eggs and sperm
- the egg gets fertilized and then becomes the big fern they see.

Uses by people:
- First Peoples of B.C. used this plant for food (rhizomes) which were cooked either in pit ovens or over fires
- used fronds to layer in pit ovens (underground)
- made thread from fibres in the rhizome
- shouldn't go around chomping on ferns – toxic! Except for ones you get at the store (not native around here)

Station 2: Spittle (or spit) Bugs
- not true bugs
- the spit or spittle bug produces a foamy froth which it then sits inside protected from predators and also lays eggs here.
- It usually forms the "spit" at a joint between the stalk and a branch of a plant.
- There the bug resides and inserts its proboscis in order to suck the plants juices (sap)
- Water from the plant sap is excreted as watery feces, to which they add a thickening secretion and blow air bubbles into. The air bubbles produce a froth that builds up to form a large mass, which eventually begins to condense very slowly.
- The insects are generally not numerous enough to cause any real problems
- Using hand-lenses students can look in the spittle for the bug, which may be either in adult form (with wings) or larvae (without wings)

Station 3: Diversity

- Ask students how many different types of plants they see?
(ferns, moss, conifers, flowering plants)
- point out the cool plants (electrified cat-tail moss, palm tree moss, big leaf maple…….)
- most diversity in the moss and the flowering plants, although the forest has many conifers there are only a few species.

Where are they living?
- on ground (soil)
- on rock (trail-head)
- on other plants = epiphyte (e.g. licorice fern)
- on dead plants

Station 4: Licorice Fern (*Polypodium glycyrrhiza*)
- can take hold by virtue of the moss mat on the tree (anchorage and maintains moisture) – we will have a piece ready for you to demonstrate the rhizome.
- called licorice root because of its licorice taste. It is very very sweet (chemical glycyrrhicin is much sweeter than sugar)
- First People of B.C. used it as a flavour (chewed on rhizomes, used to sweeten bitter medicines) also was an important medicine itself for colds and sore throat

Types of interactions – when organisms live in intimate association (symbiosis):
parasitic – one benefits the other is harmed (some fungi)
mutualistic – both benefit
commensalistic – no harm either way

Good example of mutualism is pollination – bees and flowering plants

Station 5: Oyster mushrooms (also turkey tails)
- discuss the importance of bacteria and fungi
– decomposition is a very important process – nature's recycling system (demonstrate some soft wood)
- we are actually looking at the spore-producing structures, the most important part of the fungus is growing in the soil (or wood or other substrate)
- fungi are made up of long threads that grow <u>through</u> their food, secreting enzymes and then absorbing the breakdown products – therefore they also release nutrients for other organisms to benefit from .
- Students can use their hand lenses to examine

Station 6: Slime Mold
- Students can use their hand lenses to examine
- What we are seeing is the spore-producing structures
- It is not a fungus at all
- The organism spends most of its time as one giant cell that creeps around engulfing bacteria and small particles - giant amoeba

Station 7: Big Red Cedar (*Thuja plicata*)
- ask what type of plant this is (conifer)
- general structure: roots, stems, leaves (scales)
- reproductive structures (get them to find seed cones at the base of the tree) – ask where pollen comes from (small cones may or may not be evident)
- bark – protects the inside of the tree

Importance to First Peoples:
- bark had many uses including clothing (fibrous)
- wood – important for canoes, poles, house planks, etc
– (Pojar and McKinnon – good source of info)

Station 7: Big Leaf Maple Clearing
All groups will meet here. The first groups to arrive remain in groups and continue the discussion on the differences between the forest landscape and the farm. Once all groups have arrived everyone will share as a group what they think about the contrasting landscapes.
- Why are both landscaped important?

Stop and Listen
- birds? frogs? – ignore traffic

Who Lives in the Woods?
- Each of leader will take a small group on a "treasure" hunt around the clearing (4-5 students per group)
- Students will write down (maybe draw depending on time) the different organisms (or evidence of organisms such as scat, holes, etc) that they find (insects, slugs, etc)
– When recording the "plants" they should just write down the group they belong to: moss, conifer, flowering plants, fern, lichen
    - The flowering plants can be broken into smaller groups (shrub, tree, etc)

Meet as big group to share with the rest of the class (include some animals that are common to the area – coyotes, frogs)

Break up into smaller groups to construct food webs in activity book
- go over carnivore, omnivore, and herbivore
- The easiest way to do this is have them write the names of the plants in a row along the bottom and the carnivores in a row at the top, decomposers, herbivores, and omnivores scattered around in between. If they just have a few in each category it will make it simpler. Then they will draw an arrow from an organism to what eats it…..voila! a food web!

Heading back down the trail:
Each leader will guide a small group of students out of the woods. There will be more to talk about along the trail (will depend on how much time is left and what is along the way):
- big old stump with springboard notches (forestry activities)
- decomposing animal (bird)
- toxic plants such as foxglove (plant defenses)

References

4. <http://www.landfood.ubc.ca/ubcfarm/> UBC Farm Website. Accessed August 26, 2008.

5. Pojar, Jim and Andy MacKinnon (eds.). 1994. Plants of the Pacific Northwest coast. Vancouver, BC: Lone Pine.