



SCIENTIST IN RESIDENCE PROGRAM™

Science Unit: Fossils

Lesson # 2: Field Trip to Stanley Park

School Year: 2015/2016

Developed for: George T. Cunningham, Vancouver School District

Developed by: Kate Gregory (scientist); Jodi Carson and Craig McNeil (teachers)

Grade level: Presented to grade 5-7; appropriate for grades 3-7 with age appropriate modifications

Duration of lesson: 3 hours (less with modifications); can be split into 2 or more shorter field trips

Notes: ****Before the field trip, use local tide charts to pick a day/time with a relatively low tide.**

This field trip can be run at any time during a fossils unit, with modifications. Only the stump observation exercise is specific to Stanley Park; the other three parts of the field trip, namely the intertidal walk, pebble hunt, and forest litter examination, could be undertaken at any shoreline or forest site.

Objectives

1. Review important concepts in geology, biology, and ecology, which are relevant to the study of fossils.
2. Observe a modern intertidal and forest environment
3. Examine modern beach organisms and learn about invertebrate groups
4. Distinguish between different rock types in beach pebbles
5. Examine modern forest trees and leaf litter, and think about what might become a fossil.

Background Information

The study of fossils is interdisciplinary, meaning that it draws on knowledge from more than one branch of science. To understand fossils, students will need to integrate knowledge from geology, chemistry, biology, and ecology. A field trip to the beach and forest is a fun way to review important concepts that will help students understand the the fossils they will examine later in the unit.

This field trip includes guided explorations on the beach and in the forest near Second Beach in Stanley Park. There are 4 separate activities described below (printable worksheets and ID sheets are provided for each:

1. Invertebrates living in the intertidal zone (Second Beach)
2. Beach pebbles (Second Beach)
3. A Western redcedar nursery stump (Rose Garden)
4. Forest floor (Forest west of Rose Garden)



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Vocabulary

Intertidal zone:	The zone between the highest high tide and the lowest low tide
Invertebrate:	An animal without a backbone; about 97% of animal species
Habitat:	Natural home or environment of a plant or animal
Organism:	A living thing
Plant Litter:	Fallen plant material on the forest floor
Biodiversity:	Variety of life in a particular environment

Materials

- Sturdy, water-resistant shoes with grip (no flip flops)
- Weather appropriate clothing (layers, protection from exposure to sun and/or cold)
- Clipboards for handouts
- Small buckets or yogurt containers for examining invertebrates
- White napkins

Field Trip

Introductory Discussion

1. Before the field trip, introduce the goals of the field trip and discuss what students should bring. (Slide show we used is available [here](#).)
2. Discuss safety, expectations and respect for life. (It's wonderful to send students to explore natural spaces, however, expectations for behaviour should be very high.)

Rules/Safety/Respect for Life:

- Watch where you step - rocks, seaweed and logs can be extremely slippery.
- As much as possible, do not step on living things (including barnacles)
- If you lift a rock or log with plants or animals on it, move it GENTLY and put it back in its *original* position
- If you hold an animal or plant, handle it GENTLY or put it in your bucket to examine and put it back where you found it. Do not force or pry anything off the rocks.
- Don't remove anything from the beach or forest.
- Respect for life is essential - one class can do a lot of damage to a natural space very quickly. Leave nature as you found it (or better!)
- Don't touch any garbage unless you are wearing gloves or using tongs.
- Always wash your hands before eating, especially after handling animals.
- Stay within established boundaries
- Use the buddy system
- Other instructions, as required



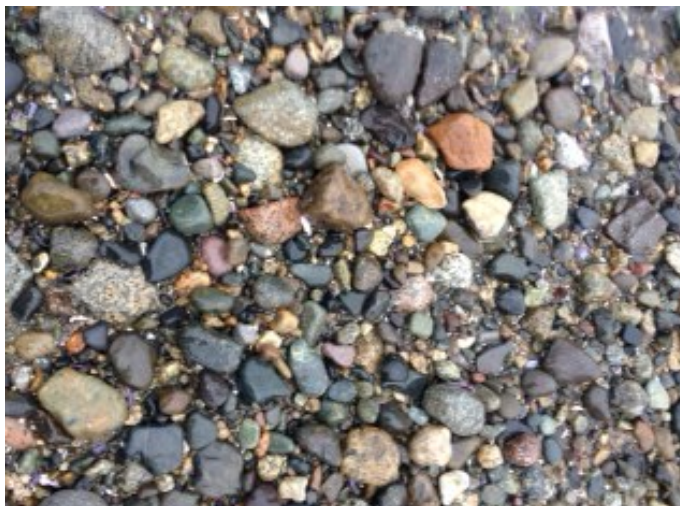
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Field Trip Detail:

1. **Intertidal invertebrate study** (beach area just south of playground)
 - a. Split students into groups of two. Tell them to take 45 min to find and identify as many different organisms as they can.
 - b. Give students: the ***Intertidal Organisms - Quick Guide*** (printable below; the intertidal pamphlet produced by *Nature Vancouver* (see Bibliography); or any intertidal ID guide of your choice.
 - c. For older students (and if it is not raining), have them fill out the **Biodiversity Survey** worksheet (printable below).

2. **Beach pebble study** (north of Second Beach Pool)
 - a. Give students a Rock ID Worksheet. They will need either the ID sheet and chart (SRP_Fossils_Lesson 2_RockWorksheet), or a copy of “Field guide to the identification of pebbles” (see Bibliography)

 - b. Most pebbles on Vancouver beaches are igneous and metamorphic.
 - **Igneous**: black (basalt), black and white (granite), light grey or pink (andesite)
 - **Metamorphic**: green (metavolcanic), striped (gneiss, though also might be sandstone). The glassy looking rock can either be a piece of quartz (mineral) or quartzite (metamorphic rock).
 - Take a look at the greenish rocks with a striped texture in the intertidal zone or in the cliffs along the seawall; these are **sedimentary rocks**, and in places contain leaf fossils and coal (the coal of Coal Harbor)





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3. **Nursery Stump Study** (Large nurse stump in Rose Garden, to west of Pipeline road)

- a. Travel to the Stanley Park Rose Garden and find the large nurse stump near the road.
- b. Information for the teacher:

This Western red cedar stump is a remnant of the old growth forest that existed in Stanley Park before European settlement. The tree was approximately 600 years old when it was cut down. The loggers used a springboard technique to cut the tree; the students will be able to see the notch from the spring board (see photo above). You can print a photo of loggers using springboards (see Bibliography). Since being logged, a new Western red cedar has established in the stump.

- c. Ask students to practice their observation/inference skills (Lesson 1 in this unit) by thinking about the history of this unusual tree.
- d. Have them use the handout, and they can use the tree ID guide (SRP_Fossils_Lesson 2PlantID) to identify the trees.

4. **Forest Floor** (In forest to the west of Rose Garden)

- a. Ask students to complete: **Worksheet: Observing the Forest Floor**.
- b. They can use the **Stanley Park Plant ID Guide** for this activity.



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Closure Discussion

1. What type of animals were most common in the intertidal zone?
2. Do you think any of these animals will become fossils? What happens to a clam, for example, if it dies?
3. What type of pebbles are most common on the beach? What type of rocks are along the seawall? Which rocks would you be more likely to find rocks in?
4. Do you think the nurse stump will become a fossil?
5. What about the leaf litter in the forest? What happens to a leaf when it falls off a tree?

References

1. Byers, Sheila. 2009. Explore the Rocky Shore at Stanley Park. Vancouver Natural History Society. Online version: <<http://naturevancouver.ca/sites/naturevancouver.ca/VNHS%20files/4/>> Nature_Vancouver_Intertidal_Pamphlet.pdf [intertidal ID guide]
2. Harbo, Rick M. 2011. Whelks to Whales: Coastal Marine Life of the Pacific Northwest. Harbour Publishing.
3. Van der Flier Keller, Eileen. 2006. A Field Guide to the Identification of Pebbles. Harbour Publishing. Online version: <http://www.pdac.ca/pdf-viewer?doc=/docs/default-source/publications---news-activities/060220-pebble-guide.pdf>
4. <<http://www.dairiki.org/tides/daily.php/van>> [Vancouver tide chart]. Accessed November, 2015.
5. <<http://www.env.gov.bc.ca/bcparks/conservelifeattheedge.pdf>> Life at the Edge. BC Parks [Intertidal pamphlet]. Accessed November, 2015.
6. <<https://www.for.gov.bc.ca/hfd/library/documents/treebook/index.htm>> Tree Book: Learning to Recognize Trees of British Columbia. Ministry of Forests, Lands, and Natural Resource Operations. [Tree ID guide]. Accessed November, 2015.
7. <<http://www.amnh.org/our-research/center-for-biodiversity-conservation/publications/general-interest/biodiversity-guides/life-in-the-leaf-litter>> Johnson, Elizabeth A., and Catley, Kefin M. 2002. Life in the Leaf Litter. American Museum of Natural History. Accessed November, 2015.
8. <<http://www.miss604.com/2013/04/archives-photos-of-the-day-tree-felling-using-spring-boards.html>>Rebecca Bollwit. Archive Photos of the Day: Tree Felling Using Springboard. [archives photo of springboard logging in the Lower Mainland] Accessed November, 2015.

Extension of Lesson

1. Make a class collection of rocks for the students to examine more closely in the classroom. These can be returned to the beach when the students are finished.
2. Back at school, teach students how to press leaves and make a class herbarium. Students could identify plants in the schoolyard or local park.



Biodiversity Survey Intertidal Zone

The **intertidal zone** is the beach that is located between the high tide line of seaweed and low-tide line of the ocean. It is an extreme environment with twice daily changes in temperature, moisture level, salt level, and wave action.

1. Find different **animals and seaweeds** living in the intertidal zone.
 - a. **Identify** each organism using your identification guide.
 - b. Write its **name** on the chart below.
 - c. Record its **habitat**
 - Did you find it closer to the high tide line of seaweed (upper intertidal) or to the ocean (lower intertidal)?
 - Did you find it living under a rock, clinging to a rock, in the sand etc..

Organism	Habitat	Organism	Habitat

2. Examine some of the **empty shells** in the intertidal zone. Think about what happens to shells after an organism dies. Do you think any of these shells might eventually become fossils?



Intertidal Organisms Quick Guide

Animals:



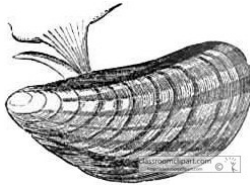
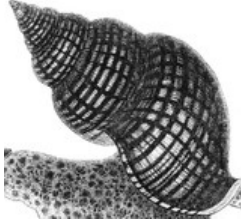
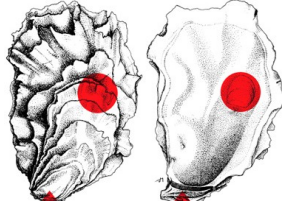
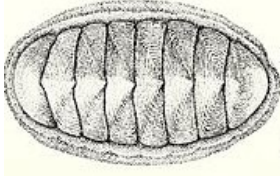
Vertebrates (Animals with backbones)

Birds: blue heron, crow, gull

Fish: tidepool sculpin, high cockscomb (looks like an eel)





Mammals: raccoon


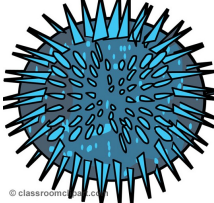
Invertebrates (Animals *without* backbones - 97% of animal species!)

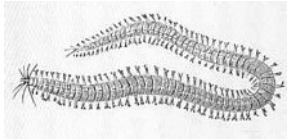

Molluscs (A diverse group of animals with soft bodies; many have shells)			
	<p>Clam Blue, smooth shells with brown coating = invasive White, ridged shell = native</p>		<p>Keyhole limpet</p>
	<p>Blue Mussel</p>		<p>Snail Whelks (larger) and periwinkles (fingernail sized) have pointed shells; Moon snails have flatter and rounder shells</p>
	<p>Pacific oyster</p>		<p>Chiton</p>



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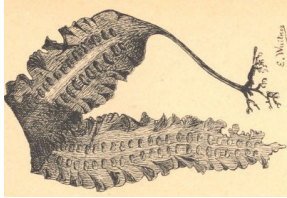
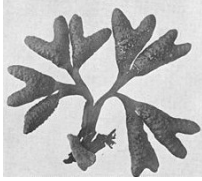

Arthropods (Animals with jointed legs; includes insects and crustaceans)			
	<p>Crabs Green shore crab (thumbnail sized) Red rock crab (larger, pink/orange) Hermit crab lives in snail shells</p>		<p>Barnacle</p>
	<p>Rockweed isopod ("pill bug")</p>		<p>Sand flea ("beach hopper")</p>

Echinoderms (Animals with spiny skin)			
	<p>Common sea star</p>		<p>Sea urchin</p>

Annelids (Worms)		Cnidaria (Animals with stinging cells)	
	<p>Sand worm Watch out! These can bite!</p>		<p>Moon jelly</p>



Marine Algae (Seaweed):

	Kelp		Rockweed “popweed” has air filled sacs at tips - avoid walking on!
	Sea lettuce (thin, bright green sheets)		Biofilm Slimy coating on rocks formed by microscopic algae, and/or bacteria

Drawing/Photo credits: Clam, By Pearson Scott Foresman [Public domain]; Whelk Philip Henry Gosse [Public domain]; Oyster, Peter Gugerell - Own Graphic, Chiton American malacological bulletin; crab Julius Fürst [Public domain]; barnacle William Thomas Calman [Public domain], Rockweed isopod © Hans Hillewaert, Sandflea Popular Science Monthly Volume 72 ; seastar By Uberprutser (Own work) [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)] sand worm Henri Filhol [Public domain]; moon jelly, NASA, Kelp, Emile Wuitner [Public domain], Rockweed Sanford Myron Zeller [Public domain], via Wikimedia Commons; Other photos from ClassroomClipart.com



Name: _____

Beach Rocks Student Worksheet

1. Explore the beach. Find one of each of these 6 types of rocks:
 - a. Black and white (or pink and white)
 - b. Black (or very dark grey)
 - c. White, light orange or tan glassy
 - d. Light grey (or light pink) with small flecks (black or white)
 - e. Bright green rock
 - f. Striped rock

2. Find 4 *other* rocks that you find interesting.

Extra Challenges

Challenge 1:

Try to find human-made “rocks” on the beach. Can you find a piece of brick? glass? concrete? asphalt? Do you see anything else human-made?

Challenge 2:

Examine the boulders in the intertidal zone (especially the ones that have a striped texture). Did you find any beach pebbles that look like the same rock type as the boulders?

Challenge 3:

Check-in with your teacher before you begin this challenge

Examine the rocks in the small cliffs above the seawall (watch for bikes!) Do these look like any rocks you saw on the beach?



Name: _____

Observations & Inferences of Trees Worksheet

Observations

1. What kind of tree is this? (Use the handout to identify)
2. What is the circumference (distance around) of the trunk?
(Note that your arm span approximately = your height.)
3. Describe the shape of the trunk
4. Describe the bark of the tree. Do you see any human-made marks?
5. Are there any other plants growing on the tree?
6. Any other observations?

Inferences

1. How old do you think this tree is? Is it older than other trees you see around you?
Why do you think that?
2. Why do you think the trunk and bark look like they do?
3. What do you think will happen to this tree in the future?














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Name: _____

Observing the Forest Floor Student Worksheet

1. Look under logs and use the shake method to find insects, spiders, pill bugs, and millipedes. If you can, GENTLY collect them and put them in the sorting containers. How many different types of land invertebrates can you find?
2. Next, look at the plant litter (the loose layer of leaves, cones, sticks, bark, logs, etc. on the forest floor). Make some observations. How thick is the plant litter? Can you see any bare soil?
3. What condition are the leaves in at the *top* of the plant litter layer? Do they look fresh, like they *just* fell off the tree? What is the condition of the leaves at the *bottom* of the layer?
4. Look at one of the fallen logs. What condition is it in? Are any plants or fungi growing on it?
5. Now for an inference: Do you think any of the logs or leaves on the forest floor might end up becoming fossils? Why or why not?
6. Pick one needle-leaved tree (conifer) and one broadleaved plant from the ID guide, and try and find them in the forest.
7. Observe the forest around you. Are the biggest trees conifers or broadleaved trees? How do their diameters compare to the tree we looked at in the rose garden?

Stanley Park Plant Identification Guide

Conifers (Trees with needle-like leaves)			
	Douglas fir		Western red
	Pointed needles.		cedar
	Cones with “mouse tails”		Tiny leaves have scaly, braided appearance
	Evergreen		Evergreen
	Western hemlock Needles with rounded tips, different lengths. Small cones Evergreen		
Flowering plants (Trees with broad leaves and flowers)			
	Vine maple Multiple thin trunks Deciduous		Salal Evergreen
	Huckleberry Deciduous		Salmon berry Deciduous
	Red alder Deciduous		Oregon grape Evergreen
	Holly (Invasive species)		Ivy (Invasive species)
	thick, very spiny leaves		vine
	Evergreen		Evergreen

Plant images from the USDA-NRCS PLANTS Database and maple and salal from wildernessrim.org, Huckleberry, how staffworks.com; Western hemlock; american conifer society, Western red cedar by MPF [GFDL (<http://www.gnu.org/copyleft/fdl.html>)] or CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons Oregon grape and salmonberry from wikimedia commons