



**Science Unit: *Aquatic Ecosystems***

**Lesson 9: *Sandy Beach Study***

School Year: 2011/2012

Developed for: Sexsmith Elementary School, Vancouver School District

Developed by: Ingrid Sulston (scientist); Mari Matsuo and Carole Murray (teachers)

Grade level: Presented to grades K-3; appropriate for grades K – 7 with age appropriate modifications

Duration of lesson: 40 minutes described below, with time for additional teaching in the afternoon

Notes: This lesson took place at Iona beach, a sandy beach in Richmond. The same activities can be run at any beach with clams, sand and mud.

Other SRP lessons contain parts of this lesson:

The sand/mud activity is adapted from Lesson 2, Weathering, in The Earth Around Us: Air, Water and Soil science unit, Scientist in Residence Program. <http://scientistinresidence.ca/science-lesson-plans/the-earth-around-us-air-water-soil/>

The clam study has been extended into a whole lesson in Lesson 5, Beach Life: Clam Dissection, in the Discovering Life in Local Habitats science unit, Scientist in Residence Program. <http://scientistinresidence.ca/science-lesson-plans/discovering-life-in-local-habitats/>

**Objective**

1. Show students a beach very close to their school, that is rich with wildlife.
2. Explore a sand and mud beach, and observe the variety of life in that habitat.
3. Learn that sand and mud are made from weathered rocks.
4. Examine the body of a clam, and learn how clams are adapted to the sandy beach environment.

**Background Information**

Iona Beach Regional Park in Richmond was chosen as a field trip location as it is very close to Sexsmith Elementary and easily accessible by families who might want to visit again. It has a sandy beach littered with clam shells, washed up driftwood and seaweed, and exposed mud flats at mid and low tides. It is a great birdwatching location with many resident and migratory birds that are only touched upon in this lesson. This lesson focuses on how the beach was made, and the clams that live in the mud.

**Vocabulary**

Sand: small particles of rock about 1mm across (sand is defined as particle sizes from 0.063mm to 2mm)

Mud: tiny particles of rock less than 1mm across (mud is made up of larger silt particles and smaller clay particles; particle sizes of mud are defined as less than 0.063mm)

Weathering: the wearing down of rocks by water and wind, that changes their shape and generates small particles of sand and silt

Clam: a kind of a mollusk, an animal with two flat shells found in sand at the beach



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Shell: the hard protective covering around the clam, and other mollusks

Mantle: the part of a mollusk that makes the shell

Foot: the part of a mollusk that lets it move and burrow

Gill: the part of a mollusk that collects oxygen from the water

Siphon: the part of a mollusk that sucks that water and food into the body

### Materials

- screw cap jars, one for every two to four students, filled with water
- beach notebooks
- magnifiers, ideally one per student
- pieces of pottery e.g. from a broken terra cotta plant pot, about 2cm square or equivalent
- tape, several rolls for easier distribution
- clam (e.g. savory clam) for each group of three or four students. Purchase at a shellfish store. Store in a fridge in a closed plastic bag for two days before use, so that the animals are dead, but still fresh.

### At the beach

#### Introductory Discussion

While students are eating their morning snack at the picnic tables, point out the swallows that fly low over the grasses. Tell students that Iona Beach is an important place for birds that live here year round (resident birds), and also for migratory birds. Show them the mud flats of the low tide and that the birds eat the animals living in the mud flats. Tell them that we will study one of the animals that lives in the mud, and also how the sand and mud of the beach is made.

Short description of other items to discuss or review:

- Show students the bathrooms, and the tap where they can wash their feet if they walk out onto the mud.
- If teachers wish, tell students the boundary limits of where they can go.

Brief description of science activities:

- Shake pottery in a jar to model how sand and mud are made from the weathering of rocks.
- Examine sand and mud closely to look at the rocks they are made up of, and their relative particle sizes.
- Dissect a clam, identify body parts, and compare clam and human anatomy.

Processes of science that the students will focus on: close observation, accurately drawing observations, estimation, species identification, classification and comparison.



## Science Activity/Experiment

**(1) Activity Title:** What are sand and mud?

**Purpose of Activity:** To understand how sand and mud are made and to become familiar with their particle sizes.

**Methods and Instructions:**

Set-up prior to experiment: none

Students work in groups of two or three.

1. Distribute a jar of water and a couple of pieces of pottery to each group.
2. Explain that they will mimic the way that the sand and mud on this beach were formed.
3. Ask students to add their pottery pieces to their jar and screw on the cap. The pottery pieces are rocks.
4. Ask students to vigorously shake the jar. They are mimicking water and wind bashing the rocks, and wearing them away - the process of weathering. With the pottery, the pieces are broken into smaller particles much much faster than most of the natural weathering of the harder rocks of mountains.
5. Students look inside their jar to see that they have made smaller particles from their rock, then draw what they see in the jar on the first page of their booklet. (The first two worksheet pages following this lesson make a booklet for older grades, and the last two worksheet pages make one for younger grades. The two pages should be copied back to back then folded once into a booklet).
6. Explain that as rocks are worn away, they make sand and mud particles that are washed into streams, then rivers, then the ocean. In the ocean they are carried by the currents until they are deposited in a calm shallow bay, like this one. Over a long time, a sand and mud beach is made, and continues to be built upon.

**(2) Activity Title:** Examining sand and mud particles.

**Purpose of Activity:** To see the difference in colour and grain size of sand and mud.

**Methods and Instructions:**

Set-up prior to experiment: none

Students work individually.

1. Students pick up a pinch of sand, tape it to the second page of their notebooks, and write down the colours of the sand particles that they see.
2. Students pick up a pinch of mud, squeeze it to remove all the water, rub a smear of mud into their notebook, allow it to dry for a few seconds, then add a piece of tape over it.
3. They use a magnifier to look at both closely, then estimate how many grains of mud could fit into a grain of sand. (See ref. 1 for names and relative sizes of rock particles).

**(3) Activity Title:** Who lives in sand and mud?

**Purpose of Activity:** View the inside of a clam and learn how it is adapted to live in sand and mud.

**Methods and Instructions:**

Set-up prior to experiment: opened clams

Students work in groups of two.

1. Ask students to look around the sandy beach for life for signs of life. Prompt discussion to find at least beach grasses, birds and clam shells.
2. Collect and identify clam species using a field guide (e.g. ref 2). (Students may have already collected clams while walking on the beach with their class, and these can be grouped into species by the students).



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3. Ask students where the clam shells came from, and lead to discussing how clams burrow into the sand. If there is evidence of recent clam-digger activity, point it out.
4. Give each pair of students an opened clam, and assist them in finding some parts of the clam, using the image from ref. 3 to refer to. Point out the mantle, foot, syphons, and gills if they are clear. Ask students to match the words to the drawing of the clam on the last page of their workbook. Older students will also compare the parts of the clam to parts of a human body, for functional equivalents. (We do not have a mantle as we do not have a shell; we have legs instead of a foot; we have lungs instead of gills; we have a mouth and an anus instead of syphons).
5. Discuss how each of the clam's body parts are adapted for living in the sand: the syphons pull in the sea water from among the sand, extract food from the water, then squirt out the waste (water spouts from clam can often be seen on sandy beaches). The gills allow clams to get oxygen from the water, like a fish. The shell protects the clam from predators.
6. Discuss what animals eat the clams, and how a food chain of living things has adapted to the sand and mud beach environment. Look for birds on the mud flats.

### References

1. <[http://en.wikipedia.org/wiki/Particle\\_size\\_\(grain\\_size\)](http://en.wikipedia.org/wiki/Particle_size_(grain_size))> Particle sizes of rocks from boulders to clay. Web site hosted by Wikipedia. Accessed May 21, 2012.
2. Harbo, Rick. 2009. A Field Guide to Seashells and Shellfish of the Pacific Northwest. Harbour Press.
3. <[http://iweb.tntech.edu/mcaprio/whole\\_no\\_mantle\\_L.jpg](http://iweb.tntech.edu/mcaprio/whole_no_mantle_L.jpg)> Clam anatomy image used by students. Other clam anatomy images for teacher use at <http://iweb.tntech.edu/mcaprio/clam.htm>. Web site hosted by Tennessee Technological University. Accessed May 21, 2012.

### Extension of Lesson Plan

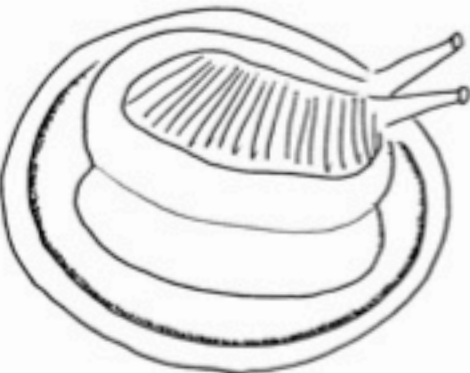

Visit a rocky beach and compare the wildlife to that of the sandy beach.

# Sandy Beach Study

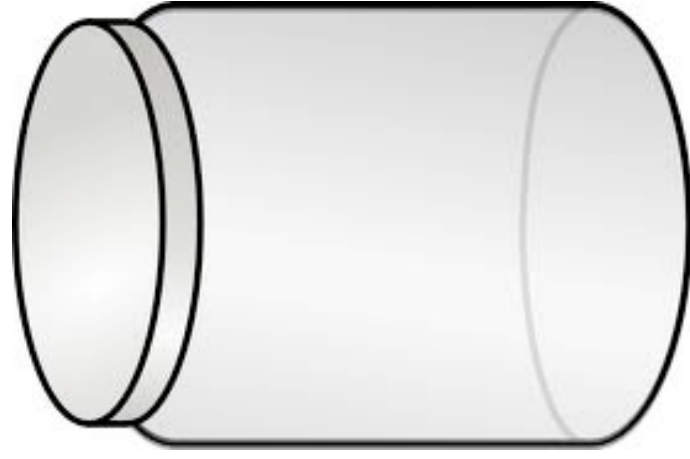
Iona Beach, Richmond  
May 2012

By \_\_\_\_\_

## Clam study

Clam	Person
	
We both eat, using a SIPHON MOUTH	
We both breathe, using GILLS LUNGS	
We both move, using our FOOT	
A clam has a SHELL made by the MANTLE	

# How sand and mud are made



After shaking the rock in the water it looks like this:

How Iona Beach sand and mud are made:

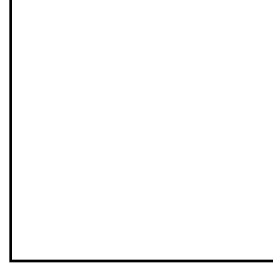
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# Sand and mud examination

Sand sample



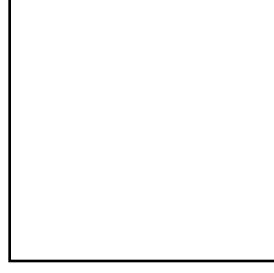
The rocks in sand are these colours:

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Mud sample



Estimate how many grains of mud could fit in a grain of sand:

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# Sandy Beach Study

Iona Beach, Richmond  
May 2012

By \_\_\_\_\_

## Clam study



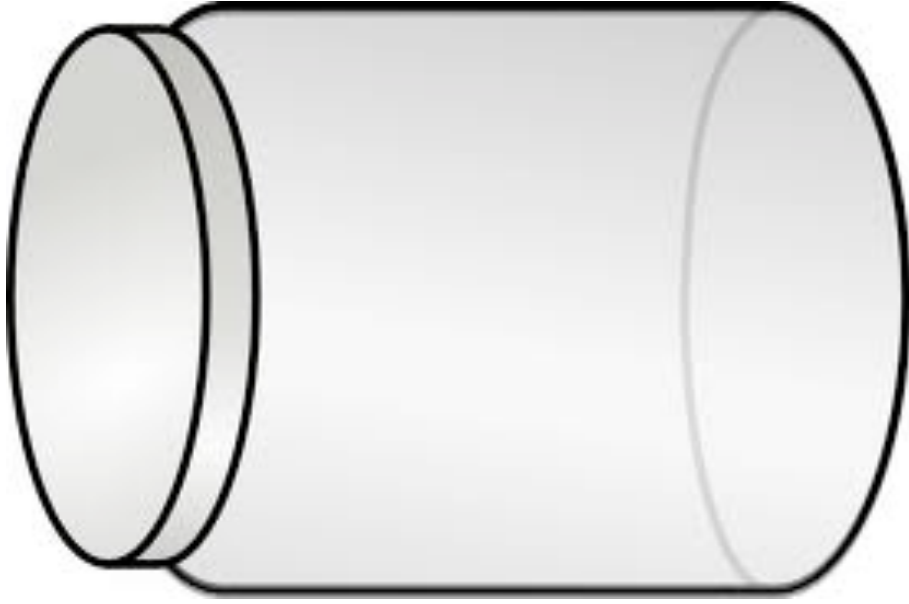
Siphon

Foot

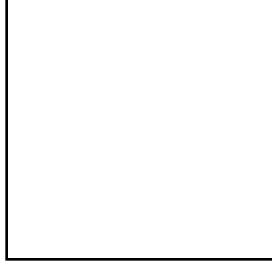
Shell

# Making sand

# Sand and mud



Sand



Mud

