Some neat things to share with students while at the Beach

Slipper Shells (Boat Shells): There are two kinds of slipper shells, the Atlantic (brown marking and arched) and the Eastern white slipper (whiter and flatter). All slippers start as males (Protandry), but can change sex as they age or there is shortage of females (sequential hermaphrodites. When piled up, the large females are on the bottom and the smaller (younger) males are on top.

Bay Scallops: Are free-living and can swim, by rapidly opening and closing its shell. Some scallops can make an audible soft popping sound as they flap their shells underwater, leading cape codders to dub them "singing scallops". They have blue eyes lining the shell opening. The scallop family is unusual in that some members of the family are dioecious (males and females are separate), while other are simultaneous hermaphrodites (both sexes in the same individual) and a few are protoandrous hermaphrodites (males when young then switching to female). Age can often be inferred by annuli, the concentric rings of their shells.

Softshell Clams: Usually found 6-10 inches under the surface. They have paired siphons at the surface to filter up to a quart of water in an hour. They help us find them at low tide when they squirt. They are also called steamers , longnecks, or Ipswich clams

Quahog (hard shells): Have short siphons so they live right below the surface. At a fish market you can buy littlenecks (up 2.5 in), cherrystones (up to 3 in), and the largest are called quahogs or chowder clams. The Wampanoag people used the inner shell to make "wampum."

Oysters: It's said that oysters should only be eaten in months with "r's" in them. This was the result of early days when refrigerated shipping didn't exist. They are called a keystone species because their bed provide habitat for an amazing variety of marine life. They are protandric, which means that during their first year they spawn as males (releasing sperm into the water). As they grow larger over the next two or three years and develop greater energy reserves, they release eggs, as females. Bay oysters are usually prepared to spawn by the end of June.

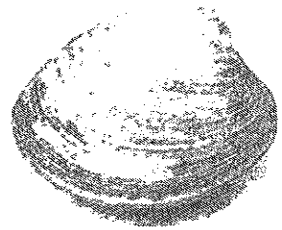
Barnacles: There are three types of barnacles in this area: Bay Barnacles (small and flat), Rock Barnacles (larger and not flat), and Ivory Barnacles (color). They are true hermaphrodites. They all are "nothing more than a shrimp-like animal standing on its head in a limestone house kicking food into its mouth" (Louis Agassiz).

Ugly Stains on the Beach: A milky-white "stain" caused by sulfide-oxidizing bacteria. The white color is elemental sulfur converted by the bacteria from sulfides in peat. A reddish-purple "stain" is caused by a photosynthetic bacteria. The bacteria use sunlight and hydrogen sulfide (instead of water) to make carbohydrates.

Common Mollusks of CCSC

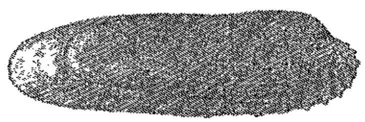
Razor Clam

Surf Clam

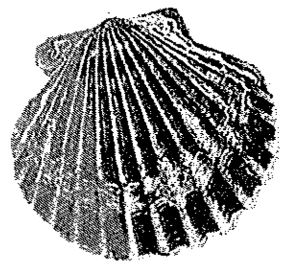


Quahog Clam

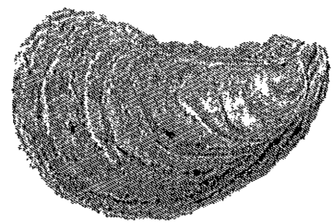
Soft Shell Clam



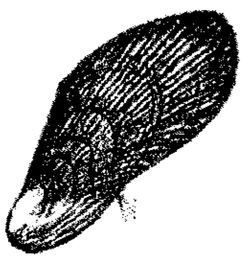
False Angle Wing



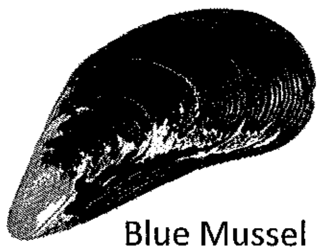
Bay Scallop



Wellfleet Oyster



Ribbed Mussel



Blue Mussel

Jingle Shell

Transverse Ark

Gem Clam

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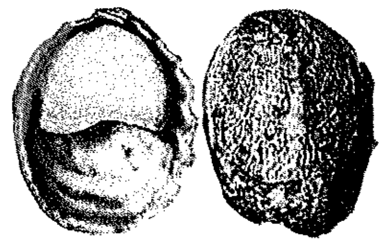
Common Gastropods At CCSC

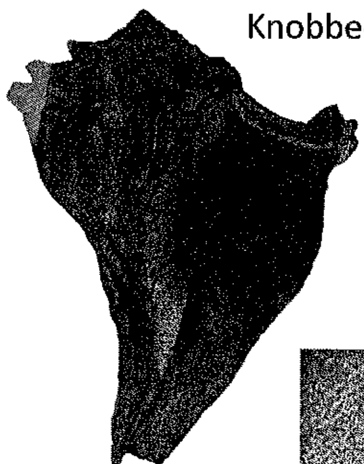
(And Friends)

Channeled Whelk

Periwinkle



Slipper Shell

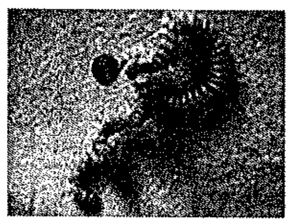


Knobbed Whelk

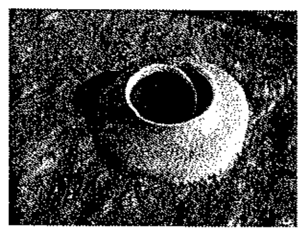
Oyster Drill

Dogwinkle

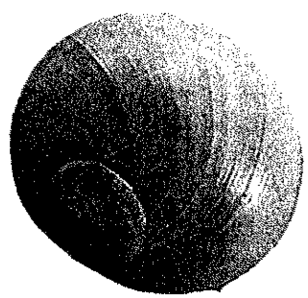
Waved Whelk



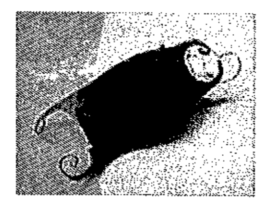
Whelk Egg Case



Moon Snail Collar



Moon Snail

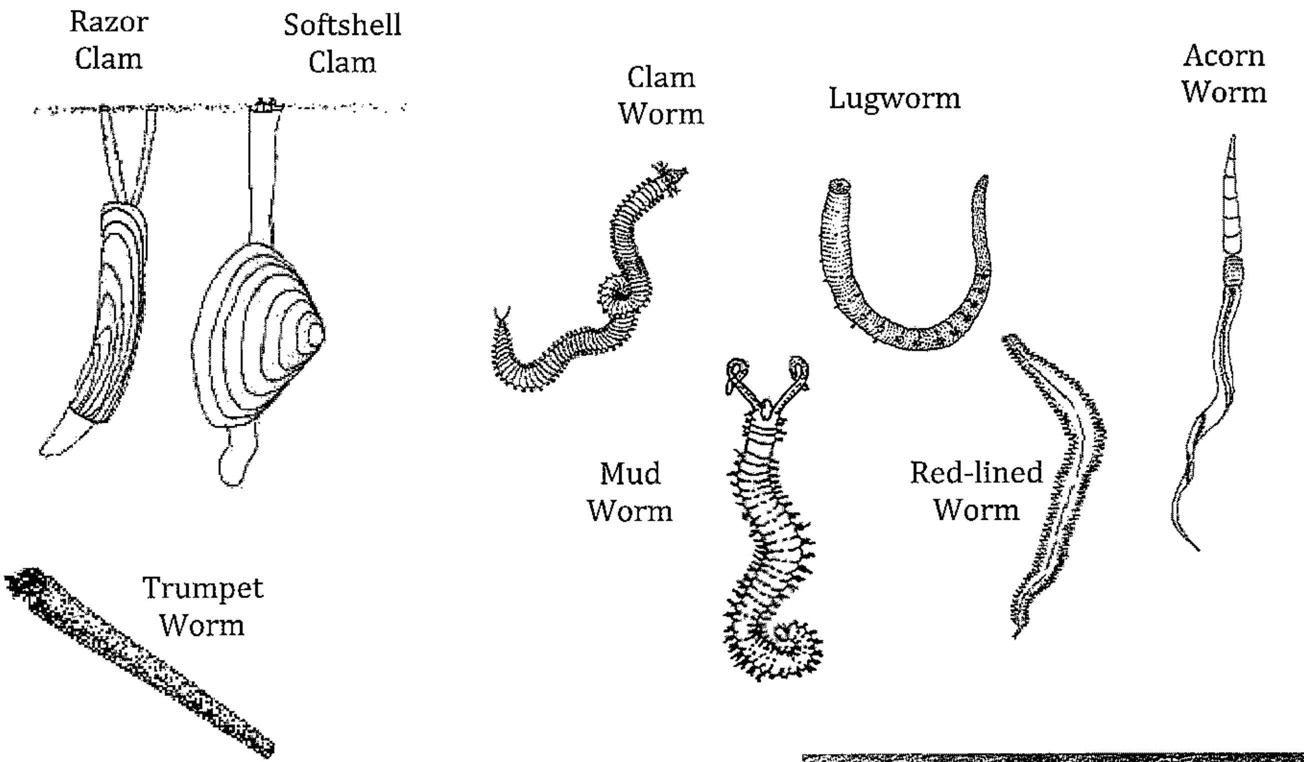


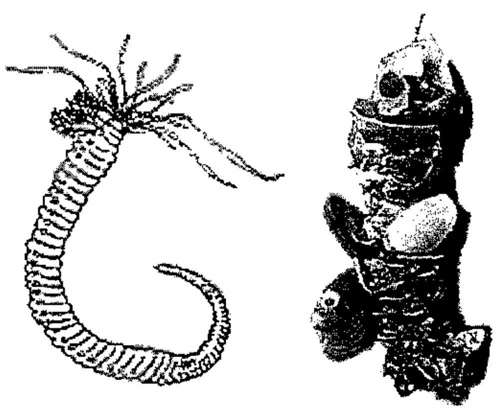
Skate Egg Case

tfd

Tidal Flats of CCSC

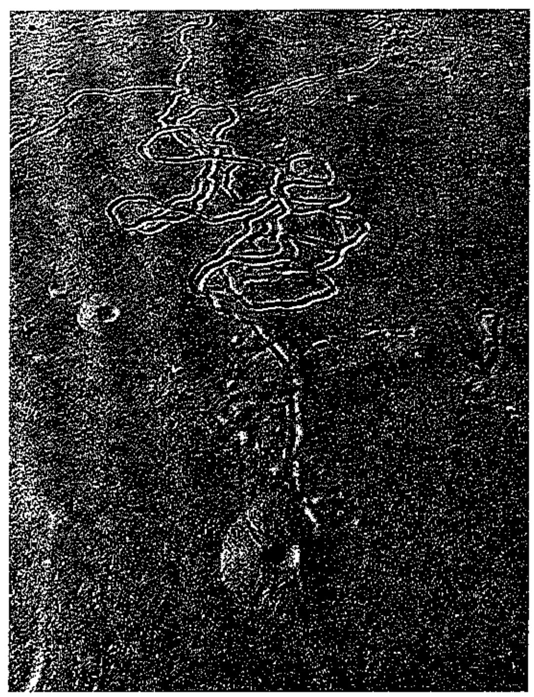
Twice each day at the beach of CCSC , water flows in and out with the tides, providing a tidal flat habitat for students to explore. Technically, this area is called a sand flat (coarse-grained sediment with grain size more than 0.1 mm) and not a mud flat (silt-sized sediment and found near a salt marsh). The flats are home to abundant phytoplankton, zooplankton, snails, oysters, clams, crustaceans, and worms. Many of the animals in this area filter-feed on plankton. Burrowing animals breathe through tubes to get oxygen from the surface. Evidence of other life is the tracks they leave as they travel the flats.





Decorator Worm

with attached material



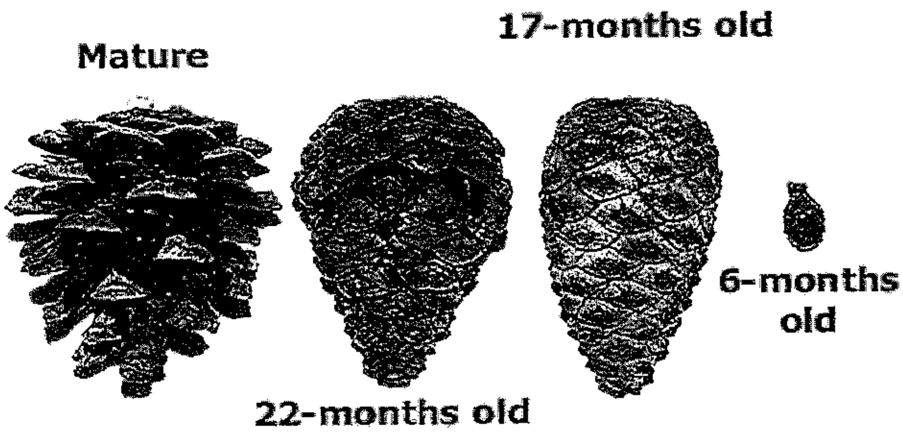
Evergreens of Cape Cod

Identifying evergreens is fun and easy, but the cones provide opportunities to explore a part of nature that is often ignored. Evergreens are monoecious; which means male and female reproductive structures occur on the same plant. Cedar trees are separate plants.

Upon reaching maturity, evergreens form male and female strobili (sing. strobilus). Male "cones" are usually 1-2 cm in diameter and vary in length. They are soft, form on the lower part of the tree, and fall off after dispersing the pollen. Usually they are found in clusters near the end of a branch. Colors can range from yellow to red.

Most female cones are larger, harder, and will usually be higher up on the tree. The "up" and "down" of cones help to cut down on self –pollination. The scales of the female cone are spirally about a central axis. Each scale has a sterile bract and two ovules. The ovules, when fertilized, will produce two winged seeds. The seeds are released at maturity, which varies a great deal depending on the type of tree.

Red Pine Female



Male "cone"

White Pine

Neat Notes:

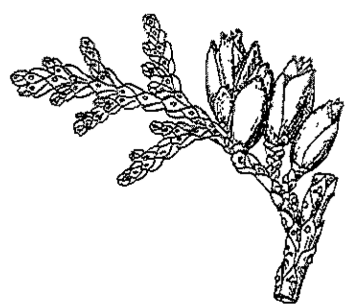
Atlantic White Cedar cones mature in one growing season.

Red Pine cones fall soon after opening and Pitch Pine cones stay on for years.

Easter Red Cedar makes the distinctive blue fruit – famous for elixirs and gin

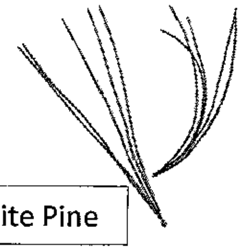
White Pine cones mature in two years.

Hemlocks have "mast years" every two or tree years.



Atlantic White Cedar

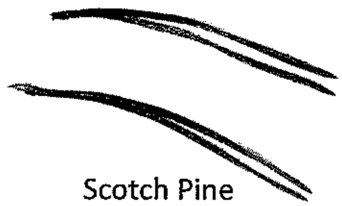
Evergreens of Cape Cod
Key



White Pine

A. Leaves are needle-like and in bundles
   1. Yes - go to B
   2. No - go to E

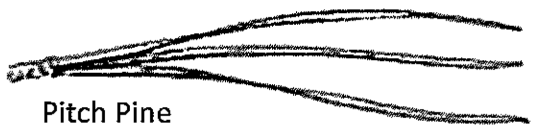
Red Pine



Scotch Pine

B. Needles are in bundles of 5
   1. Yes - this is a White Pine
   2. No - go to C

C. Needles are in bundles of 3
   1. Yes - this is Pitch Pine
   2. No - go to D

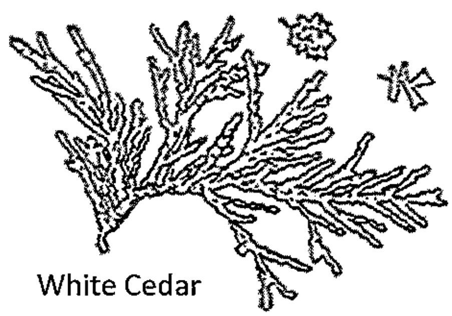


Pitch Pine

D. Needles are in bundles of 2
   1. Needles are dark-green and 4 - 6 inches long - this is Red Pine
   2. Needles have a slight twist and are 1.5 - 3 inches long - this is a Scotch Pine
   3. Needles are dark-green, stiff, and 3 - 5 inches long - this is Japanese Black Pine

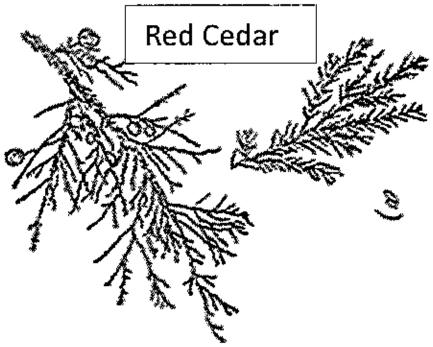
E. Leaves tiny, overlapping scale-like
   1. Yes - go to F
   2. No - go to G

F. Sprays (small branches) are flattened
   1. Yes - this a a White Cedar
   2. No - this is a Red Cedar

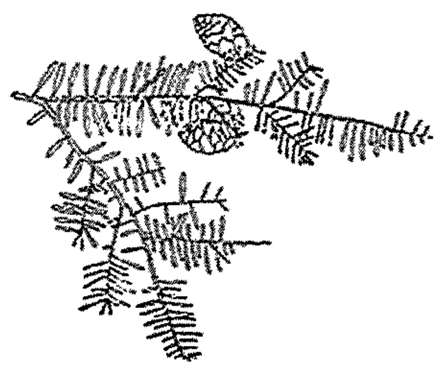


White Cedar

G. Leaves are single in a double row along the branch with two white lines underneath
   1. Yes - this is an Eastern Hemlock



Red Cedar



Eastern Hemlock

Sands and Depositional Environments

Goal of the Activity: To explore differences in sand samples and explain why those differences exist as a function the energy of depositional environments

Materials: 3 sand samples, hand lenses, mm graph paper, metric ruler, extra paper for observations

Collect about 50 grams (~1/4 cup) each of the supplied sand samples (S1, S2, and S3). Observe your samples – identify 3 similarities and 3 differences.

Similarities | Differences

1. What might be 2 reasons for the differences you noted?

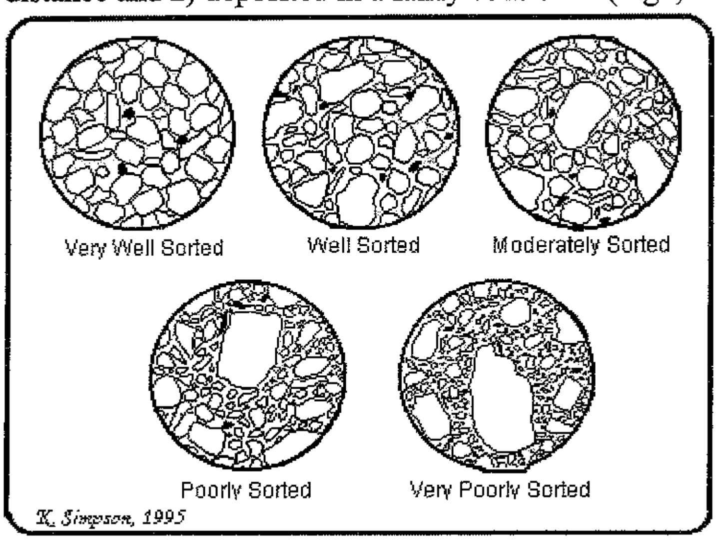
____

____

Differences in the shape, size, and sorting of sand grains can tell us about their transport to, and character of, **depositional environments** (*places where sediments are deposited and accumulate*). The 3 samples in this activity (S1, S2, S3) were collected from a delta that formed in an ancient glacial lake, a small side channel of a stream, and an ocean beach. Your task is to observe, document your observations, and determine which sample is from which environment.

The kinetic energies (remember KE = $1/2mv^2$) of the depositional environments of the 3 samples differ. The samples show evidence of either being from a *consistent high, medium, or low energy* depositional environment (which sorts sand) or a *fluctuating energy* depositional environment (which mixes up grain sizes). We can determine the type of environment the samples were deposited in by looking at how well they are **sorted,** their **shapes,** and their grain **sizes**.

Sorting: Sediment that is **moderately** to **well-sorted** will have most of its grains about the same size. This can happen for a combination of reasons, the sediment was; 1) transported for a long time and/or over a long distance and 2) deposited in a fairly consistent (high, medium, or low) energy environment. A high energy environment (such as a beach) has a high kinetic energy because of wave action. These environments are able to move sand and gravel (as bedload) and hold silt and clay-sized sediment in suspension. In medium and low energy environments, kinetic energies decrease and the finer grains drop out of suspension respectively. Areas with very fine-grained sediment (clays) are practically still. A **poorly-sorted** sand has a wide range of grain sizes because the energy of the environment may have been fluctuating.



Fill in the blanks. When naming the sands, use S1, S2, or S3.

A. Using the sorting chart, determine the sorting of the sand samples and characterize the kinetic energy of their depositional environments (high energy, fluctuating energies, medium-low energy).

S1: ____

S2: ____

S3: ____

B. What are 2 reasons that a depositional environment may experience fluctuating energies?

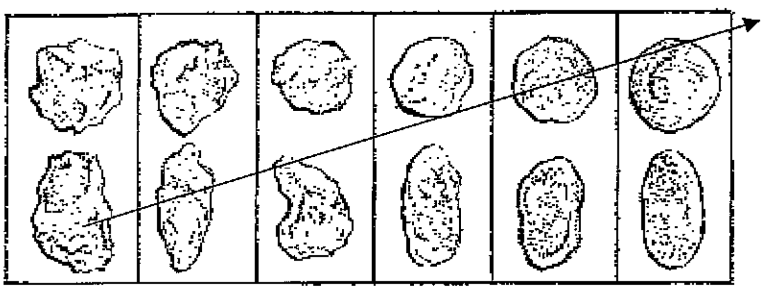
____

____

Grain Shape: We can also learn about the environment of deposition by looking at sand grain's **sphericity** (is it like a ball or more like a sub sandwich?) and **roundness** (is its surface smooth or angular?). A **highly spherical, well-rounded** sand grain  indicates that the sediment has experienced a lot of erosion (perhaps it has traveled *far* from its original source area and/or has been constantly weathered and eroded in its environment. For example, grains in sand dune deserts are constantly weathered and eroded by wind and tend to be the most spherical and rounded (smooth). **Low sphericity, angular**  sand grains have likely had *short* transport times (were dumped) or *short stays* in the depositional environment.

C. Try to separate out a small but representative amount of each sample. Spread out this subset and observe the grains closely with a hand lens. Try to observe at least 20 grains of each sample, recording grain sphericity and roundness on a separate sheet of paper. Draw 3 of the most common shapes observed in each sample using the shape diagram below: (Note: keep these grains separated for part F!)

S1: ____________ S2: ______________ S3: _____________



(arrow shows increasing time in transport and/or time in depositional environment)

D. Which sample shows a longer transport time and/or a longer time in the depositional environment (green or tan) based on the shape of the grain size? ______

E. Which sample shows evidence of a shorter transport time and/or shorter time in the depositional environment? _______

Grain Size

Grain size (metric)	Name
1–2 mm	Very coarse sand
0.5–1 mm	Coarse sand
0.25–0.5 mm	Medium sand
125–250 µm	Fine sand
62.5–125 µm	Very fine sand

F. Using the grain size chart and a metric ruler or mm sized graph paper, measure and record at least 20 of the grains of each sample on a separate sheet of paper. What is the range of sizes and average grain size for each sample? S1: range: _____________ average: _____

S2: range: _____________ average: _____

S3: range: _____________ average: _____

G. Based on your average grain sizes, which sample indicates at least some period of high energy was needed for transport and deposition? __________

H. Minerals: While there may be quite a few different types of minerals present in sands of different maturities, most contain a few hard to weather minerals such as quartz (most common grain present and only grain present in mature sands; white or grey, glassy), feldspar (pinkish or white/grey, may look blocky), muscovite (a mica, flat silvery glittery sheets), and even magnetite or ilmenite (black/steel gray, magnetite is magnetic). Try to group grains according to observed mineral types. Estimate the occurrence of the identified mineral types by percent (you may include "unknown" as a percent).

S1: ____

S2: ____

S3: ____

I. Review your answers to determine which sample came from a delta environment, a stream's side channel, and an ocean beach. Explain your determination for each in a paragraph, using your observations as evidence. Provide a sketch of what you think the environment of deposition looked like for each sample.

Beach Profile Data

4 ft 3 ft 2 ft 1 ft

4 ft 3 ft 2 ft 1 ft

- [ ] 1 ft
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Circle of Life

At Your Site:
Look for living organisms or evidence of living organisms within your circle. Decide on a symbol to use for each observation you make. Fill in your symbol in the key and write a short description. Draw your symbols in the circle to show where you observed the organism or evidence.

Symbol Key:

Your Location ______________________

Description

☐	
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