BACKYARD TRANSECT

Educational Activity

Grade Level: Grade 6 - 12

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Ocean Literacy Standards:

#5: *The ocean supports a great diversity of life and ecosystems*

This hands-on educational activity is designed to teach middle and high school students to study a natural community using a random sampling method. A case study is provided to illustrate the utility of this method in a common coastal ecosystem on the Georgia coast.

KEY CONCEPTS

- Scientific sampling
- Collection and recording of observational data
- Plant and animal identification
- Graphical communication of data
- Biodiversity of ecosystems

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA
Sea Grant

gacoast.uga.edu

Published 2020

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What does transect mean?

Let's breakdown the word. "Trans" means across, and "sect" is to divide by cutting. So, a transect cuts across an area. In the context of ecology, transects are used to collect an evenly distributed sample across a study location. This gives the scientists an understanding of the changing **biotic** (living) and **abiotic** (non-living) factors across the study site.

Part 1: Let's look at a case study!

Below is a cross-section of a salt marsh with each zone labeled. Salt marshes are a unique ecosystem. Only a small variety of plant and animal species can survive there due to the daily inundation of salty water. This means that salt marshes have low biodiversity but high abundance (or numbers) of the types of plants and animals that exist in this ecosystem. Salt marshes are influenced by the tides. At high tide, saltwater floods the low marsh and parts of the high marsh (depending on the tide's height). Alternatively, at low tide the marsh is fully exposed, allowing terrestrial animals (i.e. deer, raccoons, and foxes) to find food in the marsh.

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Using a quadrat:

When conducting a transect in an area of marsh, scientists often use the quadrat sampling method. The quadrat sampling method involves taking several random samples at different points along the transect using a **quadrat** as a standard unit of measure. Quadrats are typically one square meter. The goal of the quadrat method is to estimate the population density of species in an ecosystem. Sampling involves placing the quadrat at a random location on the ground and then the species within the quadrat are counted and recorded.

Now that you have learned about quadrat sampling, the following examples and activity will allow you to practice collecting and recording data from a quadrat in preparation for your own backyard transect. First, look at the following examples of percent coverage estimates (assuming that all plants in these example quadrats are of the same type). **Percent coverage** is a rough visual estimate of the amount of space each type of plant takes up within the quadrat area. You will estimate percent coverage in the next activity.

80-90%
COVERAGE

25-30%
COVERAGE

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An example of a quadrat placed in the high salt marsh is provided below. Use the identification guide on pages 4–5 to count the number of individuals for each type of animal and estimate percent coverage of each type of plant found within the area of the quadrat. Record your answers on the data sheet provided on page 6. An answer key for Part 1 is provided on page 11.

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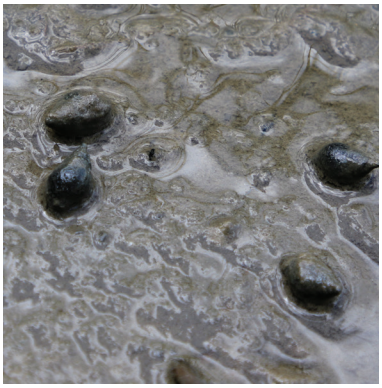
Animals of the salt marsh

marsh periwinkle snail
(Littoraria irrorata)

coffee bean snails
(Melampus bidentatus)



mud snails
(Ilyanassa obsoletuss)

Eastern oyster
(Crassostrea virginica)

ribbed mussel
(Melampus bidentatus)

sand fiddler crab
(Uca pugilator)

wharf or square back crab
(Armases cinereum)

mud fiddler crab
(Melampus bidentatus)

fiddler crab burrow
with large excavation pellets and smaller food pellets

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Plants of the salt marsh

smooth cord grass
(Spartina alterniflora)

glasswort or pickleweed
(Salicornia Sp.)

saltwort
(Batis maritime)

black needle rush
(Juncus roemerianus)

marsh elder
(Iva frutescens)

sea oxeye daisy
(Borrichia fruitescens)

salt grass
(Distichlis spicata)

salt meadow cord grass
(Spartina patens)

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Data sheet for quadrat:

ANIMALS

SPECIES	NUMBER

PLANTS

SPECIES	PERCENT COVERAGE

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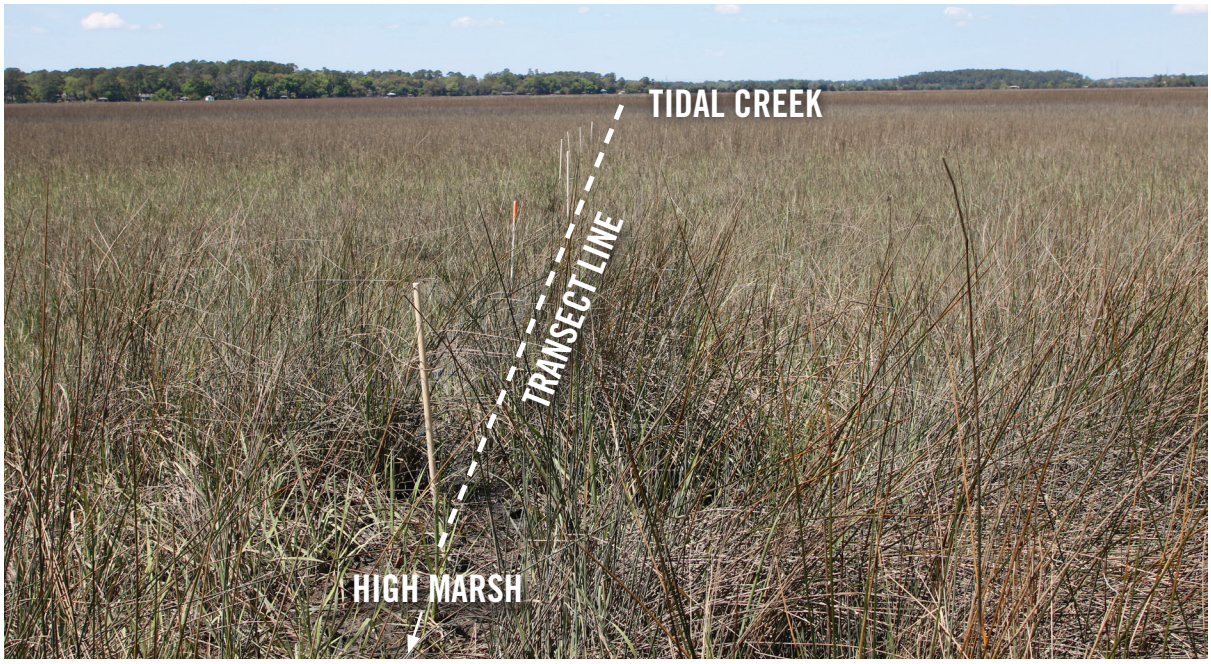
Salt marsh transect hypotheses:

Next, imagine you were to use a transect to study this salt marsh, from the high marsh all the way to the tidal creek. You can see two angles of this transect in the images below. Hypothesize in the space provided about what changes you might see in the marsh as you move from the high marsh to the tidal creek.



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Changes in plant diversity:

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

Why?

Changes in animal diversity:

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

Why?

Changes in plant coverage:

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

Why?

*** Check your hypotheses by looking at the data sheet from a real transect of the salt marsh on the Georgia coast (found in the Part 1 Answer Key).**

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Part 2: Transect your backyard

Materials Needed:

- Tape measure
- Sample site marker (need 7-10): PVC poles, sticks, traffic cones or other marker
- 4 PVC poles (12 inches each)
  (alternatives: paper towel rolls, pool noodle cut into 12 inch pieces)
- Roughly 4.5 feet of string
- Data sheet
- Pencil

Step-by-step guide to conducting your transect:

1. Determine your starting point and mark it with a PVC pole, stick or traffic cone. Based on the size of your yard, determine the distance you will have between each of your sample sites. Aim to have 7-10 sample sites equally spaced along your transect line. For example, if your transect line is 40 feet long, mark every 4 or 5 feet as a sample site. If your transect line is 12 feet long, a sample site every 1 to 2 feet. Using the tape measure, mark your 7-10 sample sites, with PVC poles (or alternative markers), at equal intervals.

Note: Walk along one side of your transect as your setting up your study site. We don't want footprints on the side where you'll be placing your quadrat.

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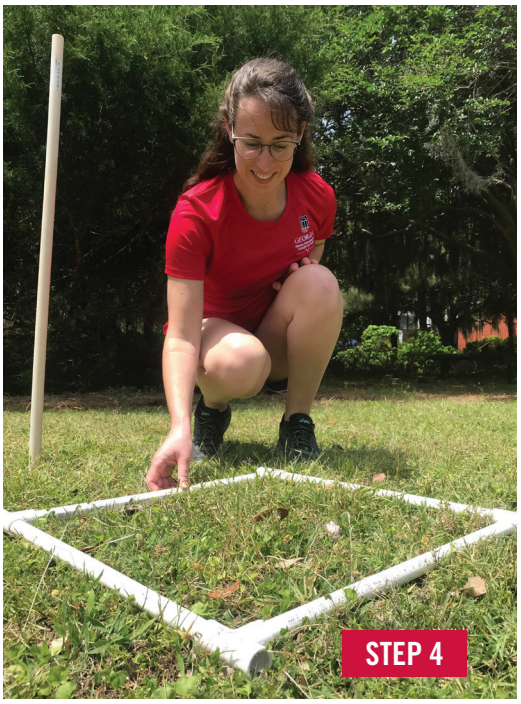
2. Once all sample sites are labeled, construct your quadrat. Take your four 12 inch PVC poles (or alternative material) and thread your string through the poles. Tighten string until the poles form a square and tie off the string. See diagram of a completed quadrat (right).

3. Walk along one side of your transect and stop at each sampling site. Randomly place your quadrat on the opposite side of the marker at each site.

4. Record data in the included data sheet, refer to the case study on pages 1–5 for an example of the type of data you are looking for (i.e. animal number and plant coverage). Remember, your backyard data will look much different from the example salt marsh data. Instead of fiddler crabs, snails and smooth cord grass, you might find ladybugs, spiders, grass, and flowers. Repeat steps 3 and 4 for all sample sites.



5. Using the space provided on page 15, graph your results. An example graph, using the real salt marsh transect data, is included on page 14.

6. An important part of science is communicating your data! Present your results to your parents or siblings and teach them something new about your backyard ecosystem.

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Real salt marsh transect data:

ANIMALS

SPECIES	NUMBER
marsh periwinkle snail *(Littoraria irrorata)*	13
mud fiddler crab claw *(Uca pugnax)*	1
ribbed mussel *(Geukensia demissa)*	1

PLANTS

SPECIES	PERCENT COVERAGE
smooth cord grass *(Spartina alterniflora)*	40 – 50%
glasswort or pickleweed *(Salicornia Sp.)*	< 10%

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Real salt marsh transect data:

SAMPLE SITE	ANIMAL (type and number)	PLANT (type and percent coverage)
1	periwinkle snail- 4	smooth cord grass- 20-30% black needlerush- 10-15%
2	periwinkle snail- 25 mud fiddler crab- 5 wharf crab- 1	smooth cord grass- 10-15%
3	periwinkle snail- 15 mud fiddler crab- 3	smooth cord grass- 60%
4	periwinkle snail- 3 mud fiddler crab- 7	smooth cord grass- 60-70%
5	periwinkle snail- 2 mud fiddler crab- 2	smooth cord grass- 60%
6	periwinkle snail- 1 mud fiddler crab- 3	smooth cord grass- 40%
7	periwinkle snail - 4	smooth cord grass- 80%

Based on this data, what are your conclusions about each of the following biotic and abiotic factors? Were your hypotheses correct for this section of salt marsh?

Changes in plant diversity:

Notice that black needlerush is only found in the high marsh. Otherwise the only plant found is smooth cord grass. As you move closer to the tidal creek there is increased salt water inundation (or flooding) at mid and high tides. Therefore, only salt-tolerant plants like smooth cord grass can survive.

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

Changes in animal diversity:

Similar to plants, only a small number of animals can survive in the lower marsh because of daily salt water inundation. Wharf crabs, for example, are only found in the high marsh so that they can move inland quickly at high tides. Mud fiddler crabs and periwinkle snails, on the other hand, have adapted to tolerate the daily high tides. Fiddler crabs hide in burrows and periwinkles climb up the smooth cord grass to escape the tides.

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

Changes in animal diversity:

Plant coverage can be variable in the marsh. For example, some areas, called salt pans, collect salt water causing these areas to be too salty even for smooth cord grass and other salt-tolerant plants to survive.

INCREASE / DECREASE / STAYED THE SAME / VARIED (NO PATTERN)

NOTE: Keep in mind that this is just a sample of a large area of salt marsh. If we were to take another transect, at a different time in the tidal cycle or in a different section of marsh, our results may look different. To get a more accurate representation of an entire ecosystem, ecologist will take many different transects and may even take more than one sample from each site along each transect.

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Data sheet part 2:

SAMPLE SITE	ANIMAL (type and number)	PLANT (type and percent coverage)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

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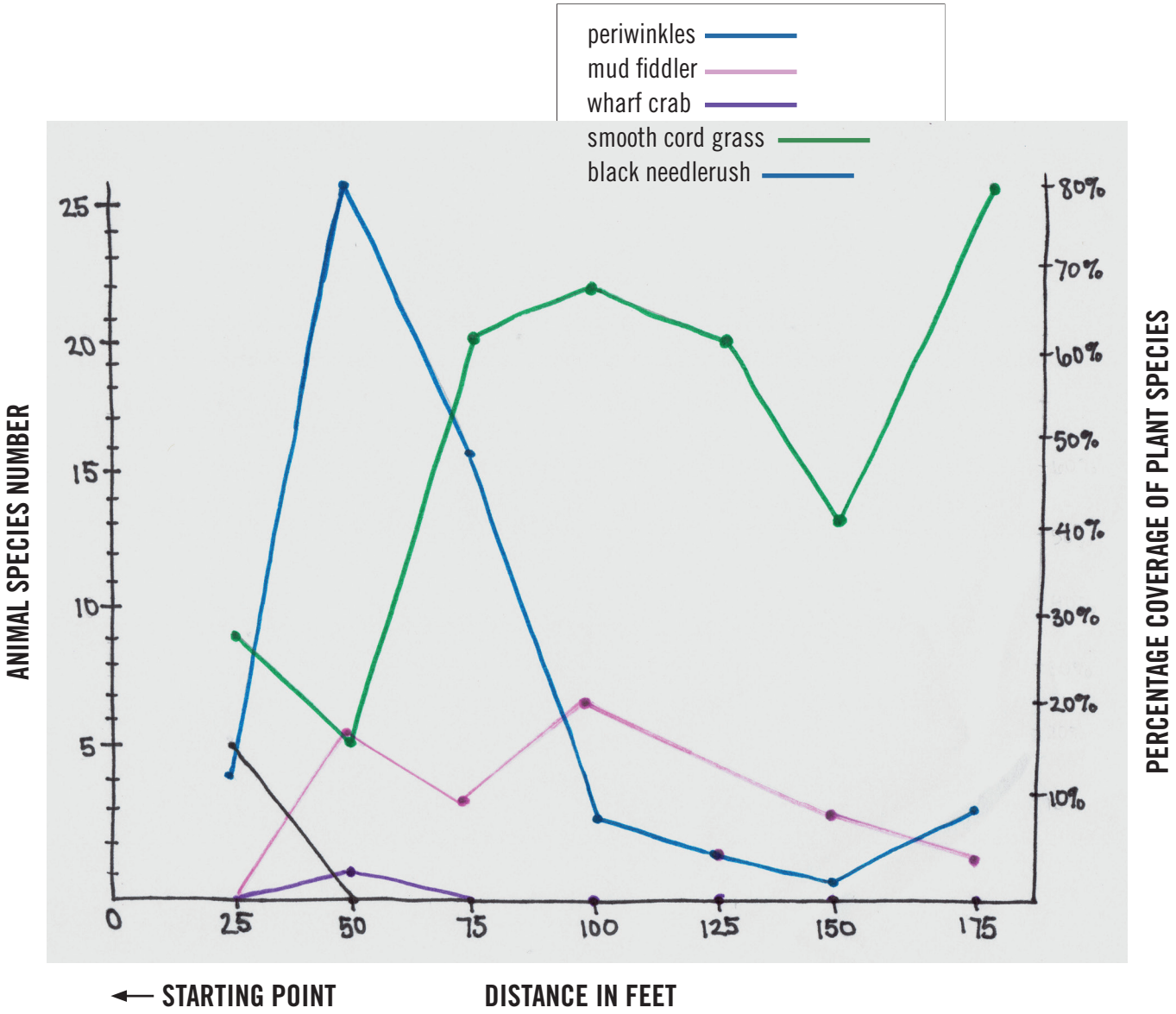
Graphic the data– Real salt marsh transect data:

The following is a graph of the real salt marsh transect data for your reference as you graph your backyard data on page 15.



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Graphic the data- Your backyard transect:

Mark the distance of each sample site from your starting point, on the x-axis (horizontal). Record plant and animal abundance, on the y-axis (vertical). You can either plot the number of species at each site or the amount/percent coverage of the dominant species. Refer to example graph on page 14.