Learning Science Through Research

University of Maryland
Center for Environmental Science
Horn Point Laboratory

Wetlands and Sea Level Rise

...a hands on science experience focusing on wetland plant adaptations and the effects of sea level rise on wetlands.

WETLANDS! THE EFFECT OF ELEVATION AND SEA LEVEL RISE ON PLANT COMMUNITIES

Background

Wetlands are areas that are inundated with water for a long enough period of time to support plants that are adapted to live in wet conditions. Some wetlands are tidal, meaning the water level rises and falls with the tides each day, while other wetlands are non-tidal. In addition, wetlands can contain freshwater, saltwater, or brackish water—a mixture of fresh and salt water.

Wetlands are very important for a number of reasons. They provide food and habitat for many living organisms and they serve as a nursery for juvenile fish and crabs. Wetlands serve as filters, preventing excess nutrients and sediments from entering bodies of water. They also store flood water, acting as a buffer when floods or storm surges occur. In addition, wetland plants hold together soil, helping to prevent erosion.

In recent decades, sea level rise has been affecting wetlands throughout the world, including those within Maryland's Blackwater National Wildlife Refuge. The wetlands of the Refuge are only 1.5 meters above sea level or less. This means that as sea level rises, the wetlands become increasingly inundated with water. Over time, areas once occupied by wetlands become open water and all of the important services provided by wetlands are lost. During this field experience, we will conduct scientific fieldwork to determine how slight changes in elevation affect plant communities.

Materials

- Thin rope/string
- Meter stick
- Line level
- Quadrat (Any size. You can use pvc piping or even hula hoops, as long as you can determine the area of the quadrat)
- Stakes (about 1.5 m high; tomato stakes work well)
- Meter tape
- Plant identification book/key: purchase for your local area or see below
- Brackish marsh: US East coast mid salinity plant guide at end of this document
- Salt marsh: http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-04-19.pdf
- Comprehensive (photos of salt and fresh species) http://ccrm.vims.edu/wetlands/teaching_marsh/wetland_plants/index.htm
- Data sheet (these can be laminated and reused)
- Pen/pencil for recording data (or grease pencil if data sheets are laminated)

Procedure

PART A. In the Field

1. Locate a wetland near your school. A wetland is any area of land that is inundated with water for some period of time. Wetlands are everywhere, not just on the coast—you just have to look closely. They often occur at the edges of ponds, etc.

1. Lay out transect.

- Depending on the age group, you could either have your students lay out the transect themselves, or you could prepare a chosen site beforehand.
- Choose a site that changes in elevation. Place a stake in the ground marking the beginning of the transect at the edge of the marsh nearest the water. Tie a line to the stake approximately 1 m. above the surface of the ground.
- Using a meter tape, place the next stake in the ground at a 3 m. distance (or whatever distance you establish) from the first stake. Stretch the line between the two stakes and level it using a line level.
- Continue placing stakes at your chosen intervals and level the line until you have traversed the distance you want to study. Assign each stake a letter: A, B, C, D, E, F.
- Your transect should look like Figure 1 below.

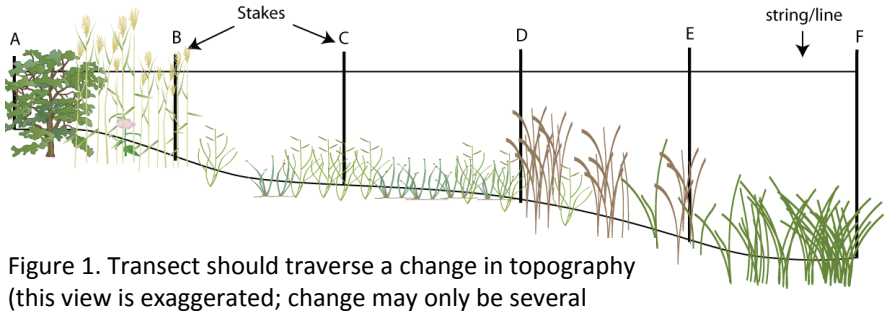


Figure 1. Transect should traverse a change in topography (this view is exaggerated; change may only be several centimeters)

2. Assign each group one or more stakes. Groups should collect the following data at each stake along the transect:

a. Measure the distance from the line to the ground using a meter stick. Record on the data sheet to the nearest centimeter (cm). NOTE: Be sure to measure from the string to the surface of the sediment.
b. Randomly drop the quadrat on the ground within 0.5 m. of the stake. Be sure to pull any leaves, stems, etc. from underneath through the quadrat so that you can accurately determine the number of plants within that study area.
c. If you must share the quadrat, mark each corner with a flag; then pass it on to the next group.
d. Carefully record the following on the data sheet:
    - plant species that occur within the quadrat (If you have trouble identifying a plant, take a small sample of it back to identify in the classroom)
    - total number of each plant species within the quadrat

PART B. Back in the classroom

1. Have each group report to the class the data recorded for their transect interval(s), including elevation in cm, plant species, and the total numbers of each species. Record the data on the board for the class to see.

2. Have students draw/graph a cross section of the transect using the collective class data on their data sheet. Graph axes/labels appear below. Students should fill in this graph by plotting distance from the line to the ground at each interval (centimeters), then connecting their plot points. They should also list the plant species observed at each interval and the number of each species counted.

3. Discuss observations:

Which plant species were most abundant in lower elevations in the marsh?

Which were most abundant in higher elevations?

Why were different species found at different elevations?

How might the species composition of the marsh change with sea level rise?

DATA SHEET

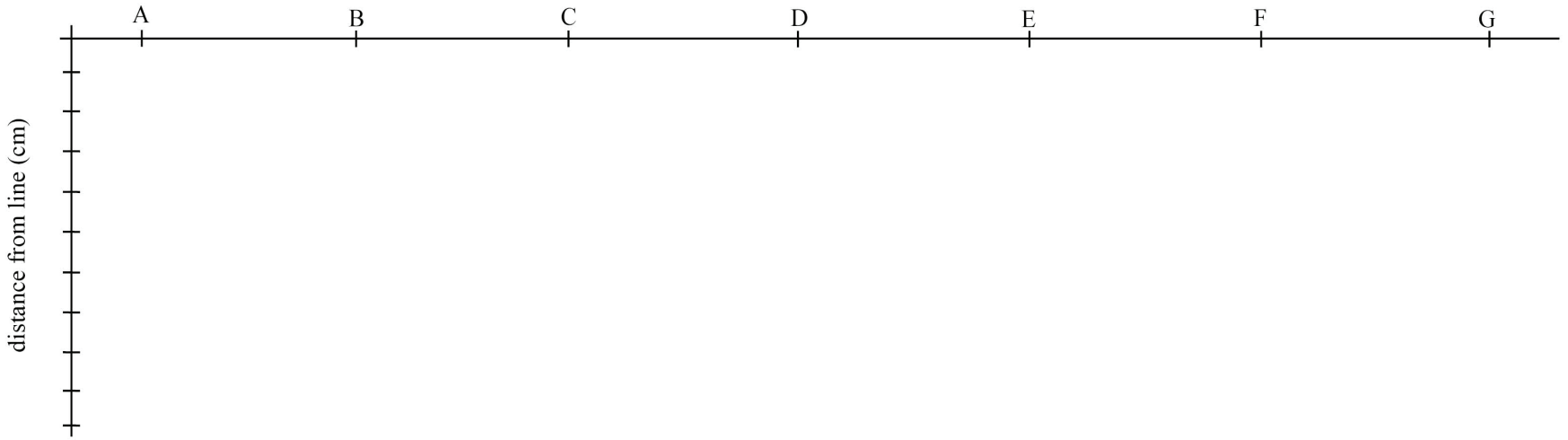
Interval ID (A,B,C, etc): _____

Investigators:_____

Distance from the ground to the line: _____ (cm)

List plant species and total number counted for each species

SPECIES	TOTAL #



Species	#	Species	#	Species	#	Species	#	Species	#	Species	#	Species	#

EXTENSION: HOW WILL SEA LEVEL RISE IMPACT WETLANDS?

Do the activity *Sea Level Rise and Storm Surge* to determine how sea level rise will impact your local area. In this activity, students use topographic maps to determine what areas will be inundated during storm events as well as under several sea level rise scenarios. Use topographic maps of low-lying wetland areas (Blackwater National Wildlife Refuge on Maryland's eastern shore is a good example) to demonstrate the impact of sea level rise on wetlands.

Activity is available at:
http://www1.coseecoastaltrends.net/modules/observing_the_ocean/access_classroom_resources/

Marsh Plant ID Guide


Salt marsh cordgrass
Flat leaves, round stem


Three-square
Flat leaves, three-sided “square” stem

Spike rush
Short, round leaves
Looks similar to moss


Marsh elder
A shrub/bush
Fleshy, opposite leaves


Phragmites
Tall
Flat leaves

Orach
Triangle-shaped leaves
Grows low to round

Salt meadow hay
Longer more round leaves
Resembles hay

Salt Grass
Shorter flatter “spiky” leaves