

Marsh March

Squish . . . squish. . . squish. . . in a marsh. Your students walk on water and on land at the same time. Marsh habitats reflect this in-betweenness. In this activity, students look for the indicators of transition from the aquatic to the terrestrial.

Background

Along the fringes of the Chesapeake Bay, its **tributaries** and up to the farthest reaches of its head-waters are **habitats** essential to the bay's survival—habitats that are part land and part water—wetlands.

By definition, wetlands are areas that have soil saturated or covered with water

for a period of time and have plants that are adapted to living, at least part of the time, in water. The most familiar wetlands are **fresh- or saltwater marshes, wooded swamps and bogs.**

Wetlands have many values. The stems and leaves of wetland plants trap eroded soil washing from the land and absorb the energy of storm waters. Nutrients that might over-enrich the waterways are trapped and used by wetland plants for growth. When these plants die, they enrich the waterways with decaying matter called **detritus**, a vital food source for microscopic organisms near the base of the **food chain.** Countless aquatic animals find food and shel-



Grade Levels: 4 – 12

Objectives

Students will investigate natural organization of a wetland and the interrelationships between the wetland and the surrounding environment by:

- *planning* a study;
- *observing wetlands*;
- *inferring cause and effect relationships.*

Materials

- “wetable” footwear
- *Wetlands Observation Sheets* (1 per team)
- *Wetlands Investigation Guides* (1 per team)
- *Wetlands Investigation Guide - Teacher's Version* (1 per teacher)
- clipboards
- pencils
- insect repellent
- trowel

At the site: Allow up to one hour for observations and discussion, plus time to walk to and from wetland area.

Where

Suggested state parks:

Belle Isle, Caledon, Chippokes, False Cape, First Landing, Leesylvania, Mason Neck, Westmoreland, York River.

Suggested natural area preserve:
Hughlett Point.

When

Any time of year is suitable. In spring and summer, new green plants are emerging or at peak growth. In fall, some will be in flower. By winter, most plants will be brown and dying back. Any daylight hours are suitable. Most tidal wetland areas may be best observed during low tide.

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Example:		
Investigation Question	Relevant Observations	Inference
1. Where does the wetland and the upland begin?	#3 #4 #8 #11	The borderline between upland and wetland separates drier soil where bushes and trees grow from wetter mud where mostly grass-like plants grow.

ter in wetlands including juveniles of many commercially valuable fishes, such as striped bass, and **crustaceans**, such as blue crabs. An array of wading birds, song birds, waterfowl and birds of prey are attracted to wetlands for food and nest sites.

Historically, wetlands have been blamed as sources of insect pests and were ditched and drained. Often close to dredging operations, they were covered with dredge spoil. Considered as inconvenient barriers between development and waterways, they were dredged in some places and filled in others for the construction of marinas and waterfront homes.

Steadily over the past few decades, scientific evidence of the many benefits of wetlands has mounted and recently laws have been enacted for their protection. However, the future of wetlands rests in the hands of today's youth.

Procedure

Before the Trip:

1. Contact the park to identify the best place for investigation. The interpretive program manager at the park should know which places are safe and would yield the best results.
2. Have students learn the following vocabulary words: *wetlands, marsh, swamp, nutrients, detritus, agricultural runoff, sediment, estuarine, obligate*.
3. Review with students the characteristics of wetlands they will be visiting. Some wetlands are ephemeral, meaning they are only underwater a short

time. Vernal pools that are underwater in the spring and dry in the summer are one example. Tidal wetlands have areas underwater with periods ranging from a few hours to all day. Bogs may get their water from underground springs that emerge from a depression in the ground. Other wetlands may depend on rain levels. Interpretive park staff will help you with identification of their wetlands.

4. Have students fill out the sheet, *What I Hope to Learn*.
5. Review the field trip plans.

At the Park:

1. Give each team a copy of the *Wetlands Observation Sheet* and the *Investigation Guide*, along with a clipboard and pencils.
2. Explain the importance of approaching the wetland area quietly in order to improve chances of seeing wildlife. Lead the class to the edge of the wetland. Pause for a few minutes of silent observation.
3. Remind students that they might not observe wetland features in the order listed on the *Observation Sheet* and that they may record any observations of interest, whether or not they are suggested on the sheet. Lead them into the wetland. In some areas, this will be along a boardwalk. In others, where the footing is sound, it will be directly onto the wetland. The teams make as many observations as possible in 30 minutes. Lead the class to key areas

Time Required

At the site: Allow up to one hour for observations and discussion, plus time to walk to and from wetland area.

Resources

<http://www.virginiaplaces.org/natural/wetlands.html>

Silberhorn, G. 1982. *Common Plants of the Mid-Atlantic Coast: A Field Guide*. Johns Hopkins University Press, Baltimore, MD.

Extensions

1. Investigate ways to verify the inferences made.
 - Discuss the scientific method. The teams develop one inference into a testable statement, design and conduct the research.
 - Investigate scientists' views on certain topics and the basis of those views.
2. Students map the distribution of plants and animals observed.
3. Visit the same area at another time of year. Compare both sets of observations and develop inferences about seasonal changes.
4. Students design an advertising campaign to inform others about wetland values and issues.
5. Students find and share media reports about wetlands.
6. Students research current wetland legislation.
7. Have students sketch plants that they do not know and note where they are located in the wetland (e.g., shade, underwater, upland). Using a field guide or Internet sources, identify the plant and the conditions necessary for it to grow.

Variations:

Younger students:

Eliminate use of teams and Observation Sheets. Discuss key wetland features before the field trip and guide class observations of these features, using the *Teacher's Version of the Investigation Guide*. Consider questions individually, seeking out pertinent observations. Take pictures of these features and your observers, collect representative leaves and make an informative classroom display.

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of the wetland (particularly where the elevation, and hence, the flora, changes dramatically) and encourage them to use all of their senses. Dig (and replace after observation) small plugs of soil so teams may observe below surface conditions. If possible, make a photographic record of the areas/items observed.

- When students have completed their observations, lead them out of the wetland to an assembly area suitable for a group discussion about their observations. Compare the teams' observations.
 - Did everyone see everything the same way?*
 - Which observations does the group think will be most useful for suggesting possible answers to the investigation questions?*
- If you have the knowledge (or access to a knowledgeable guide), tour the wetland with commentary on the value of wetlands.

Follow-up:

- Work through the first question on each worksheet and put the answers on the class board. Have the student teams work through the rest of the answers.
- The teams share and explain their inferences. As you moderate the discussion, recognize inferences which lead students toward the ideas suggested in the teachers' version of the *Investigation Guide* but also pursue discussion of other logical and interesting inferences that your students have made.

- Discuss the following:

Thinking of the conditions in which wetlands can exist, what are some activities that might destroy them?

- Damming the waterway downstream might flood wetlands.
- Damming the waterway upstream may dry them up.
- Water drawn from the waterway for irrigation or a draw-down in the water table by nearby wells could dry up a wetland.
- Cutting a ditch across a wetland may drain it.
- Pushing dirt onto the wetland, as for preparing a construction site, would obviously destroy it.
- Dramatically disturbing the soil on the nearby uplands might result in enough sediment to be washed onto the wetland to fill it in.
- Repeated wakes from excess boat traffic could destroy a marsh by erosion.

How does the wetland help life forms in the adjacent waterway by trapping sediments?

- Suspended particles intercept light essential to aquatic plant life.
- Suspended particles clog gills of fishes and other estuarine organisms.
- Sediments cover and smother oysters and other stationary bottom dwellers.

How do wetlands help life in the estuary by removing excess nutrients?

- Excess nutrients, such as nitrogen and phosphorus, cause sudden population explosions

Gifted/Advanced:

- Students design quantitative techniques to investigate a wetland (e.g., determine elevation of wetland's upper limit and water depth of lower limit; identify and list specific plants; catch and identify animals; compare soil particle size and organic content with samples from different areas of the wetland and the upland).
- Design and conduct an "E.Q." survey (environmental quotient) to assess public knowledge of wetlands and their values.

of algae. The algae block light necessary for beneficial plant life and deplete oxygen in the water, especially when they die and are being decomposed.

Where might the excess nutrients come from?

- Agricultural runoff from fertilizers.
- Animal wastes.
- Human wastes from inadequate or failing sewage treatment systems.
- Lawn fertilizers.
- Possibly acid rain.

- Pass out the completed *What I hope to learn* worksheets that were completed before visiting the park. Have them discuss if they learned what was on the sheet. Did any of their answers change after visiting a wetland?



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Wetlands Observation Sheet

Scientific observations are descriptions of what we actually see, hear, feel, taste or smell. We make inferences when we use logic, or even guesses, to interpret or explain our observations. One set of observations may lead you to many inferences or none. How do you know if your inferences are on the right track? Use the scientific method to test your ideas. This observation guide suggests where to direct your observations in order to make some logical inferences about a wetland.

1. Are all the plants in the marsh the same kind?	7. Are some specific types of plants usually found close to the water?
2. How many kinds are there?	8. Are some types of plants never found close to the water?
3. Are they distributed evenly, randomly, in clumps or in some pattern?	9. Is the soil everywhere equally damp and of the same feel (texture) and smell?
4. Are some kinds always found close together?	10. Are there any kinds of plants you find only in areas of a particular smell, texture or dampness?
5. Are some kinds never found close together?	11. What does it look (smell, feel) like under the surface?
6. Is the same amount of water visible everywhere?	12. Are there any plants that are not green? Where did you see them?

List other observations on the back of this sheet that your team will need to make in order to suggest answers to the inference questions.

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Wetlands Observation Guide

Investigation Question	Relevant Observations	Inference (Possible Answer)
1. Where does the upland end and the wetland begin?		
2. Does the wetland have a lower limit? If so, what is it?		
3. What seem to be the conditions necessary for a wetland to thrive?		
4. Where might the wetland be changing or destroyed?		
5. What characteristics of the wetland indicate that it can catch and hold sediment such as eroded soil?		
6. What features of the wetland might help remove excess nutrients and toxins from the water?		
7. What indicates that the wetland might be part of the aquatic or estuarine food chain?		
8. What indicates that the wetland is important to land and water animals?		
9. How might the marsh protect adjacent higher ground from some effects of storms and flooding?		

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Wetlands Investigation Guide — Teacher's Version

1. *Where does the upland end and the wetland begin?*

- The upper limits of wetlands are usually marked by changes in vegetation and ground moisture. In most state park and natural area preserve marshes, there is a clear transition from trees and shrubs to tall grass-like plants, such as cattails, sedges, rushes or cord grasses. The vegetation changes are less clearly defined on the upper edge of swamps, which are forested. There, soil moisture changes might be the best clue. Unless it has rained very recently or there has been a prolonged dry spell, wetland soil will be noticeably wetter, often squishy or even inundated.

2. *Does the wetland have a lower limit? If so, what is it?*

- The lower limit will be the adjacent waterway. Not every wetland, such as First Landing's cypress swamps, will have a visible lower limit but may seem bound on all sides by uplands or stretch on indefinitely.

3. *What seem to be the conditions necessary for a wetland to thrive?*

- By finding the upper and lower limits to wetlands, students can infer the conditions required for wetlands (i.e., an abundance of water but not deep water or swiftly moving water as by current of waves).

4. *Where might the wetland be changing or destroyed?*

- Over geologic time, wetlands are very dynamic places undergoing rapid change. Trapped sediments can fill in wetlands. Rising sea level can flood them, and erosion can wash them away. Only erosion may be readily apparent. This is best observed along the lower limits of wetlands bordering swift tidal creeks or open bays or rivers.

5. *What characteristics of the wetland indicate that it can catch and hold sediment such as eroded soil?*

- Encourage students to observe the abundance of plant stems and leaves and to think of them as filters of water washing off the uplands or being brought in with the tides.

6. *What features of the wetland might help remove excess nutrients and toxins from the water?*

- (This question might best be reserved for advanced students.) Basically nutrient and toxin removal occurs in two ways. Many nutrients and toxins will be bound to the sediments trapped in the wetland. Others will be assimilated directly into plant tissues. Remind students that nutrients in the water can be taken up as fertilizer by the lush wetland plants.

7. *What indicates that the wetland might be part of the aquatic or estuarine food chain?*

- Encourage students to observe the abundance of dead plant matter (detritus) in the wetland. If necessary, point out that most of the detritus along the waterway edge is likely to be washed into the estuary. From this, students might deduce the importance of wetland plants as a major component of estuarine food chains.

8. *What indicates that the wetland is important to land and water animals?*

- Wildlife benefits can be inferred by observing animals present, such as fiddler crabs, turtles, snakes, insects and birds, and by finding their signs, such as droppings, tracks and nests. Other wildlife values can be identified by noting seeds and fruits that might be food items.

9. *How might the marsh protect adjacent higher ground from some effects of storms and flooding?*

- Shoreline erosion protection can be inferred by observing eroded areas along the shoreline where marshes are absent. Examination of the peat-like soil may lead to inferences about its role in absorbing water and buffering flooding effects