Wetland Walk

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

Background

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 in the mountains are fresh water marshes and wooded swamps or bogs found in relatively low areas, valleys or along the banks of streams and lakes.

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, including juveniles of many fish species, find food and shelter in wetlands. 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 maligned by humans. Blamed as sources of insect pests, they were drained or sprayed with pesticides.

Steadily over the past few decades, scientific evidence of the 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. Study the site information in this guide and visit the site to identify the best location for exploration.
2. Divide the class into teams of three to five students. Explain that the class will be taking a field trip to a wetland to make observations and collect data. The students will help plan the study to be conducted at the wetlands.
3. Students should research wetlands using the Internet and resource materials in the library and classroom. Have the students write down some investigative questions they can answer by making observations and collecting and recording data on the wetland field trip. They can work in groups or individually.
4. Point out that part of a scientist's concept of "true facts" is that they may be verified by anyone who takes the time and trouble to make careful observations. Explain that the class will be visiting a wetland to make careful observations that will enable them to infer answers to their investigative questions.
5. Give each team a copy of the wetlands observation sheet. Point out that the 12 observation suggestions already listed should be helpful in developing inferences about wetlands, but that the students will also need to make other observations. Allow time for the teams to consider what kinds of additional observations may be needed to address all of the investigation questions and to add these to the back of the observation sheet. Collect all of the investigation guides and completed observation sheets. Check the students' observa-

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; and,
- *inferring* cause and effect relationships.

Materials

- waterproof 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 repellant
- trowel

Where

All parks.

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.

Time Required

At the Site:

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

tion lists to make sure that everything they have added may actually be seen, felt, smelled or heard.

5. Review the field trip plans.

At the Site:

1. Return the wetlands observation sheet to each team without the investigation guides.
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 at an area accessible from a nearby road or trail. 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 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.
4. 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?*
5. If you have the knowledge (or access to a knowledgeable guide), tour the wetland with commentary on the value of wetlands.

Follow-up:

1. Return to each team its investigation guide. Have teams consult their list of observations and identify those which should be helpful in responding to each of the questions on the investigation guide. On the guide sheet after each of the investigation questions, ask students to note the numbers of their observations which may lead to an answer, and, within the right hand column, state what they believe to be a likely answer to the question, based on those observations. Copy the example provided to the blackboard.
2. Work through the first two questions as a class, then allow the teams time to do the remaining seven questions. Some observations will have bearing on several questions; some may have nothing to do with any of the questions.
3. Ask teams to share and explain their inferences. As you moderate the discussion, recognize inferences that 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.
4. Discuss the following:
   Thinking of the conditions in which wetlands can exist, what are some human 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.

Resources

Silberhorn, G. 1999. *Common Plants of the Mid-Atlantic Coast: A Field Guide.* Revised Edition. Johns Hopkins University Press, Baltimore, MD.

Wading Into Wetlands. National Wildlife Federation. 8925 Leesburg Pike, Vienna, VA 22184-0001. (703) 790-1400.

Extensions

1. Investigate ways to verify the inferences made.
   - Discuss the scientific method. Have the teams develop one inference into a testable statement, design and then 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 and express their written opinions to appropriate politicians.

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.

- 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 being washed onto the wetland to fill it in.
- Repeated wakes from excess boat traffic could destroy a marsh by erosion.
- Potentially, global warming could raise sea level enough to destroy coastal wetlands by flooding.

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 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 and livestock waste
- Human waste from inadequate or failing sewage treatment systems
- Lawn fertilizers
- Possibly acid rain

Older students:

1. 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).
2. Design and conduct an "E.Q." survey (environmental quotient) to assess public knowledge of wetlands and their values.

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. Students should research wetlands using the Internet and resource materials in the library and classroom.

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 of plants are there?	8. Are some types of plants never found close to the water?
3. Are the plants 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 of plants 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 of plants never found close together?	11. What does the soil 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 next sheet. Your team will need these observations in order to suggest answers to the inference questions.

Wetlands Observation Sheet

Add additional observation questions on this sheet. Remember these observations should help you answer the questions you created on the investigation sheet.

Wetlands Investigation Guide

Investigation questions	Relevant observations	Inferences (possible answers)
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 being 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 the land and water animals?		
9. How might the marsh protect adjacent higher ground from some effects of storms and flooding?		

Wetlands Investigation Guide — Teachers' 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 marshes, there is a clear transition from trees and shrubs to tan, 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 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 or wave).
4. *Where might the wetland be changing or being destroyed?*
   - Over geologic time, wetlands are very dynamic places undergoing rapid change. Trapped sediments can fill in wetlands. Perhaps the majority of "inland" wetlands are only an early stage in normal succession and convert into dry land eventually. 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.
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 factors indicate that the wetland is important to land and water animals?*
   - Wildlife benefits can be inferred by observing animals present, such as 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 andflooding?*
   - Shoreline erosion protection can be inferred by observing eroded areas along the shoreline where marshes are absent. Examination of the peatlike soil may lead to inferences about its role in absorbing water and buffering flooding effects.

Standards of Learning: Science: 4.1, 4.5, 4.9, 6.5, 6.7, 6.9
LS.9, LS.11, ES.2, BIO.1

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