

Wetland Feedback Loops

A Carolina Essentials™ Activity

Student Worksheet



Overview

Wetlands are diverse and critical habitats that range from coastal saltwater marshes to freshwater swamps to soggy areas surrounding a pond. With the diversity in a wetland habitat comes a variety of ecosystem services such as water reservoirs, water purification, nesting grounds for birds, nurseries for amphibians and fish, and contributions to atmospheric humidity. Wetlands are so important that the federal government, through the U.S. Fish and Wildlife Service, maintains the [National Wetlands Inventory \(NWI\)](#). NWI keeps an accurate map of wetland location and extent.

Changes in wetland surface area can have multiple impacts, good or bad, locally or regionally, on species diversity, food chain connections, and atmospheric humidity, all of which are aspects of feedback loops. This activity is a short modeling exercise for you to collect evaporation rate data for simulated wetlands and to connect evaporation rate data to ecosystem feedback loops.

Phenomenon

Watch the teacher demonstration with the two saturated paper towels (a whole sheet and half sheet). Predict which paper towel holds the greatest volume of water. Was your prediction correct? How can it be explained? Think about this and write down your ideas. How does the availability of stored water affect an ecosystem?

SAFETY REQUIREMENTS

No PPE is required for the activity.

MATERIALS

2 dry kitchen sponges,
2.5 × 4.0 in
4 clear plastic punch cups, 9 oz
Disposable pipet
Scissors
Marker
Tap water
Balance (readability 0.1 g)
Stopwatch or smartphone
Access to the outdoors on
a sunny day or lamps with
incandescent bulbs

Essential Question

How can one change to Earth's surface create feedbacks that cause changes to other systems?

Activity Objectives

1. Collect data to calculate evaporation rate.
2. Relate evaporation rate to atmospheric humidity.
3. Explain how the extent of wetlands affects atmospheric humidity.

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Activity Procedures

1. Use the bottom of the punch cup as a pattern, trace 2 full circles and 1 half circle on the surface of a dry sponge.
2. Cut out the 2 full circles and 1 half circle from the sponges.
3. Place 1 full circle in a cup and label the cup “control.”
4. Place the other full circle in a cup and label the cup “100% wetland coverage.”
5. Place the half circle in a cup and label the cup “50% wetland coverage.”
6. Weigh each of the cups to the nearest 0.1 g and record the masses in a data table.
7. Add water to the last cup and using the pipet, add water to the 100% coverage and 50% coverage sponges until they are saturated. When they are saturated, you can gently push on the sponge and water will pool on the surface. There should not be any standing water in the cups. If there is standing water, pour it off.
8. Weigh the 100% coverage cup and the 50% coverage cup again and record the masses in the data table.
9. Place the 3 cups outside in the sun or under a lamp with an incandescent bulb for 15 minutes.
10. During the 15-minute heating period, investigate the U.S. Fish and Wildlife Service’s [National Wetlands Inventory](#). Click on the map and accept the conditions.
Complete the following:
 - Use the legend to determine and list what categories of wetlands are shown.
 - Name the large lakes in the northern central part of the United States, near the Canadian border.
 - Name the large lake in the central western part of the United States.
 - Use the legend to find the large forest/shrub wetland in Virginia and North Carolina. Name the area.
 - Locate the Okefenokee Swamp and Wilderness. In what states is it located?
 - Locate the Everglades in Florida. What category of wetlands is the Everglades?
11. Weigh the 3 cups and record the masses in the data table.
12. Place the 3 cups back under the heat source for an additional 15 minutes. While waiting, return to the [National Wetlands Inventory](#) and do the following:
 - Locate your state. What types of wetlands are present?
 - Zoom in on your town or city. What types of wetlands are present?
 - Try to locate your school neighborhood. Where and what types of wetlands are close to school?
13. Weigh all 3 cups and record the masses in the data table. Your teacher may ask you to complete an additional round of heating.
14. Squeeze all the remaining water from each sponge into its cup, then compare the amount of water that did not evaporate from the sponges.

Data and Observations

Construct a table to organize your data. Identify the 3 cups, mass of cups and sponge, and the mass of water initially and at 3 intervals—15, 30, and 45 minutes.

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Analysis and Discussion

Analysis

1. For each cup, calculate the amount of water that evaporated into the air.
2. Calculate the rate of evaporation for each cup. Rate is amount of water lost (g) per unit of time (min).
3. Calculate the surface area of each sponge. Area of a circle is $A = \pi r^2$.

Discussion

1. Why was a saturated sponge used to represent wetlands?
2. Where does the process of evaporation take place within a liquid?
3. Explain the factors that contribute to evaporation rate in a wetland.

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