

## Investigating the Functions of Wetlands

**Grade Level:** 2-5

**Subject Area:** Life Science

**Virginia Standards of Learning:**

2.5, 2.7, 2.8

3.4,3.6, 3.9, 3.10

4.4,4.5,4.9

5.5,5.6

**Objectives:**

Students will:

- Conduct experiments and make observations to determine the function of wetlands
- Construct models to investigate the functions of wetlands
- Understand the functions of wetlands and apply their understanding

**Summary:**

Students will perform two experiments using models of wetlands to learn about the ability of wetlands to prevent erosion, control flooding, and soak up pollutants. They will apply this knowledge in an activity using metaphors to describe a wetland. There is also an outdoor activity that may be added to teach students about a particular type of wetland, the saltmarsh, and adaptations for plants that live in those environments.

**Vocabulary:** wetland, saltmarsh, erosion, pollution, adaptation

**Materials:**

For each group/station you will need (designed for 2-5 students per group/station):

- *Student Worksheet* (included, hard and electronic copy) it may also be helpful to talk through these questions or write them on the board collectively as a group if some of your students are still struggling with reading and writing.
- 3-4 towels for cleanup

### *Runoff Race*

- 2 aluminum pans
- One wooden board with artificial turf on it
- One plain wooden board
- At least 2 jars of dirty water (should have chunks of dirt/sand/rocks in it). You may need more jars if groups or classes are going to be completing this activity back to back. One option is to have a bucket of dirt (potting soil works good) and some water or a sink nearby. That way, students can refill the jars of dirty water for the next group.
- Empty bucket to dump water into
- *Instructions* sign (included, hard and electronic copy)

### *Wetland in a Pan*

- Aluminum pan
- Paint pan
- 2-4 Sponges (to fit across width of paint pan)
- Watering can
- Dirt (such as potting soil) in a Tupperware container
- Empty bucket to dump water into
- *Instructions* sign (included, hard and electronic copy)

### *Wetland Metaphors*

- Sponge
- Pillow
- Picture of nursery
- Strainer
- Coffee filters
- Soap
- Multivitamins
- Tums
- Whisk
- Rice
- Picture of a zoo
- Picture of a hotel
- *Wetland Habitats* sign (included, hard and electronic copy)
- *Instructions* sign (included, hard and electronic copy)

### *Salt Marsh Plant adaptations*

- Salt marsh adaptation scavenger hunt sheet
- Note also that the VIMS teaching marsh is an excellent location for this, but other salt marshes can also be used, However, be sure to scope out the site beforehand to make sure you can find scavenger hunt plants at your location, or swap them out for different ones.

## Procedure:

### Introduction

1. Tell students they are going to be using models and conducting experiments to learn about wetlands and the important things they do. Wetlands serve many functions for the environment and for humans, and the students will be learning about these.
2. Describe wetland habitats – marshes, swamps, bogs, etc. But leave discussion of the importance of wetlands for wrap-up. Students should learn about the importance with these experiments.
3. Discuss salt marshes more specifically. A salt marsh is a type of wetland that is constantly flooded with brackish water. The salinity (amount of salt in the water) can change very often, since rain showers can bring in extra freshwater from streams which can lower the salinity, while high tides can bring in saltier water from the ocean or Bay. When there is a lack of rain and evaporation due to hot summers, the water can become even more salty. Many common plants do not have the ability to tolerate or grow in brackish water, so plants that live in salt marsh habitats must have a number of special **adaptations** to allow them to survive in the habitat. An **adaptation** is a characteristic or trait that helps a living thing to survive in its habitat. Plants have very different adaptations than animals, and each species of plant has different adaptations depending on where it lives.
4. Give students brief instructions. Describe each model and the experimental design for each experiment, and give an example for *Wetland Metaphors*.
  - a. *Runoff Race* – The board with artificial turf represents a healthy wetland with lots of plants. The board with nothing on it represents an unhealthy wetland with no plants or a man-made surface that water cannot pass through such as a parking lot. The aluminum pan at the end of the boards represents the river. Water will flow from a stream (their jars of water) through the wetlands and into the river. The boards should be held at the same angle and water should be poured down the boards at the same time and from the same height. This way students are looking at one variable, surface type.
  - b. *Wetland in a Pan* – The paint pan represents the land, the sponges represent a wetland, and the aluminum pan represents the river. Rain water will fall (from the watering can) onto the land and run off either through a wetland or not through a wetland into the river. The variable in this experiment is “wetland present or wetland absent”. All other variables should be kept the same – the same amount of water should be poured onto the land and the same amount of dirt should be sprinkled on the land.
  - c. *Salt Marsh Plant Adaptations*- adaptations are important so that an animal can survive in a specific habitat. Salt marshes are difficult to live in not only because

of the changing salinity of the water, but also because it can be very hot. As a result, it can sometimes also be difficult to get enough freshwater. Tell students you will be going through some different adaptations that plants use to live in the salt marsh and then they will be doing a plant scavenger hunt. In their groups they will go see how many species they can find with each type of adaptation.

- d. *Wetland Metaphors* – Ask the students if they know what a metaphor is (from their English/language classes perhaps?). Describe a metaphor to them – *a comparison between two objects without using like or as. Example: The world is a stage.* Tell the students that they will be using the objects on the table to create metaphors for wetlands. Give them an example: *A wetland is a hotel because it is a resting place for migrating birds.* It might help to have the students think about how we use each object or what each object does for us and then try to relate that function to a wetland. (Example: We use a pillow to rest/sleep on, animals might use a wetland to rest in.)
5. Remind students of safety issues: be careful with boards - don't drop them on someone's hand - be careful of glass jars, etc. Also remind them to be as clean as possible; these activities can get messy and wet. Don't stray too far from the group if going outside and be sure to always be within eyesight of an adult

## Activity

### *Runoff Race*

1. One or two students will hold both boards up so that they are angled downward and the bottoms of the boards are in the aluminum pans (see figure below).



2. One or two students will pour the jars of dirty water down the two boards at the same time.
3. Students should observe what happens. How much water and dirt enters the pan at the end of each board?
4. Once students have completed the experiment, they should answer the questions on their *Student Worksheet*.

### *Wetland in a Pan*

1. One student will hold the paint pan at an angle so that the bottom of the pan is inside the aluminum pan. The sponges should be in place across the width of the paint pan (see figure below).



2. One student will pour water from the watering can onto the paint pan. Students should observe what happens. How much water enters the aluminum pan?
3. In order to have something to compare to, students must complete the experiment without the sponges/wetland in place. Students will remove the sponges and repeat step 2.
4. Students will put the sponges back in place and sprinkle a little bit of dirt onto the paint pan.
5. Students will pour water from the watering can onto the paint pan and observe what happens to the dirt. Does it stay in place or get washed away? How much water and dirt enter the aluminum pan?
6. Students will remove the sponges and repeat steps 4-5 (without sponges).
7. Once students have completed this experiment they should answer all of the questions on their *Student Worksheet* – remind them to answer the final two questions that ask them to draw conclusions from both experiments.

### *Salt Marsh Plant Adaptations*

*\*adapted from Salt Marsh Plant Scavenger Hunt, Virginia Sea Grant Marine Advisory Program Education, Virginia Institute of Marine Science*

1. Give each group of students a Salt Marsh scavenger hunt work sheet. Go through each of the following adaptations with students an example comparison object has also been given to relate the adaptation to its purpose.

| <b>Object:</b> | <b>Adaptation:</b>                    | <b>Helps Deal With:</b>           | <b>Helps the Plant By:</b>   |
|----------------|---------------------------------------|-----------------------------------|--|
| Sponge         | <b>Succulent</b> leaves               | Heat, Little Rainfall             | Storing moisture in leaves   |
| Wax Paper      | <b>Waxy</b> or <b>leathery</b> leaves | Heat, Water Loss from Evaporation | Keeping water from evaporating off the leaf                                  |
| Rolled Paper   | <b>Cylindrical</b> (rolled) leaves    | Sunlight, Heat, Water Loss        | Reducing the amount of the leaf that is in sunlight, and reducing water loss |
| Filter         | <b>Salt glands</b>                    | Growing in Salty Water            | Removing extra salt that is brought in by the roots                          |

2. Give each group about 15 minutes to walk around outside with their worksheet they should be able to count the number of plants with a specific adaptation.
3. When students come back, have them share which adaptations that they found, and ask why they think they are important.

### *Wetland Metaphors*

*\*adapted from Aquatic Project WILD*

1. Give each student (or group) an item from the set. Give students a minute or two to think about how their item is like a wetland. They should have learned about some functions of wetlands from their experiments, and they can read about some of the functions on the *Wetland Habitats* sign. But they will also have to be imaginative and creative.

### Wrap Up

Have the students tell you what some of the functions of wetlands are. Ask them to describe how they came to these conclusions – what did they observe from their experiments? They should definitely have learned that wetlands filter the sediment out of the water and that they absorb water. Have the students imagine that the dirt they poured on the paint pan was pollution/chemicals/nutrients. Wetlands also filter pollutants out of the water. Discuss with students why these functions are important to animals, the environment, and us – wetlands keep our waterways clean and help with erosion, they keep nutrients and pollutants out of our water, and they absorb excess water and prevent flooding. Discuss the importance of the adaptation of these species. Not all plants are able to live in these conditions, and not all plants can help protect the environment in this way. Connect this to the idea of protecting these species because they are important for helping the ecosystem.

Go around the room and have each student or group share how their wetland metaphor item is similar to a wetland. You can keep a running list on the board of all of the functions of wetlands – between the experiments and the metaphor activity. Make sure you appreciate creativity, but also make sure that the students are getting the correct message.

Finish the discussion by summarizing the different functions of a wetland and pointing out to students just how important wetlands are. Also talk about where wetlands are found (*does anyone have a marsh in their backyard?*), why and how they are destroyed, and why it is important to preserve wetlands.

**Example Setup for Activity:**

*Runoff Race and Wetland in a Pan Table*



*Wetland Metaphors Table*





Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

## **Investigating the Functions of Wetlands**

### Questions from Runoff Race experiment:

1. In which wetland did the water run into the river the fastest? (Circle one.)

Healthy wetland with lots of plants                      unhealthy wetland with no plants

2. Which wetland trapped more sediment (dirt)? (Circle one.)

Healthy wetland with lots of plants                      unhealthy wetland with no plants

### Questions from Wetland in a Pan experiment:

3. Did more water enter the river when the wetland was: (Circle one.)

There (sponges in place)                      or                      Gone (sponges removed)

4. What happened to the dirt on the paint pan when you poured water over it? Did it stay in place or did it wash away?
5. Was the water cleaner when it entered the river if it flowed through the wetland first (sponges in place) or was it cleaner if it did not flow through the wetland (sponges removed)?

### Conclusions:

6. From the two experiments you should have learned about two important things that wetlands do. Write down two things that wetlands can do. Think about how much water and sediment entered the rivers in each experiment.
7. If a wetland is destroyed and houses are built in its place, what might happen to the houses during a severe rainstorm? Think about what happened when water ran down the paint pan and there was not a wetland at the end.

Partner Names \_\_\_\_\_

Try to find at least 1 plant that shows adaptation that might help it survive in the Salt marsh

Examples of adaptations: waxy or leathery leaves; succulent leaves; rolled leaves; shallow spreading roots, special seed packaging.

Adaptation  
survive?

# of Plants

How it helps a coastal plant

| Adaptation<br>survive?         | # of Plants | How it helps a coastal plant |
|--------------------------------|-------------|------------------------------|
| <b>Waxy or leathery leaves</b> |             |                              |
| <b>Succulent leaves</b>        |             |                              |
| <b>Rolled leaves</b>           |             |                              |
| <b>Salt Glands</b>             |             |                              |

## KEY - Investigating the Functions of Wetlands

### Questions from Runoff Race experiment:

1. In which wetland did the water run off into the river the fastest? (Circle one.)

Healthy wetland with lots of plants

unhealthy wetland with no plants

2. Which wetland trapped more sediment (dirt)? (Circle one.)

Healthy wetland with lots of plants

unhealthy wetland with no plants

### Questions from Wetland in a Pan experiment:

3. Did more water enter the river when the wetland was: (Circle one.)

There (sponges in place)

or

Gone (sponges removed)

4. What happened to the sediment on the paint pan when you poured water over it? Did it stay in place or did it wash away? **It washed away**
5. Was the water cleaner when it entered the river if it flowed through the wetland first (sponges in place) or was it cleaner if it did not flow through the wetland (sponges removed)? **It was cleaner if it flowed through the wetland first.**

### Conclusions:

6. From the two experiments you should have learned about two important things that wetlands do. Write down two things wetlands can do. Think about how much water and sediment entered the rivers in each experiment.

**Wetlands can absorb excess water and prevent flooding and they can filter sediment out of the water before it enters rivers or the Bay.**

7. If a wetland is destroyed and houses are built in its place, what might happen to the houses during a severe rainstorm? Think about what happened when water ran down the paint pan and there was not a wetland at the end.

**The houses might flood since there is not wetland to absorb the excess water from the rainstorm. There might also be a mudslide or the ground beneath the houses might erode away since there are no plants to stabilize the sediment around the houses.**

Wetland Metaphors- Key

| <b>Object</b>                              | <b>Wetland Function</b>   |
|--|---|
| Example: Picture of Hotel                  | Wetlands are resting places for migrating birds.                        |
| 1.sponge                                   | Absorbs excess water  |
| 2.pillow                                   | Resting place for animals   |
| 3. nursery or crib                         | Nursery area for young animals (provides them with food and protection) |
| 4.strainer                                 | separates dirt, pollutants, etc. out of the water                       |
| 5. coffee filter                           | Filter dirt, pollutants, etc. out of the water                          |
| 6.soap                                     | Cleans dirt, pollutants, chemicals, etc. out of the water               |
| 7.multivitamins                            | Provides nutrition to plants and animals                                |
| 8.tums                                     | Neutralizes pH, buffer for chemicals entering the water                 |
| 9.whisk or electric mixer                  | Mixes oxygen and nutrients into the water                               |
| 10.cereal/rice/picture of vegetable garden | Provides food and nutrition for plants and animals                      |
| 11.picture of zoo                          | Habitat for animals   |