

Wetland Metaphors!

Adapted from: *The Wonders of Wetlands* by Alan S. Kesselheim, Britt Eckhardt Slattery, Susan H. Higgins, and Mark R. Schilling. Produced by Environmental Concern Inc. and The Watercourse, 1998

Grade Level: Basic to Intermediate

Duration: 30 minutes

Setting: Classroom

Summary:

Students will compare the functions and characteristics of wetlands to common objects.

Objectives:

The students will become familiar with the characteristics and benefits of wetlands to humans, animals and plants. They will be able to explain why wetlands are important from an ecological point of view.

Vocabulary:

Wetland, hydric, hydrophytic, sequester, assimilate, buffer, habitat, vernal pool, siltation, silt, biodiversity, recharge zones, aquifer

Related Module Resources:

- Fact Sheets in the “Additional Module Resources” section:
 - “An Introduction to Wetlands”
 - “Wetlands: Functions at the Junctions”
 - “Functions and Values of Wetlands”

Materials (Included in Module):

- Wetland Metaphors Functions List and blank overhead transparency
- Container of Wetlands Metaphors Objects:
 - antacid, bottle of water, animal crackers, picture of a house, coffee filter, strainer, cradle picture, duct tape, Frisbee, motel picture, pillow, postcard, rattle, soap, speed limit sign, sponge, straw, toilet paper, Tupperware container, whisk, zoo
- Food coloring [Book Box]
- Wet erase markers [Book Box]

Additional Materials (NOT Included in Module):

- Celery
- Whiteboard/chalkboard

ACADEMIC STANDARDS:

7th Grade

- 4.1.7.D. Explain and describe characteristics of a wetland.
- Describe the different functions of a wetland.

10th Grade

- 4.1.10.D. Describe the multiple functions of wetlands.
- Describe wetlands in terms of their effects (e.g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas).
 - Explain how a wetland influences water quality, wildlife and water retention.

12th Grade

- 4.1.12.D. Analyze the complex and diverse ecosystems of wetlands.
- Explain the functions of habitat, nutrient production, migration stopover and groundwater recharge as it relates to wetlands.

BACKGROUND: What term describes swamps, marshes, bogs, fens, potholes, sloughs, bayous, quagmires, and muskegs? Wetland! A **wetland** is an area characterized by the presence of water, saturated or **hydric** soil, and plants adapted to saturated soil conditions (**hydrophytic** plants). Wetlands play a critical role in the ecosystem and are beneficial to humans, plants, and animals.

Wetlands can absorb large quantities of water, making them particularly useful when rivers and streams overflow their banks because they help minimize the effects of flooding. Because it soaks up excess water and prevents the surrounding areas from being flooded, a wetland can be compared to a sponge. If a wetland is destroyed, the area has a better chance of being flooded because excess water will have nowhere to be absorbed and water will spread over shorelines.

Another property that both wetlands and sponges share is that wetlands can hold water even after all the standing water, like ponds, creeks, or puddles, has been absorbed or dried up. There is still enough moisture in wetland soil for vegetation and animals to survive. Wetlands also prevent erosion by retaining enough moisture to support plants whose root systems hold the soil in place. Where wetlands are destroyed, erosion and flood damage are much more devastating.

In addition to soaking up and retaining large quantities of water, wetlands can filter out sediment and debris that are carried in the water column. Wetlands can also **sequester** or take up nutrients and pollutants that are dissolved in water. As water passes through a wetland, the water movement is slowed, allowing suspended sediments, pollutants, nutrients and debris to settle out and become part of the sediment of wetlands. As a result, water that comes out of wetlands is generally much cleaner than water that enters wetlands. Water that has passed through a wetland is also of better quality because wetland vegetation absorbs and **assimilates** or incorporates dissolved nutrients and pollutants into its tissues, thereby removing those nutrients and pollutants from the water. Many plants native to wetlands can even convert toxic pollutants into less potent forms. Wetlands can also neutralize acid rain. In general, wetlands act as **buffers** or protective cushions between harmful variables in the environment and plants, animals, humans, and habitats. Without wetlands, toxic levels of pollutants and nutrients could kill plants and animals.

Because of their ability to improve water quality by filtering out sediment and debris, sequestering nutrients, and transforming pollutants, some municipalities have begun to use wetlands in sewage treatment processes. In fact, in some areas of China, wetlands are being used in lieu of conventional wastewater treatment facilities! The wetlands remove waste from the water when the plants absorb it or when it settles out. Pollutants and sediments settle out of the water column because of the slow rate at which water passes through the wetland.

In addition to flood prevention, water retention, erosion control, toxin/nutrient/pollutant filtration, transformation and sequestration functions, wetlands provide a **habitat** or a home for many animals and plants. Therefore, wetland ecosystems have high **biodiversity**, meaning that they can support lots of forms of life. Furthermore, numerous other animals depend on wetlands for one or more parts of their life cycle. Many migratory birds stop in wetlands on their way south in the winter or north in the summer; these birds depend on wetlands as a place to rest and eat on their journey. Birds also use wetlands as a nesting place to lay their eggs and raise their young. Many fish species rely on wetlands as spawning grounds and numerous amphibians and insects reproduce and mature in swamps, marshes, **vernal pools** (short-lived or ephemeral wetlands) and other wetlands. It's thus no surprise that wetlands are highly productive ecosystems with high levels of biomass, nutrients, and water that can support lots of forms of life.

Why are wetlands such popular places for migratory stopover, reproduction, and development? Because they provide the water and nutrients that are necessary for all organisms to survive! Wetlands have high nutrient levels as a result of the **siltation** that occurs in them during flooding. Siltation is the settling out of **silt** (fine, nutrient rich sediment) in still or slow moving water. Wetland plants absorb the nutrients from the water and silt and when these plants die, these nutrients are returned to the soil or water for other plants to use. When other organisms consume plants, the nutrients cycle through the food web. Wetland plants also play an integral role in keeping oxygen cycling through wetland ecosystems. These plants release oxygen during photosynthesis and animals, including humans, use this oxygen. Animals and humans then release carbon

dioxide, which is used by the plants during photosynthesis. Wetland plants provide food for animals and nutrients that cycle through the food web, benefiting all organisms, including humans, while also attracting animals in search of food, shelter, nesting or spawning areas, or a place to hide from predators.

Another function to add to the long list of wetland benefits is that wetlands serve as **recharge zones**, or areas where water flows from wetlands into the ground, adding water to **aquifers**. An aquifer is an underground layer of substrate that holds water and allows it to percolate through. Wells tap into aquifers to provide drinking water.

On a more aesthetic level, wetlands are beneficial because they are often beautiful areas that serve as tourist attractions and vacation spots and provide recreational opportunities. Perhaps one of the most famous wetlands is the Everglades in Florida; hundreds of thousands of tourists journey to the Everglades every year!

Unfortunately, wetlands are not as common as they used to be and their ability to perform their plethora of beneficial functions has been severely compromised. Up until the mid-to-late-1900s, the numerous benefits and functions of wetlands were not well understood. As a result, countless wetlands were destroyed. In recent years, however, the US government has taken steps to protect the nation's remaining wetlands by making it illegal to destroy them. *(See the module activities "Marsh Madness" and "Town Hall Meeting" for more information on specific wetlands regulations.)* We must remember that when wetlands are destroyed, many species become endangered because they no longer have a habitat to live in or reproduce, nor do they have the nutrients and food they need to survive. Migratory birds no longer have a resting place on their long journeys and many animals no longer have a place to nest or raise their young. Without wetlands, areas are more susceptible to flooding and drying out, pollutants and excess nutrients create problems in the environment, sediment and debris choke waterways, and water quality diminishes. When we destroy wetlands, we also deprive ourselves of valuable recreation, tourist and vacation opportunities.

OVERVIEW:

After being divided into small groups, students will randomly choose or be given an object(s) from the Wetland Metaphor Objects box. Within their groups, the students will decide what wetland benefit or function the object represents. Each of the groups will then present their object(s) to the class.

PROCEDURE:

Teacher Preparation:

1. Locate the Wetland Metaphor Objects box in the module.
2. If you decide to use the overhead transparency included in the module to summarize students' wetland metaphors presentations, procure and set up an overhead projector and locate the wet erase markers in the module.

Student Activity:

1. Discuss the importance of wetlands and how they reduce flooding, retain water, decrease erosion, buffer against and filter out nutrients and pollutants, provide habitat and nesting/spawning/reproduction grounds, offer recreational opportunities, etc. Encourage students to share what they already know about wetlands, possibly by listing wetland functions on the board, and discuss their opinions of the importance of wetlands.
2. Explain the concept of a metaphor, giving an example and then soliciting other examples from students. For instance, "wetlands are sponges because..."
3. Divide the students into small groups and distribute a few items from the Wetland Metaphor Objects box to each group.
4. Within their small groups, have students discuss how wetlands are comparable to the different objects they received, i.e., have them determine what wetland function or benefit the object represents.
5. Create a chart on the board with the following headings or use the overhead transparency included at the end of the activity write-up to summarize students' metaphors.

Object	Wetland Function/Benefit Represented
Sponge	Absorbs excess water, retains water, prevents flooding

6. Have each group present their wetland metaphors to the rest of the class and add their results to the chart on the board or to the overhead transparency.
7. Encourage students from other groups to add their interpretations of the objects after each group has finished presenting their items and metaphors. Have students share their ideas for additional wetland metaphors.

DISCUSSION:

- Have students think back to their pre-activity thoughts on wetlands. After doing the activity, how do their impressions/knowledge/opinions of wetlands compare to those initial thoughts? If their opinions have changed, how and why? *Allow students to share their initial and current thoughts on wetlands.*
- How are wetlands important for humans? What objects represent this? *See background section and the Wetlands Metaphors Functions List.*
- How are wetlands important to wildlife? What objects represent this? *See background section and the Wetlands Metaphors Functions List.*
- How are wetlands important to water quality? What objects represent this? *See background section and the Wetlands Metaphors Functions List.*

EVALUATION:

- Discussion questions above.
- Describe the different functions of a wetland.
- Describe wetlands in terms of their effects (e.g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas).
- Explain how a wetland influences water quality, wildlife and water retention.
- Explain the functions of habitat, nutrient production, migration stopover and groundwater recharge as it relates to wetlands.

EXTENSIONS AND MODIFICATIONS:

- Instead of giving or lecturing the background information about wetland functions/value prior to this activity, do the activity first, allowing the students to try to figure out the functions just based on the objects. Then as the students share their ideas about their object, write down the information, steer the students in the correct direction with the answer and lecture more details about the function at this point.
- Have the students create a project on wetlands and present it to the class. Some suggestions are a poster, a demonstration of a wetland function, and a pamphlet on wetlands.
- Take the students to visit a nearby wetland and have them record the evidence of the wetland functions that were discussed during the activity.
- Have students identify objects in the classroom or around their homes that could also be used as metaphors for the characteristics/functions of wetlands.
- The soil anchoring capacity of wetland vegetation can also be demonstrated by removing a plant, its roots, and the soil held together by those roots from its flowerpot. The dirt and roots will retain the shape of the flowerpot even after they are removed from it. Wetland vegetation acts similarly to hold soil in place and to reduce soil erosion.
- Demonstrate the water absorbing capacity of wetlands using a sponge and water.

- Have students select a specific wetland function and do further research on that topic. For example, wetlands were compared to transformer toys in the activity, meaning that wetlands can transform noxious pollutants into less toxic forms. Have students investigate exactly how wetlands carry out this function. What are the chemical reactions involved? At what level are these processes occurring, i.e., in the soils, plant tissues, elsewhere? The results of students' research might then be presented in poster, report, pamphlet or other form. This might be a good idea for Student Research Symposium investigations.
- Have students interview community members, farmers, fishermen and environmental specialists to assess their awareness of the important functions carried out by wetlands. Students could then compare the different groups' perceptions of wetlands. Students might create educational pamphlets on the importance of wetlands to give to interviewees after asking their questions.
- Students could prepare an educational skit or puppet show using the props in this activity and other ideas they might have. They could then present it to other classes at their school in order to educate their peers on the value of maintaining wetlands. They might act out the parts of runoff, sediment, pollutants, or nutrients being held up by a riparian buffer as they try to get to a stream, etc.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Wetland Metaphors!

Functions List

Distribute the objects below to students and ask them to determine which wetland function the objects represent or are metaphors for.

Object	Wetland Function Represented by Object
Antacid	Neutralizes acid. Wetlands can neutralize acid rain
Bottle of water	Source of water. Wetlands store and retain water and recharge aquifers, which, in turn, are tapped as sources of clean water.
Box of animal crackers	Biodiversity is high in wetlands. Wetlands support many different forms of life by providing necessary habitat and needs for living organisms.
Celery (not included in module)	(When put in dye for a few days, it sucks up the dye.) Wetland vegetation absorbs pollutants and excess nutrients and stores them in its tissues. .
Illustration of a home/house AND/OR Classified ads of houses for sale	Habitat (homes) for animal life. Wetlands provide habitat for wildlife, from land-dwelling mammals to migrating birds, amphibious creatures to aquatic organisms such as fish and aquatic insects.
Coffee filter AND/OR Kitchen Strainer	Filter out pollutants, nutrients, sediment and debris. Wetlands filter out different types of pollutants from water, e.g., eroding soil, fertilizers, manure, nutrients, pesticides, chemicals, toxins, and salts. Wetlands remove sediment and debris by slowing the flow of water and allowing sediment and debris to settle to the bottom of the wetland.
Cradle Picture	Nursery that shelters, protects, and provides food for young wildlife.
Duct tape	A “fix-all” for improving water quality. Just like duct tape can fix anything, wetlands help fix numerous water quality and quantity problems.
Frisbee	Recreational opportunities. People hike, bird watch, observe nature in wetlands, and otherwise relax in or near wetlands.
Motel Picture	Stopping point/resting place for migratory animals, especially birds.
Paper Towels	Used to soak up water, clean up a mess. Wetlands soak up excess water. Wetlands can also be used in remediation of messes (pollution) caused by acid mine drainage, industrial practices, or agricultural operations.
Pillow	Resting spot for migratory animals. Wetlands provide areas for migratory birds or animals on the move to rest.
Postcard	Tourist or vacation destination. Wetlands such as the Everglades in Florida are hot tourist attractions.
Rattle	Many species of birds, fish, and aquatic insects rear their young in wetlands.

Rice	Wetland provide us food resources - rice, cranberries, fish
Soap	Help keep the water clean. Wetlands sediment filtering, nutrient uptake, and pollutant transforming abilities improve water quality.
Speed limit sign	Slows down the flow of water through a watershed. Wetlands slow down water, allowing it to soak into the ground, instead of just washing quickly over the land and into streams and rivers, thus reducing flooding potential.
Sponge	Soak up water. Wetlands soak up rainwater or floodwaters. Wetland vegetation and hydric soils retain water even after standing water dries up.
Straw	Suck up extra water. Wetland vegetation can “suck up” extra surface water and use it for growth, preventing potential flooding.
Toilet Paper	Some wetlands are used for wastewater treatment / sewage treatment.
Storage container	Store extra nutrients and extra water. Wetland vegetation takes up extra nutrients from water and stores them in plant biomass. Extra sediment is stored on the bottom of wetlands. Extra water is stored in wetland vegetation or in hydric wetland soils.
Whisk	Wind and rain mixes nutrients and oxygen into the water.
Ziploc bag	Storage. Wetlands store extra water, extra nutrients, extra sediment.
Zoo Picture	High biodiversity; habitat for many animals.