



**PITTSBURGH ZOO
& PPG AQUARIUM**

Wetland Wonders

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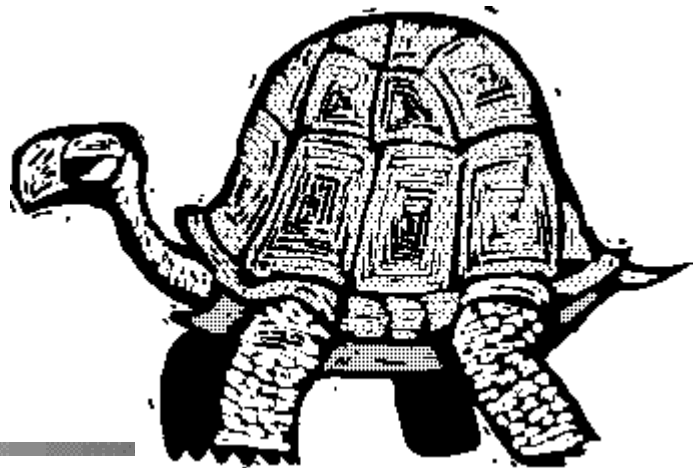
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Wild About Wetlands

Academic Standards for Environment and Ecology

4.1 WATERSHEDS AND WETLANDS

- 4. 1. 4 A Identify various types of water environments.
- 4. 1. 4 B Explain the differences between moving and still water.
- 4. 1. 4 C Identify living things found in water environments.
- 4. 1. 4 D Identify a wetland and the plants and animals found there.
- 4. 1. 4 E Recognize the impact of watersheds and wetlands on animals and plants.

4.3 ENVIRONMENTAL HEALTH

- 4. 3. 4 A Know that plants, animals, and humans are dependent on air and water.
- 4. 3. 4 B Identify how human actions affect environmental health.

4.6 ECOSYSTEMS AND THEIR INTERACTIONS

- 4. 6. 4 A Understand that living things are dependent on nonliving things in the environment for survival.
- 4. 6. 4 B Understand the concept of cycles

4.7 THREATENED, ENDANGERED, AND EXTINCT SPECIES

- 4. 7. 4 A Identify differences in living things.
- 4. 7. 4 B Know that adaptations are important for survival.

4.8 HUMANS AND THE ENVIRONMENT

- 4. 8. 4 B Know that environmental conditions influence where and how people live.
- 4. 8. 4 C Explain how human activities may change the environment.
- 4. 8. 4 D Know the importance of natural resources in daily life.

Academic Standards for Science and Technology

3.3 BIOLOGICAL SCIENCES

- 3. 3. 4 A Know the similarities and differences of living things.
- 3. 3. 4 B Know that living things are made up of parts that have specific functions.

Wetlands Background Information

A wetland is defined as an area that has standing water for at least part of the year. Marshes are fresh, brackish or salty water areas dominated by herbaceous vegetation such as pond lilies, reeds, sedges, grasses, and cattails. Swamps, on the other hand, are characterized by woody vegetation like bald cypress, tupelo, swamp oak, alder, and willow. Bogs are often characterized by sphagnum moss (a.k.a. peat moss) and low shrubs. Other types of wetlands include bottomland forests, wet meadows, and vernal ponds.

Wetlands play an important role in many animals' lives including humans. Many wetlands function as flood control, storing excess water from rivers and lakes. The slow down of water in a wetland allows the silt and mud to settle to the bottom providing a rich source of material for food, and breeding for invertebrates. This in turn provides an abundant food source for fish and birds. Dense plant matter, slow moving and often warm water provides shelter for young and developing animals. During migration, waterfowl rely on large bodies of water for rest and breeding grounds.

Many animals cannot survive without wetlands. Approximately one third of all endangered species rely on wetlands for part of their lives. Threats to wetlands include draining and filling for construction, tilling for crops, logging, mining, air and water pollutants, agricultural run-off, toxic chemicals, introduction of non-native species, and grazing by domestic animals. Two introduced species that are problematic in wetlands are the zebra mussel and the purple loosestrife plant. Purple loosestrife was introduced from Europe in the 1800's as an ornamental flower. This inedible plant outcompetes edible native plants and causes a break in the food chain. The zebra mussel was thought to have been introduced accidentally via a ship's ballast. Zebra mussels have inflicted tremendous damage to native ecosystems. Millions of dollars have been spent by surface water users, like power plant and municipal water suppliers, to control and eradicate zebra mussels.

Wetlands are not often seen for their intrinsic values, but as residential, commercial or farm land. Nearly half of the wetlands that originally existed in North American have been destroyed by human settlement. In 1972, the Clean Water Act significantly protected wetland areas and brought attention to their importance.

Vocabulary

Adaptation- behavioral or physical change that improves a plant or animals chance for survival.

Amphibian- an animal that typically lives in an aquatic habitat breathing by gills as young, and primarily in a terrestrial habitat breathing by lungs and through moist skin as an adult.

Camouflage- an organism's ability to hide or blend with its surroundings using color, pattern, or shape.

Carnivore- an animal that eats other animals.

Conservation- the wise use of natural resources in order to ensure continued availability to future generations.

Habitat- the place an animal lives.

Herbivore- an animal that eats only vegetation.

Metamorphosis- a process of change that amphibians and insects often go through from egg to adult.

Migration- the movement of animals from one location to another.

Omnivore- an animal that eats both plants and other animals.

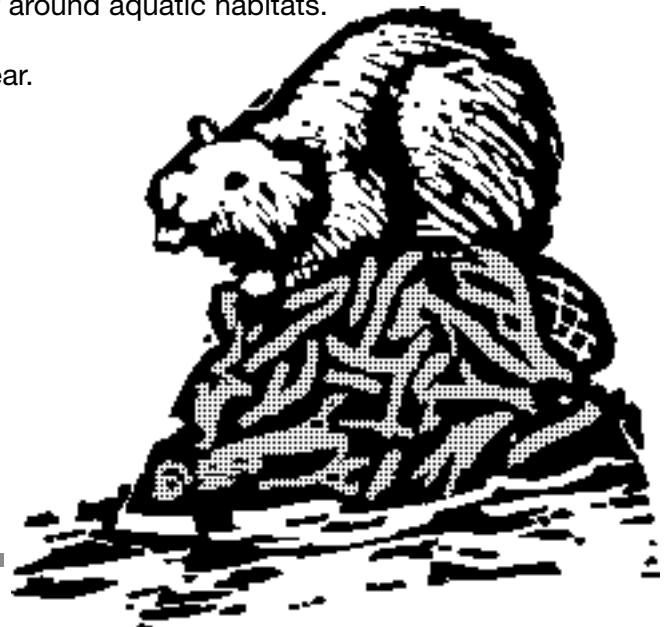
Pollution- any substance that destroys the purity of land, air, or water.

Predator- an animal that hunts and kills other animals for food.

Prey- an animal that is hunted and eaten by another animal.

Waterfowl- any bird that spends a large portion of its life in or around aquatic habitats.

Wetlands- areas with standing water for at least part of the year.



Suggested Reading List

Box Turtle at Long Pond, William T. George

Come Out, Muskrats, Jim Arnosky

Common Frog, Oxford Scientific Films

Dragonflies, Cynthia Overbeck

Fish Eyes, Lois Ehleert

If You Were a Wild Duck Where Would You Go?, George Mendoza

Let's Find Out About Frogs, Corrine J. Naden

Lily Pad Pond, Bianca Lavies

The Lorax, Dr. Seuss

Make Way for Ducklings, Robert McCloskey

The Noisy Counting Book, Susan Schade and Jon Butler

Old Mother West Wind, Thornton W. Burgess

Puddles and Ponds, Rose Wyler

Rain Drop Splash, Alvin Tresselt

A River Dream, Allen Say

River Parade, Alexandria Day

The Seminole, Emilie U. Lepthier

Spring Peepers, Judy Hawes

The Ugly Duckling, Hans Christian Anderson

Willa in Wetlands, Peyton Lewis and Rory Chalcraft



Teacher Resources

Aquatic Project WILD by Western Regional Environmental Education Center

Discover Wetlands by Washington State Department of Ecology

Hanging on to the Wetlands by Irwin Slesnick and David Newton

Living in Water by Valerie Chase

NatureScope: Wading into Wetlands by National Wildlife Federation

The Project WET Curriculum & Activity Guide Project WET and the Western Regional Environmental Education Council

River Times by Mathematics and Science Center

A World in Our Backyard: A Wetlands Education and Stewardship Program by New England Interstate Water Pollution Commission

WOW! : The Wonders of Wetlands by Environmental Concern Inc. and The Watercourse

Internet Resources

<http://www.epa.gov/OWOW/wetlands/vital/wetlands.html>

US Environmental Protection Agency

<http://www.dep.state.pa.us/educators/default.htm>

DEP educator website

<http://aquat1.ifas.ufl.edu/welcome.html>

Center for Aquatic and Invasive Plants by the University of Florida

<http://www.nwi.fws.gov/>

National Wetlands Inventory by the US Fish and Wildlife Service

<http://pittsburghzoo.com/>

The Pittsburgh Zoo and PPG Aquarium

<http://www.epa.gov/kids/>

Environmental Protection Agency's "Explorers' Club For Kids"

<http://www.cbf.org/>

Chesapeake Bay Foundation- Save the Bay

Aqua Words Activity

Pre-Visit Lesson Plan

Class Time: One or Two 20-45 minute class sections

From Project Wild Aquatic: K-12 Curriculum and Activity Guide

OBJECTIVE:

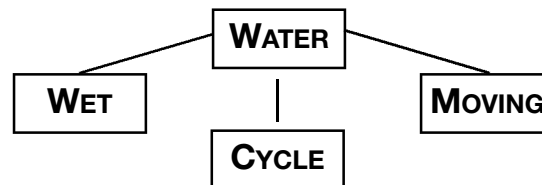
The students will describe a variety of ways and reasons why water is important to people and wildlife.

MATERIALS:

- Writing materials

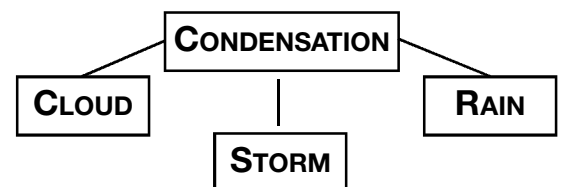
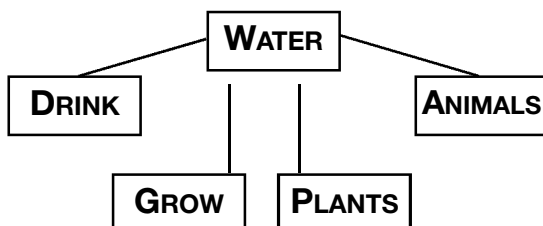
PROCEDURES:

1. Have the students bring in magazine photographs that show water habitats. Ask them to look especially for pictures that show how organisms depend upon water. Display these photographs and use them as a basis for discussion.
2. Ask students to think about some of the ways they have used water today. The pictures (if collected) may be used to get them started. Emphasize how all organisms are ultimately connected to water.
3. Using a long strip of paper or an empty chalkboard, ask the students to list at least 100 words that have something to do with water. Ask them to think of words about water including its importance to people and wildlife. Keep students stretching into new areas by suggesting examples and categories of ideas if they get bogged down. (Note: for younger students, use pictures or combination of words and pictures.)
4. Using the list of recorded words, ask the students to create word trees of water related words. Begin with a simple word tree like this:



(Note: You could give them this as an example for a start if they need it.)

Finally if possible, ask the students to create even more complex word trees like these:



5. When students have finished several word trees, have them look at what they have done and create one or two poetic definitions of water or water-related concepts. These could begin "Water..." or "Water is..." For example, using the word tree condensation-cloud-rain-storm, you might get: "Water is gray clouds condensing into a loud summer storm." Students could also simply create sentences or even paragraphs about water.
6. When the students have completed their poetic statements, have them write the statements onto various shades of blue, aqua, gray white and green construction paper cut to graphically fit the feeling of their ideas. Artistically arrange these cutouts on a wall or window. **OPTIONAL:** Have students arrange their words in: the shape of a stream, river, pond, lake or ocean; or the form of the water cycle from their words and images; or write each of their words on pieces of paper shaped like a water drop.

SUMMARY:

Ask the students to explain three ways they use water. Ask them how plants and animals use water. Ask them why water is important. The major purpose of this activity is for students to increase their appreciation of the importance of water.



Wetland Scavenger Hunt

In-Zoo Activity

Class Time: 45 minutes

OBJECTIVES:

- The students will be able to identify animals that live in a wetland.
- The students will be able to identify characteristics of wetland animals.

MATERIALS:

- “Wetland Wonders” scavenger hunt sheet, wetland animal pictures (for younger students), pencils or markers, clipboards or hard writing surface.

PROCEDURES:

ANTICIPATORY SET

Before arriving at the zoo, toss the blow-up globe around your classroom for the students to catch. Ask students to locate large bodies of water (lakes, oceans, rivers, etc.) on the globe, also naming one animal that lives there. Continue until each student has a turn.

-OR-

The zoo class, “Wetland Wonders”, may be taken prior to the scavenger hunt, too.

DEVELOPMENT OF LESSON:

1. After passing out the clipboards and pencils, have students pair up. Depending on the age and level of your students, this activity may be completed without partners. Chaperones may be included in this activity, if appropriate.
2. Explain to the students that they will be searching for animals that live in very wet places like lakes, rivers, and oceans, as they walk through the zoo. Some animals need a large area of water to survive, and without it they would die. Some animals at the zoo don't need very much water at all.
3. Beginning with the Flamingos, ask the students to look at the exhibit and decide whether it has water in it. Explain to the students that if the exhibit has water in it, then it maybe recreating a wetland for this particular animal or group of animals. If your class is older or has completed the Wetland Wonders class, you can make the “hunt” more challenging by not giving “hints” during your tour.

SUMMARY:

Discuss the answers with the students at the end of your tour, or when you return to your school.

Wetlands Scavenger Hunt

Find an animal that:

1. has webbed feet for swimming _____
2. builds a lodge _____
3. is found in the ocean _____
4. has water-proof feathers _____
5. has flippers or fins _____
6. is an amphibian _____
7. is a predator _____
8. lives in a swamp _____
9. has scales and breathes air _____
10. has long legs for wading _____

Helpful Hints

Teachers: Please include this word bank if the scavenger hunt is too difficult for your students.

Hint: The animal can be used more than once.

Beaver Duck Frog Alligator Heron Snake Sea Lion

Homemade Wetland

Post-Visit Activity

Class Time: One or Two class periods

(Adapted from “Wetland in a Pan” in *WOW!: The Wonders of Wetlands*)

OBJECTIVES:

- TSW describe interrelationships among precipitation, runoff, and wetlands.
- TSW relate the importance of wetland functions to their own needs and daily lives.
- TSW create a model that demonstrates the flood-buffering and filtering effects of wetlands.

MATERIALS:

- Modeling clay
- 9” X 13” metal or glass pan, or a sturdy rolling paint pan
- Florist’s “oasis” foam (sponges or scraps of indoor-outdoor carpeting)
- Watering can
- Cup of soil
- Jar of muddy water

PROCEDURES:

ANTICIPATORY SET:

Review with the students what they have learned about wetlands and their functional values. Show the class pictures of different types of wetlands including freshwater and salt marshes, swamps, and bogs. Have the students think about the animals and plants that might live in each kind of wetland.

DEVELOPMENT OF LESSON:

Have the students work in cooperative groups to create models.

1. Spread a layer of modeling clay in half of the baking pan to represent land. Leave the other half of the pan empty to represent a lake or body of water such as a river or ocean.
2. Shape the clay so that it gradually slopes down to the water. Smooth the clay along the sides of the pan to seal the edges. Form meandering streams in the clay that lead into the body of water.
3. Cut a piece of florist’s foam (sponge or indoor-outdoor carpeting) to completely fill the space across the pan along the edge of clay. This represents a wetland buffer between dry land and open water. Make sure the wetland fits well. The model won’t work if there are large spaces under the wetland or between it and the sides of the pan.

After the students have created their models:

- A. Ask the students what they think would happen if it were to rain on the model.
- B. Place the piece of carpeting or sponge into the wetland area, slowly sprinkle some “rain” on land, and observe and describe what is happening. Some of the water is slowed down by the “wetland,” which can be pointed out by picking up the “wetland” and squeezing out the excess water.

- C. What do you think will happen if the wetland is removed? Remove the carpet and water. Pour the same amount of water on the model at the same spot and rate as before. Observe the differences. The water should fill the body of water very quickly and may eventually overflow and flood the land. This is because there is no wetland to buffer. Ask the students, what would happen if a wetland is destroyed in order to build houses? What would happen during a severe rainstorm? Why?
- D. Remove the water and replace the carpet. Cover the clay with soil. What do you think will happen to the bare soil when it rains? Pour the same amount of water on the model at the same spot and rate as before. Observe. Some of the sediment should be carried over the land and into the body of water.
- E. Pour muddy water from the jar onto the land. Explain that this water represents polluted runoff. Ask the students to compare the water that ends up in the body of water with the water in the jar. The soil particles were trapped by the carpeting, making the water in the body of water much clearer. The uphill side of the wetland should be coated with the trapped sediment.
- F. Remove the carpet, pour out the water, and try the experiment again. What happens without the wetland in place? Why did all the dirt particles end up in the body of water this time? The plant roots in a wetland help trap silt and some types of pollutants (like the carpet or sponge).

SUMMARY:

Ask the students the following questions:

- 1. How might muddy water affect fish? It is harder for them to see and breathe.
- 2. How might other animals and plants be affected by the muddy water? Settling sediments smother oysters, plants do not get sunlight needed for growth, birds and other animals that depend on fish for a food source have less to eat if their food sources die.
- 3. How might all of this affect you? Decrease in natural resources and food sources; decline in quality of drinking water; impacts on recreation such as swimming and fishing; etc.
- 4. How can we prevent these undesirable effects? By protecting wetlands and helping to make their benefits known.

EXTENSIONS:

- 1. Have students transform their experiment into a wetland model. They can create freshwater or salt marshes, freshwater or mangrove swamps, or a bog.
 - i. For cattails-use cotton swabs. Paint sticks green and cotton parts brown.
 - ii. Use long pine needles for reeds.
 - iii. Shape wetland creatures from clay, or cut them from paper and glue them onto toothpicks.
 - iv. Make trees by gluing pieces of green sponge onto twigs. A small pinecone can be painted green for an evergreen.

Pennsylvania Academic Standards for Environment and Ecology

- 4.1.4 D Identify a wetland and the plants and animals found there.
- 4.1.7 D Explain and describe characteristics of a wetland.
- 4.1.7 E Describe the impact of watersheds and wetlands on people.
- 4.7.7 A Describe diversity of plants and animals in ecosystems.