

Water, Water Everywhere

Classifying Pennsylvania's Aquatic Habitats

(Adapted from "Water, Water Everywhere," in *Living in Water*, Edition 1 (Baltimore, MD: National Aquarium, 1987))

Concepts: Characteristics observed about a thing allow you to find its name and to place it in a system that groups similar things. Aquatic habitats differ from each other based, in part, on their physical characteristics.

Sample Objectives:

- Students will be able to classify different kinds of aquatic habitats.
- Students will use a flow chart and/or a scientific key.
- Students will become familiar with the diversity of aquatic habitats in Pennsylvania.

Introduction:

This activity introduces students to classification of habitats using their physical characteristics. Students use a flow chart to visualize the process of classification. At each step they must choose between two characters in order to proceed to the next step. They may also use a scientific key to identify aquatic habitats. Students will learn about these habitats as they do the exercise.

Materials:

- Enlarged version or overhead transparency of habitat flow chart
- Duplicates of habitat cards (1 per student) – may use line drawings or photographs of appropriate aquatic habitats from magazines.
- Copies of flow charts and keys for students

Optional:

- Salt water made with 35gm (3 Tbsp) table salt per liter (quart) water (add a color of food coloring)
- Tap water for fresh water (add a different color of food coloring)
- Mix of tap water and salt water for brackish water (will exhibit the combination of food colorings)
- Food coloring
- Small disposable paper cups for each child

Background:

When humans name things, they are classifying them. Things that are classified are first named and then placed in larger groups of things that share similar characteristics. For example, many kinds of tables are lumped under the term "table", as are many kinds of chairs under "chairs." Both tables and chairs belong to a larger category, furniture. The inclusion of ever larger groups results in a hierarchical organization.

Why bother with classifying things? Classification requires that we look for relationships among things which enhance our understanding of their functions and characters. Also, knowing that something belongs to a certain group means that you know something about it if you are familiar with the characteristics of the group. Organizing and naming things also helps us understand each other as we discuss them together.

Lesson Plan

Before Class:

Read the exercise and plan which parts you will do. Make habitat cards. You may just duplicate the cards at the end of this section. For nicer cards, photocopy them onto card stock and add pictures of the same habitat to the reverse side. Laminate the cards to make them last longer. You may not find pictures of all of the habitats – it's okay to leave some out. Make duplicates of the most common ones. Duplicate the flow chart and key.

During Class:

1. Begin by asking if the students know what the word habitat means. It is the place where a plant or animal lives and is usually characterized by a set of physical characters.
2. Can students name any aquatic (water) habitats? Write their suggestions on the board.
3. Ask the students to describe what kind of water can be found in each of those aquatic habitats. Discuss the terms salt water, fresh water and brackish water. Salt water has the salinity of the oceans, fresh water has little or no salt (you cannot taste any) and brackish water is a mix of salty ocean water and fresh water. To make your point about brackish water, mix the fresh water with the salt water while they watch.
4. Ask the students to identify which of those habitats they listed on the board can be found in Pennsylvania. Put a check mark next to these.
5. Explain that each student will be given an aquatic habitat card with a description of a Pennsylvania habitat. Each student will be responsible for determining what habitat is on the card they are given by following a classification system that divides habitats up by their characteristics. Explain that when identifying things using a system of classification, one starts with the biggest category and begins to work down to smaller groups. Here, the first category is aquatic habitats and the characteristic they all have in common is that they all involve water. Use the flow chart on the board and have a student read one card aloud to demonstrate that at each stage they must make a choice between two things until they cannot divide it any further. This is where they will find the name of their aquatic habitat.
6. Distribute the cards and give students enough time to read them. Ask if they would like to jot down a guess of what the name of their habitat is.
7. Distribute the flow charts and let them work until they have identified the aquatic habitat on their card. Have them trade cards with other students who have finished for more practice.
8. The written key is more difficult to use. Older students may repeat the same process of keying out the aquatic habitat using the written key.
9. When all students are finished, have them read aloud the information on their card and then the name of the aquatic habitat. Ask them to give reasons for how they came to that conclusion. Compare their answers to the teacher's answer key provided.

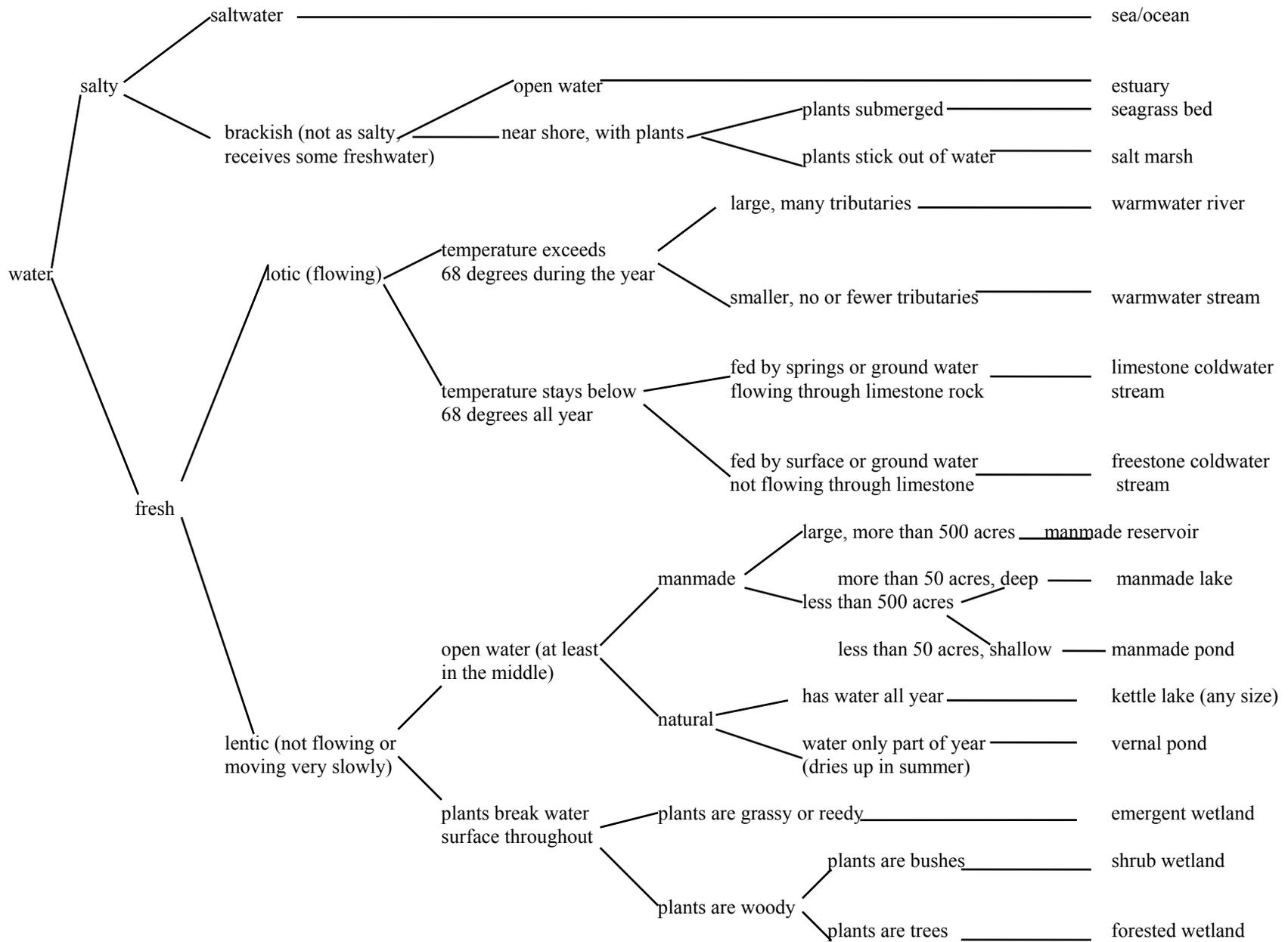
Conclusions:

1. Have the class make a list of the significant characteristics used in this exercise to classify aquatic environments. This list should include:
 - salt or fresh water
 - flowing or still water
 - water present year-round or seasonally
 - shallow or deep
 - plants submerged or sticking out of the water
 - warm or cold
 - manmade or natural
2. Refer back to the list the students made on the board. How many aquatic habitats were they able to list before the activity? How many can they add to the list after the activity? Begin a discussion of why some of the aquatic habitats weren't as well known as others. What kinds of animals live there? (This can lead into a discussion of specialists vs. generalists and threatened/endangered species.)

Extensions:

1. One way for students to test their own knowledge of aquatic habitats is to have the pictures of water habitats mounted on cards with a string long enough to hang around students' necks. The name of the habitat should be written on the back of each card. The students should not see the habitat or name, and the cards should be hung to the back of the student. Students must find out what kind of water habitat they are by moving around the room and asking other students yes/no questions about the habitat. When they think they've discovered which habitat is on the card on their back, they should sit down.
2. Have each student write a composition about an animal that lives in the aquatic habitat on the card they were given. Ideas for the composition include: challenges presented by the habitat, ways that the animal makes a living within the habitat, advantages to living in the habitat.
3. On a map of Pennsylvania, locate aquatic habitats that may be well known for their historical, recreational, ecological, or geological significance.
4. Test the students understanding of the principles governing classification and the construction of keys. Have students classify groups of other things and make their own key. The actual construction of classification systems is a higher level thinking skill. Require the students to justify their choices in their classification system. Creative choices of things might include keys to different groups of adventure toys, model or figurine

collections, or rock or rap groups, even pieces of fruit from the school cafeteria. Let them trade keys to test the quality of their work. Be sure they trade the collection of items along with their key, since each key is specific to the collection. There should be at least ten items in each key.



FLOW CHART CLASSIFICATION OF AQUATIC HABITATS IN PENNSYLVANIA

KEY TO WATER HABITATS IN PENNSYLVANIA

1. Water is salty	2
1. Water is fresh	5
2. Water is saltwater.....	OCEAN / SEA
2. Water is brackish, less salty than seawater / receives some freshwater	3
3. Open water, not near shore	ESTUARY
3. Near shore, with rooted plants	4
4. Plants are entirely underwater (submerged)	SEAGRASS BED
4. Plants stick out of water (emergent)	SALT MARSH
5. Water is flowing (lotic).....	6
5. Water is not flowing or moving very slowly (lentic).....	9
6. Water temperature exceeds 68 degrees F during the year	7
6. Water temperature stays below 68 degrees F all year	8
7. Large and wide, fed by many tributary (entering) streams.....	WARMWATER RIVER
7. Smaller and narrower, fed by no or few tributary streams	WARMWATER STREAM
8. Fed by spring or ground water flowing through limestone rock	LIMESTONE COLDWATER STREAM
8. Fed by surface or ground water not flowing through limestone.....	FREESTONE COLDWATER STREAM
9. Open water, at least in the middle.....	10
9. Plants break water surface throughout.....	14
10. Water body has been impounded, manmade	11
10. Water body is natural, not manmade	13
11. More than 500 acres of surface area	MANMADE RESERVOIR
11. Less than 500 acres of surface area	12
12. More than 50 acres and over 15 feet deep	MANMADE LAKE
12. Less than 50 acres and under 15 feet deep.....	MANMADE POND
13. Has water year-round (formed by glacial action)	KETTLE LAKE (any size)
13. Has water only part of the year (dries up in summer)	VERNAL POND
14. Plants are grassy or reedy	EMERGENT WETLAND
14. Plants are woody- stemmed	15
15. Plants are short and bushy	SHRUB WETLAND
15. Plants have tall trunks and branches.....	FORESTED WETLAND

TEXT FOR AQUATIC HABITAT CARDS

You have salt water and are a very big body of water. When the wind blows, waves roll over your surface. During storms the waves get huge. Things on you are far from land (*Answer: OCEAN/SEA*)

Saltwater mixes with freshwater from a river in your wide, shallow waters. You have lots of food for fish and crabs in your open waters above your muddy bottom. You are a nursery for many ocean animals. (*Answer: ESTUARY*)

Underwater fields of plants grow in your shallow brackish or semi-salty water. Many animals find food and shelter among the plants. The plants protect the nearby shore from erosion because they break the force of waves. (*Answer: SEAGRASS BED*)

Your brackish water is full of nutrients for the tall grasses and soft-stemmed plants that emerge along your shore. In the winter these plants die, but each spring they come back from their strong roots. The decaying grass particles are food for crabs and oysters. The grasses help protect the shore from storms and wave action. (*Answer: SALT MARSH*)

Your warm, freshwater flows over a very wide bed of mud and maybe rocks. Many smaller flowing waters, called tributaries, have joined you along your downstream journey. Because of that, you are nutrient-rich and the fish in you can grow big. Cities were located along your banks, because in the old days you were the easiest place to travel. (*Answer: WARMWATER RIVER*)

Your flowing freshwaters get warm during the summer and fish, like smallmouth bass, may live in you. Crayfish may hide under your rocks. You may also have sand, gravel and mud on your bottom. Your water flows through shallow, fast riffles and into slower, deeper pools. You may have a few water courses that flow into you (tributaries) or you may have none. (*Answer: WARMWATER STREAM*)

You are narrow and your flowing freshwater stays cool or cold all year. A lot of your flow comes from springs or ground water that flows through limestone rock. That makes your water fertile and a little milky-looking. Trout can live in you year-round and grow large, because you produce a lot of insects, crustaceans and other things for them to eat. (*Answer: LIMESTONE COLDWATER STREAM*)

Your freshwater tumbles over rocks and boulders. You are narrow and flow under heavy forest shade. This keeps your water chilly, even in summer, and trout can live in you year-round. You probably don't not have any tributaries, and are a headwater. Your flow comes from surface runoff or ground water that doesn't go through limestone, so you're not very fertile. (Answer: *FREESTONE COLDWATER STREAM*)

Your quiet, still freshwaters cover a huge area, more than 500 acres. You were formed when someone built a dam which impounded flowing water behind it. You may be very deep and your water level might change, because controls on the dam may hold some rainfall in you to prevent downstream flooding. You may also be used as a water supply and have big fish. (Answer: *MANMADE RESERVOIR*)

You were formed by a dam. You don't flow or have very slow water movement, and you are freshwater. You can be big, 50 to 500 acres in surface area, and deep, more than 15 feet. You may have fish that like warm water, like largemouth bass, or cool / cold water, like walleye or trout, or both, a "two-story fishery," because your waters form temperature layers. (Answer: *MANMADE LAKE*)

You're the "runt" of non-flowing, manmade freshwater bodies. You are small, under 50 acres in surface area, and shallow, under 15 feet deep. You may have waterweeds growing out of the water along your shore, but the middle part of you is open. Fish like bluegills often live in you if you're warm. You can also be spring-fed, be cold, and have trout. (Answer: *MANMADE POND*)

Your still, freshwaters weren't backed up by a dam. You were formed in the landscape by natural forces. In Pennsylvania, that means you were dug out, impounded or left behind by the action of huge, ancient ice sheets, called glaciers. You may be small and shallow and have a lot of weeds, or may be huge and look like an inland sea, like Lake Erie. (Answer: *KETTLE LAKE*)

You are very shallow, still and freshwater. And you're not here all year. You form when rain and snow collects into depressions in the ground. You usually dry up in the summer. But you're stay around long enough for salamanders and frogs to lay their eggs in you and go through their life cycle to become adults before you disappear in the hot weather. (Answer: *VERNAL POND*)

The plants that grow in you and stick out of your surface all over are grassy or reedy, soft-stemmed and green. You are very shallow, but your still, freshwater is present all year. Many animals use you for food, cover and nesting. You are especially important as a home for Endangered Species, like bog turtles and massasauga rattlesnakes. (*Answer: EMERGENT WETLAND*)

You have very shallow, standing freshwater, but growing out of you are plants that are woody-stemmed, low bushes, less than 20 feet tall. Wildlife likes to eat, hide or nest in you. Like others of your type, you help to reduce floods by acting like a sponge, collecting and holding water after it rains and releasing it slowly downstream or to the soil. (*Answer: SHRUB WETLAND*)

You have woody-trunked, branched trees that are more than 20 feet high. The trees are growing out of your inches-deep, still, freshwater, maybe on little humps of higher ground. You could be in a low spot on top of a wooded mountain or in the valley bottomland of a big river. You store water after rain or snowmelt and let it go slowly. (*Answer: FORESTED WETLAND*)
