girl scouts
of central maryland

The Chesapeake Bay

A patch packet dedicated to discovering everything about Maryland's massive resource, the Chesapeake Bay.

04-666
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The Chesapeake Bay Patch

In order to earn the Chesapeake Bay patch, Girl Scouts of Central Maryland suggests that girls complete six activities, with at least one in each of the following categories: Research, Experiment, Field Trip, and Community Service

Research:

1. Discover the rich history of the Chesapeake Bay by researching one of the following topics and reporting back to your group about what you have learned: Early Chesapeake Bay Settlers, The Underground Railroad, The Shipping Industry, or The Chesapeake Bay Bridge. Be creative with your report by making a poster, a story book, a collage, a computer presentation, or your own unique display.
2. Learn about the terms that describe the nature of the Chesapeake Bay. Test your knowledge by completing the crossword activity on page 6 of this patch packet.
3. Explore the details of the Chesapeake Bay Watershed. Learn more by checking out a book about the Chesapeake Bay from your local library, or exploring a couple of the many websites devoted to the Chesapeake Bay Watershed. After you have become a Bay expert, quiz your parents and friends to see how much they know about Maryland's treasure, the Chesapeake Bay.
4. Find out about the life that is centered around the Chesapeake Bay. The bay is home to more than 27,000 species of plants and animals. Which ones are in your area? Which species are endangered? Make a book or poster that demonstrates the diversity of the Chesapeake Bay aquatic life and that shows important information about these creatures.

Experiment:

1. Learn about *watersheds* by building your own in a box. Please see page 9 of this patch packet for instructions on how to experiment with watersheds, using the most basic materials. Girls will be able to see the nature of water flow in the community and how pollutants are added to main water sources.
2. Learn about acid rain by experimenting with pH. Measure the pH of natural water in your area. Try to compare at least two or three different water sources. See page 10 for details on how to measure pH.
3. Be creative on ways to reduce waste, which will contribute to a healthy watershed. One way to reduce waste is to start a simple compost pile in your back garden. Learn about compost piles and experiment with one of your own. Details on page 11 of this packet will help you get started.

Field Trip:

1) Visit the National Aquarium in Baltimore to see aquatic life up close and personal. Share your experiences with your group or your friends. What did you learn about? What were the most interesting species? What was the most surprising thing you saw or experienced?
2) Explore the fascinating technology behind bridges, clean water, wastewater and recycling in Baltimore by visiting the Baltimore Public Works Museum. Learn how Baltimore City's Department of Public Works shapes the city and its environment. For museum information please refer to page 12 of this packet.
3) Take a road trip to visit a museum devoted to the Chesapeake Bay or incorporate one of these museums in your next camping trip outside of the central Maryland area. For museum information please refer to page 12 of this packet.
4) Go on a hike with your group and follow a local stream, river or the edge of the Chesapeake Bay. Take a camera or colored pencils to document the type of wildlife you see on your hike. When you return home look on a map to see where you walked, and look up information on the birds, fish, or plants that you documented on the hike.

Community Service:

1) Brainstorm all the things that you can do to help save the bay. Make a presentation to another group to spread the word of what people can do to protect the bay, or your might submit your ideas to a local or school newspaper.
2) Contact a local Chesapeake Bay organization and find out ways you can help their efforts. Volunteer for an event or start up a unique service project in your community.

RESEARCH:
Early History of the Bay Region

Chesapeake Bay is a translation of the Powhatan Indian word "chesepiooc" which means "Great Shellfish Bays." At the time of the first European settlement, the tidewater area was inhabited by an estimated 13,000 to 14,000 Powhatan Indians.

9000 B.C.
The sea level rises from melting glaciers and fills the lower Susquehanna valley. The Chesapeake Bay begins to form. Native tribes arrive in the Bay region.

1000 B.C.
Native American agriculture begins. Crops include corn, squash and beans. Native Americans fish the Bay with spears, traps and hook and line.

1500s
Spanish and French explorers reach the Bay. The Spanish called the Bay Bahia de Santa Maria.

1550
Archeological evidence shows an early Susquehannock village on the upper Susquehanna River, but they probably had occupied the region for at least 400 years before this.

1600s
Virginia enacts laws addressing fishery wastes and the blockage of fish migrations by commercial dams. In Maryland, by 1639, game laws are enacted to protect species like the Great Blue heron.

1607
The first permanent New World English settlement is established in Jamestown, Virginia. John Smith, a member of its governing council, begins his exploration of the Bay.

1634
Lord Baltimore, who had been granted the land from the Potomac River north to what is now Pennsylvania and Delaware by the King of England, established the first English colony in Maryland, known as St. Mary's City

1650s
The Colonists establish booming businesses in ship masts and timber. They clear land for agriculture and use hook and line on shallow water species of fish.

1750s
The Colonists strip 20 to 30% of forests for settlements. They grow tobacco, which depletes the soil and causes erosion.
Bay shipping ports begin to fill with eroded sediments and become too shallow for navigation.

1770
The Chesapeake Bay region slave population reaches 250,000.

1776
Farmers begin to use plows extensively, starting a cycle of permanent tillage that prevents reforestation, dramatically alters the natural fabric of the soil profile, and begins a massive period of soil erosion.

1785
Virginia and Maryland sign the Compact of 1785. Virginia agrees to give vessels bound for Maryland free passage at the entrance to the Bay in return for an agreement by Maryland that the right to fish in the Potomac River was to be enjoyed by citizens of both states.

1792
The first light house built in the United States was built at Cape Henry, marking the entrance to the Chesapeake Bay.

1813
Oyster raking begins in the Bay.

1860s
Throughout the mid-1800s, the Chesapeake Bay region was at the center of the Civil War and the disputes over slavery in the United States. The Bay region played a large role in the beginnings of slavery in America, as both a conduit for escaped slaves on the Underground Railroad, and as a battlefield throughout the Civil War.

1890s
Nearly 60% of the watershed's forests are cleared. However, a process of land abandonment and reversion to forest begins and continues through the early 1900's.
Steamboats became a popular means of traveling around the Bay.

1900
Railroad tie replacement consumes an estimated 15 to 20 million acres of Eastern forests.
Steamships and the railroad allow fish, crabs and oysters to be marketed to distant cities.

Adapted from Chesapeake Bay Program Resources

Web Resources for Bay History:
Chesapeake Bay Program:
www.chesapeakeybay.net

The Mariner's Museum:
www.mariner.org/baylink/

Bay Dreaming
www.baydreaming.com/history.htm

RESEARCH:
Important Bay Terms

Algae - group of primitive, non-flowering plants which include certain seaweeds and microscopic phytoplankton

Aquatic Reefs - An aquatic reef is a solid, three dimensional, highly structured ecological community with oysters as its dominant species which provides vital habitat for Bay species such as finfish, shellfish and crabs

Bay grass – See Submerged Aquatic Vegetation (SAV)

Blue crab - Well-known symbol of the Chesapeake. In 1989, the Maryland Blue Crab (*Callinectes sapidus* Rathbun) was designated the State Crustacean.

Brackish water - mixture of fresh and salt water

Decomposers - organisms (chiefly bacteria and fungi) that break down dead organic matter

Dissolved oxygen - microscopic bubbles of oxygen that are mixed in the water and occur between water molecules. Most aquatic plants and animals need oxygen to survive. Fish will drown in water when the dissolved oxygen levels get too low. The absence of dissolved oxygen in water is a sign of possible pollution

Ebb tide - falling or lowering tide

Ecology - the study of the relationships of living things to one another and to their environment

Ecosystem - an interactive system of a biological community and its non-living environment

Erosion - the wearing away of land surface by wind or water; erosion occurs naturally but it is often intensified by man's land use practices

Estuary - semi-enclosed, tidal, coastal body of water open to the sea in which fresh and salt water mix

Flood tide - rising tide

Food chain - the sequence in which energy as food is transferred from one group of organisms to another

Food web - complex interaction of food chains in a biological community

Habitat - the place where a plant or animal lives

Marsh - low, wet grassland without trees, periodically covered by water

Nekton - free swimming aquatic organisms such as fish

Nitrogen - an inorganic nutrient essential for plant growth and reproduction when in oxidized forms (nitrate, nitrite, ammonia); excess problems are usually associated with agricultural runoff and sewage

Non-point source pollution - pollutants entering waterways from a general area such as runoff from farmland or suburban communities

Nutrients - chemicals (primarily nitrogen and phosphorous) necessary for organisms to live

pH - a measure of the acidity or alkalinity of a material, liquid or solid; estuarine water is naturally, slightly base

Photosynthesis - the process by which plants convert sunlight into energy using carbon dioxide, water, and nutrients

Plankton - passively drifting or weakly swimming organisms living suspended in the water column, often microscopic but sometimes visible to the naked eye

Point source pollution - pollution from a definable source, such as an outfall pipe

Pollution - the addition of a substance to an environment in greater than natural concentrations as a result of human activity producing a net detrimental effect on the environment

Salinity - the measurement of the amount of dissolved salts in water, usually measured in parts per thousand; 35 ppt is average for seawater, 0 ppt for freshwater

Sediment - particles which accumulate on the bottom of a waterway

Sewage treatment - primary = screening or settling large solids out of sewage (only removes visible material) secondary = removal of organic material in sewage by aeration and bacterial action tertiary = removal of nutrients and traces of toxic organic material from sewage by additional treatment processes

Submerged Aquatic Vegetation (SAV) - rooted vegetation which grows beneath the water surface. Also known as bay grass.

Tides - periodic movement (raising and lowering) of a body of water by the gravitational attraction of the moon and sun with the rotation of the earth

Tributaries - streams and rivers that supply a larger body of water

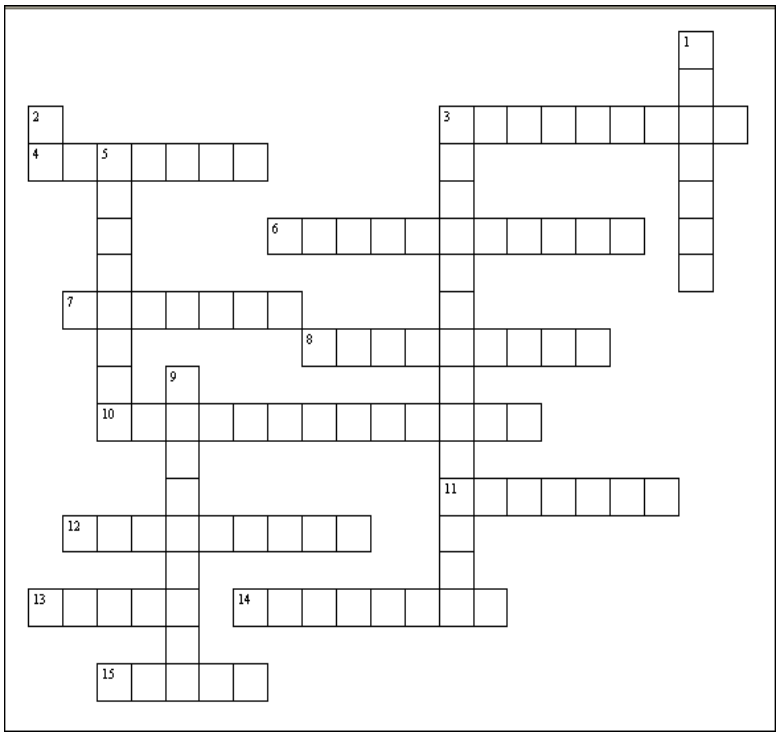
Turbidity - the measurement of water cloudiness; it may be affected by sediment and plankton concentrations

Watershed - an area of land that is drained by a river or other body of water

Source: "Bay Glossary" the Chesapeake Bay Foundation: www.cbf.org/site/PageServer?pagename=resources_glossary

RESEARCH:
Important Bay Terms – Test Yourself

Test yourself on important Bay terms by completing this puzzle. Two word answers do not have a space between



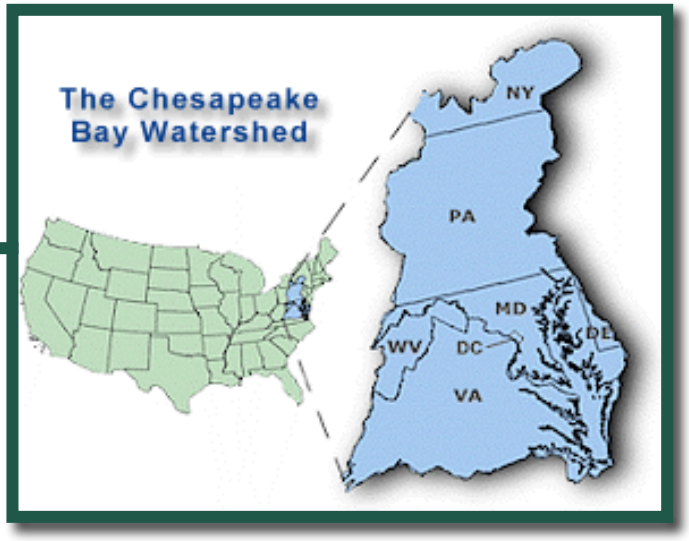
Across

3) Unwanted and harmful substances that are introduced into the environment
4) The place where a plant or animal lives
6) When a stream supplies water to a larger body of water, it is called a _____
7) The study of living things and the environment
8) The interaction and processes of living things and the environment
10) Water that is mixed with water from a stream and water from the ocean (two words)
11) A body of water that is partly enclosed and receives both fresh and salt water
12) Organisms cannot live without vital _____, or chemicals
13) Low, wet grass that is often covered by water
14) A common term for Submerged Aquatic Vegetation (two words)
15) The raising and lowering of water due to the gravitational attraction of the moon

Down

1) The vast interactions of different food chains (two words)
2) A measure of the acidity for the Bay waters
3) The process by which plants convert sunlight into energy
5) State Crustacean of Maryland (two words)
9) The area of land that drains water into a body of water

RESEARCH:
Chesapeake Bay Watershed 6



The land around a stream or river is called a **watershed**. The Chesapeake Bay watershed (the area of land that drains into the Bay) is 64,000 square miles and has 11,600 miles of tidal shoreline, including tidal wetlands and islands. The watershed encompasses parts of six states: Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia, as well as Washington D.C. There are more than 100,000 streams, creeks, or rivers in the watershed, including 150 major rivers. One can reach a Bay tributary in less than 15 minutes from nearly everywhere in the watershed. Approximately 16 million people live in the watershed; about 10 million people live along its shores or near them. Two of the five major North Atlantic ports--Baltimore and Hampton Roads--are on the Bay.

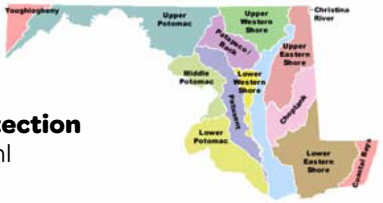
The Chesapeake Bay is approximately 200 miles long and runs north-south from the mouth of the susquehanna River to the Atlantic Ocean, with 4400 miles of shoreline. The Bay contains 18 trillion gallons of water, and the average depth of the Bay, including tributaries, is about 21 feet. The deepest part of the Bay, "the Hole," is 174 feet deep and located off Bloody Point southeast of Annapolis, Md. The narrowest part of the Bay, near Aberdeen, MD, is about 3.5 miles. The widest point - from Smith Point, VA, to Virginia's Eastern Shore - is 30 miles.

Source: "General Bay Facts" Chesapeake Bay Foundation, www.cbf.org/site/PageServer? agename=resources_facts_bay

Learn more by checking out a book about the Chesapeake Bay from your local library, or exploring a couple of the many websites devoted to the Chesapeake Bay Watershed.

Examples

Websites:



Adopt-a-Watershed
www.adopt-a-watershed.org

Center for Watershed Protection
http://www.cwp.org/index.html

Chesapeake Bay Foundation
http://www.cbf.org

Chesapeake Bay Program
http://www.chesapeakebay.net

Chesapeake Bay Trust
http://www.chesapeakebaytrust.org

EPA's Surf Your Watershed
http://cfpub.epa.gov/surf/locate/index.cfm

Maryland Department of Natural Resources
http://www.dnr.state.md.us/bay/

What's a Watershed?
http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html

Books:

Awesome Chesapeake: A Kid's Guide to the Bay By: Bell, David Owen, 1994

Chesapeake Bay in Maryland, an Atlas of Natural Resources.
By: Lippson, Alice Jane, 1973

Chesapeake Bay: Introduction to an Ecosystem, 1995
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Chesapeake Bay Walk
By: Bell, David Owen, 1998

Chesapeake Kaleidoscope
By: Hays, Anne M, 1975.

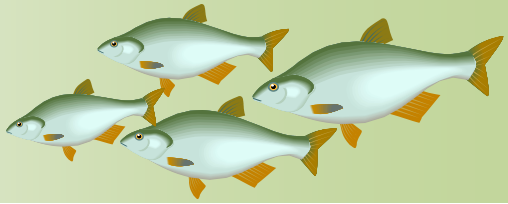
Field Guide to the Submerged Aquatic Vegetation of Chesapeake Bay
By: Hurley, Linda M., 1990.

Life in the Chesapeake Bay
By: Lippson, Alice Jane, 1984.

Where Did All The Water Go?
By: Stearns, Carolyn, 1998

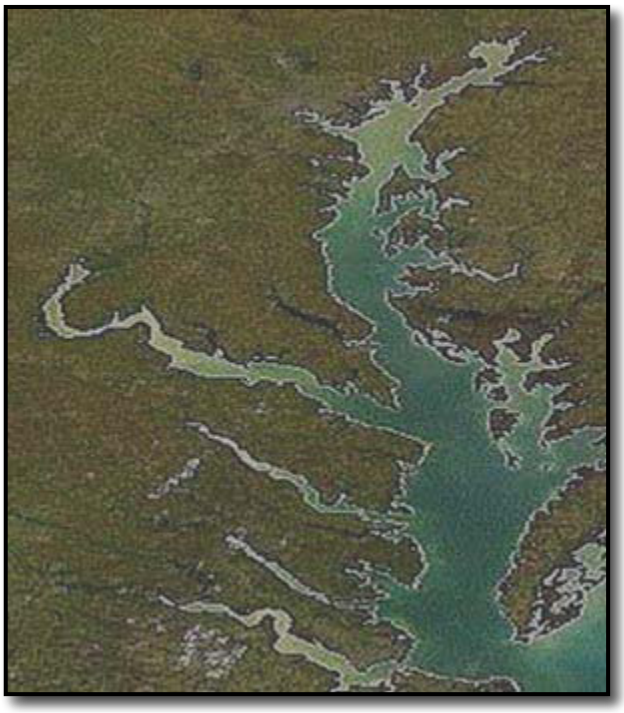
For more resources see page 14 of this packet.

Research
Chesapeake Bay Life



The Bay supports 3,600 species of plant and animal life, including more than 300 fish species and 2,700 plant types. The Bay's warm, shallow water and its mix of fresh and salt water create a variety of habitats that support many divergent species, including bald eagles, ospreys, shad, blue crabs, oysters, finfish, sharks, geese, land and sea turtles and eels.

As a large, warm, shallow, tray shaped estuary, the Bay acts as a nursery for crabs and oysters, as well as many other species of fish and shellfish. Underwater grasses or SAV (submerged aquatic vegetation) provide food, shelter, oxygen and important habitat for the young marine creatures.



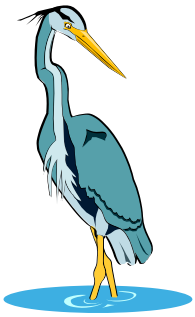
Aquatic Insects: Insects are the most common animals on the planet. There are literally millions of different species of insects! Although many people think of them as nothing more than pests, they provide food for a wide variety of animals.
Birds: The Chesapeake Bay is home to many birds and is an integral location for many birds' migratory patterns. For some birds, the Chesapeake Bay is their winter destination. About 1 million swans, geese and ducks winter on the Bay. This is roughly one third of all waterfowl wintering along the Atlantic Coast. The Chesapeake Bay now has one of the highest concentrations of bald eagles in the lower 48 states.

Fish: The Chesapeake Bay and its tributaries support a lot of fish species. They have a profound effect on the bay ecosystem, consuming everything from algae and bay grasses to crustaceans and other fish. Home to more than 300 species of fish, the Bay hosts 32 year-round species. Some species, including flounder, bluefish and menhaden, come to the Bay in late spring and summer to feed, while other species including eels and shad use the Bay and its rivers to reproduce and then return to the sea. In fact, between 70 and 90 percent of Atlantic striped bass are born in the Bay. The Chesapeake Bay has been ranked as third in the nation in fishery catch. Only the Atlantic and Pacific Ocean exceed the Bay in production.

Algae: Algae are actually the best known of a group of organisms called phytoplankton. Algae can best be described as small or microscopic plants. These organisms are photosynthetic, meaning that they function as plants, producing their own food from sunlight. Phytoplankton is the basis of most aquatic food chains, and is one of the primary producers of the oxygen we breathe. There are several different types of phytoplankton living in Chesapeake Bay and its tributaries.

Zooplankton: Zooplankton are essentially microscopic animals. They serve several purposes in the Bay. First, they are food for many larger organisms, such as fish. Zooplankton also are used as an indicator of the overall state of the Bay; a healthy zooplankton population is generally reflective of a healthy Bay.

Bottom Dwellers: The benthos is the community of organisms that live in or on the bottom of the Bay and its tributaries. Examples of some benthic animals that live in Chesapeake Bay sediments include clams, amphipods, polychaetes, and isopods.



Bay Grass: Bay grasses are an important part of the Chesapeake Bay ecosystem. Not only do bay grasses improve water quality, they also provide food and shelter for waterfowl, fish and shellfish. For example, research has shown that the density of juvenile blue crabs is 30 times greater in grass beds than in areas of the Bay without Bay grasses! There areapproximately 20 species of Bay Grasses that can be found in Maryland Bays and Tributaries.

Sources:

- Maryland's Department of Natural Resources, www.dnr.state.md.us/bay/
- Alliance for the Chesapeake Bay, http://www.acb-online.org
- U.S. Fish & Wildlife Service, Chesapeake Bay Field Office: www.fws.gov/r5cbfo/index.html

EXPERIMENT:
Watershed in a Box

BACKGROUND

No matter where you live, the water quality in rivers and streams is determined by what happens on the land around them. The land around a stream or river is called a watershed. Precipitation that falls on the watershed flows over land to reach the lowest point – a lake, river or stream. As water flows over land, it picks up soil, chemicals and other pollutants and carries them to lakes, rivers or streams. This water transportation system is called runoff.

In rural or agricultural areas, runoff water carries a wide variety of materials, including pesticides, soil and animal wastes, directly into waterways. In urban areas, hard surfaces such as driveways, sidewalks, rooftops and roadways prevent water from soaking into the ground. As a result, the runoff water, which can be contaminated with road salt, heavy metals, or automobile fluids, flushes quickly into storm drains that dump directly into streams and rivers.

By building a model of a watershed, participants will be able to see how small streams join to become rivers and how these rivers flow into the Chesapeake Bay. Participants will also learn about the passage of pollutants through these waterways, settling into the Chesapeake Bay.

MAKE YOUR MODEL

You will need for each model:

- A box cover or other shallow box that is 12" x 12" or larger
- Foam pieces, Styrofoam, or paper
- Heavy-duty aluminum foil or white plastic bag
- Permanent markers
- Spray bottle
- Cup of water
- Powdered, unsweetened drink mix – two or three different colors
- Bucket

1. Start with your box cover or a shallow box to contain the runoff model.
2. Arrange pieces of foam or crumpled paper to represent hills and land forms in the bottom of the box. Encourage your group to be creative. Remember, the highest points should be near the box walls. Leave a gully or valley in the middle of the box to represent a stream or river.
3. Cover the land forms with a large piece of aluminum foil, shiny side up. Start in the middle of the box and gently press the foil into all of the hills and valleys, working your way towards the box walls. Push the edges of the foil up along the walls of the box and fold the foil over the edge of the box. Be careful not to tear the foil.
4. With a permanent marker, draw on the foil to outline the streams or rivers in your model. Next, draw houses, roads, farm fields, feed lots, stores or anything else that you want in your community.
5. Sprinkle different colors of powdered drink mix onto the model. The colors represent different kinds of pollution.

For example:

- Use red powder to represent yard care chemicals and sprinkle it around the houses.
- Use green powder to represent salt on the roads or automobile waste and sprinkle it along roadways or in a parking lot.
- Use brown powder to represent exposed soil at a farm field or a construction site.
- Use blue powder to represent human or animal waste and leave little piles of powder near homes and farms.

6. Ask the group what they think would happen if it rained.
7. Using the spray bottle to represent a rain storm, spray water on the hillsides. Watch the water flow towards the rivers and streams.
8. Ask the group to tell you what happened. Then ask the group how they would redesign the community to prevent water pollution.
9. Dump the water from the model into a bucket. Remove the foil from the model and set it aside. Place a new piece of foil on the watershed. Ask the group to redesign the community to prevent water pollution. Sprinkle powdered drink mix in the appropriate areas. Let it rain. Was there an improvement

Activity Adapted from the Water Action Volunteers: WAV materials revised Summer, ©2001.
University of Wisconsin-Extension Water Resources Programs: http://clean-water.uwex.edu; Wisconsin Department of Natural Resources Nonpoint Source Water Pollution Abatement Program: http://www.dnr.state.wi.us/org/water/wm/nps/index.htm

EXPERIMENT:

PH of Natural Water

BACKGROUND

Before girls learn about the effects of acid rain, girls need to understand the basics of what pH means. Acidic and basic are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature. Mixing acids and bases can cancel out their extreme effects; much like mixing hot and cold water can even out the water temperature. A substance that is neither acidic nor basic is neutral. The pH scale measures how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic.

Without pollution or acid rain, most lakes and streams would have a pH level near 6.5. Acid rain, however, has caused many lakes and streams in the northeast United States and certain other places to have much lower pH levels. In addition, aluminum that is released into the soil eventually ends up in lakes and streams. Unfortunately, this increase in acidity and aluminum levels can be deadly to aquatic wildlife, including phytoplankton, mayflies, rainbow trout, small mouth bass, frogs, spotted salamanders, crayfish, and other creatures that are part of the food web.

EXPERIMENT

In this experiment, you will measure the pH of natural water located near your home or school.

You will need:

- pH paper and color chart (range pH 2 to 7) or garden soil pH testing kit
- clean paper cups
- notebook and pencil

Instructions

1. Locate a stream, river, lake, or pond. Go with an adult.
2. Scoop some of the surface water into a cup.
3. Measure the pH of the water using either pH paper or a garden soil pH testing kit and record the result.
4. Discuss the results. How does pH affect life cycles? Would the results be different in another community?

Hints

- Except for wide-range pH test paper, all the materials called for in these experiments, including distilled water and borax, can be obtained at grocery stores or from local lawn and garden stores or nurseries.
- Wide-range pH test paper is inexpensive, but not easily obtained. A school science laboratory will probably have it or can order it, or you may order it through a biological supply company. Litmus pH paper is usually included in chemical sets sold at toy stores for children over 8 years old.
- For the names of supply companies, you can consult the yellow pages of your telephone directory under a heading such as "Laboratory Equipment and Supplies." If your local directory does not have such a heading, ask your teacher for suggestions or try the yellow pages from a larger city. Telephone directories are available at many libraries.
- Inexpensive garden soil pH testing kits are available at most lawn and garden stores or nurseries. These testing kits usually contain a pH indicator solution that covers a range of at least pH 4 to 10, which is wide enough for most of the following experiments.
- Use clean, dry containers and utensils.

➢ Experiment adapted from the U.S. Environmental Protection Agency: http://www.epa.gov/airmarkets/acidrain/experiments/index.html

➢ Check out the EPA's site just for students: www.epa.gov/acidrain/site_students/index.html

EXPERIMENT:

Compost Pile

BACKGROUND

Reducing waste would be a great way to help the environment and contribute to a healthy Chesapeake Bay watershed. Yard trimmings and food scraps make up nearly 1/6 of what the average household throws into the garbage. Why throw this stuff away when it can be put to good use in your yard and garden? Composting is easy and cheap, you can cut down your garbage by hundreds of pounds each year, and create a mixture that can be used to improve the soil. By composting, you can convert organic wastes — yard trimmings, leaves and many kinds of kitchen scraps — into a dark, crumbly mixture that can be used to improve the soil and reduce your use of fertilizer and water. Composting is done by a wide variety of organisms that are found naturally in organic matter. They work together, feeding on your pile (and each other), to break materials down.

- Bacteria perform the primary breakdown of organic materials. Bacteria aren't added to your compost pile — they're found in almost all forms of organic matter. There are several different types, and they will flourish and reproduce rapidly under the proper conditions.
- Nonbacterial composters — fungi, worms, and a variety of invertebrates — go to work on your pile. Some feed directly on plant tissues, helping bacteria in their role of primary decomposers, while others will actually eat the bacteria. Bugs like centipedes and beetles will feed on the smaller invertebrates.

What goes in the Compost?

- "Greens" provide nitrogen, and act as a source of protein for the microbes that are hard at work in your compost pile. (Example: Green leaves, Coffee grounds, Tea bags, Plant trimmings, Raw fruit and vegetable scraps, Fresh grass clippings)
- "Browns" are a source of carbon, and provide energy for the microbes. (Example: Dried grasses, leaves and some weeds , Straw, Woodchips, Twigs and branches, Sawdust, Shredded newspaper, Corncobs and stalks.
- Do not include: Food with meat, dairy, oils, Pet wastes, Diseased plants, Weeds gone to seed, Ash from charcoal or coal

BUILD YOUR COMPOST

1. Pick a spot in your yard that's at least partially shaded and at least 2 feet from a structure like your house or a fence.
2. Decide if your compost will be housed in a container or in a trench.
   - ♦ Trench: Dig a hole that is at least 1 cubic yard (3 feet high, 3 feet wide, 3 feet long).
   - ♦ Container: Bins can be built from scrap lumber, old pallets, snow fence, chicken wire, or concrete blocks. Typically, several types of composting bins are sold at hardware or lawn and garden stores. Your container should be at least 1 cubic yard (3 feet high, 3 feet wide, 3 feet long).
3. Add the first materials. The key materials are nitrogen-rich "greens," carbon-rich "browns," water, and air. All of these are essential, but they're easy to mix together for quality compost.
   - ♦ Lay a base. Start with a layer of browns, laying down 4-6 inches of twigs or other coarse carbons on the bottom of the pile for good air circulation.
   - ♦ Alternate greens and browns. Add layers of nitrogen and carbon materials. Make layers about 4-6 inches thick. Once you turn the pile the first time, these materials will get mixed together and compost more efficiently.
   - ♦ Size does matter. Most materials will decompose faster if they are broken or chopped into smaller pieces, as it makes more surface area available to your composters and water.
4. Water as you go. Your compost pile should be moist, kind of like a wrung-out sponge. Mix up the pile. Once you build your pile, the real composters get to work — bacteria, fungi and insects help break down the materials in your compost bin. As the organic materials decompose, your pile will get hot on the inside and you might see some steam. In about a week, your compost will be ready for turning. Use a pitchfork or shovel to mix up the layers of green and brown and move materials toward the center of the pile.
5. Look in your pile for finished compost — material that is dark and crumbly, fresh-smelling, and no longer looks like what you originally put into your bin.
6. Your compost can really pay off in the yard or garden. While compost is not a fertilizer, it can contain nutrients which improve plant growth. By using compost, you can improve the soil and reduce your use of fertilizer and water.

Adapted from Reduce.org, Minnesota Office of Environmental Assistance: www.moea.state.mn.us/campaign/compost/

Field trips:
Contact Information

The National Aquarium of Baltimore
501 East Pratt Street
Baltimore, MD 21202

410-576-3800; www.aqua.org

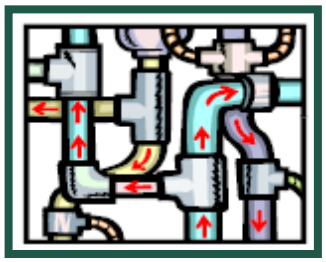
July and August: Sunday through Thursday, buy tickets between 9 a.m. and 6 p.m. You may tour the Aquarium until 8 p.m. Friday through Saturday; buy tickets between 9 a.m. and 8 p.m. You may tour the Aquarium until 10 p.m.

March, April, May, June, September, and October: Every day except Friday, buy tickets between 9 a.m. and 5 p.m. You may tour the building until 7 p.m. On Fridays, buy tickets between 9 a.m. and 8 p.m. You may tour the Aquarium until 10 p.m.

November, December, January, and February: The ticket center opens at 10 a.m. and closes at 5 p.m. every day except Friday. You may tour the Aquarium until 6:30 p.m. On Fridays, the ticket center opens at 10 a.m. and closes at 8 p.m. You may tour the Aquarium until 9:30 p.m.

Your group of 15 or more must reserve in advance to receive discounts and express entry into the building. For reservations or additional information:

- reserve@aqua.org
- phone: 410-576-3833
- fax: 410-986-2334.



Baltimore Public Works Museum
Located on Pier 7 of the Inner Harbor
51 Eastern Avenue, Baltimore, Maryland 21202
www.ci.baltimore.md.us/government/dpw/museum/index.html
(410) 396-5565
Hours: Tuesday-Sunday 10am-4pm
Admission: Children under 6 Free; Adults $2.50;
Seniors & Students $2.00; Tour Groups (10 or more) $1.25

Chesapeake Museums

Chesapeake Bay Maritime Museum
Navy Point
P.O. Box 636
St. Michaels, MD 21663
phone: 410-745-2916
fax: 410-745-6088
www.cbmm.org

Calvert Marine Museum
P.O. Box 97, Solomons, MD 20688
Group Services Coordinator, 410/326-2042 ext. 41
information@calvertmarinemuseum.com
www.calvertmarinemuseum.com

Historic St. Mary's City
18559 Hogaboom Lane,
St. Mary's City, MD 20686
800-762-1634
hsmc@ smcm.edu
www.stmaryscity.org

Jefferson Patterson Park and Museum, Calvert County
410-586-8500
www.jefpat.org/2history.htm

Community Service:
Contact Information

How can you help? Make a list of simple things that you can do around your house or your community, to contribute to a healthy watershed and a healthy Chesapeake Bay.

1) _____	5) _____	9) _____	13) _____
2) _____	6) _____	10) _____	14) _____
3) _____	7) _____	11) _____	15) _____
4) _____	8) _____	12) _____	16) _____

Concerning Volunteerism, the Chesapeake Bay Program, explains that everyone can get involved:

"Besides plants, fish, animals and other living resources, humans also are part of the Chesapeake Bay's ecosystem. Although a single individual may think he or he has very little effect on the Bay with more than 15.1 million people living in the Chesapeake Bay watershed, people have a very significant impact on the Chesapeake Bay ecosystem.

So whether you are a teacher, student, citizen, local government official, a business owner or the member of a watershed organization YOU can make a difference."

To volunteer for **The Chesapeake Bay Program**, contact:

The Chesapeake Bay Program
410 Severn Avenue, Suite 109
Annapolis, MD 21403
Phone: (800) YOUR-BAY
Fax: (410) 267-5777

The Alliance for the Chesapeake Bay wants you to... *"Get Involved!"* They highlight that:

"As part of our mission, the Alliance for the Chesapeake Bay mobilizes citizens to learn about Bay issues and participate in resolving them. In other words, we provide opportunities for everyone to get involved in some way to help restore the Bay. Getting involved can mean helping a lot or a little. It can be something as simple as spending a Saturday canoeing a river and learning about its connection to the Chesapeake, or it can mean joining the ranks of a local watershed organization and becoming a leader in local restoration efforts."

To volunteer for the Alliance for the Chesapeake Bay, contact:
Alliance for the Chesapeake Bay
6600 York Road, Suite 100
Baltimore, MD 21212
Fax: 410-377-7144
Phone: 410-377-6270

The Chesapeake Bay Foundation web site highlights:

"Volunteers Make It Happen - Not everyone wants to get involved - We want those who do!

Whether you have very little or lots of time to give, you can help make a difference for the Bay!

Here are some of the volunteer opportunities available:

- Office help needed in
- Annapolis, Maryland
- Help educate adults or children about the health of the Bay
- Help staff a display booth at fairs and festivals

Help restore underwater grasses, trees, and oysters -- participate in outdoor restoration projects"

To volunteer for the Chesapeake Bay Foundation, contact:

Philip Merrill
Environmental Center
6 Herndon Avenue
Annapolis, MD 21403
Phone: 410.268.8816

Resources:
Web and Books

WEB RESOURCES:

Adopt-a-Watershed

www.adopt-awatershed.org

Alliance for the Chesapeake Bay

http://www.acb-online.org

Bay Dreaming

http://baydreaming.com

Center for Watershed Protection

http://www.cwp.org/index.html

Chesapeake Bay Commission

http://www.chesbay.state.va.us

Chesapeake Bay Ecological Foundation

http://www.chesbay.org/

Chesapeake Bay Maritime Museum

http://www.cbmm.org

Chesapeake Bay Foundation

http://www.cbf.org

Chesapeake Bay Program

http://www.chesapeakebay.net

Chesapeake Bay Trust

http://www.chesapeakebaytrust.org

Chesapeake Research Consortium

http://www.chesapeake.org

Clean Water Action

http://www.cleanwateraction.org/md/index

EPA's Surf Your Watershed

http://cfpub.epa.gov/surf/locate/index.cfm

Marine Fish Conservation Network

http://www.conservefish.org

Maryland Department of Natural Resources

http://www.dnr.state.md.us/bay/

Maryland Farm Bureau

http://www.mdfarmbureau.com

Maryland Forests

http://mdforests.org

Maryland Sea Grant

http://www.mdsg.umd.edu/index.html

National Aquarium of Baltimore

http://www.aqua.org

U.S. Fish and Wildlife Service, Chesapeake Bay Field Office

www.fws.gov/r5cbfo/index.html

What's a Watershed?

http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html

BOOKS:

Awesome Chesapeake: A Kid's Guide to the Bay

By: Bell, David Owen, 1994

Chesapeake Bay: A Pictorial Maritime History.

By: Brewington, M. V., 1956

Chesapeake Bay in Maryland, An Atlas of Natural Resources.

By: Lippson, Alice Jane, 1973

Chesapeake Bay in the Civil War

By: Mills, Eric

Chesapeake Bay: Introduction to an Ecosystem, 1995.

Chesapeake Bay Voices

By: Duke, Maurice, 1993

Chesapeake Bay Walk

By: Bell, David Owen, 1998

Chesapeake Country

By: Niemeyer, Lucian, 1990.

Chesapeake Kaleidoscope

By: Hays, Anne M, 1975.

Chesapeake Wildlife: Stories of Survival and Loss

By: Vojtech, Pat, 2001

Early Explorations of the Chesapeake Bay

By: Byron, Gilbert, 1960

Field Guide to the Submerged Aquatic Vegetation of Chesapeake Bay

By: Hurley, Linda M., 1990.

Finding Birds in the Chesapeake Marsh:

a Child's First Look

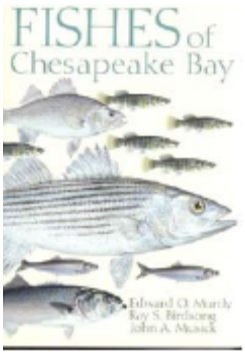
By: Aiken, Zora, 2001.

Fishes of Chesapeake Bay

By: Murdy, Edward O., 1997

Life in the Chesapeake Bay

By: Lippson, Alice Jane, 1984.



Where Did All the Water Go

By: Stearns, Carolyn, 1998

14

Attn: Program

Girl Scouts of Central Maryland
The Chesapeake Bay Patch
Report Form

girl scouts of central maryland

Please complete and return to:
Girl Scouts of Central Maryland, 4806 Seton Drive, Baltimore, MD 21215, Attention: Program

Date: _____

Troop/Group No. __ Service Unit # _____

Groups: Leader's/Advisor's Name: _____ Telephone #_____

Street Address: _____

City: _____ Zip: _____ Email Address: _____

Individuals: Name: _____ Telephone #_____

Street Address: _____

City: _____ Zip: _____ Email Address: _____

Age level (check): O Brownie O Junior O Cadette O Senior O Ambassador

Number of Girls Participating in this patch packet: _____

Patches:
Patches are available at the council store.
Please contact store for prices and information: 410-358-9711, ext. 202

We would like to hear from you!

What did you like the most about this patch packet?

What did you like the least about this patch packet?

What would you change about this patch packet?

Do you have any comments/ suggestions?