Chesapeake Bay Theme Day
Traveling Outreach Program
Pre- and Post-Visit Activities
Grades 5-6
The National Aquarium is a nonprofit organization whose mission is to inspire conservation of the world’s aquatic treasures.
A school-wide package is a great way to give classes in multiple grade levels (K-6) the opportunity to benefit from a traveling outreach program. Each package includes:

- Two auditorium presentations (one for grades K-2 and one for grades 3-6)
- Ten interactive discovery sessions that allow students to explore the theme in depth and to investigate animals introduced in the auditorium presentation. Each 20-minute session is identical and is limited to one class (of up to 30 students maximum) to allow for optimal learning. Parent volunteers are required to assist with interactive discovery sessions. See Parent Volunteer Instructions on page 2 for more information.

OUTREACH PROGRAM DESCRIPTION

Marshland Mystery Auditorium Presentation
Grades K-2 (35 minutes)
What animals can you find in the marsh and what is happening to them? Investigate the animals of a marsh, how they live, and the challenges they face.

The Waterman Auditorium Presentation
Grades 3-6 (60 minutes)
Explore the Chesapeake Bay through the experiences of a waterman. Costumes, artifacts and personal stories help students understand how the loss of habitat affects both animals and people.

Discovery Labs
Examine the Chesapeake Bay through artifacts, basic science experiments and live animals. (Live animals are subject to availability.)

PLANNING FOR THE OUTREACH PROGRAM

This lesson includes pre- and post-program activities that will supplement the auditorium program and discovery lab sessions. These activities can be incorporated into science, reading and social studies units about Maryland, the Chesapeake Bay, map studies or ecology lessons. This lesson should be covered in three days including the outreach program at your school.

AAAS Benchmarks

12C/M7-6-8: Select the proper tool for completing a particular task.

12D/E5-3-5: Find locations on maps and globes, interpret information displayed on maps and use maps to navigate.

12D/E7-3-5: Write a clear and accurate description of a real world object or event.

MD Voluntary Curriculum: Science

Grade 5 - 1.0 Skills and Processes A.1.
Gather and question data from many different forms of scientific investigations which include reviewing appropriate print resources, observing what things are like or what is happening somewhere, collecting specimens for analysis and doing experiments.

Grade 6 - 6.0 Environmental Science B.1.
Recognize and explain that human-caused changes have consequences for Maryland’s environment as well as for other places and future times.
DAY 1: PRE-OUTREACH PROGRAM ACTIVITIES

Before educators from the National Aquarium’s Outreach Department visit your school, read the Teacher Background section found on pages 4-7 and share with your students. As a class, complete Activity 1– Watershed Address on pages 13-14.

This activity will allow students to familiarize themselves with vocabulary and material that will be taught during the Aquarium programs as well as reinforce what the students already know about the Chesapeake Bay. These activities incorporate content areas touched upon during the National Aquarium’s outreach program including information about the Chesapeake Bay watershed, animals found in the Chesapeake Bay and current events associated with health of the Chesapeake Bay.

DAY 2: OUTREACH PROGRAM AT YOUR SCHOOL

On the day of your outreach program, the National Aquarium outreach staff will present two large-group auditorium programs—one for grades K-2 (35 minutes) and one for Grades 3-6 (60 minutes). Ten to twelve discovery lab sessions (depending upon what is written on the contract) will take place in a separate room throughout the school day. See sample schedule on page 3.

Auditorium Presentation Requirements:
1. One room large enough to hold all of the students scheduled to attend that presentation.
2. Students should be seated and ready to begin at the start time listed on the contract.
3. Allow 35 minutes for the K-2 presentation and 60 minutes for the Grades 3-6 presentation.

Discovery Lab Session Requirements:
1. Labs need to be in one room for the entire day. The room needs to contain four large tables (or desks that can be pushed together), a power outlet and, if possible, a sink.
2. Each individual class will come to this room approximately two minutes before their scheduled time. Teachers should have the class divided into four groups.
3. Lab sessions are 20 minutes each in duration. Each session is identical.
4. Parent volunteers are required for the lab sessions. See below for instructions.
5. National Aquarium outreach staff will need a copy of the schedule upon arrival.

Parent Volunteer Instructions:
1. Parent volunteers need to arrive approximately 30 minutes prior to the start time of the first lab session for training. (Some parents may only be able to stay for part of the day. You may wish to plan for one morning set of volunteers and one afternoon set. The afternoon set should arrive 30 minutes prior to the afternoon’s first lab session.)
2. Each parent volunteer will be in charge of one station during the entire Discovery Lab session.
3. The parent volunteers’ main task will be to guide the students through the assigned station and actively engage students with questions and fun facts.
4. Useful questions include: “Why is a marsh a great habitat for animals?” “How do watermen catch blue crabs?” or “Why might an animal have a shell?” Object comparisons are also useful (ex. find similarities, differences, etc.).
5. Please focus the students’ attention back on the National Aquarium instructor when it is time to rotate to the next station.
SAMPLE SCHEDULE

The outreach staff at the National Aquarium is happy to review your schedule to ensure that the program will run smoothly. Please send a copy of your schedule via fax to 410-659-0116 Attn: Outreach or e-mail outreach@aqua.org.

<table>
<thead>
<tr>
<th>Time</th>
<th>Program</th>
<th>Time</th>
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<tbody>
<tr>
<td>9-10 a.m. (extra time allotted for transition and set-up for the next program)</td>
<td>Grades K-2</td>
<td>9-9:30 a.m.</td>
<td>Aquarium staff will also set up labs during the morning presentation</td>
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<tr>
<td>10-11 a.m.</td>
<td>Grades 3-6</td>
<td>9:30-10 a.m.</td>
<td>Train morning set of volunteers</td>
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<tr>
<td>10-10:20 a.m.</td>
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<td>Grade 1</td>
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<td>10:25-10:45 a.m.</td>
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<td>Grade 1</td>
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<td>10:50-11:10 a.m.</td>
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<td>Grade 2</td>
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<td>11:15-11:35 a.m.</td>
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<td>11:40 a.m.-12 p.m.</td>
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<td>Grade 3</td>
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<td>12-1 p.m.</td>
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<td>Lunch, rest animals, train afternoon volunteers</td>
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<tr>
<td>1-1:20 p.m.</td>
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<td>Grade 3</td>
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<td>1:25-1:45 p.m.</td>
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<td>Grade 4</td>
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<td>1:50-2:10 p.m.</td>
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<td>2:15-2:35 p.m.</td>
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<td>Grade 5</td>
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<td>2:40-3 p.m.</td>
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<td>Grade 5</td>
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DAY 3: POST-OUTREACH PROGRAM ACTIVITIES

The day after the outreach program, complete Activity 2 – Bayscaping: Building an Environmentally Friendly Yard found on pages 17-18, which highlights current issues facing the Chesapeake Bay and conservation actions that can be taken to help, and Activity 3 – Crab Pot Challenge found on pages 22-23, which discusses the tool used by watermen to catch blue crabs. Another great extension is to complete Activity 4 – Build a Secchi Disc found on page 25. This activity will teach students to make a scientific tool for testing water quality. All activities help to reinforce what students learned from the Aquarium’s presentation and discovery lab.

NATIONAL AQUARIUM
Chesapeake Bay Theme Day – Grades 5-6
THE CHESAPEAKE BAY

The Chesapeake Bay is about 200 miles long with an average depth of less than 25 feet (7.6 meters). The Bay itself lies entirely within the states of Virginia and Maryland. However, the water from rivers and streams that drains into the Bay (known as the watershed) comes from a much larger area. The Chesapeake Bay watershed covers over 64,000 square miles and includes parts of Maryland, Virginia, Pennsylvania, New York, West Virginia, Delaware and Washington, DC. More than 16 million people live in the Chesapeake Bay watershed.

The Chesapeake Bay is one of this country’s greatest resources. The Bay is home to many plants and animals that interact in a complex ecosystem. Many species of fish that live in the ocean as adults spawn and mature in the Bay. In the winter months, the Bay provides food and a much-needed resting place for migrating birds and waterfowl. For centuries, humans have reaped benefits from the Bay; we have eaten its animals, used it for commerce and shipping and participated in recreational activities along its beautiful banks. The Bay is home to one of the largest shipping centers on the East Coast, with more than 90 million tons of cargo traveling its waters each year. Millions of people head to the Bay every year to go boating, fishing, swimming or to enjoy some other water-related activity. However, human pollution threatens to destroy the Bay’s value as a home for wildlife as well as a source of food and recreation.

HABITATS OF THE BAY

A habitat describes the place where a particular species lives and contains the necessary food, water, shelter and space needed for an organism to survive. Three important habitats found in the Chesapeake Bay are SAV beds, oyster reefs and marshes.

In the shallow water of the Chesapeake Bay, underwater grasses—or submerged aquatic vegetation (SAV)—provide food and habitat for many fish, invertebrates and migratory birds. Blue crabs hide within the underwater grass beds after molting when their soft “shells” are most vulnerable to predators. Molting is the process by which crabs shed their outer covering (called an exoskeleton) in order to grow. Small fish find refuge from larger predators among the grass beds. SAV beds act as a nursery for crabs and fish, including menhaden, herring and shad. Bay grasses are also a valuable food source for migrating and resident bird species. Underwater grasses are important primary producers in the Bay, adding oxygen to the water through photosynthesis. They improve the Bay’s water quality by absorbing excess nutrients. SAV beds also reduce wave action that can erode shorelines and trap sediment that would otherwise cloud the water.

Oyster reefs can be found throughout the mid to lower Bay. These reefs, or bars, are formed when young oysters—called spat—settle on the firm surfaces of mature or dead oyster shells. The accumulation of oyster upon oyster results in the formation of clusters of oysters, which create refuges for small fish and invertebrates. The oyster shells offer a hard substrate where organisms such as barnacles, tunicates and sponges can attach. The natural ability of oysters to filter dirt from the water results in higher water clarity and light penetration in these areas. Fish such as gobies, blennies and skillettish live in and among the oyster reef community.

Marshes are a type of wetland that contains mostly tall grasses, with some flowers and small bushes. Marshes have a natural supply of water—either from tides, flooding rivers or groundwater. Salt marshes are characterized by salt-tolerant plants and animals, while freshwater marshes contain the more salt-sensitive species. Brackish marshes—marshes with salinities ranging between those of freshwater and saltwater—are also marshes that are found along the Chesapeake Bay. In the Chesapeake Bay region, a tidal marsh experiences a change in the water level four times each day with the changing tides—two high tides and two low tides. The part of the marsh that is often submerged by incoming tides is termed the low marsh.
Plants that are found in this area, including salt marsh cordgrass, can tolerate oxygen-poor mud and have adapted to being partially or completely submerged by the tides. The upper part of the marsh—termed the high marsh—receives less tidal action, usually only from exceptionally high tides. Wetlands play numerous environmental roles. They prevent erosion by binding to soil and blocking runoff. They act as a sponge by preventing flooding and absorbing pollutants before they can enter the Chesapeake Bay. They also provide a valuable habitat for numerous species of animals and plants. Wildlife, such as beavers, muskrats, songbirds and wading birds, depend on wetlands for food and shelter. Fish and crustaceans utilize wetlands as well.

FEATURING ANIMALS IN THE BAY

Oysters are mollusks, and are in the same phylum as octopuses, squid, clams and snails. They are bivalves, which mean they have two shells held together by powerful adductor muscles. The animal itself is a filter feeder, which means that the oyster draws in water through its gills and filters out phytoplankton, its food. Pollutants and sediments are also sucked into the oyster’s body. The oyster packages the sediment into tiny pellets, which are then expelled from the oyster to settle on the bottom of the Bay, thus purging them from being suspended in the water column. An adult oyster can filter up to 60 gallons of water per day!

Blue crabs are perhaps the most famed residents of the Chesapeake Bay. The last pair of legs on the blue crab are modified into flattened paddles called “swimmerets” that assist the crabs in locomotion. Indeed, the blue crab’s scientific name, Callinectes sapidus, literally means “beautiful swimmer that tastes good.” The common name “blue crab” stems from the brilliant blue that mature males exhibit on the undersides of their claws. The blue crab is a crustacean and is related to lobsters, shrimp and hermit crabs, among others. Like most large crustaceans, blue crabs have a hard exoskeleton (often referred to as a shell) made of chitin and calcium. Because the exoskeleton does not grow with the crab, it must be shed and replaced periodically by a new, larger outer skeleton. During this process, called molting, the old exoskeleton cracks just below the crab’s eyes and all the way to the points of the shell. The exoskeleton also cracks along the backside and along the top of the claws. Once the exoskeleton is broken open, the crab backs out of it. The crab then draws in water, forcing its new soft exoskeleton to swell. The new exoskeleton will be about one-third larger than the old one. However, the newly exposed exoskeleton will not fully harden for about three days. During this time, the soft-shell crab is extremely vulnerable to predators, and it will hide in protected areas such as marshes and underwater grass beds.

The great blue heron is one of the largest and most measures up to 4 feet in height with a 6-foot wing span. Although many herons migrate through the Chesapeake Bay region, some remain in the Bay area year-round. More than half of the Atlantic Coast breeding population of great blue herons nests in the Chesapeake Bay area. These water birds hunt silently by stalking small fish and swallowing them head first. They also eat frogs, salamanders, lizards, snakes, crawfish, small birds, rodents and insects. Great blue herons are one of the top predators of the Bay food chain.

FOOD CHAIN

The organisms in a food chain are placed into one of three groups based on how they meet their energy requirements.

Producers make their own food using simple chemicals and energy from the sun. Green plants, underwater grasses and microscopic phytoplankton are producers.

Consumers are animals that eat producers or other consumers. A consumer that eats plant matter is called an herbivore (ex. oyster); one that eats animal matter is called a carnivore (ex. great blue heron). A scavenger is a consumer that feeds on dead animals (ex. blue crab). A consumer that eats both plant and animal matter is called an omnivore.
Decomposers are organisms that break down dead plant or animal material into simple chemicals. These simple chemicals are recycled when used by producers to make food. Bacteria are the most important decomposers in the Bay.

A food chain starts with a producer, such as, phytoplankton (microscopic plants that drift with water currents). The phytoplankton may be eaten by zooplankton (microscopic animals), the second link in the food chain. The zooplankton may be eaten by a small fish like an Atlantic silverside, which may then be eaten by a larger fish like a bluefish. The zooplankton, silverside and bluefish are all primary, secondary and tertiary consumers, respectively. The bluefish in turn may be eaten by an osprey or another top predator. This is the fifth and final link in the food chain. Because the osprey is not eaten by any other animal, they are called the top predators. Humans are also often considered the top predator in a food chain. This is just one example of a food chain that exists in the Chesapeake Bay.

![FOOD CHAIN Diagram]

**HARVESTING OYSTERS IN THE BAY**

When Europeans first encountered the Bay, they found abundant oysters throughout. Indeed, the Powhatan Native Americans aptly named the Bay “Chesepioe” which means “the Great Shellfish Bay.” These American oysters formed reefs so vast they posed a hazard to incoming ships. There were so many oysters that they could filter the entire Bay in a few days. Now, the same process takes over a year due to increased sediment pollution and vastly lower numbers of oysters found in the Bay.

As early as the 1850s, New England oysters off the coasts of New York and New Jersey began to show signs of overharvesting. Yankee watermen turned to the Chesapeake Bay for their harvest. With them they brought their latest innovation—the oyster dredge—and completely changed the Bay’s oyster fishery. Local watermen, who up until then had been dependent on the awkward, heavy oyster tongs for their oyster catch, began turning to the dredge. The **dredge** combined an iron rake, used to scrape oysters from other shells, with a metal bag used to collect the oysters. When combined with steam-powered ships, this method of dragging the dredge behind the boat could be used in much deeper waters and resulted in a far greater catch than tonging. Dredging proved to be far more destructive to oyster bars as well. Maryland passed laws as early as 1865 in order to protect its valuable oyster beds. The first law banned dredging from a boat that is powered by anything other than sail, resulting in a fleet of specially designed sailboats called skipjacks being used to dredge oysters from the Bay.

Once numbering perhaps in the thousands, the fleet of Chesapeake Bay skipjacks has been reduced to fewer than thirteen today. Only a handful of watermen still sail these historic beauties of the Bay. While some watermen still wrestle with hand tongs, most have turned to power-driven patent tongs to save them the toil of the days past. During the 1880s, watermen caught nearly 20 million bushels of oysters per year. Since then, the oyster harvest has declined steadily. The population of oysters in the Bay has been reduced by as much as 99 percent of its historic numbers.

**REASONS FOR DECLINE OF THE BAY**

Overharvesting of oysters in the Chesapeake Bay has threatened the oyster fishery with extinction. Both watermen and oyster connoisseurs have demanded a solution to restore the Bay’s
oysters without putting a suspension on harvesting them. The solution put forth by the Maryland Department of Natural Resources (DNR) was to regulate the industry. Methods of regulation include daily bushel limits, time limits, harvesting seasons, limited entries and periodic closures of harvesting sites. In addition, it is illegal to harvest oysters under 3 inches in length, and any boat carrying a dredge can only use a motor on certain days of the week.

The blue crab fishery is also suffering from overharvesting. To combat potential demise of the fishery, blue crab harvests are highly regulated based on size. Currently, hard shelled crabs must be 5 inches or larger to be harvested commercially. Please visit the State of Maryland’s Blue Crab Program website to learn about the Maryland DNR size regulations for blue crabs. [dnr.state.md.us/fisheries/crab/crabindex.html](http://dnr.state.md.us/fisheries/crab/crabindex.html) (Click on Regulations on the right hand side)

Land-clearing for developmental or agricultural purposes has led to increased sedimentation in the Bay. Sedimentation refers to sand, clay, or silt that gets into the water column and eventually settles on the bottom. Although sedimentation is a normal process, increased sediment from dirt runoff can be harmful to the Bay’s aquatic life. It can clog oysters’ gills if filtered in high quantities, suffocating them. It can also hinder spat (young oysters) from successfully attaching to hard substrates. The presence of sediment in the water can block sunlight from reaching the Bay’s underwater grasses, or SAV. Sedimentation in the water affects the turbidity of the Bay. Turbidity is a measurement of the clarity of water. It is usually measured with a Secchi (sek* key) disc, a circular plate that is divided into an “X” pattern of alternating black and white quarters and is tied to a rope. The Secchi disc is lowered into the water, usually from a boat or pier. When the “X” pattern of the disc is no longer visible, the depth is recorded using length increments along the rope. High Secchi depth values mean that the water is clear. Low Secchi depth values indicate high turbidity, usually due to a large amount of sediment and phytoplankton in the water. Turbidity can also increase due to pollution, dredging or during periods of elevated freshwater input from rivers and streams.

Excess fertilizers wash off farm fields, golf courses and lawns into streams and rivers leading into the Chesapeake Bay. Once in the waterways, fertilizers designed to make crops healthy and lawns green promote the growth of harmful algae. As the algae grows, it blocks sunlight, thus preventing SAV from growing. After the algae dies, it sinks to the bottom and is broken down by bacteria. This process uses up much of the oxygen in the water, which threatens underwater life that needs oxygen.

Habitat loss has also caused major problems in the Chesapeake Bay. Coastal development has increased steadily since 1970, and currently more than half the population of the United States lives in coastal counties. In the Chesapeake Bay watershed, population growth and development pressures have led to an increase in pollution and habitat fragmentation.

**WHAT YOU CAN DO FOR THE BAY**

Everyone can do something to protect the Chesapeake Bay. For example, you can conserve water by turning faucets off when not in use and taking shorter showers instead of baths. This will reduce the amount of water that has to be pumped through sewage treatment plants or septic systems, which will conserve energy. You can also conserve energy by turning lights, radios and televisions off when not in use; running only full loads in the washing machine and dishwasher; and replacing ordinary light bulbs with energy-efficient bulbs. Conserving energy will reduce the demand placed on fossil fuel plants, thereby reducing the pollution they produce. Of course, “Reduce, Reuse, Recycle” is another important concept for Bay conservation. In addition, it is important to reduce the amount of fertilizer and pesticides we use in our gardens. In a practice called bayscaping, you can incorporate native vegetation into lawns and schoolyards. Planting native trees and plants will reduce the need for fertilizer while providing habitat for native animals and reducing the amount of runoff from lawns. Planting trees also prevents sedimentation. Tree roots keep soil in place so it does not run into the Bay. You can also limit sedimentation by slowing down the flow of rainwater. This can be done by installing a rain barrel to collect water as it flows off your roof from rain gutters. Simply picking up litter on the street will also help protect the Bay. Remember, the Bay’s watershed extends over 64,000 square miles and covers six states plus Washington, DC, so make sure to ask everyone you know to do their part to help the Bay!
Glossary

Bayscaping – a landscaping technique where native plants and trees are planted to provide habitat for animals

Bivalve – a mollusk that has two shells; bivalves include mussels, scallops, oysters and clams

Blue crab – an edible crustacean with a flat abdomen and ten legs; bluish-green in color on top and white on the underside; when a blue crab outgrows its exoskeleton, it molts

Brackish – a mixture of salt and fresh water

Bushel – a basket that crabs, oysters, and other shellfish are sold in; 1 bushel equals 32 dry quarts

Consumer – an animal that eats producers or other consumers; this includes herbivores, carnivores, omnivores and scavengers

Crustacean – a mainly aquatic invertebrate that has jointed legs and must molt, or shed its exoskeleton, to grow; examples include crabs, lobsters and shrimp

Decomposer – an organism that breaks down complex organic materials to get energy and nutrients needed for its own growth

Dredge – a metal cage with small spikes on one side that is attached to a boat and dragged along the bottom of the Bay to harvest oysters

Ecosystem – a community of living organisms and their relationships with the non-living materials in a given area

Exoskeleton – the hard, shell-like covering of crustaceans (crabs, lobsters and shrimp); literally “outside skeleton;” must be cracked open and discarded (molted) for animal to grow

Filter feed – a method of collecting food from the water; used by oysters, clams and other shellfish; involves drawing water in through an intake siphon, passing it over their gills, and expelling the water through an exit siphon

Food chain – a sequence that shows how each living thing gets food and how energy is passed from organism to organism; organisms in a food chain can either be producers, consumers, or decomposers

Habitat – the environment in which an organism or biological population lives or grows; there are four elements to a habitat: food, water, shelter and space

Habitat fragmentation – the division of a large area into smaller, isolated patches, separating the organisms that lived there; causes of habitat fragmentation include development, road building, logging and agriculture

Harvest – collecting animals to sell for profit

High marsh – the portion of the marsh that is affected the least by the tides

Low marsh – the portion of the marsh that is most often submerged during the tides; the plants in this area are most tolerant to the poorly oxygenated mud and daily submersion during high tides

Marsh – a type of wetland that contains mostly tall grasses but few trees; serves as an important breeding ground for many animals

Maryland Department of Natural Resources (DNR) – a government agency that manages the health and recreational use of Maryland’s natural resources, including fresh and saltwater fish and shellfish

Mollusk – an invertebrate with a soft body covered by a thick membrane; can have 0, 1, 2 or 8 shells; examples of shelled mollusks include clams, oysters, snails and scallops; octopuses and squid are examples of mollusks without an external shell

Molting – the process in which crustaceans grow larger; the exoskeleton splits and the animal backs out of it to reveal a new, larger, soft exoskeleton which hardens after a few days
**Oyster** – a bivalve mollusk with one convex and one flat shell; eats by filtering phytoplankton from the water

**Oyster reef** – an aquatic reef consisting of individual oysters piled on top of each other; many other animals use the reef as habitat including oyster toadfish, skilletfish and sea squirts

**Oyster tongs** – large hand tongs with handles 12-30 feet in length used to harvest oysters; the tongs are held from a boat and are used like scissors to break apart and then trap the oysters

**Phytoplankton** – small (generally microscopic) single-celled aquatic plants that drift with the currents; includes many kinds (phyla) of organisms called algae

**Producer** – an organism that makes its own food; for example, plants

**Rain barrel** – a barrel designed to collect and store rainwater as it drips from a rooftop

**Runoff** – pollution associated with water washing over water-resistant surfaces and carrying loose soil, fertilizer, garbage or other pollutants into a body of water

**Salinity** – the amount of salt in the water, measured in parts per thousand (ppt); fresh water has a salinity of < 1 ppt while saltwater has a salinity between 30-35 ppt

**Salt-sensitive plants** – types of plants that do not survive well in areas with high salinity

**Salt-tolerant plants** – types of plants that are adapted to living in areas with high salinity

**Secchi (sek’ key) disc** – a tool used to measure water quality; a weighted white disc with a black “X” on top attached to a calibrated line; high readings indicate clean water while low readings indicate dirty (or turbid) water

**Sedimentation** – the process of sand, clay or silt being deposited into the water column and accumulating on the bottom

**Soft-shell crab** – a crab that is soft-bodied for a few days after molting; very popular seafood dish and are very profitable to watermen

**Spat** – a juvenile, newly attached oyster

**Submerged Aquatic Vegetation (SAV)** – underwater plants that are an important habitat for many of the Bay’s animals

**Tide** – changes in water level produced by the gravitational attraction of the moon and the sun

**Turbidity** – a measurement of the clarity of or amount of dirt in the water; often measured with a Secchi disc

**Watershed** – an area of land from which water (rain or snow) drains into a stream, river, or other body of water

**Wetland** – land that is saturated with water and that contains plants and animals that are adapted to living on, near or in water; wetlands have hydric soils and are usually located between a body of water and land

**Skipjack** – a sailboat used to dredge for oysters; about 40-50 feet long
Resources

NATIONAL AQUARIUM, BALTIMORE VENUE: HARRY & JEANETTE WEINBERG WATERFRONT PARK
aqua.org
Harry & Jeanette Weinberg Waterfront Park outside the entrance to the National Aquarium. Look for the map of the Chesapeake Bay watershed, as well as examples of flora found in various watershed habitats. Be sure to listen for watershed inhabitants like birds and frogs as you explore the park.

NATIONAL AQUARIUM, BALTIMORE VENUE: MARYLAND: MOUNTAINS TO THE SEA, LEVEL 2
aqua.org
These exhibits depict Maryland habitats in a water cycle that moves from an Allegheny stream through a tidal marsh and coastal beach and out to the continental shelf.

LIVING WATERS OF THE CHESAPEAKE CD-ROM, NATIONAL AQUARIUM
Living Waters of the Chesapeake CD-ROM is loaded with interactive learning activities about the Bay for teachers and students.

ALLIANCE FOR THE CHESAPEAKE BAY
acb-online.org/pubs.cfm
Contains information on bayscaping and rain barrels.

BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND RESOURCE MANAGEMENT
baltimorecountymd.gov/Agencies/environment/rowing-home/index.html
Includes tips on planting your own tree.

CHESAPEAKE BAY FOUNDATION
cbf.org
Provides information on the health of the Chesapeake Bay and its watershed.

CHESAPEAKE BAY PROGRAM
chesapeakebay.net/inyourbackyard.aspx?menuitem=16888
Provides information on Bay-friendly landscaping. Includes information on bayscaping, composting and reducing runoff.

LIFE IN THE CHESAPEAKE BAY
by Alice Jane and Robert L. Lippsen.
ISBN# 0-8018-5475-X
Life in the Chesapeake Bay is an excellent resource book about the plants and animals of the Chesapeake Bay.

MARYLAND COOPERATIVE EXTENSION’S HOME AND GARDEN INFORMATION CENTER
hgic.umd.edu/content/onlinepublications.cfm
Includes information on tree planting.

MARYLAND DEPARTMENT OF NATURAL RESOURCES
dnr.state.md.us/
Contains tips on storm drain stenciling.

MARYLAND SEA GRANT’S OYSTERS AND THE CHESAPEAKE IN THE CLASSROOM
mdsg.umd.edu/oysters/

U.S. FISH AND WILDLIFE SERVICE’S CHESAPEAKE BAY FIELD OFFICE
fws.gov/chesapeakebay/baysc2.html
Includes information on bayscaping.
Activity 1 – Watershed Address

DESCRIPTION
A watershed is an area of land from which water (rain or snow) drains into a stream, river, or other body of water. No matter where you live, you live in a watershed!

In this activity, students use a map of the Chesapeake Bay watershed to identify the states included in the watershed and where their school is located. Students use this information to complete the activity on the Student Page.

PROCEDURE
1. Review the definition of a watershed and information on the Chesapeake Bay watershed with students. Refer to page 4 of the Teacher Background. Be sure to include the fact that all water in a watershed drains into a common outlet, which in this case is the Chesapeake Bay. As a result, human behavior on land, like using fertilizer or littering, can affect the health of the Bay and its inhabitants.
2. Distribute copies of the map and the student page for the Watershed Address activity found on pages 13-14. Have the students study the map of the Chesapeake Bay watershed to complete Step A.
3. As a class, complete Steps B and C. Label where your school is located on the Chesapeake Bay watershed map.
4. Have your students complete the rest of the Student Page individually or in pairs. Discuss the answers as a class, including what can be done to protect the Chesapeake Bay.

For more information about your watershed and others within the United States, visit cfpub.epa.gov/surf/locate/index.cfm.
Activity 1 – Watershed Address

STEP A
Using the map, list the six states and one district in the Chesapeake Bay watershed.

1. New York
2. Pennsylvania
3. Delaware
4. Maryland
5. Virginia
6. West Virginia
7. Washington, DC

STEP B
As a class, locate and label where your school is on the map. Is your school within the Chesapeake Bay watershed? If not, visit cfpub.epa.gov/surf/locate/index.cfm to find out which watershed your school is located within.

Write the name of that watershed here:

STEP C
There are many rivers on this map that flow into the Chesapeake Bay. Name the river that is closest to your school. Note: there may be a non-labeled river that is even closer to your school. There are 10 rivers labeled on the map. You may have a river closer to your school that is not labeled.

Using a blue crayon or marker, draw a line from your school to that river. Continue tracing a path from that river to the Chesapeake Bay. This line represents the flow of water.

Where would that water flow next? into the Atlantic Ocean

STEP D
You just traced the flow of water that connects your school to the Chesapeake Bay. Anything that gets into the water can end up in the Chesapeake Bay. Since your school is connected to the Bay, trash and pollution at your school can hurt the Bay. List three things you can do at your school to protect the Chesapeake Bay.

Answers vary. Possible answers include recycling, planning a schoolyard clean-up event, planting native trees and flowers, creating a rain barrel, using reusable water bottles, reusing old school supplies, bringing your lunch in a reusable lunch box or cooler, covering your books with newspaper, etc.
Activity 1 – Watershed Address

DIRECTIONS
Answer the following questions in the space provided.

STEP A
Using the map, list the six states and one district in the Chesapeake Bay watershed.

1.  
2.  
3.  
4.  
5.  
6.  

STEP B
As a class, locate and label where your school is on the map. Is your school within the Chesapeake Bay watershed?  
If not, visit cfpub.epa.gov/surf/locate/index.cfm to find out which watershed your school is located within.  
Write the name of that watershed here:

STEP C
There are many rivers on this map that flow into the Chesapeake Bay. Name the river that is closest to your school. Note: there may be a non-labeled river that is even closer to your school. There are 10 rivers labeled on the map. You may have a river closer to your school that is not labeled.

Using a blue crayon or marker, draw a line from your school to that river. Continue tracing a path from that river to the Chesapeake Bay. This line represents the flow of water.

Where would that water flow next?

STEP D
You just traced the flow of water that connects your school to the Chesapeake Bay. Anything that gets into the water can end up in the Chesapeake Bay. Since your school is connected to the Bay, trash and pollution at your school can hurt the Bay. List three things you can do at your school to protect the Chesapeake Bay.

1.  
2.  
3.  

NATIONAL AQUARIUM
Chesapeake Bay Theme Day – Grades 5-6
Activity 1 – Watershed Address
Activity 2 – Bayscaping: Building an Environmentally Friendly Yard

DESCRIPTION
Bayscaping is another great activity you can do to help the Bay. It can include many different activities and can be performed in many different settings. For more information on bayscaping, refer to page 7 in the Teacher Background.

In this lesson, students are exposed to the concept of bayscaping and explore how they can help the environment by making environmentally friendly landscaping improvements. Students compare bayscaped and non-bayscaped areas and will practice writing complete sentences to describe improvements they can make.

PROCEDURE
1. Distribute copies of the Bayscaping worksheets on pages 17-18 to the students.

2. Read *What is Bayscaping?*, located on page 17, as a class.

3. Review the bayscaping improvements mentioned in the reading and discuss how each strategy helps the environment. (For example: plant roots hold dirt in place, rain barrels save and slow the flow of rain water, native plants require less watering and fewer chemical pesticides and fertilizer, gravel paths slow down the flow of water into rivers, etc.)

4. Instruct students to color or circle the differences between the two pictures of bayscaped and non-bayscaped schoolyards found on page 18.

5. After they have pointed out the differences between the two pictures, have the students write a short paragraph describing ways they can help the environment. (For example: students may decide to plant trees, write letters to government officials, use less water, set up rain barrels, recycle, clean up litter, encourage their parents to use less fertilizer on their lawns, etc.).
Activity 2 – Bayscaping: Building an Environmentally Friendly Yard

STEP A

There are two pictures below. One picture is of a bayscaped schoolyard and the other picture is of a schoolyard that has not been bayscaped. Color or circle the differences between the two pictures.

STEP B

Write a short paragraph about what you and your family can do to help bayscape your yard at home, neighborhood or schoolyard.

Answers will vary but may include: planting gardens, trees, grass, and other plants; putting fences around areas that can spread dirt or sand; picking up litter; putting recycling bin in yard; putting up a rain barrel at the base of the gutter.
Activity 2 – Bayscaping: Building an Environmentally Friendly Yard

DIRECTIONS
Read the article What is Bayscaping? and complete Steps A and B.

WHAT IS BAYSCAPING?

Bayscaping is changing an area to make it better for the environment. Bayscaping includes changes that help by stopping erosion, reducing chemical use, saving water, and reducing dirt runoff.

One example of bayscaping includes planting trees, bushes, and other plants. Plant roots prevent erosion by keeping dirt from washing into streams and rivers when it rains. Less dirt in the water makes it easier for sunlight to reach underwater plants like submerged aquatic vegetation (SAV). Planting trees and other plants also creates habitats for animals to live.

While all plants help slow erosion, native plants are the best for the environment. Native plants have adaptations to help them survive where they naturally grow. Because of this, they need to be watered less than plants from other regions. Also, native plants need to be sprayed with fewer chemicals like fertilizer and pesticide. When these chemicals wash into streams and rivers, they kill the animals that live in the water.

Rain barrels are also a part of bayscaping. These large barrels are connected to rain gutters and are used to catch and save rain water. Saving rain water before it reaches the ground keeps it from washing dirt into streams and rivers. Saved rain water can be used to water plants when it is very dry.

Another part of bayscaping is making paths out of gravel instead of blacktop, asphalt, or cement. This allows rain to soak into the ground more slowly. Rain that soaks into the ground or is saved in rain barrels does not move extra dirt (called runoff) into lakes and rivers.
Activity 2 – Bayscaping: Building an Environmentally Friendly Yard

STEP A
There are two pictures below. One picture is of a bayscaped schoolyard and the other picture is of a schoolyard that has not been bayscaped. Color or circle the differences between the two pictures.

STEP B
Write a short paragraph about what you and your family can do to help bayscape your yard at home, neighborhood or schoolyard.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Activity 3 – Crab Pot Challenge

DESCRIPTION
In this activity, students will recall and identify parts of a crab pot. By writing a letter to an absent classmate, students recall their experience.

PROCEDURE
1. Review the previous day’s activity.
2. Divide the students into groups of 2-3.
3. Each group will work together to complete Steps A and B found on page 27.
4. Once all of the students have completed Steps A and B, discuss the answers as an entire class. Be sure to include a discussion on how the crab pot works. Include parts and function for each part.
5. Direct the students to complete Step C on page 28. In this activity, students write a detailed letter to a classmate that explains how a crab pot works. Each student should work on this step individually.
Activity 3 – Crab Pot Challenge

DIRECTIONS
Work together in your group to fill in the worksheet.

STEP A
1. Label the parts of the crab pot. Use the list of crab pot parts provided.
2. Explain what each part is used for.

<table>
<thead>
<tr>
<th>NAME: Cull Ring</th>
<th>FUNCTION: Small ring that allows the small crabs (under legal limits) to escape.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME: Bait Pocket</td>
<td>FUNCTION: Where the watermen put the bait. Bait includes bull lips, chicken necks and dead fish.</td>
</tr>
<tr>
<td>NAME: Funnel</td>
<td>FUNCTION: Where the crabs enter the crab pot. It is more narrow on the inside so crabs can’t get back out.</td>
</tr>
<tr>
<td>NAME: Upstairs</td>
<td>FUNCTION: Where the crabs get trapped. The watermen open this area to collect the trapped crabs.</td>
</tr>
<tr>
<td>NAME: Sides</td>
<td>FUNCTION: There are four sides. The sides keep the crabs inside.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRAB POT PARTS</th>
<th>sides</th>
<th>bait pocket</th>
<th>dredge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>funnel</td>
<td>upstairs</td>
<td>cull ring</td>
</tr>
</tbody>
</table>

STEP B
One of the words in the Word Bank does not belong. Which part does not belong? Dredge
Activity 3 – Crab Pot Challenge

STEP C
In the space below, write a detailed letter to a classmate explaining how a crab pot works. Remember to use complete sentences.

Dear _______________________

Answers vary. Blue crabs are attracted to the crab pot because of the bait. The bait includes smelly items such as bull lips, chicken necks and dead fish. The crabs enter through the funnel. The crabs cannot go back out the same way because it is more narrow and pointed on the inside of the crab pot. The crabs may eat the bait from the bait pocket. The crab tries to find a way out of the crab pot so it swims to the part called the upstairs. Crabs that are smaller than the legal limit can swim out through the cull ring. All the other crabs get stuck in the upstairs until the watermen come to check their crab pots. Watermen sort through the remaining crabs and only keep those that are large enough.

Sincerely,

Date: ____________________________
Activity 3 – Crab Pot Challenge

DIRECTIONS
Work together in your group to fill in the worksheet.

STEP A
1. Label the parts of the crab pot. Use the list of crab pot parts provided.
2. Explain what each part is used for.

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<tbody>
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<tr>
<td>dredge</td>
</tr>
<tr>
<td>funnel</td>
</tr>
<tr>
<td>upstairs</td>
</tr>
<tr>
<td>cull ring</td>
</tr>
</tbody>
</table>

NAME: __________
FUNCTION: __________

NAME: __________
FUNCTION: __________

NAME: __________
FUNCTION: __________

NAME: __________
FUNCTION: __________

NAME: __________
FUNCTION: __________

STEP B
One of the words in the Word Bank does not belong. Which part does not belong? __________
Activity 3 – Crab Pot Challenge

STEP C
In the space below, write a detailed letter to a classmate explaining how a crab pot works. Remember to use complete sentences.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Date: ___________________________

Dear ____________________________ ,

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Sincerely,

__________________________________________________________________________
Activity 4 – Build a Secchi Disc

DESCRIPTION
In this activity, students will create a Secchi (sek’ key) disc. This is a tool used to measure turbidity, or cloudiness of the water. A Secchi disc is a white disc with a black “X” on it. A rope is attached to the center and marked in 1-foot (½ meter) increments.

The Secchi disc is lowered into the water until the disc is no longer visible. The depth is measured from the calibrated line and recorded. (For greater accuracy, the Secchi disc can be raised until it just appears, and that depth is also recorded from the calibrated line. These readings are added together and divided by two.) The result is the Secchi disc “transparency.” The deeper the disc is visible, the clearer and less turbid the water.

PROCEDURE
Explain to the students the purpose of a Secchi disc and show them one as an example. Break the class into groups of two. Make sure each group has all of the items listed on the left. Have students follow the directions to make their own Secchi disc. The steps to create a Secchi disc are as follows:

1. Using electrical tape, make a black “X” on the top of the bucket lid.
2. Screw one nut into the eyebolt until it is around 1 inch from the bottom of the eyebolt. Note: It sinks best when most of the eyebolt is above the bucket lid.
3. Put the eyebolt through the hole in the center of the disc. The “eye” of the eyebolt should be on the side of the lid with the “X.”
4. Screw another nut onto the eyebolt until it stops at the bottom of the plastic lid.
5. Tie one end of the piece of string to the eyebolt. The piece of string should be at least 10 feet long.
6. Using the ruler, draw a mark on the string every foot (or 1/3 meter) starting from where the string is attached to the eyebolt.

Once they have put the disc together, it may require more weight to sink. The Student Page instructs them to test it in a bucket of water.
Activity 4 – Build a Secchi Disc

A Secchi (sek’ key) disc is used to measure the turbidity, or cloudiness, of the water. A Secchi disc is a white disc with a black “X” on it. A rope is attached to the center and marked in 1-foot sections. The disc is lowered into the water until it can no longer be seen. The deeper the disc can be lowered, the clearer (or less turbid) the water.

DIRECTIONS

Working as a group, follow these directions to make a Secchi Disc.

STEP 1: Using black electrical tape, make a black “X” on the top of the bucket lid (see picture).

STEP 2: Screw one nut onto the eyebolt until it is 1 inch from the bottom end of the eyebolt.

STEP 3: Put the eyebolt with the nut through the hole in the center of the disc. The “eye” of the eyebolt should be on the side of the lid with the “X.” The nut should be above the bucket lid.

STEP 4: Screw another nut onto the eyebolt until it stops at the bottom of the plastic lid. Now there is one nut on each side of the bucket lid.

STEP 5: Tie one end of a piece of string to the eyebolt. The piece of string should be at least 10 feet long.

STEP 6: Using the ruler, draw a mark on the string every 1 foot starting from where the string is attached to the eyebolt.

TESTING THE SECCHI DISC

Now that your Secchi disc is complete, your group needs to see if it will sink. Hold your Secchi disc by the string and slowly lower it into the water. What happens?