



PICKERING CREEK  
Audubon CENTER

# Gateways to Conservation

*an environmental  
education curriculum  
for students in grades 1-5*



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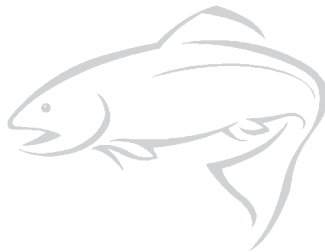


CHESAPEAKE BAY  
GATEWAYS NETWORK

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# Acknowledgements

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Pickering Creek Audubon Center is a Chesapeake Bay Gateways site—a place to explore and learn about the Chesapeake region. Visit this and other places in the Gateways Network to experience the Bay's stories, culture, spirit and mystery. Learn about the Chesapeake Bay restoration effort and how you can contribute. Our well-being and the Bay's health are interdependent. Visit [www.baygateways.net](http://www.baygateways.net) for more information.

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# Introduction

## Audubon, Pickering Creek and Gateways to Conservation

Over one hundred years ago, a committed group of Americans came together to protect birds from slaughter at the hands of plume-hunters. Hats sporting feathers and even entire birds were the height of fashion, making the hunting of egrets and other birds a highly profitable enterprise. Fortunately, the bold and dedicated efforts of a far-sighted group of men and women were successful in saving the Great Egret and other birds from extinction. It was these early conservationists who founded the National Audubon Society, which still includes the Great Egret in its logo.



Today, Audubon is continuing its legacy of protecting birds and other wildlife through individual action. Citizen science programs, like the century-old Christmas Bird Count, the more recently launched Great Backyard Bird Count and the Important Bird Areas Program enlist thousands of volunteers for conservation. Audubon Centers from coast to coast introduce new generations to the wonders of nature and the importance of protecting it.

As Audubon enters its second century, the conservation challenges we face are no less urgent than those that confronted our founders. Our mission remains as vital as it was one hundred years ago. Birds have long served as barometers for the overall health of our environment, and of our own quality of life and health. By helping to protect them, each of us, like the men and women who worked to outlaw plume hunting, can make a conservation difference. That is the Audubon legacy.

## Pickering Creek Audubon Center

In Maryland, Pickering Creek Audubon Center connects students of all ages to the environment, science and the beauty of the Chesapeake Bay. Working in partnership with local school systems, the Pickering Creek education staff provides science-based environmental education to over 16,000 children each year from eight Maryland counties and the District of Columbia. In Talbot County, Pickering Creek programs are integrated into the school curriculum for all first through fifth grade students. Pickering Creek reveals to every student the joy



of being outside and the science behind what they see. Participants in our programs have an experience they cannot have reading a book or by watching nature programs on television. They are awestruck as a real Bald Eagle soars overhead, and are triumphant as they return from their first canoe adventure. Their curiosity is awakened. We have helped them connect with nature.

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## Gateways to Conservation

The 64,000 square-mile Chesapeake Bay Watershed is a diverse ecosystem. In order to understand the complexities of the Chesapeake Bay and restore and protect its quality, it is critical that students understand water quality, the effects of changes to local landscapes, the many living organisms that use the Bay or depend on the Bay for their survival and the important role humans play in the health of the ecosystem. The Gateways to Conservation curriculum provides exciting hands-on learning adventures for children that will create an environmentally literate student body with strong academic science skills and an understanding of their relationship to the Chesapeake Bay. This curriculum was produced in cooperation with the Chesapeake Bay Gateways Network.



Each lesson addresses Maryland State Voluntary Curriculum Standards for science or social studies, and each lesson has been field tested by Pickering Creek in the Talbot County Public School system. Both an in-school lesson and an outdoor field trip experience are provided for each grade. Although each lesson can stand alone, the lessons outlined in this book build on one another and are best taught in a series. Students participating in the lessons will gain skills and understand concepts that they apply in subsequent lessons. Students who participate in the entire curriculum gain an understanding of concepts important for maintaining and improving the health of the Chesapeake Bay.



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# Summary of Lessons

## Grade 1



### **Schoolyard Habitats** (*one-hour in-school lesson*)

Students will learn that some animals can live in a wetland while others need the Chesapeake Bay. Students will interact with live animals, animal models and puppets. The lesson includes a visit to the schoolyard and an assessment of two different habitats found near the school.



### **Water and Wetlands** (*two-hour field trip experience*)

This field experience will teach first-graders the basic properties of water in the water cycle and the characteristics of wetlands through a wetland nature walk, a game and an outdoor ponding activity where they use nets to capture living creatures from a pond.

## Grade 2



### **Wetland Habitats** (*one-hour in-school lesson*)

This lesson is designed to give students a basic introduction to wetland ecology and natural resources. Using animal mounts, students will learn adaptations of various animals that help them meet their basic needs in wetlands for finding food, shelter and nesting sites. Students are introduced to the concept that people, who use trees to meet their needs, affect the needs of wood ducks within the Chesapeake Bay Watershed.



### **Seeds and Plants** (*two-hour field trip experience*)

Through discussion and hands-on activities, students will be able to explain how seeds are dispersed, how plants grow and how plants are used to meet human needs such as: food, shelter, clothing and tools. Students will hike through and explore different habitats where they will compare and contrast the soil and plants found in each habitat.

## Grade 3



### **Changing Landscapes** (*one-hour in-school lesson*)

This lesson will introduce students to the ways humans have changed and continue to change natural landscapes. Using a model, students investigate the way different landscapes affect the Chesapeake Bay Watershed and the role plants play in filtering and improving the quality of water flowing into the Chesapeake Bay.



### **Forests** (*two-hour field trip experience*)

In this lesson, students will use all of their senses to explore and study a forest. They will study various trees in the forest, investigate tracks and traces left behind by animals and use magnifying lenses to investigate living organisms found under a rotten log. Students will learn that trees play an important role in improving the quality of water flowing into the Chesapeake Bay.



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## Grade 4



### **Reducing Use of Resources** (*one-hour in-school lesson*)

In this lesson, students will learn about recycling and its importance to the environment through class discussions and hands-on activities. Students will learn how recycling conserves natural resources, is a service provided by local governments and is part of the economic market.



### **Cutting Back on Bay Pollutants** (*two-hour field trip experience*)

This field trip will take place at the local waste management facility. Students will tour the waste management facility and learn through hands-on activities how to recycle different materials. Students will learn how waste management facilities significantly reduce the amount of pollution flowing into the Chesapeake Bay.



### **Ecosystems of the Chesapeake Bay** (*two-hour field trip lesson*)

By comparing and contrasting the interaction between the living and non-living components of two different ecosystems, students will explain the variation that can occur between ecosystems. Students will conduct hands-on investigations using scientific tools. They will collect scientific data in each ecosystem to further study back in the classroom the biological diversity of the Chesapeake Bay area and determine whether or not an ecosystem is healthy.

## Grade 5



### **Erosion Affects Bay Water Quality** (*one-hour in-school lesson*)

This lesson will introduce students to the ways water erodes the earth's surface. By using a model, students will understand the ways water transports sediment and pollution into the Bay and the role plants play in reducing the amount of sediment transported into the Chesapeake Bay. Students will investigate their school grounds for signs of erosion and explore ways to reduce the degree of erosion taking place.



### **Erosion Affects Bay Water Quality** (*two-hour field trip experience*)

This lesson will introduce students to the ways water, wind and animals erode the earth's surface. Students will investigate actual sites of erosion and conduct outdoor erosion experiments using large models in order to understand the effects of erosion on the water quality of the Chesapeake Bay.

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# ↑ *Schoolyard Habitats*



## **In-school Lesson** **Grade: 1**

Program Length: 1 hour  
Number of Instructors needed: 2  
*(1 with help of classroom teacher)*

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 1:

**Science:** *Diversity of Life*—Compare and explain how external features of different animals help them survive in different environments; *Environmental Issues*—recognize that caring about the environment is an important human activity.

## This lesson also meets the following State Standards:

### Grade 2:

**Science:** *Ecology*—Explain that organisms can grow and survive in many different habitats.



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## Synopsis

This lesson teaches students that a habitat is a place where an animal finds its food, water, shelter and air or space. Students will learn that different animals can grow and survive in different habitats. Students will learn through meeting live animals, animal models and puppets that some animals can live in a field, others can live in a schoolyard, while some animals need the Chesapeake Bay. Students will go outside and assess two different habitats found near their school.

## Objectives

- Students will be able to define habitat and give examples of different habitats found near their school.
- Students will be able to explain how external features of different animals help them survive in different habitats.
- Students will understand that different animals can grow and survive in different habitats because that is where the animal finds its food, water, shelter and air or space.

## Materials

- **Animals:** Use live animals, pictures, stuffed animals, puppets, or other representations of the animals. Avoid using taxidermy animals with this age group unless you are ready discuss that these are real animals that are now dead. First grade students can get confused and may not be able to understand that the taxidermy animals are real but not alive.

School: House Spider

Forest: Black Rat Snake, \*Red-tailed Hawk, \*Small forest birds such as the Blue Jay, Tufted Titmouse and Carolina Chickadee,\*Gray Squirrel, Box Turtle

Pond: \*Green Frog, \*Sunfish, \*Pond Slider (turtle), \*Duck, Dragonfly

Chesapeake Bay: \*Blue Crab, White Perch, \*Osprey, \*Gull, Diamond-backed Terrapin, Hermit Crab

Field: \*Mouse,\*White-tailed Deer, Corn Snake, Bluebird, Butterfly, Praying Mantis, Ladybug, Barn Owl, Fox

Wetland: Barred Owl, Northern Water Snake, Marsh Wren, Red-winged Blackbird, Green Tree Frog, Spring Peeper, Wood Turtle

*\* these animals may be easier for students to guess where the animal lives*

- **Habitat Puzzle:** A giant cardboard puzzle with the words “food”, “shelter”, “water” and “space” each on a different piece of the puzzle.



- **Field guides:** to identify insects and possibly other animals
- **Schoolyard Habitat Worksheet** (see Teaching Aids)
- **Habitat Cards** (optional): words or pictures representing the different habitats you will discuss.
- **Pictures of animals** camouflaged in their habitat (for extra activity).
- **Magnifying lenses** 1 per student (for extra activity).
- **Pieces of string:** (1 yard in length) 1 per student (for extra activity).

## Vocabulary

**Habitat** - a place where an animal or plant lives and can find food, water, shelter and space.

**Shelter** - an animal's home.

**Space** - the amount of air or room an animal needs to survive.





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# Schoolyard Habitat Lesson Plan

*The following lesson is broken into eight parts. The lesson takes place in the students' classroom and on the schoolyard or in a nearby park.*

**Part 1. Introduction** - 1 minute. One Instructor.

**Part 2. What is a Habitat?** - 5 minutes. One Instructor.

**Part 3. What Kinds of Animals Live Inside the School?** - 5 minutes. One Instructor.

**Part 4. What Kinds of Animals Live Outside the School?** - 20 minutes. Two Instructors.

**Part 5. Who Lives in the Schoolyard?** - 10 minutes. Two Instructors.

**Part 6. Things We can do to Improve our Schoolyard Habitat** - 4 minutes. One Instructor.

**Part 7. Conclusion** - 5 minutes. One Instructor.

**Part 8. Extra Activities**

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## **Part 1. Introduction:**

Introduce yourself and tell the students what you will be doing with them today. Then, discuss what a habitat is.

## **Part 2. What is a habitat?**

- Put the word “habitat” on the board. Tell the students a habitat is a place where an animal or plant lives. In its habitat an animal can find its food, water, shelter and space.
- Ask the students if the school is their habitat. Discuss whether students can live in their school and find food, water, shelter and space. A school can provide shelter or a home for students, but a school will not provide enough space and food for the students to survive for a long period of time. Ask the students, “*Can you grow food inside your school? Where can you grow food to eat?*” (Outside in a garden) So, you would need a school and a big garden to complete your habitat. You can also discuss the need for farms or forests where people can raise or hunt animals to provide meat to eat.
- Hand out a piece of the Habitat Puzzle to four different students and tell them to assemble the pieces in front of the class. Discuss each vocabulary word. Discuss how you need all four pieces of the puzzle to survive, and therefore, you need all four things in a habitat. If you don't have all four pieces, then it is not a habitat.

## **Part 3. What kinds of animals live inside the school?**

- Ask the students what kinds of animals live in their school. Put the word “school” on the board as a habitat. After some ideas from the students, get out a picture or other representation of a spider.



- House Spiders live in schools because they can find food, water, shelter and space inside a school building. Discuss with the students that spiders eat insects they find inside the school and they find fresh water drops to drink in the water fountains, sinks and bathrooms inside the school.
- Tell the students they will probably see spiders outside of the school building too, but they will not be house spiders because a house spider's habitat is inside the school building or another building.

#### **Part 4. What kinds of animals live outside the school?**

- Ask the students, "*What kinds of animals do you see living outside in the schoolyard?*" (squirrels, birds, rabbits).
- Tell the students you are going to put up some different habitats that can be found in the schoolyard on the board (adjust number of habitats to the amount of time you have for this section, but you must include the Chesapeake Bay as one of the habitats).
- Describe each habitat to the students.
- Tell the students you are then going to bring out a live animal or representation of an animal and you want the students to raise their hand if they know what habitat the animal lives in. Give the students some clues about the animal, such as how it uses its different body parts and where it lives. (You can describe the animal's behavior and describe what each animal eats).

Example: This animal (a Praying Mantis or a Ladybug) likes to live in open areas and climb up small plants to eat other insects. Where do you think it lives?

*Answer = In a field habitat*

- Discuss how the habitat supplies everything the animal needs to survive.

#### **Additional examples:**

##### Forest or Woods:

- Black Rat Snake (climbs trees and eats small birds and small rodents like mice)
- Small birds such as the Blue Jay (builds nest in trees and eats seeds, fruit, insects, eggs and baby birds), Tufted Titmouse (builds nest in trees and eats insects, seeds and berries), Carolina Chickadee (builds nest in trees and eats insects, seeds and berries)
- Red-tailed Hawk (builds nest in big trees and eats small mammals, birds and reptiles)
- Gray Squirrel (builds nest in big trees and eats nuts, fruit, buds and the inner bark of trees)
- Box Turtle (crawls on the ground and digs for earthworms)

##### Pond:

- Green Frog (sits in shallow water and eats insects)
- Sunfish (swims and eats small aquatic animals like insects and shrimp)
- Pond Slider (Turtle) (swims really fast and eats mostly aquatic plants but will also eat small aquatic animals like fish)



- 
- Duck (swims, flies and eats aquatic plants or small aquatic animals like fish)
  - Dragonfly (lays its eggs in the water and eats mosquitoes while it flies through the air)

#### Chesapeake Bay:

- Blue Crab (likes salty water and eats dead animals)
- White Perch (lives in salty water and eats small aquatic animals like fish and shrimp)
- Osprey (builds nests near water and eats fish such as menhaden)
- Gull (builds nests in sand and eats dead and live animals, as well as peoples' trash)
- Diamond-backed Terrapin (likes to swim in salty water and eats small aquatic animals like fish and shrimp)
- Hermit Crab (likes salty water and eats pieces of dead things that it finds on the bottom of the marsh)
- Horseshoe Crab (needs salty water and eats pieces of dead things that it finds on the bottom of the Bay)

#### Field:

- Mouse (lives in holes in the ground and eats seeds and fruit)
- White-tailed Deer (needs grassy open spaces and eats plants, nuts and farm crops)
- Corn Snake (its colors help it blend into its habitat and it eats mice)
- Bluebird (builds its nest near open areas and eats seeds, berries and insects)
- Butterfly (flies in open areas and eats green plants as a caterpillar and flower nectar as an adult)
- Praying Mantis (lives in open areas and eats other insects)
- Ladybug (lives in open areas and eats aphids found on small green plants)
- Fox (likes open grassy fields and loves to eat birds and rabbits)
- Barn Owl (lives in old barns and old trees found near fields and hunts for mice at night)

#### Wetland:

- Barred Owl (builds its nest in wet areas and eats small mammals, amphibians, reptiles and insects)
- Northern Water Snake (swims really fast and eats small aquatic animals such as frogs and fish)
- Marsh Wren (builds its nest in wet areas and eats aquatic insects or sometimes other birds' eggs)
- Red-winged Blackbird (builds its nests in wet areas and eat seeds and insects)
- Green Tree Frog or Spring Peeper (climbs trees in wet areas and eats insects)





## Part 5. Who lives in our schoolyard?

- Tell the students we are going to go outside and figure out what kinds of habitats are in their schoolyard. Split the class into two groups and one group will work with the center’s instructor and the other group will work with their teacher. We are going to work as a group to answer the questions on the Habitat Worksheet (see Teaching Aids).
- Instruct the other instructor or teacher to find a habitat outside (such as a field) and have the students answer the questions by investigating that habitat.

*\*In the case of inclement weather, see if you can see a habitat from the windows of the classroom and work through the Habitat Worksheet as a class. If there is no view from the window of this classroom or another room in the school (such as the hallway or library), then use one of the extra activities found below.*

## Part 6. Things we can do to improve our schoolyard habitats

Show the students pictures or models of bird boxes, bird feeders, bird baths, trees and shrubs. As you hold up or pass around each object, ask the students to raise their hand and tell you how they think this object improves a habitat. For whom does it improve the habitat? Have the students seen any of these objects before? Do they have any of these objects in their schoolyard? Have they ever seen any animals using the object?

## Part 7. Conclusion

Review the parts of a habitat with the students. Ask them, “*What are some of the habitats that they can find around their school? Do any animals use the school as a habitat? What do the students need to make their habitat complete?*”



Blue Jay



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## Part 8. Extra Activities

### A. Extra Indoor Activity: Camouflage Critters

Show the students pictures of animals camouflaged within their habitat. Introduce the word “camouflage” and give the following definition: “Camouflage is the way an animal hides and blends into its environment.” When an animal is camouflaged, it is hiding in its habitat. Ask the students, “*Who is the animal hiding from?*”

### B. Extra Indoor Activity: One Animal’s Habitat

Present to the class a representation of an animal (see suggestions listed in the materials section of this lesson). Describe to the students the type of habitat this animal lives in. Have them guess what this animal uses for water, food and shelter in its habitat. You may need to give the students clues such as in the example below:

Example: Great Blue Heron

This animal lives near the Chesapeake Bay in the marshes and freshwater wetlands. He has long legs for walking in the water.

“*What do you think he eats?*” (fish, frogs, snakes)

“*What does he use for shelter?*” (big trees on the edge of the water)

### C. Extra Outdoor Activity: A Micro-hike

This activity takes place outside in the schoolyard. You will need a piece of string for each student or each student partner group and a magnifying glass for each student.

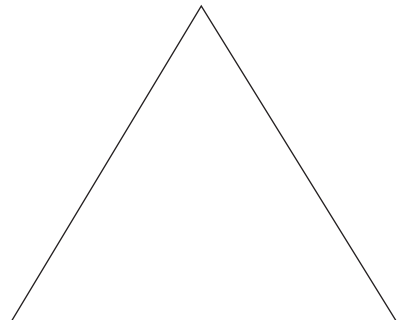
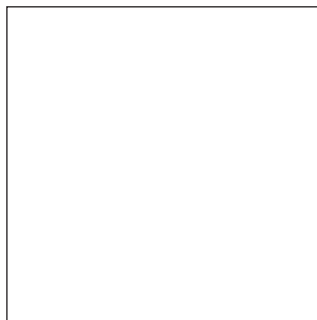
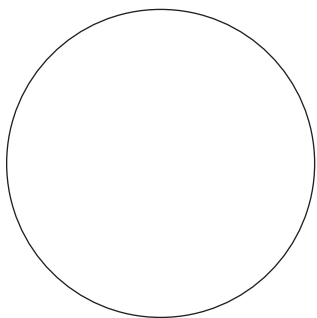
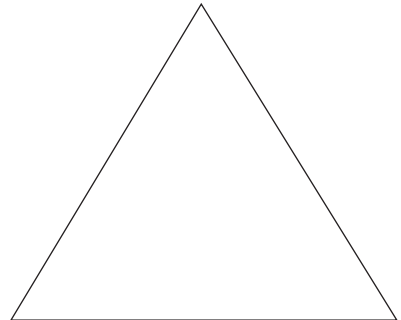
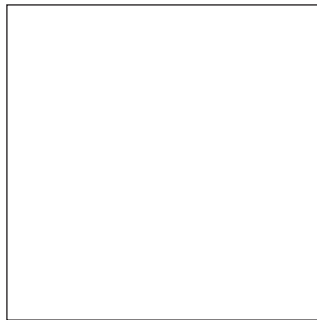
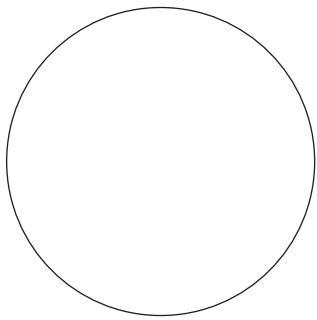
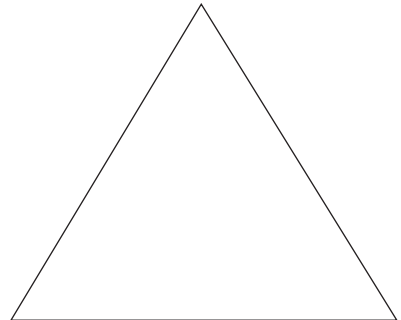
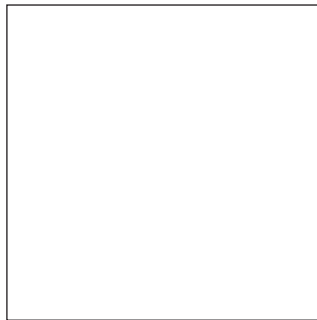
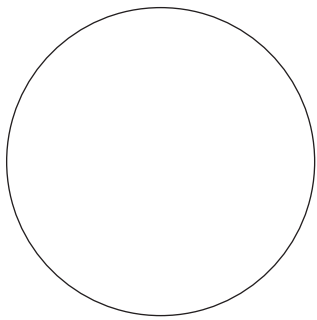
- Explain and demonstrate to the students how they will be placing the string on the ground outside within a designated area. They will hike or walk on their hands and knees along the string using their magnifying glass to see the tiny animals using this habitat.
- When the instructor yells ‘the magic word’ the students will move to another location and lay out their string on the ground. They will then hike in that spot until they hear the magic word again.
- You will need to remind kids to look closely at the ground so they don’t miss seeing any of the animals.
- Tell the students they can move blades of grass, leaves and rocks to see who is hiding under them.
- After multiple hikes, gather the students to discuss and possibly record their findings.



# Teaching Aids

## Habitat Worksheet

1. What is the name of the habitat that you are studying? \_\_\_\_\_  
(Example: *Field, Forest, Wetland, etc.*)
2. Name or describe the animals that you see (or think you could find) in this habitat. Put one animal in each of the circles below.
3. What does each animal eat? Put your answers in the square below for each animal circle.
4. What does each animal use for shelter in this habitat? Write your answer in the triangle for each animal circle.





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# Extension Activities

## *Pre and Post-activities for Classroom Teacher*

### Improve a schoolyard habitat

1. Review with the students the different habitats found around their school on the day that Pickering Creek Audubon staff came to visit them.
2. Ask the students which habitat they would like to make better for wildlife.
3. Work with the students to determine what part of the chosen habitat they can improve:  
Water                  Food                  Shelter
4. Have the students describe in writing or through drawings how they will improve the chosen habitat.

#### **Example 1:**

Habitat chosen: Field with forest edge

Improvement: Put up a wooden bluebird box

Our plan: We will ask our parents to build a blue bird box with a post and predator guard. We will use the directions we found on the Audubon at Home web page (see below). We will put up the bluebird box on the forest edge facing the sliding board in our playground. We will watch our bluebird box to see if a native bird is using it. Our teacher will clean out the bluebird box next fall or winter so a new bird can use it in the spring.

#### **Example 2:**

Habitat chosen: Field near school building

Improvement: Plant a holly tree

Our plan: We will ask our parents to help our class get a small holly tree. We will plant the holly tree outside the principal's window. The birds will use the holly tree for shelter and food during the winter.

*For ideas about ways to improve your school yard or nearby park, please consult some of the following resources:*

Audubon at Home website at [http://www.audubon.org/bird/at\\_home](http://www.audubon.org/bird/at_home)



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## Resources

*Animals of Maryland:* Field Guide to the Mid-Atlantic States (National Audubon Society), Ecosystems in Action: Life in an Estuary by Walker, Life in the Chesapeake Bay, 2nd edition by Lippson, Alice J. and Robert L.

*Amphibians:* Frogs and Toads (a Golden Guide by St. Martin's Press).

*Birds:* Birds of North America (Golden Field Guide), Birds, Eastern (Golden Field Guide), Birds (a Golden Guide by St. Martin's Press).

*Fish:* Freshwater Fishes (Peterson Field Guides).

*Insects:* Insects and Spiders; North America (National Audubon Society Field Guides) Butterflies and Moths (a Golden Guide by St. Martin's Press), Insects (a Golden Guide by St. Martin's Press).

*Chesapeake Bay:* Life in the Chesapeake Bay, 2nd edition by Lippson, Alice J. and Robert L.

*Ponds and Wetlands:* Pond Life (a Golden Guide by St. Martin's Press).

*Reptiles:* Reptiles of North America (a Golden Field Guide) Reptiles and Amphibians (a Golden Guide by St. Martin's Press).

*Spiders:* <http://www.indiana.edu/~animal/academics/animalmonth.html>, <http://www.zoo.org/> (search for spiders), Spiders and their kin (a Golden Guide by St. Martin's Press).

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# *Water and Wetlands*



## Field Trip Experience Grade: I

Program Length: 2 hours  
Number of Instructors needed: 3

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 1:

**Science:** *Interactions of the Hydrosphere and Atmosphere*—Describe observable changes in water on the surface of the Earth. *Diversity of Life*—Compare and explain how external features of plants and animals help them survive in different environments. *Environmental Issues*—Recognize that caring about the environment is an important human activity.

## This lesson also meets the following State Standards:

### Grade 2:

**Science:** *Ecology*— Explain that organisms can grow and survive in many different habitats.



## Synopsis

This lesson teaches first-graders the basic properties of water in the water cycle and the characteristics of wetlands through a nature walk through a wetland, a game and an outdoor ponding activity. During the ponding activity, students will use nets and capture living creatures from a pond. The students will closely examine the body parts of various animals that live in water. Children will leave with a basic understanding of what a wetland does as a whole and why it is important to care about and protect wetlands.

## Objectives

- Describe a wetland, its characteristics as a habitat, and its wildlife.
- Explain the water cycle and how a wetland cleans water before it flows into the Chesapeake Bay.
- Students will use tools to examine a wetland and aquatic animals close-up.

## Materials

### Wetland Walk

- Ruler
- Hand lenses with lanyards or strings
- A cup for sampling wetland water
- Tape player and frog call tape or *Identiflyer*<sup>TM</sup> with frog call cards (optional)

### Ponding Around

- Small nets
- Small magnifying boxes
- Buckets
- Pictures, puppets, or models of the animals found in a pond
- Field guides
- Large laminated sheets identifying freshwater macroinvertebrates

### Watercycle Game

- Rope
- Hoola hoops
- Large white paper or white board
- Signs





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# Vocabulary

**Wetland** - An area between land and water that has special soil and special plants that filter water running off the land.

**Water Cycle** - A process where water moves from the ground, is evaporated into the air, and returns to the ground (as rain or snow).

**Habitat** - Shelter, food, water and space.

## Water and Wetlands Lesson Plan

*This lesson plan is broken into three parts. The class must be divided into three groups.*

**Part 1. Wetland Walk** - 40 minutes. One Instructor. Suggested location: wetland trail.

**Part 2. Ponding Around** - 40 minutes. One instructor. Suggested location: pond.

**Part 3. Games** - 40 minutes. One Instructor. Suggested location: open area for running.

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### Part I. Wetland Walk

To prepare for this component, look for animal signs along the trail to be “discovered.” Carry the ruler with you. Have the hand lenses ready for distribution.

#### A. Introduction

- Introduce yourself.
- Tell the students they are about to embark on a Wetland Walk.
- Ask them, “*What words do you think of when you think of a wetland?*”
- Ask them, “*What is a wetland?*” (An area between land and water that has special soil and special plants that filter water running off the land.) Since these students are in first grade and may not know the answer, be prepared to tell them what a wetland is and what it looks like.
- Ask them, “*What do you think lives in a wetland?*”
- Ask them, “*What do you think you will see in the wetland?*”
- Go over rules for the wetland. (Everyone must stay on the trail, plants are not to be touched without permission from the instructor, the group must stay together, and running is not allowed.)



Song Sparrow

### B. Animal “Discovery”

- On the walk to the wetland look for interesting animal signs. Use interesting finds to get students excited; ask them questions about these finds. For example, if you see a deer trail, asks students, “*What do you think it is?*” Get them thinking about deer and other local animals.
- Bring all possible animal signs to the students’ attention. Some examples are: animal homes, chewed plants, rotten logs with insects or fungus, birds, bird nests, etc.
- Ask the students, “*What is this?*”, “*To whom does this belong?*”
- Talk about other animals that may live in or depend on the wetland. Some examples are: a raccoon who finds food like crawfish and shelter in wetlands or a screech owl who will live in a wood duck box and eat frogs.

### C. Wetland Water

- When you start walking along a boardwalk, stop and have the students sit down for a discussion.
- Ask the students, “*Do wetlands always need to be wet?*” (No, they don’t have to be wet all the time — only for more than 7 days in a row.)
- Ask them, “*How far do you need to dig down in a wetland to reach water when the surface of it is dry?*” (At most twelve inches.)
- If your wetland is dry, dig a hole for the students so they can see the ground water.



- 
- Ask them, “*Where did this water come from?*” (Groundwater or water stored under the ground.)
  - Ask them, “*How deep do you think this water is?*”
  - Have a student volunteer lean over and measure the depth of the water with an adult’s help.
  - Ask them, “*Where do you think the wetland is deepest?*”
  - Measure the water again with the ruler in a different location.
  - Ask them, “*What kind of water is this?*” (Freshwater or partly salty.)
  - If your wetland is tidal, find a place to show how the tide rises (water marks) or explain the visible difference between high and low tide.
  - Pick up a cupful of mud-free wetland water and show it to the students.
  - Ask the students, “*What do you notice about the water?*” Most wetland water will be colored from the tannins, or natural dyes released by decaying plants. Tell the students the plants that fall into the water and start to rot or break down release something that makes the water turn this color.
  - Ask them, “*What do you think it smells like?*” (It smells kind of rotten because of the decomposing plants that are in it.)
  - Pick up some rotting plants from the water to show the students.

#### **D. Wetland Soil**

- Show the students some wetland soil. The soil is wet and like clay because you can roll it into a ball. If the students don’t mind getting dirty, they can handle the wetland soil themselves and smell it. Let the students who don’t want to touch the soil look at your soil.
- Tell the students wetland soil has this special smell because it has rotten things in it like the water did. Have the students wipe their hands on the boardwalk, nearby grass, or in some nearby water.
- Tell the students they now know what wetland soil is like and how special it is because it can hold water and help the wetland clean the water before it goes into the Chesapeake Bay.

#### **E. Wetland Plants**

- Point out some wetland plants to the students. Show them the special things that wetland plants have so they can live in wetlands: rubbery leaves, hollow stems, long roots, etc. If you have plants like sweet flag growing in your wetland, you can have each student take a piece, crush it up in their fingers, and smell it.
- Have the students touch and smell as many different plants as possible (without damaging the plants).



### F. Silent Observation

- Have the students close their eyes, stand perfectly still and listen to the wetland sounds.
- Ask them, “*What did you hear?*” Talk about the different animals that you could hear in a wetland.
- Play the frog calls and see if some frogs call back. Discuss how the frogs might sound like birds and none of the frogs in Maryland really sound like they are saying “ribbit ribbit.”

### G. Close Observation

- Bring the students to an area where they can use their magnifying lenses to look closely at some wetland water in containers or a place where there are multiple insects to examine such as a place with rotten logs. Make sure that the area is not too wet. Encourage the students and adult chaperones to help the students use their magnifying lenses to properly focus on things that are very small.

### H. Conclusion

- Ask the students, “*What can be found in a wetland? What can you hear in a wetland? What is water like in a wetland? Why are Wetlands important?*”





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## Part 2. Ponding Around

Bring enough ponding nets and containers for each student, ponding field guides and a few small magnifying boxes. Place them at the ponding location before the lesson.

### A. Introduction

- Introduce yourself.
- Introduce the pond you will be exploring.
- Discuss where the water comes from such as from the land around the pond, from rain or from a bubbling spring or small creek.
- Discuss with the students where the water goes from the pond (To a creek? To a wetland? To the Chesapeake Bay?).
- Talk about life in the pond and who they might see.
- Discuss various animals that live in the wetland using the animal teaching props. You can start to explain food chains by explaining how one animal in the pond might eat another one. Keep the explanations simple.

### B. Ponding

#### Ponding Rules:

**When you have a net in your hand, don't run.**

**Do not raise the net over your head.**

**Be careful because the banks of ponds are very soggy and it is easy to get wet.**

**You will all share the buckets** (*this will help minimize competition about how much each student is catching*)

**No one should get more than their shoes wet unless they have special permission to go into the water.**

- Demonstrate how to use the net to scoop things from the pond and safely transfer the creatures to a water container.
- Have the teacher or adult chaperones fill the containers with clear pond water before the students start dipping into the pond.
- Most children do not need help catching things, but they do need help identifying them. They love to hear “Great job! You’ve caught something!” when they bring an animal to the collection bucket. If children do need help catching things, give them encouragement, a few pointers like “Dig your net into the mud a bit”, and pair them with someone who is catching a lot. This is a great opportunity to get the teachers and chaperones involved.
- Ask a teacher, student or chaperone to help tally the types and numbers of critters you caught as you put them into the buckets.



### C. Wrap-up and Review

- Gather the students together, collect supplies and share the findings as a group.
- Ask the students, “*How many different kinds of animals did we find? What did we find the most of?*”
- Ask them, “*Why do you think this is so?*”
- Discuss the variety of organisms found in the pond. Ask the students if they previously thought this many different kinds of animals lived in ponds.

## Part 3. Games

Set up the playing field with rope, hula-hoops and signs (refer to Teaching Aids). Set up large white paper or white boards for the mapping exercise and for collecting data from the predator/prey game.

### A. Introduction

- Introduce yourself.
- Introduce the concept of the **water cycle** (Explain that it is like a circle because water moves from the ground to the sky and back to the ground again) through the following questions:
- Ask the students, “*What is a wetland?*” (A place with special plants and special soil that is usually wet and helps clean water before it goes into the Chesapeake Bay.)
- Ask them, “*Where does the water in the wetland come from?*” (Answers include rain and run-off.)



## B. Water Cycle Game

- Ask the students, “*Do you know what the water cycle is?*”
- Tell them that they are going to play a game where they will all pretend to be water and they will go through the water cycle.
- Ask the students, “*What are the three kinds of water?*” (Fresh, salt and brackish.)
- Ask them, “*What is brackish?*” (A mix of fresh and salt water.)
- Tell them, “*The Chesapeake Bay is a place where fresh water from land meets salt water from the ocean. What kind of water is in the Chesapeake Bay?*” (Brackish.) Explain to them how the Bay is an **estuary**, a place where freshwater and ocean water mix.
- Tell them that they are all going to start and end up in the Chesapeake Bay.
- Ask the kids to gather around the Chesapeake Bay sign.
- Say to the students, “*We are all water droplets in the Chesapeake Bay. What happens next?*” (We evaporate.) Since the students are in first grade, they may not know the answer. Explain to the students how water becomes vapor in a dry atmosphere and becomes clouds.
- Have the kids run quietly (because nobody hears or sees water evaporate into the clouds) from the Chesapeake Bay sign to the Cloud sign (the hula-hoops).
- Ask the students, “*What happens next?*” (We rain.) Explain how water vapor becomes liquid when a cloud is saturated (can’t hold any more water) and that liquid is rain that falls back to the ground.
- Have the kids run loudly, because rain sounds loud as it falls, from the Cloud sign to the Field sign.
- Ask the students, “*Now that we have rained down on the fields what happens next?*” (When the field has all the water it can hold, the water runs-off, perhaps into a nearby stream.)
- Have the kids carefully walk on the rope as they travel “down the stream.”
- Stop halfway down the rope at the Wetland sign.
- Ask the students, “*Now that we have traveled down a freshwater stream what happens next?*” (The stream enters a wetland where the water is filtered, removing soil and nutrients.)
- Have the kids do jumping jacks and hop up and down as they are being “filtered” by the wetland.
- Ask the students, “*Now that we have been filtered by the wetland, what happens next?*” (The water returns to the Chesapeake Bay.)
- Have the students walk down the rope back to the Chesapeake Bay sign.





- Ask the students, “*Now that we are back in the Bay, what happens next?*” (Evaporation!)
- It may take the students a while to realize that the water cycle is circular and that they are going to go around and around.
- Have them go around the cycle again, but ask them to lead.

### **C. Mapping the Center**

- Talk to students about the Audubon Center and let them get excited and tell you stories about their experiences.
- Ask the students, “*Have any of you been to the Center before?*”
- Ask them, “*What do you remember seeing on the hike through the wetlands?*”
- Tell the students you are going to draw a map of the center together.
- Tell them where the pond is in relation to the wetland, the fields, the creek and the Chesapeake Bay.
- Have the students take turns drawing different parts of the map.
- When you have a rough map that is “accurate enough,” start looking at how the water cycle takes place at your center.
- Let the students trace on the map as you discuss where rain falls, where it is cleaned by the wetland, and where it flows into the creek and into the Chesapeake Bay.
- Ask the students, “*How does the water get from your house to the Bay?*”
- Ask them, “*Do you think that you could draw a map of how the water flows from your house or school to the Bay?*” Encourage the students to do this at home or back in the classroom.

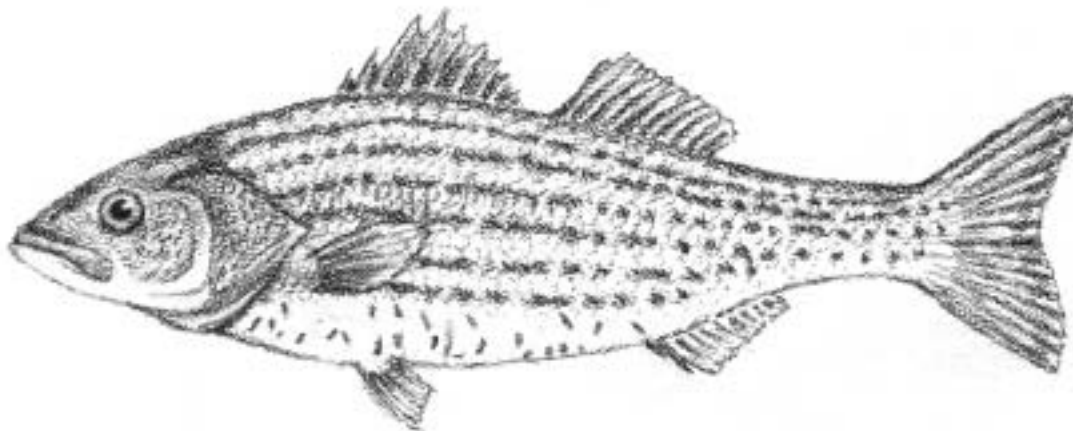
### **D. Rockfish Return Game**

- Talk with the students about the importance of wetlands as habitats for animals.
- Ask the students, “*What animals need wetlands?*” (Crabs, ducks, Rockfish.)
- Ask them, “*How are wetlands important to these animals?*” (Sources of food, help keep other habitats clean, as a nursery for young animals (places to hide, food like detritus to eat, etc).)
- Explain how Rockfish migrate from the ocean far upstream to lay eggs and how baby rockfish rely on wetlands near where they are hatched as protection, food sources, and filters to keep their streams clean.
- Ask the students, “*What challenges might Rockfish face during their spring migration to lay eggs?*” (Anglers and predators.)
- Choose one student to be an angler. This student will try to catch fish as they swim by. The angler’s foot will be in a box to represent a boat. They may move around, but their foot must always be in the box.





- Choose one student to be a Bald Eagle. This student will also try to tag fish as they swim by. They must flap their arms as they chase fish to simulate a flying eagle.
- Choose two students to be a stream blockage, like a dam. These students will swing the rope (as one swings a jump rope). The rope represents hurdles the fish must pass through on their way upstream. Fish tagged by the rope are “out.”
- The angler, eagle, and jump rope students each get one area of the playing field to try to catch fish. They may not catch fish out of their area.
- Place hula-hoops at the end of the playing field. The hula-hoops represent wetlands. Only a certain number of Rockfish can be in each wetland. Decide on that number based on the number of students who are fish. In the first round, have enough space for everyone. Any Rockfish unable to fit in a wetland is “out.”
- Fish start at one end of the playing field, representing the ocean. On command they must try to reach the safety of the wetlands. Any fish tagged is out. For each fish that reaches the wetland, one of the tagged fish may reenter the game (they are “born” by the successful spawning fish).
- In consecutive rounds change the number of safe wetlands and the number of fish allowed in wetlands. Ask the students why wetlands might disappear and why they might hold less fish. On the white board record wetland changes and the number of successfully spawning fish.
- At the conclusion of the game ask the students, “*Why are Rockfish important to us?*” (To catch for fun and for food.)
- Ask them, “*What happens to Rockfish when wetlands disappear?*” Use the white board data to help the students interpret this data.
- Ask them, “*How are wetlands important to both us and Rockfish?*”

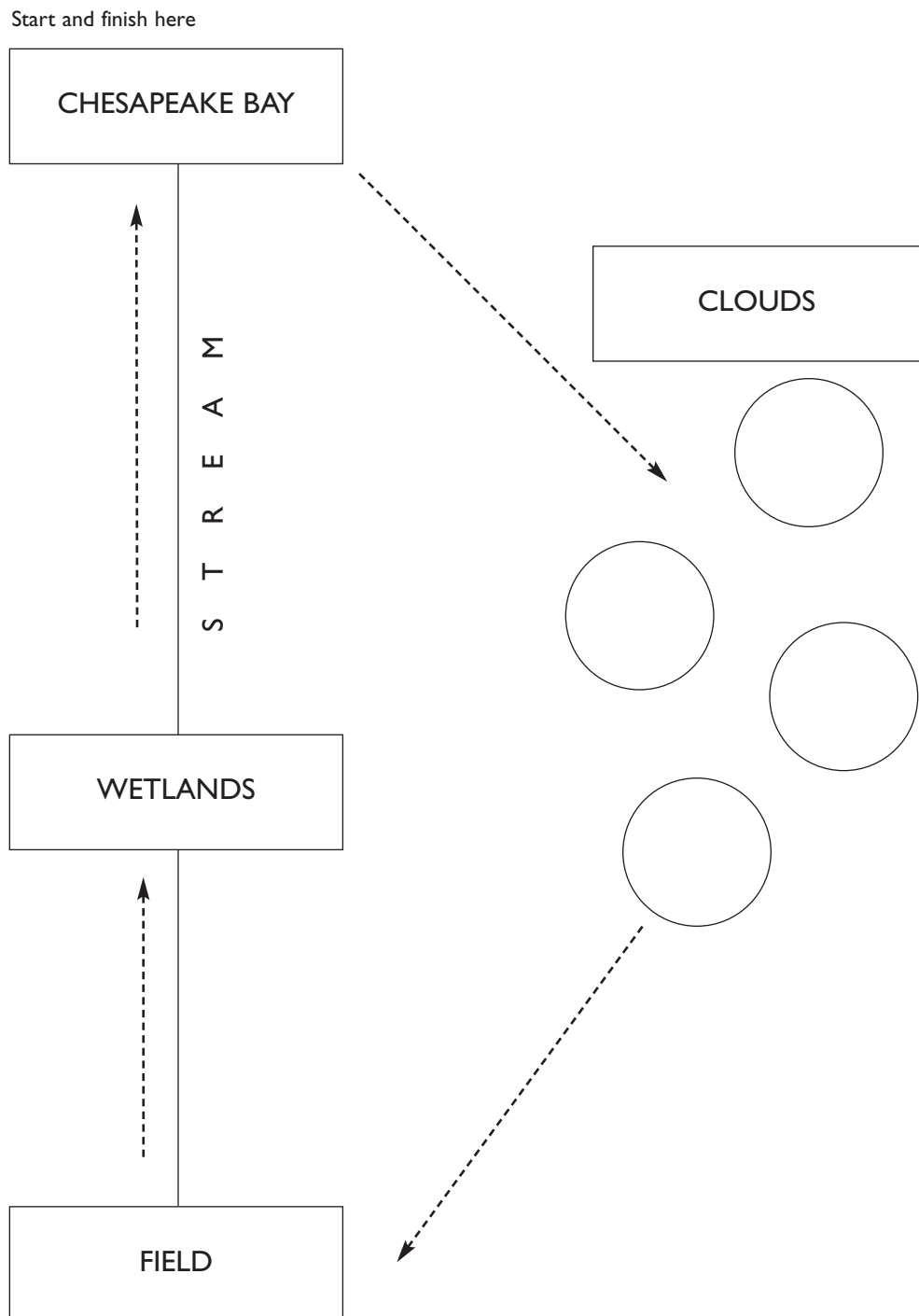


Rockfish



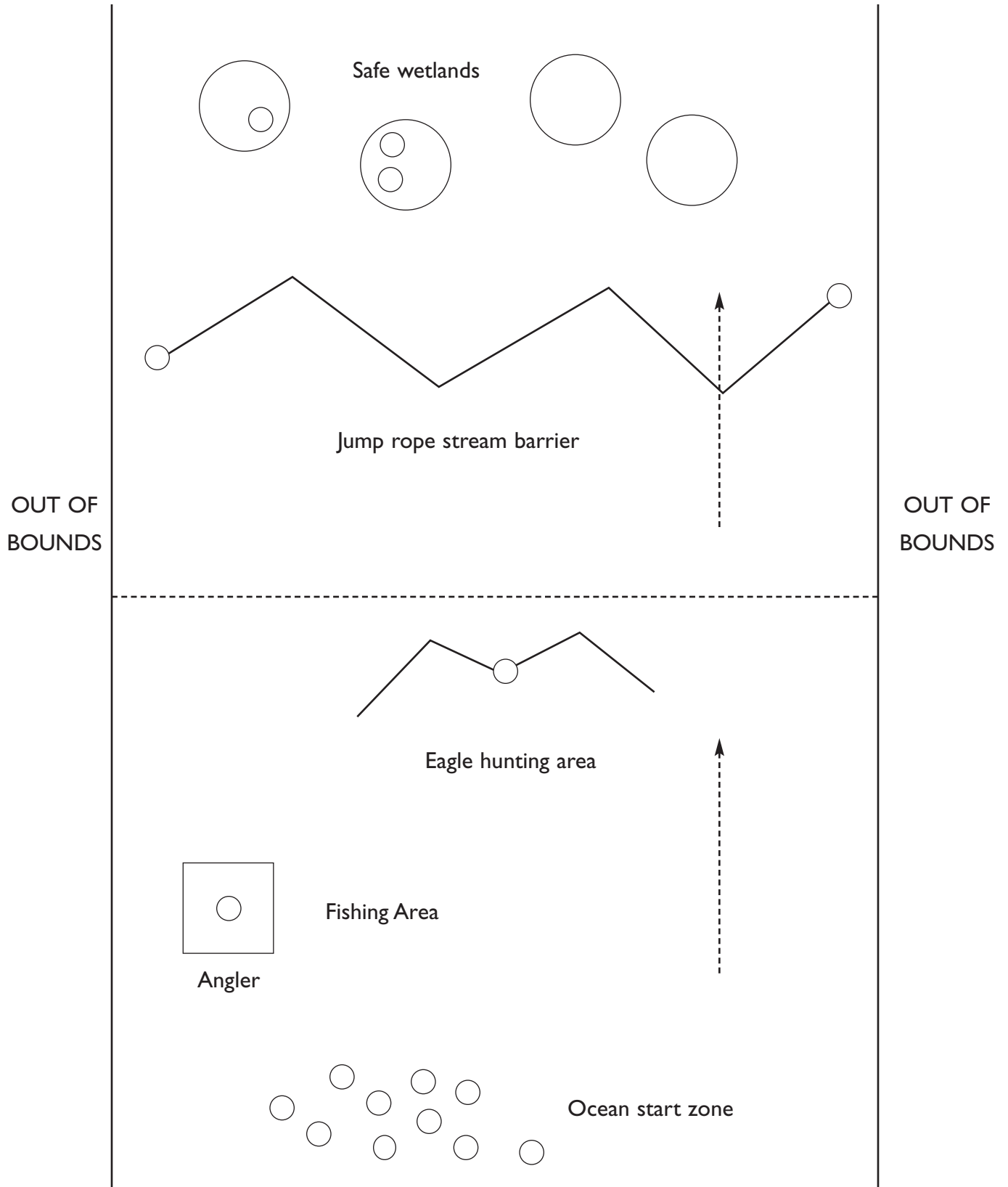
# Teaching Aids

## Water Cycle Game Diagram





# Rockfish Return Game Diagram





# Extension Activities

## *Pre and Post-activities for Classroom Teacher*

### Pre-Field Trip Activity

In order to help the students understand how plants absorb polluted water in the wetlands, conduct the following class experiment.

#### **Wetland Experiment** - *Requires a 3 day observation period*

**Objective:** Allow the students to visualize absorption functions of wetland vegetation as they experiment using colored water and celery stalks.

**Background:** Pollutants that enter wetland soils can be absorbed into plant tissues and passed through the food chain, affecting many types of animals.

Materials:

Celery stalks

Small jars

Water

Food coloring

Salt

**Methods:**

- Place water in the jar and add food coloring and salt.
- Add the celery.
- Have students log their observation on a Wetland Experiment Observation Sheet.

|       | Morning | Afternoon |
|-------|---------|-----------|
| Day 1 |         |           |
| Day 2 |         |           |
| Day 3 |         |           |

- Have the students write a description of what happened to the celery as time passed. Be sure to include the color changes and the time it took for the celery to change.
- Discuss with the students:
  - “How does this experiment show how plants purify water?”
  - “What happens to the pollutants (food coloring)?”

For an extended version of this activity, please refer to “Treatment Plants” in WOW.



### *Post Activity for Classroom Teacher*

Have the students draw a large class map illustrating how water flows from your schoolyard to the Chesapeake Bay. Most likely the water flows into a storm drain, which may or may not be treated at the local water treatment plant before it flows into a nearby river and then into the Bay. Your local water treatment plant may be able to help you trace the water flow. Local maps that show local creeks and streams are also useful tools to trace water flow into the Chesapeake Bay.

## Resources

Alliance for the Chesapeake Bay. Bay Journal. Retrieved from <http://www.bayjournal.com/> (search wetlands).

Backyard Wetland retrieved from <http://www.nrcs.usda.gov/feature/backyard/BakWet.html> on March 18, 2006.

Brewer, Richard. *The Science of Ecology*. 2nd edition. Saunders College Publishing. 1994.

[How Do Wetlands Filter Harmful Substances?](http://techalive.mtu.edu/meec/module12/Chemicalfunctionsofwetlands.htm) Retrieved from <http://techalive.mtu.edu/meec/module12/Chemicalfunctionsofwetlands.htm> on March 18, 2006.

Slattery, Brit. 1991. [WOW! The Wonders of Wetlands](#). Maryland: Environmental Concern.

Wetlands Forum retrieved from <http://www.wetlandsforum.org/wetlands/index.htm> on March 18, 2006.

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 *Wetland Habitats*

**In-School Lesson**  
**Grade: 2**

Program length: 1 hour  
Number of Instructors needed: 1

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

### Grade 2:

**Science: Ecology**—(LS4) Explain that organisms can grow and survive in many very different habitats. (4a) Investigate a variety of familiar and unfamiliar habitats and describe how animals and plants found there maintain their lives and survive to reproduce. (4b.) Explain that organisms live in habitats that provide their basic needs. (4c.) Explain that animals and plants sometimes cause changes in their environment. *Science: Natural Resources and Human Needs*, —(EN4) Recognize and explain how Earth’s natural resources from the natural environment are used to meet human needs.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 2:

**Science: Ecology**—Explain that organisms can grow and survive in many different habitats. *Interactions of the Hydrosphere and Atmosphere*—Recognize and describe that the surface of Earth is more than half covered with water. *Evolution*—Observe and describe examples of variation (differences) among individuals of one kind within a population. *Natural Resources and Human Needs*—Recognize and explain how Earth’s natural resources from the natural environment are used to meet human needs.



## Synopsis

This lesson is designed to give students a basic introduction to wetland ecology and natural resources. The lesson focuses on the different types of birds that live in Maryland wetlands. Using bird mounts or models, students are shown different characteristics of various birds that help the birds find their basic needs in wetlands, such as: food, shelter and nesting sites. Students are introduced to the concept that people, who use trees to meet their needs, affect the needs of wood ducks within the Chesapeake Bay Watershed. The program stresses the fact that natural resources are limited and need to be used wisely.

## Objectives

- Students will list the characteristics of a wetland including the ability of a wetland to filter water before it enters the Chesapeake Bay.
- Students will be able to describe a wetland as a habitat and name five common wetland birds.
- Students will be introduced to trees as a natural resource of a wetland.
- Students will learn about the local history of the wood duck in the Chesapeake Bay Watershed.

## Materials

- Sample of wetland soil with detritus
- Samples or pictures of wetland plants
- Space on the chalkboard or pre-made vocabulary word signs (see Teaching Aids)
- Tape player and bird call tape or the Identifier Unit with necessary bird call cards
- Bird mounts or models of the following:
  - Red-winged Blackbird
  - Red-shouldered Hawk
  - Great Blue Heron
  - Barred Owl
  - Wood Duck
  - Wood Duck Box (or pictures of wood duck boxes)





# Vocabulary

**Wetland** - an area between land and water that has special soil and special plants and filters water running off the land.

**Filter** - similar to a strainer which removes some particles and substances from a liquid while letting the liquid pass through.

**Swamp/Marsh/Bog** - other names for a wetland.

**Detritus** - decomposed organic matter, both plant and animal.

**Bird of Prey** - a bird that eats other birds and animals.

**Talons** - claws on a bird.

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

**Webbed Feet** - feet that have the toes connected by skin and help the bird swim.

**Natural Resource** - something from the natural environment that is used to meet one's needs.





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# Wetland Habitat Lesson Plan

*This lesson plan is broken into five parts. This lesson takes place in the students' classroom.*

**Part 1. Introduction** - 5 minutes. One Instructor.

**Part 2. Characteristics of a Wetland** - 10 minutes. One Instructor.

**Part 3. Wetland Birds** - 30 minutes. One Instructor.

**Part 4. Natural Resources of the Wetlands** - 10 minutes. One Instructor.

**Part 5. Conclusion** - 10 minutes. One Instructor.

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## Part 1. Introduction

- Tell the students, *“More than half the Earth is covered by water.”*
- Tell the students, *“The Chesapeake Bay is a body of water and it is surrounded by a very important type of habitat called wetlands.”*
- Write the word **“wetland”** on the board.
- Ask the students, *“What two words do you see in wetland?”* (Wet and land.)
- Ask the students, *“What do you think the word wetland means?”* (An area between land and water that has special soil and special plants that filter water running off the land.)
- Ask the students, *“Can you think of some other words for wetland?”* (**Marsh, swamp and bog.**)
- Tell the students there are three characteristics of a wetland.
- Ask the students, *“Do you know what three things are special about wetlands?”* (It has: water, special soil and special plants.)
- Write the characteristics on the board in a row.

## Part 2. Characteristics of a Wetland

### A. Wetlands filter water

- Tell the students the first characteristic of a wetland is water.
- Tell students wetlands are very special and very important to the Chesapeake Bay because they hold water and clean it before it gets to the Bay.
- Tell students wetlands store water, provide homes for a lot of plants and animals, and help clean the water on the way to the Bay by filtering it.
- Write **“filter”** on the board under water characteristic. Make sure the students understand what a filter is. Ask them to think of filters they have seen before such as fish tank filters. Explain to the students that the wetland is like a filter because a wetland holds back pollution and lets the water flow through to the Chesapeake Bay. So, the water that flows through a wetland is cleaner when it reaches the Chesapeake Bay.



- Tell the students how the roots of wetland plants act like a filter. (Wetland plants take many of the harmful substances that are found in polluted water into their roots and change the harmful substances into less harmful ones before they release the water into the Chesapeake Bay.)
- Tell the students how the soil in the wetland is also a filter. (Harmful substances can end up buried in wetland soil, where bacteria and other microorganisms break the substances down so they are no longer harmful.)
- Review with the students that wetlands clean water before it flows into the Bay because of the special soil and special plants.
- Ask the students, “*Do wetlands always need to be wet?*” (They may always be wet or infrequently flooded, but they need to have standing water for 7-30 consecutive days of the year.)
- Write “Wet for 7-30 days” on the board under the water characteristic.
- Ask the students, “*Does a wetland have to be wet with freshwater?*” No, it can be freshwater or saltwater.
- Write the two types of water on the board under water characteristic.

## **B. Special Soil**

- Tell the students the next characteristic of a wetland is special soil.
- Ask the students, “*What do you find on the ground in a wetland?*” Plants, leaves and all kinds of old dead things. The things make up “**detritus.**”
- Write “detritus” on the board under soil characteristic.
- Show students the wetland soil detritus sample. Take the soil sample around to the students. Discuss how the students will be participating in or already participated in the field trip



component where they investigate wetland soil and wetland plants.

- Ask the students, “*What do you notice about the soil in a wetland?*” (The color is black and gray.)
- Ask the students, “*What do you think it feels like?*” (Wet, muddy.)
- Ask the students, “*What does it smell like?*” (Bad, gross, yucky, like rotten eggs.)
- Tell the students the soil in wetlands contains no oxygen and because there is no oxygen in the soil special chemical reactions occur.
- Write “no oxygen” on the board under the soil characteristic.
- Tell the students these chemical reactions affect the color, smell and feel of the soil.

### C. Special Plants

- Tell the students another characteristic of a wetland is the type of plants that live there.
- Ask the students, “*Can you think of an example of a wetland plant?*” (Cattail.)
- Tell the students these plants are adapted to live in wetland conditions so this means that the plants sometimes live under water and they live in soil that contains no oxygen.
- Tell the students the plants have special cells to store oxygen.
- Show the students some samples of wetland plants with large cells or hollow stems where they store oxygen.

### D. Wetlands are Great Habitats

- Tell the students a wetland is habitat for many animals. Write “habitat” on the board. Ask the students, “*What four things do animals need in order to survive in their habitat?*” (Food, shelter, water, space.) Write these four things on the board.

## Part 3. Wetland Birds

Suggested section length: 30 minutes.

*You may not have time to discuss all of the birds, therefore adjust your lesson accordingly.*

- Tell the students to close their eyes and imagine they are in a wetland.
- Ask students, “*What kind of noises would you hear?*”
- Ask students, “*What animals might live in wetlands?*”
- Tell students many animals live in wetlands. These animals have special characteristics that allow them to find everything they need to survive in a wetland. Tell the students we are going to compare different birds that live in wetlands.
- If using taxidermy bird mounts, take some time to explain how taxidermy mounts are formed when you bring out the first mount. Tell the students the mounts are real animals that are no longer alive. Bird mounts are very helpful for studying birds up close and in classrooms.



### A. Red-winged Blackbird

- Play the sound of the Red-winged Blackbird.
- Ask the students, “*What is this bird called?*” (Red-winged Blackbird.)
- Tell the students to look at the beak of the bird.
- Ask the students, “*What do you think this bird eats?*” (Crickets, ants, grasshoppers, etc.)
- Tell the students to look at the patch of color on the bird’s wing.
- Ask the students, “*Why would this color be important?*” (The bird uses it to attract a mate and defend its territory.)
- Tell the students that during the winter feathers cover the red patch.
- Ask the students, “*Why doesn’t the bird need its wing colors in the winter?*” (In the winter birds are not building nests, attracting mates, etc.)
- Tell the students that the color will reappear in the spring and that this birds call sounds like “conkleree, conkleree.”

### B. Great Blue Heron

- Play the sound of the Great Blue Heron.
- Ask the students, “*What is this bird called?*” (Great Blue Heron.)
- Ask the students, “*Look at this bird and tell me what is so unusual about it?*” (Its long neck, long legs, long beak.)
- Ask the students, “*What does this bird eat?*” (Fish, salamanders, frogs, tadpoles.)
- Ask the students, “*How does it catch food?*” (The bird uses its long neck to thrust its long beak into the water and scoop up fish. It uses its bill like people use tongs; it does not spear the fish with its beak.) Demonstrate, with your thumb and index finger, how the Great Blue Heron uses its beak to grab its prey.
- Show the students the Great Blue Heron’s feet.
- Ask the students, “*Do the herons feet look like the Red-winged Blackbirds feet?*” (No.)
- Tell the students sometimes the heron will stand very still in deep water and gently disturb the water and bottom with its feet to attract fish.





### C. Red-shouldered Hawk

- Play the sound of the Red-shouldered Hawk.
- Ask the students, “*How did this bird get its name?*” (There is a prominent red color on its shoulder.)
- Tell the students this bird is considered a “**bird of prey.**”
- Ask the students, “*What does bird of prey mean?*” (A bird that eats other animals.)
- Ask the students, “*What kind of prey would this hawk find in a wetland?*” (Mice, snakes, smaller birds, etc.)
- Ask the students, “*What does the bird use to kill its prey?*” (Its claws called “talons.”)
- Ask the students, “*What does it use its beak for?*” (The beak is used like a knife.)
- Show the students how the talons and beak of the Red-shouldered Hawk are different from those of the Great Blue Heron and Red-winged Blackbird.

### D. Barred Owl

- Play the sound of the Barred Owl.
- Tell the students that this is another bird of prey of the wetland.
- Ask the students, “*How is this Barred Owl similar to the Red-shouldered Hawk?*” (The beak and talons are similar.)
- Ask the students, “*How do you think it got its name?*” (The bar markings on the feathers.)
- Tell the students that it is the most vocal of our owls. This owl sounds like it is saying, “who cooks for you, who cooks for y’all.”
- Ask the students, “*What do you notice about the talons of this bird?*” (They are covered with feathers. If its prey tries to bite its legs, the prey will bite feathers instead of the legs.)
- Ask the students, “*What does this bird eat?*” (Birds and small mammals like rabbits.)
- Tell the students owls have a “disc-shaped” head that helps to funnel in sound. They can turn their necks about 270°, which helps them hunt prey because their eyes are fixed in their heads. They cannot move their eyes in their sockets like humans can.
- To help explain this, have the students move their eyes but not their heads.
- Tell the students humans can do that but owls cannot.
- Have the students look as far as they can over their right shoulder.
- Tell the students that if they were an owl, they would be looking over their left shoulder now, because owls can turn their heads about 3/4 of the way around.



## E. Wood Duck

- Play the sound of the Wood Duck.
- Ask the students, “*How do you think this bird got its name?*” (Some say it is so beautiful it looks like a painted piece of wood. It also nests in tree cavities.)
- Show the students the Wood Duck’s feet and tell them they are called “webbed feet.”
- Ask the students, “*Where do you think this bird spends most of its time?*” (In the water.)
- Show the students the Wood Duck’s beak.
- Ask the students, “*Do you think this bird eats the same thing as the Great Blue Heron?*” (No.)
- Tell the students this is a shy bird that eats small insects as a duckling, and plants as an adult.
- Ask the students, “*Why would this duck want to nest above the water?*” (Fewer predators.)
- Tell the students within 24 hours of hatching the young leave the nest by jumping out onto the water and the mother will then spend her time on the water with the young. Emphasize that the ducklings often have a long drop from the nest to the water!



Checking a Wood Duck box.

## Part 4. Natural Resources of Wetlands

- Ask the students, “*Do you know what a natural resource is?*” (Something from the natural environment that is used to meet one’s needs.)
- Ask the students, “*What are some things that we use that come from nature?*” (Water, air, soil, minerals, animals and plants.)
- Write the examples of natural resources on the board.
- Tell students all these things can be found in wetlands, which makes wetlands very important places.
- Ask the students, “*What are some ways that we use trees?*” (Timber, paper, etc.)
- Tell the students in Maryland the Chesapeake Bay is surrounded by wetlands and people have used the natural resources for a very long time.
- Tell the students years ago people cut down a lot of the trees that grow in wetlands here to make fields for farming.
- Tell the students when they cut down the large trees they also cut down the homes of the Wood Duck and other animals. Wood Ducks build their nests inside holes in large trees.
- Ask the students, “*Do you remember the Wood Duck?*”



- Show the students the Wood Duck mount.
- Tell the students when people cut down the large trees the Wood Ducks had no place to keep their eggs and almost all the Wood Ducks disappeared.
- Tell the students once people realized the Wood Ducks were almost gone they tried to help the ducks. They designed and built “Wood Duck Boxes” to give them new homes in which to lay their eggs.
- Show students the Wood Duck Box or a picture.
- Ask the students, “*Why do you think we put PVC pipe or skirts around the poles?*” (To help deter snakes from getting into the boxes and eating the eggs. It does not always work though.)
- Tell the students that luckily the boxes worked and today there are lots of Wood Ducks in the wetlands of the Chesapeake Bay. If they go and visit a wetland, they can often see wood duck boxes.
- Tell the students we need to be careful how we use our natural resources in order to protect habitat in the Chesapeake Bay area.

## Part 5. Conclusion

- Review with the students what a wetland is, and what the characteristics of a wetland are.
- Ask the students how wetlands help keep the Chesapeake Bay clean.
- Review what a “natural resource” is.
- Ask the students, “*What natural resources did we talk about today?*” (Water, plants, animals, etc.)  
“*Why we need to use our Earth’s natural resources wisely?*” ( The resource could disappear like they almost did for the wood duck.)
- Ask the students, “*Which natural resource does the Wood Duck need in order to survive?*” (Trees.)
- Ask the students, “*How do we know that wetlands are a special animal habitat?*” (They have food, water, shelter and air or space for the birds we studied today.)
- Ask the students, “*What are some adaptations or characteristics birds have that help them live in wetlands?*” (They have beaks for catching fish, webbed feet or long feet for swimming and standing in water, etc.)





# Teaching Aids

## Wetland Characteristic Cards:

It may be helpful to make cards containing the following words or phrases. By placing magnets on the back of the cards, they will easily stick to a blackboard. By color-coding the cards, it may be easier to keep the cards in order by group on the board.

**Wetland** (make sure the card is large and has the two word parts underlined separately or comes apart to demonstrate the compound word.) Color the card yellow.

**Water** (blue)

**Special Soil** (gray)

**Special Plants** (green)

**Filter** (yellow)

**Habitat** (yellow)

**Wet for 7-30 days** (yellow)

**Brackish** (blue)

**Detritus** (brown)

**No Oxygen** (brown)

**Food** (yellow)

**Shelter** (yellow)

**Water** (yellow)

**Air or Space** (yellow)

## How to Build a Wood Duck Box

Please refer to the following website for directions on how to build a wood duck box:  
<http://www.dnr.state.md.us/wildlife/wawoodduck.asp>

# Extension Activities

## *Pre-lesson Activity for Classroom Teacher*

Review the vocabulary words with students before the lesson with the Center staff. Discuss the Chesapeake Bay with the students.



## Resources

Alliance for the Chesapeake Bay. Bay Journal. Retrieved from <http://www.bayjournal.com> (search wetlands).

Backyard Wetland retrieved from <http://www.nrcs.usda.gov/feature/backyard/BakWet.html> on March 18, 2006.

Brewer, Richard. The Science of Ecology. 2nd edition. Saunders College Publishing. 1994.

How Do Wetlands Filter Harmful Substances? Retrieved from <http://techalive.mtu.edu/meeec/module12/Chemicalfunctionsofwetlands.htm> on March 18, 2006.

Kids Page. Natural Resources Kids Page. Retrieved from <http://www.metrokc.gov/dnr/kidsweb/>

Wetlands Forum retrieved from <http://www.wetlandsforum.org/wetlands/index.htm> on March 18, 2006.

Wood Duck Nest Boxes retrieved from <http://www.dnr.state.md.us/wildlife/wawoodduck.asp> on March 18, 2006.



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 *Seeds and Plants*



**Field Trip Experience**  
**Grade: 2**

Program Length: 2 hours  
Number of Instructors needed: 3

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

### Grade 2:

**Science: *Materials and Processes that Shape a Planet*** (ES 1)—Describe and compare properties of a variety of Earth materials. 1b. Collect soil from different locations and compare the properties of the samples.

**Science: *Genetics*** (LS 3)—Explain that there are identifiable stages in the life cycles (growth, reproduction and death) of plants and animals. 3a. Investigate and describe that seeds change and grow into plants.

**Science: *Ecology*** (LS 4)—Explain that organisms can grow and survive in many very different habitats. 4a. Investigate a variety of familiar and unfamiliar habitats and describe how animals and plants found there maintain their lives and survive to reproduce. 4b. Explain that organisms live in habitats that provide their basic needs. 4c. Explain that animals and plants sometimes cause changes in their environment.

**Science: *Natural Resources and Human Needs*** (EN 9)—Recognize and explain how Earth’s natural resources from the natural environment are used to meet human needs.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 2:

**Science: *Materials and Processes that Shape a Planet***—Describe and compare properties of a variety of Earth materials, ***Ecology***—Explain that organisms can grow and survive in many very different habitats, ***Natural Resources and Human Needs***—Recognize and explain how Earth’s natural resources from the natural environment are used to meet human needs.

This lesson also meets the following standards:

### Grade 1:

**Science: *Diversity of Life***—Compare and explain how external features of plants and animals help them survive in different environments.

***Genetics***—Explain that there are identifiable stages in the life cycles (growth, reproduction and death) of plants and animals.

***Environmental Issues***—Recognize that caring about the environment is an important human activity.



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## Synopsis

Students will have the opportunity to compare properties of a variety of soils, seeds and plants through hands-on investigations. Students will hike through and explore different habitats. In each habitat, students will compare and contrast the soil and plants found there. Through discussion and hands-on comparison of seeds and plants, students will be able to explain how seeds are dispersed, how plants grow and how plants are used to meet human needs such as: food, shelter, clothing and tools. Students will visit a wetland and be able to provide examples of how plants help keep the Chesapeake Bay clean.

## Objectives

- Explain the basic needs of seeds and plants.
- Understand and identify the parts of a seed and a plant.
- Know and describe the different means of seed dispersal.
- Compare and contrast different soils.
- Compare and contrast different plants and habitats.
- Be able to give examples of how people use plants as natural resources.
- Be able to explain how plants help keep the Chesapeake Bay clean and provide food and shelter for some Bay animals.

## Materials

### Seeds Part

- Peanuts
- Parts of a seed poster or model
- Bowl filled with water
- Pictures or cards representing: “Soil” with nutrients, “Water,” “Carbon Dioxide” and the “Sun”
- Seed Classification Cards
- Seed Question Cards (4 sets)
- Seed sample: such as peanut, sunflower, milkweed, maple, sweet gum, acorn, walnut, burr, beech nut and pinecone.

### Soil Part

- Colanders for sifting soil
- Hand-held garden shovel
- White containers to hold sifted soil
- Magnifying lenses or bug viewing boxes

### Plants Part

- Parts of a plant poster or model
- Crayons
- Tree worksheets



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## Vocabulary Words

**Embryo** - a baby plant.

**Seed coat** - the outer layer of the seed that helps protect the seed.

**Nutrients** - necessary food for a seed or plant.

**Sprout** - a very young plant that has just grown out of a seed.

**Seed Dispersal** - the manner in which a seed moves from one location to another.

**Hitchhiker** - a type of seed that attaches to animals in order for the seed to disperse.

**Deciduous** - a type of plant that loses its leaves every year.

**Evergreen** - a type of plant that has leaves on it year-round.

**Conifer** - a type of plant that produces cones.

**Broadleaf** - a plant with wide leaves.





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# Seeds and Plants Lesson Plan

*This lesson is broken into three parts. The class must be divided into three groups and will rotate through each part.*

**Part 1. Seeds** - 40 minutes. One Instructor. Suggested location: a classroom or set of picnic tables.

**Part 2. Soils** - 40 minutes. One Instructor. Suggested location: a short trail through a variety of different habitats.

**Part 3. Plants and Trees Hike** - 40 minutes. One Instructor. Suggested location: a garden or short nature trail.

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## Part I. Seeds

### A. Introduction

- Introduce yourself.
- Tell the students we will be discussing seeds.
- Show the students some seeds. Ask them what kind of seeds they are. (Ex. Peanut)
- Tell the group a seed is like a birthday present. *“What is the first thing you do when you open a present?”* (You take off the wrapping paper.)
- After the wrapping paper, *“What do you need to open next to get to the present?”* (The box.)
- Show them, using peanuts, how a present and seed are similar because the seed has two outer layers like their present did. (Make sure only adults handle the peanuts because some children are allergic to nuts. It is important to have the teacher work with all students who are allergic to nuts because these students should not touch any nuts throughout the program.)
- Show the two outer layers of the peanut.
- The hard **outer shell** is like the wrapping paper.
- The paper-thin layer is the **seed coat**.
- The seed has these two layers to help protect what is inside.
- Inside is the embryo or baby plant and some stored food.
- Ask the students, *“What are the four things a seed needs in order to grow?”* (Seeds need soil containing **nutrients**, carbon dioxide, and water in order to **sprout**. They then need the sun in order to grow bigger.)

### B. Parts of a Seed

- Show the students the poster of the seed. First point to a part of the seed. Have the kids tell you what it is. Label that part of the seed with the aforementioned vocabulary word.
- Discuss the importance of each seed part: **shell, seed coat, baby plant or embryo, food source**.



- Ask the students what the seed needs to grow.
- Discuss the importance of sun, water, soil, nutrients and carbon dioxide to the plant.

### C. Seed Dispersal

- Ask the group, “*How do seeds move?*” (Wind, water, animals, etc.)
- Ask the students, “*Why do seeds need to move?*” (To find places that have room for them to grow.)
- Explain the four methods of seed dispersal through discovery.

#### 1. Water

- Have them identify and feel the sweet gum ball.
- Have them share their observations.
- Ask them, “*Does it have one or many seeds?*” Show them the seed openings within the gumball.
- Ask the students how they think the sweet gum ball will move.
- Throw it up in the air and blow on it—it falls right away = not wind.
- Tell the students to remember how it feels. Ask them, “*Would you or an animal want to eat it?*”  
NO = not animals.
- Float the sweet gumballs in a bowl of water.
- Once the students see that the sweet gumball floats ask them, “*What different bodies of water can their seeds float on in order to travel from one place to another?*”

#### 2. Animals

- Show the students a sunflower seed. Ask them, “*Do you think this seed is moved from one place to another by the wind?*” (NO.) Demonstrate why not by dropping the seed on the table.
- Ask them, “*Do animals eat seeds?*” (Yes.)
- Ask, “*What kind of animals?*” (Squirrels, birds, mice.)
- Tell the students that animals sometimes carry seeds from one place to another or hide seeds to eat later.
- Ask, “*Do you think the animals eat all the seeds they carry around or store for later?*” (NO.)  
The discarded seeds can then grow.
- If your class brings up that fact that animals eat seeds and then disperse them in the feces as a means of seed dispersal, discuss it briefly and move onto the next discussion.
- Show pictures of animals that help transport seeds.

#### 3. Hitchhikers

- Show the students burrs or beechnuts.
- Have them feel and describe the burrs.





- Ask them, “*Are these seeds?*”
- Ask them, “*How do you think they move?*”
- Do the wind test and float them on water.
- Burrs will float on water, but tell the students that burrs also move in another way.
- Stick the burrs to yourself to show them how they move.
- Ask the kids what could make them move like that. (Humans/animals.)
- Finally, introduce the word “hitchhikers.”
- Demonstrate how the seeds hitchhike by using the students as transporters. Have the students try to make the seed hitchhike on them. You can also use a stuffed animal or puppet to demonstrate this.

#### **4. Wind**

- Show the students some milkweed seeds and an acorn. Have them describe the differences between the two.
- Ask the students how they think these seeds will disperse.
- Ask them, “*What makes the milkweed able to disperse by wind but not the acorn?*”
- Blow the milkweed seeds to show how they would disperse. Having the students help you demonstrate this on a windy day can be a lot of fun!

#### **D. Review**

- Review the four forms of seed dispersal.

#### **E. Seed Classification**

- Divide the students into small groups.
- Hand out a variety of seeds such as: pinecones, sweet gumballs and acorns. Make sure each group gets a variety of seeds. Ask the students to sort the seeds into piles using the following categories. (Use the cards as a guide.)

##### **1. Classify by Name**

- Make sure the students have cards with the names of the seeds written on them.
- Review the seeds’ names.
- Have the students place their seeds into a large pile based on their names.

##### **2. Classify by the Way They Disperse**

- Make sure the students have cards with the methods of seed dispersal written on them.
- Redistribute the seeds so each group gets a variety of seeds.
- Have the students group the seeds by the way they disperse.



### 3. Classify as Single Seed or Seed Pod

- Redistribute the seeds so each group gets a variety of seeds, and hand out the cards with the words “single seed” or “seed pods” on them.
- Ask the students if the seed they have is one seed or a seed pod which contains many seeds.
- Tell the students to look closely at the seeds in order to decide in which category to put them.
- For example, have the students place the maple and acorns together and label the pile “One Seed.” Then have them place the pinecones and sweet gumballs together giving them the “Many Seeds” card.
- Explain to the students how a single seed is different from a seed pod containing many seeds.
- Continue thinking of various ways to divide the seeds into smaller groups, asking pointed questions and repeating the question after each group is formed.
- Review the three seed parts, the five things a seed needs to grow and the four methods of dispersal.

### F. Extra Activities:

#### 1. Plants and Seed Questions Card Game (see Teaching Aids)

- Use pre-written question cards to quiz the students about what they have learned. You can divide the students into two teams and let them take turns reading the questions to each other.



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## 2. Act out Methods of Dispersal

- Use actions or motions to act out the various methods of seeds dispersal. This is a great activity if your students are getting fidgety from sitting too long. For example, you can have the students put out their arms and sway back and forth to represent a floating seed or have the students twirl around to represent seeds that are blown in the wind.

## 3. Seed Relay

- Line up various seeds in a line in a large open space. Divide the students into two teams. Have them line up at starting lines some distance away from the centerline with one team on each side of the line. The goal is for the students to take one seed at a time and bring it back to their team for matching. All the seeds must be sorted into piles by the way they are transported for the team to win the game.

## Part 2. Soils

### A. Introduction

- Introduce yourself.
- Get the students warmed up by telling them that they will be hiking through different areas that have different plants and different soils.
- Before you begin the hike, remember to go over the Trail Rules.
  1. No one touches anything.
  2. Everyone must stay on the trail.
  3. If you find something interesting please let me (the instructor) know and I will show it to everyone and discuss it with you.

### B. Soil Hike

This hike will take students through different habitats so they can compare the soil and plants they encounter in each one. In each habitat, have the students feel, smell, sift and closely examine the soil. Have the students look closely at the organisms found in the soil as well as the type of plants that grow in the habitat being studied.

#### 1. Wetland

This is a very important habitat to cover with the students due to its important role in the Chesapeake Bay Watershed. Allow extra time in this habitat.

- Ask the students if they know what kind of habitat this is.
- Ask them, “*Do you see water around you?*” Ask the students if they can guess where the water comes from. Explain to the students where the water comes from and how the water travels through the wetland on its way to the Chesapeake Bay.



- Have the students look around at the plants in the wetland. Explain to the students that the plants in the wetland have a very important role in the Chesapeake Bay area. The plants help clean or filter the water that flows through the wetland.
- Tell the students these wetland plants absorb water out of the soil and help clean the water before it goes into the Chesapeake Bay. This is a very important thing plants do for the Chesapeake Bay and for people who live near the Bay.
- Have the students look at the plants that grow here. Show the students some plant samples and point out the special wetland characteristics of the plants. For example, point out the plants that have hollow stems and large visible cells (see Background Information in the Teaching Aids section of this lesson for more information). Ask the students how they would describe the plants that grow here.
- If there are Cattails or Phragmites plants available, take a stalk and break it off. Show the stalk to the students.
- Ask them, “*What does this remind you of?*” (A straw.)
- Ask them, “*Why do you think a plant needs a straw?*” Remind them that the reason the soil smells is because it does not have air. (Plants need air, so they take it to the roots through the stalk.)
- If the students have looked at one other habitat have the students compare the plants in one site to another. Ask the students, “*Are the plants here similar or different? How?*”
- Discuss how wetland soil has no air or oxygen in it because of the water and that makes it special.
- Dig out some soil and give samples of it to the students. Have each student smell the soil and touch it.
- Ask them what it feels and smells like. Have them describe it to you.
- Have the students place their soil samples into the colander and shake them into the white containers.
- Discuss what remains after the soil has been shaken out. For wetland soils nothing may shake out, so ask them why they think the soil didn’t shake through the shaker.
- Tell the students soil is held in place by the plants that live here. If there were no plants, all this soil could wash into the Chesapeake Bay. Demonstrate, using your hand, how the plant roots are like a claw that holds the soil in place. Explain to the students if there were no plants in any of the habitats we visit today and we had a big rainstorm, the soil would all wash into the Chesapeake Bay with the water. This would make the water cloudy which is not good for underwater grasses that grow in the Bay. Many animals that live in the Bay depend on these grasses.
- Hike to the next habitat.



## 2. Forest

- Begin by talking about the forest, asking general questions about the site.
- Ask the students, “*Do you think the forest soil will be different from our wetland soil? (Yes.) Why?*” (There is air in this soil.)
- Ask them, “*Will we find the same plants as in the wetland?*”
- Once again dig out some soil and pass it around to the kids, having them smell and touch it.
- Ask them, “*How does it feel? What does it smell like?*”
- Ask them, “*How is this different or similar to our wetland soil?*”
- Have them place their samples in the soil shakers and shake them.
- Ask them, “*What remains after you shake the soil?*”
- Ask them, “*How does this compare to our wetland soil?*”
- Have the students look at the plants that grow here. Ask the students how they would describe the plants that grow here. Have the students compare the plants in one site to another. Ask the students, “*Are the plants here similar or different? (Different.) How?*”
- Tell the students trees are really good at holding onto the soil. They can hold onto more soil than some of the other smaller plants. These trees have many roots that hold onto the soil and keep it from washing into the Chesapeake Bay after a rainstorm.

## 3. Field

- Ask if they think the soil in the field will be different from the forest soil. Ask them, “*Why?*”
- Ask them, “*How is this different from our wetland soil?*”
- Dig out some soil, pass it around and have everyone smell and touch it.
- Ask them, “*What does it feel like. How does it smell?*”
- Have them compare it to the soils they examined before.
- Have the students look at the plants that grow here. Ask the students how they would describe the plants that grow here. Have the students compare the plants in one site to another. Ask the students, “*Are the plants here similar or different? How?*”
- Tell the students the roots of these plants can hold onto water and soil and keep it here in the field rather than letting the water and soil wash into the Chesapeake Bay. If there were no plants in this field and a rainstorm came, a lot of mud and water would be carried from the field into the Chesapeake Bay.





#### 4. Compost

- Ask the students what they think a compost is.
- Ask them if this is soil. *“Why or why not?”*
- Tell them it is soil, and it’s soil that humans made!
- Discuss how food scraps and grass clippings can break down and turn into “composted soil.”
- We collect table scraps such as coffee grounds and uneaten veggies and place them in a bin with raked leaves and grass. The bin has slats on the sides to let air in. Every once in a while we’ll mix it and spray it with water. All of this invites insects to come and live in our pile and they finish the process of making soil.
- Dig out some compost and pass it around. Have the kids smell and touch it.
- Have them sift the compost and ask them to compare it to the other soils that they saw today.
- Ask the students what they find when they sift the compost.
- Ask them, *“How does this differ from or how is this the same as our other soils?”*

#### 5. Review

- Ask the students what they found in the soil.
- Ask them, *“What do the insects do for the soil?”*
- Pick any two soil samples and ask the students how they were alike and how they were different.
- Have the students compare the plants in one site to another. Ask the students, *“Were the plants similar or different? How?”*

### Part 3. Plants and Trees Hike

Place the plant label cards on the trail ahead of time (see Teaching Aids).

#### 1. Introduction

Begin a discussion with the students in an open area.

- Introduce yourself.
- Ask the students, *“Who has a garden?”*
- Ask them, *“What is in a garden?”* (Food, pretty flowers.)
- Ask the students, *“How do we use plants. How do they help us?”*



Discuss how plants are a very important natural resource for us. Have the students brainstorm about what items we make using plants.

- Food
- Shelter
- Clothing
- Wood Products

Discuss how plants help their environment: Plants help filter and clean water. **Make sure you mention that plants help filter and clean water that travels to the Chesapeake Bay which helps keep the Bay healthy.** Plants that help filter and clean the water are native plants like wild rice found in wetlands, Red Cedar and Tulip Poplar trees, or Black Eyed Susan flowers found in the fields. Plants also help clean the air by absorbing carbon dioxide and producing oxygen.

## 2. Parts of a Plant

- Go over the parts of a plant using the Parts of a Plant poster or model.
- Start the hike by choosing a nearby plant to review the parts of the plant. (Ideally the plant was already dug up for this purpose, so you can show the roots to the students. You can replant the plant after the lesson if it was carefully dug up.)
- Be sure to ask them what each part is and what it does for the plant. Have the students demonstrate the parts of the plants to you by using various poses.

### Answers:

- Stem = transports the water and nutrients from the roots to the leaves. It's the plants "backbone." (Have the students illustrate this by standing up tall and straight.)
- Roots = holds the plant in the ground and collects water for the plant. (Have the students demonstrate this by spreading their legs wide apart.)
- Leaves = this is where the plants gather sunlight, make food and store it. (Have the students demonstrate this by holding their arms up to the sun.)
- Flowers = used to attract insects and other animals. (Have the students demonstrate this by cupping their hand and making their fingers flare out like flower petals.)
- Seeds/Fruits = this is how plants make more plants. (Have the students demonstrate this by closing their flower and making a fist with two hands.)

## 3. Plant Protection

Show the students different ways plants protect themselves and why they need protection by pointing out real examples.

- Thorns/Spines = Holly and Prickly Pear Cactus are spiny so animals won't eat them.
- Poisonous = Mountain Laurel is poisonous to eat, so animals won't eat it.
- Allergic Reactions = Poison Ivy produces a rash so animals won't touch or eat it.



- Have the students feel the Lamb's Ear. Ask them, "*Is its softness a form of protection?*" (Yes it is. It is so fuzzy that some animals, especially insects, can't eat it!)
- Ask the students how the cactus and lamb's ear are different and how they are the same.
- Take the students through the herb garden having them smell and feel the plants.
- Ask them, "*Why do you think the plants smell?*"
- Ask, "*What do they feel like?*"
- After discussing the plant parts, types and protection, move from the garden to a lawn.



#### 4. Parts of a Tree

- Go to a place where there are multiple large trees. Point out each type of tree: **evergreen**, **conifer**, **broadleaf** and **deciduous**. Give the definition of each type of tree, and point out the defining characteristics such as cones, needle-like leaves, or broad leaves. Have the students repeat the vocabulary words back to you.
- Divide the group into three groups. Assign each group a different tree.
- Stand back and ask each group to point out where the roots are. Ask them, "*What do they do?*" (The roots suck water and nutrients from the soil. They keep the tree from falling down.) Spread your legs wide apart to show the students how the roots help keep the tree from falling down.





- Ask them, “*Where is the trunk of the tree? What does it do?*” (It holds the branches high in the air so the leaves can capture sunlight to make food.)
- Ask them, “*Where are the branches? What do they do?*” (The branches hold the leaves.)
- Ask them, “*Where’s the bark? What does it do?*” (Protects the tree like our skin protects us.)
- Ask, “*Where are the leaves? What do they look like? What do they do?*” (They use sunlight to make food for the tree using a process called photosynthesis.) If the students have not studied photosynthesis, you can briefly explain that it a process plants use to make food using the energy of the sun.
- Ask, “*Does your tree have flowers? What do flowers do?*” (Flowers help a tree reproduce and make seeds.)
- Ask, “*Can you see any seeds on the tree? What do the seeds do?*” (Grow into new trees.)
- Have each group feel the bark and have them describe what it feels like.
- See if they can reach their arms around the tree. How many kids does it take to encircle the tree?

### Other activities and topics to cover throughout the hike

The following activities may be placed anywhere within the hike as the instructor sees fit.

Note: The vocabulary words must be completed by the end of the hike.

- As you walk point out different trees and plants that are deciduous, coniferous, broad-leaved or evergreens, and give the definition of each of these types of tree (see Vocabulary words). Have the students repeat the vocabulary words back to you. Quiz the students by asking them to identify different types of plants. When pointing to a plant, ask the students, “*Is this a deciduous plant or an evergreen? Is this a deciduous plant or a conifer? Does this plant have broad leaves or needle-like leaves?*”
- Have the students look closely at tree buds, tree flowers and tiny flowers on the ground. Ask them questions about the plants. Encourage them to closely examine the plant. For example, ask the students, “*How many petals does this flower have? Do the petals have lines on them? What color is the center of the flower?*”
- After you have introduced the tree and plant vocabulary words, say a tree type and tell the students to find an example of that type of tree nearby.
- As you hike, you may want to pick up some interesting items and discuss them. Some examples are leaves, seeds, nuts or fruits.
- When you find two or three different plants close together, have the students compare and contrast them.



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## Extra Activities:

### Parts of a Plant Game

- Get the students excited about plants by playing Simon Says.
- Simon says, “Curl up like a seed.”
- Simon says, “Stand tall like a sprout.”
- Simon says, “Spread your one arm out like a single leaf on a sprout.”
- “Sit down.”
- “Uh oh, Simon didn’t say to do that.”
- Simon says, “Stand up and move your arms like tree branches in the wind.”
- “Now reach your hands up to the air like leaves reaching for sunlight.”
- “Uh oh, Simon didn’t say to do that.”
- Simon says, “Spread your legs out like tree roots so you don’t fall over, etc.”

### Tree Bark Rubbings

- Hand out sheets of paper to each student. Have the students do a rubbing of the tree’s bark with crayons and then ask them to trace or draw the leaves of their tree.
- Tell them to put their names on the sheets, along with the name of their tree. As time permits, you can have the students do multiple bark rubbings.

### I Spy Plants and Seeds

- Play the game “I spy” with the students. Use vocabulary words or clues about the type of plant you are looking at and ask the students to find it. You can also choose a letter and ask the students if they know any plant or seed nearby that starts with the letter you have chosen.

## Teaching Aids

### Plant Label Cards:

- Make large laminated cards containing the vocabulary words: deciduous, conifer, evergreen and broad-leaved.

### Plants and Seed Questions Card Game:

- Make cards containing the following questions (one question per card):
- “*Name one thing that a seed needs to survive.*” (Sunlight, water, soil etc.)
- “*How can a fox help a seed move from one place to another?*” (The seed can stick to its fur, hitchhike.)



- Take a look at this picture of a pinecone. *“Is this pinecone just one seed or many seeds?”* (Many.)
- Take a look at this picture of seed from a dandelion. *“How does this seed travel?”* (Wind.)
- Some seeds have a hard outer layer like the ones pictured on this card. *“How does this help the seed?”* (Protects the seed.)
- *“How do birds help seeds travel from place to place?”* (A bird can carry a seed in hopes of eating it and then drop it. Birds also eat berries and drop the seeds in their poop.)
- *“How can a sweet gum ball disperse?”* (Water.)
- *“What is a baby plant called?”* (Embryo.)
- *“Name a way you can classify seeds.”* (Color, size, amount of seeds etc.)
- *“How can a seed travel from one part of the Chesapeake Bay to another?”* (Float on the water, or be carried by a bird.)

#### Seed Classification Cards:

- Make index cards with the different ways in which seeds can be classified written on them. These cards will help guide the students through the activity. See Seed Classification Activity.

#### Parts of a Plant Poster:

- Make a poster of a plant that illustrates the following parts of a plant: Roots, Stem, Leaves, Flowers, Seeds/Fruits.

#### Background Information on Visible Wetland Plant Characteristics

Wetland plants have the following general characteristics that can be seen with the naked eye. These special characteristics help the plants survive in wetlands during periods when it is inundated with water. The leaves, stems and roots of wetland plants can have large spaces where the plant stores Oxygen and Carbon Dioxide to be recycled. These spaces, called “lacunae,” also allow air to be transported to the parts of the plant that are submerged underwater. Wetland plants can also have shallow roots.

When looking at plants in a wetland, you can also look for some of the following characteristics. Trees or upright plants can exhibit watermarks that show when the water level was high. Also look for trees with wide, buttressed bases with multiple roots coming out of the trunks of the trees. The wide bases help stabilize the trees in the soft wetland soil. Other plants have spongy tissue in the stems. This type of tissue may help the leaves of the plants float as well as store air for the plants when they are under water. Wetland plants can also have a waxy surface or a rubbery feel. This coating on the leaves helps to protect the leaves when they are in constant contact with water.



## Extension Activities

### *Pre and Post-activities for Classroom Teacher:*

#### Dissect a Seed

Before conducting this activity, you will need to find out if any students are allergic to specific nuts or seeds and have those students avoid contact with those seeds. Using nuts and seeds purchased from your local store have the students dissect the nuts and seeds. Write the parts of a seed on the board or use a poster illustration to help you discuss what the students should look for in each seed: **outer shell, seed coat, baby plant or embryo, food source**. Have some really small seeds, such as basil seeds, to show the students how small seeds can be. If you have access to magnifying lenses, the students can use these to help them study the seeds up close. The students may need help verifying the parts of their seed. Whole beans and whole peanuts will exhibit all the parts, and they easily split in half (using your fingernails) so students can see the embryo inside.

#### Dissect a Plant

Using a couple of whole plants, divide the class into small groups and give them each a whole plant to study. You may want to spread out newspaper for each group to catch the soil clinging to the roots of the plants. The plants should have the following parts so the students can find them: **roots, stem, branches, leaves, seeds or flowers** (optional). Write the parts of a plant on the board or use a poster illustration to help you discuss what the students should look for on their plant. On pieces of lined paper, have the students describe how each part of the plant looks on their plant and write what each part does. You can give them writing tips such as, “*Where was the part located on your plant? What color was it?*” Don’t forget to tell them what the part is used for.

#### **Recommended plants for this activity:**

- Small Blueberry or Huckleberry bushes
- Small Azalea bushes
- Any small woody houseplant
- Any small tree
- Any complete long stem flower or tropical houseplant (note that you may need to discuss the following things with the students: there may be no branches and the root may have a bulb)

## Resources

Project Learning Tree Activity Guide PreK-3. American Forest Foundation. 2006.

Brewer, Richard. The Science of Ecology. 2nd edition. Saunders College Publishing. 1994.

Wetlands Forum retrieved from <http://www.wetlandsforum.org/wetlands/index.htm> on March 18, 2006.

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# *Changing Landscapes*



## **In-school Lesson**

**Grade: 3**

Program length: 1 hour

Number of Instructors needed: 2

*(1 with help of classroom teacher)*

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 3

**Social Studies:** *Geography*—Explain the similarities and differences of communities using geographic characteristics; Explain how people adapt to, modify and protect their natural environment. *Economics*—Examine goods and services provided in communities.

**Science:** *Technology, Making Models*—Examine and modify models and discuss their limitations.



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## Synopsis

This lesson will introduce students to the ways humans have changed and continue to change natural landscapes. Students will be introduced to the concept of a watershed and the way changes in regional landscapes affect the flow of water into the Chesapeake Bay Watershed. Students will understand the ways in which humans modify natural landscapes and the reasons why we would make such modifications. Students will be introduced to the role plants play in filtering and reducing the amount of sediment and pollutants flowing into the Chesapeake Bay. Students will use a model of their local area to investigate ways to modify natural landscapes and lessen the amount of unfiltered water flowing into the Bay.

## Objectives

- Students will understand that humans have modified their natural environment in the past and continue to do so today in order to address human needs such as: food production, creation of electric power and building shelters.
- Students will observe and understand the way water flows through their local watershed.
- Students will be introduced to the concept that plants filter water before it flows into the Chesapeake Bay.
- Students will use a model to investigate ways to modify natural landscapes and observe the affect specific modifications may have on the Chesapeake Bay.

## Materials

10 overhead transparencies of photos of various landscapes (natural and man-made)  
2 watershed models (see Teaching Aids)  
2 cups  
Water

## Vocabulary

**Community** - a group of interdependent organisms such as people inhabiting the same region and interacting with each other.

**Landscape** - the outdoor scenery.

**Watershed** - the entire region that water drains from as it flows into a particular body of water such as the Chesapeake Bay.

**Filter** - something that removes particles from water that passes through it.

**Agriculture** - the production of plants used for food and materials.

**Hydro power** - the use of water to produce power such as electricity.



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# Changing Landscapes Lesson Plan

*This lesson is broken into five parts. It takes place in the students' classroom.*

**Part 1. Introduction** - 2 minutes. One Instructor.

**Part 2. Discussion about Natural Versus Unnatural Landscapes** - 8 minutes. One Instructor.

**Part 3. Pictures of Local Landscapes** - 17 minutes. Two Instructors.

**Part 4. Watershed Experiment** - 30 minutes. Two Instructors.

**Part 5. Conclusion** - 3 minutes. One Instructor.

**Part 6. Extra Activities**

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## Part 1. Introduction

- Introduce yourself.
- Ask students, “*What does the word community mean?*” (Definition of community)
- “*What does the word natural landscapes mean?*” (Definition of landscapes)
- Tell the students when they go outside and look around, they see different landscapes. Some landscapes are natural and some are manmade.

## Part 2. Discussion about natural versus manmade landscapes

- Ask the students, “*Have you ever been in a forest?*” (If the class has been on the third grade field trip already, you can discuss the forest that they visited.) “*Was the forest a man-made or a natural landscape?*” (Natural.) Discuss how the students have already participated in the Forests field trip experience or how they will participate in the Forests Field Trip Experience. In the forest they will learn the things that make up this landscape.
- Discuss whether the schoolyard and surrounding areas are man-made or natural landscapes.
- Discuss that humans need to change the landscapes to fill certain needs such as growing food, building shelters and providing electricity.

## Part 3. Pictures of local landscapes

Using an overhead projector, show the students various photos of different local landscapes. The pictures should include a wetland, a forest and the Chesapeake Bay. Other suggested pictures are local agricultural fields, highways, local housing developments and local shopping malls.

- Tell the students you will now be showing them photographs of different landscapes they might see in their community.





- Discuss again how humans need to change the landscapes to fill certain needs exhibited by the photographs such as growing food, building shelters and providing electricity.

## Part 4. Watershed Experiment

### A. Introduce the term “watershed”

- Discuss how the landscapes they just saw fit into the Chesapeake Bay Watershed. For example, rain falls onto the agriculture fields, then the water flows through the agriculture fields, through the forests, through the housing developments and all parts of the watershed (such as a stream to a river and into the Chesapeake Bay). You can use the overheads and draw a diagram on the board to help the students understand all the landscapes the water would flow through before it gets to the Chesapeake Bay.
- Explain to the students that plants and soil can filter or clean water before it flows into the Chesapeake Bay. Explain that a filter is something that removes particles from the water that passes through it. Have the students think of filters they have seen before (fish filters, coffee filters, etc.) Explain that filters remove things like pollution from the water and let the water pass through. So, when the water comes out of a filter it is cleaner than when it went in. Plants and soil can trap particles from the water that passes through them. So, plants and soil are a type of filter.

### B. Introduce the Experiment

- Tell the students we are going to do experiments using models.
- Discuss what a model is. A model is a representation of something larger. When scientists can't easily study the real thing, they make a model and conduct experiments using the model. Using a model helps us get an idea of what will happen in real life.
- Tell the students, “*We will be creating a model of the Chesapeake Bay Watershed.*” Review the definition of the Chesapeake Bay Watershed.
- Tell the students, “*Using the model, we are going to test the ability of different kinds of landscapes to filter water.*” Describe the experiment to the students without divulging the answers.
- Show them the pieces of the model and tell them what they represent:
  - 11 black tiles = impermeable surfaces such as blacktop or concrete
  - 11 white tiles = houses and shops
  - 11 dark green tiles with thick sponges = trees
  - 11 light green tiles with thin sponges = grasses or crops

### C. Have students develop hypotheses about what will occur

- Explain to the students what a hypothesis is. It is a statement saying what you think will happen in the experiment.



- Write the students' answers to the following questions on the board:
  - a. *"What will happen after we pour water on the model and we have sponges there to represent plants? Will the sponges soak up some of the water?"*

b. Explain to the students what concrete and blacktop surfaces are. Explain how these surfaces do not absorb water and they do not let water pass through them. Ask the students, *"What will happen if we replace the sponges with tiles to represent concrete? Do you think some of the water will be soaked up or filtered?"* Make sure you have two hypotheses on the board and tell the students we will now test their hypotheses using models.



Watershed model

#### D. Split the class into two groups

- Conduct two experiments simultaneously in separate locations so all the students can see the experiments.
- Have the other instructor or classroom teacher work with one group while you work with the other. Give the teacher clear, concise directions on what to do if they have never done this experiment before.
- Lead the students through the first two experiments.

#### E. Conduct experiments

1. With a Grass and Tree Vegetation Buffer - Set up the paint pan by placing the pre-moistened sponges with green tiles attached in a line approximately two inches away from the top of the pan (make two rows of these). Have water ready. Tell the students what each part of the model represents. Tell the students, *"Now watch what happens when it rains over here."* Pour the water onto the top of the pan. The sponges should soak up some of the water as it trickles down the pan.
2. Without Vegetation Buffer - Set up the paint pan again but replace the green tiles with the black tiles to represent concrete. Have the water ready. Tell the students what each part of the model represents. Tell the students, *"Now watch what happens when it rains over here."* Pour the water onto the top of the pan. Most of the water should end up in the bottom of the pan.
3. Now let the students work in large groups and build their own watershed using all the pieces available. Ask someone in the group to take notes. Each group must have an adult to help maintain order and to help the students take turns putting pieces into the model.



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## Part 5. Conclusion

- Gather the class back together and discuss what type of landscapes filtered the most water and which ones did not.
- As a class, review what happened in the different experiments during each step.
- Ask the students, “*How could you use this knowledge to make changes to real landscapes? How can you use this knowledge to help filter water before it flows into the Chesapeake Bay?*” (Plant gardens or trees where there is just grass, plant some vegetation along stream banks, drainage ditches, etc.)
- Review how plants are better at filtering water than concrete, and trees are better than grass.

## Part 6. Extra Activities

### 1. Pollution

This activity extends the model investigation to study what happens when pollution enters the watershed.

- Tell students they are scientists and scientists make a hypothesis or an educated guess about how their experiment will turn out based on the knowledge they already have. Ask the students to form a hypothesis about what will happen if we put some pollution such as food coloring onto the top part of the model. Write the hypothesis on the board.
- Run the experiment again and add a couple of drops of food coloring to the top of the pan before you pour on the water.
- Discuss what happened in the experiment and the students’ hypothesis.
- Do not let the students help clean up the model or they will get food coloring all over themselves and the classroom.

### 2. Schoolyard Landscapes

- Take the students outside to see what landscapes surround the school building. (If the school is in an area with few different types of landscapes, then this might not be a worthwhile activity. This activity is also something the classroom teacher can do after you leave.)
- Tell the students they will be going outside to investigate the school grounds and the landscapes surrounding the school. Have the classroom teacher help get students dressed to go outside. The classroom teacher should follow the group.
- Once outside, walk the students to an open area where they can look around. Talk about the different landscapes you see. For example, you can talk about the parking lot, the school building, the playground, the nearby woods, etc.
- Lead your group to areas of the school grounds or adjacent park where you will be able to see other landscapes.



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# Teaching Aids

## The Watershed Model

- For construction of one model, you will need: a large metal paint pan, forty-four 2" x 2" ceramic tiles, modeling or self-drying clay, a hot glue gun, 2 or 3 large thick sponges, 2 or 3 large thin sponges, blue porcelain paint, dark green porcelain paint, light green porcelain paint, black porcelain paint and white porcelain paint.

Step 1: Paint the bottom half of the paint pan blue with metal paint.

Step 2: Cut the thick sponges into 2" x 2" pieces and hot glue them to the bottom of 11 tiles that will be painted dark green. Cut the thin sponge the same way and glue it to the 11 tiles that will be painted light green.

Step 3: Paint 11 tiles black and 11 tiles white.

Step 4: Push strips of modeling clay into the sides of the paint pan so water does not run down the sides of the pan when you conduct the experiment. You may need to seal the edges of the modeling clay with hot glue.

Step 5: Let the model dry thoroughly before use.

# Extension Activities

## *Post Activity for Classroom Teacher*

**See Schoolyard Landscapes Extra Activity above.** The classroom teacher can take the students outside for this activity if there was not enough time in the original lesson. The classroom teacher can then have the students draw pictures of a natural and a man-made landscape that they see near their school, house or on their way to school. The students can also write a description of the landscapes they drew. The description can contain a certain number of descriptive words or use a writing format that is currently being learned in English class (such as writing in cursive or writing a certain type of poem).

# Resources

Earth:The Water Planet. National Science Teachers Association. 1992. This resource provided activity ideas and information.

Encarta Dictionary. [http://encarta.msn.com/dictionary\\_1861609044/erosion.html](http://encarta.msn.com/dictionary_1861609044/erosion.html)

Slattery, Brit. 1991. WOW! The Wonders of Wetlands. Maryland: Environmental Concern. This resource provided activity ideas and information.

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 *Forests*

**Field Trip Experience**  
**Grade: 3**

Program Length: 2 hours  
Number of Instructors needed: 3

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

### Grade 3

**Science: *Cells* (LS3)**—Explain the world of minute living things to describe what they look like, how they live, and how they interact with their environment. (3a) Use magnifying instruments to observe and describe minute organisms that are found in different environments. (3b) Describe any observable activity displayed by these organisms. (3c) Provide reasons that support the conclusion that these organisms are alive.

**Science: *Flow of Matter and Energy* (LS 5)**—Recognize that materials continue to exist even though they change from one form to another.

**Science: *Structure of Matter* (CH 6)**—Identify ways to classify objects based on observable properties. (6a) Classify objects according to selected properties. (6b) Provide reasons for placing objects into one group or another.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 3

**Science: *Cells***—Explore the world of minute living things to describe what they look like, how they live, and how they interact with their environment.

***Flow of Matter and Energy***—Recognize that materials continue to exist even though they change from one form to another form.

### **This lesson also meets the following State Standards:**

#### Grade 2

**Science: *Genetics***—Explain that there are identifiable stages in the life cycle (growth, reproduction, and death) of plants and animals.

***Evolution***—Observe and describe examples of variation (difference) among individuals of one kind within a population.

#### Grade 4

**Science: *Diversity of Life***—Explain how animals and plants can be grouped according to observable features.



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## Synopsis

Students will explore a forest by studying various trees in the forest, investigating tracks and traces left behind by animals, and investigating life found under and inside a rotten log. Students will use magnifying lenses and their senses to explore all parts of the forest and learn how decomposers help complete the life cycle of a tree by turning it into forest soil. Students will learn why forests are important to wildlife and people in the Chesapeake Bay area.

## Objectives

- Understand why forests are important to wildlife and people in the Chesapeake Bay Watershed.
- Identify forest animals by examining traces they left behind.
- Learn to classify and identify different trees.
- Examine animal decomposers and understand the way decomposers change debris in the forest into soil which is then used by plants.

## Materials

### **Rotten Log**

- Insect guides
- Bug boxes with magnifying lenses
- Moist containers for holding amphibians for observation
- Magnifying lenses
- Large tally sheet - 1/rotation (see Teaching Aids)
- Markers

### **Tracks and Traces**

- Animal skulls/bones
- Deer antlers
- Variety of pelts (deer, rabbit, opossum)
- Scat cards
- Track cards
- Rubber scat (optional)
- Paw-print molds

### **Forest Hike**

- Tree guides



# Vocabulary

**Habitat** - a place where an organism lives that contains food, water, shelter and oxygen.

**Organism** - a living being.

**Ecosystem** - an area containing living and non-living things that interact with each other.

**Life Cycle** - the different stages of an organism's life from birth to death.

**Seedling** - the young first-year sprout of a tree.

**Sapling** - a young tree of 3-4 years of age.

**Snags** - a dead tree that is still standing and rooted into the ground.

**Decay/Decompose** - the natural breakdown of an organism from its original, living state to nutrient rich soil.

**Decomposer** - an organism that helps to breakdown another organism from its original, living state, to nutrient rich soil.

**Predator** - an organism that lives by preying on other organisms.

**Prey** - an organism that is hunted for food by predators.

**Camouflage** - the coloration or pattern of an organism that allows it to appear as part of the its natural surroundings.

**Scat** - a scientific term for animal poop.

**Carnivore** - an organism that eats only meat.

**Herbivore** - an organism that eats only plants.

**Omnivore** - an organism that eats both plants and meat.

**Detritivore** - an organism that eats dead things.

**Forest** - an extensive tract of land covered with trees and undergrowth.

**Fascicle** - a number of leaves, needles or flowers growing or occurring in a bunch.

**Canopy** - the uppermost layer of a forest.

**Conifer** - a plant that has needle-like or scaly leaves and produces cones.

**Broadleaf** - a plant with a large wide leaf area.

**Evergreen** - a plant that does not lose its leaves every year; it is green year-round.

**Deciduous** - a plant that loses its leaves every year.

**Tree Cavity** - a hole in a tree.





# Forest Lesson Plan

*This lesson plan is broken into three parts. The class must be divided into three groups and will rotate through the three parts.*

**Part 1. Rotten Log-** 40 minutes. One Instructor. Suggested location: A wooded area with rotten logs.

**Part 2. Tracks and Traces-** 40 minutes. One Instructor. Suggested location: An outdoor area.

**Part 3. Forestry Hike-** 40 minutes. One Instructor. Suggested location: A forested area.

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## Part 1. Rotten Log

### A. Introduction

- Introduce yourself.
- Brainstorm with the students about trees.
- Ask them, “*What is a life cycle?*” (A life cycle is the different stages of an organism’s development from birth to death.)
- Ask them, “*Who knows what the stages of a tree’s life cycle are?*” (**Seedling, saplings, mature trees, snags, and rotten logs.**)
- As you list the stages of a tree’s life cycle have them point out examples of each within the forest you are standing.
- Have the students act out the life cycle of a tree by using the following actions:



Seedling = squat down and hold your knees.

Sapling = stand up straight with one arm out to represent a small branch.

Mature Tree = stand up tall with both arms out to represent a large tree with multiple branches.

Snag = slump down but remain standing with only one arm out to represent a dead tree with one branch.

Rotten Log = lie down on the ground.

Soil = spread out arms and legs while lying down on the ground or have the students pick up some soil in their hands if the ground is too wet.

You can make this activity into a game by speeding up the cycle.



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- Now focus the students' attention on a rotten log. Ask them, "*What is happening to the rotten log?*" (It is rotting, decaying, or decomposing.)
  - Ask them, "*What does it mean to **decay** or **decompose**?*" (To break down and return to the soil.)
  - Ask them, "*How is the rotten log helping to complete the life cycle of a tree?*" By decaying, the log is leaching nutrients back into the soil, making fertile soil.
  - Tell the students how a rotten log is important in the entire forest ecosystem. When the log fell it created an opening in the canopy allowing more light onto the forest floor and more room for new trees to grow. The rotten log also serves as a habitat and a source of food for some organisms.
  - Ask the students if they have heard about living organisms that are called decomposers. The students may be able to provide you with examples of decomposers. (Bacteria, fungus, some insects, millipedes, worms, etc.). You can tell them that decomposers are organisms that help break down other organisms, like trees, into nutrient-rich soil like we see here in the forest. Sometimes these organisms are so small that we cannot see them without a magnifying glass or a microscope.

## **B. Rotten Log**

- Have the Rotten Log Tally Sheet and your supplies ready in a space near the collection site.
- Review with the students, "*What helps a fallen tree decompose?*" (Bacteria, fungus, insects, birds, water, wind, etc.)
- Ask them, "*What type of animals do you think you will find today under the rotten log?*"
- As they answer, place their guesses on a large tally sheet under the column heading 'Hypothesis'.
- Have them hypothesize how many of each animal they will find. Place the number they hypothesized next to the appropriate animal.
- Tell the students the rules of the Rotten Log activity:
  - Every student must be within sight of the instructor or chaperone.
  - Be very careful with the animals. They are much smaller than we are. Please be careful not to destroy the animals' homes.
  - Do not pick up salamanders or frogs with your hands, because amphibians have sensitive skin. Amphibians dry out easily and will absorb anything that is on your hands. Have containers ready to hold amphibians for observation.
  - Remember to roll the log away from you, to protect your feet and toes.
  - Roll the logs back over when you have finished examining them.
  - No running!
- Now tell the students they will be searching for animals under rotten logs. Hand out bug boxes to each student so they can collect the animals they find. Tell them to have fun.
- After 20 to 25 minutes, gather the students. Make sure you allow time for discussion and review.



- Tell students to look for the tiny creatures living in the log and around it. They should look really closely and use their magnifying glasses to see what is on the rotten log. Once a student puts a tiny creature in the bug box, the student should look to see what parts the animal has. Does it have mouthparts, legs, feet, wings, antennae?
- Have the students divide the animals they found into the categories they created on the tally sheet. Have them write down the actual number of animals found next to their respective groups on the tally sheet under the 'Amount' heading in the 'Data Found' column.
- Ask the students, "*Did your original hypotheses come close to what you actually found?*"
- Ask them, "*Why or why not?*"
- Have the students gently return the animals to their homes in an effort to conserve life in the forest.
- Review with the students what was discussed at the beginning of the lesson.
- Discuss what the students saw on the rotten log that was alive and what was not alive.
- Before the students leave from the field trip be sure to give the teacher(s) the tally sheets so they may complete their post-lesson activities.

## Part 2. Tracks and Traces

Before the students arrive, choose a small wooded area near where you are teaching. Look for wild animal tracks and traces, or place various animal tracks in the area for the students to find later. You can place the rubber scat and bones within the area as well.

### A. Introduction

- Introduce yourself.
- Begin by discussing how everyone wants to catch a glimpse of an animal in nature, but sometimes it's hard to see animals in nature.
- Ask the students, "*What kinds of animals have you seen in nature?*"
- Ask them, "*Why is it hard to see animals in nature?*" (We scare them with our loud noises, the animals may be asleep, or the animals may be well camouflaged.)
- Tell the students, "*We see their tracks and traces such as their scat, their footprints, their bones and fur, their nests, and various marks like the holes in a tree from a woodpecker.*"
- Tell the students, "*We may use our sense of smell or our sense of hearing. We can hear animals like birds or frogs even though we don't see them, and sometimes we smell animals like a skunk if we walk into an area where it recently sprayed.*"

### B. Tracks and Traces

#### Animal Skulls

- Show the students an herbivore skull, such as a deer skull, and have them guess what it is.



- Point out the eye sockets. The eyes of this animal are on the side of its head. The deer cannot see directly in front and behind itself, but it can see everywhere else.
- Ask them, “*What do you think this tells us about the animal?*” (It is a prey animal, other animals eat it. The eyes are on the sides of its head so that it can keep watch for predators.)
- Point out the teeth of the animal. Deer teeth are like our molars and are used for grinding plants because it is a **herbivore**.
- Take an omnivore skull, such as a bear skull, and have the students guess what animal the skull came from.
- Have the students focus on the eyes.
- Ask them, “*Where are its eyes pointed?*” (Towards the front of its head, like us.)
- Ask them, “*Why is this?*” (Because a bear is a predator and hunts for meat.)
- Ask them, “*By looking at the skull how else can you tell that the bear is a predator?*” (By its pointed teeth. It has large canines.)
- Ask them, “*What other types of teeth does the bear have?*” (It has molars.) “*What do you think this means about the bear?*” (The flat molars mean that bears eat plants. Therefore a bear is an **omnivore**.)
- Take out another skull such as a fox skull and have the students guess which animal it is. As they are guessing remind them to think about the teeth, the over-all size of the skull and the direction of the eyes. All of these things will help the students.
- After the students have answered correctly walk around and show them the skull. Have them look at the teeth.
- Ask them, “*Do you see anything interesting or special about the fox’s teeth?*”
- Point out to the students that the fox has two small molars at the back of its mouth.
- Ask them, “*What does this mean about the fox?*” (This means the fox is an omnivore as well.)
- Ask the students, “*Can you guess by the number of sharp teeth to flat molar teeth what the fox eats more of?*” (The fox eats more meat, but will eat plants and berries during difficult times, like winter.)
- Take out a rodent skull, such as a beaver, mouse, rat or squirrel skull, and have them guess which animal it is.
- Point out the teeth because they are the main characteristic of a rodent skull.
- Finally, take out the bat skull. Remind the students to look at the animal’s teeth and the skull’s shape before making their guess as to what it is.
- Walk around to every student showing them the skull and pointing out the teeth.
- Give the students clues if they need help identifying the skull as a bat skull.



## Tracks

- Show the students track cards and have them guess which track belongs to which animal. As you do this, make sure to highlight the differences between different tracks. For example, a dog and cat footprint look very similar, but because cats can retract their claws you do not see claw marks in a cat footprint as you can in a dog print. An opossum and a raccoon both have five digits on their front paws, but point out the size difference of their front paws, the difference in the size of their hind feet (raccoon's rear paws are larger than their front, while an opossum's paws are of similar size) and the difference between their pads. A raccoon's front tracks appear to be an entire paw, while an opossum's front tracks appear to have holes in them.
- Ask them, "*What type of ground would show the clearest tracks?*" (Wet ground near the shore, wet sand, mud, or ground covered with snow. The moisture would help the print to form more clearly, and it will hold the print for a longer period of time. Prints made on dry ground will blow away with the wind very quickly.)
- Ask them, "*What can tracks tell you about an animal?*" (The size of the animal, if it has claws, where the animal was going, and the kind of animal.)

## Scat

- Next show them the scat cards, having them guess which scat came from which animal.
- As they guess, tell them which animal the scat belongs to, and any helpful hints to help them remember. For example, deer scat portions are about the size of a marble.

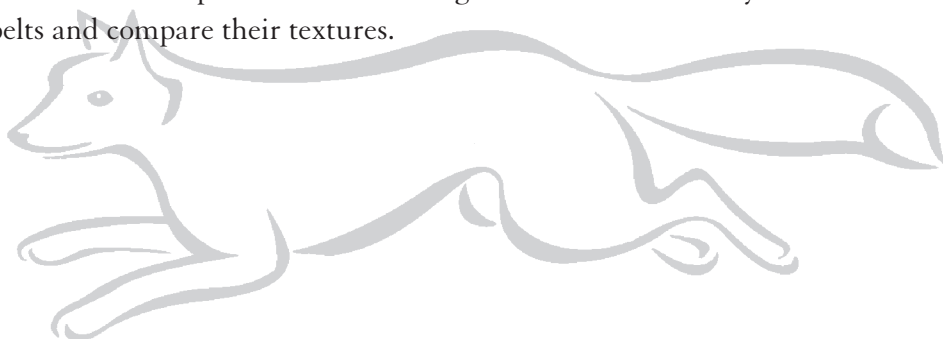
## **C. Mini-hike**

- Take the students out to the area where you have found or planted animal tracks and traces such as those discussed in the Teaching Aids.
- Help the students find the tracks and traces and discuss the tracks and traces as you find them with the students.
- After they are done, gather the students to review the tracks and traces they found on the hike.

## **Extra Activity (if time permits)**

### Animal Pelts

- Show the students various pelts and have them guess what animals they are from. Let them touch the pelts and compare their textures.





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## Part 3. Forest Hike

### A. Introduction

- Introduce yourself.
- Tell the students they are in a forest. A forest is a special kind of landscape that is very different from other landscapes. If the students already had the third grade in-school lesson on landscapes, then you can ask them if they remember what big plants with big roots were really good at filtering water as it ran into the Chesapeake Bay. (Trees.) Tell the students that we will be exploring the forest and studying the trees.
- Start near a large tree and ask the students, “*What are the different parts of the tree?*” (The roots, trunk, branches, leaves and bark.)
- Have the students look at the different parts of the tree.
- Ask them, “*What do the different parts of the tree do for the tree?*”
  - The roots help hold the tree and they absorb water and nutrients from the soil, and sometimes the roots absorb pollution from the water.
  - The trunk is like the tree’s backbone; it holds the tree upright and allows water and nutrients to move from the roots to the leaves.
  - The branches hold the leaves.
  - The leaves are the site of photosynthesis, the place where the tree collects sunlight and its food is made. (Ask the students if they know what photosynthesis is. If they do not, tell them that photosynthesis is the process plants use to make food from sunlight.)
  - The bark, similar to our skin, is used to protect the tree from bugs, disease and weather.
- Ask them, “*Why are trees important?*” (They provide us with oxygen, shade, wood, paper and various other products and they provide habitat for animals. Trees help filter pollutants from water before it enters the Chesapeake Bay.)
- Ask them, “*What animals do trees provide habitat for?*” (Trees provide habitat for animals that live in or around the Chesapeake Bay. Tree cavities, or holes in trees, are great Wood Duck homes. Trees’ branches are great locations for birds like the Great Blue Heron and Bald Eagle to build their nests.)
- Ask the students if they remember learning that plants filter water before it goes into the Chesapeake Bay (this concept is covered in the first and second grade field trip lesson as well as the third grade in-school lesson). Ask them, “*Is a tree a filter?*” (Yes, trees are great filters.)
- Ask them, “*What does a filter do?*” Have the students think of filters they have seen before (fishtank filters, coffee filters, etc.) Explain that filters remove things like pollution from the water and let the water pass through. So, the water coming out of the filter is cleaner than when it went in. So, if there are trees on the land, the water that flows into the Chesapeake Bay will be cleaner than if there were no trees.



- Ask them, “*Are all trees the same?*” (No, trees are different. We are going to study different kinds of trees to see how they are alike and how they are different.)

## **B. Forest Hike**

- Tell the students the rules of the trail:
  - Stay with the group on the marked trail.
  - Don't pick any plants or leaves off plants, trees or bushes unless you are told to do so.
  - Stay quiet; the quieter we are the more wildlife we will see.
- Now guide the students on their hike to study trees. You may choose any or all of the trees for the students to look up in their field guides before discussing them.
- As you begin your hike keep in mind the following trees; they are the tree species you will find in a typical Maryland forest and will want to discuss during the hike:
  - Virginia Pine
  - Loblolly Pine
  - American Beech
  - Mountain Laurel
  - American Holly
  - White Oak
  - Red Oak
  - Tulip Poplar
  - Sweet Gum
- It is important to have the students participate in the tree investigation and touch as many parts of each tree as possible. When investigating a tree, have the students look for its leaves, touch its bark, look for its seeds and look for a similar tree in the area. You can guide the students through each of these activities.

*Here are some helpful teaching tips and information for studying various common trees.*

### Loblolly and Virginia Pines

- Look for a location with both Virginia and Loblolly Pines near each other. Have the students look up and ask them, “*What kinds of trees are these?*” (Conifer, pine, or evergreen.)
- Pick up needles from both trees from the forest floor. Discuss how the Virginia Pine has shorter needles and only has two needles per fascicle, forming a “V” for Virginia. The Loblolly has much longer needles and has three needles per fascicle. Another helpful hint is that the three needles represent the three syllables of “Lob-Lol-Ly.”

### Beech Tree

- Split the class into groups of two to three and hand each group a field guide. Review how to use the field guide. Finally, point to the Beech tree and have them look for the tree in the guide.



- After they find the tree in the guide have them read the description of the tree.
- Ask them, “*What type of tree is this?*” (Beech tree, broadleaf, or deciduous.)
- Hold up one of the Beech tree leaves and say “*I think this looks like a surfboard.*” Ask them, “*Who thinks this look like a surfboard too?*” Then ask them, “*Where do you go surfing?*” (The beach.) This leaf is from a Beech Tree. Another way to remember this is a Beech tree is to hold the leaf horizontally and point out the edges of the leaf look wavy, like waves on an ocean.
- Point out the smooth gray bark characteristic of the Beech tree and suggest that it looks like a huge elephant leg.

#### Mountain Laurel and American Holly

- Look for a location with both Mountain Laurel and American Holly.
- Ask the students, “*Will these trees lose their leaves in the fall?*” (No.) “*Why not?*” (Because they are broadleaf evergreen trees, and evergreen trees do not lose their leaves in the fall.)
- Pick a Holly Leaf and have the students feel it.
- Ask them, “*What does this leaf feel like?*” (Thick, leathery and prickly.)
- Ask them, “*What kind of tree does this leaf belong to?*” (American Holly.) If they answer correctly go onto the next question; if they are incorrect or don’t know the answer have them use their guides to identify this tree.
- Ask them, “*Why do you think Holly leaves are prickly?*” (For protection, since they are one of the few trees that have leaves on in the wintertime; their prickly edges deter animals from eating them and protect the tree.)
- The Mountain Laurel is a broadleaf evergreen. It needs protection in the wintertime, but it doesn’t have prickly leaves. Instead, it is poisonous to eat. Show the class a Mountain Laurel leaf and have them compare the two types of leaves.
- Show the students a Mountain Laurel.

#### Red and White Oaks

- Look for a white oak tree and a red oak tree, and find leaves on the ground. Show the students a leaf from each tree.
- Ask them, “*What are the differences between these leaves?*” (One leaf has rounded lobes and the other has pointed lobes.)
- Tell them the pointed lobe leaf belongs to a red oak tree. Point out a red oak tree.
- Tell them the rounded lobe leaf belongs to a white oak tree. Point to a white oak tree.

#### Tulip Poplar

- Look for a Tulip Poplar. Find a leaf and ask the students, “*What do you think this leaf looks like?*”
- To find out what tree this leaf belongs to have the students get back in their groups and look for the tree in the tree field guide.





- After they find the tree have one group read the description of the tree.
- Tell them that yes, this is a Tulip Poplar leaf, and show them the tree it came from. Discuss how the leaf looks like a tulip in bloom. This is an easy way to remember the Tulip Poplar.

### Sweet Gum

- Look for a Sweet Gum. Have the students use their field guides to identify this tree. Have them read the description of it before discussing its leaf and seed pod characteristics.
- Sweet Gum trees have pointy, five-lobed leaves that look like a human hand.
- They also have golf-ball sized seedpods. Point out the seedpods as well as a sweet gum tree.
- Before going to the next portion of the lesson, review with the students the different parts of a tree.

## **Extra Activities (if time permits)**

### **1. Leaf/Seed Relay**

- As you are hiking with the students or before they arrive, collect two of each leaf, needle, or seedpod you will be identifying with them.
- At the end of the forest hike divide the group into two smaller groups and place each group in a single file line.
- Explain to the students they will be running a race and testing their knowledge of the trees they studied.
- In order to win, they must not only be the first team to get back into their original line-up but they must also be able to correctly identify the leaves and seed pods they collected.
- Place the two piles of leaves, needles and seedpods a distance away from them.
- Tell the students when you say “go,” the first person must run, grab a single leaf or seedpod and tag the next person in line. The person who was tagged will run and grab another leaf or seedpod and do the same thing as the first. The first needs to return to the back of the line. The students will continue doing this until they are lined up in their original order.
- Once you have them back in their original line-up, ask each student in the team that finished first to identify their leaves, needles and seedpods. If they can individually identify their leaf or seedpod correctly their team wins. However, if some cannot identify their leaves or seedpods, the second team will have a chance to win the race by correctly identifying their leaves and seed pods. In the event that neither teams identifies all of their leaves correctly, the team with the most correctly identified leaves wins. If both teams identify the same number of leaves correctly the team who finished first is the winner. Another option (if time permits) would be to review the leaves, needles and seedpods again and run the race one more time as a tie-breaker.

### **2. Meet a Tree:** (See Teaching Aids)



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# Teaching Aids

## Background Information:

### Life in a Rotting Log

#### Importance of fallen trees:

- The rotting log serves as a habitat or as a source of food for certain organisms.
- These trees eventually decompose and change into nutrient-rich soil, which can provide new areas for plant growth.

#### Stages of a tree's life cycle:

- Seedling
- Sapling
- Mature tree
- Snag

#### Some things which cause the death of a tree:

- Old age
- Lightening
- Disease
- Insects
- Humans

#### Some things which can help a log decompose:

- Insects
- Birds
- Wind
- Rain
- Snow

### Tracks and Traces

#### Reasons why we might not see animals:

- We scare them with our loud noises
- The animals may be asleep
- The animals may be well camouflaged

#### Visual clues animals may leave:

- Tracks
- Feathers
- Fur
- Bones
- Scat
- Nests
- Holes in the ground

(Turkeys disturb areas where they scratch at the ground for insects and buried seeds. In the fall, deer rub their antlers on trees and scrape off the bark.)



Ground type which shows the best tracks:

- Wet ground near the shore
- Wet sand
- Mud

Sense of smell clues:

- Skunk odor

Sense of hearing clues:

- Bird songs or calls
- Animals rustling in the leaves

Information we gather from tracks:

- The size of the animal
- Whether the animal has claws
- Where the animal was going
- The number of animals in the area and how many different kinds



**Forestry Hike**

- Difference between a White Oak leaf and a Red Oak leaf
- A White Oak leaf always has rounded lobes
- A Red Oak leaf always has pointy lobes

**How to play Meet A Tree**

- First, separate students into pairs. Have one of the students close his or her eyes or blindfold him/her. The other partner takes his/her partner to meet a tree. Have the student with closed eyes feel the tree and take notice of the bark and leaves and any other characteristics. Then take him/her away from the tree and spin him/her around a few times. Take the blindfold off or tell him/her to open his/her eyes and have him/her try and guess which he/she just met.<sup>1</sup>

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<sup>1</sup> *Project Learning Tree Activity Guide, 2006.*



# Rotten Log Tally Sheet

| Hypotheses |        | Data Found |        |
|------------|--------|------------|--------|
| Animals    | Amount | Animals    | Amount |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |
|            |        |            |        |



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## Extension Activities

### *Pre-activity for Classroom Teacher*

Review the vocabulary words and discuss why we need forests. The students can draw pictures of what they think the forests will look like on their field trip.

### *Post-activity for Classroom Teacher*

Use the tally sheet from the rotten log activity as data to create graphs representing the different numbers of each kind of animal found on the field trip. Using graph paper, illustrate the various kinds of charts and graphs used by scientists to illustrate data. Have the students determine which of the following type of graph best represents the data: a bar graph, a line graph or a pie chart.

Make a class list of why forests are important to people, animals and the Chesapeake Bay. Discuss with your students what they learned on the field trip. Ask them what they learned that they did not know before they went. Write the students' answers on the board. You may want to make this a creative writing exercise.

## Resources

- Brewer, Richard. The Science of Ecology. 2nd edition. Saunders College Publishing. 1994.
- Burns, Diane. Trees, Leaves and Bark Northwood Press. Minnetonka, MN. c. 1995.
- Dendy, Leslie. Tracks, Scats and Signs Northwood Press. Chanhassen, MN. c. 1995.
- Mitchell, Martha & Levine, Lynn. Mammal Tracks Life Size Tracking Guide Heartwood Press. East Dummerston, VT.
- Project Learning Tree Activity Guide Pre-K-3. American Forests Foundation. 2006
- Spiders and their kin. A Golden Guide. St. Martin's Press: New York, NY. 2002.
- Trees. A Golden Guide Golden Press. St. Martin's Press: New York, NY. 1987.
- What Tree is That? Pamphlet by The National Arbor Day Foundation. Nebraska City, NE. Draft-March 2006.

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 *Reducing Use of Resources*



**In-school Lesson**  
**Grade: 4**

Program Length: 1 hour  
Number of Instructors needed: 1

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 4

**Social Science: *Economics***—Explain how taxes finance government operations and provide public goods and services in Maryland. Describe the different types of markets in Maryland.

**Political Science**—Describe how governments create rules to maintain order, protect citizens and provide services in Maryland. Explain the importance of civic participation as a citizen of Maryland.



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## Synopsis

Students will gain an understanding of recycling and its importance to the environment through class discussions and hands-on activities. Students will learn how their recycling efforts affect the Chesapeake Bay, and help conserve natural resources. Recycling is a service provided by local governments, and is a part of the economic market. This lesson is taught in the classroom and can serve as a pre-trip session or follow-up session for the landfill field experience.

## Objectives

- Explain the importance of recycling.
- Recognize that recycling is a governmental service and all individuals can participate in recycling.
- Explain how recycling is part of the economic market.
- Explain how students' participation in recycling contributes to the economic market.
- Explain how recycling conserves natural resources and benefits the Chesapeake Bay Watershed.

## Materials

- At least two items made from recycled plastic
- At least two items made from recycled paper
- A metal can
- A glass bottle
- Recycle process bags
- School classroom's garbage can
- A large garbage bag cut open
- Garbage can display or poster illustrating percent of each type of recyclable waste found in an average garbage can (see Teaching Aids)
- Fake money
- Pre-made recycling process bags or cards (see Teaching Aids)
- Over-packaged lunch and package-friendly lunch (see Teaching Aids)





# Vocabulary

**Landfill** - A plot of land used to dispose of solid waste.

**Recycle** - To reuse or reprocess something.

**Natural Resources** - Things obtained from nature used to meet human needs.

**Biodegradable** - The ability to decay or breakdown by itself.

**Decomposition** - The decay or breakdown of an object.

**Compost** - A mixture of decaying organic material.

**Economy** - The organized production, consumption, and exchange of goods and services.

**Economics** - The study of the economy.

**Market** - A meeting together of people to buy and sell goods and services.

**Conservation** - The careful use and care of our natural resources.





# Recycling Lesson Plan

*The following lesson plan is broken into four parts. The lesson takes place in the students' classroom.*

**Part 1. What is Recycling?** - 30 minutes. Two instructors.

**Part 2. What Can We Do?** - 10 minutes. One Instructor.

**Part 3. Understanding the Recycling Market as an Economy** - 15 minutes. One Instructor.

**Part 4. Conclusion** - 5 minutes. One Instructor.

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## Part I. What is Recycling?

To prepare for this section place products made from recycled materials nearby for easy access.

### A. Introduction

- Introduce yourself.
- Ask the students, “*Who drinks milk? Who reads magazines?*”
- Ask them, “*What happens to the magazine or milk jug once you’re done reading the magazine or drinking the milk?*” (It may get thrown away).
- Ask them, “*Where do things go when they are thrown away?*” (To the **landfill**.)
- Ask them, “*What is a landfill?*” (It’s a plot of land used to dispose solid waste.) If the class has visited the landfill, review what they saw at the landfill. If the class has not been to the landfill, tell them a landfill is a place to safely store trash and it is surrounded by plastic liners and layers of clay to help prevent toxic liquids leaking into the ground.
- Ask the students, “*What is one way to reduce the amount of trash sent to the landfill?*” (Reduce, reuse, or recycle things.)
- Ask them, “*What does it mean to recycle?*” (It means to reprocess something in order to use it again.)
- Write the three R’s on the board: Reduce Reuse and Recycle.
- Show the students some products made from recycled materials (i.e. something made from recycled plastic, something made from recycled paper, a metal can and a glass bottle).
- Ask them, “*Why do you think it is good to recycle?*” (Recycling saves energy and money, reduces pollution, increases landfill space and saves natural resources.)
- Ask them, “*What are some things you use that are considered a natural resource?*” (Trees, oil, water, cotton, lead in pencils, energy, etc.)



## B. Recycling Process Activity

For this activity, use the pre-made recycling process bags or cards.

- Divide the students into groups and hand each group a bag or set of cards. (depending on the materials you created.)
- Tell the students that these items will help explain the recycling process. Ask them to put the items in the order they think the recycling process would occur.
- Once all the groups have put their items or cards in order, go through and explain each product's recycling process.
- Ask the students, "*Which item do you think is the most beneficial to recycle: an aluminum can, glass bottle or plastic bottle?*" (The aluminum can and glass bottle because they can be entirely recycled to make another aluminum can and glass bottle. Currently, plastic bottles are not entirely recycled into another plastic bottle due to cost.)

## Part 2. What Can We Do?

For this section, use the class' garbage can and the pre-made garbage can display.

### A. Reduce by reusing

- Tell the students that we can reduce the amount of waste that goes into the landfill by reusing things. (Reusing pasta sauce jars to store other food, using packing peanuts again.)

### B. Reduce by recycling

- Ask the students, "*What items do you think we throw away the most in a day?*"
- Show the students the contents of the classroom garbage can (dump it out onto a large, cut garbage bag). Show the students how we throw away items that can be recycled.
- Show the display garbage can and explain that we often throw away items that can be recycled (newspaper, tissues, paper bags, paper towels). This display represents the average household's trash.
- Ask them, "*What if something cannot be recycled and you don't want to throw it away? What can you do with it?*" (Reuse it. Point out the Containers/Packaging section of the trashcan display that contains a styrofoam or plastic cup.)
- Ask them, "*How can you reuse this cup?*" (Use it to put plants in, use it as a vase, or use it to hold things like nails, money, etc.)
- Ask the students, "*Should glass, plastic and aluminum cans be in the trashcan?*" (No, because you can recycle them.)
- Ask the students, "*How can we reduce the amount of yard waste and food we throw away?*" (We can recycle and put things in a **compost**.)



Rich composted soil helps the garden flourish.

- Ask the students, “*What is compost?*” (It is a mixture of decaying organic matter.)
- Ask the students, “*What does it mean when something is **biodegradable**?*” (It means that the object can **decompose** by itself—orange peel, gum, paper etc. Tell the students that if something can decompose, it means that it can break down or decay. Items we throw in a compost pile should be able to decompose quickly.)
- Tell the students by reusing products and reducing the amount of trash we throw away, we are helping to protect our natural resources. Tell them the careful use and care of our natural resources is called **conservation**.

### C. How Can We Recycle?

- Governments in Maryland help pay for recycling. The government collects taxes from people in order to pay for services everyone needs, such as recycling. Ask the students, “*Do you know how taxes are collected?*” (Tolls on highways, taxes on candy, taxes on toys, taxes are taken out of people’s work checks each time they get paid, etc.). The government uses some of the money they get from taxes to help set up and operate a recycling system for the community.
- Explain your local municipality’s recycling operations to the students, so they understand how they can recycle in their local community.

## Part 3. Understanding the Recycling Market as an Economy

### A. A student in the Recycling Market

- Tell the students, “*An **Economy** is the organized production, consumption and exchange of goods and services. **Economics** is the study of an economy.*”



- Tell the students, “A Market is a meeting together of people to buy and sell goods and services. Think about a flea market where people meet to buy and sell things to each other. Now, think about a Recycling Market, where people meet to buy and sell recyclables.” Tell the students you understand that they may be confused, so you will try to help them understand the Recycling Market by drawing a diagram and having student volunteers act out the parts.
- Select a student volunteer or draw a person on the board and tell the students, “This is you.” Draw a soda can inside of a square to represent a store. Tell the students that this symbolizes a store with soda bottles and cans for sale. (Select another student or draw another person on the board who represents the store cashier, and give him/her a soda can and a soda bottle).
- Tell the students, “You have money to spend on a drink so you choose a soda in a metal can, and you give your money to the store.” Draw a line connecting the person and the can with a dollar sign in the middle. (Have the student volunteer give some money to the cashier in exchange for the soda can.)
- Tell the students, “When you’re done with your soda can, you bring your can to the recycling center.” Draw another square to represent the recycling center and another person with a hat to represent the recycling plant owner (select a student volunteer to be the recycling center operator who takes the can).
- Tell the students, “The recycling operator takes your can and combines it with other cans until they have a lot of metal cans.” Connect the recycling plant operator and the can. Draw another square to represent the soda company.
- Tell the students, “The recycling operator then sells this metal to the soda company to make more cans.” (Have another student represent the soda company owner and give this student some money.) Draw arrows and dollar signs to connect the recycling plant operator, the can, and the soda company. (Have the recycling plant operator give the soda company owner the metal can in exchange for some money.) Now, the soda company makes more cans from the old recycle cans.
- Tell the students, “This exchange of money forms a market economy and what we have illustrated here is the recycling market.” Ask the students, “Are you part of the recycling market?” (Yes.) “Does the recycling plant owner make money because you recycled?” (Yes.) “Did the soda company have to go out and use natural resources to make the can?” (No.) Energy is still needed to make new cans, but less energy is required.
- Ask the students, “Would you be willing to pay more for your soda if the bottle was made out of recycled materials instead of natural resources?”





- Tell the students every person has the right to make their own choices when they buy things in the **market**.
- Tell the students that a recycled plastic soda bottle can be made into: plastic bottles (currently they are not made of 100% recycled plastic), plastic grocery bags, trash bags, plastic lumber and polar fleece.

## **B. Your choices as consumers in the market**

### 1. Buying items made from recycled materials

- Repeat to the students, *“Everyone has choices to make in the economic market. Not everyone has the same amount of money to spend.”*
- Explain to the students how recycling only works if we complete the cycle and buy recycled products. We contribute to the cycle when we reuse things and bring things to the recycling center.
- Ask the students, *“What are some things you can buy with your money that are made from recycled materials?”* (paper, soda cans, glass soda bottles, paper folders, plastic folders, etc.)  
\*NOTE plastic soda bottles were not 100% recycled into another soda bottle at the time this lesson was written.
- Ask the students, *“How do we know if an item is made from recycled materials?”* (If it is aluminum or glass and sometimes it says so on the item).

### 2. Considering Packaging

- Tell the students, *“We can reduce the amount of paper and plastic we throw away if we consider the packaging products come in.”*
- Ask them, *“What is packaging?”* (A product’s wrapping.)
- Ask them, *“What is your favorite thing to buy at the grocery store?”*
- Ask them, *“What is your favorite thing usually wrapped in?”*
- Ask the students, *“Why is packaging necessary?”* (It protects food from spoilage, it keeps products clean and it advertises the products.)
- Tell the students to think about the amount of packaging some things are wrapped in. For example, ask them to think about the toys they buy at toy stores. Sometimes the toys have cardboard attached to their backs to help them stand up. The toys are attached to the cardboard by plastic ties that take forever to untwist. In addition, the toys are often wrapped in a box and in plastic.
- Ask the students, *“Do you think all this packaging is necessary?”*
- Ask them, *“Do you think you could use less packaging for a toy while keeping it protected and still advertise it?”*



**C. Packaging Activity** (start this activity only if there are at least 10 minutes remaining, otherwise skip to “Why should we recycle?” section.)

For this activity you will need two student volunteers. Have each student come up to the front of the room. Give each student an imaginary lunch (an over-packaged lunch or a recyclable lunch).

- Tell the students that each student has a different kind of lunch. Point out to the class what kind of lunch each student has.
- Have the volunteer students go through each lunch to show the class the contents of the lunches.
- Ask the students, “*Once you are finished eating your lunch, what do you have left to throw away?*” Go through each item and discuss whether it can be recycled or whether it must go into the landfill.
- Ask the students, “*Which do you think is the best kind of lunch to pack?*” (A lunch that is 100% recyclable.) “*Why?*” (Less waste will be going to the landfill)
- Ask the students, “*Why should we care about packaging and recycling?*”

## Part 4. Conclusion

### A. Why should we recycle?

- Tell the students that recycling and reducing the amount of packaging we throw away affects the different kinds of habitats because it reduces the amount of trash and the amount of natural resources that we use.
- Ask the students, “*Can you think of a large habitat that is important to the Eastern Shore?*” (The Chesapeake Bay.)
- Tell the students the Chesapeake Bay and the habitats surrounding the Bay are all part of a very important ecosystem that provides a home to a variety of wildlife such as birds, fish and small mammals.
- Ask them, “*How do we depend on the Chesapeake Bay ecosystem?*”  
(For **food** such as fish and crabs.)  
(For other **natural resources**, like trees.)  
(For **industry**, such as commercial fishing and crabbing, boat-building, tourism, etc.)  
(For recreation, like swimming, boating, fishing, hiking, etc.)
- Ask the students, “*What would happen if we cut down too many of the trees around the Chesapeake Bay?*” (We would not have trees to provide us with shade and oxygen. Birds would need to find other places to nest. Without trees, sediment would run into the Bay and cloud the water, so plants couldn’t grow in the water. There would be fewer plants for Bay animals to feed on and to hide in. Also, there would be no local wood source for boat-building and home construction.)
- Tell the students that recycling helps to protect our natural resources.
- Ask the students, “*So, does recycling help protect the health of the Chesapeake Bay Watershed?*” (Yes!)



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# Teaching Aids

## 1. Collect information on your local municipality's recycling system.

## 2. Directions for making a garbage can display or poster illustrating the volume of each type of waste found in an average garbage can:

Make a cardboard garbage can display by gluing actual items to the cardboard. Divide the garbage can into the following sections so that it represents different volumes (similar to a pie chart or bar chart). Label each section:

- Nondurable Consumer Goods (31%): Items that don't last a long time. This category includes newspapers, magazines and paper towels, clothing and disposable dinner plates.
- Containers/Packaging (27%): This category includes cans, jars, bags, bottles, boxes and wrapping materials. (Note - This section must contain a Styrofoam or plastic cup.)
- Durable Consumer Goods (32%): Items that last a long time. This category includes large items such as washing machines, old furniture and rubber tires.
- Yard Wastes and Food Wastes (10%): This category includes leftover food, grass clippings, dead plants and bushes, branches and soil.

## 3. How to make the recycling process bags or cards

Refer to a resource such as: (**Energy Kid's web page at <http://www.eia.doe.gov/kids/energyfacts/saving/index.html>**) to obtain information on how aluminum cans, glass bottles and paper are recycled. A Ziploc sandwich bag containing items or a card with a picture can be used to represent each stage of the process. For example, if using Ziploc bags to illustrate the recycling of a metal can, make four bags with cards containing the following illustrations or items and messages:

1. A metal can with the following statement: *"You recycle the aluminum can."*
2. Metal chips or fragments with the following statement: *"The recycling company shreds the can."*
3. A piece of aluminum foil or a 2 inch by 2 inch piece of a can that looks like an aluminum sheet with the following statement: *"The recycling company melts the aluminum pieces and makes it into aluminum sheets."*
4. An aluminum can with the following statement: *"The aluminum sheet is rolled into a can."*

## 4. Directions for making a packaged lunch and a recyclable lunch.

Over-packaged lunch: Place a pre-packaged lunch such as a Lunchable, a container of juice that can't be recycled (ex. a foil bag), a bag of potato chips and a novelty candy made of plastic such as a Baby Bottle Pop inside a plastic bag (the plastic bottle and bag could be recycled).

Package-friendly or recyclable lunch: Place a sandwich wrapped in plastic wrap or wax paper, a metal juice can, a whole carrot, an apple and a wrapped cookie inside a reusable or recyclable lunch bag.





Note for lunch bag activity: Sometimes reusable lunch boxes and plastic containers use more natural resources and energy during production compared to plastic supermarket bags, paper lunch bags, wax paper or plastic wrap. In addition, most reusable lunch boxes and plastic containers must be discarded in a landfill when they are no longer usable.

## Extension Activities

### Recycling Jeopardy

For this activity, divide the students into two groups. Assign one person from each group as the spokesperson. It works best if the spokesperson is the only one allowed to tell you the group's answer.



#### A. Recycling Jeopardy Game

- Draw a large table on the board with 5 columns and 5 rows. Fill in each column of the table with the category headings and points values provided below.
- Ask the students if they know the rules of Jeopardy. If they don't, explain that all the answers must be in the form of a question and that if one team doesn't answer a question correctly, the other team can steal the question.
- Go over each category and explain to the students what each category means. Explain that the more difficult questions are indicated by the higher numbers.
- Keep score on the chalk board and play until there is only about five minutes left to the class.

### Categories, Points and Answers for Recycling Jeopardy

#### TERMS AND PHRASES

- 100:** The 3 R's of Recycling.  
(Answer: What is reduce, reuse, recycle?)
- 200:** A site for the burial and decomposition of solid waste.  
(Answer: What is a landfill?)
- 300:** Helps compost piles decompose properly.  
(Answer: What is moisture, air and organic material?)
- 400:** The contamination of soil, water, or air by the release of harmful substances.  
(Answer: What is pollution?)
- 500:** The careful use and care of our natural resources.  
(Answer: What is conservation?)

#### PAPER AND TREES

- 100:** Product made from recycled paper.  
(Answer: What are stationary, cardboard packaging, cups, newspapers?)
- 200:** Recycling paper.  
(Answer: What saves forests, energy and water. It also cuts down on garbage?)
- 300:** Uses 500,000 trees every Sunday.  
(Answer: What are newspapers?)
- 400:** The largest percentage of our trash.  
(Answer: What is paper?)
- 500:** Uses 2 large pine trees worth of paper products each year.  
(Answer: What is one person?)



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## WHAT CAN WE DO

- 100:** What you can do with a product that can't be recycled.  
(Answer: What is reuse it?)
- 200:** Can be used when grocery shopping instead of plastic or paper bags.  
(Answer: What are cloth or string bags?)
- 300:** Use instead of paper and plastic plates, cups and utensils.  
(Answer: What are washable plates, cups and utensils?)
- 400:** Recycling location.  
(Answer depends on your community's recycling policies and procedures)
- 500:** Reusing a piece of paper.  
(Answer: What is writing or drawing on the other side?)

## RECYCLING FACTS

- 100:** The percentage of landfill that is packaging waste.  
(Answer: What is 33%?)
- 200:** The period in which the average American throws away his weight in packaging.  
(Answer: What is a month?)
- 300:** In America, 1,500 cans are recycled every \_\_\_\_\_  
(Answer: What is a second?)
- 400:** The most abundant metal on earth.  
(Answer: What is aluminum?)
- 500:** 75% of America's glass is used for this purpose.  
(Answer: What is packaging?)

## RECYCLING SCIENCE

- 100:** Done to glass containers before recycling.  
(Answer: What is rinse them out and take off the lid?)
- 200:** Of an aluminum can, a wool sock, a cotton rag and a piece of paper, this biodegrades the fastest.  
(Answer: What is a piece of paper?)
- 300:** Helps in the decomposition of an object.  
(Answer: What is light, air, moisture, worms, bacteria, insects and wind?)
- 400:** Of tin, steel and aluminum, the easiest to recycle.  
(Answer: What is aluminum?)
- 500:** The term that describes an object that breaks down by itself.  
(Answer: What is biodegradable?)

## RECYCLE, COMPOST, OR LANDFILL

- 100:** Soda Can  
(What can be recycled?)
- 200:** Glass Baby Food Jar  
(What can be recycled?)
- 300:** Old, Stinky Sneaker  
(What is sent to the landfill?)
- 400:** Lawn Clippings  
(What can be composted?)
- 500:** Waxed Cardboard  
(What is sent to the landfill? or What can sometimes be recycled?)



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## Resources

Douglas County Recycle Power. <http://www.co.douglas.or.us/recycle/fair.htm>

Energy Kid's Page. <http://www.eia.doe.gov/kids/energyfacts/saving/index.html>

Merriam - Webster Online Dictionary. <http://www.m-w.com/home.htm>

Municipal Solid Waste website. <http://www.epa.gov/msw/recycle.htm>

Patagonia PCR clothing website. <http://www.patagonia.com>

Process of Paper Recycling. <http://www.rgs.edu.sg/events/cyberfair98/recycling/process.html>

Recycling Fun Facts. <http://www.resourcefulschools.org/html/facts.html>

Talbot County, Maryland - Public Works. <http://www.talbgov.org/pw/publicrecycle.html>





# *Cutting Back on Bay Pollutants*



**Field Trip Experience**

**Grade: 4**

Program Length: 1 hour, 45 minutes

Number of Instructors needed: 2

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

### Grade 4:

**Science:** *Natural Resources and Human Needs*—Recognize and explain how renewable and non-renewable natural resources found in Maryland are used by humans to meet basic needs.

*Environmental Issues*—Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences and trade-offs.

**Social Studies:** Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 4:

**Social Studies:** *Geography*—Describe how people adapt to, modify and impact the natural environment.

*Economics*—Describe the different types of markets in Maryland.

*Political Science*—Describe how the government creates rules to maintain order, protect citizens and provide services in Maryland.

### Grade 5:

**Science:** *Natural Resources and Human Needs*—Recognize and explain how renewable and non-renewable natural resources are used by humans to meet basic needs.

*Environmental Issues*—Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences and trade-offs.



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## Synopsis

This lesson is a field trip experience that takes place at the local waste management facility. It has two components that teach students the basics of waste management and recycling. Students will tour the waste management facility and learn through hands-on activities about different recyclable materials and what products can be made from those materials. Students will leave with an understanding that waste management and recycling services provided by local government are also a part of the economic market. Students will be able to explain how landfills use a non-renewable resource. Students will be able to explain how recycling can reduce the amount of solid waste that goes into the landfill and the amount of natural resources that we use.

## Objectives

- Understand the need for governments to assist with providing waste management and recycling services to the community.
- Describe how people impact the natural environment by creating landfills and by recycling.
- Explain that waste management and recycling are part of the economic market.
- Recognize and explain how creating landfills uses a non-renewable natural resource to meet basic human needs.
- Understand how these waste management practices benefit the Chesapeake Bay.

## Materials

### Landfill Tour

- A map of the landfill
- Sample of the plastic liner used in landfills

### Recycling

- A plastic bottle with cap
- 5 plastic shopping bags containing 6 recyclable items (1 bag for every 4 students)
- 5 clipboards (1 for every 4 students)
- Pencils
- Scrap paper
- Products made from recycled materials



# Vocabulary

**Landfill** - Areas where solid waste is placed into the land and surrounded by layers of plastic and soil.

**Solid Waste** - Also referred to as trash or garbage, it consists of everyday waste such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries.

**Leachate** - Liquid that drains out of the waste material in the landfill. It may consist of toxic liquids from the garbage, bacteria and small particles of waste.

**Decomposition** - The breakdown of garbage into smaller particles and soil.

**Biodegradable** - The ability of material to decompose.

**Non-biodegradable** - The inability to decompose.

**Recycling** - The process of reusing or reprocessing something.

**Natural Resources** - Materials found in nature that we use to meet our needs.

**Economic market** - The organized production, consumption, and exchange of goods and services.

**Market** - A meeting together of people to buy and sell goods and services.

**Non-renewable resource** - A natural resource that is not replaceable after it has been used.



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# Cutting Back on Bay Pollutants Lesson Plan

*This lesson plan is broken into three parts. The class will stay together for the introduction and then must be divided into two groups. The groups will rotate through the second and third parts of the lesson.*

**Part 1. Introduction** - 10-15 minutes. One Instructor. Suggested location: On bus.

**Part 2. Landfill Tour** - 45-minutes. One Instructor. Suggested location: On bus driving through landfill.

**Part 3. Recycling Area Tour** - 45-minutes. One Instructor. Suggested location: In front of recycling containers at landfill.

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## Part I. Introduction

### A. Introduction

This introduction should be done before the landfill tour and recycling area tour. Give the introduction while the students are on the bus, if possible.

- Introduce yourself.
- Ask the students, “*Did you throw something in the trash today?*”
- Ask them, “*Where do you think it goes after it leaves your home or school?*” (To the landfill.)
- “*Who can tell me the definition of a landfill?*” (It is an area where solid waste is placed into the land and surrounded by layers of plastic and soil.)
- Explain how trash gets to the landfill in your area. Explain how the government is involved in providing this service to the community. In many areas, waste management companies collect the trash from the curb in front of your home, then deposit it at the landfill. Sometimes the government pays for this service using tax dollars, and sometimes residents must pay for the service.
- Ask the students, “*What would happen if the government didn’t provide a place to put trash?*” (We need landfills because they are safe locations where all trash is placed. If everyone were to dump their garbage in their backyard or on the side of the road, it would be very unsanitary and pollute the Chesapeake Bay.)
- Tell the students landfills are plots of land used for the disposal of solid waste. **Solid waste**, also referred to as trash or garbage, consists of everyday waste such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint and batteries.
- Ask them, “*What else could we do with our trash besides putting it into a landfill?*” (Reduce, reuse and recycle. For example, they can compost at home, reuse un-recyclable items in projects and take recyclables to local recycling areas.)
- Divide the students into two groups for the landfill and recycling tours. Take one half of the students off the bus for the recycling tour.





## Part 2. Landfill Tour

### A. Introduction

In preparation for the tour, contact the local landfill. Make sure school tours are allowed. Collect information to be included in this tour, including: a map, the year the landfill will close, information on recycling at the landfill, a list of items that are separated out, such as yard waste, tires and refrigerators, and the locations of leachate lagoons. Before beginning the bus tour, make sure the students know to remain seated in the front of the bus.

- Introduce yourself.
- Ask them, “*Have you been to a landfill before?*” Tell the students they will be driving over a mountain of trash!

### A. Structure of a Landfill

- Landfills use space in the ground. This ground space is a non-renewable natural resource. Once we use the space, we might never be able use it again, so this landfill is using a natural resource that is non-renewable.
- Pass maps out to the students. Show them where they are on the map.
- Explain to the students the structure of the landfill. Most landfills are broken into individual cells, which have a bottom layer of clay, a plastic liner, and another layer of clay, with trash and soil layers above that. When the cells are filled, they are capped, covered with soil and seeded to prevent erosion.
- Ask the students, “*Does the landfill smell as bad as you thought it would?*” Tell the students that every night the landfill material is covered with dirt. This reduces the smell and stops wildlife from searching for food in the landfill.

### B. Landfill Liners and Leachate

- Pass around the samples of plastic liners.
- Ask the students, “*Why do you think landfills must be lined on the bottom with heavy plastic?*” (Landfills are regulated by many laws. One requirement is they must be lined to protect the environment and public health. These liners are puncture resistant and impermeable. If landfills were not lined, toxic chemicals and other nasty liquids could leach through the soil into our drinking water supply and eventually make their way to the Chesapeake Bay. Mandatory water quality testing is done at landfills on a regular basis.)
- Stop at a leachate pool.
- Ask the students, “*Can you guess what liquid is in this pool?*” It is **leachate**, or toxic liquid that has drained out of the waste material in the landfill. If they see liquid on top of the leachate pool’s rubber or plastic covering, it is probably rainwater. They should not be able to see the leachate itself as it is too toxic. Explain that they would need masks and protective suits to be near the leachate. In some landfills, leachate is taken to a hazardous waste facility. In others it is pumped back through the individual cells to aid in decomposition.



- Point out the methane torches next to the leachate pool. Ask the students, “*What do you think the torches are used for?*” (These burn off the methane gas that is a result of the decomposition.)

### C. Decomposition

- Ask the students, “*What is decomposition?*” (Decomposition is the breakdown of an item, in this case of garbage, into smaller particles and soil.)
- If you are getting no response to “what is decomposition” ask them a question such as, “*Will a banana peel look like a banana peel in 50 years?*” (No.) “*Why not?*” (It decomposes.)
- Ask them, “*What helps things decompose?*” (Air, sunlight, water, worms, bacteria and bugs all contribute to decomposition.)
- Ask them, “*Why do we want the trash to decompose?*” (As trash decomposes, it allows room for more trash.) Adding the leachate back into the cells causes faster decomposition. Under normal circumstances, a glass bottle takes 1 million years to decompose. A plastic beverage bottle and a disposable diaper take 450 years to decompose. An aluminum can takes 100-250 years to decompose and a Styrofoam cup takes 50 years. So, a Styrofoam cup is more biodegradable than an aluminum can because it decomposes faster. A plastic film canister takes 10-20 years to decompose.



### D. Re-usable Items

- Stop at piles of **non-biodegradable** items, such as tires, refrigerators and other appliances, etc.
- Ask the students, “*What does non-biodegradable mean?*” (The inability to decompose or breakdown.)
- Ask them, “*Why are these items separated from the regular landfill material?*” (These items don’t decompose, so they are not suitable to be placed in a landfill where other things are decomposing.) Some items, such as tires, may be reused. Others, such as refrigerators, can be reused or recycled, but must have harmful toxins or chemicals removed first.
- Stop at a brush pile. Ask them, “*Why is this separated from other landfill material?*” (Trees and other items can be reused or recycled as mulch or compost, decreasing the amount of material that goes into the landfill.)



## E. Conclusion

- Ask the students, “*Why would we want to reduce the amount of trash we put into a landfill?*” (Most landfills only last 20 years. Finding space for landfills is difficult and landfills can have a negative impact on surrounding homes and neighborhoods, the local environment or watershed, and wildlife. Creating a landfill impacts the land, but it is a way we can dispose of the trash that is non-recyclable and non-biodegradable. Ask the students, “*Why does the government help provide landfills for trash?*”
- Ask the students, “*What are ways we can keep landfills from filling up too fast?*” (Reuse, Reduce, Recycle.)
- “*Is it ok to dump your garbage out in open areas, ditches, or forests?*” (No!) “*Why not?*” (It pollutes the soil and water and hurts animals or people that come in contact with it.)
- Ask them, “*What are some ways in which this landfill helps the Chesapeake Bay?*” (The liner prevents leachate from reaching the ground water. Hazardous waste materials could be in the leachate, etc. If there were no fences or caps on top of the cells, trash could blow away and get into the surrounding environment. The landfill could also release toxic gases that harm the ozone layer.)
- Ask the students, “*What is the difference between dumps and landfills?*” (Landfills are regulated, and dumps are not. Dumps are any location where the dumping of trash is not regulated. Dumps are illegal in many states.)
- Explain to the students some practices that this landfill uses which are significant to this discussion.

## Part 3. Recycling

### A. Introduction

- Introduce yourself.
- Tell the students, “*We are going to tour the recycling area.*”
- Ask them, “*What is recycling?*” (Recycling is the process of reusing or reprocessing something.)
- Ask them, “*Why do we recycle?*” (To keep the amount of waste down.) As landfills fill up quickly, it is difficult to find new areas to make new ones. Recycling also uses less natural resources. Natural resources are materials found in nature that we use to meet our needs.
- Tell the students how glass bottles are created using sand, a natural resource. By recycling glass bottles, we will use less of the natural resource (sand). Also, aluminum is a natural resource, so by recycling aluminum cans, we conserve that resource.
- Tell the students recycling is a business that makes money because the recyclables can be sold to companies who make products out of recyclables.
- Ask the students, “*Who would want to buy recyclables?*” (If the students already had the in-school lesson on Recycling, they may be able to answer this question. Recyclables can be sold to



companies who can make them into products like paper, cans, bottles or other plastic materials.)

- This buying and selling of recyclables is an economic market. In an economic market, people meet and buy and sell things. (If the students already had the in-class lesson on recycling, you can remind them about the recycling market activity involving a soda can or soda bottle.)

### **B. Recycling Area Tour**

- Ask the students, “*What do you notice about these containers?*” See if the students notice any words on the containers. (There are instructions on the containers.)
- Ask them, “*Are instructions on the recycling containers important?*” (Yes, the instructions help people to know where to separate the recyclables, and to keep out anything that can’t be recycled with those items.)
- Ask them, “*Do you notice any garbage around the area of the containers? If so, why would this be a problem?*” (It is unsightly, attracts animals and pollutes.)
- Show the students the area where oil and anti-freeze can be dropped off.
- Ask them, “*Why is it important that people place their used oil and anti-freeze here and not in the street, on the ground or down a drain?*” (If they place it in the street, on the ground or down the drain it will harm people and animals.) Animals like the smell and taste of antifreeze and they will ingest the toxic chemicals. If someone dumped pollution like oil or antifreeze, it will eventually drain into the Chesapeake Bay. Polluting the water in the Bay harms plants and animals in the Bay. Ask the students, “*What happens to oil and anti-freeze at the landfill?*” (The used oil can be recycled as low-grade lubricant and the antifreeze is recycled as new antifreeze.)
- Show the students other recyclable collection areas for textiles, cardboard, batteries or other materials.

### **C. Recycling Relay**

- Divide the students into five groups. Give each group a bag of recyclables. Ask the groups to place them into the correct containers.
- Ask them, “*Was it easy or hard to figure out where the items were supposed to go? Why or why not?*”
- If there is a place to recycle the plastic grocery bags, then tell them to recycle them. Ask them, “*What else could we do with the plastic grocery bags?*” (We could reuse them to hold other things.)

### **D. Recycled Products**

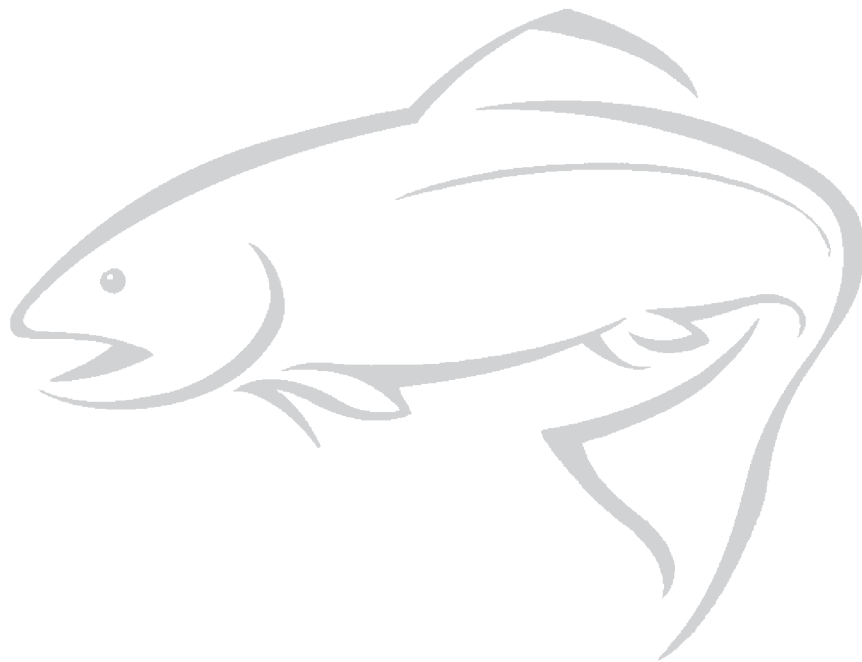
- Keep the students in the same groups as in the recycling relay. Pass out a piece of paper, a pencil and a clipboard to each group.
- Start passing around objects that are recycled products, such as carpet made from plastic fiber, plastic lumber, doormats made from tires, etc. Give each item a number. The students will try to guess what the item was before it was recycled.
- Go over the answers.



- Ask the students if they have bought recycled paper. Most products will be labeled as having recycled products in them. Ask them, “*Why is it good to buy products like these?*” (If you don’t buy recycled products, then you are not completing the cycle in the word “recycle.”)
- “*What things can you buy that are made from recycled materials?*” (Paper, aluminum cans, glass bottles, things made out of recycled plastic.) It is important to know that items made from plastic often end up in the landfill when the items break. We hope scientists will figure out a way to recycle all the pieces of plastic.

#### **F. Wrap-up and Review**

- Ask the students, “*How does recycling help the Chesapeake Bay?*” (It keeps landfills from filling up, uses fewer natural resources, lessens pollution of the Bay.)
- Remind the students recycling is a cycle. It is important to recycle and buy recycled products to support the recycling market.
- Remind the students that recycling is an economic market, where people make money. Companies buy recyclable items and use them to make new items for people to buy. Ask them, “*What was the term we used to describe the way people buy and sell recyclables?*” (The recycling market or an Economic Market.)
- Ask the students, “*What can you use that is made from recycled materials?*” (Paper, including newspaper, bottles, cans, plastic bags, plastic binders, rugs, etc.)
- Ask them, “*What could you reuse?*” (Stuff for school projects, such as egg cartons or shoe boxes, for example. They can compost biodegradable items and spread the compost on their lawn and garden.)





# Teaching Aids

## Acquiring Recycled Products:

- Recycled cotton. (to contact companies and acquire samples: [www.ecobags.com](http://www.ecobags.com), <http://yarn-store.com/2nd-time-cotton-yarn.html>)
- Carpet made from recycled plastic bottles. (to contact companies and acquire samples: <http://www.greenfloors.com>, <http://imageind.com>)
- Plastic lumber. ([www.usplasticlumber.com](http://www.usplasticlumber.com), [www.epsplasticlumber.com](http://www.epsplasticlumber.com))
- Recycled paper. (Staples, Office Depot, and Office Max all carry office products made from recycled plastic and paper)
- Doormat made from tire strips. (<http://www.rbrubber.com>, <http://www.recycledproducts.com>)
- Various products such as Fleece made from recycled plastic bottles. (<http://www.recycledproducts.com>, <http://www.patagonia.com>)

# Extension Activities

## *Pre and Post-activities for Classroom Teacher*

### Pre-Field Experience Activity:

#### 1. What is in our trash at home?

Brainstorm with the class about what they throw away or put into their trashcan at home. Make a list on the chalkboard. Since the students may not think of everything, help them think about the following items: take-out containers, plastic food containers, meat packaging, non-recyclable plastic bottles, broken toys. Make sure the list has some recyclable items in it like food scraps and paper. Ask the students, “*Is there anything we can recycle? Does everything have to go into the landfill?*” Brainstorm about how they can reduce, reuse and recycle items at home.

#### 2. The structure of the landfill

Illustrate on the board how a landfill has a special structure to hold trash and toxic substances in one place. Draw a large rectangle with the top line missing so that it looks like a square letter “U.” This represents the liner that surrounds the landfill. Inside the rectangle (on the bottom), draw a layer with lines coming out of the rectangle to represent the leachate pipes that collect leachate (toxic liquids that ooze out of the landfill). Draw a line over the leachate layer to represent a mesh liner that separates the trash and the leachate. Draw a layer of trash (squiggly lines). Put a layer of soil on top of the trash (polka dots). The soil stops the trash from blowing, decreases the smell and covers the trash so wildlife can’t eat it. Now, draw a line coming out of this layer to represent the methane gas flare. Gas builds up in the landfill. The gas needs to be released so the



landfill doesn't explode! Draw layers of trash and soil until the landfill is full. Cap the landfill with a layer of soil and then grass (draw lines to represent grass). Draw pipes coming out the top to represent more methane gas flares. The landfill will be monitored for leaks and gas build-up for years.

## Post Field Experience Activity:

### 1. Creative Writing

Tell the students to write a story about the landfill. The story should have at least two characters in it. These characters can be animals, people or make-believe characters like a soda can or a plastic bottle. Write the following questions on the board to get them started:

- a. Who are the characters in your story? What are their names?
- b. Describe the place where the characters are at the beginning of their adventure at the landfill.
- c. Write a sentence using action words to say what the characters do on their adventure at the landfill.

## Resources

Midshore Regional Landfill  
7341 Barker's Landing Road  
Easton, MD 21601

Patagonia (plastic fleece)  
8550 White Fir St., 89523  
P.O. Box 32060  
Reno, NV 89533-2050  
[www.patagonia.com](http://www.patagonia.com)

U.S. Environmental Protection Agency  
"Municipal Solid Waste"  
<http://www.epa.gov/epaoswer/non-hw/muncpl/facts.htm>



# *Ecosystems of the Chesapeake Bay*



## **Field Trip Experience** **Grade: 4**

Program length: 2 hours (1 hour for each ecosystem)

Number of Instructors needed: 2

Pickering Creek Audubon Center





# Standards of Learning

## Talbot County Student Performance Objectives:

Same as State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 4:

**Science: *Constructing Knowledge***—Gather and question information from many different forms of scientific investigations including observing what things are like or what is happening somewhere, collecting specimens for analysis and doing experiments.

***Communicate Scientific Information***—Recognize that clear communication is an essential part of doing science because it enables scientists to inform others about their work, expose their ideas to criticism by other scientists and stay informed about scientific discoveries around the world.

***Diversity of Life***—Explain how animals and plants can be grouped according to observable features.

***Flow of Matter and Energy***—Recognize food as the source of materials that all living things need to grow and survive.

***Ecology***—Explain ways that individuals and groups of organisms interact with each other and their environment.

***Environmental Issues***—Recognize and describe that people depend on, change and are affected by the environment.



## Synopsis

This lesson will introduce students to the various living and non-living components that make up an ecosystem. By comparing and contrasting the interactions between the living and non-living components of two different ecosystems, students will be able to explain variations that can occur between ecosystems. Students will conduct hands-on investigations using scientific tools and they will collect scientific data in each ecosystem that can be used back in the classroom. Students will be able to explain how each ecosystem is connected to the Chesapeake Bay.

## Objectives

- Understand what makes up an ecosystem.
- Understand the way food energy flows through an ecosystem.
- Analyze the interactions between the living and non-living components of an ecosystem.
- Compare and contrast two different ecosystems, one upland and one wetland.
- Classify plants and animals based on their observable features.
- Explain how the ecosystems are connected to the Chesapeake Bay.

## Materials

### For Field Ecosystem:

- Copies of Field Investigation Worksheet (1 / group) (see Teaching Aids)
- Pencils (1 / group)
- Clipboards (1 / group)
- Dry erase board & marker or flip chart & marker
- Wildflower field guides

### For Pond Ecosystem:

- Dry erase board & marker or flip chart & marker
- Large and small buckets or containers
- Pre-made sample jars of macro-invertebrates or macro-invertebrate identification cards
- Laminated pond chart
- Thermometer
- Large Pond Tally Sheet
- Center's pond data binder
- Long pole nets (1/student)
- Magnifying boxes or magnifying lenses
- Pond field guides such as *Pond Life*



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### For Wetland Ecosystem:

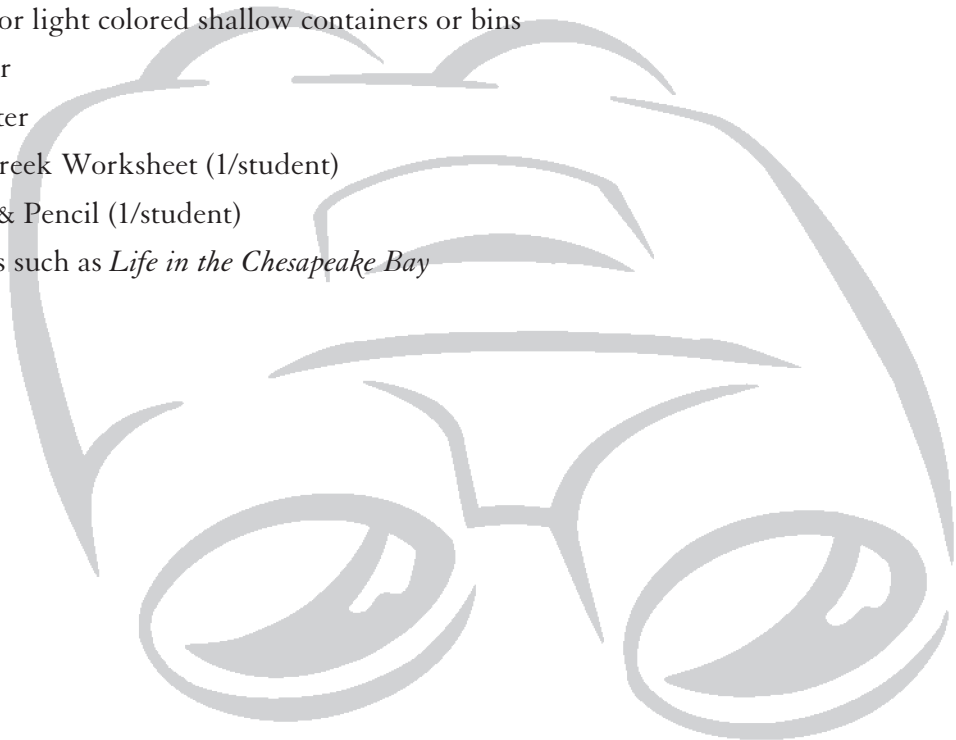
- Copies of Wetland Zones Worksheet (1 per group) (see Teaching Aids)
- Clipboards (1/group)
- Pencils (1/group)
- Plant guides (1/group)
- Wetland plants (1/group)
- Field guides such as *Pond Life*

### For Forest Ecosystem:

- Copies of forest find worksheet (1/group)
- Clipboards (1/group)
- Pencils (1/group)
- 4 pieces of rope or string (each 20ft in length)
- Dry erase board & marker or flip chart & marker
- Field guides such as *Eastern Forests* & *Newcomb's Guide to Wildflowers*

### For Creek Ecosystem:

- Binoculars (1/student)
- Crab traps with bait such as chicken necks
- 4 or 5 habitat boxes (see Teaching Aids)
- 4 or 5 clear or light colored shallow containers or bins
- Secchi meter
- Thermometer
- Copies of Creek Worksheet (1/student)
- Clipboards & Pencil (1/student)
- Field guides such as *Life in the Chesapeake Bay*





# Vocabulary

**Adaptation** - a change within an organism that allows it to better survive and reproduce.

**Bird of Prey** - a predatory, carnivorous bird such as an eagle or hawk.

**Brackish** - partly fresh and partly salt water.

**Camouflage** - concealment by disguise or protective coloring.

**Carnivore** - a flesh eating animal.

**Climax community** - the stage where a community of organisms is stable and capable of reproducing more of itself.

**Climax species** - the animal at the top of the food chain that has no predators as an adult.

**Community** - a group of plants and animals living and interacting with one another in a specific region under similar environmental conditions.

**Dead** - something that is no longer alive.

**Detritus** - debris and disintegrated organic materials.

**Ecosystem** - a collection of living and non-living things that function together within the environment.

**Environmental Indicator** - an organism whose presence, or lack of presence, determines how healthy the ecosystem is.

**Food Chain** - a line of succession that simulates energy flow from one organism to another as members lower on the chain are consumed by those higher up.

**Food Pyramid** - (Like a Food Chain) organisms lower on the pyramid are consumed by those higher up—a food pyramid illustrates how organisms at the bottom of the pyramid have a higher population than those at the top of the pyramid.

**Habitat** - the environment where an organism usually lives.

**Herbivore** - an animal that feeds mostly on plants.

**Living** - something that is alive.

**Non-living** - something that was never alive or was made from something that was once alive.

**Omnivore** - an animal that eats both meat and vegetation.

**Population** - all the organisms that make up a specific group or occur in a specific habitat.

**Predator** - an organism that lives by preying on other organisms.

**Prey** - an animal hunted or caught for food.

**Understory Growth** - the plants that grow on the forest floor.



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# Ecosystems Lesson Plan

*This lesson consists of a study of two different ecosystems, with one-hour sessions in each ecosystem. The Center instructor or schoolteacher may pick any two ecosystem combinations. Possible ecosystem combinations will vary depending on the lesson location. The lesson plan references each ecosystem separately, therefore, you will not use all parts of this lesson for a two-hour field trip. It can be extended by including more ecosystems. The class will be divided into two groups and will rotate through the two chosen parts.*

**Part 1. Field Ecosystem** - One hour. One Instructor. Suggested location: a meadow.

**Part 2. Pond Ecosystem** - One hour. One Instructor. Suggested location: a pond with shallow edges.

**Part 3. Wetland Ecosystem** - One hour. One Instructor. Suggested location: a wetland with water and typical wetland plants.

**Part 4. Forest Ecosystem** - One hour. One Instructor. Suggested location: a forest with areas of different vegetation.

**Part 5. Creek Ecosystem** - One hour. One Instructor. Suggested location: a large creek or river with access to a dock or pier.

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## Part I. Field Ecosystem

### A. What is an Ecosystem?

- Introduce yourself.
- Ask students, “*What is an ecosystem?* (A collection of living and non-living things that function together within the environment.) *What kind of ecosystem are we in?*” (Field ecosystem.)
- Ask students, “*What are the components of an ecosystem?*” (Living and non-living things.)
- Ask students, “*What do we mean by living? non-living? dead?*” (Something that is alive; something that was never alive or was made from something that was once alive; something that is no longer alive.)
- Have the students place their hands on their knees, close their eyes and be silent for ten seconds.
- Ask the students what they felt, smelled and heard while their eyes were closed.
- Explain that everything they felt, smelled and heard contributes to this ecosystem.
- Choose different components of the ecosystem (ex: grass, wind, sun, etc.) and have the students determine whether these factors are living or non-living.
- Ask the students how these components might affect each other.
- Tell the students that a good example of how living and non-living components affect each other is how the sun gives the grass energy to grow.
- Ask them, “*What are the different ecosystems in the Chesapeake Bay?*” (Salt marsh, freshwater wetland, forest, stream, bay and field.)



## B. Food Pyramid (see Teaching Aids)

- Tell the students that living organisms need to eat and get energy from some sort of food.
- Ask the students, “*How do plants get food or energy in order to survive?*” (Plants get their energy from the sun and soil.)
- Ask the students, “*What eats plants? animals? plants and animals?*” Introduce the terms **Herbivore**, **Carnivore** and **Omnivore**.
- Ask the students, “*What is a food chain? a food pyramid?*” (A food chain or food pyramid illustrates the transfer of energy from one organism to the next.)
- Draw a triangle on the board.
- Ask the students, “*What do we have the most of in our field?*”
- Write “Plants” at the base of your triangle.
- Ask the students, “*What eats plants?*”
- Choose one answer and write it above the “Plants” category.
- Do the same for the rest of the pyramid until you reach your **climax species**.
- Ask the students, “*What would happen if a fire destroyed half of our field?*”
- Demonstrate the removal of the listed species on the board.
- Ask the students, “*What would happen if the climax species were removed?*”
- Demonstrate their removal on the board.
- Tell the students that our ecosystem exists in a delicate balance—if something happens to one **population** the other species are affected.

## C. Field Find

- Tell the students that they are now going to investigate our field to find the living and non-living components within it.
- Have the students separate into groups of three or four.
- Give each group a clipboard, a pencil, and a copy of the Field Investigation Worksheet.
- Have the students take turns reading the questions on the worksheet to make sure everyone understands what they are supposed to do.
- Explain to the students that they should stay on the trail while filling out their worksheets to avoid ticks, poison ivy, and possible damage to the **habitat**.
- Lead the students along the trail, answering questions and pointing out interesting things along the way (ex: spider web, an over-turned log, a beetle, etc.).
- Make sure an adult is in the back of the student line and monitoring the students.
- Gather the students together.
- Have the groups take turns giving their answers to the questions.
- Have the students give their papers to their teacher.



## D. Predator Prey Game: Salamander Scurry

### Materials:

- 3 hula hoops
- 1 rope

Select two volunteers from the group. They are “**predators**” (ex: hawk and fox). The rest of the children are “salamanders.” Their mission is to run from where they are standing on one side of the stream (the rope) to their nesting ground on the other side (the hula hoops). The predators try to catch the salamanders. If a salamander is tagged, he/she becomes a predator. Once it becomes clear that there are more predators than prey, stop the game and have the students decide if it is better to have more predators or more prey. What happens if there are too many predators? Too many prey species?

## Part 2. Pond Ecosystem

### A. A Pond as an Ecosystem

- Introduce yourself.
- Since an **ecosystem** is made up of both **living** and **non-living** things, ask students, “*What do we mean by living? non-living? dead?*” (Something that is alive; something that was never alive or was made from something that was once alive; something that is no longer alive.)
- Point out examples of each to the students.
- Ask the students, “*What non-living things exist in this pond?*” (Water, rocks, sand, etc.)
- Discuss with the students how these components affect each other (ex: The sun and water affect the aquatic plants by giving them the energy they need to grow. Some aquatic plants need soil or the detritus found in the bottom of the pond in order to grow.)
- Explain what detritus is and tell the students it is an important part of the pond ecosystem.

### B. Food Pyramid (see Teaching Aids)

- Tell the students that living organisms need to eat and get energy from some sort of food.
- Ask the students, “*How do plants get food or energy in order to survive?*” Explain that plants get their energy from the sun and soil.
- Ask the students, “*What is a food chain? A food pyramid?*” (A food chain or food pyramid illustrates the transfer of energy from one organism to the next.)
- Draw a triangle on the board.
- Tell the students that we have various kinds of plants that grow in the pond.
- Write “Detritus” at the base of your triangle. Explain that some aquatic plants need the detritus in order to get nutrients, just like plants get nutrients from soil on land.
- In the next space above detritus write “Pond Plants.”
- Ask the students, “*What eats pond plants?*”



- Choose one answer (such as nematodes) and write it in the space above the “Plants” category (see Teaching Aids for pond food pyramid ideas).
- Do the same for the rest of the pyramid until you reach your climax species. Explain what a **climax species** is.
- Ask the students, “*What would happen if pollution destroyed half of our pond?*”
- Demonstrate the removal of half of the species on the board.
- Ask the students, “*What would happen if the climax species were removed?*”
- Demonstrate their removal on the board, and discuss the effects of overpopulation of a particular species.
- Tell the students that our ecosystem exists in a delicate balance. If something happens to one population the other species are affected.

#### **The Importance of Ponds to the Chesapeake Bay**

- Tell the students about your pond. If it is a man-made pond, ask the students, “*Why would anyone want to make a pond?*” (Ponds are often created to collect drainage from agricultural fields.)
- Tell the students that an agriculture pond is very important because it serves as a place to collect water before it runs into the Chesapeake Bay. When the water is collected in a pond, it can then be sent into a wetland and filtered before it goes into the Bay. Remind the students when they learned about wetlands and plants in first, second and third grade (see previous grades’ lessons)





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that wetlands and wetland plants are very good at filtering water before it flows into the Bay. Wetlands can actually remove pollution from water that flows through them.

- Ask the students, “*What factors might affect organisms that live here?*” (Water pollution, water temperature.)
- Tell the students how temperature can affect how much life is active in the pond. (When the water is warm, the organisms tend to be more active and move around the pond. When the temperature is low, the animals tend to stay in the deeper waters and burrow into the mud.) Have the students determine the temperature of the water.

## **B. Ponding**

- Tell the students that they are going to study the pond ecosystem like scientists and record what they find.
- Ask them, “*What do you think we are going to find the most of? Why?*”
- Ask them, “*What do you think we are going to find the least of? Why?*” Ask the students to list some animals they might find in the pond and to guess or hypothesize about how many they will catch.
- Record the students’ guesses in the guess part of a large version of the pond tally sheet.

### Ponding Rules:

- Many ponds support various organisms such as tadpoles, crawfish, dragonfly nymphs and different kinds of water beetles that live in water. **Therefore, everything that is removed from the pond must go into a container of water or immediately go back in the pond.** (Show the students the containers where they will place their live animals.)
- When you have a net in your hand don’t run or raise the net over your head. Be careful not to hit anyone with your net when you turn around.
- Be careful because the banks of ponds are very soggy and it is easy to get wet. Everyone will share buckets. (This will help minimize competition about how much they are catching.)
- Demonstrate how to effectively catch pond animals and transfer them to the water containers. Teach the students how to use nets to sneak up on animals and quickly scoop them from the pond.
- Tell your parent chaperones and classroom teacher to make sure each container is filled up with clear water before the students dip into the pond, otherwise the water will be murky and they won’t be able to see the animals they place in the container.
- Divide the class into small groups and assign them an adult and a different area around the pond.
- Tell the students to take a net and go catch critters. Most children do not need help catching things, but they do need help identifying them, and they love to hear “Great job! You’ve caught something!” when they bring an animal to the collection bucket. If a student needs help catching things, give them encouragement and a few pointers such as: dig your net into the mud a bit or



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scoop near plants because that is where the animals hide. You can also pair students with someone who is catching a lot. This is a great opportunity to get the teachers and chaperones involved.

- Make sure the students do not wade in the water without the teacher's permission.
- Take out the ponding guides and the pond tally sheet. Ask a teacher, student, or chaperone to help tally the types and numbers of critters caught as the students put them into the buckets.

### C. Review

- Review the pond tally sheet with the students.
- Ask the students, "*What did we find the most of?*"
- Ask them, "*Why do you think this is so?*"
- Ask them about their predictions and why they were right or wrong and what their reasons were for making the predictions.
- Write the information in the Center's Pond Data Binder. Briefly compare their findings with another group's. Show them how their data will be kept and compared with other groups in the future.
- Have the students carefully release their animals back into the pond. Demonstrate how they must bend down and carefully dump their containers into the pond. Make sure they don't throw the animals back or dump the containers into the pond from a great height.
- Have the students stack their tools neatly for the next group.

## Extra Activities:

### A. Bio-indicators of the Pond's Health

- Explain to the students how some animals, such as damselfly **larvae** and frogs, are **environmental indicators** of the pond water's health because the pond must be a healthy ecosystem in order for them to survive and continue to reproduce. (Environmental indicators are also called bio-indicators.)
- Ask the students if, based on the data collected, they think the pond is healthy.

### B. Rain Through a Stream Game

Materials: 1 rope

- Split the group in half. Identify one side as "raindrops" and the other side as "plants." Place the plants on either side of the stream (the rope) and the raindrops at the head of the stream. The object of the game is for the raindrops to make it from the head of the stream down to the Bay. If a plant tags them, they must run around the plant five times before heading downstream again. Plants can only move their arms and can only tag an individual raindrop once. Point out the playing field boundaries (you can use natural markers or chaperones as boundary markers). Tell the students that any "raindrop" who goes out of bounds dries up and loses a turn. After a few

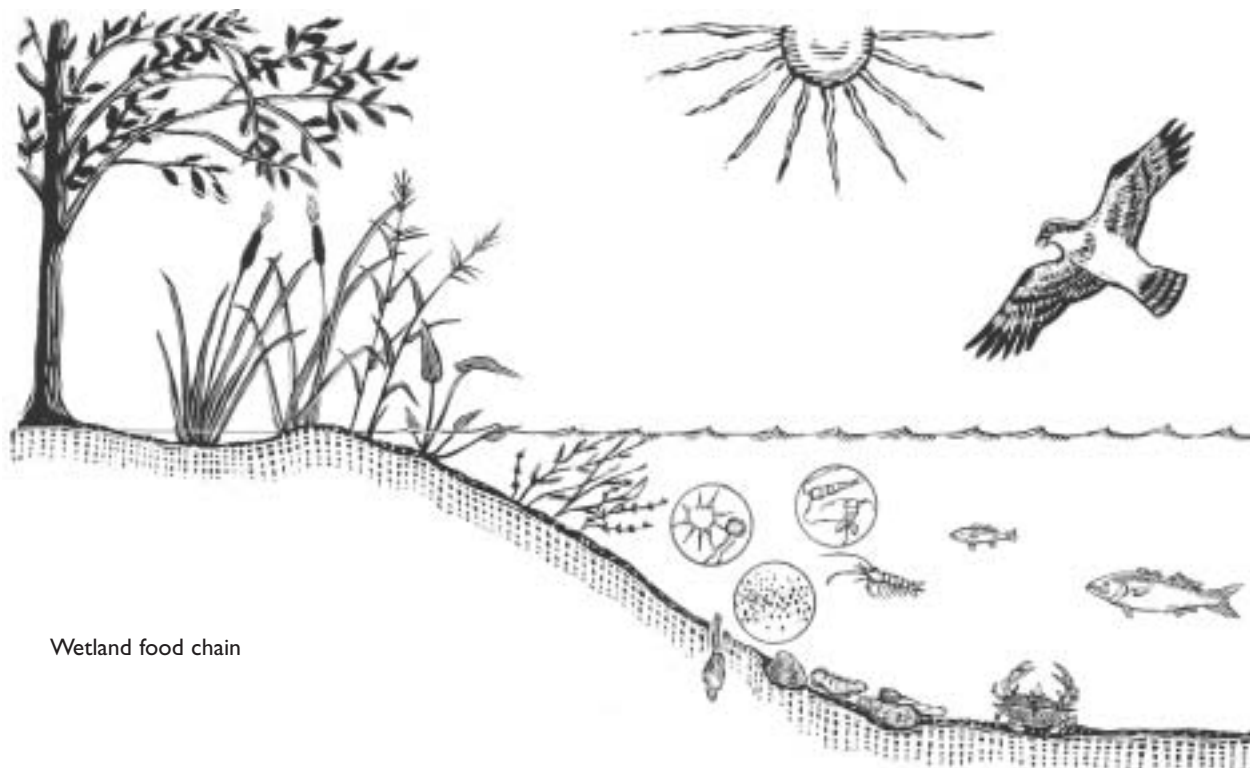


rounds, turn the plants into rocks to see what happens when there is nothing to absorb all of the water flow. Explain to the students that we need plants to absorb some of the water and clean it before it goes in the Chesapeake Bay.

### Part 3. Wetland Ecosystem

#### A. The Wetland as an Ecosystem

- Introduce yourself.
- Ask the students what they think of when they hear the word “wetland.” Discuss how often the water is not very deep in a wetland, but it is a very important ecosystem in the Chesapeake Bay region.
- Discuss with the students how an **ecosystem** is made up of both **living** and **non-living** things, Ask students, “*What do we mean by living? non-living? dead?*” (Something that is alive; something that was never alive or was made from something that was once alive; something that is no longer alive.)
- Ask the students, “*What non-living things exist in this wetland?*” (Water, rocks, sand, etc.)
- Discuss with the students how these components affect each other (ex: The sun and water affect the aquatic plants by giving them something they need to grow. Some aquatic plants need soil or the detritus found in the bottom of the wetland to grow).
- Ask the students if they can guess “*Where does the water in our wetland come from?*” Explain how the water collects in a wetland.



Wetland food chain

Liz Fisher



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- Ask the students, “*What types of plants live in a wetland?*” (Special plants that can tolerate being submerged in water for long periods of time but not all the time.)
  - Remind the students when they studied wetlands and wetland plants in first, second and third grades (see previous grades’ lessons). Ask them what they remember about wetlands and wetland plants. Most importantly, remind the students of the wetlands’ important role of filtering water before it reaches the Chesapeake Bay. (Wetlands soak up water like a sponge and clean the water before it flows into the Chesapeake Bay.) Mention that the filtering cuts down the amount of nutrients and pollutants that reach the Bay.

### **B. Plant Classification**

- Split the class into teams of two or three. Hand out clipboards, pencils and copies of the Wetland Worksheet.
- Point out samples of wetland plants for the students to study.
- Tell the students that they should look for a plant that is in the water, so they can be sure it is a wetland plant. Give each group a field guide to discover the plant’s name and to complete the worksheet.
- Go over the questions they will answer on the worksheet.
- Give the students boundaries to use for their search, and tell the students they should not go wading into the wetland (unless you have made that part of the lesson). The students should choose a plant that is near the edge of the water so they can closely examine it. Tell the students they can’t pick or cut the plant so it will be there for the next school group to study.
- Gather the students and go over each groups’ answers.
- Remember to ask each group to describe how their plant is adapted to life in a wetland.
- Have the students hand in their clipboards and pencils and give their papers to their teacher.

### **C. Plant Zones**

- Take the students along the shoreline and surrounding area to observe the change in plant life (for example, from field or forest to wetland).
- Ask the students why they think the plant types change as they are found closer to the wetland.

### **D. Birding with Binoculars**

- Ask the students, “*What the type of animals live in wetlands?*” (Frogs, turtles, birds, etc.)
- Ask the students, “*What animals live on the water in a wetland but don’t live in the water?*” (Waterfowl.)
- Tell the students wetlands are very important to birds and all kinds of animals because they contain freshwater and many sources of food, and provide shelter.
- Tell students, “*We are going to look for these animals using binoculars. We are especially going to look for birds that live in or near the wetland.*”



- Hand out the binoculars, and instruct them as to their proper use. (Keep in mind that many of them may never have used binoculars before.)
- Have the students scan the shoreline for animals that depend on the water. (Crabs, herons, turtles, etc.)
- If there is time, take the students on a short hike to an overlook to look for animals. Encourage them to look for Chesapeake Bay bird species near their homes and neighborhoods—perhaps with their parents.



### E. Look for Animal Signs

Materials: None

- Have the students search the edges of the wetland (without going beyond the boundaries) for signs of animals in the area.
- Ask students to share their observations with the group.

## Part 4. Forest Ecosystem

### A. The Forest as an Ecosystem

- Introduce yourself.
- Ask the students, “*What do you think of when you hear the word forest?*”
- Ask the students, “*What non-living things exist in the forest?*” (Soil, rocks, sunlight, etc.)
- Discuss with the students how the non-living things interact with the living things (such as soil helping plants grow).
- Ask the students, “*What kind of animals might live in this forest? Where might they live?*”
- Remind the students of their third grade field trip to the forest (see Forests lesson).
- Discuss how forests are important to the health of the Chesapeake Bay and the wildlife in our region.

### B. Food Pyramid

- Ask the students, “*Where do plants get their energy?*” (From the sun and soil.)
- Ask the students, “*Where do animals get their energy?*” (From plants and other animals.)
- Ask the students, “*What is a food chain? food pyramid?*” (Define it for them if they do not fully understand how a food chain or pyramid illustrates the transfer of energy in the ecosystem.)
- Draw a triangle on the board. (see Teaching Aids for more information)
- Ask the students, “*What do we have the most of in our forest?*”
- Write “Trees/Plants” at the base of your triangle.
- Ask the students, “*What animal eats plants?*”
- Choose one answer and write it above the “Trees/Plants” category.



- Do the same for the rest of the pyramid until you reach your **climax species**. (Make sure to introduce the terms **Herbivore**, **Carnivore** and **Omnivore**.)
- Ask the students, “*What would happen if a fire destroyed half of our forest?*”
- Demonstrate the removal of the listed species on the board.
- Ask the students, “*What would happen if the climax species were removed?*”
- Demonstrate the removal of the climax populations on the board.
- Ask the students, “*What would happen if there were too many animals for the forest to support?*”
- Tell the students that our ecosystem exists in a delicate balance—if something happens to one **population** the other species are affected.

### C. Forest Investigation

- Pick a location within the forest.
- Divide the class into small groups.
- Each group should receive a Forest Find worksheet, a tree guide, a plant guide, a clipboard and a pencil.
- Using your four, 20-foot strings, have each group make a large box or circle on the forest floor. Tell the students that this will be their “study plot.” Explain to the students that scientists do this in multiple places in the forest when they want to sample the different kinds of plants found in the forest they are studying.
- Go over the worksheet to make sure everyone understands what they are supposed to do.
- Have the students investigate the study plot, answering the questions on their worksheet as they go along.
- Ask the students what might determine which trees grow in this forest and which trees do not. Tell the students all the plants in the forest, especially the trees, are competing for sunlight, water and nutrients in the soil. (If the students can’t work in small groups effectively, you can make one large plot and study it together.)





- Take the students to another location that has a different plant population, and point out the similarities and differences between this area and the previous location.
- Point out animal signs to the students as you see them. Remind the students they learned about forests in third grade (see third grade lesson). Have the students tell you or show you some of the things they remember learning about forests.

### *Extra Activity:*

#### **D. Camouflage Game**

Materials: None

- Make sure you are at a point where it is safe for kids to run through the forest.
- Discuss how camouflage helps animals hide in the forest. Ask the students who the animals are hiding from. Explain the rules of the game.
- One person closes his/her eyes while everyone else hides. The start of the game is signaled by the person who closes his/her eyes yelling, “Camouflage!” Students must be visible but concealed. The person finding students is not allowed to move. If students can see the finder when hiding, they are visible. The finder can set certain rules such as students only taking a certain number of steps to hide, and set boundaries, so as to keep students at a safe distance.
- Have the students follow you down the trail. At some point yell “Camouflage!” The students may then run and hide behind the trees. Try to find as many of the students as possible. Be sure to set boundaries so that the students don’t go too far off the trail.

## **Part 5. Creek Ecosystem**

Before the students arrive, make sure you have set the crab traps, placed the thermometer in the water, and stocked the habitat crates with rocks, shells, etc., and filled some containers with creek water (for the animals that the students will pull out of the habitat crates).

### **Introduction to the Creek**

- Introduce yourself.
- Take the students to a dock or open space.
- Have the students sit while you discuss the creek as an ecosystem.
- Ask the students, “*Do you think this creek is an ecosystem?*” (Yes.) “*What is the definition of an ecosystem?*” (A collection of living and non-living things that function together within the environment.)
- Ask them, “*What are the living components of the creek?* (Plants, animals, fish, etc.) **Non-living?**” (Water, wind, rocks, sand, etc.)
- Explain how water flows in and out of your creek. If applicable, explain to the students that the creek receives both freshwater run-off from the land and salt water from the Chesapeake Bay. Explain that this type of water is called **brackish** water.
- Ask the students, “*Why is the creek is partly salty?*” (It receives freshwater from streams and salt water from the Bay.)



- 
- Explain how the creek is connected to the Chesapeake Bay.
  - Discuss with the students how creeks, streams and rivers “feed” the Bay and support plants and wildlife.
  - Ask the students if they think the change in salinity has an effect on the plants that live there.
  - Ask, “*How might the plants adapt to those changes? The animals can leave this creek if it becomes too salty or too fresh, but what about the plants?*” (The plants must be able to tolerate all types of conditions.)

### **Scientific Investigation**

#### 1. Forming Hypotheses

- Show the students the Creek Find Chart.
- Have the students hypothesize under “The Guess” category.
- Discuss the different questions with the students.

#### 2. Scientific Investigation

##### **a. Salt Question**

- For the salty water question: discuss whether the creek is brackish or fresh.

##### **b. Depth Question**

- For the depth question: use the secchi meter as a weighted tape measure. Explain this use of the secchi meter to the students. Have a student volunteer lower the secchi meter into the water to determine how deep it is at the dock. Discuss the affect tides have on the depth of the water. Explain how the water depth changes in your creek.

##### **c. Light Question**

- For the light question: have a student volunteer use the secchi meter to determine how clear the water is. Ask the students, “*How might this affect the plants that grow in the water? How would it affect the animals?*”
- Ask the students, “*How do plants get their energy?*” (From the sun.) “*How do animals get their energy?*” (By eating plants and other animals.)

##### **d. Temperature Question**

- For the temperature question: have a student volunteer pull up the thermometer and read off the degrees. Ask, “*How will the temperature affect the plants and animals living here?*”
- Tell the students how temperature can affect active organisms in the creek. (When the water is warm, the organisms tend to be more active and move around the creek. When the temperature is low, the organisms tend to stay in the deeper waters and some burrow into the mud.)





### e. Aquatic Animals Question

- For the animals in the water question: discuss with the students how we will pull up the habitat crates and the crab traps (see Teaching Aids for more information).
- Divide the class into small groups and assign them a habitat box and a container of water.
- Give the students directions on how to safely pull up the crates. They should all work together as a team. They must take out all living organisms and put them in the container of water right away.
- Have the students look closely at the varying types of organisms among the rocks and shells in the crate. They should work in small groups with guidance from an adult.
- Tell the students to gently move their crate in case organisms have fallen through to the bottom.
- Have the students safely lower their crates back into the water.
- Share everyone's findings and have them record the types and numbers of animals found on the back of their Creek worksheets. (The teacher can use this data back in the classroom.)
- Teach the students how to safely return the animals to the creek. (You may need to carry the animals to the creek's edge or use a bucket on a string in order to gently lower the animals back into the water.)

### Introduction to Binoculars



- Tell students we are going to look for animals that live on the water by using binoculars.
- We are especially going to look for birds that live in or near the creek.
- Hand out the binoculars.
- Instruct the students in the proper use of binoculars. (Keep in mind that many of them may never have used binoculars before; see Teaching Aids for tips.)
- Have the students scan the shoreline for animals that depend on the water.
- Talk to the students about key species we commonly see in the Chesapeake Bay region such as: migratory waterfowl, Great Blue Herons, Eagles, Ospreys, etc.

### Extra Activity:

#### I Spy Game

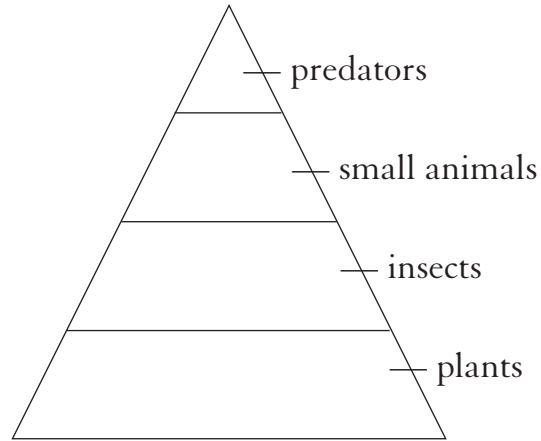
Materials: None

- Have the students look out over the water. Say, "I spy...(whatever you see)." Have the students guess what you are looking at. Whoever guesses right gets to spy next.



# Teaching Aids

## I. Food Pyramid



Basic Food Pyramid

## 2. Wetland Ecosystem Teaching Tips

Some common freshwater wetland plants:

- Cattails
- Phragmites
- Arrow Arum
- Pickerelweed
- Umbrella Sedge
- Bulrush

During the Identification Section, be sure you know what the plants are prior to the students' arrival so you can help them identify the plants and answer any questions that may come up. Most wetland plants have special adaptations. Some examples are: spongy leaves, air-tubes at the tips of their stems, and salt secretion pores. (Adaptations will differ from species to species.) Wetland plants vary in a wetland due to its salinity levels and the amount of water saturation it receives over a specific period of time.



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### 3. Pond Ecosystem Teaching Tips:

#### Food Chain/Food Pyramid ideas:

- A. Detritus → Bottom-dwelling organisms such as: insect nymphs or larva, worms, or crayfish → Carnivores such as: frogs, turtles, big fish → Carnivores such as: herons and snapping turtles.
- B. Plants → Herbivores such as: snails, nematodes, tadpoles, small fish → Carnivores such as: frogs, turtles, big fish → Carnivores such as: herons and snapping turtles.

### 4. Forest Ecosystem Teaching Tips

- Animals that frequent the forest: deer, fox, raccoon, owls, squirrels, rabbits, box turtles, salamanders, tree frogs, etc. They can live in nests, in tree cavities, or in ground burrows.
- A sample food pyramid could be: Plants → Mice → Screech Owl → Great Horned Owl.
- Another sample could be: Plants → Birds → Snakes or Squirrels (will eat birds' eggs) → Red-tailed Hawk

For the Food Pyramid Activity, try to keep the class focused on forest-dwelling animals. If you need help picturing what the food pyramid should look like, look over the field teaching tips. You can mention that if there were too many animals for the forest to support (as there are with the deer) a number of things could happen, including the spread of disease within the species; a decrease in understory plants because they are over-browsed, and a decrease in other species that may utilize the same habitat.

Make sure students place their study boxes in a typical area for your type of forest.

### 5. Creek Ecosystem Teaching Tips

- Creek organisms include herons, fish, turtles, osprey, algae, oysters, aquatic grasses, etc.
- Non-living components of the creek that affect its living components include: water, sediment, rocks, wind, tides, sun, temperature.

Remember there are no wrong hypotheses! If you have different answers from the group, write multiple guesses on the board and record how many people agree with each guess in parentheses next to them.

A secchi meter, which measures turbidity, can be extrapolated to measure light penetration. The distance light can penetrate the water determines if plants can grow in the creek bed. Because high levels of silt enter the Chesapeake Bay, the water is often not very clear. On a calm day, light will only penetrate between two and three feet.

In shallow areas, the water temperature varies a lot, especially along the shores. Creek animals have different ways of adapting to colder water temperatures such as burrowing under the mud (crabs and frogs) and swimming to warmer waters (rockfish).



### **Habitat Crates:**

The habitat crates are simply milk crates tied with heavy ropes so that they can sit on the bottom of your creek and simultaneously remain tied to the dock. They should be stocked with rocks and shells to produce places for animals to hide.

### **Using crab traps:**

This is a dirty and smelly activity, but it's fun! You don't have to take any crabs out if you don't want to, but be sure to release them by the end of the day! You can tell the difference between a male crab and a female crab because the female will have a broad, rounded apron on her underside and will have a red outline around her claws. The male crab will have a narrow, pointed apron. Be sure your trap is fitted with a turtle excluder.

### **Tips on teaching students how to use binoculars:**

Have the students look through the small end of the binoculars. Have them look at a particular object and focus on it (using the big middle focus wheel). For fine focusing, there is a little knob on the right eye-piece. Have the students cover their left eye and focus their right eye using this smaller knob.

Tell the students that the quieter they are, the more wildlife they will likely see as they go along the trail.



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# Pond Tally Sheet

Classroom Teacher's Name: \_\_\_\_\_

|                                |                       |                       |                       |                        |
|--------------------------------|-----------------------|-----------------------|-----------------------|------------------------|
| <b>Crayfish</b>                | <b>Snails</b>         | <b>Water Boatman</b>  | <b>Back swimmers</b>  | <b>Diving Beetles</b>  |
| # Gussed:<br># Found:          | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found:  |
| <b>Water Scavenger Beetles</b> | <b>Whirligig</b>      | <b>Water Spider</b>   | <b>Water Scorpion</b> | <b>Damselfly Nymph</b> |
| # Gussed:<br># Found:          | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found:  |
| <b>Dragonfly Nymph</b>         | <b>Tadpoles</b>       | <b>Frogs</b>          | <b>Turtles</b>        | <b>Fish</b>            |
| # Gussed:<br># Found:          | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found:  |
|                                |                       |                       |                       |                        |
| # Gussed:<br># Found:          | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found: | # Gussed:<br># Found:  |



# Field Investigation

Names: \_\_\_\_\_

1. Name two animals you might find in this field ecosystem.
2. Find evidence that animals are using this field. Record your observations below.
3. Name one problem an animal would face living in this field.
4. Draw the most common plant in this field.
5. Why would a plant be prickly or hairy? Draw a picture of a prickly or hairy plant.
6. What do you predict this field will look like in ten years? Why?



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# Wetland Plants

Names: \_\_\_\_\_

1. Draw a picture of a wetland plant.

2. What kind of plant do you think it is? How do you know? You may use a field guide.

3. Write down one interesting fact about your plant.



# Forest Find

Names: \_\_\_\_\_

|   | Site #1 | Site #2 |
|---|---------|---------|
| Number of <b>trees</b>                                    |         |         |
| Main <b>tree type</b>                                     |         |         |
| <b>Special characteristics</b><br>of main tree type       |         |         |
| Are there many<br><b>understory plants?</b>               |         |         |
| If yes, what <b>species?</b>                              |         |         |
| If no, <b>why not?</b>                                    |         |         |
| Is there evidence of <b>animals</b><br>using this forest? |         |         |
| What is the <b>soil</b> like?                             |         |         |





# Creek Find

Names: \_\_\_\_\_

| The Question   | The Guess | The Reality |
|--|-----------|-------------|
| How <b>salty</b> is the water?                       |           |             |
| How <b>deep</b> is the water?                        |           |             |
| How <b>far down</b> into the water can you see ?     |           |             |
| What is the <b>temperature</b> of the water?         |           |             |
| What <b>animals</b> live <b>in</b> the water?        |           |             |
| What <b>animals</b> live <b>on top</b> of the water? |           |             |

# Pond Data Sheet for Center's Data Binder

| Date | School | Class | Favorite Find | Organisms Found and How Many of Each Were Found:<br>Ex. Damselfly Nymphs 3, Dragonfly Nymphs 12,<br>Crayfish 1, Frog 1, Tadpoles 11 | Water Temp | Air Temp | Weather |
|------|--------|-------|---------------|---|------------|----------|---------|
|      |        |       |               |   |            |          |         |
|      |        |       |               |   |            |          |         |
|      |        |       |               |   |            |          |         |
|      |        |       |               |   |            |          |         |



# Extension Activities

## *Pre-activity for Classroom Teacher:*

Discuss with the students how an ecosystem is a collection of living and non-living things that function together within the environment. In order for students to understand the difference between living and non-living things, have the students investigate the schoolyard for both elements. Make a class list for discussion back in the classroom.

Explain that the Chesapeake Bay is an ecosystem. Talk about living and non-living things that are found in the Bay. Discuss how both elements are needed for the Bay to function (ex: oysters attach themselves to non-living things to grow; plants grow on the Bay bottom, etc.). From here, talk about why it is important to keep the Bay ecosystem healthy.

## *Post-activity for Classroom Teacher:*

### **Graphing the Data:**

Have the students make various graphs and charts illustrating the data they collected from the ponding activity and other activities where data was collected. The students may work in groups on different types of graphs. Have the students make different graphs such as: line graphs, bar charts and pie charts to determine which is the best graph or chart to represent the data. See the next page for an illustration of how you can set up your ponding line graph or bar graph.

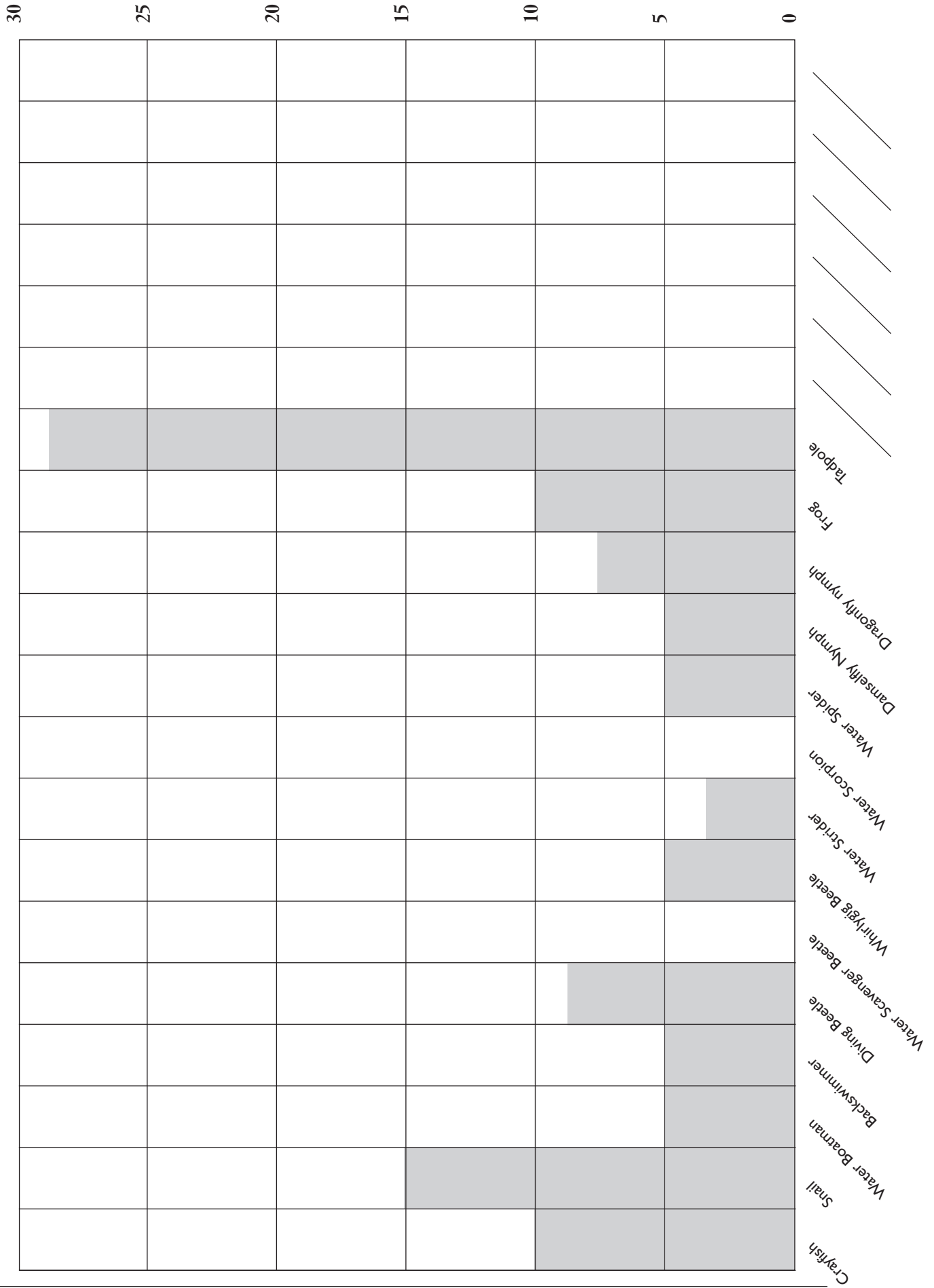
### **Creative Writing Exercise:**

1. Have the students write a story about one of the ecosystems they investigated. The students should describe the living and non-living things in the ecosystem and how they work together. They should also describe some of the living things they found on the field trip. The students can write a story with characters that are imaginary animals or plants they found on their field trip.

2. Have the students write a story about an ecosystem near their home or school, or have the students describe an ecosystem near their home or school. Make sure the students describe the living and non-living parts of the ecosystem. Ask the students to tell you how the ecosystem is related to the Chesapeake Bay. For example, does their ecosystem help clean the water before it flows into the Bay? If so, how does it do that?

# Graph Example for Ponding Data

Class \_\_\_\_\_ Date \_\_\_\_\_





## Resources

Brewer, Richard. The Science of Ecology. 2nd edition. Saunders College Publishing. 1994.

Kricher, J. and G. Morrison. 1988. Eastern Forests. Boston: Houghton Mifflin Company.

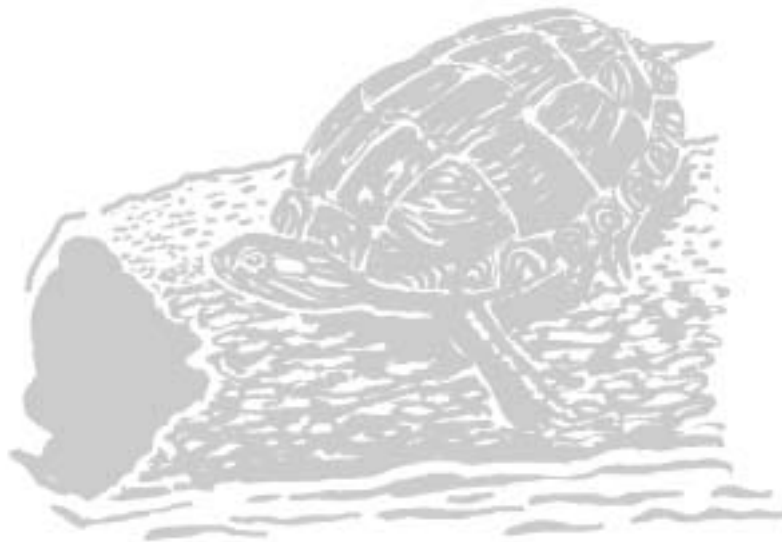
Lippson, A. and R. Lippson 1997. Life in the Chesapeake Bay: Second Edition. Baltimore: Johns Hopkins University Press.

Newcomb, L. 1977. Newcomb's Wildflower Guide. Boston: Little, Brown and Company.

Pond Life. A Golden Guide from St. Martin's Press: New York, NY. 2001.

Project Learning Tree Activity Guide Pre-K-3. American Forest Foundation. 2006.

Venning, F. 1984. Wildflowers of North America. New York: Golden Press.



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# *Erosion Affects Bay Water Quality*



**In-school Lesson**

**Grade: 5**

Program Length: 1 hour

Number of Instructors needed: 2

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

Same as Maryland State Standards below.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 5:

**Science: *Constructing Knowledge***—Gather information from many different forms of scientific investigations including observing what things are like or what is happening somewhere, collecting specimens for analysis and doing experiments; ***Applying Evidence and Reasoning***—Seek better reasons for believing something than “Everybody knows that...” or “I just know.”

***Communicate Scientific Information***—Recognize that clear communication is an essential part of doing science because it enables scientists to inform others about their work, expose their ideas to criticism by other scientists and stay informed about scientific discoveries around the world; Examine and modify models and discuss their limitations.

***Technology***—Examine and modify models and discuss their limitations.

***Materials and Processes that shape a planet***—Cite and describe the processes that cause rapid or slow changes in the Earth’s surface.

***Environmental Issues***—Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences and trade-offs; ***Environmental Issues***—Recognize and describe that consequences may occur when Earth’s natural resources are used.



## Synopsis

This lesson will introduce students to the ways water erodes the earth's surface. Students will be introduced to the concept of sediment transport and its affects on the Chesapeake Bay ecosystem. Students will understand the ways in which water transports sediment and pollution into the Bay, and students will understand the role plants play in reducing sediment transport using a model of the Chesapeake Bay Watershed. Students will investigate their school grounds for signs of erosion and investigate ways to decrease erosion.

## Objectives

- Students will understand the way water erodes the earth's surface.
- Students will be introduced to the concept of sediment transport and its effects on the Chesapeake Bay ecosystem.
- Students will observe the ways in which water transports sediment and pollution into the Chesapeake Bay.
- Students will observe the role plants play in reducing sediment transport using a model of the Chesapeake Bay Watershed.
- Students will investigate their school grounds for signs of erosion.
- Students will investigate ways to decrease the degree of erosion taking place.

## Materials

- Map of Chesapeake Bay Watershed
- 10 cups of dry sand in a bucket
- 2 empty buckets (1 is needed in case the classroom does not have a sink)
- 2 watershed models and pieces (see Teaching Aids)
- Food coloring





## Vocabulary

**Erosion** - the gradual wearing away of rock or soil caused by water, wind, ice, or animals through processes such as: physical breakdown, chemical solution and transportation of material.

**Watershed** - the entire surface area that water flows over as it drains into a particular body of water such as the Chesapeake Bay. A watershed includes the water stored underground.

**Sediment Transport** - the rate at which sediment washes off the surface and flows into a body of water.

**Impermeable Surface** - a surface water can't penetrate, such as concrete.

**Renewable Natural Resource** - a natural resource that can be replaced after it is used, such as trees.

## Erosion Affects Bay Water Quality Lesson Plan

*This lesson is broken into five parts. It takes place in the students' classroom and in the schoolyard or in a nearby park.*

**Part 1. Introduction** - 2 minutes. One Instructor. Suggested location: inside a classroom.

**Part 2. Discussion about Erosion** - 8 minutes. One Instructor. Suggested location: inside a classroom. Introduce Vocabulary words.

**Part 3. Watershed Experiment** - 30 minutes. Two Instructors. Suggested location: inside the classroom.

**Part 4. Investigate School Grounds for Signs of Erosion** - 17 minutes. Two Instructors. Suggested location: outside on school grounds or at an adjacent park.

**Part 5. Conclusion** - 3 minutes. One Instructor. Suggested location: inside a classroom.

---

### Part 1. Introduction

#### A. Introduce yourself.

- Tell the students you will be teaching them about erosion, and they will be learning about erosion by using models, doing experiments and investigating their schoolyard for signs of erosion.

### Part 2. Discussion about Erosion

#### A. Introduce Vocabulary Words

- Ask if any students know the definition of **erosion** or can describe what erosion is. Write this definition of erosion on the board. (The gradual wearing away of rock and soil caused by water, wind, or ice through processes such as: physical breakdown, chemical solution and transport of material).



- Tell the students, “*Your community is part of the Chesapeake Bay Watershed. The entire surface area that water flows over as it drains into the Chesapeake Bay is called the Chesapeake Bay Watershed.*” Show a map of the watershed and have the students find their location on it.
- Explain **sediment transport** to the students. When water transports soil into the Chesapeake Bay, it is called “**sediment transport.**” Soil is a type of sediment. Sometimes more sediment is washed into the Bay than at other times. This is because it depends on how much water is washing into the Bay and the kinds of surfaces the water is washing over. For example, after a hurricane, there is so much water washing over the Chesapeake Bay Watershed that a lot of sediment flows into the Bay. You will see later in this lesson how plants trap sediment, while concrete does not trap sediment. So, if water washes over a surface covered with plants, not as much sediment would wash into the Bay.
- Tell the students, “*If water washes over a concrete surface, more sediment will wash into the Bay. Concrete is considered an **impermeable surface** because water can’t penetrate it.*”
- Discuss signs of water erosion. Describe how a site would look if erosion has taken place.

## Part 3. Watershed Experiment

### A. Introduce Experiment

- Discuss what a model is. (A model is a representation of something larger. When we can’t easily study the real thing, we make a model and conduct experiments using the model. Using a model gives us an idea of what will happen in real life.)
- Tell the students, “*We will be creating a model of the Chesapeake Bay Watershed. Using the model, we are going to test the ability of plants to stop erosion.*”
- Describe the experiment to the students without divulging the answers.
- Show them the pieces of the model and tell them what each one represents.
  - 22 Black or White tiles = impermeable surfaces such as blacktop or concrete
  - 11 Dark Green with thick sponges = trees
  - 11 Light Green with thin sponges = grasses or crops

### B. Have students develop hypotheses about what will occur

Write the students’ answers to the following questions on the board:

- a. Landscape with plants - “*What will happen to the sand after we pour water on it and we have the sponges there to represent plants? Will the sponges stop the water and the sand?*”
- b. Landscape with impermeable surfaces - “*What do you think will happen if we replace the sponges with tiles to represent concrete?*”

Basically, you want the students to think about whether plants (the sponges) will help stop some of the erosion (i.e. will plants help stop the sand from flowing into the bottom of the paint pan or the Chesapeake Bay?).



### C. Split class into two groups

Conduct two experiments simultaneously in separate locations so all the students can see the experiment. Have the classroom teacher conduct the experiment with one group while you work with the other one. Be sure to give the teacher clear, concise directions if he/she has never helped with this lesson before.

### D. Conduct experiment

Help the classroom teacher set up the experiment.

1. With vegetation buffer - Set up the paint pan by pouring a strip of sand into the higher (non-blue) end of the pan (this represents a field of soil). Place the pre-moistened sponges (dark green or light green tiles) along the border of the sand (this represents a strip of vegetation). Place a row of the plain white tiles downstream from the green tiles. Have the watering can already filled with water



Erosion model

- nearby. Have the empty bucket or sink with the pillowcase ready.
- Tell the students what each part of the model represents (remember to tell them the sponges represent the plant's roots).
  - Tell the students, "*Now watch what happens when it rains on the field over here.*" Pour the water onto the sand. Some of the sand and water will be trapped by the sponges. The plants (sponges) will also soak up some of the water.
  - Have the students complete the Student Investigation Log Worksheet.
  - Clean up the models - Have the students help you, but give them clear directions. Clean up the model by carefully removing the pieces and dump the water and sand into the pillowcase while holding it over the empty bucket or sink. The water should drain out of the pillowcase leaving the sand behind in the pillowcase. The sand can be saved for later by storing it in another container or bucket. Be careful not to dump the sand down the drain.
2. Without vegetation buffer - Set up the paint pan again by placing sand in the higher (non-blue) end of the pan. Place white tiles to represent concrete along the border of the sand. Place another



row of white tiles downstream from the first row. Have the watering can ready. Tell the students what each part of the model represents. Tell the students, “*Now watch what happens when it rains on the parking lot or concrete over here.*” Pour the water onto the sand. Most of the sand and water should end up in the Chesapeake Bay.

- Clean up the models.
3. Manipulate the model - Now, set up the model with the sand at the top.
- Ask the students to think about making a landscape they think will trap most of the sand.
  - Discuss how well the trees (big sponges) work in comparison to the grass (small sponges) and compare it to the concrete (white tiles).
  - Have the groups assemble their landscape and test their hypotheses.
  - Depending on how many supplies you brought and how much time you have left, you can have the students manipulate the model one more time. If it is a rainy day and you will not be going outside, you can keep manipulating the model or you can proceed with the extra activity below.

#### **Extra Activity**

- Have students hypothesize about what will happen if we put some pollution such as food coloring into the soil part of the model.
- Adding pollution to the model (if time and supplies permit) - Run the experiment again and add a couple of drops of food coloring to the sand before you pour on the water.
- Discuss the experiment and the students’ hypotheses.

#### **E. Review and discuss as a group what happened in the experiment**

- As a class, review what happened in the experiment during each step.
- Ask the students to tell you what happened and what worked better to slow down erosion.
- Ask the students, “*How can you use this knowledge from this experiment to decrease erosion?*” (Plant vegetation along stream banks, drainage ditches, etc.)

### **Part 4. Investigate School Grounds for Signs of Erosion**

- Tell the students they will now be going outside to investigate the school grounds. Have the classroom teacher help get the students dressed to go outside. (The classroom teacher should follow one of the groups in order to carry out the extension activity). Gather two clipboards and two copies of the School Ground Erosion Observation Worksheet.
- Once outside, divide the students into two field groups.
- Lead your group to areas of the school grounds or adjacent park where you suspect there is erosion. Look for areas where there is drainage from paved areas. Once you see some signs of erosion, point them out, and complete the School Ground Erosion Observation Worksheet with the students.



- If there are no signs of erosion, then find a storm drain or area where the water drains off an impermeable surface. Discuss impermeable surfaces again and how these types of drainage areas affect the Chesapeake Bay. Brainstorm with the students about how we could have the water pass through some plants on the way to the storm drain (before it goes into local streams and rivers and then into the Chesapeake Bay). Rain gardens are helpful to the Chesapeake Bay area and can often be planted in an area such as this.

## Part 5. Conclusion

- Once back inside the classroom, review what sites on the school ground had signs of erosion.
- Ask the students, “*How did we know that erosion was occurring at that site? What signs did you see or what signs did you look for?*” (Signs of erosion could be soil exposed on a stream bank, piles of sand transported by wind, or grass worn away where students play ball.)
- Ask the students, “*How can we decrease the amount of erosion occurring at a particular site?*” (Plant some plants.)
- Ask the students, “*When erosion occurs on your school ground, where does the soil go?*” (Into local streams and rivers and eventually into the Chesapeake Bay.)

# Teaching Aids

## The Watershed Model

For construction of one model, you will need: a large metal paint pan, forty-four 2” x 2” ceramic tiles, modeling or self-drying clay, a hot glue gun, 2 or 3 large thick sponges, 2 or 3 large thin sponges, blue enamel paint, dark green enamel paint, light green enamel paint, black enamel paint and white enamel paint.

Step 1: Paint the bottom half of the paint pan blue.

Step 2: Cut the thick sponges into 2” x 2” pieces and hot glue them to the bottom of 11 tiles that will be painted dark green. Cut the thin sponges the same way and glue them to the 11 tiles that will be painted light green.

Step 3: Paint 11 tiles black and 11 tiles white (or you may choose to make them all one color).

Step 4: Push strips of modeling clay into the sides of the paint pan so that water and sand do not run down the sides of the pan when you run the experiment. You may need to seal the edges of the modeling clay with hot glue.

Step 5: Let the model dry thoroughly before use.



# School Ground Erosion Observation Worksheet

**Location 1:** Location of site on school grounds or in adjacent park:

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Description of what we observe (signs of erosion occurring):

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Ideas about ways to decrease the amount of erosion:

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**Location 2:** Location of site on school grounds or in adjacent park:

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Description of what we observe (signs of erosion occurring):

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Ideas about ways to decrease the amount of erosion:

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# Student Investigation Log Worksheet

Use a separate sheet for each experiment or investigation.

Name: \_\_\_\_\_

**Question** (This is the question the investigation is asking):

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**Hypothesis** (This is a statement about what you think will happen in the investigation):

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**Materials** (List the materials being used in the investigation):

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**Procedures** (Describe the steps of the investigation):

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**Observations** (Describe what happened):

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**Conclusion** (Explain if your hypothesis was correct):

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Explain how your findings in this investigation will help people in the Chesapeake Bay Watershed.

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## Resources

Earth: The Water Planet. National Science Teachers Association. 1992. Activity ideas and information.

Encarta Dictionary. [http://encarta.msn.com/dictionary\\_1861609044/erosion.html](http://encarta.msn.com/dictionary_1861609044/erosion.html).

Slattery, Brit. 1991. WOW! The Wonders of Wetlands. Maryland: Environmental Concern. Activity ideas and information.

USDA-Ag in the Classroom. [www.agclassroom.org](http://www.agclassroom.org). Activity entitled, "Losing Ground."







# *Erosion Affects Bay Water Quality*



## Field Trip Experience Grade: 5

Program Length: 2 hours  
Number of Instructors needed: 2

Pickering Creek Audubon Center



# Standards of Learning

## Talbot County Student Performance Objectives:

### Grade 5:

**Science: *Materials and Processes that shape a planet***—Cite and describe the processes that cause rapid or slow changes in the Earth’s surface.

***Environmental Issues***—Recognize and describe that consequences may occur when Earth’s natural resources are used.

## Maryland State Voluntary Curriculum Standards of Learning:

### Grade 5:

**Science: *Constructing Knowledge***—Gather information from many different forms of scientific investigations including observing things, collecting specimens for analysis and doing experiments; ***Applying Evidence and Reasoning***—Seek better reasons for believing something than “Everybody knows that…” or “I just know.”; ***Communicate Scientific Information***—Recognize that clear communication is an essential part of doing science because it enables scientists to inform others about their work, expose their ideas to criticism by other scientists and stay informed about scientific discoveries around the world.

***Technology***—Examine and modify models and discuss their limitations.

***Materials and Processes that shape a planet***—Cite and describe the processes that cause rapid or slow changes in the Earth’s surface.

***Natural Resources and Human needs***—Recognize and explain how renewable and non-renewable resources are used by humans to meet basic needs.

***Environmental Issues***—Recognize and explain that decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences and tradeoffs; ***Environmental Issues***—Recognize and describe that consequences may occur when Earth’s natural resources are used.

This lesson also meets the following State Standards:

### Grade 4:

**Science: *Materials and Processes that shape a planet***—Recognize and explain how physical weathering and erosion cause changes to Earth’s surface.



## Synopsis

This lesson will introduce students to ways in which water and wind erode the earth's surface. Students will be introduced to the concept of sediment transport and its effects on the Chesapeake Bay ecosystem. Students will investigate actual sites of erosion and conduct outdoor erosion experiments using large models.

## Objectives

- Students will gather information about erosion from various scientific experiments and site inspections.
- Students will communicate scientific information to others and form experimental hypotheses.
- Students will be able to cite and describe the processes that cause erosion of the Earth's surface.
- Students will explain how erosion affects the Chesapeake Bay and cite ways to slow down erosion.

## Materials

- 2 stream table set-ups (see Teaching Aids)
- Soil
- Grass clumps
- Three 24 inch-long plastic basins
- A large watering can or hose
- Large fan (electricity and possibly an extension cord)
- Play sand
- 2 (2ft. x 2ft.) flat pieces of aluminum sheet metal or smooth plastic
- A concrete block, some bricks, or large rocks
- Man-made objects such as a plastic house (approximately 6" x 6")
- Two small rocks (approximately 3" x 3")
- 20 clipboards
- Erosion site investigation worksheet
- Pencils (1/student)



# Vocabulary

**Erosion** - the gradual wearing away of rock or soil caused by water, wind, ice or animals through processes such as: physical breakdown, chemical solution and transportation of material.

**Weathered and Weathering** - to expose something to the open air where it is subjected to the action of the elements.

**Non-renewable Resource** - a natural resource that is not replaceable after it has been used.

**Renewable Resource** - a natural resource that can be replaced after it has been used.

## Erosion Affects Bay Water Quality Lesson Plan

*This lesson plan is broken into four parts. Set-up the following experiments ahead of time:*

- *Both stream table experiments*
- *Both wind experiments*

**Part 1. Introduction** - 10 minutes. One Instructor. Suggested location: Open field, amphitheater, picnic tables, etc.

**Part 2. Experiments** - 45 minutes. One Instructor. Suggested locations: field clearing or natural open space set up with equipment for experiments (will need electricity and may need access to water).

**Part 3. Erosion Site Investigation** - 45 minutes. One Instructor. Suggested locations: coastal erosion sites, stream bank erosion sites, agricultural field erosion sites, suburban/urban drainage erosion sites, industrial or historical mining sites.

**Part 4. Conclusion** - 10 minutes. One Instructor. Suggested location: Open field, amphitheater, picnic tables, etc.

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### Part I. Introduction

**A. Welcome the students to your Center.** Have the students place all their belongings in a central location. Tell your guests where the bathrooms are located.

**B. Go over the plan for the day.**

- Tell the students, *“You are here to study erosion.”* Introduce staff. Tell the students, *“We will break into 2 groups. One group will study sites where erosion has occurred and one group will conduct experiments. We will then switch activities so that everyone will have a chance to do everything.”*

**C. Split students into 2 Field Groups.**

One field group will investigate erosion sites located on the property and the other field group will conduct experiments.



## Part 2. Experiments

### A. Scientific Investigation - How Does Vegetation Affect Erosion?

Need: Two stream table set-ups. Before the students arrive, spread a layer of soil in both stream tables. Leave just soil in one and cover the soil in the other table with the grass clumps (push the grass clumps into the soil). Place a basin at the bottom of each stream table to represent the Chesapeake Bay. Raise the stream tables up using the 6-inch piece of post. Have extra soil, the wooden posts and a full watering can nearby.

- Tell the students, *“We are going to investigate how plants help slow down water erosion by using a model. Models are very helpful to scientists because sometimes you can’t experiment on the real thing. This model represents a hillside along the Chesapeake Bay.”*
- Discuss the scientific process: ask a question, develop a hypothesis, conduct an experiment to test the hypothesis, record your observations and develop a conclusion.
- Hand out two copies of the student investigation worksheet, pencils and clipboards to each pair of students.

#### 1. Experiment without grass

- Have the students predict what will happen in the model without the grass clumps.
- Have the students record the process on the student investigation log worksheet.
- Do the experiment using the 6-inch post to raise the table.
- Discuss how this model shows how soil is washing into the Chesapeake Bay.
- Ask the students, *“What will happen as we raise the stream table higher?”* Remind the students that they are forming a scientific hypothesis just like a scientist does.
- Repeat the experiment using the various sized posts until all the soil washes off the stream table.

#### 2. Experiment with grass clumps

- Have the students predict what will happen with the grass clumps.
- Have the students record the process on the student investigation log worksheet.
- Do the experiment with the 6-inch post.
- Discuss what happened. Ask the students if plants help stop soil from washing into the Chesapeake Bay.
- Ask the students, *“What will happen as we raise the stream table higher?”*
- Repeat the experiment using the various sized posts until all the soil washes off the stream table. (This may never happen in the stream table with the grass clumps.)
- Discuss the real world application of this experiment by asking the students what people could do differently in order to help keep soil from washing into the Bay. (If the class already had the in-school portion of this lesson, you can discuss the effect of concrete surfaces and planting trees versus grass). Farmers plant cover crops between planting cash crops so that the soil is not left



exposed to water and wind erosion (USDA-Ag in the Classroom). A cover crop is usually grass or clover. A cash crop is a crop the farmer sells for money. Sometimes, a farmer makes money on the cover crop, but not always. In Maryland, farmers usually plant cover crops in late fall so the fields are protected through the winter.<sup>1</sup>

- Ask the students if other things besides soil particles might wash into the Bay.
- Discuss how pollutants, such as pesticides and fertilizers, often wash into the Bay along with soil particles.
- Discuss the effects of pollution on plants, fish, etc.

### **B. Scientific Investigation 2 - Wind Erosion**

Set up the experiment ahead of time. Plug in the fan. Spread a layer of play sand on each of the two (2ft. x 2ft.) flat pieces of aluminum sheet metal or smooth plastic. Place a 24-inch long basin on its side at the end of the sheet metal opposite the fan. (Use the brick or rocks to keep the basin from blowing over.) The fan will blow the sand into the basin. You will need the clumps of grass used in the stream table experiment, along with the man-made objects and the small rocks.

- Tell the students, “*We are going to investigate how plants and other objects help slow down wind erosion by using a model.*” Explain that this model represents a field with no plants or cover crops along the Chesapeake Bay.
- Explain the experiment to the students without telling the students what will happen.

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<sup>1</sup>USDA-Ag in the Classroom.



- Have the students hypothesize about what will happen with the grass clumps and without the grass clumps. (You may want the students to complete the student investigation worksheet for these experiments.)

1. Experiment without grass clumps

- Use one of the pieces of sheet metal to do the experiment without the grass clumps. (Turn on the fan and let it blow the sand into the basin.)

2. Experiment with grass clumps

- Now move the basin over to the other piece of sheet metal and place the grass clumps around on top of the sand on the sheet metal. Move the fan over so that it will blow the sand off this piece.
- Discuss whether the students' hypotheses were correct. Ask the students if they think that the same thing that happened with the grass clumps will happen with other objects.

3. Experiment with other objects

- Reuse the sand to set up the experiment again.
- Conduct the experiment with rocks and then with your man-made objects.
- Ask the students if the objects helped hold the sand or soil and kept it from blowing away.
- The results will probably be the same for the grass clumps and all the objects, but there may be slight variations worth discussing with the students. If there are slight variations between objects, have the students figure out why the variations occurred.
- Ask the students if they have ever seen objects placed in the way of blowing sand to prevent the sand blowing away. Examples of this are on the Atlantic coast of Maryland where there are sand dunes. Sand blows easily. Communities plant dune grass to create dunes in order to slow down beach erosion being caused by water. The dune grass collects sand. Once the dune grasses are covered up, people plant more dune grass. Eventually, the dune grass grows naturally and keeps the dune from being eroded. People in Delaware and Maryland used to put down old brush (like old Christmas trees) to collect the sand being carried by the wind. The sand dunes built up over the brush. People then planted dune grass to slow the erosion of the new sand dune by wind and water. This method was not as effective as starting with live plants.

### Part 3. Erosion Site Investigation

Before the students arrive, you will need to investigate your Center's landscape for signs of erosion and a place where excavation of soil has taken place (ex. a building site where tracts of land have been excavated). Determine route you will take the students on in order to use the time allotted to stop and investigate each site.



## Introduction

- Tell the students you will be going on a hike to investigate the landscape for signs of erosion.
- Go over the rules of safety: Follow the Center instructor. Pay attention to where you are walking. We may be walking into ditches and down stream banks.
- Ask the students, “*What signs of erosion should we look for?*” (Water paths, lack of plants, etc.)
- Describe to students what your erosion sites look like so they will know what to look for. Even though you will be with the group and you will be there to point out the sites, it is good to have the students visualize what we are looking for. Do not forget to mention that erosion can be caused by numerous people when they create trails through natural areas. Water will often flow along these trails and cause more erosion.

## Scientific Investigation -What kinds of erosion can be observed at the Center?

Possible sites to observe:

- Stream bank erosion
- Field erosion sites
- Erosion from water flowing off non-permeable surfaces
- Heavily-used trails
- At each site, have the students make an entry into their Observation Journal (see Teaching Aids).
- In the Chesapeake Bay Watershed, rip-rap is the term commonly used to describe the stone material laid along the coast to prevent erosion. Point out examples of rip-rap to the students if possible. Tell the students how rip-rap slows down erosion on one property but sends the waves and the force of the wave action somewhere else where the water waves cause erosion. Ask the students, “*What do you think would happen if every one who owned property on the Chesapeake Bay put down rip-rap?*” (The natural, shallow, sandy coast would be lost; there would be no place for turtles to come out of the water, and it would be unattractive.)
- At some point on your hike, discuss how sediment currently flowing into the Chesapeake Bay from erosion is causing parts of the Bay to become shallower over time. This is a problem for areas like the Baltimore Harbor. The Maryland government has started a dredging project where they are taking out the sediment, called dredge, from the bottom of the Harbor in order to make







the Harbor deeper. They are piling the dredge onto islands known as Poplar Island and Hart-Miller Island. So, currently, erosion and transport of sediment into the Bay is a common and costly problem for the people in the Chesapeake Bay. Discuss possible solutions such as more shoreline plantings, and end this discussion on a positive note. After conducting the in-class experiments and the outdoor field trip experiments, the students should be able to think of ways people can reduce the amount of erosion occurring in the Chesapeake Bay Watershed.

- When discussing erosion caused by people, you can point out techniques your Center uses to minimize trail erosion. For example, some Center's make rules to limit trail use by horses and ATVs or the Center sets up boundaries to keep people on designated trails which are maintained and managed.

### Soil Excavation Site

- Tell the students, *"This site demonstrates how humans extract non-renewable resources from the environment."*
- Ask the students if they know what natural resources are. If they do not, define it for them and give them some examples (a resource found in nature, that is used to meet human needs, such as oil).
- Ask the students if they can define the terms renewable resource and non-renewable resource. Reword what the students have provided as an answer or provide a definition of these terms to make sure that all students know what they mean.
- Stop at a building site where soil has been removed to suit human needs.
- Ask the students what they think caused this site to look like this. Was it erosion or something else? Tell the students humans, who extracted a non-renewable resource from this area, caused it to look this way. While erosion may now be taking place at this site, humans changed the landscape and helped cause erosion of this site.
- Ask the students to guess which **non-renewable resource** was extracted from this site. The answer is soil, or more specifically clay or sand. *"Can we grow more soil to replace the soil that was extracted from this site?"* (No.) Therefore, this is an example of how humans impact the environment when they extract non-renewable resources.
- Discuss how this human behavior sometimes has large negative consequences and sometimes very small consequences. The consequences vary from site to site. Discuss the impacts to the site they are studying.
- Discuss how humans can minimize their impact on the environment. For example, soil could be composted from food scraps and placed at another site where the extraction of soil has caused a larger negative impact. This would help minimize the human impact on the environment.
- Be sure to discuss how humans need to minimize their impacts when they are extracting resources.



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### Extra Activities (if time permits)

#### 1. Nature Journal:

Explain to the students that Naturalists often keep nature journals on areas they have visited. Have the students write a Nature Journal entry on the back of their erosion site observation worksheet about the erosion they saw at the Center today. Ask them to describe what the site looked like or create sketches of the erosion. You should pick one erosion site or two that are near one another and have the students focus on that site or sites for this activity. The students should be quiet and work alone. The students should think about how seeing erosion sites like this makes them feel. The students should write or illustrate how we could slow down erosion on the Chesapeake Bay.

#### 2. Drawing Erosion murals

Need: large sheets of paper and markers or crayons

- Have the students sit down at tables to draw two murals. One mural should show the Center grounds with a lot of erosion and the other mural should show the Center grounds without any erosion.

### Part 4. Conclusion

Gather both field groups of students together. Explain to the students that they have now conducted scientific experiments using models and investigated actual sites for signs of erosion.

- Ask the students to list some of the things people can do to slow down water erosion.
- Ask the students to list some of the things people can do to slow down wind erosion.
- Ask the students to tell you how erosion here at the Center and in their neighborhoods affects the Chesapeake Bay.





# Teaching Aids

## Stream Table Set-ups

### Materials needed for construction:

- Hammer and 50 - 2" nails or screwdriver and 25 - 2" wood screws
  - Waterproof wood glue or caulking
  - For each stream table, you will need the following boards: two 6 inch long 4" x 4" pieces, two 1-ft. long 4" x 4" pieces, two 2-ft. long 4" x 4" pieces, two 4" x 2" x 5-ft boards, one 8" x 2" x 5-ft board, two pieces of 2-ft. x 2-ft. plywood
  - Two 24" (or longer) shallow pans
- Assemble the stream table tray: Attach the sides of the stream table (two 4" x 2" x 5-ft boards) to the base (8" x 2" x 5-ft board) so that it forms a 'u' shaped tray. Seal the board junctions on the inside of the stream table with waterproof wood glue or caulking to prevent water from running through the cracks. (Wait until the sealant is dry before using the tables.)
  - Assemble the stream table base at the time you conduct the experiment. The post will rest on the 2-ft. x 2-ft. plywood and the stream table will rest on the top of the post. The bottoms of the posts will need to be flat in order to provide stability (they should be able to stand up on the plywood by themselves).

Stream table





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# Science Observation Journal

Student Investigator's Name: \_\_\_\_\_

**Site 1:**

Description of site being observed:

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Description of erosion that occurred or is occurring at this site:

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Ideas about ways to stop the erosion of this site:

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**Site 2:**

Description of site being observed:

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Description of erosion that occurred or is occurring at this site:

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Ideas about ways to stop the erosion of this site:

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**Site 3:**

Description of site being observed:

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Description of erosion that occurred or is occurring at this site:

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Ideas about ways to stop the erosion of this site:

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# Student Investigation Log Worksheet

Use a separate sheet for each experiment or investigation.

Name: \_\_\_\_\_

**Question** (this is the question the investigation is asking):

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**Hypothesis** (this is a statement about what you think will happen in the investigation):

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**Materials** (List the materials being used in the investigation):

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**Procedures** (describe the steps of the investigation):

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**Observations** (describe what happened):

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**Conclusion** (Explain if your hypothesis was correct):

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Explain how your findings in this investigation will help people in the Chesapeake Bay Watershed.

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## Extension Activities

### *Post-activity for Classroom Teacher*

#### Classroom Creative Writing Activity:

Have the students think about their field trip to the Center or the erosion sites discovered on their schoolyard during the in-class lesson. Ask the students to think about what the erosion looked like. Ask the students to write a story. The story should start with what the land looked like 300 years ago before erosion took place. The students can use their imagination and be creative. Their story can fast forward or jump to current time after erosion has started to occur. Their story should involve people or characters. Tell the students to tell you how the characters in their story have to deal with erosion occurring on their land. The students can write about how the characters feel about these changes happening to the Chesapeake Bay Watershed.

You can build on this activity by involving students' creative art skills. The students can work alone or in groups to draw pictures, murals, build dioramas, or make up skits to go with their story. Have the students share their projects with the rest of the class.

## Resources

*Baltimore Dredging Project*-Source of information gathered from Chrissy Albanese, Tour Coordinator for Poplar Island. For more information on Poplar Island and Hart-Miller Island contact: 410-770-6503 or the Port of Baltimore at The World Trade Center, Baltimore, MD 21202 tel. (410) 631-1102.

DNREC. Christmas Trees Can Be Recycled But Not Placed on Dunes. December 21, 2005. Article retrieved from <http://www.dnrec.state.de.us/dnrec2000/Admin/Press/Story1.asp?PRID=1865> on March 22, 2006.

Earth:The Water Planet. National Science Teachers Association. 1992.

Encarta Dictionary. [http://encarta.msn.com/dictionary\\_1861609044/erosion.html](http://encarta.msn.com/dictionary_1861609044/erosion.html)

*Peter Stifel*. Professor Emeritus. University of Maryland. Conversations February, 2006.

USDA-Ag in the Classroom. [www.agclassroom.org](http://www.agclassroom.org). Activity entitled, 'Losing Ground'. This reference provided activity ideas and information for this lesson.

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# Pre and Post lesson assessment for Grade 1: Schoolyard Habitats and Water and Wetlands

*These questions are intended to be administered both prior to and following the lessons in order to assess learning. Depending on student ability they can be done individually or as a group activity.*

## I. Schoolyard Habitats

- **What are the four components of a habitat?**

1. Food
2. Shelter
3. Water
4. Space

- **Pick an animal you know. Where does this animal live? What helps this animal live where it does?**

There are many possible answers. Does the answer identify one aspect of an animal that enables it to use its habitat (e.g. a fish has gills so it can live under water).

- **A box turtle lives in the forest. What does a box turtle have that makes the forest a good habitat for it?**

Claws made to dig for worms, not swim. A shell they can close for protection since they can't swim away. The colors of a box turtle make it blend with the forest floor.

- **Why is it important to care about the environment?**

There are many possible answers ( e.g. we need clean water to drink, clean air to breath, or healthy food to eat).

## II. Water and Wetlands

- **What are two things that all wetlands have?**

Special soil and special plants.

- **How does a wetland clean water before it flows into the Chesapeake Bay?**

It filters water with its roots and collects pollution, soil, etc.

- **What kind of water can you find in a wetland, Salt, Brackish, Fresh, or all of them?**

All of the different types of water.

- **What is one of the special things plants have that help them live in wetlands?**

Rubbery leaves, hollow stems, long roots.

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## Pre and Post lesson assessment for Grade 2: Wetland Habitats and Seeds and Plants

*These questions are intended to be administered both prior to and following the lessons in order to assess learning. Depending on student ability they can be done individually or as a group activity.*

### I. Wetland Habitats

- **How much of the Earth is covered by water?**  
More than half.
- **What does a wetland have that meets the needs of a Great Blue Heron?**  
Food like fish and tadpoles.
- **What is a natural resource we can get from Wetlands? How does this affect wildlife?**  
Trees. Removing trees can take away the homes of some animals, like Wood Ducks.
- **What are five kinds of wetland birds?**  
Red-winged Blackbird, Red-shouldered Hawk, Great Blue Heron, Barred Owl, Wood Duck.

### II. Seed and Plants

- **What are the different parts of a seed?**  
Outer shell, seed coat, embryo, food source.
- **What are the different parts of a plant?**  
Stem, root, leaf, flower, seed, fruit.
- **What is an example of how people use plants?**  
People grow them for food, like corn, soybeans, and wheat.
- **What is a difference between soil found in a wetland and soil found in a field?**  
Wetland soil is gray, wet, and may smell like rotten eggs. Field soil is red, black, or brown, and dry.



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## Pre and Post lesson assessment for Grade 3: Changing Landscapes and Forests

*These questions are intended to be administered both prior to and following the lessons in order to assess learning.*

### I. Changing Landscapes

- **What is a watershed?**  
The entire region that water drains from as it flows into a particular body of water.
- **Does the Chesapeake Bay have a watershed?**  
Yes.
- **What parts of a watershed filter the water that drains from the land?**  
Plants and soil.
- **If you add more roads and buildings to the Chesapeake Bay watershed will the Bay be more or less clean?**  
Less.
- **Why?**  
There are less plants and soil to absorb pollutants.

### II. Forests

- **What big plants with big roots are very good at filtering water as it runs into the Chesapeake Bay?**  
Trees.
- **What else do trees do for us?**  
They provide us with oxygen, shade, wood and paper. They also provide animals with habitat.
- **What is a decomposer?**  
An organism that helps to break down another organism from its original, living state to nutrient-rich soil.
- **What do decomposers do for us?**  
They break down detritus into nutrient-rich soil that trees and plants use to grow.
- **How can you tell an animal has been near even though you did not see it?**  
There are many answers to this question. By seeing tracks left by the animal, finding fur caught on a branch, hearing an animal walk, etc.

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# Pre and Post lesson assessment for Grade 4: Reducing Use of Resources, Cutting Back on Bay Pollutants, and Ecosystems of the Chesapeake Bay

*These questions are intended to be administered both prior to and following the lessons in order to assess learning.*

## I. Reducing Use of Resources

- **Why is recycling important?**  
It saves energy and money, reduces pollution, increases landfill space and saves natural resources.
- **Who organizes recycling?**  
In Maryland, local governments organize recycling.
- **Do you participate in the economy when you recycle?**  
Yes.

## II. Cutting Back on Bay Pollutants

- **Why are landfills important?**  
If landfills were not built, trash piles behind people's houses would grow huge and there would be a problem of how to get rid of trash.
- **How does recycling help the Chesapeake Bay?**  
It keeps landfills from filling up too fast, uses less natural resources, etc.
- **What can be done in addition to recycling to help the Chesapeake Bay?**  
Buy products that use less packaging.

## III. Ecosystems of the Chesapeake Bay

- **What is an ecosystem?**  
A collection of living and non-living things that function together within the environment.
- **What man-made ecosystem is important to the Chesapeake Bay because of its ability to collect water and direct it to water filtering wetlands?**  
A man-made pond.
- **What do we mean by living? Non-living? Dead?**  
Something that is alive. Something that was never alive or was made from something that was once alive. Something that is no longer alive.

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## Pre and Post lesson assessment for Grade 5: Erosion Affects Bay Water Quality and Erosion Affects Bay Water Quality

*These questions are intended to be administered both prior to and following the lessons in order to assess learning.*

### I. Erosion Affects Bay Water Quality (in-school lesson)

- **How do plants in the Chesapeake Bay Watershed change the way sediment washes into the Bay?**  
Plants lessen the amount of sediment and water that washes into the Bay by absorbing the sediment and water with their roots.
- **How can you tell that a landscape has eroded away?**  
Worn-away paths where water has flowed and where there are no plants, bare sand, etc.
- **If you find a piece of land that has erosion, how can you stop the erosion?**  
Install plants, change the flow of water that is cutting into the land and causing erosion, etc.

### II. Erosion Affects Bay Water Quality (field trip experience)

- **What is erosion?**  
The gradual wearing away of rock or soil caused by water, wind, ice, or animals using processes such as: physical breakdown, chemical solution and transportation of material.
- **How is erosion affecting the Chesapeake Bay?**  
The Bay is becoming shallower because of sediment transport, shorelines washing away, the turbid water from sediment (making it difficult for underwater plants to grow), etc.
- **How do human actions such as excavation or digging large holes for mining or construction cause erosion?**  
Man has removed the plants that once held the soil together and covered it. Now the land can easily be washed away.







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