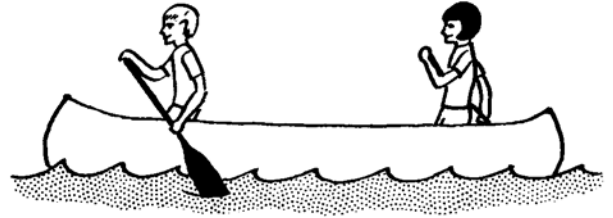


Lesson: Water's Living Things: Indian Creek Exploration



Environmental Literacy Question: How has human land use affected the living things in the Chesapeake Bay?

Topic/Essential Question: How have humans affected aquatic plants and organisms in the Chesapeake Bay Watershed?

Unit/Lesson Sequence: One of three lessons (overnight trip) or one of two lessons (day trip) in the "Water's Living Things" 4th grade module based at Arlington Echo Outdoor Education Center.

Content Standards:

- **Environmental Literacy:**

- 5.A.1. Analyze the effects on human activities on earth's natural processes.

- 8.F.1.b. Identify actions that can be taken as individuals and those that require the involvement of other people, organizations and government.

- **Science:**

- 6.4.B.1. Recognize and describe that people in Maryland depend on, change, and are affected by the environment.

- **Common Core Standards for English Language Arts Standards-Speaking and Listening-4th Grade**

- Comprehension and Collaboration**

- CCSS.ELA-Literacy.SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Length of Lesson: 35 minutes

Student Outcome: The student will demonstrate proper canoeing technique and water safety. The student will identify three common methods of erosion control (bulkhead, rock riprap, living shoreline) and explore Indian Creek to find wildlife and manmade features of the environment.

Knowledge of the Learner:

- Prerequisite knowledge, skills, and processes: Basic understanding of erosion as a natural process and erosion made worse by human development.
- Student needs, interests, previous learning: These will be determined during the pre-assessment.
- Conceptual difficulties: Learning to navigate the canoe. Specifically that the boat moves opposite of the paddling motion.
- Differentiated: This lesson will appeal to different types of learners. Kinesthetic learners should do well with the physical act of navigating the canoe. Interpersonal learners will benefit from the team dynamic required for steering a canoe. Observing the different

shoreline types and making assessments should appeal to visual learners.

Knowledge of Content:

- Content knowledge for instructor: Understanding of proper canoeing technique. Working knowledge of the different erosion control techniques (see Supplement C: Volunteer Background Information Sheet).
- Vocabulary: Erosion, bulkhead, rock riprap, living shoreline, port (left), starboard (right), canoe parts: stern, bow, thwart, gunwale, and keel, paddle: grip, shaft, throat, blade, and tip.
- Resources:
 - PFD for each child and adult (given at Introduction)
 - Paddle for each child and adult (given at Introduction)
 - Waterfront radio (walkie-talkie)
 - Emergency blanket
 - Life ring
 - Canoe scavenger hunt poster
 - Parts of the canoe poster

Lesson setup:

Pick up the waterfront radio from the upper Resource Lab. Go to the waterfront and pull down the number of canoes needed for the group (one canoe for each student pair and one for instructors). Secure the canoes by tying them to the floating dock. Set up the posters and put out the life ring and emergency blankets from the pier closet. Meet the first group of students at the Water's Living Things introduction on the patio outside the Dining Hall. Take the students to pick up paddles after they've received their PFDs at the water safety briefing.

Instructional Delivery

Module Introduction: All students and instructors will meet on the Dining Hall patio (outside the dining hall on the right side) for a water safety talk from an Arlington Echo staff member. At this time, everyone will receive PFDs. They must keep on for the duration of all three activities (two activities on a day trip).

Pre-Assessment:

1. Welcome the students to the activity and introduce yourself.
 - Ask students if anyone has been on a boat before. What kind of boat (motorboat, canoe, rowboat)? Do any of them have boats at home?

Motivation/Warm-up:

2. Engage the students by explaining that they will be going on a canoe scavenger hunt. Tell them they are going to be exploring the cove at Arlington Echo by canoe and searching for wildlife and different shoreline features. (Show pictures on poster.)
3. Ask students what kinds of animals and plants they think they might see. Briefly explain the three different shoreline types (bulkheads, riprap, and living shorelines) and tell them it's going to be their job to find one example of each type and figure out which one is the best for our environment. (Pictures on Poster)

Procedure

4. Go over canoeing skills. Each student should select a paddle appropriate for their height (when standing with the blade of the paddle on your toes, the grip should fall between your nose and chin).
5. Have students pair up and stand in two rows as if they are in imaginary canoes. The more experienced paddler should be in the back. Where skill is equal, the larger person should take the back seat.
6. Briefly go over the parts of a canoe at the waterfront: bow, stern, port, starboard, thwart, gunwale, and keel.
7. One instructor could demonstrate in the water the following techniques as they are being discussed and mimicked on land by the students.
8. Demonstrate basic canoeing maneuvers: forward stroke, back stroke, canoeing in a straight line, and turning a canoe. Have the pairs of students follow along with their paddles.
9. Demonstrate the proper technique in boarding a canoe. Be sure to emphasize the importance of staying low and keeping three points of contact.
10. Point out the boundaries for canoeing. Students can go back into the cove (Indian Creek), but are not to canoe past the buoys.
11. An adult or two should be the first to go out into their canoe(s). The other instructors/chaperones will stay behind to assist students in boarding their canoes and keep a lookout from the shore.
12. Guide the students into the cove, where they can scavenger hunt for various wildlife and physical features of the area. Be sure they try to locate one example of each of the three shoreline types (wooden bulkhead, rock riprap, and living shoreline).

Assessment:

13. Upon returning to shore, ask the students to tell you what they found on their scavenger hunt. After they've pointed out a few things, guide them towards discussing the shoreline types.
 - Can the students identify the physical characteristics of the different shorelines (*the bulkheads are hard and flat, the riprap is hard but has many gaps, the living shoreline has many grasses, etc.*)?
 - Why do the students think people would build these structures on their property (*to stop erosion*)?
 - If the water is choppy, ask the students if they noticed how the waves break on the various shorelines. If there's no visible wave action, have the students make a guess (*the water breaks hard against the bulkheads and riprap; it breaks more gradually on the sloped, grassy shores of the living shoreline*).
 - While all three shorelines do their intended job of protecting their landowner's property, ask students which they think is the most environmentally friendly [*The living shoreline provides habitat and food for grass shrimp, small fish, larva, molting crabs, and many other creatures. Bulkheads and riprap don't provide sheltered habitat for wildlife. Additionally, bulkheads and riprap don't diffuse wave energy; they simply pass it on to cause erosion on adjacent properties, as well as churning up*]

of the underwater soil, so that underwater grasses (SAV's) cannot grow.]

Notes for Clean up

Please clean, organize and return the lesson materials to their proper locations at the end of each day of instruction. Remember to inform the Arlington Echo Staff if you need assistance or if any materials are damaged or missing.

Notes for morning set up (overnight trips):

Remember to set up your materials prior to the mornings activities. If you do not spend the night, please check in with the AE staff assigned to the model and be at your teaching location by 9:00 a.m.

Notes for Inclement Weather:

- Arlington Echo encourages keeping our outdoor activities outdoors —even in the rain— but in the case of severe weather (thunder, severe cold, etc.), the rain location for this activity will be determined at the time of your school's arrival (Upper Resource Lab or Dining Hall).

Supplement A

Canoeing Skills

Choosing the right paddle and PFD

1. Paddle: Place the blade of the paddle on top of your toes while standing. The grip should fall between your chin and nose.
2. PFD: All Type II PFDs are sized according to the weight of the wearer. Have students pick the PFD that corresponds to their weight.

Entering a Canoe

1. Keep body low and move slowly. Always keep three points of contact. Always have at least one hand on the gunwale.
2. Board directly into your paddling position, if possible.
3. One person enters the canoe at a time.

Holding the Paddle Properly

1. If paddling on the right side of the canoe, hold the grip with your left hand with fingers facing away from the body (Tell the students to "high five" their paddles to place their hands in the proper position.). Hold the shaft wherever your right hand falls comfortably.
2. If paddling on the left side, reverse this so that the right hand is on the grip and the left hand is on the shaft.

Forward Stroke

1. Extend the right arm (if paddling on the right side of the canoe) forward and dip the blade straight into the water.
2. Pull the blade straight back towards you, pushing the water backwards and propelling the canoe forwards.
3. Stroke ends when the top arm is fully extended.
4. Turn the paddle sideways, lift it from the water, and return to the starting position.
5. Note that doing this stroke on the right side of the canoe will make the boat veer left; paddling on the left will make the canoe veer right.

Backstroke

1. Blade enters the water just behind you and flat to the surface.
2. With your top arm extended and your lower arm bent, move the blade forward through the water.
3. The stroke ends when your lower arm has fully extended.
4. Turn the paddle sideways, lift it from the water, and return to the starting position.
5. Note that doing this stroke on the right side of the canoe will make the boat veer right; paddling on the left will make the canoe veer left.

Supplement A continued

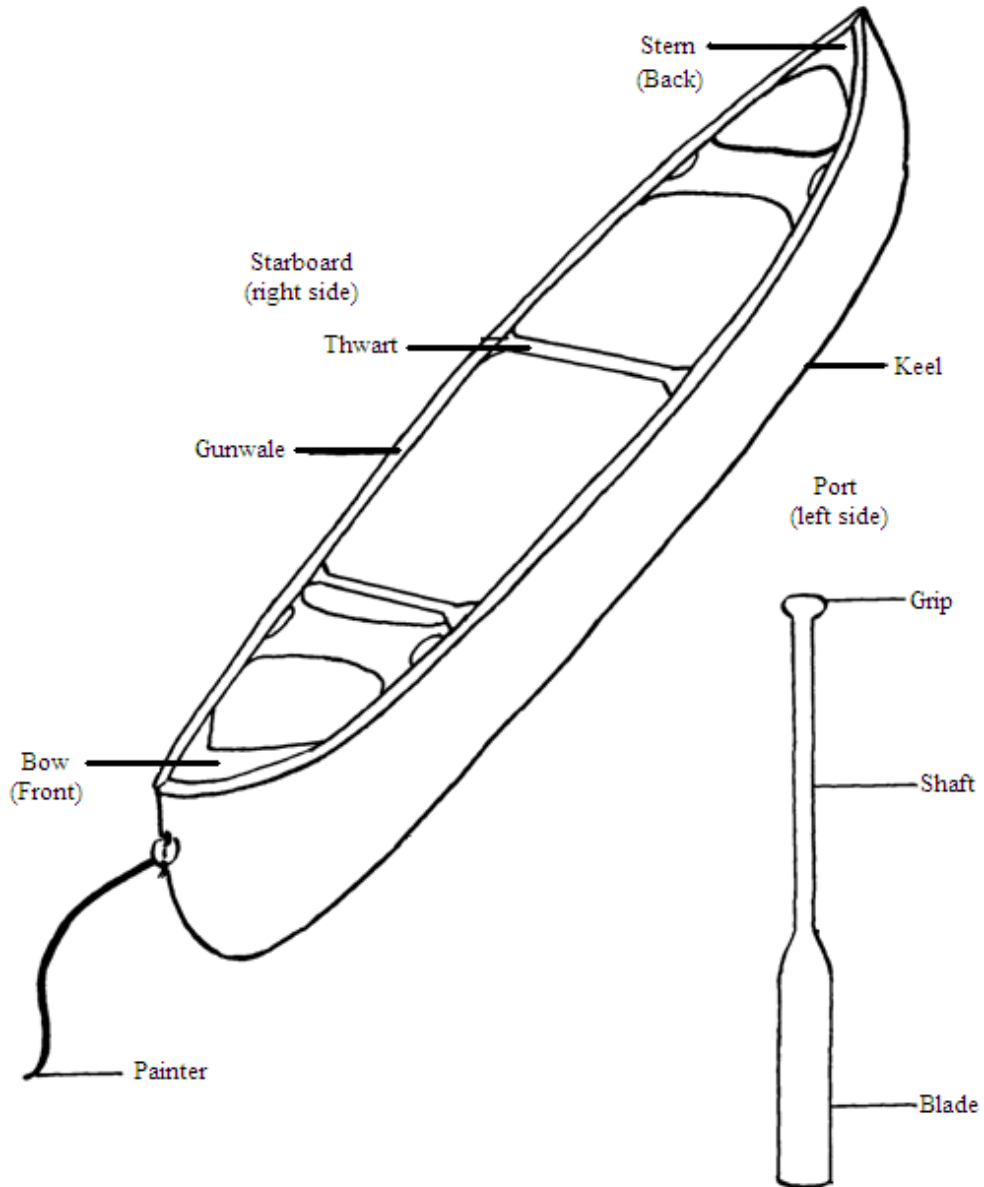
Push away Stroke (optional)

1. Paddle enters the water directly alongside the boat. Blade of the paddle should be parallel to the gunwale.
2. Push the paddle through the water straight out away from the canoe.
3. Canoe will move sideways, away from where you're pushing. For example, if you push away on the right rear of the canoe, the rear of the canoe will turn left while the front turns right. If you push away on the right front of the canoe, the front of the canoe will turn left while the rear turns right.

Draw stroke (optional)

1. Paddle enters the water directly to the side of the paddler, out away from the canoe. Blade of the paddle should be parallel to the gunwale.
2. Pull the paddle through the water straight towards the canoe, drawing water towards the boat.
3. The canoe will move sideways, towards where you're drawing. For example, if you draw on the right rear of the canoe, the rear of the canoe will turn right while the front turns left. If you draw on the front right of the canoe, the front of the canoe will turn right while the rear turns left.

Supplement B



Supplement C

Volunteer Background Information

Erosion is the process of wind, rain, and waves moving soil from one place to another, such as from the land to the water. While erosion is a natural process, it can be made worse by human development. Clearing land, for example, quickens the pace of erosion since trees and other plants play a large role in its prevention.

Waterfront landowners face the challenge of keeping their property from eroding away. The most common method is building up a retaining wall called a **bulkhead**, made from wood or synthetic materials. In areas of high wave action, **rock riprap revetments** are also used.



Wooden Bulkhead



Riprap Revetment

While bulkheads and riprap revetments do a fair job of keeping their landowner's property intact, they present some problems. Bulkheads and riprap revetments don't provide the grassy wetland habitat needed by various aquatic animals, such as small or baby fish, molting crabs, and other crustaceans. Bulkheads also suffer wear and tear and eventually need to be replaced, putting more expense on the landowner. Additionally, bulkheads and riprap don't diffuse wave energy; they simply pass it on to cause erosion on adjacent properties, as well as the churning up of the underwater soil, so that underwater grasses (SAV's) cannot grow.



Living Shoreline

Living shorelines present an environmentally-friendly alternative. Using bio-logs made from coconut or other natural fiber, stakes, sand, and many native wetland plants, we can build a natural shoreline that serves the same purpose of preventing erosion *and* provides much needed habitat for aquatic life.

The Maryland Department of the Environment (MDE) now prefers the installation of living shorelines as the best erosion-prevention method in areas with low wave action.

Even in areas with moderate wave action, living shorelines can be installed as long as they're protected by rock riprap. The MDE banned the building of bulkheads in tidal areas, except for the replacement of pre-existing bulkheads.