Lesson: Watershed Wonders
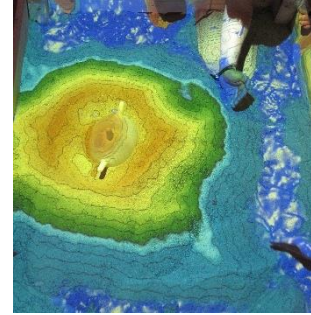
*Arlington Echo works to continuously improve our lessons. This lesson may be modified over the course of the school year.

Environmental Literacy Question: How have humans affected the Chesapeake Bay and its watershed?

Topic/Essential Question: How does water move throughout a watershed?

Unit/Lesson Sequence: This lesson is one of two in the "Water's Living Things" 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
  1.A.5.f. Make recommendations supported by data to help address or resolve the issue.
  8.F.1.b. Identify actions that can be taken as individuals and those that require the involvement of other people, organizations and government.
- **Social Studies**
  3.D.1.b Geography Describe ways and reasons people in Maryland and the U.S. modify the natural environment and the consequences of modifications.
- **Science**
  4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.

Length of Lesson:
45 minutes *Times subject to change based on group size.

Student Learning Outcome: The students will explore the Chesapeake Bay Watershed through an augmented reality sandbox.

Knowledge of the Learner:
- Prerequisite knowledge, skills and processes: When rain hit a slope it will travel downhill. Students should be able to listen to instruction and follow directions.
- Student needs, interests, previous learning: These will be identified in the pre-assessment.
- Conceptual difficulties: All students should be able to experiment with building landforms out of sand and testing how water flows over the land. Some students may have difficulty understanding the difference between the model and a realistic environment.
- Differentiation: Students are in 4th grade with a diversity of backgrounds and skill levels.

Knowledge of the Content
At the beginning of the lesson, students work with the activity leader to understand how our environment is depicted on a two dimensional map. Students will then work as a team to determine how water flows over a watershed in a three dimensional model. They may discuss their findings along

the way to improve understanding and encourage cooperation. Students will use their knowledge of stormwater and a watershed to investigate why pollution prevention is important.

- **Vocabulary:**

Stormwater	Watershed
Topography	Erosion
Pollution	Runoff

- **Resources:**

    AR Sandbox

    Topographic Map

    Chesapeake Bay Model

- **Supplements:**

    A: Topographic Maps

    B: Watershed Dance

    C: Watershed Game

Lesson setup:
Set up cones and poly spots as directed in **Supplement C.**
AR Sandbox will be set up during training **Supplement D**.

Instructional Delivery
Engage:

1. Show the students map #1 **Supplement A**. Ask the students if they know what location the map is showing. *This is a map* of *Arlington Echo. "*Can you tell if Arlington Echo is flat or hilly, by looking at this map?" *No, it does not show elevation.* Show the students map #2 **Supplement A**. Ask the students "Has anyone ever seen a map like this?" *This is a topographic map which shows the shape of Earth's surface. The lines show a change in elevation.*
2. Ask the students "While walking around Arlington Echo, did you have to walk up or down any hills?" *A topographic map will show you where hills and slopes are and how steep they are.*
3. When the lines are very close together, that means that there is a steep hill. "Can you find somewhere on this map where the lines are very close together?" *Close to the shoreline and on our trails.* These steep slopes are found all along the Severn River and are very characteristic of this area.
4. Show students the "Top vs. Side View" graphic **Supplement A**. Explain how the left column shows elevation as you would see it on a topographic map and the right column shows elevation in a side view (as if you are looking at the side of a mountain).
5. Ask the students "If rain fell on this surface, where would it flow?"
6. Ask the students "Do you know what a watershed is?" Lead the students in the watershed dance, **Supplement B.**

Chesapeake Bay Watershed Model:

1. Show the students the watershed model of the Chesapeake Bay. This is a 3D model that shows the topography of the land. The changing colors show a change in elevation. All the low areas are all lighter green in color and the higher elevations are darker green and gray. This model also shows the depth of the water in the Chesapeake Bay.
2. Ask the students "If we poured water on top of this model, where would the water collect?" *The Chesapeake Bay.*

Explore:
Tell the students that they are going to get a chance to create their own 3D topographic map in the sand.

1. Allow students to explore the AR sandbox, 8-10 students at a time. Each group will get 10 minutes to explore.
2. If groups are larger than 8-10, those that are not exploring in the sandbox will be participating in the watershed game **Supplement C**.

Explain:
Once each student has had a chance to explore, gather the entire group around the AR Sandbox.

1. Ask the students "Does anyone remember what a watershed is?" (Students who have finished the Watershed Game should already be familiar with a watershed) *A watershed is an area of land where all the rivers and streams flow into a body of water.*
2. Demonstrate how rain flows down the topography and into a basin by holding your hand over the top of the AR Sandbox.

Elaborate:

1. Create two separate watersheds in the sand (i.e. the Chesapeake Bay and Mississippi Watersheds). Make the Appalachian Mountains in the center with two basins on either side. One will represent the Chesapeake Bay and the other the Mississippi River.
2. Make a rainstorm on top of the mountains.
3. Ask the students "Does all of the rain water flow into the Chesapeake Bay?" "Where does some of the rain water end up?" *Rain that falls on the other side of the Appalachian Mountains will drain into the Mississippi River. One side of the mountain is part of the Chesapeake Bay Watershed and the other is part of the Mississippi River Watershed.*
4. If the group is smaller than 10 students, take the group outside and complete the watershed game, **Supplement C.**

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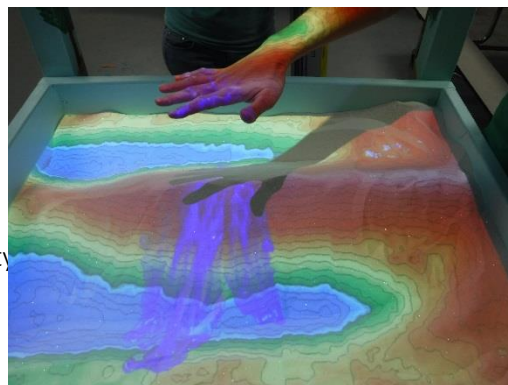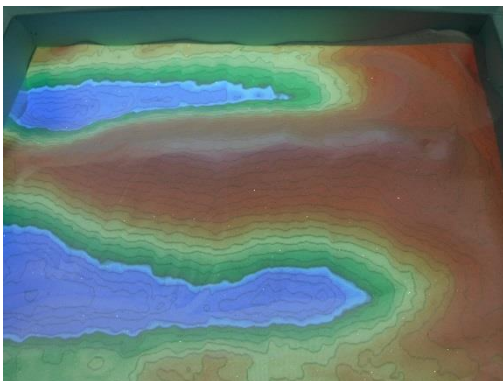
Evaluate:

Review the definition of a watershed. Ask the students "How can humans change the topography of a watershed? How would this affect the Chesapeake Bay?" *Clear cutting trees, building houses and roads can cause erosion and change the topography of the land. This can affect water quality through increased sediment and pollution.*

Notes for Clean up

To exit out of the AR display, press ESC. Logout of the computer and make sure the projector is turned off. Cover the sand with the Chesapeake Bay model.

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 10 minutes before the lesson begins.

SUPPLEMENT A: Topographic maps