ENVIRONMENTAL LITERACY MODEL ELM

# Environmental Literacy Model


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| Title | Making a Difference in Our Watershed |
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| School, District | Harford County Public Schools |
| Audience (grade, course) | Grade 2 Science |

## Curriculum Anchor

### Defining the Learning Objectives and Curriculum Connection

Curriculum indicators, performance expectations, and/or student learning objectives.

**NGSS**

**2-ESS1-1.** Use information from several sources to provide evidence that Earth's events can occur quickly or slowly.

**2-ESS2-1.** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

**2-ESS2-2.** Develop a model to represent the shapes and kinds of land and bodies of water in an area.

**2-ESS2-3.** Obtain information to identify where water is found on Earth and that it can be solid or liquid. *(In Issue #1, students identify where water is found within our watershed. They have a previous understanding from Science Curriculum that water can be a solid or a liquid).*

**2-PS1-1.** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

**K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

**K-2-ETS1-2.** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**2-LS4-1.** Make observations of plants and animals to compare the diversity of life in different habitats.

**Common Core State Standards**

**RI.2.1** - Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

**W.2.7** - Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

**W.8-** Recall information from experiences or gather information from provided sources to answer a question.

**Environmental Literacy Standards**

**Standard 5:** Humans and Natural Resources
Topic B: Human Impact on Natural Resources
Indicator 1: Analyze from local to global levels, the relationship between human activities and the earth's resources.

**Standard 6:** Environment and Health
Topic A: Natural Changes and Human Health
Indicator 1: Identify and describe natural changes in the environment that may affect the health of human populations and individuals

**Social Studies Standards**

**1.0 Civics** C. Protecting Rights and Maintaining Order

**2.0 Peoples of the Nations and World** C. Conflict, Cooperation and Compromise

**3.0 Geography** A. Using Geographic Tools; B. Geographic Characteristics of Places and Regions D. Modifying and Adapting to the Environment

**6.0 Skills and Processes** A. Constructing Compelling Questions; B. Constructing Supporting Questions; C. Determining Helpful Sources

## Describing the Local Context

The life-relevant issue that will serve as the context for learning.

The life-relevant issues described below were retrieved from https://www.chesapeakebay.net/

"The Chesapeake Bay—the largest estuary in the United States—is an incredibly complex ecosystem. The Bay and its rivers, wetlands and forests provide homes, food and protection for countless animals and plants. The Chesapeake Bay watershed spans more than 64,000 square miles, encompassing parts of six states—Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia—and the entire District of Columbia. More than 18 million people live in the Chesapeake Bay watershed. The Susquehanna, Potomac, Rappahannock, York and James rivers are the five largest rivers in the Chesapeake Bay watershed. More than 100,000 streams, creeks and rivers—called tributaries—thread through this watershed. Each watershed resident lives within a few miles of one of these local waterways, which act like pipelines that connect our communities to the Bay."

**Litter:**

*What it is?* Trash left on the ground outside and/or in our waterways (ex: Plastic bags, cigarette butts, beverage bottles, etc.)

*Where it comes from (sources)?* While nine in ten watershed residents never toss food wrappers, cups or cigarette butts onto the ground, about five percent of watershed residents sometimes, usually or always do. Wind/water can also move trash from one place to another (ex: out of garbage cans, off boats/beach)

*Why is it a problem?* **Litter** can detract from an area's beauty, smother aquatic plants and bottom-dwelling organisms, add toxic contaminants to the water and make animals sick.

*Possible Solutions?* To reduce litter, properly dispose of all trash and recycling. When on board a boat, stow and secure used bags, bottles, fishing lines and other trash so it doesn't fall into the water. And consider participating in a volunteer cleanup to remove trash from local rivers and streams. Watershed organizations around the region rely on volunteers to remove litter from waterways, and many cities have installed trash traps to capture litter and debris.

**Excess sediment:**

*What it is?* Particles of sand, silt and clay that we call "sediment" often float through the water rather than settling to the bottom, and can be carried long distances during rainstorms.

*Where it comes from (sources)?* Sediment is easily carried off of land surfaces without vegetation including stream banks and construction sites. Impervious surfaces such as concrete, buildings, and asphalt speed up the flow of water which increases the amount of sediment carried into the waterways.

*Why is it a problem?* When there are too many sediment particles suspended in the water, the water becomes cloudy and muddy-looking. Cloudy water does not allow sunlight to reach the plants that grow on the bottom of the Bay's shallows. Without sunlight, these plants—including underwater grasses—die, which affects the young fish and shellfish that depend on them for shelter. Excess sediment can also have harmful effects on the wider Bay and the people who use it:

Nutrients and chemical contaminants can bind with sediment, spreading through the Bay and its waterways with particles of sand, silt and clay. Fish and shellfish that live and feed on or near contaminated sediment can become contaminated themselves, triggering fish consumption advisories in various portions of the watershed.

Excess sediment can smother oysters and other bottom-dwelling species.

Accumulating sediment can clog ports and channels, affecting commercial shipping and recreational boating.

*Possible Solutions?* To lower sediment pollution, consider combating erosion on your property. Spread mulch over bare ground, or plant buffers of trees and shrubs to capture runoff and hold soil in place. Consider installing rain gardens, conservation landscaping, rain barrels, and/or pervious pavers to replace impervious surfaces.

**Chemical Contaminants:**

*What it is?* Any chemicals from the insecticides that are put on farm fields to the cleaners we use to disinfect our homes

*Where it comes from (sources)?* Four general sources push chemical contaminants into the Chesapeake Bay and its tributaries:

Air pollution emitted by factories, power plants, cars, trucks, gas-powered lawn tools and other sources,

Agricultural runoff,

Stormwater runoff, and

Wastewater discharged from industrial facilities and wastewater treatment plants into rivers and streams.

*Why is it a problem?* More than three-quarters of the Chesapeake Bay's tidal waters are considered impaired by chemical contaminants that harm the health of both humans and wildlife

*Possible Solutions?* To lower chemical contaminants in the Bay watershed, consider using non-toxic pesticides or chemical-free cleaning and personal-care products. You can also follow safe and legal disposal methods for paint, motor oil and other household chemicals."

All Harford County Public Schools are located within the Chesapeake Bay Watershed. The human actions of the community in Harford County can positively or negatively impact the health of the Chesapeake Bay. While each elementary school has diverse geography and access to nature/streams, they all have the ability to make a difference in the health of the Chesapeake Bay.

## Identifying the Driving Question

A broad, open-ended, life-relevant question that is based on the standards/learning objectives. Guides inquiry for the investigation(s), prompts the development of actionable claims.

How do our actions, as residents of Harford County, affect the health of the Chesapeake Bay?

# Issue Investigation

**Asking Questions, Defining Issues and Problems**

Students define the issue, problem, or phenomenon to be investigated and develop supporting questions that are relevant for investigation.

| Issue Investigation 1 | Issue Investigation 2 | Issue Investigation 3 |
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| 4 days at Extend/Elaborate part of Experience 1 of ESS)<br><br>)ay 1: Display an image of the Chesapeake Bay. Ask, "How do people in our community use the rivers and streams that connect to the Chesapeake Bay?" (Elicit responses such as fishing, boating, swimming, picnicking next to, etc.)<br><br>)isplay pictures of trash (link Issue #1 pictures here) in rivers/streams/bay of Harford County.<br>What do you notice?"<br>What do you wonder?"<br>How does this make you feel?<br>Students record thinking in their Science Notebooks.<br><br>f the students don't bring it up on their own:<br>How did this trash get here?"<br>How do you think this affects the people your community?"<br>How do you think this affects the wildlife in our community? | 4 days at Extend/Elaborate part of Experience 1 PS)<br><br>)isplay Issue #2 pictures (link) of muddy rivers, erosion, water runoff turbid water from flooding, a picture of trash in the water. (more pictures of pollutants)<br>What do you notice?"<br>What do you wonder?"<br>How do you think these pictures relate?"<br>How does this make you feel?"<br><br>f students don't bring it up on their own:<br><br>-Why is the water in the rivers, streams, and bay not clean and what can be done about it? | days at Extend/Elaborate part of Experience 2 LS)<br><br>how video clip:<br>ttps://www.chesapeakebay.net/issues/sediment<br><br>Show data from Chesapeake Bay Program about populations and these population graphs regarding grasses, crabs, striped bass, and oysters in the Chesapeake Bay.of grasseshttps://www.chesapeakebay.net/state/blue_crabs<br>ttps://www.chesapeakebay.net/state/underwater_grasses<br>ttp://bayweekly.com/old-site/year98/lead6_17.html (oyster graph 1)<br>ttps://aamboceanservice.blob.core.windows.net/oceanservice-prod/news/wbnews/04spring/pdfs/oysterbrief1.pdf (oyster graph 2)<br><br>Vhat do you notice?<br>Vhat do you wonder?<br>Iow does it make you feel?<br>Iow do you think sediment, pollution, and biodiversity relate?<br><br>If the students don't bring it up themselves, ask<br><br>'How does sediment and pollution in the water affect the biodiversity of the rivers, streams and the Chesapeake Bay? Are humans a part of that biodiversity?" |

**Planning and Conducting Investigations**

Students plan and conduct investigations and classroom activities (indoor and outdoor) that actively address students' supporting questions. Students collect data that will be used to inform actionable claims.

| Issue Investigation 1 | Issue Investigation 2 | Issue Investigation 3 |
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| )ay 1: Give attached maps to students of the Chesapeake Bay Watershed to recognize the shapes of the land and where water flows in Harford County. Use this GIS system https://www.arcgis.com/home/webmap/viewer.html?webmap=e1bd823382b04750acc0a2adb6963f81. Enter your school's address. Find the closest water to your school. Follow this creek/stream by clicking and dragging until the water trail reaches the Chesapeake Bay. If the GIS system is too challenging, you can do this same activity through google earth or google maps.<br>Ask "Where is the water is flowing?" (downhill to the streams/rivers into the bay)<br>Record thinking in Science Notebooks.<br><br>)ay 2: Create a model with high and low points using aluminum foil. Put it in a clear paint tray or clear plastic tub for the water to flow in. "Make it rain" with a watering can to see where the water goes. Add "trash" to their model. Predict what will happen. "Make it rain" and see what happens. Discuss. Draw your model in your science notebook. Record your prediction, observations, and conclusion after you run your test.<br><br>)ay 3: Ask students: "How can we investigate where the water flows on our school property?" "What tools do we need?" Facilitate the planning of this investigation, guiding students to realize that a map to record on might be helpful, water is needed (either through rain or a bucket), and they need something to collect trash in (a bag).<br><br>Give students GIS maps of the school grounds to mark their observations | Day 1-2: Look at the picture of muddy water and ask "What is making the water look like this?" Students share guesses about what they think is in the water. Because they just looked at the above pictures, they will probably guess that the water has mud, dirt, or soil. Ask them how we can investigate this to make sure our guess is correct? Guide them to going outside to collect one to two soil samples to observe properties like color and texture and how it appears suspended in water (avoid gardens and favor fields or around trees. Open, bare soil will be the best if possible.)<br><br>)ecide as a class how they would like to record their observations of the soil before and after being suspended in water (science notebook).<br><br>Have them refer back to the pictures from the beginning of this lesson and ask "Based on our investigation, what claims can you make about why the water looks this way? What evidence do we have to support this claim?" can we make connections between our samples and the picture?"<br><br>f the students need guidance, ask "Do you think this is what soil looks like when it is mixed into the rivers and streams?" Explain to the students that another word scientists use to describe soil in the water is sediment.<br><br>Day 3: The teacher should create a 3-D model of the watershed similar to the one you created in Issue Investigation #1 prior to class. Read "Who Polluted the Bay?" **(attached as a resource).** Record results in science notebooks using a before and after format using colors and labels. | CBF Grasses Video: https://www.cbf.org/about-the-bay/more-than-just-the-bay/chesapeake-plants/bay-grasses.html<br><br>**Background knowledge**: (https://www.chesapeakebay.net/issues/sediment)<br><br>"Excess sediment is a leading factor in the Chesapeake Bay's poor health.<br><br>Because of their small size, the particles of sand, silt and clay that we call "sediment" often float through the water rather than settling to the bottom, and can be carried long distances during rainstorms. When there are too many sediment particles suspended in the water, the water becomes cloudy and muddy-looking. Cloudy water does not allow sunlight to reach the plants that grow on the bottom of the Bay's shallows. Without sunlight, these plants—including underwater grasses—die, which affects the young fish and shellfish that depend on them for shelter.<br><br>Excess sediment can also have harmful effects on the wider Bay and the people who use it:<br><br>· Nutrients and chemical contaminants can bind with sediment, spreading through the Bay and its waterways with particles of sand, silt and clay. Fish and shellfish that live and feed on or near contaminated sediment can become contaminated themselves, triggering fish consumption advisories in various portions of the watershed.<br><br>· Excess sediment can smother oysters and other bottom-dwelling |

such as arrows to show where water is flowing, etc.

Either go out on a rainy day and observe where the water is flowing (put map in a plastic sleeve)
OR
Go out with water buckets and students choose some locations to pour their water to see where it goes.

If you have a stream or a creek within walking distance, this would be a good time to observe the creek to help them realize that the storm water flows to the creek and eventually to the bay. If you don't have a stream or creek, observe the area around a storm drain. Point out that the storm drain leads to the rivers and streams because they may not have that background knowledge.

Observe the rain flow or the flow of water when you a bucket of water by a storm drain and/or a creek and record water flow observations on the map you provided them.

While they are investigating how the water flows, ask students to collect any trash they see outside as well.

To get a better visual of how water can pick up and transport trash, they can also experiment by dumping water (or allowing it to rain) on a piece of trash they found outside and observe how it moves (probably plastic would work best but any trash should move). If you went out on a rainy day, you may strategically ask them put the trash in an already flowing water stream to show the movement of the trash. If you are using a bucket of water, avoid storm drains.

Additional Activity: Use videos on the list to compare to the experiment. (Link attached)

How did the actions of humans affect the health of the bay in this story? (Elicit specific examples)

Day 4:
Show video https://www.youtube.com/watch?v=im4HVXMGI68
This shows that soil and leaves without vegetation makes the water below brown with sediment. The soil with vegetation stays clear. Allow students to discuss what they notice and wonder following this video.

Next, you will use the 3-D model to investigate the impacts of adding trees/plants to slow sediment and treat pollution. The 3-D model of the watershed should already be cleaned and filled with clear water after yesterday's investigation. You should have sponges available to represent trees/gardens/plants.

As you read through "Who Saved the Bay?" Add the sponges and have students follow the directions included in the story.
Reflect, "How does the water in the bay look now compared to the water in our last model when we read "Who Polluted the Bay?"
Students should record their observations and conclusions in their science notebooks.
Ask "What impact do you think plants have on the water in the bay?" " How did the human's actions in the story positively impact the Chesapeake Bay?" Facilitate a discussion on how human actions might help us positively impact the Chesapeake Bay.

Point out to students that when there are less trees in the watershed, the water can move more sediment faster. This is called *erosion.* (Teachers may need to have students look back at prior learning about erosion in

species.

· Accumulating sediment can clog ports and channels, affecting commercial shipping and recreational boating." https://www.chesapeakebay.net/issues/sediment

**Investigation 1:**

Ask the students how you could investigate some of the things you wondered about when you looked at the graphs and watched the video on sediment. Could you just go and visit the Bay right now? Guide them to the answer of creating a model. Then ask the students if you wanted to create a model of the Chesapeake Bay, what would it include? Have them watch the CBF Grasses Video. After watching the video, what did they see that they could put into their model? Have them draw a picture of what their model could look like. After, work in groups to actually create a model of the Chesapeake Bay that includes underwater grasses and animals (i.e. clams, crabs, and fish). To do this you can follow the steps listed on the resource sheet labeled CB Model. There is an option to use live clams, details for that can be found on the CB Model w/ Live Clams sheet. Once the model is completed ask them how could they use their model to show what it looks like when too much sediment enters the Chesapeake Bay? Guide them to the answer of adding soil to the water.

Once the sediment is added to the water, have them draw a picture of what they see, write down their observations, and take pictures.

**Investigation 2: Filter Feeders**

Next, if you are not using live clams, watch this time lapse video (https://youtu.be/VTuBbuUro4g) and record observations. You can also show the provided picture of water before and

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| )o you see anything that the water might pick up and carry with it as it moves? (Maybe trash or leaves) Record findings in your Science Notebooks. | Experience 1 of Science to make this connection).<br><br>Now show a visual (insert visual) on what other ways vegetation are useful to cleaning our water from pollutants. | after oysters cleaned it. If you are using clams, leave the clams in for a few hours. Observe the clams and how the water changes within the next few hours and record observations. Consider setting up a device to video record the change and make a time lapse as data (i.e. set up an iPad or a phone on time lapse). Allow at least a day to see optimal results of clearer water.<br><br>Have them draw what they see or write down their observations. If they are using the clams, the time lapse video could be something they watch over again to see what's happening.<br><br>**This link shows pictures of filter feeders which may be helpful for students who are not familiar.<br><br>https://www.chesapeakequarterly.net/V06N2/side2/index.html<br><br>FIELD TRIP OPPORTUNITY: Consider providing students with a field experience at Harford Glen, Anita C. Leight Estuary Center, Eden Mill, or Havre de Grace Maritime Museum to learn more about the biodiversity in the watershed of the Chesapeake Bay and how they are affected by sediment and pollution. |

## Issue Investigation (con't.)

**Analyzing and Interpreting Data**

Students analyze data through graphs, models, and other methods to reveal patterns and relationships. Students synthesize and apply evidence from their investigations to draw conclusions that address the supporting questions.

| Issue Investigation 1 | Issue Investigation 2 | Issue Investigation 3 |
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| Day 3 continued: Students collect data during their observations of water flow around the school grounds on the GIS maps.<br><br>What evidence did you collect about how the water flowed?<br><br>How did your experience outside relate to the model we made and the maps we observed?<br><br>How might trash in the water affect humans?<br><br>How might trash in the water affect the animals?<br><br>Record Information in Science Notebooks. Share and compare ideas about these questions. | Data Analysis #1 on Day 2: Students recorded properties of sediment and what it looks like suspended in water. Students use this data about sediment and the pictures from the beginning of the lesson to begin to answer, "Using the data you collected during this investigation, why do you think the water in the rivers, streams, and bay are not clear?" (At this point, you would expect them to at least realize there is sediment in the water).<br><br>Data Analysis #2 on Day 3: Students drew and labeled what the water looks like when the sediment was washed down the 3-D model of the watershed. Students use this data about sediment and the pictures from the beginning of the lesson to begin to answer, "Using the data you collected during this investigation, why do you think the water in the rivers, streams, and bay are not clear?" (At this point, you would expect them to at least realize there is sediment in the water and that the sediment comes from runoff from the collective watershed).<br><br>Data #3 on Day 4: Students drew with labels showing what the water looked like when sediment and pollution was washed down the 3-D model of the watershed. Students then recorded their thinking in pictures and/or words about how the model with sponges (trees) looked in comparison to the model without the sponges (clearer). Students use this data about sediment, pollution, and plants and the pictures from the beginning of the lesson to write their answer in their Science Notebook, "Using the data you collected during this investigation, why do you think the water in the | Following the plant investigation, ask students to review their data (the drawings, photos, and observations they wrote). Then discuss the following questions:<br>- "How did the model change when you added sediment?"<br>- "How do you think this would affect the plants?"<br>- "How do you think this would affect the animals?"<br>- "How do you think this would affect **you** and the other people in your community?" (Elicit responses regarding recreation including fishing/crabbing)<br><br>Following the clam or oyster investigation, ask the students to review their data (the drawings, photos, and observations they wrote). Then discuss the following questions:<br>- "How did the water change?"<br>- "What do you think caused the change?"<br>Once students come to the understanding that the clams/oysters caused the change, ask<br>- "How do filter feeders like clams, oysters, mussels, and barnacles help clean the water in the bay?"<br>- "What do you think might happen to these filter feeders if there is too much sediment and other pollutants in the water?" |

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| | rivers, streams, and bay are not clear and what can we do about it?" Share and compare ideas about these questions prior to writing. (At this point, students should be able to make a complete claim.) | |

**Constructing and Communicating a Claim**

Students draw on the conclusions from their investigations to make a claim about the driving question and communicate these evidence-based claims to internal and/or external audiences.

| Issue Investigation 1 | Issue Investigation 2 | Issue Investigation 3 |
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| Teacher presents the data on this website https://www.chesapeakebay.net/state/litter and the pictures from the beginning of this lesson:<br><br>the following question, "Using the evidence you collected from these investigations, what claims can we make about how the trash in the pictures and the data chart got there? What impact does this have on humans and animals?"<br><br>Students communicate their thinking through discussion.<br><br>Possible claims:<br>Rain moved the trash into the rivers and onto the bay.<br><br>Someone threw the trash into the rivers and the bays.<br><br>The wind blew it there.<br><br>There was a flood or hurricane that moved the trash.<br><br>Animals might get hurt from the trash.<br><br>Animals might eat the trash.<br>Humans might not want to spend time enjoying the bay (fishing/boating/swimming/picnicking).<br><br>Humans might get sick from eating the animals that eat the trash. | Teacher presents the following question "Using the data you collected during this investigation, why do you think the water in the rivers, streams, and bay are not clear and what can we do about it?"<br><br>Possible claims:<br><br>Sediment makes the water not clear looking or harder to see through.<br><br>Pollution makes the water in the bay unhealthy.<br><br>Sediment and pollution might be a bad thing for the plants and animals that live there.<br><br>Sediment might cover the plants in the bay.<br><br>The Chesapeake Bay has sediment and pollution in it.<br><br>Plants and trees can hold the sediment and pollution back so it doesn't get in the bay.<br><br>We shouldn't cut down trees or plants to build buildings and roads.<br><br>We should plant more trees and plants to help the bay stay clear and healthy.<br><br>Following this, discuss which problems we as a class might be able to address | Teacher presents the following questions: "Using the data you collected with your model, how do you think the sediment and pollution in the water affects the biodiversity of the rivers, streams and the Chesapeake Bay overall?"<br><br>Teacher should facilitate conversations to get students to these claims:<br><br>Sediment blocks the light from the underwater grasses so they can't survive.<br><br>If the underwater grasses don't survive, the animals don't have the hiding places they need to stay safe.<br><br>If the underwater grasses don't survive, the animals don't have a safe place to raise their young.<br><br>Filter feeders can help clean the water.<br><br>Pollutants in the water can kill the filter feeders and other animals.<br><br>Following this, discuss which problems we as a class might be able to address and some possible solutions. To build understanding of what other people have done to solve these problems, utilize the BMPs (attached) to spark conversation. This will |

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| ollowing this, discuss which problems we as a class might be able to address and some possible solutions. To build understanding of what other people have done to solve these problems, utilize the BMPs (attached) to spark conversation. This will continue students thinking of possible solutions they may want to use for their Stewardship/Civic Action Project. Add the problems and solutions students come up with to a class anchor chart entitled “How do our actions, as citizens in Harford County, impact the health of the Chesapeake Bay?? | and some possible solutions. To build understanding of what other people have done to solve these problems, utilize the BMPs (attached) to spark conversation. This will continue students thinking of possible solutions they may want to use for their Stewardship/Civic Action Project. Add the problems and solutions students come up with to a class anchor chart entitled “How do our actions, as citizens in Harford County, impact the health of the Chesapeake Bay?? | continue students thinking of possible solutions they may want to use for their Stewardship/Civic Action Project. Add the problems and solutions students come up with to a class anchor chart entitled “How do our actions, as citizens in Harford County, impact the health of the Chesapeake Bay?? |

# Stewardship and Civic Action

## Identifying Solutions

Students identify and explore solutions that directly address the problem, challenge, or opportunity reflected in their claim. Students use decision making processes to identify the solution(s) to implement.

How do our actions impact the rivers and streams in Harford County as well as the Chesapeake Bay?
How can we make a difference to improve the problems in the rivers and streams in Harford County or the Chesapeake Bay?

Allow students to brainstorm problems and possible solutions to address the problems. Record ideas on an anchor chart. Once they have brainstormed, you may decide to provide the attached list of things people have done to address certain problems. This is not always necessary if students were successful brainstorming without it but it is provided in case more facilitation is necessary. Facilitate a discussion to ultimately determine which problem(s) they want to address and which solution(s) they want to use to take action in their community. Their choice(s) might be from the attached list OR may be a different solution they brainstormed on their own.

Considerations for teachers:

- If you are interested/willing to have your students create a sustainable change on your school grounds such as a rain garden or conservation landscaping, consider taking steps to facilitate this early on in the year and plan for how it will be maintained in the future. It can be very powerful to a student to realize they can be a part of a lasting sustainable change for their community and this option is recommended. If you need assistance with projects such as rain gardens, rain barrels, or conservation landscaping. Website to check out: http://www.harfordcountymd.gov/1841/Harford-Streams
- If your class is considering conservation landscaping, consult this "Simple School Wildlife Garden Guide" Simple School Wildlife Garden Guide provided by MD DNR.
- Warning: If your class wants to plant more underwater grasses, this may not be an ideal solution because the grasses they plant will probably not survive due to sediment.
- If your class decides to get involved with the oyster recovery in the bay, please contact Oyster Recovery Partnership and go to this website (https://oysterrecovery.org/volunteer/) for guidance for the appropriate methods for this process
- If your class decides to communicate with a local restaurant and give them information about why oysters are beneficial for the bay and how to recycle their oyster shells through https://oysterrecovery.org/public-recycling-collection-centers/
- https://www.natureworkseverywhere.org/resources/city-habitats/ Nature Works Everywhere is an outstanding resource of ideas.

## Designing a Plan and Taking Informed Action

Students design a plan for implementing solutions through informed action in their classrooms, schools, and/or communities. The plans should include criteria for determining the extent to which the action successfully addresses the problem, challenge, or opportunity reflected in the claim. Students implement their plans.

Facilitate discussion:

"What steps do we need to take?"

"What information do we still need in order to complete this project?"

"Who do we need to communicate with to make this goal happen?"

"How does this action project address the issues we investigated?"

"How much of an impact will this project have on the bay?"

"What evidence will we have that we made a difference for the bay?"

"How much will this cost?"

"What materials do we need?"

"Is the impact we will make WORTH the cost and the amount of materials we need?"

As students are coming up with the plan, consider assigning roles/responsibilities. Also consider students' learning styles and strengths and provide opportunities for them to embrace them through this action project. It is okay for students to be working on different aspects of the project, or an entirely different project and can be differentiated for students.

## Evaluating Action

Students reflect on the action and determine the extent to which it successfully addresses the problem, challenge, or opportunity reflected in the claim. Students communicate their findings and share proposals for sustaining or extending the action.

Revisit the driving question: How did our actions impact the rivers and streams in Harford County as well as the Chesapeake Bay?

Facilitate discussion for reflection:

"Was your project successful?"

"What evidence do you have that your project was successful?"

"If the students choose to do this project next year, what changes would you recommend they would make to your plan? OR What would you have done differently if you could do this project again?"

"What do you think are the next steps are for helping the bay?"

"Who should we share our project and our ideas with?"

Ideas:

-Present your project to other classes in your school to tell them what you've done and your ideas for what they can do to help the bay (ex: go to another classroom to share pictures or give a speech or share a poster)

-Present your project to the school community to tell them what you've done and your ideas for what they can do to help the bay (ex: PTA meeting or newsletter to send home)

-Contact local reporters to tell them about your project and ideas for what they can do to help the bay

-Contact local officials to tell them about your project and your ideas for what they can do to help the bay