DC 5TH GRADE MEANINGFUL WATERSEHD EDUCATIONAL EXPERIENCE

This curriculum will walk you through how to turn students' energy and excitement for nature into a meaningful, student driven, stewardship action project.

Alice Ferguson Foundation
Systemic Meaningful Watershed Educational Experience

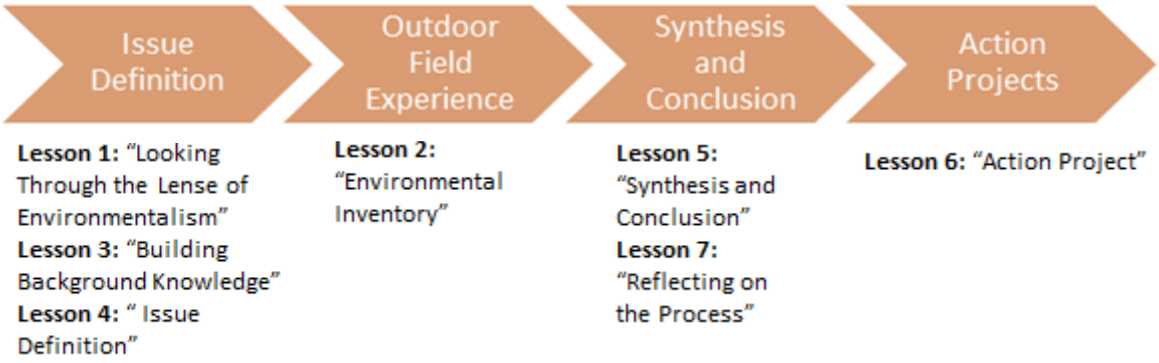
Before you begin: Some background

How was this curriculum developed?

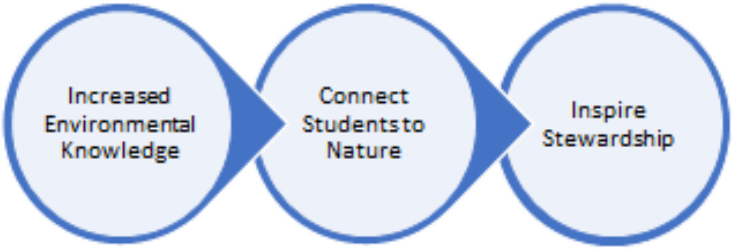
The Alice Ferguson Foundation (AFF) has spent four years piloting many forms of what would become the DC 5th Grade Systemic Meaningful Watershed Educational Experience (MWEE). The goal was to discover the most effective, impactful, and simple method of implementing a MWEE in a DC 5th grade classroom. AFF partnered with a group of DC teachers, who experienced the process for themselves, to write and pilot what you are implementing today.

What is a MWEE?

The MWEE process can best be summarized as a student led, project-based learning program. The MWEE and this curriculum is divided into four essential elements. Within each of these components one or more lessons will help you reach the goals of each step.



Student led does not mean teachers can't plan, guide or drive the project in a direction that best meets classroom learning objectives. A comprehensive Educator's Guide to the MWEE can be found here. The guide provides detailed explanations about the process as well as a Planning Toolbox. The information in the MWEE Guide has many useful applications, however your project does not have to into any specific mold. It is most important to remember three goals the program is trying to reach. If your MWEE accomplishes these three goals, you have been successful!



MWEE Alignment with NGSS

Science and Engineering Practices	**Lesson number**						
	1	2	3*	4	5	6	7
Developing and using models	✓						
Using Mathematics and Computational Thinking							
Planning and Carrying Out Investigations		✓					
Asking Questions and Defining Problems	✓	✓		✓	✓		
Analyzing and Interpreting Data		✓		✓	✓		✓
Constructing Explanations and Designing Solutions					✓	✓	
Obtaining, Evaluating and communicating Information	✓	✓		✓	✓	✓	✓
Engaging in Argument From Evidence		✓		✓		✓	✓

Crosscutting Concepts	**Lesson number**						
	1	2	3	4	5	6	7
Patterns				✓			
Energy and Matter							
Stability and Change							
Cause and Effect	✓			✓	✓	✓	✓
Systems and System Models	✓	✓		✓	✓		
Structure and Function							
Scale, Proportion and Quantity	✓	✓		✓			

Disciplinary Core Ideas

Since MWEEs are student led, and adaptable to meet the learning needs of the classroom, the disciplinary core ideas will be different based on the topics covered in the content areas of the project. Visit the action project resource library to view the various areas of study a MWEE can be designed around.

***Lesson 3**

Lesson 3: Building Background knowledge is written purposefully to be flexible. The alignment of the lesson depends on the hands-on activity chosen from the action project resource library.

Lesson 1:
Looking through the "Lens of Environmentalism"

Driving Questions: *What is my position on this planet? Why does that matter? How can I become more aware of the environment?*

Overview: The goal of this lesson is for students to start seeing the natural world from the perspective of an environmentalist and understanding human impact. They will develop a "lens of environmentalism" that will help to view themselves as part of the natural world and someone who has power to protect it by taking action.

Lesson Characteristics:
Use the table below for lesson planning purposes:

Time Required	30-45 minutes
Setting	Classroom
Materials	Map images (powerpoint) Lens Templates Colored Pencils or Crayons Anchor Chart of Class Lens

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Learning Objectives

Students will…

- …define environmental awareness
- …demonstrate understanding of their position in the world and why it matters
- …begin developing a "lens of environmentalism"

This lesson drives the MWEE forward by...
One of the most important outcomes of a MWEE is for students to see themselves as environmental stewards. This lesson is meant to launch students to notice the natural world around them and in doing so, identify where they fit into this world. Learning to observe their local environment and viewing themselves as a part of that environment, they will be able to analyze their position in later lessons.

Preparation:

- Access the Lesson 1 Looking Through the "Lens of Environmentalism" PowerPoint from the Action Project Resource Library.
- Make copies for each student of the Lens Template.
- Gather colored pencils or crayons for students to use on lens activity.
- Generate Class Anchor Chart to add to throughout the lesson.

Background Information:

Vocabulary:

Term	**Definition**
watershed	All of the land that sheds rainwater into a nearby creek, river or bay.

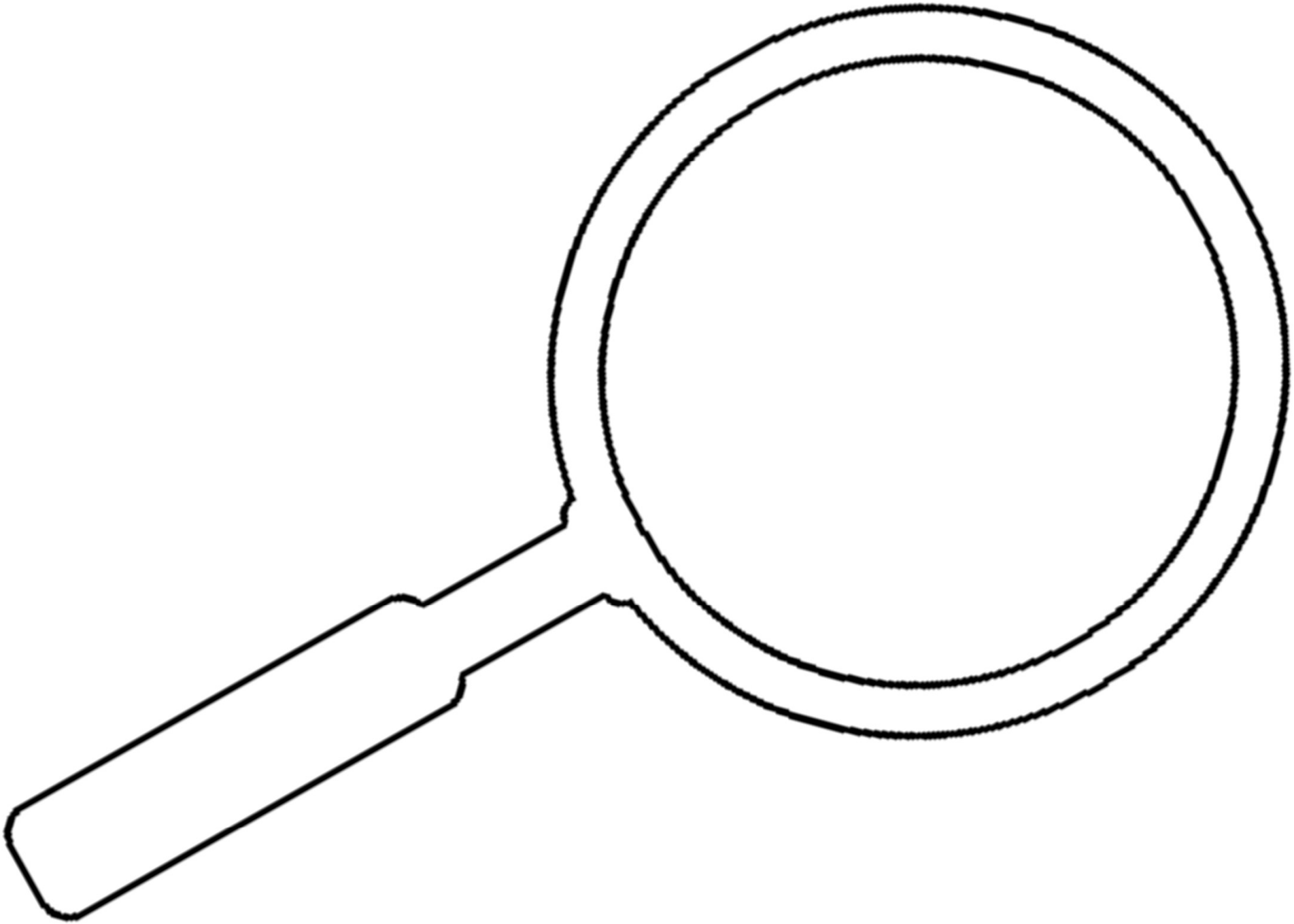
Procedure:
Follow the steps in the table below to conduct the activity.
Sentences in bold are suggestions for what an educator might say to students.
Items in italics are possible student answers to questions.

Step	**Action**
	5E's: Engage Learning Cycle: Invitation
1	Bring students together and begin with the following prompt: **Today we will begin our journey to becoming more environmentally aware. What do you think it means to be environmentally aware?** *It means we'll be more aware of the world around us. We'll learn how to help the environment.* Guide students to an understanding of environmental awareness as understanding what is going on in the natural world around you.
	5 E's: Explore Learning Cycle: Exploration
2	**Throughout this unit we will be developing a "lens of environmentalism". To do that, let's start by looking at this image.** Display a satellite image of Earth from space in the PowerPoint. Ask students to share what they notice about the image. Encourage varied student responses but be sure to define this image as being a picture of Earth before moving on.

3	Display the image of the political world map. **What do you notice about this image?** Support student explanation of the first image and this second image both showing the same area but representing natural boundaries versus boundaries defined by people. Again, encourage varied student responses, but be sure to define this image as being a model of the world of the before moving on.
4	Display the image of the political map of the United States. **If we zoom in further, we might see something like this. What do you notice now?** Encourage student identification of land and water areas and discussion about how these political boundaries do not represent geographical features and boundaries.
5	Display the image that is focused on the land in the Chesapeake Bay Watershed with a boundary line around the watershed. **If we zoom in further, we might see something like this. What do you notice now?** Guide students to identify state boundaries and water features, specifically the Bay. **What does this boundary line** (around the Watershed) **represent?** If needed, define or review the definition of a watershed. **What is your position on this map? Where are you located? Why does this matter?** *The Chesapeake Bay Watershed. It matters because all waterways in the Chesapeake Bay are connected.* Display a map of your local watershed.
6	**What if we zoom in further? Where would you be then?** Display the local map. Student responses should include: the city or state in which you live/reside. **What do you notice about where you are on the local map and your connection to the first image of the entire Earth?** *We are a part of the larger planet as a whole. We are connected because we live on planet Earth.* **We can make the biggest impact world wide by becoming aware of our local environmental issues.**
	5 E's: Explain Learning Cycle: Concept Invention
7	**Becoming environmentally aware begins with knowing what local environment you are a part of. When we recognize that we are part of the natural world, we start to understand the impact of our actions differently. We start to see things through a different lens.**

	Ask students what "lenses" or perspectives they current see the world through. For example, they may see the world through the "lens of a student" which would result in different priorities and actions than someone with the "lens of a teacher".
8	Display the magnifying glass template. **What type of tool is this? How is it used?** *It's a magnifying glass. It is used to look closely at something."* **Today we will be adding a new "lens" to our collection: the "lens of an environmentalist".**
5 E's: Elaborate Learning Cycle: Application	
9	**Today your job is to think, if we used this magnifying glass to look at and focus on the environment around us, what might we see?** On the inside of the magnifying glass have students write or draw things they already do that is good for the environment. Or, things your community is doing that is good for the environment. On the outside of magnifying lens, have students write things they, or their community could do better for the environment.
10	Have students take 10-15 minutes to write in or illustrate their magnifying lens. Monitor students during this time to make sure they continue to respond with an environmental perspective. It may be helpful to give students couple of example items to added to your own magnifying glass, or an anchor chart.
5 E's: Evaluate Learning Cycle: Reflection	
11	Bring the class back together to share out their thinking. **So, if we looked at the world around us through an environmental lens, what would we see?** Add students answers to the anchor chart magnifying glass, if using one.
12	**What we just created is a "Lens of Environmentalism". When we look closely at what is going on in the environment, we become more aware of the world around us.** Ask students to discuss how human impact on the environment occurs. Compare what actions and behaviors might look like without the Lens of Environmentalism compared to actions based on viewing the world through this lens.
13	**Sometimes this can feel overwhelming, but the good news is that each one of us holds a specific position in this world and if we try really hard to look at our local environments through this "Lens of Environmentalism" we can think and act in**

	ways that protect our local environment, which will then have a larger impact on the global environment.
14	Remind students that in the beginning of the lesson, they identified their position in the larger community. **Doing our small part, in our smaller communities will add up to big things for the whole planet. In this unit, we'll be using our "Lens of Environmentalism" to look at the world around us and within our local watershed to take action for a positive change in our environment.**



Lesson 2: Community Environmental Inventory

Driving Question: How is my community impacting the health of our watershed?

Overview: In this lesson, students will analyze their communities by observing and recording how their communities contribute to environmental issues. Students will use their environmental lens to evaluate how their communities are impacting the environment.

Lesson Characteristics:
Use the table below for lesson planning purposes:

Time Required	30-45 minutes
Setting	Classroom, Schoolyard, Community
Materials	Inventory, Pencil

Learning Objectives
Students will…

- …define and explain the four areas of investigation (waste, water, biodiversity, and energy).
- …recognize the environmental impact of their communities.
- …evaluate the environmental impact their communities have on the larger Chesapeake Bay Watershed.

This lesson is done when...

- …students have completed the environmental inventory of their campus.
- …students can demonstrate observation skills.

This lesson drives the MWEE forward by...
Students are learning and exercising their observation skills. As they answer the questions in the inventory they will begin to notice parts of their school and community that they may have previously overlooked. The data collected, and observations made in this lesson will be referenced in future lessons when students analyze and draw conclusion about how their community is impacting the environment.

Preparation:

- Print inventory
- Define water, waste, energy, and biodiversity
- Establish routine and procedure for using outside as a space for learning

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Background Information:

The inventory is organized into four areas of investigation. The goal of the inventory is to give the students structure to use their environmental lenses and to collect data for analysis. It is up to the discretion of the teacher, how the students will collect the data (groups, individually or as a class), over what period of time the data is collected, and what areas of investigation are emphasized. Consider what vision you may have for the direction you would like your students to go with their action project and emphasize those areas of investigation.

Vocabulary:

Term	**Definition**
Biodiversity	The variety of life in the world or in a particular habitat or ecosystem.
Energy	Power derived from the utilization of physical or chemical resources
Erosion	The gradual destruction of an area due to wind, water, or other natural agents.
Impervious Surface	Areas or materials that are impenetrable by liquid.
Pollution	The presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects.
Runoff	The draining away of water (or substances carried in it) from the surface of an area of land, a building or structure, etc.
Waste	material that is not wanted; the unusable remains or byproducts of something
Watershed	All of the land that sheds rainwater into a nearby creek, river or bay

Procedure:

Follow the steps in the table below to conduct the activity.

Sentences in bold are suggestions for what an educator might say to students.

Items in italics are possible student answers to questions.

Step	Action
5E's: Engage Learning Cycle: Invitation	
1	**Today, you will be using your new environmental lens to make observations about your community. In partners, you will be answering questions under our four areas of study** (water, waster, energy, and biodiversity). **You will be given an inventory asking you different questions about the school and your community. You will simply answer the questions based on what you can see, or observe.**
5 E's: Explore Learning Cycle: Exploration	
2	**Teacher may want to start lesson by having students read over inventory and circle any words that are unknown. After, teacher and students can familiarize themselves with unknown words in order to establish an understanding of each question on the inventory. Visit the Action Project Resource Library to access a PowerPoint with picture examples of many vocabulary words on the inventory. Students will work in partners to answer the questions on the inventory.
5 E's: Explain Learning Cycle: Concept Invention	
3	When done, students will discuss their findings with others in the class. **What did you notice about our community?**
5 E's: Elaborate Learning Cycle: Application	
4	Now that students have completed their inventory, there are two ways you can use this step to launch students' interest in a subject, and subsequently toward a particular action project: A. Based on the conclusions the students draw from their inventory, the

	teacher can choose an area of study (Waste, Water, Biodiversity, and Energy). This can be a useful option to meet learning objectives. The teacher choosing the subject of the activity is also a way for the teacher to control what direction the students action project takes. B. The teacher may survey the students to determine what area of investigation they are most concerned about. The following questions can be used to survey students' interest: **What are some areas where the community is doing well?** *Answers will depend on what results show in the inventory.* **What are some areas where the community needs to improve?** *Answers will depend on what results show in the inventory.* **What are some things we could do to help the environment?** *Turn off lights, compost our food, recycle, carpool, plant trees, etc.*
5 E's: Evaluate	Learning Cycle: Reflection
5	**Based on the inventory, how does our community contribute to the health of the Chesapeake Bay watershed?** *Our run-off water brings a lot of trash with it to the drains* *Our school doesn't recycle* *There was a lot of impervious surfaces on our school campus* Extension: **This week, I want you to observe your homes and your neighborhoods in your Science Notebooks. Take note of the different things you observe that are environmental strengths or issues.**

Community Inventory

Water

1. Rainwater falling on nearby buildings drains into mostly:
    a. well vegetated trees and shrubs or un-mowed grass
    b. mowed grass
    c. bare soil or impervious surface
    d. directly into storm drain
    e. entirely onto impervious surface, then into a visible storm drain

2. Look for patches of bare soil and signs of erosion such as areas where rainwater has carved out ditches or washed out vegetation. The community has:
    a. very little erosion and few patches of bare soil
    b. several patches of bare soil or areas where soil is eroding
    c. mostly bare, exposed soil or impervious surfaces

3. Does your community have any of these run-off control systems:
    a. Rain Garden
    b. Rain Barrel
    c. Meadow
    d. Wetland
    e. Forested buffer zone (More than 50 feet wide)
4. Where does rain water drain after hitting the streets or parking spaces?
    a. highly vegetated area
    b. mowed or slightly vegetated drainage ditch
    c. storm drain marked to indicate to where the water flows
    d. unmarked storm drain

Biodiversity

1. By counting the different types of leaves or bark, how many different types of trees are there in your community?

a. 10 or more b. 7-9 c. 4-6 d. less than 4

2. By counting the different types of leaves and berries, how many different types of shrubs are there in your Community?

a. 7 or more b. 4-6 c. less than 4

3. Below are examples of habitats for animals. Which of the following apply to your community? Circle all that apply.

a. woodlands with many layers of plants and trees
b. tall grassy fields/meadow
c. thick brush and brambles or a brush pile
d. dead standing trees or rotting logs on the ground
e. streams with forested buffers
f. native plant or pollinator garden
g. bird houses and/or feeders

4. Describe the vegetation in your community:

a. Trees and bushes cover a significant part of the community
b. Trees and bushes dot the landscape
c. There are few or no trees

5. How much of the grass and vegetated areas in your community are being mowed?

a. less than 50 %
b. between 50% and 80%
c. over 80%
d. there are no grassy or vegetated areas to mow

6. How is the vegetation in your community is fertilized?

a. Grass clippings are left on the grounds as natural fertilizer
b. Lawn fertilizer is used according to a formula after doing soil tests
c. Lawn fertilizer is used according to instructions
d. Lawn fertilizer is applied randomly
e. I am not aware of how the vegetation is fertilized

7. Describe the vegetation in the lowest lying part of your community:

a. well vegetated with trees and shrubs
b. vegetated with unmowed grass
c. mowed grass
d. bare soil, pavement, or concrete

Energy

1. Observe vehicles driving by. Are they:
    a. mostly occupied by one individual
    b. mostly occupied by more than one individual
    c. not enough vehicle traffic to make an assessment

2. When observing nearby traffic, which of the following do you observe?
    a. Mostly cars
    b. Public transportation
    c. People utilizing bicycles or non-motorized vehicles for transportation
    d. People on foot
    e. Other: _____

3. Does your community have access to any of the following?
    a. Bus Stops
    b. Train/Metro
    c. Bike Share
    d. Commuter Lots
    e. None of the Above

4. Does your school have any initiatives that encourage students/teachers to reduce energy (for example: rewards/incentives or signs reminding individuals to turn off lights and appliances)?
    a. Yes
    B. No

5. Do the lights in your school or home have motion-sensor lights?
    a. Yes
    b. No

6. Where does your school get its energy?
    a. Biofuel, solar, geothermal, hydropower, or wind (renewable resources)
    b. Coal, oil, or natural gas (non-renewable resources)

Waste

1. In the bathroom, how do students dry their hands?
    a. Air dryer
    a. Environmentally friendly paper products (100% post-consumer recycled content)
    b. Paper towels

2. What does your school do with food waste?
    a. Compost
    b. Garbage

3. What are cafeteria cups/flatware/plates made of?
    a. They are re-usable items
    b. One time use items that are biodegradable
    c. One time use items made of plastic or Styrofoam

4. Are recycling bins present? If yes, pre-sorted or single-stream recycling?
    a. Yes, recycling is collected for three or more categories (paper, plastic, cans, etc.)
    b. Yes, for one or two categories only
    c. No

5. Are recycling bins present?
    a. Yes, in Cafeteria Only.
    b. Yes, in Classrooms Only.
    c. Yes, in hallways only.
    d. Yes, in Cafeteria, Classrooms and hallways.
    e. No

5. How are school/classroom newsletters, announcements, field trip information, meeting information, etc. disseminated to parents?
    a. Mostly e-mail/website
    b. Some electronic, some paper
    c. Printed paper

Looking through our environmental Lens...

What are some things your community is doing well?	What are some things your community could do better?

How do you contribute to the strengths of your community?

Think about your environmental lens. After taking inventory, are there things you would add to the inside or outside of your lense?

Lesson 3: Building Content Knowledge

Driving Question: What do I need to know about the issues?

Overview:

In this lesson, students will participate in a hands-on lesson based around the chosen area of study to gain more background information.

Lesson Characteristics:

Use the table below for lesson planning purposes:

Time Required	Dependent on chosen lesson
Setting	Dependent on chosen lesson
Materials	Dependent on chosen lesson

Learning Objectives

Students will…

- …demonstrate a deeper understanding of background information about their chosen area of study.

This lesson is done when...

- …students have participated in a hands-on lesson based around an area of study.
- …students are able to demonstrate a deeper understanding about their chosen area of study.

This lesson drives the MWEE forward by...

Providing students with information to better understand an area of study, which will guide future action.

Preparation:

- Using the area of study selected in lesson 2, select an activity within the Action Project Resource Library.
- Each lesson in the Action Project Resource Library will outline needed materials and preparation.

Background Information:

Dependent on lesson choice in the action project resource library.

Vocabulary:

Term	Definition
Dependent on Lesson Choice	Dependent on lesson choice

Procedure:

Follow the steps in the table below to conduct the activity.

Sentences in bold are suggestions for what an educator might say to students.

Items in italics are possible student answers to questions.

Step	Action
5E's: Engage	Learning Cycle: Invitation
1	**We have chosen _____ as our area of study. We will now participate in an activity to strengthen our understanding.** Depending on the lesson chosen the setting may change and students need to be prepared for whatever the setting calls for.
5 E's: Explore	Learning Cycle: Exploration
2	Lead the chosen lesson.
5 E's: Explain	Learning Cycle: Concept Invention
3	Each lesson will have a different Explain section where students will be able to demonstrate their level of understanding.
5 E's: Elaborate	Learning Cycle: Application
4	Use the lessons' Elaborate section
5 E's: Evaluate	Learning Cycle: Reflection
5	Use the lessons' Evaluate section to determine the level of student understanding.

Lesson 4: Issue Definition

Driving Question: How does my community impact the watershed?

Overview:

In this lesson students will define their community. Within their defined community, students will analyze the strengths and issues within one of the four areas of study: water, waste, biodiversity, and energy. Students will democratically decide on an issue to find and implement a solution to.

Lesson Characteristics:

Use the table below for lesson planning purposes:

Time Required	30-45 minutes lessons
Setting	Classroom
Materials	Strengths and issues graphic organizer, criteria graphic organizer

Learning Objectives

Students will…

- …define their community.
- …analyze the data they collected during their community inventory.
- …generate a list of issues in their community.
- …use democratic decision making to decide on the issue they will act on.

This lesson is done when...

- …student can describe how their issue impacts their community.
- …students have selected a single issue that best meets the criteria.
- …students engaged in democratic decision-making to select the issue.

This lesson drives the MWEE forward by…

Having students revisit their inventory after they have built some background knowledge allows them to think more deeply about the issues in their community. This revisit will challenge the students to generate a thoughtful and robust list of environmental issues in their community, one of which they will select to take action on.

Preparation:

- Print Graphic Organizers
- Have inventory and data available

Background Information

Vocabulary:

Term	**Definition**
Community	The people who live in a particular **place** or region and interact with each other, common places or organizations. These interactions all impact one another.
Strength	Anything that adds to overall health of the environment and community
Issues	Anything that takes away from the overall health of the environment and community
Impact	Have an influence of strong effect on something
Measurable	You are able to notice a difference in behavior, conditions, or attitudes

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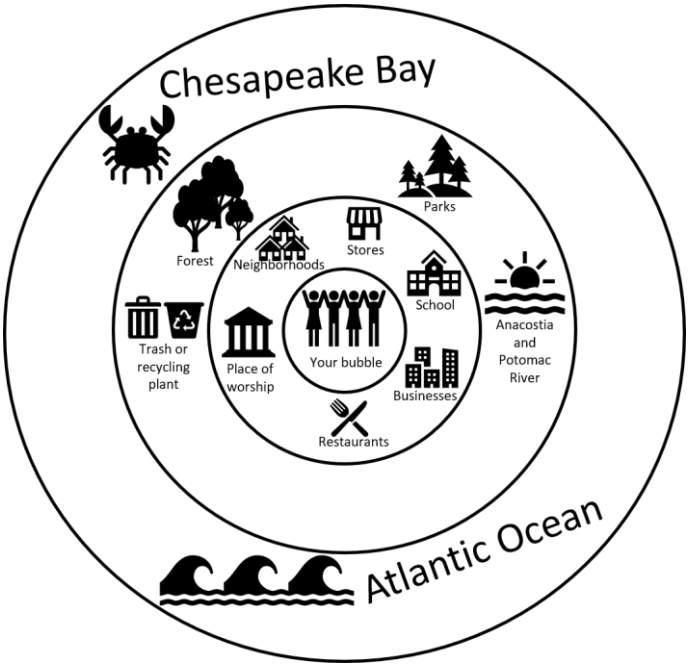
Procedure:

Follow the steps in the table below to conduct the activity.

Sentences in bold are suggestions for what an educator might say to students.

Items in italics are possible student answers to questions.

Step	**Action**
	5E's: Engage Learning Cycle: Invitation
1	Teacher will draw stick figure on the board representing the student. Teacher will ask students to show a thumbs up if they live with someone at home. Teacher will draw smaller stick figures on the board next to the first and circle around them. **Does this count as a community?** *Yes because I live in the same place as my family and we have stuff in common.* Teacher will then draw/write school outside the circle. **Does this count as a community?** *Yes because I come to school with the same people and we have different things in common.*

	Teacher will then draw/write houses to represent DC or neighborhood. **Does this count as a community?** *Yes, because we all live in the same area.* Students will continue to name parts of their community and the teacher will add their ideas to the board. After students have named components of their community the teacher will add two more outer circles. **Our community can be defined as small or as large as we want it to.** Add the Anacostia and Potomac River to the next circle, and the Chesapeake Bay to the outer-most circle. Explain how their community is connected to others because we all live in the same watershed. We are all connected by our waterways. 
	5 E's: Explore Learning Cycle: Exploration
2	After the community has been defined, students will begin to list the strengths and issues of that community. Teacher will make inventory and data collected available. Teacher should establish how they want students to complete graphic organizers (individually, partnerships, small groups). Teacher will need to establish definition for strength and issue. **What are some of the strengths we can see in our community?**

	Answers will vary **What are some of the environmental issues we see in our community?** *Answers will vary* Using an anchor chart list all strengths and issues students determine. Once students have come up with a list of issues they observed, the teacher will narrow down the list to no more than four issues. The teacher will provide reasoning for why certain issues are being excluded while others are being considered. Another option is for students to focus only on the issues that exist in the area of study the teacher is interested in students developing an action project around. For example, if the teacher already has a community clean up in mind for the action project, having the students focus only on the "waste" section of the inventory will make it easier to lead students to a community clean up.
5 E's: Explain	Learning Cycle: Concept Invention
3	Teacher will define impact and measurable. **Looking at the issues we have identified, we need to choose one to take action around. We are going to be using the following criteria, impact, ability to measure a change, and interest, to help us decide the best issues to tackle.** Teacher will show anchor chart/ graphic organizer for choosing issue. **When choosing our issues, we need to consider if:** **1. This issue has a large impact on my community.** **2. We can measure a change in this issue.** **3. We interested in this issue.** Students will be given a graphic organizer with the above questions as guiding criteria. They will work with a group or partner to discuss each question related to the issues. One option is to have each small group focus on one issue and discuss the level to which the criteria are met. Another option is to have each group assess criteria for all 3-4 issues chosen.

	Students should assign a value to each criterion based on how well they think the issue meets the criteria using a 1-5 scale (1 being not meeting the criteria and 5 being completely meeting it). Students will record their reasoning for the value they assigned in the criteria graphic organizer. Have the students come back together to share the results of their discussion. Teacher should be prepared to help refine student responses and record on the anchor chart. While the values assigned to each response from groups will help to guide the discussion, students should still engage in a democratic process to choose the issue they will move forward with.
5 E's: Elaborate Learning Cycle: Application	
	N/A (this will occur in Lesson 5)
5 E's: Evaluate Learning Cycle: Reflection	
4	Guide students to complete the following sentence frame. **The issue we will be focusing on is (issues selected). Our goal is to (how you want the issue to change).** Example: The issue we will be focusing on is litter in the park. Our goal is to reduce the amount of litter in the park.

Issue Criteria Grid-example

Group Members: _____ _____ _____

_____ _____ _____

Directions: Identify the issue that your group is going to discuss. With that issue in mind, respond to the questions under each criteria. Remember to discuss your response as a group before writing your notes.

Issue	**Criteria**		
	Community: *This issue has a large impact on my community.*	***Measurability:*** *We can measure a change in this issue.*	***Interest:*** *We are interested in this issue.*
The river is polluted with litter	We rate this issue a 5 out of 5 for community impact. Litter in the river has a large impact on community because it makes our community look dirty and we get our drinking water from the river.	We rate this issue a 3 out of 5 for measurability. Measuring our impact could be challenging because the litter is in the water and it may be hard to collect in order to do an audit. Also, the amount of litter in the river at each location can be impacted by a lot of factors like tides or rain.	We rate this issue a 5 out of 5 for interest. This issue is interesting to us because there are many complex reasons litter enters the river, and finding solutions will have many different options for us to explore.
The school uses too much electricity produced from the burning of fossil fuels	We rate this issue a 3 out of 5 for community impact. Although all burning of fossil fuels impact the atmosphere, and in turn, all humans on earth, this issue does not have a huge impact on our local community specifically.	We rate this issue a 5 out of 5 for measurability. We could do a survey of the electricity we currently use and then do another survey after we have implemented our reduction techniques.	We rate this issue a 2 out of 5 for interest. This issue is not that interesting to us because the potential solutions we could implement are kind of boring and not very inventive.

Issue Criteria Grid

Group Members: _____ _____ _____

_____ _____ _____

Directions: Identify the issue that your group is going to discuss. With that issue in mind, respond to the questions under each criteria. Remember to discuss your response as a group before writing your notes.

Issue	**Criteria**		
	Community: *This issue has a large impact on my community.*	***Measurability:****:* *We can measure a change in this issue.*	***Interest:*** *We are interested in this issue.*

Lesson 5: Synthesis and Conclusion

Driving Question: How can we positively impact the health of our watershed?

Overview:

In this lesson, students will use their research to decide on an appropriate action. Students will be looking at possible solutions that already exist, as well as adding ideas they generate on their own. Students will use criteria and democratic decision making to choose an action project. Students will research or brainstorm the causes and effects of the issue they selected in lesson 4. This will help them become experts on the issue and lead them towards more meaningful solutions.

Lesson Characteristics:

Use the table below for lesson planning purposes:

Time Required	30-45 minutes
Setting	Classroom
Materials	Criteria Graphic Organizer, Previously conducted research, previously collected data, Category G.O., poster paper

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Learning Objectives

Students will…

- …explore the causes and effects of their selected issue
- …generate list of solutions
- …compare solutions against criterion
- …democratically choose a solution

Lesson 5 is done when…

- …students have determined the project goal and strategy/strategies for change.
- …students can explain why the goal and strategy/strategies were selected.

- …students can explain how their strategy will positively impact their watershed.

This lesson drives a MWEE forward by….

The solution students decide on this lesson addresses the conclusions and claims they drew through their previous investigations. The solution chosen will directly impact the issue selected in the previous lesson.

Preparation:

- Make collected data and research available
- Print Cause and Effect Graphic Organizer
- Print Criteria Graphic Organizer

Background Information:

Below are examples of action projects organized into categories. These categories are a useful guide to helping your students brainstorm solutions.

Restoration	Civic Action	Community Engagement	Everyday Choices
A clean-up project Planting a rain garden Planting wetland plants on the Anacostia	Write letters to local officials	Hold a town hall about a given issue A poster campaign to raise awareness about the issue	Riding your bike to school instead of driving Using technology less to conserve energy Conserving water

Vocabulary:

Term	**Definition**
Goal	The desired outcome of implementing a solution
Solution	The method used to address the issue

Action	The step by step plan for addressing the issue
Restoration	The action of returning something to a former owner, place, or condition.
Civic Action	Type of operation designed to assist an area by using the capabilities and resources of a civilian organization to conduct long-term programs or short-term projects.
Community Engagement	Seeks to better engage the community to achieve long-term and sustainable outcomes, processes, relationships, discourse, decision-making, or implementation.
Everyday Choices	The choices and actions that we make on a day to day basis

Procedure:
Follow the steps in the table below to conduct the activity.
Sentences in bold are suggestions for what an educator might say to students.
Items in italics are possible student answers to questions.

Step	Action
	5E's: Engage Learning Cycle: Invitation
1	Review the issue the students chose to act on. Describe that they will be selecting a solution to the issue they choose, and that they will implement this action. It may be useful to write their chosen issue on the board. For example: "We have chosen the issue of litter in our community to focus on. Our goal is to reduce the amount of litter in our community. We will achieve this goal by… (this is where the solution selected will be added later)" **Today we're going to become experts on this issue by thinking through what is causing the issue to occur and what effects the issue has on the environment. Then, we are going to brainstorm possible solutions and choose which solution(s) we want to implement in our community.** **A cause is what leads to an event or problem. The effect is the impact the issue has on the environment.** Draw a cause and effect diagram on the board putting the

	issue in the middle, the causes above, and the effects below. Using your chosen issue, provide students with one example. The point of this activity is to discover the root causes of the issue your class identified. By dissecting the issue, and continuing to ask "but, why", students will uncover the root cause of the issue, and in turn, thoughtful, holistic solutions. See the example attached.
	5 E's: Explore Learning Cycle: Exploration
2	Distribute cause and effect graphic organizer to students. Students may work in groups, pairs or individually. Ask students to use their cause and effect papers to start brainstorming as many causes and effects as possible. You may need to prompt students by continuing to ask them "but, why?". Come back together as a class. Have students share out a cause they thought of and ask them for a corresponding solution to the cause. For example, if the cause is not enough trash cans, the solution would be to install more trash cans. Record their ideas on poster paper. Be sure not to react positively or negatively to students' ideas. Your role here is to be a recorder. Reinforce that students have more power than they may think. Encourage students to think deeply about the impact they can have and think beyond the most obvious solution choices.
	5 E's: Explain Learning Cycle: Concept Invention
3	Narrow down the list to no more than three or four solutions. Provide reasoning for why certain solutions are being excluded while others are being considered. One way to narrow down solutions is by rewording or combining solutions that are similar. **Now that we have organized our possible solutions, we need to choose one for our action project. Just like we did when selecting our issue, we are going to use criteria to see which solution would be best suited for reaching our goal.** Teacher will distribute criteria graphic organizer and explain that all solutions will be rated based on time, money, and interest. Teacher will explain each of the criteria.

	When considering each solution, we should ask: **1. Do we have enough time?** **2. Do we have enough money?** **3. Are we interested in implementing this solution?** Students will be given a graphic organizer with the above questions as guiding criteria. They will work with a group or partner to discuss each question related to the solutions. One option is to have each small group focus on one solution and discuss the level to which the criteria are met. Another option is to have each group assess criteria for all solutions chosen. Students should assign a value in response to each solution based on how well they meet the criteria using a 1-5 scale (1 being not meeting the criteria and 5 being completely meeting it). Students should be able to provide their reasoning for the value they assigned. Students will record their reasoning on the criteria graphic organizer. Have the students come back together to share the results of their discussion. Be prepared to help refine student responses and record on the anchor chart. While the values assigned to each response from groups will help to guide the discussion, students should still engage in a democratic process to choose a solution. The class may choose to focus on more than one solution. Some solutions are well suited to be paired. For example, if the project is installing trash stations in the cafeteria that includes composting, it will also be necessary to make some sort of educational materials to inform staff and students how to properly compost.
5 E's: Elaborate	Learning Cycle: Application
4	After a solution has been decided, add it to the goal statement. Example: We have chosen the issue of litter in our community to focus on. Our goal is to reduce the amount of litter in our community. We will achieve this goal by adding decorative trash cans around our schoolyard and conducting a community clean up.
5 E's: Evaluate	Learning Cycle: Reflection

5	Some students may feel disappointed “their idea” wasn’t selected. This is a great learning opportunity to discuss democracy with the students.
	5 E’s: Extension
6	During this process, students may find a need to collect additional data or conduct research based on the causes/effects of the solutions they selected. They should be encouraged to conduct additional research to deepen understanding of the issue related to their community. Options of what this may look like… • Survey of community members • Further research • Data collection • Interviewing an expert • Experiments

Cause and Effect- example

Name _____

Research on Causes

People aren't aware littering can hurt the environment, including humans.

There aren't enough trash or recycling cans.

People throw litter on the ground.

The storm drains don't have netting or a grate to keep litter from entering them.

Litter on the land is washed in the storm drain by rain and carried into the river.

These things lead to...

The river is polluted with litter.

THE ISSUE:_____

And as a result...

Research on Effects

Pollution can harm the plants and animals that live in the river.

The source of our drinking water is contaminated with plastics.

Our community looks dirty.

Litter can attract rats, which can carry diseases that can make you sick.

Cause and Effect

Name _____

Research on Causes

These things lead to...

THE ISSUE:_____

And as a result...

Research on Effects

Solution Criteria Grid- example

Group Members: _____ _____ _____

_____ _____ _____

Directions: Identify the issue that your group is going to discuss. With that issue in mind, respond to the questions under each criteria. Remember to discuss your response as a group before writing your notes.

Solution	**Criteria**		
	***Time**:* *How long do we have to implement this solution? Do we have enough time?*	***Money:*** *How much money do we have to implement the solution? Is this enough money?*	***Interest**:* *Are we interested in implementing this solution? Why?*
Educational campaign to inform people how litter can harm humans	We rate this solution a 5 out of 5 for time. Our campaign would consist of making and hanging posters around our school, presenting at a school assembly, and going on the morning announcements. All these activities are not time consuming.	We rate this solution a 5 out of 5 for money. All the activities we have planned are inexpensive or free.	We rate this solution a 3 out of 5 for interest. Although the campaign would be useful in solving the issue, it is not as interesting as the other options.
Install storm drain markings and grates to stop trash from flowing into them	We rate this solution a 5 out of 5 for time. After we acquire the materials, it will only take one day to install.	We rate this solution a 5 out of 5 for money. We discovered in our research that DOEE Riversmart schools will provide you with the materials and guidance for installing the drain marking.	We rate this solution a 5 out of 5 for interest. We are interested in this solution because it is very hands on and would be fun to install.
Decorate and place recycling cans near areas that are known to have a lot of litter	We rate this issue a 4 out of 5 for time. Painting can be a lengthy process, but once it is painted, placing them will be fast	We rate this solution a 4 out of 5 for	

Solution Criteria Grid

Group Members: _____ _____ _____

_____ _____ _____

Directions: Identify the issue that your group is going to discuss. With that issue in mind, respond to the questions under each criteria. Remember to discuss your response as a group before writing your notes.

Solution	**Criteria**		
	***Time**:* *How long do we have to implement this solution? Do we have enough time?*	***Money:*** *How much money do we have to implement the solution? Is this enough money?*	***Interest**:* *Are we interested in implementing this solution? Why?*

Lesson 6: Action Project

Driving Question: How can we positively impact the health of our watershed?

Overview:

In this lesson, students will take action! All their research will culminate in carrying out an action that positively impacts their watershed. They will plan, communicate with power, and implement their action project.

Lesson Characteristics:

Use the table below for lesson planning purposes:

Time Required	Varies
Setting	Dependent on selected project
Materials	Dependent on selected project

Learning Objectives

Students will…

- …form an action plan.
- … interact with an individual "power"
- …implement their action plan.
- …document their progress and determine how to measure success.

Lesson 6 is done when…

- …students develop a detailed action plan.
- …students assign a list of tasks to each group/student.
- …students develop project evaluation measures.
- **…**students Implement their action plan.

This Lesson drives the MWEE forward by…

Today is the day they have been working for! Driving their work through to taking action is essential in developing students' view of themselves as environmental stewards. The action they plan for and take in this lesson addresses the conclusions and claims they drew through

their previous investigations.

Preparation:
Check out the teacher resource library for some helpful graphics to help your student get organized!

Background Information:
Due to the nature of student led action projects, there are few projects that occur without obstacles. These obstacles are all opportunities for learning! The most important outcomes of this lesson are that students are engaged in stewardship behaviors, feel that they can overcome obstacles, and positively impact their community.

As students plan for their action, it may be necessary to scale down the project for a variety of reasons. The teacher's role is to celebrate all successes, big and small, to keep the students engaged.

The students will need your guidance and support in this step by communicating and prepping your administration, facilities team, or other parties involved to the students plans. If their project should require any higher-level approval or permitting, it is a good idea for the teacher to follow up on these needs.

A successful action project is one that is:

- Youth-driven
- The result of the selected environmental issue
- One in which youth interact with "power"
- Have measurable impact

Vocabulary:

Term	**Definition**
impact	a powerful or major influence or effect

Procedure:
Follow the steps in the table below to conduct the activity.
Sentences in bold are suggestions for what an educator might say to students.
Items in italics are possible student answers to questions.

Step	**Action**

5E's: Engage	Learning Cycle: Invitation
1	Choose an invitation to learning that reinforces the project you chose and its importance to the local watershed. Remind students that today they will participate in the last step of becoming an environmental steward -- action.
5 E's: Explore	Learning Cycle: Exploration
2	Have students generate an action plan that outlines the steps needed to complete the solution they selected. The following are possible ways of determining an action plan: • Have students generate a list of action items, to-dos, and questions they still need answered in order to implement their project • Based on this action item list, students can from committees to complete each task. (examples of committees: documentation team, permission crew, budget/supplies committee, etc.) • Students may need to create a budget and timeline if their project costs money or takes longer than one class period/day. • Consider what permissions are needed to implement the project. Have students engaging with those various powers to gain permission. (Examples of power: teachers, principal, community members, board members, city officials) • Utilize community partners for content, financial or volunteer resources.
5 E's: Explain	Learning Cycle: Concept Invention
3	This step is dependent on the project you select. If your project is on a larger scale, consider students will be working in their committees to complete each task or set of tasks. If the project is on a smaller scale you will be working as a class to complete tasks.
5 E's: Elaborate	Learning Cycle: Application
4	Implement your plan.
5 E's: Evaluate	Learning Cycle: Reflection
5	At the end of the action project, students can respond in writing or discussion to the following questions: • What was the purpose of this action project?

	• How did it make you feel to participate in this action project? • Did the project have as much impact as you expected it to, why or why not? • What impact did you have as a community member today? Note: These questions will depend on the environment in which you complete your project. Adapt the structure to wherever you are. The most important thing here is that students are given a chance to reflect on their project.

Lesson 7: Reflecting on the Process

Driving Question: Has my understanding of, attitude towards and/or interactions with the environment changed at all?

Overview:

In this lesson, students will share their findings and reflect on their experience throughout the unit. They will make conclusions about how their understanding of, attitude towards and interactions with the environment have or have not changed and why.

Lesson Characteristics:

Use the table below for lesson planning purposes:

Time Required	One-Two 30-45 minute lessons
Setting	Classroom
Materials	Reflection Sheets, Technology (optional for creating presentation)

Learning Objectives

Students will…

- …demonstrate knowledge of their project topic by presenting to an external audience (another group of students, a different grade level, community members, their parents and families, etc.)
- …communicate how their attitude toward and understanding of the environment has or has not changed and why.

Lesson 7 is done when...

- …students have shared their learning with someone else (another group of students, a different grade level, community members, their parents and families, etc.)
- …students have reflected on how their attitude toward and understanding of the environment has or has not changed and why

Preparation:

- Print reflection sheets
- Technology (optional if creating a presentation)

Background Information:

Students have completed their action project, it's time for celebration! This lesson should feel like a celebration. The teacher should recognize and congratulate the students on their hard work and dedication. The teacher should also celebrate obstacles of the project, ways the project could be improved, and the students' perseverance.

Vocabulary:

Term	**Definition**
Stewardship	The act of supervising or taking care of something, such as the environment.

Procedure:

Follow the steps in the table below to conduct the activity.

Sentences in bold are suggestions for what an educator might say to students.

Items in italics are possible student answers to questions.

Step	**Action**
	5E's: Engage Learning Cycle: Invitation
1	**We've been working really hard to create positive change to the environment in our community. Today I want to give you a vocabulary word for that. It's called stewardship. Stewardship is the act of supervising or taking care of something, such as the environment.** Display the vocabulary word and definition on the board. **Over the past few weeks we have been environmental stewards -- people who support helping the environment.**
	5 E's: Explore Learning Cycle: Exploration
2	An important part of being an environmental steward is to help others on their journey. Determine what way you would like your students to present their project. This can be determined by the teacher, or as a class. <u>Ideas for sharing:</u> • A brochure that is distributed to students, teachers, families or community members

	• A presentation shared at a school wide meeting or to lower grades • Posters hung around the school or community • A student panel discussion hosted for parents/teachers to interview students <u>Guidelines for what should be shared:</u> • A short summary of the process they went through and why they did it • A summary of their findings about the causes and effects of their issue • The solutions they brainstormed and what one they ultimately selected • An update as to how the action project went • Any ways they might change their approach to make their project more successful • Any further investigation or action they plan to take • What you as an audience member can do to help
5 E's: Explain Learning Cycle: Concept Invention	
3	Send students off to complete their part of the reflection. Remember that students should be focused on the following: • What was the issue you selected? How did you try to solve the issue? • Did the project work well? • How can the audience move toward action around this issue?
5 E's: Elaborate Learning Cycle: Application	
4	Present to the audience you/the students select (this may take place at another time as determined by who your audience is).
5 E's: Evaluate Learning Cycle: Reflection	
5	Have students complete the reflection form. A class discussion based around the reflection form could be an additional method of evaluation.

Reflection question prompt options:

1. Do you see the world through an environmental lens, paying closer attention to how your choices have an impact on the world around you?

2. Why is it important to know about your local watershed?

3. Name one fact about the issue we studied that you didn't know before.

4. On a scale of 1-10, 1 being not successful and 10 being very successful; how successful would you rate your project?

5. What advice would you give to someone else completing a project similar to ours?

6. How might your everyday actions or behaviors change as a result of this process?

7. What power do you as a 5th grader have to impact your community?