

# Teacher/Facilitator Guide



## WAVE OF PLASTIC

Meaningful Watershed Educational Experience

## LESSON FIVE: WE CAN MAKE A DIFFERENCE

- How do we describe, quantify, and communicate about issues related to plastic waste?
- What is environmental stewardship?
- How are students and other citizens engaging in informed action to address issues of plastic pollution?
- What can we do?

### Unit Driving Question:

**How do human choices regarding the consumption and disposal of plastics impact ecosystems and our communities and what actions can we take to minimize those impacts?**

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**Wave of Plastic MWEE Unit Next Generation Science Performance Expectations**

**Earth and Human Activity**

1. **MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. Add evidence and clarification statements
2. **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

**Lesson Five Key Ideas**

- “Stewardship” refers to the responsible use and conservation of the natural environment.
- Students are critical stakeholders for supporting ecosystem resiliency and stability and displaying behavior that consciously seeks to minimize the negative impacts of plastic pollution on Earth’s systems.
- There are many ways that students can take individual and collective action to mitigate the impacts of plastic pollution.

**Lesson Five Overview**

	<b>Goal</b>	<b>Description</b>	<b>Activities</b>
<b>Part 1</b> Introduction	Building Understanding	Review and reflect on issues related to plastic pollution and how they affect the Chesapeake. Explore four types of action projects.	<ol style="list-style-type: none"> <li>1. <b>Analyze, Share, &amp; Reflect:</b> Students reflect on what they’ve learned in prior Wave of Plastic lessons and explore the four categories of informed action.</li> <li>2. <b>Activity: Preparing to Take Action</b> Students explore and discuss examples of different types or categories of informed action and brainstorm ideas for their own action projects.</li> </ol>
<b>Part 2</b> Investigation	Integrating Information and Ideas	Use <i>Wave of Plastic Student Action Journal</i> to organize, plan, implement, and evaluate stewardship action projects.	<ol style="list-style-type: none"> <li>3. <b>Plan, Implement, and Evaluate Action</b> <ul style="list-style-type: none"> <li>▪ Ask questions.</li> <li>▪ Collect information &amp; draw conclusions.</li> <li>▪ Develop a claim and identify solutions.</li> <li>▪ Design a plan and take informed action.</li> <li>▪ Evaluate and reflect.</li> </ul> </li> </ol>
<b>Part 3</b> Application	Applying What We Learned Through Informed Action		
<b>Part 4</b> Assessment	Demonstrating Our Understanding	Summarize and reflect on Lesson 5 and on the entire <i>Wave of Plastic</i> Unit.	<ol style="list-style-type: none"> <li>4. <b>Part 1: Student Action Project Summary</b> Students summarize the experience and respond to the NGSS Performance Expectation (MS-ESS3-3)  <i>Note: The Action Project Summary draws on student learning in all Wave of Plastic lessons, but specifically assesses students’ understanding</i> </li> </ol>

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			<p><i>of the key ideas in Lesson 5 according to the Performance Expectation MS-ESS3-3.</i></p> <p>5. <b>Part 2: CER.</b> Students respond to the NGSS Performance Expectation (MS-ESS3-4) <i>Note: This final CER draws on student learning in all Wave of Plastic lessons and specifically assesses students' understanding according to the Performance Expectation MS-ESS3-4.</i></p>
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Part 1- Introduction: Building Understanding

Objectives:

- We will ask questions and make observations about how our choices and activities regarding the consumption and disposal of materials contribute to issues of plastic pollution.
- We will explore ways that we can take informed action to address issues related to plastic pollution.
- We will integrate and interpret information presented in different media or formats to develop a coherent understanding of a topic or issue.

1. Analyze, Share, & Reflect:

Students will:

- Review and reflect on issues related to plastic pollution and how they affect the Chesapeake.
- Review and reflect on the actions taken in previous Wave of Plastic Lessons.
- Explore stewardship definitions and the four different types of action projects promoted by the Chesapeake Bay Program for Meaningful Watershed Educational Experiences (MWEE): watershed restoration and protection, civic action, community engagement, and everyday choices.

Whole Group Discussion Questions:

- How can we describe issues related to plastic waste?
- How can issues related to plastic waste affect the Chesapeake Bay and its watershed?
- What were the actions that we took in the previous Wave of Plastic lessons to address issues of plastic waste?
- What was the intended impact of each action? (What did we hope it would achieve?)
- What was the actual impact of each action?
- How can we classify each action?
- What other types of action are there?

Materials & Resources:

- **Video:** “Bay 101: Restoring the Chesapeake Watershed” (4min, 52 sec)
  - **Source:** Chesapeake Bay Program
  - **Description:** What does it take to restore a 64,000-square-mile watershed?
- **Website:** “Bay 101”
  - **Source:** Chesapeake Bay Program
  - **Description:** A collection of videos about some of the critters that live in the Chesapeake and the issues that affect Bay restoration.
  - **Link:** <https://www.chesapeakebay.net/discover/bay-101>
- **Website:** “Stewardship definitions: Educating people in environmental stewardship practices”
  - **Source:** National Oceanic and Atmospheric Administration (NOAA).
  - **Description:** a framework and examples about different types of stewardship actions you can be used in education programming.
  - **Link:** <https://www.noaa.gov/resource-collections/common-measures-definitions/stewardship-definitions>

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## 2. Activity: Preparing to Take Action

### Students will:

- Explore actions that others are taking to address issues related to plastic pollution.
- Brainstorm problems they've noticed with plastic pollution or the use of plastic products

### Whole Group Discussion Questions:

- What was the specific problem (or aspect of the problem) that each action is intended to address?
- What steps were taken to address the issue?
- What was the impact of the action? How do we know if their action is successful?
- How is the action being shared with the broader community?
  
- What are some issues related to plastic pollution that we've observed in our community?
- What are some ways we could take action to address them? What impact do we think those actions could have?

### Materials & Resources:

- **Video:** "Kids Take Action Against Ocean Plastic"
  - **Source:** National Geographic (4min 14 sec)
  - **Description:** *This resource was chosen for its format (a video or PSA), representing community engagement. Children and adults address the negative impacts of plastic pollution, students are recorded presenting these thoughts on stage for their schoolmates.*
  - **Link:** <https://edpuzzle.com/media/5d51bd93afdf65412d16f568>
  
- **Letter:** "From the House of Commons, London to the Chief Executive of Tesco Plc. requesting the elimination of plastic packaging from brand products"
  - **Source:** Chesapeake Bay Program
  - **Description:** This resource was chosen for its format (a letter) and representation of a civic action project. Also, the letter references entanglement and ingestion which connects to previous lessons.
  - **Link:** [pbs.twimg.com/media/DT5s4i0XUAAhT1c.jpg](https://pbs.twimg.com/media/DT5s4i0XUAAhT1c.jpg)
  
- **Website & Infographic:** "Less Plastic: 9 Reasons to Refuse Single-Use Plastic"
  - **Source:** Less Plastic UK
  - **Description:** This resource was chosen for its format (an infographic). It represents an everyday choices project. The infographic is very clear and concise in its message of how single-use plastics affect the world.
  - **Link:** <https://lessplastic.co.uk/9-reasons-refuse-single-use-plastic/>





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## **Activity: “Preparing to Take Action”**

**Description:** Students will explore and discuss examples of different types or categories of informed action and brainstorm ideas for their own action projects.

### **Prior to Beginning the Activity:**

1. Review key ideas from previous Wave of Plastic lessons and the impacts of actions that the students have previously taken.
2. Introduce the goal of this lesson:  
*Using what you’ve learned about plastic and its effects on the environment, design and implement an action project to minimize the negative impacts of plastic pollution. Monitor the project’s progress and evaluate its success.*

### **Procedures:**

1. Share the visual, “Types of Action Projects” (found in the *An Educator’s Guide for Meaningful Watershed Educational Experiences*). Discuss potential examples of each type of action. Are their examples of actions that could fall into more than one category?

### **Types of Action Projects**

- » **Watershed Restoration or Protection** (e.g., create schoolyard habitat, planting trees or grasses, invasive species removal, community cleanup, stormwater management)
- » **Civic Action** (e.g., town meetings, voting, writing elected officials/decision makers, advocating for policy change)
- » **Community Engagement** (e.g., presentations, social media, event-organizing, messaging at community events/fairs/festivals, mentoring, PSAs, flyers, posters)
- » **Everyday Choices** (e.g., reduce/reuse/recycle/upcycle, composting, energy conservation, water conservation)

3. In teams, students explore ways that others are taking action to address the causes and negative effects of plastic waste. Teachers may choose to have students review the resources listed above (online or via printed copies) and/or locate their own examples of action projects.
4. For each project, teams should identify:
  - a. The specific problem that the action is intended to address (for example, overuse of single-use plastics, entanglement and ingestion by aquatic animals, etc.)
  - b. The steps that were taken to address the issue
  - c. The impact of the action
  - d. How the action was shared with the broader community

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**Wrap Up and Making Connections:**

The following are suggested discussion questions to conclude the activity:

- Engage students in small and/or whole group discussions of the actions they explored (see whole group discussion questions above).
- Brainstorm plastic issues in their local community (note, you may have kept a running list of action projects throughout the unit. If so, refer to this list and add to it as needed).
- What are some action projects that we could plan and implement to address these issues?

**Extensions:**

Present the following discussion topic. “Social scientists often define specific periods in human history by the material or technology that most impacted society at that time. The Stone Age, Bronze Age, and Iron Age were named based on artifacts found at various, dated archaeological sites. Some believe that the present time period will become known as the Plastic Age. Is that justifiable? Using what you know about plastic, discuss this with classmates and defend judgements based on evidence learned.” Students share their thoughts with the whole group, including problems they’ve noticed with plastic pollution or the unnecessary use of plastic products that may eventually end up as pollution.



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**Part 2- Investigation: Integrating Information & Ideas**  
**Part 3 – Application: Applying What We Learned Through Informed Action**

**Objectives:**

- We will use our *Student Action Journals* to plan, implement, and evaluate solutions for addressing issues related to plastic waste in our communities.

**Plan, Implement, Evaluate Action:**

**Students will:**

- Use *Wave of Plastic Student Action Journals* to organize, plan, implement, and evaluate stewardship action projects.

**Materials & Resources**

- *Student Action Journals*
- Other materials as needed

**Whole Group Discussion Questions:**

- How can we describe issues related to plastic waste?
- How can issues related to plastic waste affect the Chesapeake Bay and its watershed?
- What are some issues related to plastic pollution that we've observed in our community?
- What are some ways we could take action to address them? What impact do we think those actions could have?





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**Part 4- Assessment: Demonstrating Our Understanding**

**Objectives:**

- Part 1: Students will respond to the Performance Expectation, **MS-ESS3-3**. *Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment*, in a Student Action Project Summary.
- Part 2: Students will respond to the Performance Expectation, **MS-ESS3-4**. *Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems*.

**Part 1: Student Action Project Summary.**

- Students will respond to the Performance Expectation, **MS-ESS3-3**. *Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment*, in a Student Action Project Summary.

Observable features of the student performance by the end of the course:

1	Using scientific knowledge to generate design solutions
a.	Given a problem related to human impact on the environment, students use scientific information and principles to generate a design solution that: <ul style="list-style-type: none"> <li>i. Addresses the results of the particular human activity.</li> <li>ii. Incorporates technologies that can be used to monitor and minimize negative effects that human activities have on the environment.</li> <li>iii. Incorporates technologies that can be used to monitor and minimize negative effects that human activities have on the environment.</li> </ul>
b.	Students identify relationships between the human activity and the negative environmental impact based on scientific principles, and distinguish between causal and correlational relationships to facilitate the design of the solution.
2	Describing* criteria and constraints, including quantification when appropriate
a.	Students define and quantify, when appropriate, criteria and constraints for the solution, including: <ul style="list-style-type: none"> <li>i. Individual or societal needs and desires.</li> <li>ii. Constraints imposed by economic conditions (e.g., costs of building and maintaining the solution).</li> </ul>
3	Evaluating potential solutions
a.	Students describe* how well the solution meets the criteria and constraints, including monitoring or minimizing a human impact based on the causal relationships between relevant scientific principles June 2015 Page 1 of 2 about the processes that occur in, as well as among, Earth systems and the human impact on the environment
b.	Students identify limitations of the use of technologies employed by the solution.

**Student Action Project Summary**

Use the chart below to summarize and reflect on your action plan.

- The problem that we addressed:**
- Our solution:**
- The scientific principles that informed our solution:**
- The impact of our solution:**
- Advice for others working to address this problem:**

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**Part 2: Claim Evidence Reasoning Response (Wave of Plastic Unit Summative Assessment)**

- Students will respond to the Performance Expectation, [MS-ESS3-4](#). *Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.*

Observable features of the student performance by the end of the course:

1	<b>Supported claims</b>
a	Students make a claim, to be supported by evidence, to support or refute an explanation or model for a given phenomenon. Students include the following idea in their claim: that increases in the size of the human population and per-capita consumption of natural resources affect Earth systems
2	<b>Identifying scientific evidence</b>
a	Students identify evidence to support the claim from the given materials, including:
i.	Changes in the size of human population(s) in a given region or ecosystem over a given timespan.
ii.	Per-capita consumption of resources by humans in a given region or ecosystem over a given timespan.
iii.	Changes in Earth systems in a given region or ecosystem over a given timespan
iv.	The ways engineered solutions have altered the effects of human activities on Earth's systems.
3	<b>Evaluating and critiquing evidence</b>
a	Students evaluate the evidence for its necessity and sufficiency for supporting the claim.
b	Students determine whether the evidence is sufficient to determine causal relationships between consumption of natural resources and the impact on Earth systems.
c	Students consider alternative interpretations of the evidence and describe* why the evidence supports the claim they are making, as opposed to any alternative claims.
4	<b>Reasoning and synthesis</b>
a	Students use reasoning to connect the evidence and evaluation to the claim. In their arguments, students describe* a chain of reasoning that includes:
i.	Increases in the size of the human population or in the per-capita consumption of a given population cause increases in the consumption of natural resources.
ii.	Natural resource consumption causes changes in Earth systems.
iii.	Because human population growth affects natural resource consumption and natural resource consumption has an effect on Earth systems, changes in human populations have a causal role in changing Earth systems.
iv.	Engineered solutions alter the effects of human populations on Earth systems by changing the rate of natural resource consumption or mitigating the effects of changes in Earth systems.

*\*Unless otherwise specified, "descriptions" references in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.*



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Claim/Evidence/Reasoning Writing Rubric				
	0	1	2	3
<b>Claim</b> – statement or conclusion that answers the original question/problem.	Does not make a claim.	Makes an inaccurate claim.	Makes an accurate but incomplete claim.	Makes an accurate and complete claim.
<b>Evidence</b> – scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.	Does not provide evidence.	Only provides inappropriate evidence (Evidence that does not support the claim.).	Provides appropriate, but insufficient evidence to support claim. May include some inappropriate evidence.	Provides appropriate and sufficient evidence to support claim.
<b>Reasoning</b> – justification that links the claim and evidence and includes appropriate and sufficient scientific principles to defend the claim and evidence.	Does not provide reasoning	Only provides reasoning that does not link evidence to claim.	Repeats evidence and links it to some scientific principles, but not completely.	Provides accurate and complete reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles.

Use the Claim, Evidence, Reasoning model.

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.