Into the Outdoors

National Marine Sanctuary Foundation

National Marine Sanctuaries

PLASTICS ON THE BEACH

6th-12th Grade Discussion Guide

Developed by: Emily Nienhaus-Stahl

SCIENCE CATEGORIES
Ecology, Marine Biology, Environment, Social Studies

TIMEFRAME
3 sessions of 30-40 minutes each

MATERIALS
ITO Video, "How Long Does it Last" cards or video slides, student internet access

KEY WORDS
Continental Shelf, Open Ocean, Microplastics, Congenital Defect, Marine Sanctuary, Volunteer, Conservation

LEARNING OBJECTIVES

Students will be able to:

- Describe how ocean plastics are a danger to ocean life in the water and on the beach.
- Understand the importance of controlling waste and recycling.
- Describe their role in generating plastics that enter the ocean.
- Tell about the importance of citizen action.
- Understand first or second hand how citizen action enriches those involved.

ACTIVITY SUMMARY

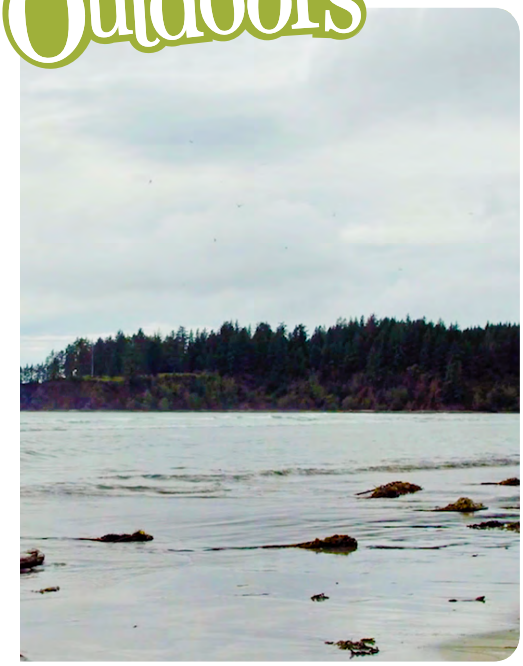
- Students will investigate the problem of plastics on the beach.
- Students will research which riparian and ocean creatures are most profoundly affected by plastics in their habitat.
- Students will reflect on volunteering and project development for volunteer projects.

BACKGROUND INFORMATION

PROJECT HISTORY:

In the middle of the night, Chris Moriarty woke up his wife, Laura with an idea. He was aware of the problem of plastic pollution on the Pacific coast where he lives. And he decided to take action. The "Million Waves Project" was born of that thought.

The Million Waves Project seeks to utilize citizen action to clean beaches, using the reclaimed plastics to turn into 3D printer filament which can produce plastic limbs for people who need them.



VOCABULARY

CONTINENTAL SHELF: The oceanic zone where the continent provides a shallow, sloping habitat for plant and animal life to live in community.

OPEN OCEAN: The oceanic zone where life free-swims or floats without reference to a bottom surface habitat or home. Species are nomadic in movements, with wide undefended territory zones.

MICROPLASTICS: What happens when plastic is broken down physically into small pieces, often the size of sand.

CONGENITAL DEFECT: When, from birth, a limb is missing or abnormal in a way that alters the function of the limb.

MARINE SANCTUARY: An area that is restricted from certain human activity in order to enable plant and animal communities to thrive without interruption.

VOLUNTEER: Someone who works on a task without pay, often for a cause.

CONSERVATION: Preservation, protection, or restoration of the natural environment, natural ecosystems, vegetation, and wildlife

SOCIAL IMPACT:

Projects that involve a call to citizen action not only solve problems that people have created in the environment, communities or within groups, but also helps people to understand the problem and become part of the solution. The ownership of the problem transfers from an entity (government group, DNR, Fish and Wildlife, or private companies) to citizens; the work of the citizens themselves impacts the people doing good as well as improving the situation at hand. Counteracting social and environmental problems helps people to feel connected, empowered, mentally uplifted and more positive about themselves. They are feeling these positive personal impacts because of the good that they are doing for creatures in nature or other humans. Therefore, citizen action is a winning situation for anyone involved.

The video focuses on 4 groups of volunteers. The first are the project creators, the second are students and families picking trash off the beach, the third is a girl named Abby, and the fourth is Abby's mother. Each group has a unique perspective on how involvement in the project has impacted them.

LEARNING FOCUS:

The critical question of this video is "In what ways can ocean plastics be recovered and recycled?" The video clip shows one way; however, there is a lot more to uncover outside of the video clip. Some examples that lesson plans will ask students to uncover are:

- What animals live on the ocean shelf habitat near the Pacific shore?
- How are the animals affected by plastics in their environment?
- How do plastics get into the ocean?
- How am I involved in influencing plastics in the ocean or other parts of the environment?
- Who is dealing with the problem of plastics in the ocean?
- How can I help?
- What is citizen action, and why is it important?

LEARNING PROCEDURE

ACTIVITY 1: VIDEO VIEWING PRE AND POST DISCUSSION AND OBSERVATIONS GUIDANCE

Session 1: Watching the Video

- **A.** The teacher should prepare by reading over the Pre-video Worksheet and Video Viewing Guide before the students arrive.
- **B.** When students arrive, introduce the fact that we will be watching a short video in class today. The students will have 5-10 minutes to fill out a pre-video worksheet that will help them think about the topics the video will focus on, and identify areas their knowledge could grow.
- **C.** After filling out the worksheet and distributing or displaying other suggested viewing guide note taking formats (KWL, INIWIRMO) as desired, view the video together.
- **D.** Discuss what we saw on the video using the student notes and questions in the video viewing guide as a model

1. Before viewing the video, discuss the following questions with the class:
   - **A.** Ask the students to discuss what they currently know about plastic waste in the environment.
   - **B.** Ask them if they've seen it, and if they have considered or have actually done something about it.
2. Segue into viewing the video, explaining that we are going to see footage and testimonies about plastics on the beach, and what people are doing about it.
   - **A.** To engage students in critical thinking practices, utilize an INIWIRMO style observation for the video. This will focus your students on simple observations and inspire them to think critically on their own. INIWIRMO stands for, "I notice, I wonder, it reminds me of."
   - **B.** After viewing the video, ask them for their initial impressions on each phrase and discuss their impressions. You can teach them hand signals (thumb and pinky up rocking between the speaker and themselves) when they agree, and raise their hands if they have more to add or a debate to offer. Encourage open and respectful discussion.
3. Further discussion questions you may want to use for after the video for students to share and process what they've seen:
   - **A.** Project ideas:
     - **a.** Have you ever had a great idea that could help people, animals or the earth?
     - **b.** What did you do with your idea?
     - **c.** What ideas did you see come to fruition in the Million Waves Project?
     - **d.** The people of the Million Waves project didn't just clean the beach, but also found an application for the materials they recovered. As you think about their project, what more do you realize you could have done with your own project idea?

B. Volunteering:

- **a.** Have you ever volunteered anywhere?
- **b.** Did you feel connected to the cause? Why did you feel this way?
- **c.** How are people rewarded for volunteering?
- **d.** Is volunteering important? Why or why not? (Be prepared to debate.)
- **e.** How would the project be different if all the people involved were paid employees? Do you think as many people would be able to be involved? Why might doing this project with employees be better or worse for the overall goals of the project. (Be prepared to debate your answer.)

ACTIVITY 2: VOLUNTEERING PERSPECTIVES:

1. Session 2: Researching Key Topics - “Stories from the Blue”
   - **A.** Introducing the topic: Stories from the Blue was a subtopic in the video that mentioned briefly the creatures who would be affected by ocean plastics but did not delve deeply into the issue of who is affected or why. In this investigation students will research and confront the real issues underlying ocean plastics.
   - **B.** Allow students to group up into small groups (5 or less, optimally 2-3) with access to Chromebook or other internet source.
   - **C.** Distribute Stories from the Blue worksheet.
   - **D.** Either assign or allow students to choose one topic to research for about ⅓ to ½ of the class period. Challenge students to view as many websites as they can find that seems to fit their topic and take notes of the facts that seem most relevant. They will present their information for discussion to the rest of the class, so they should take thorough notes so they have good facts to present.

E. Allow students to work at their task; teacher should circulate to answer questions, pose questions, and encourage students to stay on task and focus on their information.

F. Give students a 5 minute announcement, saying they will present their information and they should spend a few minutes organizing the information and who will present it.

G. Guide the discussion, challenge critical thinking, and foster respectful debate as students present information.

Background:

From the video, you'll see the perspectives of 4 types of volunteers:

1. Project designers
2. Casual volunteers (students or families out for a day trip)
3. Volunteers who may benefit from the project
4. Volunteers who have a personal long term stake in the project

Project Designers:

- Why did Chris and Laura Moriarty start the "Million Waves Project"?
- What kind of work do you think Chris and Laura do to support the project?
- What innovations did Chris and Laura invest in to make the project something of deeper significance?
- How are Chris and Laura benefitting people and wildlife through their efforts?
- How do you think they feel about the impact of their project? How would you feel in their place?

Casual Volunteers:

- The Moriartys said for every one person they ask to assist, 20 more ask how they can help. What roles do these people play in the project? (List all that you can think of that people might do to help.)
- If you were a volunteer who could only come out once ever, once a year, or once a month - how would your time in the project affect you personally regarding how you feel about yourself and your involvement? Would your feeling be stronger if you spent more time on the project rather than less?

Volunteers Who Benefit:

- Abby is a young person who is involved in the project and may also benefit from the project. What does Abby say about how she feels about her involvement in the project? Did her involvement change the way she feels about herself?
- How is Abby uniquely able to assist and advise the project?
- How does having Abby involved help other volunteers to connect more deeply to the project?

Volunteers Who Have a Long-Term Stake:

- Abby's mother is someone who has a long-term investment in the "Million Waves Project." What observations has she made about the project's effect on Abby? What does she observe about the effect on others?

Let's think about how volunteer projects can benefit people and wildlife in our own community. We will do a small group brainstorm session that could actually become a real-life citizen action effort. It all depends on what you decide to do with what you know.

Citizen Action Projects (30-45 minutes):

1. Get into a group of 3-5 people.
2. Discuss in your group a time that you were able to volunteer. How did you make a difference for the Earth, living things, or other people?
3. Discuss needs that are present in your community. What have you noticed or observed? Has there been anything you've seen that has made you sad or mad because you think it's not right, it's unfair, or it could just be made much better?
4. Choose one issue as a group. Discuss what kind of project you could do to address one need that you see in your community. What people need to be involved? What resources are needed? What kind of time commitment will it take? What is the work that needs to be done? How will people find out about it?
5. As a class, discuss the issue your group choose and what you would do about it if you designed a volunteer project.
6. Your teacher may have the resources to help you make one of your projects a reality, or you may decide to take action as a group! Even a group of 2 people who believe in a cause and show dedication to it can grow when people catch on and want to join in.
7. Look for other groups who are already organized in your community. How can you join forces with them to affect your cause? They may have money and people looking for a cause or people to invest in!

Coastal Ocean Life and Habitat

- What types of animals live on the Pacific Coast?
- What impact do humans have on these animals?
- Can you think of a time that you lost a plastic bottle or bag? Is it easy to do?
- How do you feel when you see garbage on the shore?
- Do you think it's ok for garbage to be in the ocean? Why or why not (be prepared to debate.)

ACTIVITY 3: "STORIES FROM THE BLUE"

Session 3: Citizen action.

1. Start by reviewing with the students the conclusions they had made through their discussion the previous class period. Ask them to recall what people in the video were doing to mitigate the problems they identified and to draw public attention to the problem. Ask them if there were other benefits to the way the project organizers chose to approach the problem.

2. Get the students into groups of 3-5. Review the Volunteering Perspectives worksheet.
3. Students will work through the entire worksheet in class, culminating with a discussion with the whole class, presenting group projects and if desired, choosing one to make a reality or suggesting groups that students could join in their community to make a difference.

Introduction:
"Stories from the Blue" is a topic heading in the Into the Outdoors video that focuses on plastics on the beach and in the ocean ("In what ways can ocean plastics be recovered and recycled?")

Biologist Jaqueline Laverdure speaks about humpback and blue whales that come to feed on the plankton that is abundant on the shorelines of the sanctuaries of the Northern US Pacific coast. The video specifically mentions the 14 marine sanctuaries and 2 marine monuments on the Washington state shoreline. This is the area where the "Million Waves Project" focuses its efforts.

Although species and sanctuaries are mentioned, to really have a better understanding of the importance of these sanctuaries and the animals who depend on them, we can do some research on our own.

"Stories from the Blue" Class Activity (30-45 minutes):
Today we will take some time to delve deeper into the possible effects of plastics on ocean life. We will do this in small groups by doing a web search and discussion/debate on topics we uncover. Students will be prepared to offer information, clarifying questions, agreements and disagreements to uncover opinions and truths about plastics and ocean life, and human influences both positive and negative.

One of the best ways to learn about an environmental topic is to split up the topic and work in small groups. Make a group of 2-5 students who can work together to research plastics in the ocean on the internet. Students will search and compile their information, discussing what is the most relevant information. Discussion rules are that everyone's voice matters, everyone gets to have a say, and disagreement is ok as long as it is respectfully discussed.

Here are some questions to examine with quick web searches. Student groups should divide up topics one to a group and find answers together with their group mates, as resource and time allows.

Presentation of group information to the class at the conclusion of the search will be limited to 3 minutes. Questions and answers are limited to 2 additional minutes.

1. What sanctuaries can you find on the Pacific coastline, and what makes each one important in its own way? (Do a web search to see how much you can uncover in the allotted time.)
2. What animals live on the Pacific coastline continental shelf? Make a list and describe in what habitat the animal is normally found.
3. What are the most common whales, mammals and larger animals on the Pacific coast? What do they eat?
4. Have ocean mammals, birds and sea turtles been known to eat plastic? Find evidence to support your answer. Why do people think they might do that?
5. What are microplastics? What animals have been found or speculated to be affected by microplastic?

6. How does plastic get into marine and riparian environments? Be thorough in your list and explanations so you don't miss any sources. What is the most common source?
7. Is someone doing anything about plastic waste in the environment? Find groups whose mission is to educate, reduce and eliminate plastics in the ocean, and be ready to tell the class what each group's purpose and method of action is.

Teacher suggestions:

- Provide each student group one question to analyze.
- Circulate among student groups as they explore their topic, and encourage them to write down answers they found, questions they have, and things they want to tell the class or debate about to uncover deeper opinions and truths.
- Give students 15 minutes to research, with the understanding that they will present and discuss their findings with the class. Give 5 extra minutes to wrap up and practice their discussion with each other.
- Give student groups 5 minutes each to present their topic, and for other students to ask questions.
- Challenge the class at the end to consider what action they think should be taken in light of the knowledge they have just gained. This can lead into an assignment and discussion of volunteerism and citizen action groups in the next class period.

Links and summary information for teacher preparation:
(Please click the linked text for more information and reference.)

Common Whales on the Pacific Coast

The most common whales seen off the Pacific coast are Cuvier's whales and Blue Whales.

Blue Whales

"The enormous mammals dive up to 500 metres beneath the surface, then lunge into the swarms of tiny krill above them at several metres per second. As they strike, their massive mouths fill with huge volumes of water, including plenty of krill. The water is pushed out through the filters, or baleen, in each whale's mouth, trapping the krill."

Cuvier's Whales

These whales dive incredibly deep to feed. They have been able to dive as much as 3,000 meters and 3 hours and 42 minutes (that's a long time for an air breathing mammal to hold its breath.)

Washington Post: "Whales keep eating plastic, dying."

In this article, floating plastic was the cause of death for a 15 foot whale that normally feeds on squid and deep water fish. "The autopsy he conducted revealed more than 88 pounds of waste in the young whale's stomach — grocery bags, plastic garbage bags, four banana plantation sacks and 16 rice sacks."

Ecosystems in the Pacific North American Continental Shelf

- What categories of living things live on the continental shelf? (phytoplankton, zooplankton, fish and squid, bottom life, deep corals.)

- What invasive species live on the shelf, and what causes them to thrive? i.e.: Japanese kelp, Asian clam, Japanese clam, Chinese mitten crab, Bamboo worm, etc. - brought in by ship ballast water, they establish as good competitors.) What effect do they have on other inhabitants of the shelf? (They outcompete native animals/plants for habitat and resources.)
- What threatened species live on the shelf, and what do they need to thrive again? (i.e.: Blue whale, Humpback whale, Tufted puffin, Pacific harbor porpoise, Pacific cod, etc.) What suppresses their survival ability? (Loss of habitat, over-hunting, injury from human activity, pollution, etc.)

The Danger of Plastics in the Ocean

- 8 million metric tons of plastic enters the ocean each year. This number is expected to double in the next 10 years as our current rate of plastic production increases.
- This means there is estimated to be 150 million metric tons of plastic in the ocean now ... directly impacting over 70 species who regularly mistake it for food. Plastic is found in 70% of bird species and 100% of sea turtles, which are just two examples of the problem.
- Plastics take from 10 - 1,000 years to decompose, and cannot be effectively broken down in the digestive system of any animal.
- Use the teaching resource "How long does it take to break down" to illustrate the importance of recycling durable reusable resources.

HOMEWORK ASSIGNMENT (INDIVIDUAL):

What are some other things that recycled plastics could be used for that would "do the most good"? Assign individual students a homework project to do research and present their ideas through a homework submission or in class in a 2-5 minute presentation.

Homework presentation rubric:

1pt (D)	2pts (C)	3pts (B)	4pts (A)
Item is identified and shown in use	Item is identified and purpose/impact is explained	Item is identified, purpose is explained, manufacturing process is illustrated	Presentation shows thorough research into purpose, impact, creation, materials and feasibility
Words and pictures on 3-5 slides	Complete ideas and photos on 5-7 slides	Complete ideas, photos, process explanation on 7-9 slides	Detailed descriptions and relevant photos, credits and references on 9-12 slides

CONCLUSION:

Through discussion and activities, students should now have a sense of involvement in the ability to keep plastics out of the ocean, and the sense of responsibility to do so. They may be motivated to volunteer to help solve environmental problems in their own home areas, or volunteer at ocean projects while traveling with family or on school organized trips.

EXTENDING THE LESSON

- "How Long Does It Last" cards: These cards can be used any time that seems to fit into the time and discussion.
- Some examples of good times to insert the "How Long Does It Last" cards:
  - Students may bring up garbage and speculate as to its effect on the ocean community. Get out the cards to get them to guess how long a particular recyclable waste product would last in the environment if not recovered.
  - Students may wonder if plastics or other garbage can decompose inside of a whale. Bring out cards to demonstrate the normal decomposition of the materials and speculate whether or not they'd break down in time to keep from affecting the health of the whale.
  - The teacher may want to focus students on a problem in the community or at school that a group may work on - as a peer education project or practical project and use the cards as a thought provoker.
  - The teacher may want to use the cards before the video and pre-worksheet as a thought-provoking introduction to get students engaged in the topic. Students may draw cards from the deck to pose the question of how long does it take for an item to decompose, and after classmates try guessing, the student with the card reveals the answer.

RELATED LINKS

- millionwavesproject.com for updates on the Million Waves Project
- noaa.gov for all that NOAA does
- sanctuaries.noaa.gov for information on the National Marine Sanctuaries
- "How Long does it Last?" activity cards in slideshow format: docs.google.com/presentation/d/1tLYvD0JokDvoHKYc__VJZWdiftE6KU4Vhv6rmMsQT0o/edit?usp=sharing

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PRE-VIEWING WORKSHEET FOR RECOVERING AND RECYCLING OCEAN PLASTICS

Developed by: Emily Nienhaus-Stahl

Before watching the video Recovering and Recycling Ocean Plastics or exploring the webpage, review these questions and listen for answers while watching the video.

What do you know or what have you heard about the health of the ocean and the creatures in it? _____

_____

_____

What kinds of ocean creatures live near the North American coastlines? _____

_____

_____

What do you know about how humans control waste and utilize recycling? _____

_____

_____

Do you think it would be a problem if things like plastic bags or bottles get into the ocean or on the shoreline? _____

_____

_____

Do you know of any citizen action groups in your area? What is citizen action, and why is it important? _____

_____

_____

As volunteers in citizen action groups do their tasks, how do they personally benefit, as well as benefiting other people and wildlife through their work? _____

_____

_____

While watching, make notes here of what you notice, what you wonder, what you would like to know more about. (INIWERMO)_____

_____

_____

_____

_____

How Long Does it Last?

Guess the time it takes for trash to decompose.

Plastic Water Bottle

450 years

Disposable Diaper

550 years

Aluminum Soda Can

80 - 200 years

Glass Containers

1 Million Years +

Paper Towel

2 - 4 Weeks

Orange Peel

6 months

Banana Peel

1 month

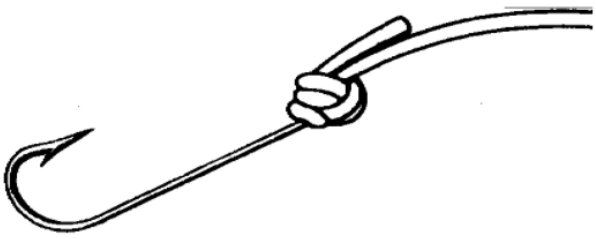
Cigarette Butt

5 - 10 years

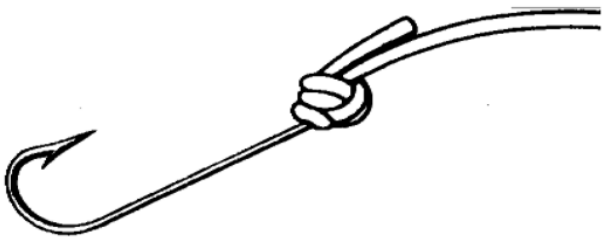
Styrofoam Cup

Never

Monofilament Fishing Line



600 years



Leather Boot

25 - 40 Years

Plastic Bag

10 - 20 Years

The following National Common Core Standards can be met teaching;

PLASTICS ON THE BEACH:

COMMON CORE STANDARDS (GRADES 6-12):

GRADE 6:

CCSS.ELA-LITERACY.RI.6.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
CCSS.ELA-LITERACY.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
CCSS.ELA-LITERACY.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
CCSS.ELA-LITERACY.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
CCSS.ELA-LITERACY.W.6.7	Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
CCSS.ELA-LITERACY.W.6.8	Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
CCSS.ELA-LITERACY.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
CCSS.ELA-LITERACY.SL.6.3	Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
CCSS.ELA-LITERACY.SL.6.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.6.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.6.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.6.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
CCSS.ELA-LITERACY.L.6.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.6.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

GRADE 7:

CCSS.ELA-LITERACY.RI.7.1	Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
CCSS.ELA-LITERACY.RI.7.8	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
CCSS.ELA-LITERACY.W.7.7	Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
CCSS.ELA-LITERACY.W.7.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.7.2	Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
CCSS.ELA-LITERACY.SL.7.3	Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.
CCSS.ELA-LITERACY.SL.7.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.7.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.7.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.7.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
CCSS.ELA-LITERACY.L.7.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.7.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

GRADE 8:

CCSS.ELA-LITERACY.RI.8.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and

tone, including analogies or allusions to other texts.

CCSS.ELA-LITERACY.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
CCSS.ELA-LITERACY.W.8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
CCSS.ELA-LITERACY.W.8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.8.2	Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
CCSS.ELA-LITERACY.SL.8.3	Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
CCSS.ELA-LITERACY.SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.8.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.8.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.8.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
CCSS.ELA-LITERACY.L.8.4	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.8.5	Demonstrate understanding of figurative language, word relationships, and
CCSS.ELA-LITERACY.L.8.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

6TH - 8TH GRADE:

CCSS.ELA-LITERACY.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-LITERACY.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-LITERACY.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
CCSS.ELA-LITERACY.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-LITERACY.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
CCSS.ELA-LITERACY.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
CCSS.ELA-LITERACY.WHST.6-8.1	Write arguments focused on discipline-specific content.
CCSS.ELA-LITERACY.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
CCSS.ELA-LITERACY.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
CCSS.ELA-LITERACY.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
CCSS.ELA-LITERACY.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

GRADES 9-10:

CCSS.ELA-LITERACY.RI.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
CCSS.ELA-LITERACY.RI.9-10.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.
CCSS.ELA-LITERACY.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.2	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
CCSS.ELA-LITERACY.SL.9-10.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

CCSS.ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-LITERACY.SL.9-10.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.9-10.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.9-10.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
CCSS.ELA-LITERACY.L.9-10.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9-10 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.9-10.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CCSS.ELA-LITERACY.RST.9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.ELA-LITERACY.RST.9-10.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
CCSS.ELA-LITERACY.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
CCSS.ELA-LITERACY.RST.9-10.5	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
CCSS.ELA-LITERACY.RST.9-10.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
CCSS.ELA-LITERACY.RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
CCSS.ELA-LITERACY.RST.9-10.9	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
CCSS.ELA-LITERACY.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.

GRADES 11-12:

CCSS.ELA-LITERACY.RI.11-12.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

CCSS.ELA-LITERACY.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
CCSS.ELA-LITERACY.W.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.W.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCSS.ELA-LITERACY.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CCSS.ELA-LITERACY.SL.11-12.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
CCSS.ELA-LITERACY.SL.11-12.4	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
CCSS.ELA-LITERACY.SL.11-12.6	Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.11-12.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.11-12.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
CCSS.ELA-LITERACY.L.11-12.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11-12 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CCSS.ELA-LITERACY.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCSS.ELA-LITERACY.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCSS.ELA-LITERACY.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCSS.ELA-LITERACY.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

CCSS.ELA-LITERACY.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-LITERACY.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-LITERACY.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CCSS.ELA-LITERACY.WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

CCSS.ELA-LITERACY.WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

NEXT GENERATION SCIENCE STANDARDS:

GRADES 6-8:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

GRADES 9-12:

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but changing conditions may result in a new ecosystem.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.