Alignment to the PA STEELS Standards

The mySci *Using Our Resources Wisely* unit was designed for the Next Generation Science Standards (NGSS) and throughout the unit there are indications of NGSS Performance Expectations. The unit is also aligned to the Pennsylvania Science, Technology & Engineering, Environmental Literacy and Sustainability (STEELS) Standards[1]. The targeted performance expectations for this unit from both the NGSS and STEELS standards are shown in the tables below.

STEELS Performance Expectations Addressed	
3.3.4.D Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	3.3.5.D Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

STEELS Performance Expectations Partially Addressed	
3.3.5.E Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	3.4.3-5.A Analyze how living organisms, including humans, affect the environment in which they live, and how their environment affects them.**
3.5.3-5.M Demonstrate essential skills of the engineering design process.*	3.3.5.C Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
3.5.3-5.P Evaluate the strengths and weakness of existing design solutions including their own solutions.*	3.2.4.B Make and communicate observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

*The PA Technology and Engineering standard is partially aligned to the claimed NGSS ETS performance expectation for this unit.
** The PA Environmental Literacy and Sustainability standard is partially aligned to the claimed NGSS ESS performance expectation for this unit.

Color Coding for the Three Dimensions

The mySci *Using Our Resources Wisely* unit uses NGSS color coding to indicate specific connections to each of the three dimensions. The PA STEELS standards use different colors for the three dimensions. The colors used in both standards to refer to the three dimensions are below.

Color coding used for the three dimensions of the NGSS standards	**Color coding used for the three dimensions of the STEELS standards**
Orange text highlights connections to DCIs (**Disciplinary Core Ideas**)	**Blue text** highlights connections to DCIs (**Disciplinary Core Ideas**)
Blue text highlights connections to the SEPs (**Science and Engineering Practices**)	**Green text** highlights connections to the SEPs (**Science and Engineering Practices**)
Green text highlights connections to the CCCs (**Cross-Cutting Concepts**)	**Purple text** highlights connections to the CCCs (**Cross-Cutting Concepts**)

[1] Alignment is based on mySci's NGSS claims and not an in-depth evaluation for STEELS standards.

The purpose of this unit is not to be used in a PA classroom, but rather to illustrate the shifts required by STEELS. With strong science, engineering, and environment connections, it represents the integrated nature of the Pennsylvania STEELS standards while showcasing strong curriculum-based system of assessments.

mySci inspiring the next generation of scientists

Earth and Space Systems:
Natural Resources, Earth Systems, Renewable and Non-Renewable Energy, Human Impacts

Teacher Guide

mySci **Unit 22**:

Using Our Resources Wisely

Washington University in St. Louis
Institute for School Partnership

Bayer Fund

HIGH QUALITY NGSS DESIGN
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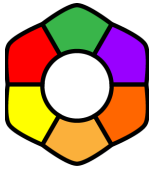
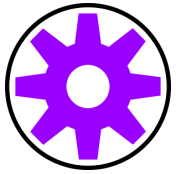
mySci Symbols Key

 Indicates an opportunity for students to write	 Indicates an opportunity for assessment	 Indicates an opportunity to employ a driving question board
 Indicates an opportunity for the teacher to make a chart	 Indicates an opportunity to attend to equity and inclusion	 Indicates appropriate time to administer the post assessment
 Indicates an opportunity for reading	 Indicates an opportunity to differentiate instruction	 Indicates link to a teacher facing mySci tutorial explaining how to set up the activity for students
 Indicates an opportunity for discourse	 Indicates a key science idea	 Indicates a multimedia resource

Unit 22: Quick View **Using Our Resources Wisely**

ANCHORING PROBLEM:

We need farms to grow food, but the process of producing food for all of us can harm Earth systems.

DRIVING QUESTIONS:

How are farms part of Earth's systems?
How does our use of natural resources on farms affect Earth's systems?
How can farmers use resources wisely to protect Earth's systems?

These questions are provided for you as model driving questions to support categorizing individual student questions and organize the learning progression. Each section is designed to intentionally build toward defining the anchoring problem and designing a solution. You can use these questions to guide your instruction, however, you are encouraged to adapt these questions using the language you develop with your students.

Throughout mySci Units color coding is used to call out specific connections to each of the 3 dimensions of the NGSS standards:

Orange text highlights connections to DCIs (Disciplinary Core Ideas)

Blue text highlights connections to the SEPs (Science and Engineering Practices)

Green text highlights connections to the CCCs (Cross-Cutting Concepts)

STORYLINE

In this unit, students will **make sense of Earth's systems and natural resources, ways that humans use natural resources, human impacts on Earth systems, and how humans can change behaviors to reduce impacts on the environment.**

This unit **intentionally develops the Crosscutting Concept of System and System Models and also uses Scale, Proportion, and Quantity and Energy and Matter for sensemaking**.

This unit **intentionally develops the Science and Engineering Practices of Developing and Using Models and Obtaining, Evaluating, and Communicating Information.**

The unit also **incorporates Using Mathematical and Computational Thinking, Constructing Explanations and Designing Solutions, and Planning and Carrying Out Investigations for sensemaking.**

1. First, students will explore the four Earth systems (hydrosphere, biosphere, atmosphere, and geosphere) and learn how these systems interact.

2. Next, students will learn about natural resources and how humans use them for things like energy, food, and shelter. They will investigate some of the impacts of using natural resources, including the effects of fossil fuel consumption. Students will also examine the hydrosphere in detail, including the distribution of water on Earth. They will learn that water is a limited resource, and the amount and quality of available water can be affected by human activities.

3. Finally, they will learn about strategies humans can use to decrease our impact on the environment. They will examine a case study of an island in Denmark that changed from using non-renewable to renewable energies and then engage in a design challenge to design, build, test, and refine a wind turbine to perform a specific task. Students will also consider how farms can repurpose animal waste to generate energy using biodigesters.

Unit 22: Sections Quick View

Section 1 **How are farms part of Earth's systems?**	Section 2 **How does our use of natural resources on farms affect Earth's systems?**	Section 3 **How can farmers use resources wisely to protect Earth's systems?**
Total time: 6 days LESSON 1 **How can we describe the different parts of the Earth?** *(3 days)* LESSON 2 **How do Earth's systems interact?** *(3 days)*	*Total time: 11 days* LESSON 3 **What are natural resources and how do humans use them?** *(3 days)* LESSON 4 **How does our use of fossil fuels affect Earth's systems?** *(3 days)* LESSON 5 **How does our use of water affect Earth's systems?** *(3 days)* LESSON 6 **How does animal waste affect the environment, and what can we do about it?** *(2 days)*	*Total time: 9 days* LESSON 7 **How can people use resources in a way that is less harmful to the Earth?** *(3 days)* LESSON 8 **How can we use farms to harness wind energy?** *(3 days)* LESSON 9 **How can farms make better use of animal waste?** *(3 days)*

Links to Resources for this Unit

SECTION 1 SLIDE DECK **SECTION 2 SLIDE DECK**

SECTION 3 SLIDE DECK

PARENT/GUARDIAN LETTER

English Version Spanish Version

STUDENT JOURNAL:

Digital Student Journal Answer Key

Print Student Journal Answer Key

ASSESSMENT DOCS:

Post Assessment Answer Key

LITERACY LINKS:

Epic Booklist Unit 22

Quizlet Unit 22

Printable Glossary

Google Slide Vocabulary Cards English

Google Slide Vocabulary Cards English/Spanish

APPENDICES:

Teacher Background Information: Appendix A

Read-Aloud Guides: Appendix B

Handouts/Teacher Pages: Appendix C

NGSS/MLS: Appendix D

Safety Guidelines: Appendix E

Performance Expectations Addressed

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
3-5-ETS1- 3. (5.ETS1.C.1) Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
5-ESS2-2. (5.ESS2.C.1) Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Performance Expectations Partially Addressed

5-ESS3-1. (5.ESS3.C.1) Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
3-5-ETS1- 2. (5.ETS1.B.1) Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
5-ESS2-1. (5.ESS2.A.1) Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
4-PS3-2.(4.PS3.B.1) Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Unit 22: **Fast Track** Pacing Guide

Unit 22 Fast Track Pacing Guide

These suggestions can be used if you do not have the full amount of time required to dedicate to the whole unit.

Lesson	How to Adapt
Lesson 1	- Explore: Omit going outside.. - Elaborate: Only show one video, or shorten the length of each video. - Elaborate: Provide students with the Gotta Have It checklist instead of co-constructing it.
Lesson 2	- Explore: Use the virtual adaptation of the activity to reduce setup time. - Explain: Omit the Crash Course Kids videos. - Elaborate: Only show one video, or shorten the length of each video. Provide students with the Gotta Have It checklist instead of co-constructing it.
Lesson 3	- Explore: Omit comparing and sorting the self-documentation data, and only do the class chart about it. - Elaborate: Provide students with the Gotta Have It checklist instead of co-constructing it.
Lesson 4	- Explore: Omit the student choice research and only do the asthma research. Alternatively, skip the asthma research and allow for student choice. - Explain: Based on what you omitted in the Explore section, only do one cause and effect sphere interaction activity. - Elaborate: Provide students with the Gotta Have It checklist instead of co-constructing it.
Lesson 5	- Omit all portions except for the Explore graduated cylinder, graphing activity, and development of a claim.
Lesson 6	- Keep as is.
Lesson 7	- Elaborate: Omit returning to the model. Students will revise the model again in Lesson 9.
Lesson 8	- Explain: Only have students draw their model and how energy is transferred. Omit drawing an actual wind turbine for comparision. - Elaborate: Read The Boy Who Harnessed the Wind or watch the video.
Lesson 9	- Keep as is.

Lesson 5: Summary

How does our use of water affect Earth's systems?

Time: 3 days

Learning Targets

Analyze and graph data to explain the distribution of the salt and freshwater on Earth in terms of volume..

Revise a model to explain how water use and waste production on farms interacts with Earth's systems.

Summary

- In the last lesson students explained how our use of fossil fuels affects Earth systems.
- In this lesson students analyze and graph data to show how water is distributed on Earth. They obtain information about how human activities can affect the amount and quality of our water resources.
- **Students figure out that the amount of freshwater available for human use is limited. Many activities, including farming, can deplete water resources. Human activities can also cause water resources to become polluted.**
- In the next lesson, students will set up biodigesters to investigate if we can use farm waste as a natural resource for energy.

Building Towards

5-ESS2-2. (5.ESS2.C.1) | 5-ESS2-1. (5.ESS2.A.1) | 5-ESS3-1. (5.ESS3.C.1)

NGSS 3-Dimensions:

ESS2.C: The Roles of Water in Earth's Surface

Processes ESS2.A: Earth Materials and Systems

ESS3.C: Human Impacts on Earth Systems

Using Mathematics and Computational Thinking

Developing and Using Models

System and System Models

Scale, Proportion, and Quantity

Lesson 5: Five E Quick View	
ENGAGE	Students ask questions about water use farms.
EXPLORE	Students use models to visualize amounts of different kinds of water on Earth, and how our waterways are connected.
EXPLAIN	Students construct explanations about how humans' use of water resources affects Earth's systems.
ELABORATE	Students develop a model to show how farms use water and how animal waste can pollute water resources.
EVALUATE	Students evaluate each other's farm models and give feedback.
EXTEND	Students use a model to explain how we can create drinkable water from saltwater.

Lesson 5: Prep List

Inside mySci kit you will find:	Items you must supply:	Preparation:
100mL Graduated cylinder 10mL Graduated cylinder Food coloring Pipette (1mL) 1 Petri dish	Computer with internet access Chart Paper Water	Lesson 5 Student Journal pages or Printed Student Journals

Literacy Connections	Remote Learning
Key Vocabulary **aquifer**: large bodies of underground rock that contain fresh groundwater **freshwater:** water that does not contain a large amount of salt (like river or lake water) **saltwater**: water that contains a lot of salt (like ocean water) **volume:** the amount of space an object takes up Supplemental Reading Resources The Dead Zone High and Dry	Interactive & Mini Lesson Videos How Is the Water on Earth Distributed? Mini-Lesson How Does Your Water Use Compare to the Rest of the World? Mini-Lesson Hands-on at Home Suggestions Have students track what they use water for, and how many minutes they use water per day.

L5– Five E Lesson Plan

ENGAGE

Students ask questions about water use farms.

Begin the lesson by revisiting the Driving Question Board. Highlight questions connected to the learning goals of this lesson by calling attention to questions about the **use of water on the farm and how it might affect Earth's systems**. If no questions directly relate, use prompts to build on student questions, supporting them to think about what they observed on a farm and pointing out the instances where farmers use water and highlighting examples of how water is used on a farm.

Say to students:

Today's activity will support us in answering this question (ex: **How does our use of water affect Earth's systems?**). *By answering this question, we will be able to build on our understanding of how using natural resources might affect the farm and Earth's systems*.

Show students the following video: The Ogallala Aquifer (Stop at 1:36) from the National Science Foundation. After students have observed the video, ask:

- *What do you observe about water on farms?* (Farms need water to grow food. Some farms pump water out of the ground.)

If students don't offer these responses you can ask:

- *What do you think farms use water for?*
- *Where do you think farms get this water?*

Say to students:

- *Water is. another important natural resource humans use. All life on Earth depends on water.*

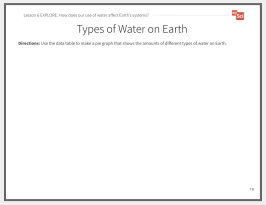
Then ask:

- *Are there any problems that you can think of related to the use of water on farms?* (In the video farmers were using big watering systems. They look like they use a lot of water.)

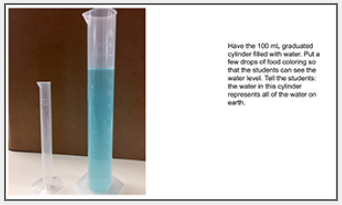
	If students don't offer these responses you can ask: ▸ *What did you notice about the tools farmers used to water the plants?* ▸ *How much water do you think it takes to water all of those plants we saw in the video?* Then ask: ▸ *What questions do you have?* (Students may ask: Where else can farmers get water besides underground? How does the water get in the ground? Can farms run out of water?) It is okay if students do not offer these questions.  Revisit the Driving Question Board. Review the words, phrases, or questions used to categorize student questions. Have students consider where they might place these new questions about water on farms. Consider if any of these questions are connected to the learning of this lesson. If so, highlight this (these) question for students. Say to students: ▸ *Today's activity will support us in answering this question. By answering this question, we will be able to build on our understanding of the anchoring problem.*

EXPLORE

Students use models to visualize amounts of different kinds of water on Earth, and how our waterways are connected.



Types of Water on Earth Student Journal page



tutorial

Teaching Tip:
This is an opportunity to integrate math standards. Students can change the decimals to fractions, notice the magnitude of difference between the numbers, compare different numbers on the chart, or make a number line to show the scale of difference between numbers. The CCC of

Say to students:

- *Let's start by thinking about how we use water, and the forms of water on Earth.*

Use the USGS water cycle maps and have students look at the maps. The focus here is not on the process of the water cycle, but rather to visualize the different places we can find water on Earth. It is recommended to use the "beginner" version of this map since it is not as crowded with words. Ask:

- *What are the different types of water you see?* (Oceans, rivers, lakes, streams, ground water, ice)
- *Is ocean water the same as river or lake water?*
- *How are they different?* (Students may or may not know that ocean water is **saltwater**, while rivers and lakes are **freshwater** without high amounts of salt. If no one mentions this, point out that difference.)

Ask students:

- *What type of water do we use as humans for drinking, watering plants, and taking care of farm animals?* (Freshwater from rivers, lakes, streams, and groundwater) *Freshwater is very important for human activities. Let's explore how much of each type of water resource we have on Earth.*

Show the data table of the amounts of types of water on Earth (in Section 2 curriculum slides). Have students make observations and ask questions about the data.

Say to students:

- *We noticed that there were big differences in the amounts of types of water on Earth. Let's make a model to make it easier to understand these differences in amount.*

Set up the graduated cylinder demo. Here is a teacher tutorial showing the setup. The detailed procedure for this activity can be found in Appendix C Lesson 5 Water Demonstration Procedure.

Ask students:

this lesson is Scale, Proportion, and Quantity. It can be challenging for students to visualize the vast difference between large percentages and 1/1000 of a percent, so these discussions can help students make sense of the data.	▸ *What did you notice about how we measured the amount of water? What is volume? Why is this unit of measure important* Explain to students that **volume** is a standard unit used to measure the amount of space something takes up. Scientists use standard units, instead of everyone using their own units, in order to measure quantities accurately and communicate with one another. Give students time to take the data from the chart (in Section 2 curriculum slides) and make a graph of the data on the Types of Water on Earth Student Journal page. Be sure not to show students the student journal page until after they discuss which type of graph to make. There are different ways to approach this. You could have students make a pie chart, but first discuss why this is the best way to represent this kind of data. You could have students graph only the amount of freshwater vs. saltwater, or have them graph the different kinds of freshwater.

EXPLAIN

Students construct explanations about how humans' use of water resources affects Earth's systems.

Formative Assessment

ESS2.C: The Roles of Water in Earth's Surface Processes

Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

Using Mathematics and Computational Thinking

Describe and graph quantities such ~~as area~~ and volume to address scientific questions.

Scale, Proportion, and Quantity

Standard units are used to measure and describe physical quantities such as ~~weight and~~ volume.

Have students work in groups to analyze their graphs. To support students to do this, ask:

- *Which slice of the pie chart is the biggest? What does that tell you?*
- *Which slice of the pie chart is the smallest? What does that tell you?* (The saltwater slice is the biggest. The freshwater slice is the smallest. This means most of the water on Earth is salt water.)

Ask students:

- *What claim can you make about humans and freshwater on Earth, based on the data table and graph you made?* (Most of Earth's water is found in the ocean. We don't have a lot of usable freshwater on Earth.)

Give students time to work on developing their claims individually first. Then they can share them with their groups to come up with group claims. Finally, each group shares their claims with the class.

This activity is a chance to formatively assess students' understanding of the DCI ESS2.C, SEP Using Mathematics and Computational Thinking and CCC Scale, Proportion, and Quantity. See the student journal answer key for an example. If students are struggling to create their graphs, walk through graphing one data point as a class. If students are struggling to develop their claims, provide them with sentence starters.

Say to students:

- *Humans use water to drink, bathe, water their lawns, in the production of energy, etc. We also need a lot of it to keep up with all of the food we need to grow. We saw that groundwater is less than 1% of water on Earth. However, it makes a majority of the freshwater available for us to use. Let's see what the effects are of our use of groundwater for farming.*

Remind students of the video they watched at the beginning of the lesson. Then, have students pair up and look at their farm models (Farm Model Student Journal page). Say:

- ***Aquifers** are large bodies of underground rock that contain fresh groundwater. How does what we saw in the video apply to our farm models?*
- *Use your model to talk to a partner about how humans are affecting Earth's systems by using*

Teaching Tip:
Students can track their own water usage using the USGS website, or their own tracking method.

groundwater for farming. (Listen for students discussing how humans (biosphere) take water (hydrosphere) out of the aquifers in the ground (geosphere) to water crops. The water can't be replaced fast enough, so the groundwater gets too low.)

If students do not mention the system in their discussions, use these probing questions:

- *Which system is water a part of?*
- *Which system are humans a part of?*
- *Which system are aquifers located in?*
- *What do you think happens to the aquifer as farmers use the water?*

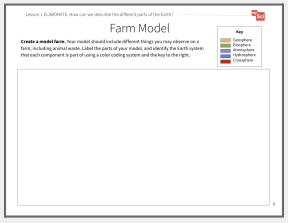
Show students the following video:

The Ogallala Aquifer (5:37) from the National Science Foundation.

Have them focus on the problem that comes from using water from the aquifer. The students can then add to their ideas they discussed prior to watching the video.

ELABORATE

Students develop a model to show how farms use water and how animal waste can pollute water resources.



Farm Model
Student Journal page

Say to students:

- *We now know that farms use a lot of water and we have limited amounts of freshwater on Earth. If we have limited fresh water, we want to make sure that the water stays clean so that it can be used.*
- *How do you think farms contribute to the cleanliness of Earth's fresh water?*
- *What are some things that are produced as a result of farming?*
- *What happens after the cows or other animals are fed? Where does that poop go?*
- *What happens if it rains when there is poop on the ground?*
- *Let's consider a farm that produces a lot of animal waste. When rain falls or water moves over the*

Attending to Equity:

People from different cultures across the globe view water as a sacred resource that deserves to be protected. You could read the children's book *We are Water Protectors* by Carole Lindstrom to examine how Indigenous people of North America have rallied to protect the waters of the land. Missouri has many natural springs that have been important to both native tribes and early European settlers.

ground, some of that waste may get picked up and moved with it. Let's see where it goes.

To help students develop their explanations further, project the following resource for students: River Runner. Locate an area near your school that appears to be farmland.(Students should observe that water in Missouri eventually ends up in the Mississippi River, and ultimately the Gulf of Mexico in Louisiana.)

- *What do you think might be some issues with animal waste running into rivers, lakes, and the ocean?*
- *Has anyone seen a lake or pond that looks like this before?* (Show the photos of dead zones and pond eutrophication In Section 2 Curriculum Slides. Use the descriptions in the slides to provide context for students.

Say to students:

- *There are multiple activities that contribute to these phenomena including deforestation, sewage discharge, fertilizer that is applied to people's lawns or golf courses to maintain green fairways, fertilizer applied on farms, and animal waste. There are many contributing factors to this problem, but we are going to focus on animal waste.*
- *What do you wonder about animal waste and how it contributes to the dead fish and algae growth?* (Students may wonder – what is it about animal waste that is causing dead fish, and lots of algae growth?)

Say to students:

- *What do we need to know to be able to answer that question?* (We need to know what animal waste is made of, and how it is connected to the ocean if farms are not in the ocean. We need to know how the animal waste gets in the water. We need to know why this is important to us.)

Say to students:

- *Let's watch a video that shows what is happening to cause water pollution. As you're watching, think about how you could represent this on your farm model.*

Show What is Eutrophication? by USOceanGov (1:03).

It is not critical that students understand the process of eutrophication (this is an above grade level expectation). The purpose of this video is to introduce students to one effect of water pollution so that

	they can visualize the harm it can cause. Have students draw on their farm models (Farm Model Student Journal page) to show how farm animal waste can pollute different water sources. Ask students what they should add to their "Gotta Have It" checklist so that their models are showing what they want them to show. Their models should show: - How water is being used on the farm - Where the water is coming from - Animal waste - Something to show how the animal waste is affecting the water - How the pollution gets from a farm to a water source that is not near the farm As students are making their models, this is a good time to reinforce vocabulary about Earth systems, and ask students to point out how our water use affects Earth systems. For example, they might say that the biosphere (farming) is affecting the hydrosphere (lakes and oceans) by adding too much waste. This then circles back to affect the biosphere (too much algae grows, so aquatic animals die).

EVALUATE

Students evaluate each other's farm models and give feedback.

Formative Assessment **ESS2.A: Earth Materials and Systems** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice),	Have students share their models with a partner or another group and give each other feedback using the "Gotta Have It Checklist". - How do their models compare with each other's? - What interactions between water, animal waste, and Earth's systems did they identify? Students will continue to refine this model over time. Bring the class back together, and ask students to share out the differences and similarities in their models. This supports students to see the different ways you can represent and label things in models. Based on their discussion, students should change

the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. ~~The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather~~

ESS3.C: Human Impacts on Earth Systems Human activities in agriculture, ~~industry, and everyday life~~ have had major effects on the ~~land, vegetation~~, streams, ocean, ~~air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.~~

Developing and Using Models
Develop a model using an example to describe a scientific principle.

System and System Models
A system can be described in terms of its components and their interactions.

their models to reflect feedback.

Return to the class consensus model that was created in the Engage portion of lesson 1. Revise the class model to include how farms use water resources, and how farming can impact water quality. Ask students what labels you should put on your drawing. This helps scaffold the revision process and provides continuity throughout this unit.

 This activity is a chance to formatively assess students' understanding of the SEP Developing and Using Models, DCI ESS2.A and ESS3.C, and CCC System and System Models. See the student journal answer key for an example. If students are struggling to apply what they have learned in developing a model, use the class consensus model you created to support students to further develop their models.

To support student sensemaking across the unit, orient students back to the DQB. Ask students:

- *What did we observe during today's activity?*

Record the activity and their observations. Next, ask students:

- *What did we learn today? (We examined how humans' use of natural resources can impact the amount of usable water and the quality of water on Earth.)*

Record their responses. If students need a reminder, they can reference their student journals.

Ask students:

- *How might this help us figure out how our use of natural resources on farms affects Earth's systems? (Students may say that farms need water to grow food, and that using too much water can deplete the resource. They may also discuss how human activities can cause water pollution.* For example, animal waste can be moved by water to different locations on Earth. The nutrients in the waste can lead to dead zones in lakes and oceans)

Next, ask students:

- *What new questions do you have?*

Write student responses on the driving question board. (They may have new questions, such as:

	• How can we reduce the amount of animal waste that gets into our waterways? • How can we reduce the amount of water we use, so we don't deplete it?) Do not provide these questions for students, instead help them start thinking about these ideas by focusing their attention to the different interactions between water use and Earth systems that they labeled on their models and how that could relate to the anchoring problem: Farms use a large amount of resources. This can have a negative impact on the environment. Have students place their questions into existing categories, or create new categories.

EXTEND (Optional)

Students use a model to explain how we can create drinkable water from saltwater.

	If students demonstrate success with DCI ESS2.C and begin to wonder about solutions to the problem, you can provide them with this extension. It is not expected that every student completes this extend activity. • *So much of Earth's water is saltwater, but there are ways to make saltwater safe for people to drink. Today we are going to make an evaporation still to desalinate (take the salt out) of water.* You will need the following materials for the model: A large container, small container, rubber band, plastic wrap, ball bearings, salt, food coloring, and water. For online directions and sketches for setting up the activity visit Desalinate Water from Wikihow.

Lesson 6: Prep List

Inside mySci kit you will find:	Items you must supply:	Preparation:
(16) small clear travel size plastic bottles (1) 4 oz. bag of soil 1 Large yellow funnels Small bottle of vinegar 40 balloons 1 set of yellow measuring spoons 2 coffee stirrers Roll of string (from previous lessons) to measure balloon circumferences	If students do not choose the type of scraps used variable: a uniform mixture of pureed fruit and vegetable scraps to evenly divide among biodigester bottles (Note: Choose items that will break down relatively fast. **Lettuce, blueberries, and bananas** work well, for example.) If students do choose the type of scraps used variable: make the mixture based on their experimental design. If students choose temperature as their variable: a refrigerator and a sunny, warm place. Food processor or blender to make a puree of the scraps Water Rulers	Puree the food scraps the morning or evening before this lesson. Lesson 6 Student Journal pages or Printed Student Journals

Literacy Connections	Remote Learning
Key Vocabulary **biodigester:** a container that collects gas created by living things as they break down food **decomposer:** an organism, such as bacteria or fungi, that breaks down dead organisms **constraint:** what the design is limited by or cannot do **criteria:** what the design must have or be like Supplemental Reading Resources What is compost?	Interactive & Mini Lesson Videos Hands-on at Home Suggestions Have students collect kitchen scraps and watch them decompose either outside or in a cup covered with cellophane. What factors make them decompose faster or slower?