Getting to the Core

Grade 7 Unit of Study

TEACHER EDITION (Feb. 2014)

Biodiversity

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SAUSD Common Core Intermediate School – Biodiversity

Contents:
Big Idea: All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?
- Why is biodiversity loss a concern?

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SAUSD Common Core Lesson Planner **Teacher:**

<table>
<tr><td>Unit:
BIODIVERSITY
Day: 1</td><td>Grade Level/Course:
7TH Grade
Life Science</td><td>Duration: 1 day
Date:
What is Biodiversity? Determining a species</td></tr>
<tr><td colspan="3">Big Ideas:
All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:
• What is biodiversity and who/what does it affect?
• How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?
• What is the economic value of biodiversity?</td></tr>
<tr><td>Common Core and Content Standards</td><td colspan="2">Content Standards:
LS2.A Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
LS4.D Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on.
LS2.C Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations.
LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Reading Standards for Literacy in Science and Technical Subjects:
1. Cite specific textual evidence to support analysis of science and technical texts.
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Writing Standards for Literacy in Science and Technical Subjects:
Bundled Writing in Science Standard(s):
1. Write arguments focused on discipline-specific content.
a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</td></tr>
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	Speaking and Listening Standards (ELA): **Bundled Speaking and Listening Standard(s):** **9.** 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.	
Materials/ Resources/ Lesson Preparation	Student Resource: 1.1 What is Biodiversity Quick Write Student Resource: 1.2 Extended Anticipatory Guide Student Resource 1.3 Brainstorming Circle Map Student Resource 1.4 Quick Leaf Lab Realia—Large variety of fresh leaves picked from the local area Teacher Resource: 1.5a Bill Nye Video on Biodiversity Student Resource: 1.5 Bill Nye Worksheet with vocabulary	
Objectives	**Content:** Students will bridge their personal experiences and knowledge of plants and animals to understand that biodiversity is the measure of the variety of organisms in an ecosystem.	**Language:** Students will read and comprehend informational texts in order to participate in collaborative conservations using academic language.
Depth of Knowledge Level	☐ **Level 1: Recall** ☒ **Level 2: Skill/Concept** ☒ **Level 3: Strategic Thinking** ☐ **Level 4: Extended Thinking**	
College and Career Ready Skills	☒ **Demonstrating independence** ☒ **Building strong content knowledge** ☒**Responding to varying demands of audience, task, purpose, and discipline** ☐ **Comprehending as well as critiquing** ☒**Valuing evidence** ☐**Using technology and digital media strategically and capably** ☐ **Coming to understand other perspectives and cultures**	
Common Core Instructional Shifts	☐ **Building knowledge through content-rich nonfiction texts** ☐ **Reading and writing grounded from text** ☒ **Regular practice with complex text and its academic vocabulary**	

Academic Vocabulary (General & Domain Specific)	KEY WORDS ESSENTIAL TO UNDERSTANDING	WORDS WORTH KNOWING
TEACHER PROVIDES SIMPLE EXPLANATIO	Species	Ridges Edges Veins
STUDENTS FIGURE OUT THE MEANING	Biodiversity Ecosystem	

Pre-teaching Considerations	Day one requires leaves for the "Leaf Me Alone" quick lab!! Ask students to help collect leaves from local plants/trees as they walk to school or from a yard or park. The more types the better. Don't forget to include grasses. This lab can be done by giving each lab group a collection of leaves (requires a lot of each leaf type), OR, different leaf samples can be laid out around the classroom and lab groups rotate to each leaf station (only need 1 or 2 of each sample). **Grouping**: There are 2 jigsaw activities in this unit: A jigsaw is designed to be differentiated for students by reading ability. Each of the biomes articles has a different complexity based on Lexile on reader task. Within a base group, all jigsaw articles need to have been read. **The final project**, starting on day 15 will require 2-3 days of research/time in the classroom to plan the presentation. Plan ahead to reserve this time in the computer lab. If computer lab access is difficult at your site, you may need to stagger this access with other teachers in your department or allow your students to begin researching their topic before you finish the unit. If only one day is possible, have students print out resources to bring back to the classroom.
Lesson Delivery	
Instructional Methods	**Check method(s) used in the lesson:** ☐**Modeling** ☐**Guided Practice** ☒**Collaboration** ☒ **Independent Practice** ☒**Guided Inquiry** ☒ **Reflection**

Lesson Continuum	**Lesson Open-ing**	**Preparing the Learner (~20mins)** Prior Knowledge, Context, and Motivation: **Bridging/Contextualizing: Word dissection** 1. Write the word "biodiversity" on the board with "bio" in one color and "diversity" in a different color. Explain to students that a "word dissection" can often help bring meaning to complex or unfamiliar words 2. (Resource 1.1) Ask students to help figure out the meaning of each part by sharing their ideas. "bio" means "life" and "diverse" means "many different kinds" (hand a volunteer a dictionary if needed) so putting the two together "biodiversity" means "many different kinds of life." **Pre-Assessment** 1. Now that students have a little contextualization about biodiversity, turn to the Extended Anticipatory Guide. (Resource 1.2) ***NOTE**: Let students know that it is okay if they do not know an answer, but that they should make their best guess. They will return to these questions at the end of the unit and revise their answers. 2. Read each statement aloud in the Extended Anticipatory Guide and ask students to mark whether they agree or disagree in the 1st column "Day 1" 3. Pick one or two questions for students to discuss with their elbow partner. 4. Model how students can share their answer AND comment on a partner's response using the "Language Supports for Agreeing or Disagreeing" written at the bottom of the Extended Anticipatory Guide. *Partner 1: "I agree with the statement that …because…* *Partner 2: Although you make a valid point, I still feel that….because…* 5. Refer students to the language supports on their worksheet and ask them to practice using academic language with their partner. 6. Remind them to switch roles with the second question. **Language Supports for Agreeing** I agree with the statement that ... because... I agree with my classmate that ...because... I share a similar belief to _____. (Explanation) **Language Supports for Disagreeing** I disagree with the statement...because... I disagree with _____. I believe that ... because... Although _____makes a valid point, I still feel that ... because.. **Brainstorming Thinking Map:** 1. Have students create a thinking map (Resource 1.3) inside the box where they will brainstorm possible answers to the question to "How does a forest and everything in it affect your life?" A circle map is suggested for brainstorming, but a brace or flow map could work as well. ***NOTE**: With thinking maps, teachers should let students think how they want to organize their information rather than copy a blank map and fill it in.

	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	2. Finally students answer the "Frame of Reference" question at the bottom of the thinking map to "frame" to indicate the source of their information. This is a good thing for teachers to check to see what kind of exposure students have to a forest ecosystem. **Interacting with the concept/ text (35min)** "Leaf Me Alone" Quick Lab (10 minutes) **NOTE: This lab can be done by giving each lab group a collection of leaves (requires a lot of each leaf type), OR, different leaf samples can be laid out around the classroom and lab groups rotate to each leaf station. The more types the better. Don't forget to include grasses in the sampling. 1. Have a large variety of freshly picked leaves available for each lab group (collected ahead of time). This technique of surveying biodiversity is called a "Sampling." If available pass out magnifiers for closer leaf examination. 2. In lab teams, have students make careful observations of the different leaves' characteristics by using the supplemental "Leaf I.D." sheets (Resource 1.4a.) 3. Model how to classify one or two leaves on the overhead with the class. 4. Give students about 5 minutes to observe the leaf edges, veins, and general shape to classify their leaves into different species. They should record 5 of their leaf samples in the data table provided (Resource 1.4). ***NOTE**: In the analysis questions, students are asked how scientists classify a **species** of organism because they can't always do it by looking at an organism (many males/females also look very differently). The most commonly accepted definition is two species that can't interbreed and produce viable offspring. This however, is not always true! Genetic testing is one option that reveals the genome and gives a more detailed picture of an organism, but it is hard to determine the cutoff for when an organism is considered a new species. This definition is an ongoing debate among scientists. 5. Students should answer the first analysis question but save the last question for AFTER the Bill Nye Video.	**Students Needing Additional Supports** Heterogeneous or homogeneous grouping depending on students' needs. Allow students to manipulate and example the leaves for hands-on exploration. Circulate and provide teacher proximity for immediate support and prompting. Allow students who need more time to take the lab or video clips home to extend exposure time to the material. Model and print out sentence frames to guide discussion and provide language support for EL learners.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Bill Nye Biodiversity Video (0-4:30min)** ***Note:** The entire 22 minute video clip is on the CD. You are only showing minute 0-4:30 right now. 1. 1st Viewing: The first viewing is an unencumbered view where students are actively watching the video but are not distracted by note-taking or a focus question. 2. 2nd Viewing: Ask students to turn to Resource 1.5 and scan the two tasks. Students are asked to define 3 words based on the video clip and record two key ideas. The words species, biodiversity, and ecosystem and discussed several times so that students should be able to extract the definition ***NOTE**: Students should use pencil in case they need to revise their definition. Students may need to see the video a third time to complete their definitions. 3. Students should compare definitions with each other or with a dictionary, but should be careful to use words they know rather than a technical definition. ***NOTE**: If you review terms with the whole class, consider not writing the definitions on the overhead or students will copy your words rather than using their own definition. As a class you could create an image to represent each term and post these on a word wall for future reference. **Extending/Transferring Understanding:** 1. After students have watched the Bill Nye clip, in lab groups or as a class, answer the analysis question 3 on resource 1.4 "How does the biodiversity of leaves affect the biodiversity of things like insects, birds, and mammals?" 2. If time permits, probe student responses to get them to think of the bigger picture. You could draw in ideas about food webs and different kinds of consumers based on pervious units and knowledge	Enable captions on youtube.com for the Biodiversity video.
Lesson Reflection			
Teacher Reflection Evidenced by Student Learning/ Outcomes			

What is Biodiversity?

Directions: Look at the word "biodiversity." It's actually two words combined together. Make a prediction about what you think this word means.

I think biodiversity means _____

_____

_____

With the class or your partner, breakdown the meaning of the two words in biodiversity.

Biodiversity means _____

_____

_____

Extended Anticipatory Guide

	Day 1: Opinion		Day 14 Findings		**Evidence**: Explain using your own words by using the text in this booklet and from videos you watched
	Agree	Disagree	Support	No Support	
1. Environmental changes caused by humans can always be reversed.					Video Text / Page #
2. We can learn from history so that we do not make the same mistakes again.					Video Text / Page #
3. Environments have always changed throughout time, therefore current environmental changes are part of earth's natural processes.					Video Text / Page #
4. It is very expensive and difficult to repair the environment.					Video Text / Page #
5. If humans know that an activity, such as deforestation or pollution, hurts the environment, they will stop doing that activity.					Video Text / Page #
6. One organism, or living thing, going extinct does not hurt nature because there are millions of plants and animals on earth.					Video Text / Page #

Language Supports for Agreeing

I agree with the statement that …because…
I agree with my classmate that …because…
I share a similar belief to _____. (Explanation)

Language Supports for Disagreeing

I disagree with the statement…because…
I disagree with _____. I believe that … because…
Although _____makes a valid point, I still feel that … because…

Brainstorming Thinking Map

Draw a thinking map in the box below where you will brainstorm your ideas about the question "How does a forest and everything in it affect your life?"

Have you ever been to or hiked around in a forest? If so, describe what it looked/smelled/felt like. If not, image a forest and describe it.

"Leaf Me Alone" I.D Lab

Purpose: To investigate the biodiversity of leaves in your community.

Procedure: Example the various leaf samples your teacher gives you. Use the Leaf identifying chart to classify the leaves into different species (groups) based on their shape, edges, and vein structure. Remember a big leaf and a small leaf may be the same kind of leaf!

Data Table/Observations: (Pick 5 different leaves to describe below)

Leaf Drawing	Shape	Edges	Vein Structure

Analysis Questions: Answer using complete sentences:

1. You only describe five leaf specimens above. How many total different types of leaves did you have?

_____

2. You determine different species of leaf by looking at them. How do you think scientist determine different species of tiny bacteria or plants and insects when they look very similar?

_____

_____

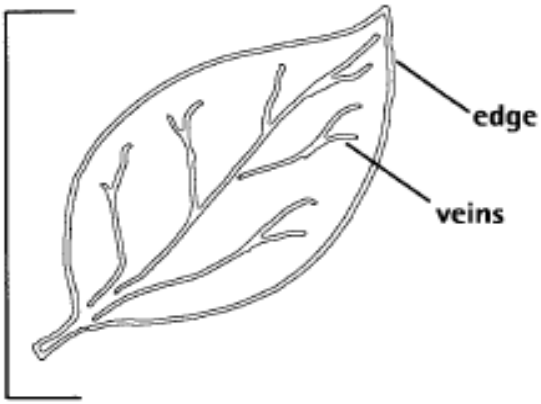
3. Answer AFTER the Bill Nye Video Clip. How does the biodiversity of leaves affect the biodiversity of things like insects, birds, and mammals?

_____

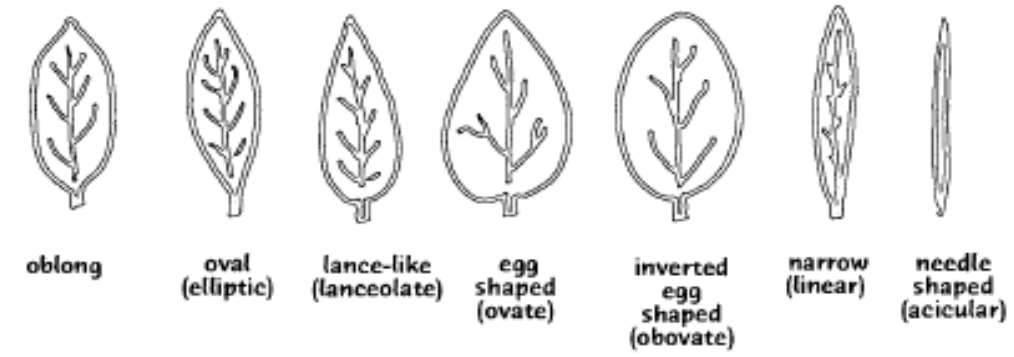
_____

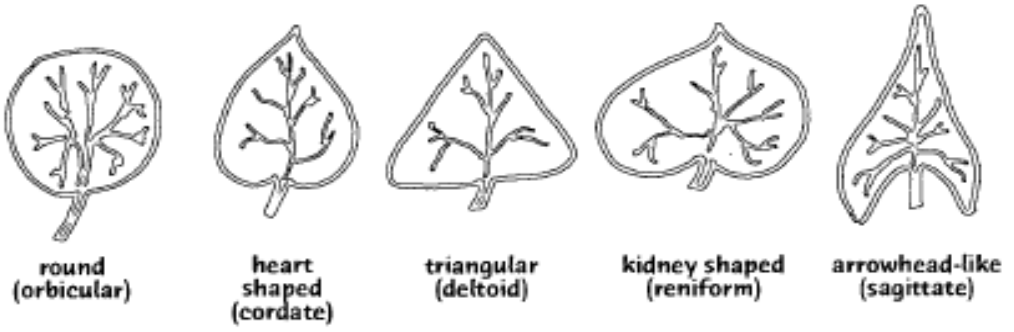
Leaf Identification Chart 1

One way to tell plants apart is by looking at their leaves.



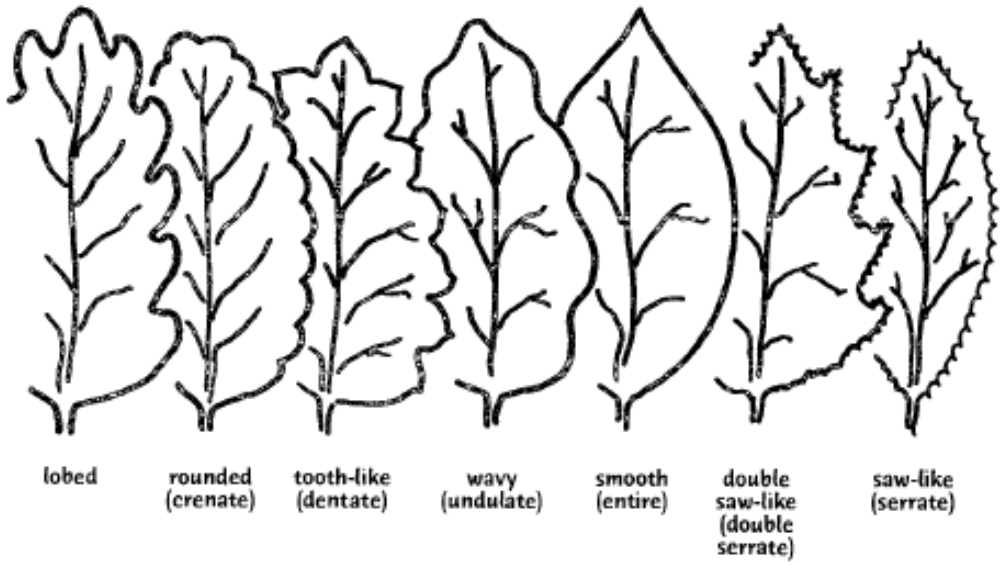
Shapes



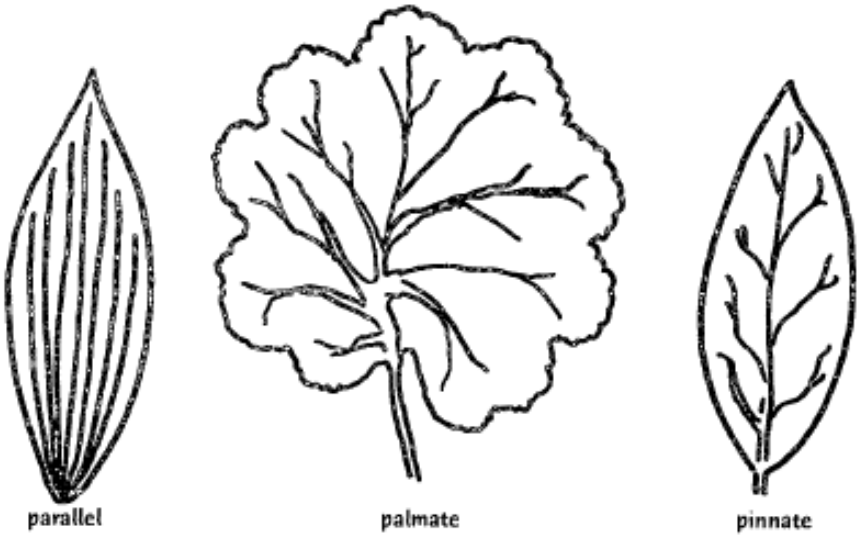


Leaf Identification Chart 2

Edges



Veins (There are three main ways that veins are arranged on leaves.)



Bill Nye & Biodiversity

Directions: As you watch the video clip, do your best to define the word or think of an image that would represent the word.

Term	Definition	Graphic/Image
Species		
Biodiversity		
Ecosystem		

Write down two key ideas you learned from the Bill Nye video using complete sentences.

1. _____

_____

_____

2. _____

_____

_____

Bill Nye Biodiversity

Lesson 1: What is Biodiversity
First Clip: 0-4:30min

Summary: Explores the term species, biodiversity, and ecosystem. It discusses the possible Jenga-like effect of removing one species from an ecosystem and how it could cause a whole ecosystem to collapse.

Note: Bill says a collapse of an ecosystem hasn't happened yet, which isn't true! On a grand scale involving humans, our ecosystem hasn't collapsed, but many smaller ones have and directly because of human activity.

Optional Clip: Min 14:30-17:00

Summary: Bill literally goes under water to discuss the largest ecosystem on the planet, the oceans, where incredible biodiversity exists but is hard to find because it can be very tiny or simply because it's hard to explore underwater.

SAUSD Common Core Lesson Planner **Teacher:**

Unit: **BIODIVERSITY** **Day:** 2-3	**Grade Level/Course:** 7TH Grade Life Science	**Duration:** 2 days **Date:** What Creates Biodiversity? Abiotic and biotic factors create biomes.

Big Ideas:

Big Idea: All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?

Common Core and Content Standards	**Content Standards:** **MS-LS2-2**. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **LS2.A** Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. **LS4.D** Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on. **LS2.C** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations. **Reading Standards for Literacy in Science and Technical Subjects**: **Bundled Reading Informational Text Standard(s):** 1. Cite specific textual evidence to support analysis of science and technical texts. 2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. 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.* **Writing Standards for Literacy in Science and Technical Subjects**: **Bundled Writing in Science Standard(s):** 1. Write arguments focused on *discipline-specific content*. a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the

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b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):
9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">Student Resource: 2.1 What creates biodiversity Quick Write
Student Resource: 2.2 Ecoregion species match up
Teachers Resource: 2.2a Ecoregion Answer Key
Student Resource: 2.3 Note Taking for Biomes PPT
Teacher Resource: 2.3a Biome PPT
Student Resource: 2.4a Aquatic Biome Article
Student Resource: 2.4b Desert Biome Article
Student Resource: 2.4c Forest Biome Article
Student Resource: 2.4d Grasslands Biome Article
Student Resource: 2.4d Tundra Biome Article
Student Resource: 2.5 Biomes thinking map
Student Resource: 2.6 Biomes jigsaw matrix
Supplemental Resource: Ecoregion Cards</td></tr>
<tr><td>Objectives</td><td>Content:
Students will be able to understand that a biome is composed of an interconnected relationship of biotic and abiotic factors that determine what organisms are able to live and thrive in a specific environment called a biome.</td><td>Language:
Students will be able to extract key information from complex text and represent their ideas orally and in writing.</td></tr>
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☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
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<tr><td rowspan="2">Academic Vocabulary (General & Domain-Specific)</td><td>TEACHER PROVIDES SIMPLE EXPLANATION</td><td>KEY WORDS ESSENTIAL TO UNDERSTANDING
Biome
Aquatic
Terrestrial
Grassland
Desert
Tundra
Ecoregion
Savanna
Chaparral</td><td>WORDS WORTH KNOWING
Distribution
Tropical Rain Forest
Temperate Forest
Deciduous
Producer
Decomposer
Compare/Contrast
Observe
Scavenger Hunt</td></tr>
<tr><td>STUDENTS FIGURE OUT THE MEANING</td><td>Abiotic
Biotic</td><td>Top predator
Primary consumer
Secondary consumer
Habitat
Carnivore
Herbivore
Omnivore</td></tr>
<tr><td colspan="2">Pre-teaching Considerations</td><td colspan="2">• This lesson has a jigsaw reading on biomes. A jigsaw is designed to be differentiated for students by reading ability. Each of the biomes articles has a different complexity based on Lexile and reader task.
•
Base Group: Heterogeneous mix with 5 students, each reading a different article.
Expert Group: Homogenous mix with all students reading the same article.

• This unit also assumes students have learned about food webs and levels of consumers. If students are rusty in this area or have not learned this yet, it will need to be covered for students to see the full set of relationships between organisms in a biome.

• Ask a student helper or your 1st period to help cut out the supplemental resource of Ecoregions cards. A full deck has about 60 cards. There are three organisms per ecoregion.

• Take note of the PPT content. If you want to guide students in selective note taking, you could change the color of essential information in the PPT slide or as a class quickly decide what is essential and worth recording. Additionally, halfway through the PPT, students are asked to stop taking notes, and instead, actively consider the description of each biome and how abiotic factors determine what organisms can survive. Adjust the PPT to work best with your students.</td></tr>
</table>

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<tr><th colspan="3">Lesson Delivery</th></tr>
<tr><td colspan="2">Instructional Methods</td><td>Check method(s) used in the lesson:
☒ Modeling ☒Guided Practice ☒Collaboration
☒ Independent Practice ☒Guided Inquiry ☒ Reflection</td></tr>
<tr><td rowspan="2">Lesson Continuum</td><td>Lesson Open-ing</td><td>Preparing the Learner
Prior Knowledge, Context, and Motivation:
<u>Preparing the Learner (15 minutes)</u>
Think-Pair-Share/Quick Write
1. To get students thinking about the unit big idea and the essential questions of the day, they will do a think-pair-share followed by a quick write (Resource 2.1). Read the directions and prompt with students.
2. Give them 30 seconds to 1 minute to think independently and then ask students to share with their elbow partners for 1-2 minutes. Reluctant or confused students will hopefully begin building on their initial idea.
3. Give students 2 minutes to write down their ideas. Remind them that is okay if they are not certain of their answer.
4. Ask for a few students to share their ideas and accept all answers at this point.
Ecoregion Scavenger Hunt
5. Segue to the next activity explaining to students that they will be learning about organisms from around the world (many of which they will never have heard of) in order to examine how different ecoregions enable different types of organisms to live there.
*NOTE: Ecoregion is a new term. It is being introduced in context. It is a highly localized region where a certain ecosystem can exist.

6. The students' goal is to find the other two members of their ecoregion using the information on their ecoregion card. Clues to identify one or both of the ecoregion partners are given within the species' description. Students must read closely so they don't miss anything.
7. Once students have located their two teammates they should identify where this ecoregion exists in the world and even what it might be called (grasslands, Tundra, desert, etc). It is okay if students don't know where the place actually is, but they are using context clues to identify names of places or global location.
Option: Have students google the name of where their organism live and mark it on a map on their worksheet or have them look up this for homework.

8. Hand out the Ecoregions cards. Instruct students to, "Walk around the room and find two other people that have cards from the same region of the world."
9. Circulate and observe students' "methods" of finding partners. Students having trouble getting started should be prompted to read their card aloud to various other students. For students who find their partners quickly a second card could be provided, but note that they will have two ecoregions to work with. (60 species cards total)</td></tr>
</table>

Lesson Continuum

Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding

10. Once students have found their partners (about 2 minutes), they need to decide where these organisms live and if they can, what this ecoregion might be called. Consider having students google the location of their ecoregion and a few quick fun facts about this region.

Interacting with the concept/text:
Biome PPT Overview (~10-15 mins)

1. To preview biomes, use the PPT to introduce the big ideas associated with biomes. Students will create a thinking map to take notes. The Big Idea is written on the top of resource 2.3 to guide the focus on this PPT.

The suggested focus of this PPT is not the tiny details about each biome, but rather helping students grasp the idea that abiotic factors determine what is able to live and thrive in each biome.

*__NOTE__: If you want to guide students in selective note taking, you could change the color of essential information in the PPT slide or as a class quickly decide what is essential and worth recording.

Biome Close Read and Jigsaw

2. Base groups will include five students reading the five different articles. The teacher will assign each student one of the five biomes; desert, grassland, tundra, aquatic, or forest and distribute articles appropriately.

Lexile Level	Article
*Tundra	1211
Desert	1286
Aquatic	1265
*Forest	1364
Grassland	1242

NOTE: Lexile is only <u>one</u> measure of the difficulty. Reader task and the qualitative features are equally important. That said, Lexile is very high for these articles because of the scientific names used, but readers are not asked to understand all of those terms.

Prepare your students by telling them that there will be terms they do not know, but that they can read past them and still understand the article!

Students needing additional supports

Pair students of high-low ability to support ecoregion activity.

Differentiate Jigsaw articles for students of different reading ability.

Provide printout of biome PPT for students who need visual or auditory processing support.

Color code the PPT to help key in visual learners to essential information.

Adjust the task or questions associated with the ppt and jigsaw based on student ability.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	3. **First read: Unencumbered**. (In Base Groups) The teacher will invite students to independently read as much of their article as they can in the time provided (4 min). Remind them that if they finish early, they should go back and reread it. Also, assure slower readers that it is fine if they do not finish with in the time provided. Students will have additional opportunities to finish reading the article. 4. At the end of four minutes, the teachers should excuse students to go to the section of the room where their expert group will be working. In this case, you will need 5 areas, 1 for each of the 5 biomes. 5. **Second read: With an expert group partner, look for logical ways to organize the information on a thinking map (Resource 2.5)**. When students are settled in their expert group area, instruct them to work with a partner to look at the article a second time. This time the focus will be on how to organize the information into a thinking map. If students struggle, remind them the purpose of each map (ex. Double Bubble is for compare and contrast, Tree map is for classifying, Brace map is for part to whole relationships…etc). If students have not completed their thinking map in the allotted time (around 12 minutes), remind them they will have more time later. 6. **Third read: Individually read the article looking for an interesting fact to underline**. The teacher will invite students to reread the article (3 min). This time they will look for an interesting fact to underline 7. **Fourth read: With an expert group partner, create a description of their biome that is no longer than 30 words and contains as much detail as possible.** It can be more than one sentence, as long as they do not exceed 30 words (4min). 8. **Finish thinking map, including source citation, interesting fact and 30 word description.** (Time for this will vary according to how much they accomplished in steps 1-5.) 9. **Direct Students to go back to their Base Group**. The Group member with a birthday closest to New Year Eve will begin by sharing the name of their Biome, the interesting fact they underlined and their 30 word description. Other members of the base group will listen and record a summary of what was said on the Jigsaw matrix. Each group member will share until all five members have spoken and all members have completed their Jigsaw Matrix.	Limit the number of questions in the jigsaw matrix for struggling students. Focus students on one particular type of thinking map to best represent the information. Teacher proximity for immediate support. Provide language supports to prompt discussion to provide vocabulary for students in need.

		Extending/Transferring Understanding: (~7 mins) **Quick Write:** 1. To emphasize the interconnectedness and interactions of biotic and abiotic factors, student will return to their "What Causes Biodiversity" handout and look at the **Follow Up** question. *Now that you've learned about the five key biomes, biotic and abiotic factors, explain how abiotic factors affect what lives in a biome. Be specific. "Use the words **abiotic**, **biotic**, and **species** in your response. Underline each term every time you use it.* 2. Students should then share their response with a partner. Comment using the language prompts from lesson 1 and then switch roles. Remind students that it's okay to go back and add more to their follow up response after talking with their partner	
Lesson Reflection			
Teacher Reflection Evidenced by Student Learning/ Outcomes			

What Creates Biodiversity?

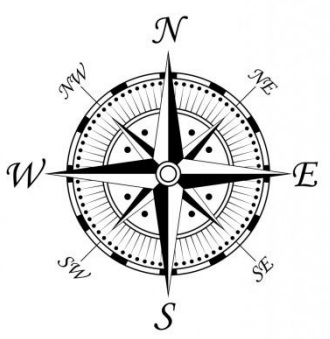
Directions: Think about the question below and then share your ideas or questions with your partner.

When your teacher asks you, write down your thoughts.

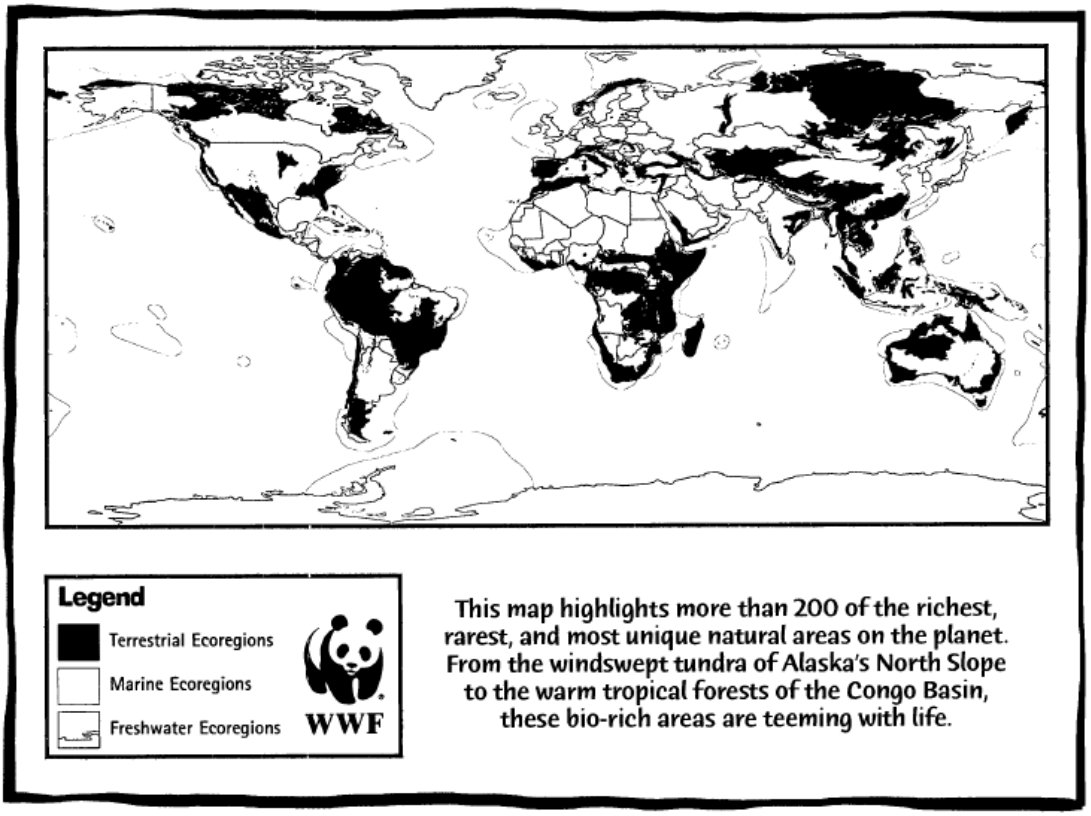
Prompt: In Orange County, some local organisms include hawks, eagles, mountain lions, oak trees, sea otters, rattlesnakes, and lots of types of flowers and grasses. In Antarctica, 8,070 miles to the south, you'll find very different life like penguins, elephant seals, leopard seals, mosses (a short fuzzy plant that grows on rocks), and several kinds of birds. Think of as many different things that contribute to what kind of organism can live in a specific region and explain them below. Use complete sentences.

Follow Up Quick Write: Now that you've learned about the five key biomes, biotic and abiotic factors, explain how abiotic factors affect what lives in a biome. Use the words **abiotic**, **biotic**, and **species** in your response. Underline each term every time you use it. You will share with your partner afterwards.

Ecoregion Species Match Up



1. Name three of the species that live in this ecoregion:
   - _____
   - _____
   - _____
2. Name of this ecoregion_____
3. Describe this ecoregion <u>using at least three facts</u> from the information on your cards (hot, cold, icy, dry, windy, etc.)
   - _____
   - _____
   - _____
4. Based on the organisms living in your ecoregion and the facts you described above, where do you think this ecoregion is located in the world? (Hint: Are your organisms designed for cold or hot weather, rainy or dry weather?)
5. If you know where your ecoregion is, mark it and label it on the map below.



ANSWERS—ECOREGION SPECIES CARDS

Ecoregion #25
Southern Congo Basin Forests
- Okapi
- Bonobo
- Salongo Monkey

Ecoregion #57
Madagascar Dry Forests
- Giant Baobab
- Sicklebilled Vanga
- Panther Chameleon

Ecoregion #64
Mexican Pine-Oak Forests
- Monarch Butterfly
- Imperial Woodpecker
- Wild Maize

Ecoregion #66
Klamath-Siskiyou Coniferous Forests
- Cobra Lily
- Western Azalea
- Siskiyou Mountains Salamander

Ecoregion #78
Central/Southwest China Temperate Forests
- Fountain Bamboo
- Giant Panda
- Golden Pheasant

Ecoregion #85
Central and Eastern Siberian Boreal Forests and Taiga
- Wolverine
- Siberian Spruce
- Long-Eared Owl

Ecoregion #92
Scandinavian Alpine Tundra and Taiga
- Norway Lemming
- Reindeer
- Arctic Fox

Ecoregion #94
Tallgrass Prairies
- Prairie Dog-Tooth Violet
- Greater Prairie Chicken
- American Bison

Ecoregion #105
Terai-Duar Savannas and Grasslands
- One-Horned Rhinoceros
- Chital
- Tiger

Ecoregion #110
Everglades Flooded Grasslands
- Snail Kite
- Florida Tree Snail
- Red Bay

Ecoregion #114
North Andean Paramo
- Frailejón
- Andean Condor
- Vicuña

Ecoregion #125
Namib and Karoo Deserts and Shrublands
- Welwitschia Plant
- Darkling Beetle
- Sand-Diving Lizard

Ecoregion #136
Southwest Australian Shrublands and Woodlands
- Drosera Sundew
- Numbat
- Brown Goshawk

Ecoregion #154
Eastern Australian Rivers and Streams
- Platypus
- Freckled Duck
- Murray Cod

Biomes

Big Idea: All living things exist in a balance with other living things and the physical factors.

Directions: Create a thinking map in the box below to record your notes on "Biomes." Keep in mind the big idea throughout this presentation

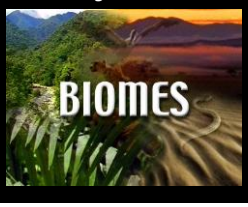
What is your source for this information?

Which biomes have you visited?

Biomes

Big Idea: All living things exist in a balance with other living things and the physical factors.

Essential Question: How are organisms dependent on their interactions with other organisms and with nonliving factors?



Biomes

Biome- A biome is a large area on the Earth's surface that is defined by the types of animals and plants living there.

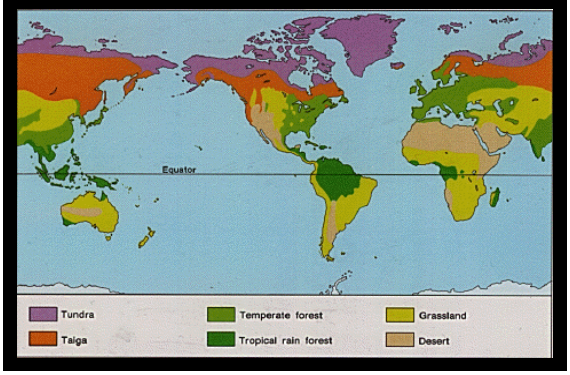
A biome can be partially defined by the local climate patterns.

Land Biomes

The 6 most common biomes are:

Tundra
Taiga Forest
Deciduous Forest
Grasslands (Savannas, Chaparral)
Tropical Rainforest
Desert

Land Biomes



What creates a biome?

- It's all about the non-living factors! No, not zombies.

- We're talking "abiotic" or physical characteristics of an environment. These determine what kind of organisms can survive and thrive.

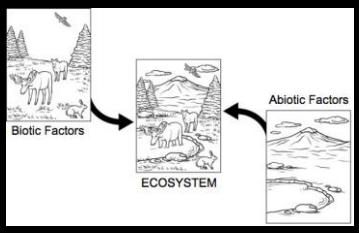
Biotic Factors -living things

Animals | Plants | Insects | Fish | Reptiles | Bacteria/ Decomposers

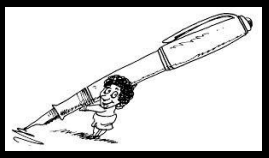
Sunlight | pH | Temperature | Humidity | Acid Rain | Soil Type

Abiotic Factors-non-living

Biotic and abiotic factors combine together to determine the survival of an organism and the productivity of the ecosystem in which the organism lives.



Stop Taking Notes!



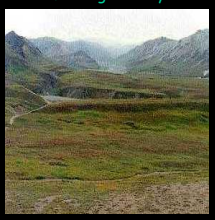
Just Look & Listen. Think about how the abiotic factors determine who/what can live in each biome.

Tundra – "The Cold Desert"

- Found around the North Pole
- Less than 10 inches precipitation yearly
- Very cold year round (-40°F in winter)
- Cold, dry, treeless region

Tundra – "The Land of the Midnight Sun"

- Winter lasts 6 to 9 months with no daylight
- Summer is short and cold with 24 hours of sunlight a day



Soil is poor
Permafrost
Layer of permanently frozen soil

Plants of the Tundra- Tundra plants are resistant to drought and cold

- Reindeer moss – It's a lichen!

Grasses

Animals of the Tundra

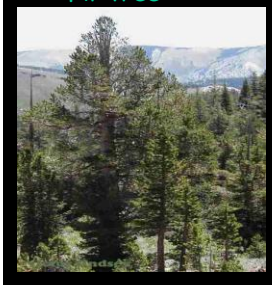
- Caribou – "Reindeer"
- Musk oxen

Taiga or Coniferous Forest

- World's largest land biome (Think Canada)
- Latitudes between 50°N and 60°N
- Warmer and wetter than the Tundra
- Winters are long and cold
- 13-15 in of precipitation yearly (mostly snow)

Plants of the Taiga- There is no permafrost, so trees can grow. Mosses and lichens grow on the forest floor.

- Fir tree



Spruce Tree

Animals of the Taiga

- Moose

Black Bear

Temperate Deciduous Forest

- Found below 50°N latitude (East Coast, USA)
- 30 to 60 cm precipitation yearly

- Wide range of temperatures with 4 seasons
- Below freezing in winter to 30°C in summer

Life in the Temperate Deciduous Forest

- **The mild climate and rich soil of the temperate deciduous forest allow a wide variety of plant and animal life.**
- Soil is rich in nutrients from layers of decomposing leaves.

Plants of the Temperate Deciduous Forest

- Oak tree

Maple Tree

Animals of the Temperate Deciduous Forest

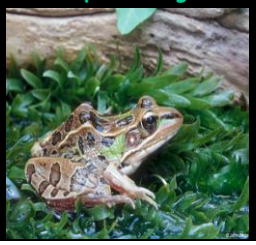
- Birds-Bald Eagle
- Barn Owl


Animals of the Temperate Deciduous Forest

- Amphibians

Spotted Salamander

Leopard Frog



Animals of the Temperate Deciduous Forest

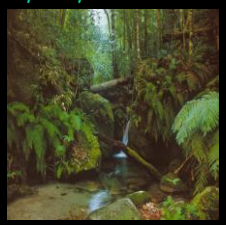
- Small Mammals

Field Mouse

Squirrel

Tropical Rain Forest

- Near the equator
- Receives 78 to 85 inches precipitation yearly!!



- Hot and humid all year
- Temperatures are fairly constant around 25°C

- Soil is nutrient poor and acidic

Plants of the Tropical Rain Forest

- Flowering plants


Animals of the Tropical Rain Forest

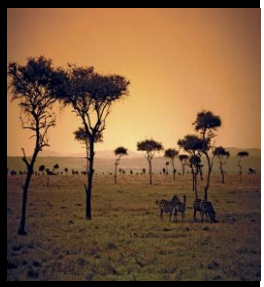
- Large Cats

Sumatran Tiger

Jaguar

Characteristics of the Savanna

- Grassland scattered with shrubs and isolated trees
- Not enough rainfall to support forests
- Long dry winter with 4" rainfall and rainy summer with 15 – 50 inches of rainfall annually
- 90°F in dry season; 70°F in summer



Savanna Consumers

- Large herbivores such as antelope, gazelles, giraffes, elephants, zebras, wildebeests
- Large carnivores such as lions, hyenas, and leopards

Grassland

- Wet seasons followed by a season of drought
- 10 to 30in precipitation yearly
- The soil is rich and fertile.
- The grass has extensive root systems, called sod.

Plants of the Grassland-Grassland regions of the world are important farming areas. Cereal and grains grow here.

- Wheat
- Corn

Animals of the American Grassland

- Bison
- Prairie Dog

Desert

- Extreme temperatures- Can be very hot or very cold
- Found on every continent
- The driest biome on Earth

Desert

- Very little rainfall
- Less than 10in precipitation yearly

The soil ranges from gravel to sand.

Soil is nutrient poor.

Plants of the Desert

- Cactus

Saguaro

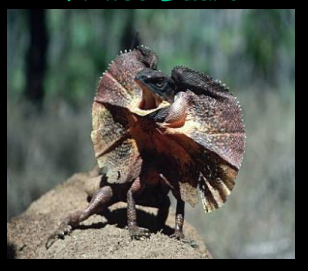
Prickly Pear

Animals of the Desert

- Lizards

Desert Iguana

Frilled Lizard



THE AQUATIC BIOME

Water is the common link among the five biomes and it makes up the largest part of the biosphere, covering nearly 75% of the Earth's surface. Aquatic regions are home to numerous species of plants and animals, both large and small. In fact, this is where life began billions of years ago when amino acids first started to come together. Without water, most life forms would be unable to live and the Earth would be a barren, or empty, desert-like place. Although water temperatures can vary widely, aquatic areas tend to be more humid and the air temperature on the cooler side.

The aquatic biome can be broken down into two basic regions, freshwater (i.e, ponds and rivers) and marine (i.e, oceans and estuaries).

Freshwater Regions

Freshwater is defined as having a low salt concentration—usually less than 1%. Plants and animals in freshwater regions are adjusted to the low salt content and would not be able to survive in areas of high salt concentration (i.e, ocean). There are different types of freshwater regions: ponds and lakes, streams and rivers, and wetlands. The following sections describe the characteristics of these three freshwater zones.

Ponds and Lakes These regions range in size from just a few square meters to thousands of square kilometers. Scattered throughout the earth, several are remnants from the Pleistocene glaciation.

Streams and Rivers These are bodies of flowing water moving in one direction. Streams and rivers can be found everywhere—they get their starts at headwaters, which may be springs, snowmelt or even lakes, and then travel all the way to their mouths, usually another water channel or the ocean.

Wetlands Wetlands are areas of standing water that support aquatic plants (plants that live in the water). Marshes, swamps, and bogs are all considered wetlands. Plant species adapted to the very moist and humid conditions are called hydrophytes. These include pond lilies, cattails, sedges, tamarack, and black spruce.

Marine Regions

Marine regions cover about three-fourths of the Earth's surface and include oceans, coral reefs, and estuaries. Marine algae supply much of the world's oxygen supply and take in a huge amount of atmospheric carbon dioxide. The evaporation of the seawater provides rainwater for the land.

Oceans

The largest of all the ecosystems, oceans are very large bodies of water that dominate the Earth's surface.

Coral Reefs

Coral reefs are widely distributed in warm shallow waters. They can be found as barriers along continents (e.g., the Great Barrier Reef off Australia), fringing islands, and atolls (ring shaped coral reefs).

Estuaries

Estuaries are areas where freshwater streams or rivers merge with the ocean. This mixing of waters with such different salt concentrations creates a very interesting and unique ecosystem.

THE DESERT BIOME

Deserts cover about one fifth of the Earth's surface and occur where rainfall is less than 50 cm/year. Although most deserts, such as the Sahara of North Africa and the deserts of the southwestern U.S., Mexico, and Australia, occur at low latitudes, another kind of desert, cold deserts, occur in the basin and range area of Utah and Nevada and in parts of western Asia. Most deserts have a considerable amount of specialized vegetation, as well as specialized vertebrate (has a backbone) and invertebrate (has no backbone) animals. Soils often have abundant nutrients because they need only water to become very productive and have little or no organic matter. Disturbances are common in the form of occasional fires or cold weather, and sudden, infrequent, but intense rains that cause flooding.

There are relatively few large mammals in deserts because most are not capable of storing sufficient water and withstanding the heat. Deserts often provide little shelter from the sun for large animals. The dominant animals of warm deserts are non-mammalian vertebrates, such as reptiles. Mammals are usually small, like the kangaroo mice of North American deserts.
There are four major types of deserts:

Hot and Dry
Semiarid
Coastal
Cold

Hot and Dry Desert The four major North American deserts of this type are the Chihuahuan, Sonoran, Mojave and Great Basin. Others outside the U.S. include the Southern Asian realm, Neotropical (South and Central America), Ethiopian (Africa) and Australian. The seasons are generally warm throughout the year and very hot in the summer. The winters usually bring little rainfall. Temperatures exhibit daily extremes because the atmosphere contains little humidity to block the Sun's rays.

Semiarid Desert The major deserts of this type include the sagebrush of Utah, Montana and Great Basin. They also include the Nearctic realm (North America, Newfoundland, Greenland, Russia, Europe and northern Asia)

Coastal Desert These deserts occur in moderately cool to warm areas. A good example is an area in Chile. The cool winters of coastal deserts are followed by moderately long, warm summers. The average summer temperature ranges from 13-24° C; winter temperatures are 5° C or below. The maximum annual temperature is about 35° C and the minimum is about -4° C. The average rainfall measures 8-13 cm in many areas. Some animals have specialized adaptations for dealing with the desert heat and lack of water.

Cold Desert These deserts are characterized by cold winters with snowfall and high overall rainfall throughout the winter and occasionally over the summer. They occur in the Antarctic, Greenland and the Nearctic realm. They have short, moist, and moderately warm summers with fairly long, cold winters. The mean winter temperature is between -2 to 4° C and the mean summer temperature is between 21-26° C.

THE FOREST BIOME

About 420 million years ago, ancient or very old plants and arthropods (ex. insects, spiders, millipedes) began to occupy, or live on the land. Over the millions of years that followed, these land colonizers developed and adapted to their new habitat. The first forests were dominated by giant horsetails, club mosses, and ferns that stood up to 40 feet tall.

Life on Earth continued to evolve, and in the late Paleozoic era, gymnosperms (ex.Christmas trees) appeared. By the Triassic Period, gymnosperms dominated the Earth's forests. In the Cretaceous Period, the first flowering plants (angiosperms, like roses and tulips) appeared. They evolved together with insects, birds, and mammals and quickly grew, dominating the landscape by the end of the Period. The landscape changed again during the Pleistocene Ice Ages—the surface of the planet that had been dominated by tropical forests for millions of years changed, and temperate forests spread in the Northern Hemisphere.

Today, forests occupy approximately one-third of Earth's land area, account for over two-thirds of the leaf area of land plants, and contain about 70% of carbon present in living things. They have been valued in folklore and worshipped in ancient religions. However, forests are becoming major casualties of civilization as human populations have increased over the past several thousand years, bringing deforestation, pollution, and industrial usage problems to this important biome.

Present-day forest biomes can be classified according to latitude (distance from the equator). There are three major types of forests:

- tropical
- temperate
- boreal forests (taiga)

Tropical forests Tropical forests are characterized by the greatest diversity of species. They occur near the equator, within the area bounded by latitudes 23.5 degrees N and 23.5 degrees S. One of the major characteristics of tropical forests is their distinct seasonality: winter is absent, and only two seasons are present (rainy and dry). The length of daylight is 12 hours and varies little.

Temperature is on average 20-25° C and varies little throughout the year: the average temperatures of the three warmest and three coldest months do not differ by more than 5 degrees.

Precipitation is evenly distributed throughout the year, with annual or yearly rainfall above 200 cm.

Temperate forests Temperate forests occur in eastern North America, northeastern Asia, and western and central Europe. Well-defined seasons with a distinct winter characterize this forest biome. Moderate climate and a growing season of 140-200 days during 4-6 frost-free months distinguish temperate forests.

Temperature varies from -30° C to 30° C.

Precipitation (75-150 cm) is distributed evenly throughout the year

Boreal forests Boreal forests, or taiga, represent the largest terrestrial (land) biome. Occurring between 50 and 60 degrees north latitudes, boreal forests can be found in the broad belt of Eurasia and North America: two-thirds in Siberia with the rest in Scandinavia, Alaska, and Canada. Seasons are divided into short, moist, and moderately warm summers and long, cold, and dry winters. The length of the growing season in boreal forests is 130 days.

Temperatures are very low.

Precipitation is primarily in the form of snow, 40-100 cm annually.

Current extensive logging in boreal forests may soon cause their disappearance.

THE GRASSLAND BIOME

Grasslands are characterized as lands dominated by grasses rather than large shrubs or trees. In the Miocene and Pliocene Epochs, which spanned a period of about 25 million years, mountains rose in western North America and created a continental climate favorable to grasslands. Ancient forests declined and grasslands became widespread. Following the Pleistocene Ice Ages, grasslands expanded in range as hotter and drier climates prevailed worldwide. There are two main divisions of grasslands: (1) tropical grasslands, called savannas, and (2) temperate grasslands.

Savanna

Savanna is grassland with scattered individual trees. Savannas cover almost half the surface of Africa and large areas of Australia, South America, and India. Climate is the most important factor in creating a savanna. Savannas are always found in warm or hot climates where the annual rainfall is from about 50.8 to 127 cm (20-50 inches) per year. It is crucial that the rainfall is concentrated in six or eight months of the year, followed by a long period of drought when fires can occur.

Different savannas support different grasses due to differences in rainfall and soil conditions. Savannas receive an average annual rainfall of 76.2-101.6 cm (30-40 inches). However, certain savannas can receive as little as 15.24 cm (6 inches) or as much as 25.4 cm (10 inches) of rain a year.

Savanna has both a dry and a rainy season. Seasonal fires play a vital role in the savanna's biodiversity. In October, a series of violent thunderstorms, followed by a strong drying wind, signals the beginning of the dry season. Fire is prevalent (common) around January, at the height of the dry season.

Some of the animals that live in the savanna include giraffes, zebras, buffaloes, kangaroos, mice, moles, gophers, ground squirrels, snakes, worms, termites, beetles, lions, leopards, hyenas, and elephants.

Temperate Grassland

Temperate grasslands are characterized as having grasses as the dominant vegetation. Trees and large shrubs are absent. Temperatures vary more from summer to winter, and the amount of rainfall is less in temperate grasslands than in savannas.

Precipitation in the temperate grasslands usually occurs in the late spring and early summer. The annual average is about 50.8 to 88.9 cm (20-35 inches). The temperature range is very large over the course of the year.

Some of the fauna (animals) of the temperate grasslands include gazelles, zebras, rhinoceroses, wild horses, lions, wolves, deer, mice, foxes, birds, snakes, and spiders.

Temperate grasslands can be further subdivided. **Prairies** are grasslands with tall grasses while **steppes** are grasslands with short grasses.

THE TUNDRA BIOME

Tundra is the coldest of all the biomes. Tundra comes from the Finnish word ***tunturia***, meaning treeless plain. It is noted for its frost-molded landscapes, extremely low temperatures, little precipitation, poor nutrients, and short growing seasons. Dead organic material functions as a nutrient pool. The two major nutrients are nitrogen and phosphorus. Nitrogen is created by biological fixation, and phosphorus is created by precipitation (rainfall).

Characteristics of Tundra

1. Low biotic (living) diversity
2. Extremely cold climate
3. Simple plant structure
4. Limited drainage
5. Short season of growth and reproduction
6. Energy and nutrients in the form of dead organic material
7. Large changes in population size

Tundra is separated into two types: arctic tundra and alpine tundra.

Arctic
Arctic tundra is located in the northern hemisphere, encircling the north pole and extending south to the coniferous (ex. Christmas tree) forests of the taiga. The arctic is known for its cold, desert-like conditions. The growing season ranges from 50 to 60 days. The average winter temperature is -34° C (-30° F), but the average summer temperature is 3-12° C (37-54° F) which enables this biome to sustain life. Rainfall may vary in different regions of the arctic. Yearly precipitation, including melting snow, is 15 to 25 cm (6 to 10 inches). Soil is formed slowly. A layer of permanently frozen subsoil called **permafrost** exists, consisting mostly of gravel. There are about 1,700 kinds of plants in the arctic and subarctic. They are all adapted to sweeping winds and disturbances of the soil Some of the plants of the tundra include:

- low shrubs, reindeer mosses, and grasses
- 400 varieties of flowers

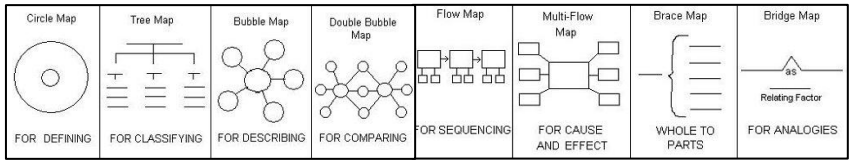
The fauna (animals) in the arctic is also diverse:

- Herbivorous mammals: lemmings, voles, caribou, arctic hares and squirrels
- Carnivorous mammals: arctic foxes, wolves, and polar bears
- Migratory birds: ravens, snow buntings, falcons, loons, ravens, sandpipers, terns, snow birds, and various species of gulls
- Insects: mosquitoes, flies, moths, grasshoppers, blackflies and arctic bumble bees
- Fish: cod, flatfish, salmon, and trout

Alpine
Alpine tundra is located on mountains throughout the world at high altitude where trees cannot grow. The growing season is approximately 180 days. The nighttime temperature is usually below freezing. Unlike the arctic tundra, the soil in the alpine is well drained. The plants are very similar to those of the arctic ones and include grasses, dwarf trees, and small-leafed shrubs. The animals in the alpine tundra are also well adapted and include mammals (goats, sheep and elk), birds and many insects (beetles, grasshoppers and butterflies).

Biomes

Directions: Using what you learned reading your Biome article, select a thinking map that best organizes the information in your article. You may need to use more than one thinking map to represent all of the information. You also may find that the space below is too small. Feel free to use this as a brainstorming area. Then use a bigger piece of paper to draw your thinking map(s), complete with the frame of reference.



Last up: Create a frame of reference for your map by citing the source of your information, a 30 word description of your biome, and one fact about your biome that you find interesting.

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Five Major Biomes

Jigsaw Matrix

	30 word description	Interesting Fact
The Aquatic Biome		
The Tundra Biome		
The Grassland Biome		

The Desert Biome		
The Forest Biome		
Use the space below to write a 2-3 sentence summary of the overarching main ideas of the information sheets:		

SAUSD Common Core Lesson Planner **Teacher:**

<table>
<tr><td>Unit:
BIODIVERSITY
Day: 4-5
Lesson 3</td><td>Grade Level/Course:
7TH Grade
Life Science</td><td>Duration: 2 days
Date:
Why is biodiversity so important? The monetary value.</td></tr>
<tr><td colspan="3">Big Ideas:
All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:
• What is biodiversity and who/what does it affect?
• How does human activity influence the sustainability of an ecosystem and its natural resources?
• Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
• How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?
• What is the economic value of biodiversity?
• Why is biodiversity loss a concern?</td></tr>
<tr><td>Common Core and Content Standards</td><td colspan="2">Content Standards:
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
LS2.A Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
LS4.D Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on.
LS2.C Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Reading Standards for Literacy in Science and Technical Subjects:
Bundled Reading Informational Text Standard(s):
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
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.
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Writing Standards for Literacy in Science and Technical Subjects:
Bundled Writing in Science Standard(s):
1. Write arguments focused on discipline-specific content.
a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
d. Establish and maintain a formal style.
e. Provide a concluding statement or section that follows from and supports the argument presented.
Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):
9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">Student Resource: 3.1 Where is biodiversity found
Student Resource: 3.2 Thinking map: parts of the forest
Teacher Resource: 3.2a Mau Forest Video Clip (~7 ½ minutes)
Teacher Resource: 3.2b Ecosystems Brace Map Teacher's Edition version 1
Teacher Resource: 3.2c Ecosystems Brace Map Teacher's Edition version 2
Student Resource 3.3 Value of an ecosystem article
Teacher Resource 3.3a Video What is Nature worth?
Student Resource 3.4 Value of an ecosystem: Collaborative Annotation Chart</td></tr>
<tr><td>Objectives</td><td>Content:
Students will analyze the different components of a forest to interpret the dollar value of the economic services provided free of charge by an ecosystem.</td><td>Language:
Students will create a thinking map to demonstrate the breakdown of a forest ecosystem.

Students will analyze and discuss a complex text and video to support their conclusion about the value of biodiversity.</td></tr>
<tr><td>Depth of Knowledge Level</td><td colspan="2">☒ Level 1: Recall ☒ Level 2: Skill/Concept
☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
</table>

<table>
<tr><td colspan="2">College and Career Ready Skills</td><td colspan="2">☒ Demonstrating independence ☒ Building strong content knowledge
☒Responding to varying demands of audience, task, purpose, and discipline
☐ Comprehending as well as critiquing ☒Valuing evidence
☒Using technology and digital media strategically and capably
☒ Coming to understand other perspectives and cultures</td></tr>
<tr><td colspan="2">Common Core Instructional Shifts</td><td colspan="2">☒ Building knowledge through content-rich nonfiction texts
☒ Reading and writing grounded from text
☒ Regular practice with complex text and its academic vocabulary</td></tr>
<tr><td rowspan="3">Academic Vocabulary (General & Domain Specific)</td><td></td><td>KEY WORDS ESSENTIAL TO UNDERSTANDING</td><td>WORDS WORTH KNOWING</td></tr>
<tr><td>TEACHER PROVIDES SIMPLE EXPLANATION</td><td>Community
Ecosystem Interactions
Ecosystem services</td><td>Species
Predator Prey
Soil erosion Run-off</td></tr>
<tr><td>STUDENTS FIGURE OUT THE MEANING</td><td>Habitat</td><td>Characteristics
Whole to part</td></tr>
<tr><td colspan="2">Pre-teaching Considerations</td><td colspan="2">Before the unit
Be sure to have the Mau Forest video clip ready for use. The Mau Forest video brings to light the fact that “a forest is more than just trees.”</td></tr>
<tr><td colspan="4">Lesson Delivery</td></tr>
<tr><td colspan="2">Instructional Methods</td><td colspan="2">Check method(s) used in the lesson:
☒Modeling ☒Guided Practice ☒Collaboration
☒ Independent Practice ☒Guided Inquiry ☐ Reflection</td></tr>
<tr><td colspan="2"></td><td colspan="2"><u>Preparing the Learner (~10mins)</u>
Prior Knowledge, Context, and Motivation:
1. Connecting biomes to today’s lesson, students will begin with the “Where on EARTH is biodiversity found?” worksheet. This activity is about observing labels on a diagram (a complex text), interpreting the information, and drawing conclusions.
2. Allow two minutes for students to read the introduction paragraph independently.
3. Review the directions below the triangle diagram with students. Model what is meant by “describe three trends or patterns you observe” by making an observation of students in the classroom or of seating patterns or art work on the wall.
4. Allow students about 6 minutes to examine the diagram, re-read the opening paragraph and make their observations. Students can work in partners or independently.</td></tr>
</table>

Lesson Continuum

Lesson Opening

5. Ask students or partners to share with another set of partners.
6. After students have shared, look at the last question as a class. *Summarize your findings, describing where you would find the biome with the most biodiversity and how you knew this.* Students need to combine the information in the opening paragraph along with their observations to decide where the most biodiverse region would be.

Example observations include: This diagram shows how precipitation, latitude, temperature, and Earth's major land biomes are related. For example, as the latitude increase, the average temperature decreases. If you follow the triangle, you'll see biome shifts from the hot rain forest, savannas, and deserts near the Equator to more temperate forests and grasslands in the mid-latitudes to cold, icy tundra in the Artic. In general, the warmer temperatures, the more precipitation, and the closer the latitude is to the equator, the more biodiversity increases.

Interacting with the Concept/Text: (~30-35 minutes)

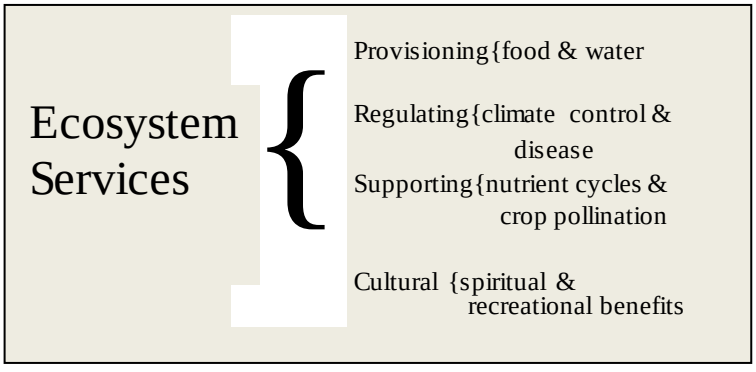
Viewing with a focus: (QTEL)

1. Teacher plays an unencumbered view of the "Mau Forest" video clip **(~7 ½ minutes),** after the viewing:
2. Teacher writes the question on the board and asks the students to consider the following question as they watch the video clip, ***"How is a forest more than just trees?'***
3. Teacher plays the Mau Forest Video Clip a second time.

(~7 ½ minutes)

4. After the viewing, have students turn to their "elbow partners" and ask them to discuss the following statement "How is a forest more than just trees?"
5. Depending on students answers explain that environmental scientists have grouped the services provided by an ecosystem into four broad categories: ***provisioning***, such as the production of food and water; ***regulating***, such as the control of climate and disease; ***supporting***, such as nutrient cycles and crop pollination; ***cultural***, such as spiritual and recreational benefits.

*NOTE: The Ecosystems Brace Map below could be used to present the information on the board.



Remind students that brace maps help in understanding relationships from whole to parts.

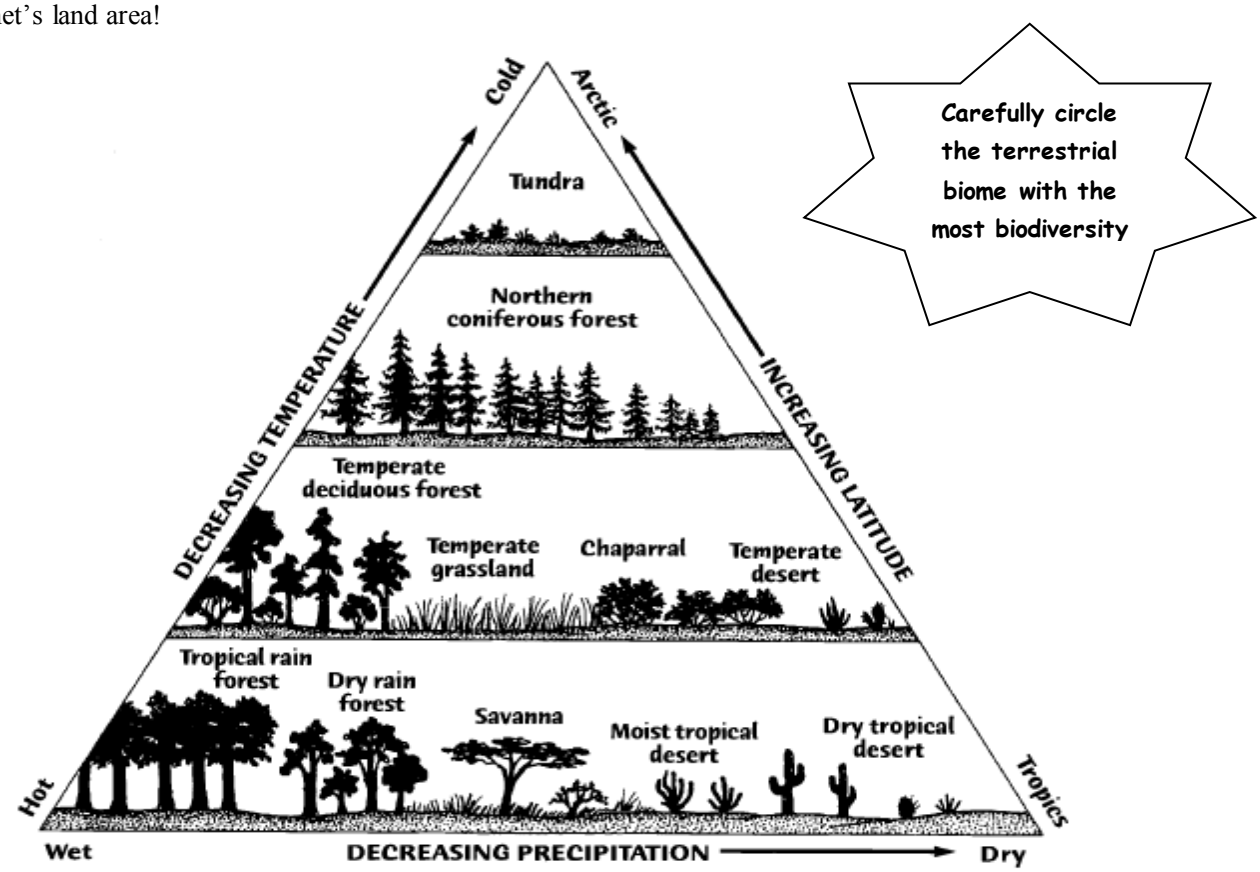
Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	6. In partners, students will now create their own thinking map to represent the various components of a forest ecosystem. The map is blank to give students flexibility to express their knowledge in a way that makes sense to them. The brace map above could guide students. Students need to include three the terms abiotic, biotic, and natural resources in their map. *NOTE: Two samples maps are included in the Teachers Edition as possible ways to organize information. 7. Circulate around to make sure students are still adding to their maps and don't need help. Allow no more than 10 minutes. 8. The last part of this activity is for students to flesh out their ideas from the thinking map into a short paragraph. Students may opt to write about a different biome and should reference their notes from lesson 2 on biomes. 9. Bring students back to the essential question: *How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?* They should students emphasize the connection between abiotic and biotic facts and if known, the specific interactions with humans. **<u>Day 5</u>** **Prepare the Learner**: ~5 mins 1. To draw students back into the deep connection humans have with biodiversity and nature, show the 3:15 minute clip of "Big Question: What is Nature Worth?" *NOTE: The word "Mangrove" may be unfamiliar to students. *The word 'mangrove' refers to a habitat with trees or shrubs that grows in chiefly tropical coastal swamps that are flooded at high tide. Mangroves typically have numerous tangled roots above ground and form dense thickets. Sometimes the habitat is called a 'tidal forest' or a 'mangrove forest' to distinguish it from the trees that are also called mangroves.* 2. After watching it, tell students they are going to look more closely at the monetary value of different parts of biodiversity by reading and taking notes on an article. (Students will watch this video again at the end of this lesson.)	**Students who need additional supports** Guide students in which thinking map to select without limiting creativity to create the map. Heterogeneous or homogeneous grouping to support various abilities. Pair students for thinking map or writing activities Teacher proximity to provide immediate support. Allow students extended response time and access to videos and article ahead of time. Pull out essential vocabulary from the ecosystem service article and post on wall

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Interacting with the Concept/Text: ~50 mins** **What is the Economic Value of Biodiversity Article**; *NOTE: Preview this article before beginning with students. The article is chunked (¶1-3, ¶4-5, ¶6, ¶7-8) to break up the article for students. 1. **First Read of** ¶1-5: Instruct students that during the first read of the article they are reading without a pencil and just focusing on the content. Give students 6 minutes to read ¶1-5. It is okay if students do not finish as the goal is to understand everything they do read (so they may need to reread specific lines). 2. After students complete the first unencumbered read, they will pick up a pencil to complete the second read. 3. **Second Read of** ¶1-5: Students will using a * to indicate the Author's main point, key ideas, or significant ideas with in ¶1-5. Read the comic and the first paragraph aloud with students following along and demonstrate how you would mark a key idea in the first paragraph. Continue **modeling** this technique and reading aloud ¶1-3 with students. *NOTE: Emphasize that this technique is more effective than highlighting because students know why they marked the idea as important by the identifying symbol. When students highlight they often highlight arbitrarily or over highlight and forget why they marked part of the text. This technique helps them focus their markings and indicates why a part of the text was selected *=key point. ! = shocking/surprising point. O = personal connection 4. Give students an additional 6 minutes to read/reread ¶1-5 with the * as their only focus. 5. **First Read** ¶6: Now have students move onto ¶6. Give 2 minutes for students to will read over this piece of the article highlighting the dollar value of an ecosystem. 6. **Second Read of** ¶6: Have students to look for pieces of information that are surprising or shocking (use a ! to mark these pieces), or for ideas that they connect with or remind them of a prior experience (use a O to mark these parts. 7. **First Read** ¶7-8: Have students spend two more minutes finishing the article, just focusing on the content. 8. **Second Read** ¶7-8: Have students use any of the three	**Students who need additional supports** The article is broken into chunks to facilitate scaffolding for all learners. Scaffolds are gradually removed as you progress through the article. Adjust as needed for your students/class periods.

		symbols, (*, ! O) to mark and read through the final paragraphs 7 and 8. 9. Independently students will select 4 of their markings and transfer them to their Collaborative Annotation Chart along with a quick note about why they selected that sentence or phrase (ex. *I never thought of CA as being a place with lots of biodiversity or I didn't realize how much money we make off the environment.)* **MODEL THIS** for students**.** 10. Students will then share their annotations with their partner using the "Sample Language Supports" (students can already be sitting next to this person or can be paired up after completing the reading). ***NOTE:** Again **model** the use of conversation starters with a student volunteer. Students often struggle with responding to their partner and stop at "I agree" or "I said the same thing." 11. Partner 1 jots down partner 2's response to the annotation marks. They switch roles and continue until they have discussed all for annotations or time runs out. (If students are having a good discussion, it's okay if they don't finish discussion all 4 annotations.) **Extending/Transferring Understanding:** 12. Pairs or teams should write a 40-50 word summary of the article using key facts and ideas. 13. Ask students to select one of the essential questions of Lesson 3 to guide their summary. This should be written at the top of their summary. 14. Emphasize the importance of selecting essential information and leaving out unnecessary details.	
		Lesson Reflection	
Teacher Reflection Evidenced by Student Learning/ Outcomes			

Where on EARTH is biodiversity found?

While almost every environment on Earth supports life, certain areas have more biodiversity than others. In general, the diversity of species tends to increase as you move from the North and South Pole towards the equator. The tropical regions, with their rain forests, coral reefs, and large tropical lakes, have an average of twice as many mammal species per square mile as temperate areas. And flowering plants are even more abundant in the tropics: A tropical forest in the Amazon basin, for example, might have over 80 species per acre, while the same amount of temperate forest in the United States would typically have less than 12. Amazingly, more than half the world's species live in tropical forests, which make up less than 7 percent of the planet's land area!



Look at the pyramid of biodiversity along with the opening paragraph and describe three trends or patterns you observe. Use complete sentences. "I observe…" or "I notice that…"

- _____
- _____
- _____

Summarize your findings, describing where you would find the biome with the most biodiversity and how you knew this. Based on my observations…_____

_____

_____

_____

_____

Adapted from *Windows on the Wild*

Parts of a Forest Ecosystem.
More than just trees!

Directions: Starting with the word Forest Ecosystem, create a thinking map to breakdown the parts of this ecosystem. Be sure to include how the forest connections to things outside the forest and to humans.
Use the following terms: **abiotic, biotic, natural resources, humans**

Forest Ecosystem

Describe the parts of an ecosystem and how it connects to humans. Explain relationships between biotic and abiotic factors. Choose a biome (such as desert, grassland, tundra, ocean, tropical rain forest) to focus on and provide examples of the parts of an ecosystem in that biome. Use and underline the terms **abiotic**, **biotic**, **natural resources**, **humans** in your answer.

_____
_____
_____
_____
_____

Kenya's Mau Forest - More Than Trees

Length: 7:35 minutes

Parts of a Forest Ecosystem.
More than just trees!

Directions: Starting with the word Forest Ecosystem, create a thinking map to breakdown the parts of this ecosystem. Be sure to include how the forest connections to things outside the forest and to humans.
Use the following terms: **abiotic, biotic, natural resources**

TEACHER EDITION: one version

- Forest Ecosystem
  - **Abiotic Factors** (non-living)
    - Temperature
    - Soil pH
    - Precipitation
    - Space for organism
    - Water
    - Air quality
  - **Biotic Factors** (non-living)
    - Producers
      - Plants, Trees, Photosynthetic bacteria
    - Consumers
      - Herbivores, carnivores, Omnivores
    - Decomposers
      - Fungus, mushrooms
      - Worms
    - Benefits
      - **Natural Resources** → building materials/food → money
      - CO_2 → Oxygen, Climate Regulation,
      - Shelter for animals, Predatory-Prey balance
      - Nutrients returned to soil
      - Water and waste management
      - Cultural/Spiritual/Recreational: Hiking, ceremonies, swimming (lakes), tribal
      - Medicinal potential/Scientific research

Describe the parts of an ecosystem and how it connects to humans. Explain relationships between biotic and abiotic factors. Choose a biome (such as desert, grassland, tundra, ocean, tropical rain forest) to focus on and provide examples of the parts of an ecosystem in that biome. Use and <u>underline</u> the terms **abiotic**, **biotic**, and **natural resources** in your answer.

_____

_____

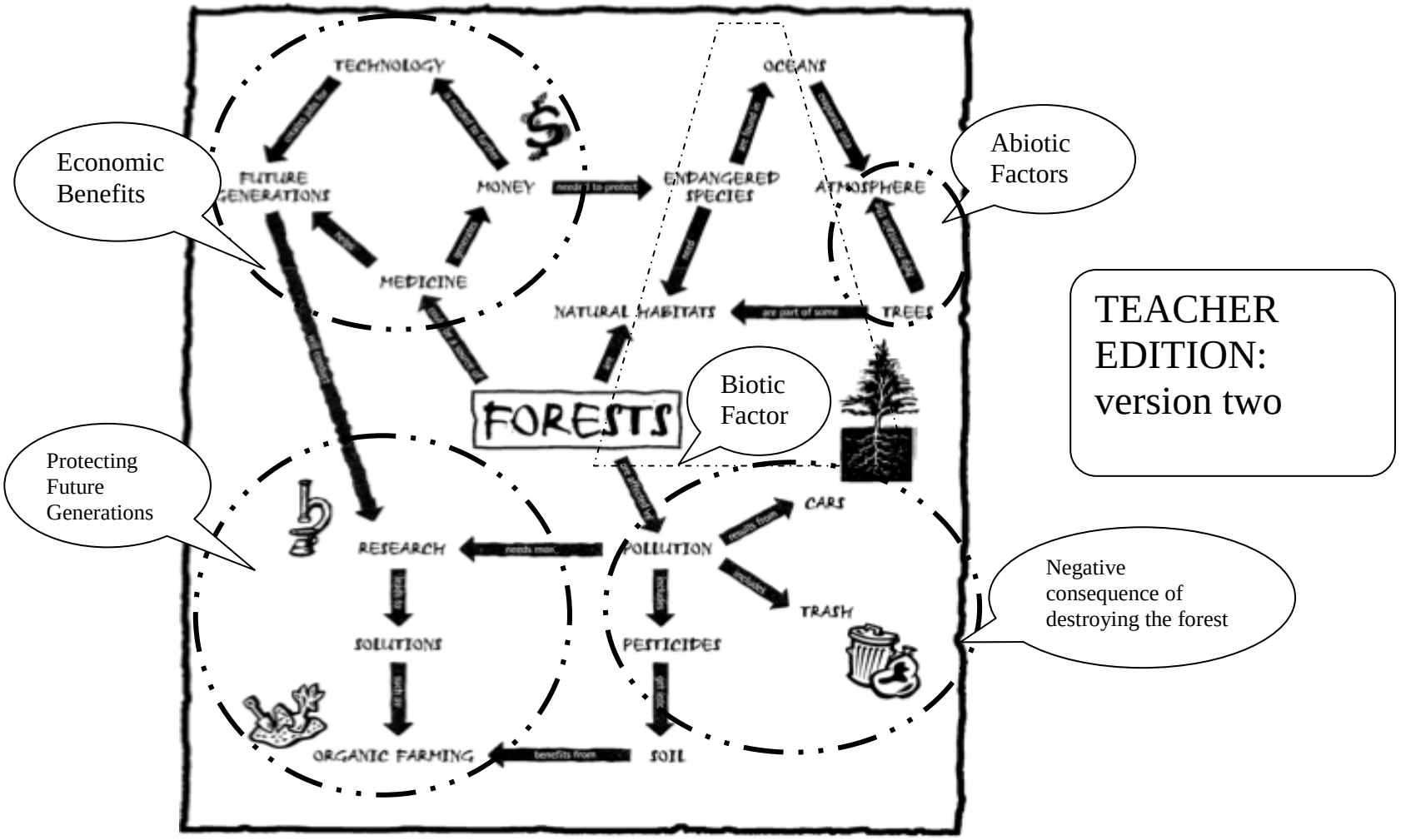
_____

_____

_____

Parts of a Forest Ecosystem.
More than just trees!

Directions: Starting with the word Forest Ecosystem, create a thinking map to breakdown the parts of this ecosystem. Be sure to include how the forest connections to things outside the forest and to humans.
Use the following terms: **abiotic, biotic, natural resources**



TEACHER EDITION: version two

Describe the parts of an ecosystem and how it connects to humans. Explain relationships between biotic and abiotic factors. Choose a biome (such as desert, grassland, tundra, ocean, tropical rain forest) to focus on and provide examples of the parts of an ecosystem in that biome. Use and <u>underline</u> the terms **abiotic**, **biotic**, and **natural resources** in your answer.

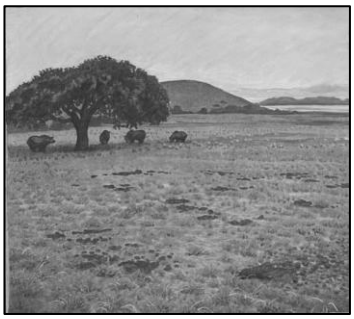
The Value of Biodiver$ity

Directions
1st Read: Read to understand. No pencil needed.
2nd Read: Use the * to mark key ideas
3rd Read: Use the ! or O to mark surprising ideas or things that you connect with.

Symbol/ Section	Comment/ Question/ Response
*	▪ Key ideas expressed ▪ Author's main points
!	▪ Surprising details/claims ▪ Emotional response
O	▪ Ideas/sections you connect with ▪ What this reminds you of

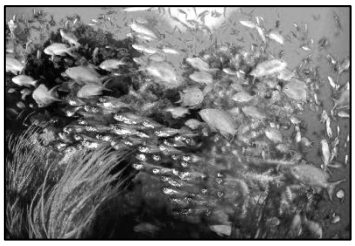
1. Biological diversity - or biodiversity - is the term given to the variety of life on Earth. The biodiversity we see today took billions of years of evolution to form, shaped by natural processes and more recently through the influence of humans. Biodiversity refers to the variety of plants, animals and microorganisms like bacteria. So far, about 1.75 million species have been identified, mostly small creatures such as insects. Scientists think that there are actually about 13 million species, though some scientist estimate there might be 100 million species on Earth!

2. Biodiversity also describes the different kinds of ecosystems and habitats that occur in deserts, forests, wetlands, mountains, lakes, rivers, and places where we grow crops of food. In each ecosystem, living creatures (biotic factors), including humans, form a community, interacting with one another and with the air, water, and soil (abiotic factors) around them. Biodiversity provides a large number of goods and services that sustain our lives, but biodiversity is rapidly decreasing due to human activity and the choices we make.



3. Habitat loss has been increasing in the last 30 years. Most of this is happening because we are bulldozing forests worldwide to plant crops of food. We do need food to survive, and growing food makes farmers money, but what is the cost of removing all of those trees? No, not the cost to actually knock down the trees, but the value of the jobs the forest was already doing, like cleaning the air and water, keeping the climate cool and regulating weather, and providing a home to thousands of organisms that could potentially help scientists discover a cure for cancer or asthma or diabetes? And guess what, all of those important crops of food we are planting? Well most of that food doesn't even go to humans; it goes to feed animals like cows and chickens and pigs!

4. Let's think locally. California didn't always look like it currently does. Temperate and Mediterranean forests (like those found right here in California) and temperate grasslands are among the fastest changing biomes in the world. Seventy-five percent of this natural habitat has already been converted into fields for growing crops. In the last 50 years, biodiversity in tropical and sub-tropical dry forests is also quickly being changed.



5. Travel south towards the equator and 20% of known coral reefs have been destroyed and another 20% seriously damaged in the last two decades. While coral reefs cover only 1.2 % of the world's shorelines, they are home to more than a million species, including more than a quarter of all ocean fish species! An estimated 30 million people

Sources Include: Ecological society of America, cdfa.ca.gov, World Health Organization, NYT.com "Putting a Value on Biodiversity", Millennium Assessment Reports, and Convention on Biological Diversity

make an income or survive off the food and resources found in a coral reef. If coral reef destruction continues, how will these 30 million people feed themselves and make enough money to support their families?

6. Nature's services have financial ($) value! Many of these services are performed seeming for "free," yet are worth many trillions of dollars. Consider the following:

   - About 78% of the top medicines used in the U.S. come from nature like plants, fungi, bacteria and vertebrates (like snakes and frogs). Plant-based drugs and medicines are worth $40 billion per year and save countless lives. How much is a life worth?

   - Companies in the US and Canada made $271 billion in 2012 in the fossil fuel industry of coal and oil found naturally in the ground. Better protecting our forests would prevent $3.7 trillion in damages created by greenhouse gases.

   - Over 100,000 different animals species—including bats, bees, flies, moths, beetles birds, and butterflies—provide free pollination services, making our food grow. One third of human food is a direct result of this free pollination.

   - Additionally, insects naturally control pests and reduce diseases (Over $11 billion was spent on pesticides in 2001 in the US alone).

   - Nature detoxifies and breaks down waste products (like feces), but we produce more than nature can handle and need to build machines to help keep waste from piling up on the streets or in the oceans. Orange County spent $480 million to build a water purification plant that nature used to do for free. We spend $29 million a year just to keep the water plant running.

   - Biodiversity or "ecotourism" is a tourist attraction that brings in over $300 billion dollars a year. How much would you pay to go to a beautify beach or see a lion in the wild?

7. Our personal health, and the health of our economy and human society, depends on the continuous supply of various ecological services that would be extremely costly or impossible to replace. These natural services offer us endless benefits and many cannot be replaced by humans or machines created by humans. Biodiversity even helps control the weather and climate. For example, biodiversity helps:

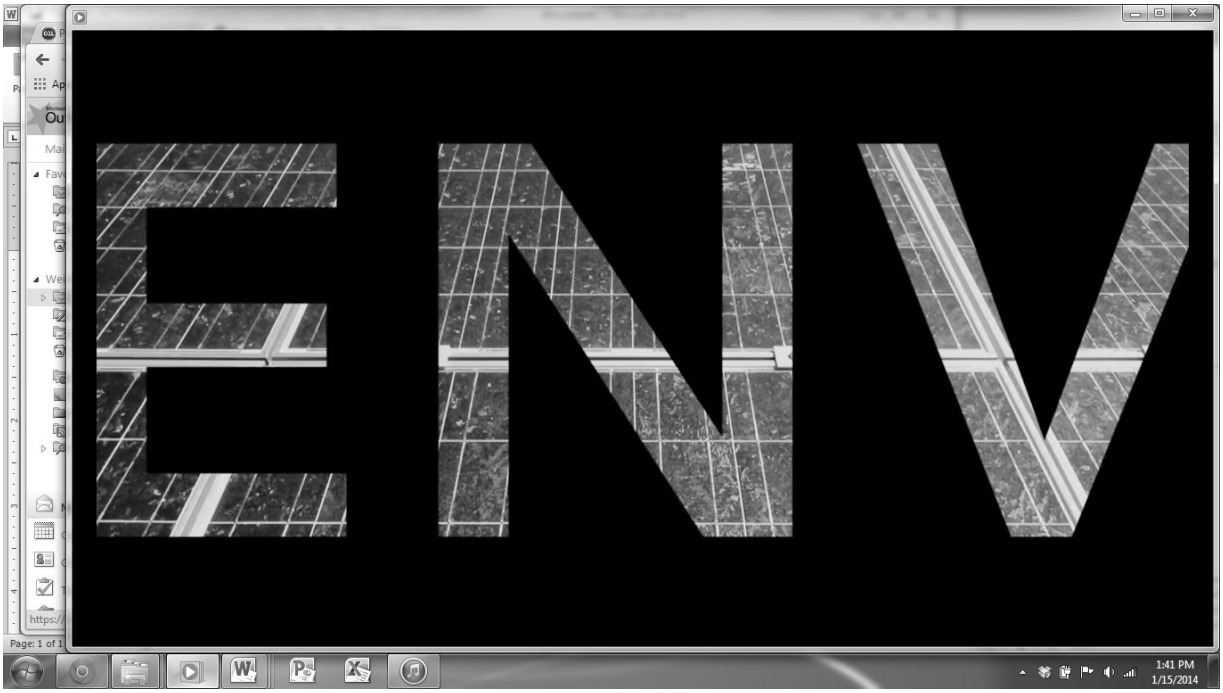
   - Stabilize and regulate Earth's climate (Think Global Warming, continual droughts, and 80°F in January in California!)

   - Reduce flooding, droughts (lack of rain), temperature extremes and the forces of wind (Southern California got less than 3 inches of rain in 2013).

8. Protecting biodiversity is not easy and will require big changes to how we live and use Earth's resources. Biodiversity supports everything from agriculture (food), cosmetics (makeup), pharmaceuticals (medicine), paper, construction (of buildings, cars, roads), and waste treatment. The loss of biodiversity threatens our food supplies, opportunities for outdoor fun and tourism, and sources of wood, medicines and energy.

Sources Include: Ecological society of America, cdfa.ca.gov, World Health Organization, NYT.com "Putting a Value on Biodiversity", Millennium Assessment Reports, and Convention on Biological Diversity

Big Question: What is Nature Worth?



Length: 3:15 mins

Source: Institute on the Environment from the University of Minnesota. Online magazine “Momentum”

Summary: Helps put a dollar sign on different services provided by nature.

Collaborative Annotation Chart:

Directions: The 1st time you read your article, put your pencil down and just read to understand.

- The 2nd time you read, use the ***** symbol to mark key ideas.
- The 3rd time you read, use the **!** or **O** symbol to mark surprising ideas or things you connect with.

Next, select 4 annotated sections and write them below with a quick comment about why you picked that sentence, word, or idea.

Lastly, share with your partner. Be sure to identify the quote or passage you selected. Then, share your comment using a "Sample Language Support" to get your discussion flowing. Record your partner's response before moving on to the next passage you selected.

Symbol/ Section	Comment/ Question/ Response	Sample Language Support
*	▪ Key ideas expressed ▪ Author's main points	▪ One significant idea in this text is… ▪ The author is trying to convey…
!	▪ Surprising details/claims ▪ Emotional response	▪ I was surprised to read that… ▪ How can anyone claim that…
O	▪ Ideas/sections you connect with ▪ What this reminds you of	▪ This section reminded me of… ▪ This connects with my experience in that…

Symbol/ Section	Para-graph #	Your comment/reason for marking this passage	Your partner's comment/question/ response to what you said

Essential Questions about Biodiversity

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?
- Why is biodiversity loss a concern?

Summarize: Select one of the Essential Questions from today's lesson as your focus and write a 30-50 word summary of the article using key facts and ideas. Paraphrase essential information and leave out unnecessary details. Use your own words!

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SAUSD Common Core Lesson Planner **Teacher:**

Unit: **BIODIVERSITY** **Day: 6** **Lesson 4**	**Grade Level/Course:** 7TH Grade Life Science	**Duration:** 1 day **Date:** Threats to Biodiversity: Human Civilization

Big Ideas: All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions

- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms and populations of organisms dependent on their interactions with other organisms and with nonliving factors?
- Why is biodiversity loss a concern?

Common Core and Content Standards	**Content Standards:** **LS2.A** Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. **LS4.D** Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on. **LS2.C** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations. **MS-LS2-2**. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **Reading Standards for Literacy in Science and Technical Subjects**: **Bundled Reading Informational Text Standard(s):** 1. Cite specific textual evidence to support analysis of science and technical texts. 2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. 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.* 8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. 9. Compare/contrast information from experiments, simulations, video, or

<table>
<tr><td></td><td colspan="2">multimedia with that gained from reading a text on the same topic.

Writing Standards for Literacy in Science and Technical Subjects:
Bundled Writing in Science Standard(s):
1. Write arguments focused on discipline-specific content.
a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
d. Establish and maintain a formal style.
e. Provide a concluding statement or section that follows from and supports the argument presented.
Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):
9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">Student Resource: 4.1 Threats to biodiversity Quick Write
Student Resource:4.2 Shades of meaning
Teacher Resource: 4.2a Easter Island Video Clip
Supplemental Resource: Agree/Disagree Statements Sentence Frames (1 per student)
Student Resource: 4.3 Easter Island Comic Strip
Teacher Resource: 4.3a Easter Island Complex Text: Gate/honors/HW article
Student Resource: 4.4 Text Dependent Questions
Supplemental Resource: Shades of Meaning word strips pre-cut</td></tr>
<tr><td>Objectives</td><td>Content:
Students will understand how human actions have wide reaching effects on biodiversity through the example of Easter Island.</td><td>Language:
Students will identify evidence and paraphrase evidence from reading that supports their assertions.</td></tr>
<tr><td>Depth of Knowledge Level</td><td colspan="2">☒ Level 1: Recall ☒ Level 2: Skill/Concept
☐ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
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<tr><td colspan="2">College and Career Ready Skills</td><td colspan="2">☒ Demonstrating independence ☒ Building strong content knowledge
☐Responding to varying demands of audience, task, purpose, and discipline
☐ Comprehending as well as critiquing ☒Valuing evidence
☐Using technology and digital media strategically and capably
☒ Coming to understand other perspectives and cultures</td></tr>
<tr><td colspan="2">Common Core Instructional Shifts</td><td colspan="2">☒ Building knowledge through content-rich nonfiction texts
☐ Reading and writing grounded from text
☒ Regular practice with complex text and its academic vocabulary</td></tr>
<tr><td rowspan="3">Academic Vocabulary (General & Domain-Specific)</td><td></td><td>KEY WORDS ESSENTIAL TO UNDERSTANDING</td><td>WORDS WORTH KNOWING</td></tr>
<tr><td>TEACHER PROVIDES SIMPLE EXPLANATION</td><td>Extinct
Soil erosion
Polynesian
Pollen grain
Native</td><td>Canoe
Porpoise
Paradise
Domestic</td></tr>
<tr><td>STUDENTS FIGURE OUT THE MEANING</td><td>Lush
wasteland</td><td></td></tr>
<tr><td colspan="2">Pre-teaching Considerations</td><td colspan="2">Before the unit:
Check video clip to be certain it’s functioning
Copy & Pre-cut Shades of Meaning word strips & place in envelopes. You may want to laminate the strips to extend the shelf-life of the materials.</td></tr>
<tr><td colspan="4">Lesson Delivery</td></tr>
<tr><td colspan="2">Instructional Methods</td><td colspan="2">Check method(s) used in the lesson:
☒Modeling ☒Guided Practice ☒Collaboration
☒ Independent Practice ☒Guided Inquiry ☒ Reflection</td></tr>
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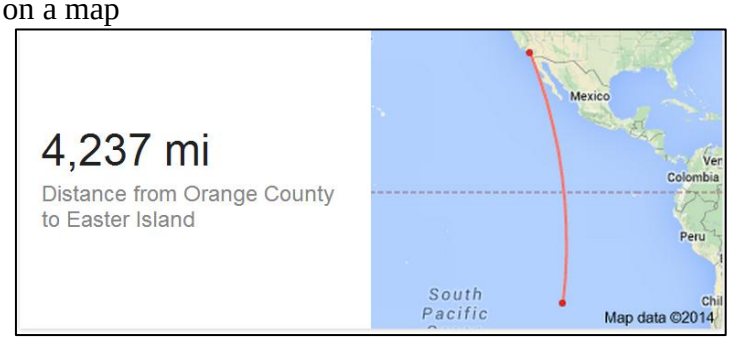
	Lesson Open-ing	**Preparing the Learner (~15 minutes)** Prior Knowledge, Context, and Motivation: **Quick Write: Threats to Biodiversity** 1. Read the quick write prompt with students. (It is contextualized by the video "Big Question: What is nature worth" in Lesson 3 if you need to show it again to students). Give students 3 minutes to write to this prompt. 2. Ask students to share with a partner or with the whole class and begin generating a list of threats to biodiversity on chart paper or the white board (put this in a place where it can stay up for the next 10 days). **<u>Preparing the Learner Continued</u> (~8 mins)** 1. Tell students that today they will be learning about a place called Easter Island (it was named on Easter Sunday). Easter Island is 2,182 mi from the nearest large body of land (Chile). However, being a remote island doesn't always mean an Island is isolated. Plants and animals found their way to this volcanic island long before there were airplanes or speed boats. 2. Before beginning the video (Resource 4.2a), show students where Easter Island is on a map  **3. 1st Viewing**: Show the Easter Island video clip with students just watching and listening (unencumbered). **<u>Interacting with the Concept/Text-Video</u>** **Easter Island Video (~8 mins)** 4. Show the Easter Island video clip a second time, asking the students to find evidence to answer the questions in the Extended Anticipatory Guide (EAG) from (Resource 1.2). Students may not necessarily answer all of the questions from this video, but can come back to it later. Remind students that they will be submitting the EAG as part of their final assessment. (Students will come back to this before the final writing assessment to find and cite text to support their answers) 5. Allow students an extra two minutes to record their observations in the EAG after the video ends.

Lesson Continuum

Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding

Interacting with the concept/text continued

Shades of Meaning- "Easter's End" (~15 minutes)

****NOTE***:* This close reading strategy allows students to explore subtle differences between similar words or phrases. It works best in pairs to ensure each student is engaged in the activity and has an opportunity to speak and interact with the terms.

1. Hand each pair of students an envelope containing the pre-cut word/definition strips related to life and loss of life on Easter Island. Instructs students to work together in pairs.
2. Hand each pair of students an envelope containing the pre-cut word/definition strips related terms related to the Easter Island comic strip.
3. Review the directions together and model how to analyze a word. *Ex: Read from the strip: "**fertile** –having the power of reproduction, producing, or capable of producing vegetation, crops, offspring, abundantly." Point out the words **reproduction** and **producing** to show these terms relate to new life being formed,* so it would go in the category for words representing life.
4. Students will take turns reading the word strips aloud and sort them into general categories: words associated with "life" and words associated with "lack of life" or "loss of life."
5. Give pairs 3 minutes for the initial sort. Circulate throughout the classroom prompting groups that may have difficulty getting started.
6. For the second sort, students will arrange the words in one long list with the word at the top representing the "most life" and the bottom of the list as the term meaning the "least life." Partners MUST agree on their order and will justify their arrangement but there is no official correct order. (about 4 minutes)
7. Once completed, pairs should record their final order and draw a quick illustration of words #1 and #10.
8. **Lastly they will justify how they differentiated between terms on line #1 and #2**. Sorting patterns will likely differ. The focus is on student's ability to justify how and why they sorted the terms as such, rather than one specific answer.

Optional Extension

9. Student pairs should share with another pair and compare their word order and justification for the first 2 terms. Teams should listen to each other and try to convince the other team that their order is correct.

Students needing additional supports

Extend writing time for quick write.

Provide comic strip and video for home viewing for students to preview the material.

Access the video on Discovery streaming and enable closed captioning to support auditory processing difficulties.

Heterogeneous grouping to provide immediate support to students.

Teacher circulation for immediate support and feedback.

Create a word wall from "shades of meaning" terms to support EL students. Add visual images to support term meaning.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Easter Island Comic Strip *:*** (~20 minutes) 1. Have students number the comic strips panels from left to right (do the first few together. There are about 30 boxes), and then read the story. Reading may be done independently, silently or in groups, aloud. If read in groups, ask students to take turns reading to their group members. Each student reads one panel aloud and the reading continues around the table for the 4 pages of the comic strip. *__NOTE__: The comic strip is a great example of visual literacy. If you have the time or have a student looking for additional information, a supplemental article is included on the CD titled "4.3a Supplemental Article. Easter's End. For extension or extra credit." 2. After groups finish reading the comic, they will answer the three text-dependent questions (Resource 4.4). Students must cite their evidence by indicating which comic boxes they looked at to craft their response. Emphasize that while citing evidence, students need to write responses using their own words! **Extending Understanding: (~ 5minutes)** 1. As an independent, concluding activity, students will revisit the Threats to Biodiversity Quick Write (Resource 4.1) and answer the second question. ***Explain in your own words what happened to the lush ecosystem on Easter Island:*** *Use four words from the shades of meaning activity.* (fertile, abundant, pristine paradise, multiplied, vanish, barren, wasteland, ceased, disappeared, extinct)	Homogenous grouping to increase the group rigor or to level the playing field. Enlarge the comic for visually impaired students.
Lesson Reflection			
Teacher Reflection Evidenced by Student Learning/ Outcomes			

Threats to Biodiversity

Quick Write: Every hour, three species of plants, animals, and other living things vanish forever. Describe as many things that you can think of that are contributing to these organisms extinction.

_____

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Easter Island Ecosystem Downfall

Quick Write: Explain in your own words what happened to the lush ecosystem on Easter Island: Use four words from the card sort in your explanation. (fertile, abundant, pristine paradise, multiplied, vanish, barren, wasteland, ceased, disappeared, extinct)

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Easter's End Close Read
Shades of Meaning: words dealing with life

"Shades of Meaning" explores subtle differences between similar or related words & phrases.
1st Sort: Sort the words related to the comic Easter's End into two categories **"life"** to **"lack of life"**.
2nd Sort: Rank all of the words from **"most life"** to **"least life"**. Illustrate words #1 and #10.

Second Sort: Rank	Illustration
Word that most strongly represent Life Most life → 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ Some life 6. _____ 7. _____ 8. _____ ↓ No life 9. _____ 10. _____ **Word that most strongly represents Lack of Life or Loss of Life**	**Word #1** **Word #10**

Justify (explain why) in writing how you determined the order of words on line #1 and #2. Be specific.

_____

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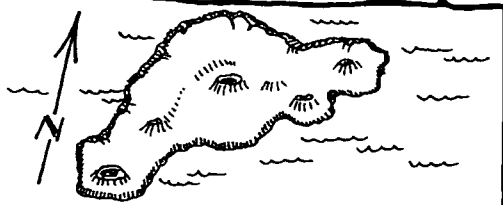
Easter Island

Length 5:05 minutes

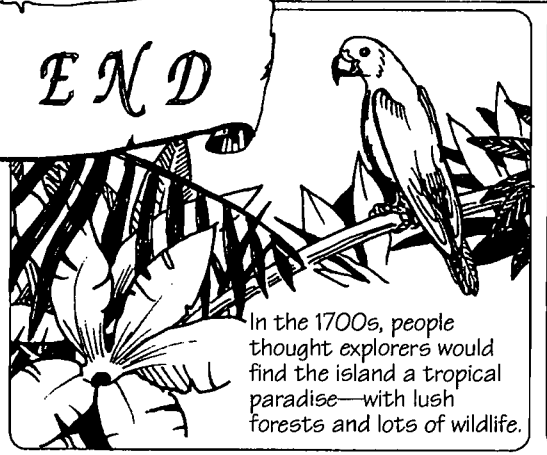
Source: Wild Evolution, Discovery Education

Summary: This video takes a look at what the island looked like when explorers landed on Easter Island and how they discovered people at war on a desolate, barren island. The video describes the scientific process of trying to determine what the island looked like before humans caused massive destruction of the biodiversity on the island.

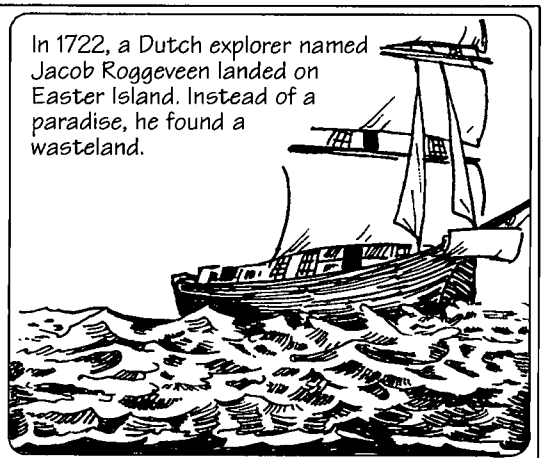
EASTER'S END



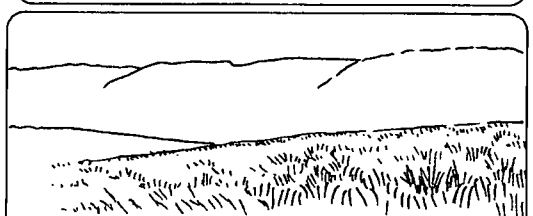
Easter Island lies far out in the Pacific Ocean. It has an area of about 64 square miles, almost three times the size of Manhattan.



In the 1700s, people thought explorers would find the island a tropical paradise—with lush forests and lots of wildlife.

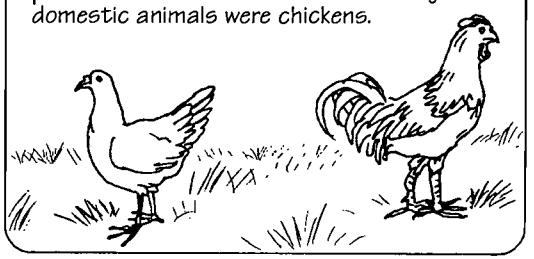


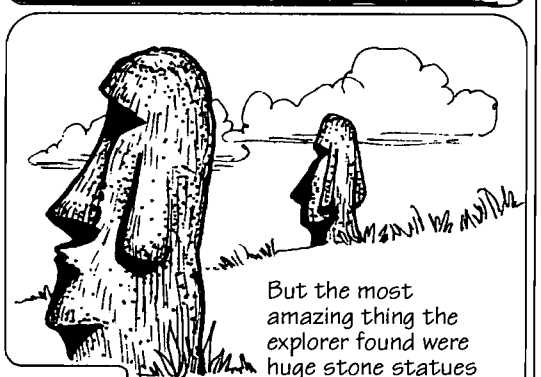
In 1722, a Dutch explorer named Jacob Roggeveen landed on Easter Island. Instead of a paradise, he found a wasteland.



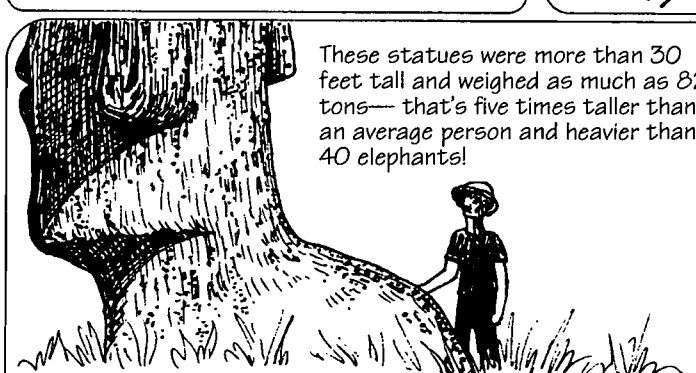
There were no tall trees. And the only native wildlife he saw were insects and other tiny creatures. There was not a single bat, snail, songbird, or lizard.

Instead of busy cities, he found only 2,000 people—not a big population for an island paradise. And he noticed that the only domestic animals were chickens.





But the most amazing thing the explorer found were huge stone statues lining the shore.



These statues were more than 30 feet tall and weighed as much as 82 tons— that's five times taller than an average person and heavier than 40 elephants!

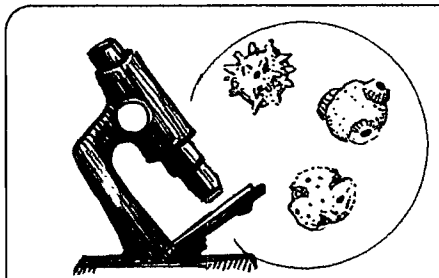
How did these enormous statues get there with no machines or ropes or horses?

For more than 200 years, no one could solve the mystery.

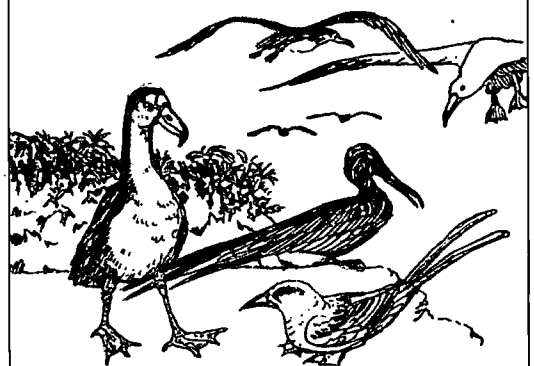
EASTER'S END (Cont'd.)

30 Easter's End

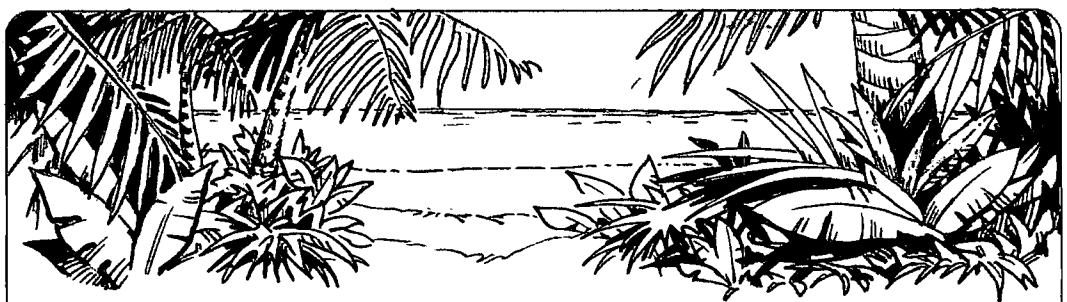
But now, scientists think they have some answers. By digging up old garbage heaps, they learned what kinds of animals the Islanders used to eat.



And by looking at ancient pollen grains buried at the bottom of lakes and swamps, they have learned what kinds of plants used to grow on the island.

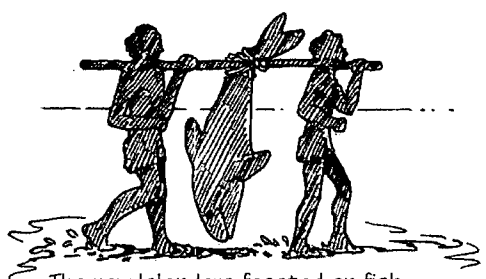


They found more than 20 types of seabirds nesting on the island, including albatross, boobies, frigate birds, storm petrels, terns, and tropical birds.



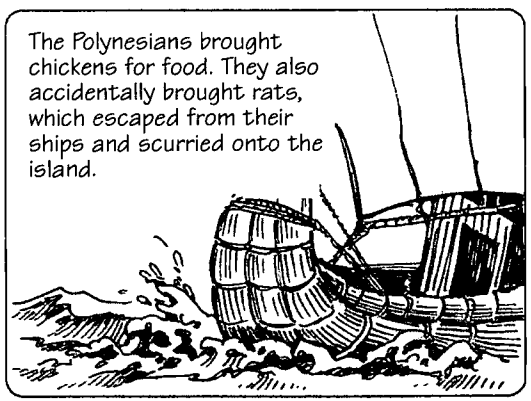
Here's what they think happened . . . The first people to live on the island came from Polynesia about 1,600 years ago. When they first stepped ashore, they found a lush tropical island. It was covered with forests of hauhau trees, toromiro trees, tree daisies, and giant palm trees called Easter Island palms.

They also found barn owls, herons, parrots, rails, and other types of land birds when they arrived on the island.



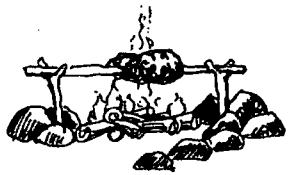
The new Islanders feasted on fish, porpoises, seals, and other animals.

The Polynesians brought chickens for food. They also accidentally brought rats, which escaped from their ships and scurried onto the island.

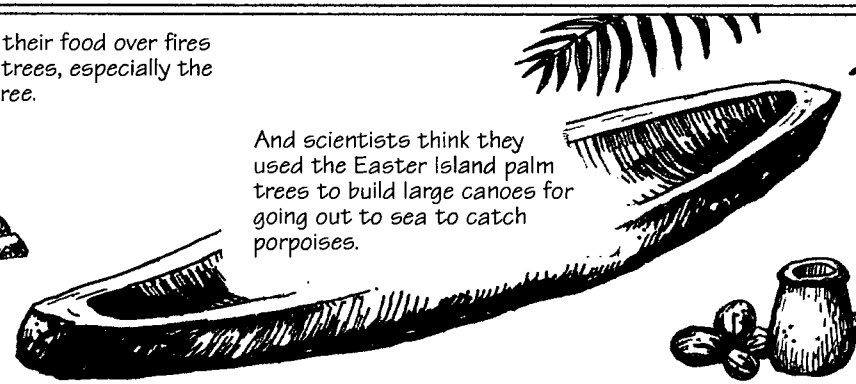


EASTER'S END (Cont'd.)

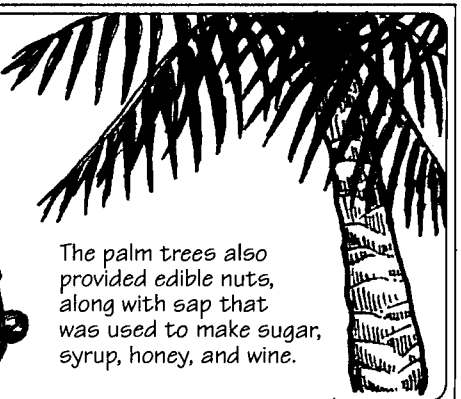
The Polynesians cooked their food over fires made from the island's trees, especially the slow-burning toromiro tree.



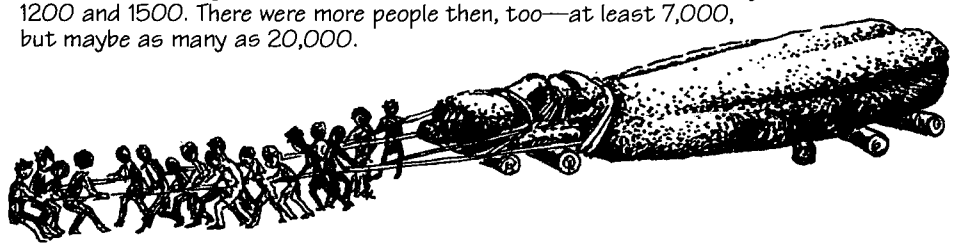
And scientists think they used the Easter Island palm trees to build large canoes for going out to sea to catch porpoises.



The palm trees also provided edible nuts, along with sap that was used to make sugar, syrup, honey, and wine.



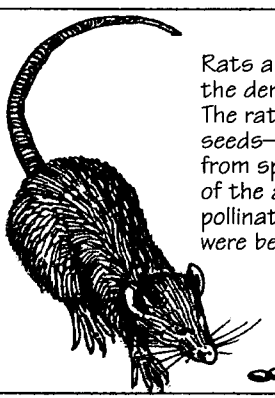
What about the statues? Using strong palm trees, the Easter Islanders could have built wooden tracks or rollers, then dragged the statues across the tracks on wooden sleds. Scientists also think the Islanders used the hauhau trees to make rope for pulling the statues. According to records, most statues were built between the years 1200 and 1500. There were more people then, too—at least 7,000, but maybe as many as 20,000.



- But what happened?
- Why did they stop building statues?
- Where did the people go?

By studying pollen grains, scientists think the Islanders destroyed most of the forests by the year 800. And by the 1400s, Easter Island palms were extinct.

The rest of the forest was disappearing quickly. After years of cutting forests to clear land for gardens and using trees to build canoes, transport statues, and fuel fires, by the end of the 1400s only a few trees were left.



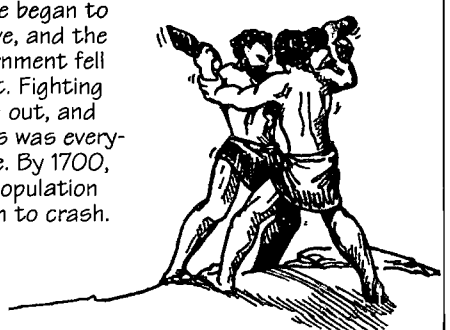
Rats also played a role in the demise of the forests. The rats were eating tree seeds—preventing them from sprouting. And some of the animals that pollinated the plants were becoming rare.

EASTER'S END (Cont'd.)

As the forests disappeared, so did other living things. Every species of native land bird became extinct. And more than half of the seabirds were wiped out, too.

People started running out of things to eat. There were fewer crops because without trees more erosion caused the soil to lose its richness. And people could no longer fish or hunt for porpoises because there were no trees left for making canoes.

People began to starve, and the government fell apart. Fighting broke out, and chaos was everywhere. By 1700, the population began to crash.



People started living in caves to protect themselves from their enemies. And during the fighting, rival clans knocked down each other's statues.

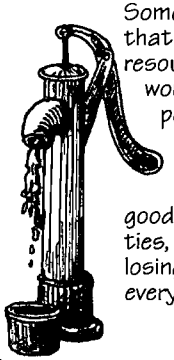
By 1864, the last statue had been knocked down and destroyed.

Why didn't the Easter Islanders realize what was happening before they destroyed the forest and their civilization?

Maybe they couldn't see that the forests and animals were disappearing until it was too late.

Or maybe the people didn't know how to change their lives and to better protect their environment.

Could something like this happen again?



Some people say it is happening . . . that people are overusing natural resources in many parts of the world and causing hardships for people and wildlife everywhere. They point out that even today millions of people don't have enough food, clean water, good soil, educational opportunities, or health care. And that we're losing species and habitats on every continent.

But many people say that what happened to the Easter Islanders won't happen to us—that although we have problems, we can learn from history and not repeat the mistakes of the past.

What do you think?

EASTER'S END

by Dr. Jared Diamond

Among the most riveting mysteries of human history are those of vanished civilizations. Everyone who has seen the abandoned buildings of the Khmer, the Maya, or the Anasazi is immediately moved to ask the same question: Why did the societies that erected those structures disappear?

Among all vanished civilizations, that of the former Polynesian society on Easter Island remains the most mysterious. The mystery stems especially from the island's gigantic stone statues and its impoverished landscape.

Easter Island, with an area of only 64 square miles, is the world's most isolated scrap of habitable land. It lies in the Pacific Ocean more than 2,000 miles west of the nearest continent (South America), and 1,400 miles from even the nearest habitable island (Pitcairn). Its subtropical location and latitude help give it a mild climate, while its volcanic origins make its soil fertile. In theory, this should have made Easter Island a miniature paradise, remote from the problems of the rest of the world.

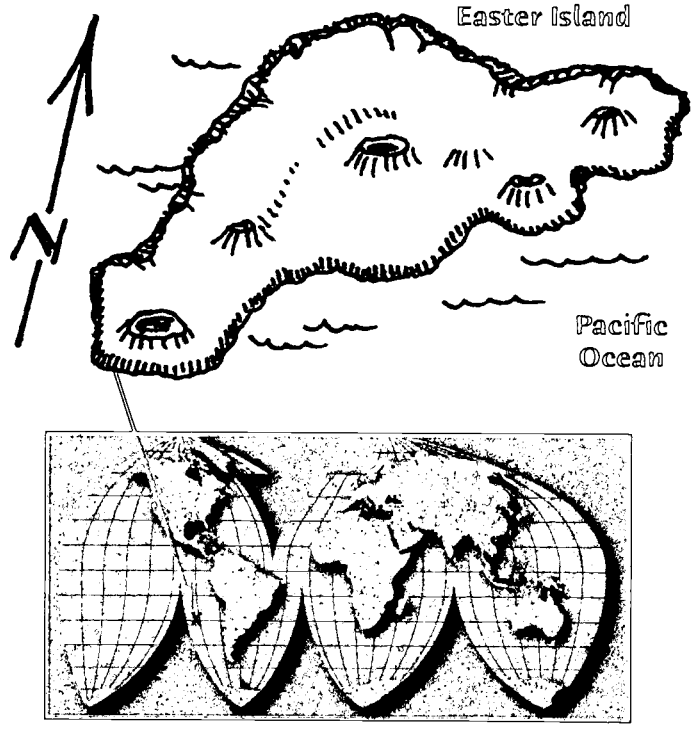
The island derives its name from its "discovery" by the Dutch explorer Jacob Roggeveen on Easter (April 5) in 1722. Roggeveen's first impression was not of a paradise but of a wasteland.

The island Roggeveen saw was a grassland without a single tree or bush over ten feet high. Modern botanists have identified only 47 species of plants native to Easter, most of them grasses, sedges, and ferns. The list includes just two species of small trees and two of woody shrubs. With such plant life, the Islanders Roggeveen encountered had no source of real firewood to warm themselves during Easter's cool, wet, windy winters. Their native animals included nothing larger than insects, not even a single species of native bat, land bird, land snail, or lizard. For domestic animals, they had only chickens.

European visitors throughout the eighteenth and early nineteenth centuries estimated Easter Island's human population at about 2,000. As Captain James Cook realized during his brief visit in 1774, the Islanders were Polynesians. Yet despite the Polynesians' well-deserved fame as a great seafaring people, the Easter Islanders who came out to Roggeveen's and Cook's ships did so by swimming or paddling canoes that Roggeveen described as "bad and frail." The canoes, only 10 feet long, held at most two people, and only three or four canoes were observed on the entire island.

With such flimsy boats, the Islanders could not travel far offshore to fish. The Islanders Roggeveen met were totally isolated, unaware that other people existed. Yet the people living on Easter claimed memories of visiting the uninhabited Sala y Gomez reef 260 miles away, far beyond the reach of the leaky canoes seen by Roggeveen. How did the Islander's ancestors reach that reef from Easter, or reach Easter from anywhere else?

Easter Island's most famous feature is its huge stone statues, more than 200 of which once stood



EASTER'S END (Cont'd.)

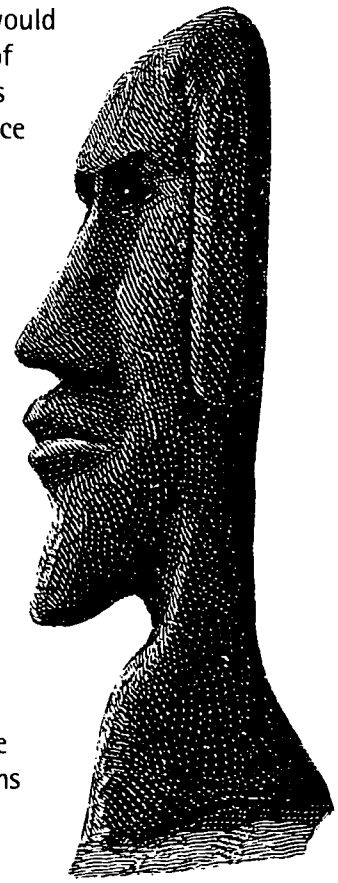
on massive stone platforms lining the coast. At least 700 more, in all stages of completion, were abandoned in quarries or on ancient roads between the quarries and the coast, as if the carvers and moving crews had thrown down their tools and walked off the job. Most of the erected statues were carved in a single quarry and then somehow transported as far as six miles—despite their being as tall as 33 feet and as heavy as 82 tons. The abandoned statues, meanwhile, were as much as 65 feet tall and weighed up to 270 tons. The stone platforms were equally gigantic: up to 500 feet long and 10 feet high, with facing slabs weighing up to 10 tons.

Roggeveen himself quickly recognized the problem the statues posed: "The stone images at first caused us to be struck with astonishment," he wrote, "because we could not comprehend how it was possible that these people, who are devoid of heavy thick timber for making any machines, as well as strong ropes, nevertheless were able to erect such images." Roggeveen might have added that the Islanders had no wheels, no draft animals, and no source of power except for their own muscles. How did they transport the giant statues for miles, even before erecting them? To deepen the mystery, the statues were still standing in 1770, but by 1864 all of them had been pulled down, by the Islanders themselves. Why then did they carve them in the first place? And why did they stop? The statues imply a society very different from the one Roggeveen saw in 1722. Their sheer number and size suggest a population much larger than 2,000 people. What became of everyone?

The fanciful theories of the past must give way to evidence gathered by hardworking scientists in three specialties: archaeology, pollen analysis, and paleontology.

Modern archaeological digs on Easter have continued since 1955. The earliest evidence of human activities are from around A.D. 400 to 700. The period of statue building peaked around 1200 to 1500, with few if any statues erected after that time. Densities of archaeological sites suggest a large population: An estimate of 7,000 people is widely quoted by archaeologists, but other estimates range up to 20,000, which does not seem impossible for an island of Easter's area and fertility.

Archaeologists have also enlisted surviving Islanders in experiments aimed at figuring out how the statues might have been carved and erected. Twenty people, using only stone chisels, could have carved even the largest completed statue within a year. Given enough timber and fiber for making ropes, teams of a few hundred people could have loaded the statues onto wooden sleds, dragged them over lubricated wooden tracks or rollers, and used logs as levers to maneuver them into a standing position. Rope could have been made from the fiber of a small native tree called the hauhau. However, that tree is now extremely scarce on Easter, and hauling one statue would have required hundreds of yards of rope. Did Easter's now barren landscape once support the necessary trees?

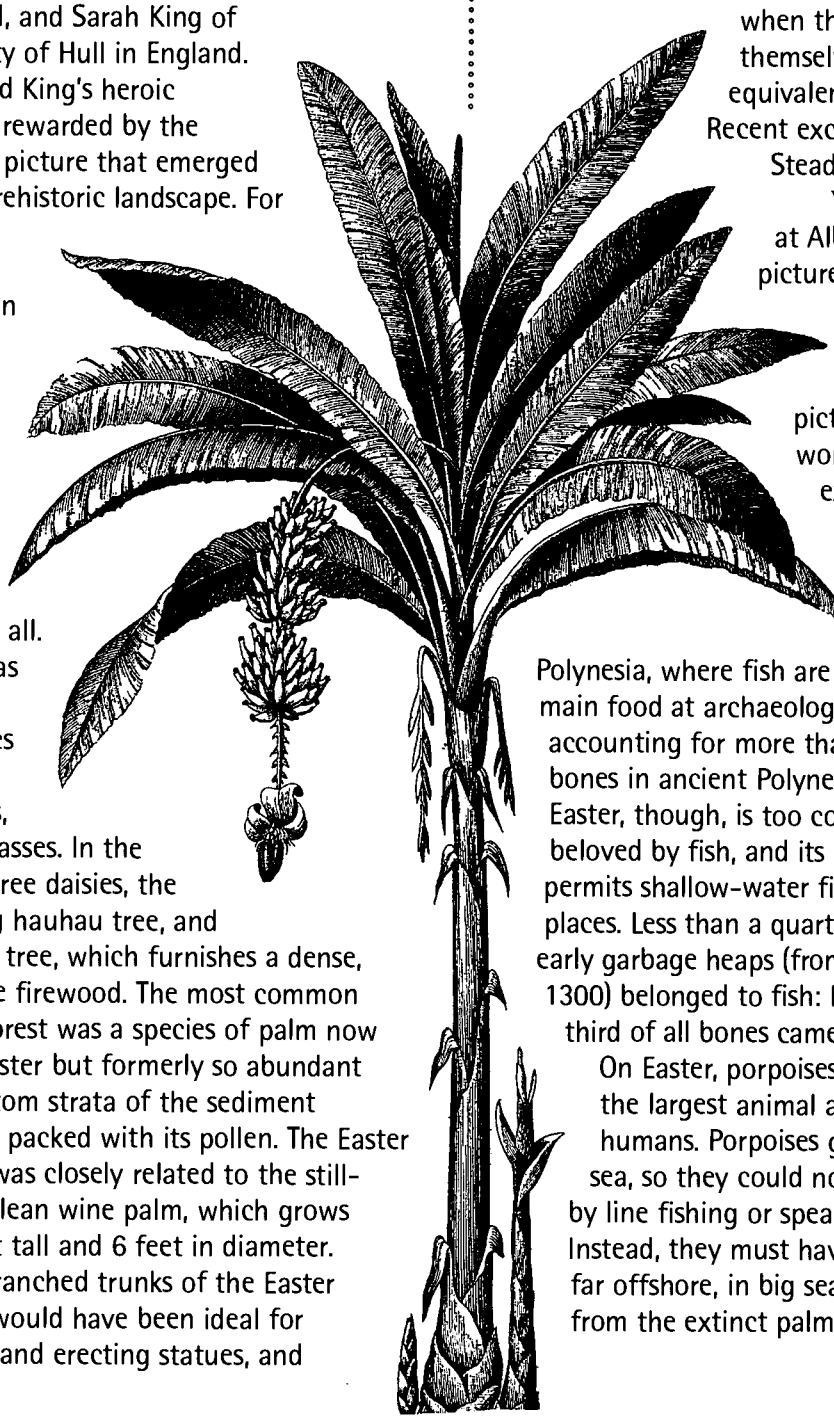


That question can be answered by the technique of pollen analysis, which involves boring out a column of sediment from a swamp or a pond, with the most recent deposits at the top and relatively more ancient deposits at the bottom. The absolute age of each layer can be dated by radiocarbon methods. Then begins the hard work: examining tens of thousands of pollen

EASTER'S END (Cont'd.)

grains under a microscope, counting them, and identifying the plant species that produced each one by comparing the grains with modern pollen from known plant species. For Easter Island, the bleary-eyed scientists who performed that task were John Flenley, now at Massey University in New Zealand, and Sarah King of the University of Hull in England.

Flenley and King's heroic efforts were rewarded by the striking new picture that emerged of Easter's prehistoric landscape. For at least 30,000 years before human arrival and during the early years of Polynesian settlement, Easter was not a wasteland at all. Instead, it was a subtropical forest of trees and woody shrubs, herbs, ferns, and grasses. In the forest grew tree daisies, the rope-yielding hauhau tree, and the toromiro tree, which furnishes a dense, mesquite-like firewood. The most common tree in the forest was a species of palm now absent on Easter but formerly so abundant that the bottom strata of the sediment column were packed with its pollen. The Easter Island palm was closely related to the still-surviving Chilean wine palm, which grows up to 82 feet tall and 6 feet in diameter. The tall, unbranched trunks of the Easter Island palm would have been ideal for transporting and erecting statues, and constructing large canoes. The palm would also have been a valuable food source, since its Chilean relative yields edible nuts as well as sap from which Chileans make sugar, syrup, honey, and wine.



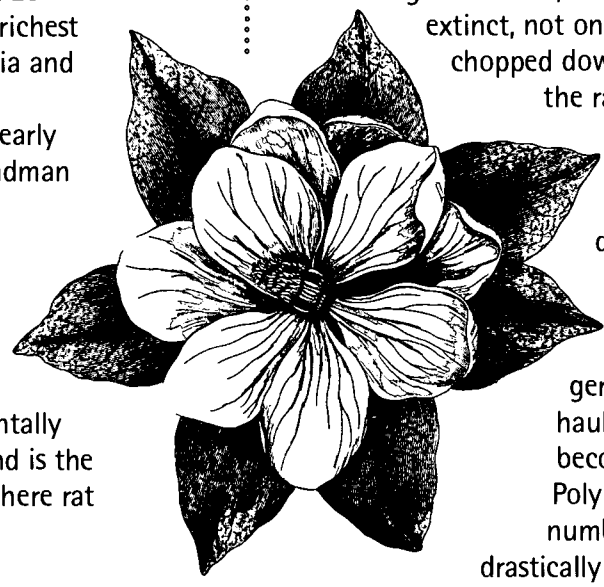
What did the first settlers of Easter Island eat when they were not glutting themselves on the local equivalent of maple syrup? Recent excavations by David Steadman, of the New York State Museum at Albany, have yielded a picture of Easter's original animal world as surprising as Flenley and King's picture of its plant world. Steadman's expectations for Easter were conditioned by his experiences elsewhere in Polynesia, where fish are overwhelmingly the main food at archaeological sites, typically accounting for more than 90 percent of the bones in ancient Polynesian garbage heaps. Easter, though, is too cool for the coral reefs beloved by fish, and its cliff-girded coastline permits shallow-water fishing in only a few places. Less than a quarter of the bones in its early garbage heaps (from the period 900 to 1300) belonged to fish: Instead, nearly one-third of all bones came from porpoises.

On Easter, porpoises would have been the largest animal available—other than humans. Porpoises generally live out at sea, so they could not have been hunted by line fishing or spear fishing from shore. Instead, they must have been harpooned far offshore, in big seaworthy canoes built from the extinct palm tree.

EASTER'S END (Cont'd.)

In addition to eating porpoise meat, Steadman found, the early Polynesian settlers were feasting on seabirds. For those birds, Easter's remoteness and lack of predators made it an ideal haven as a breeding site, at least until humans arrived. Among the large numbers of seabirds that bred on Easter were albatross, boobies, frigate birds, fulmars, petrels, prions, shearwaters, storm petrels, terns, and tropical birds. With at least 25 nesting species, Easter was the richest seabird breeding site in Polynesia and probably the whole Pacific.

Land birds as well went into early Easter Island cooking pots. Steadman identified bones of at least six species, including barn owls, herons, parrots, and rails. Bird stew would have been seasoned with meat from large numbers of rats, which the Polynesian colonists accidentally brought with them; Easter Island is the sole known Polynesian island where rat bones outnumber fish bones at archaeological sites.



Porpoises, seabirds, land birds, and rats did not complete the list of meat formerly available on Easter. A few bones hint at the possibility of breeding seal colonies as well. All these delicacies were cooked in ovens fired by wood from the island's forest.

Such evidence lets us imagine the island onto which Easter's first Polynesian colonists stepped ashore some 1,600 years ago, after a long canoe voyage from eastern Polynesia. They found themselves in a pristine paradise. What then happened to it? The pollen grains and the bones yield a grim answer.

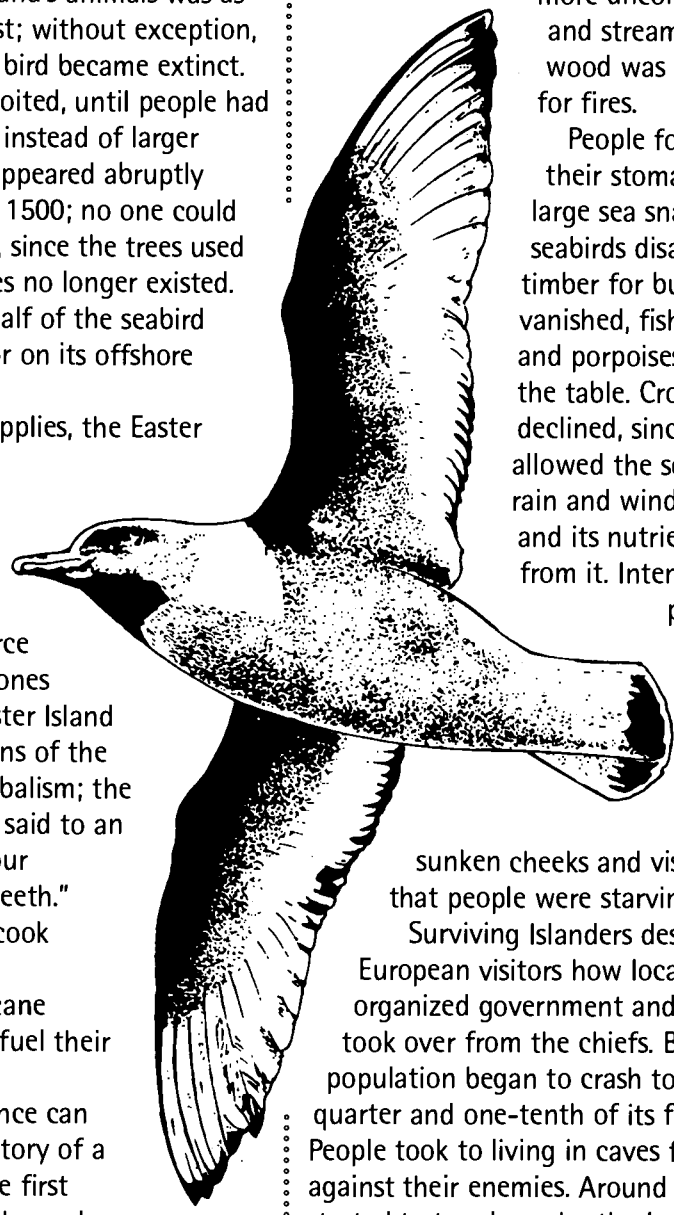
Pollen records show that destruction of Easter's forests was well underway by the year 800, just a few centuries after the start of human settlement. Then charcoal from wood fires came to fill the sediment cores, while pollen of palms and other trees and woody shrubs decreased or disappeared, and pollen of the grasses that replaced the forest became more abundant. Not long after 1400, the palm finally became extinct, not only as a result of being chopped down but also because the rats prevented its germination: Of the dozens of preserved palm nuts discovered in caves on Easter, all had been chewed by rats and could no longer germinate. While the hauhau tree did not become extinct in Polynesian times, its numbers declined drastically until there weren't enough left with which to make ropes. By 1955 only a single, nearly dead toromiro tree remained on the island, and even that lone survivor has now disappeared.

The 15th century marked the end not only for Easter's palm but for the forest itself. Its doom had been approaching as people cleared land to plant gardens; as they felled trees to build canoes, to transport and erect statues, and to burn; as rats devoured seeds; and probably as the native birds died out that had pollinated the tree's flowers and dispersed their fruit. The overall picture is among the most extreme examples of forest destruction anywhere in the world: the whole forest gone, and most of its tree species extinct.

EASTER'S END (Cont'd.)

The destruction of the island's animals was as extreme as that of the forest; without exception, every species of native land bird became extinct. Even shellfish were overexploited, until people had to settle for small sea snails instead of larger cowries. Porpoise bones disappeared abruptly from garbage heaps around 1500; no one could harpoon porpoises anymore, since the trees used for constructing large canoes no longer existed. The colonies of more than half of the seabird species breeding on Easter or on its offshore islets were wiped out.

In place of these meat supplies, the Easter Islanders intensified their production of chickens, which had been only an occasional food item. They also turned to the largest remaining meat source available: humans, whose bones became common in late Easter Island garbage heaps. Oral traditions of the Islanders are rife with cannibalism; the biggest insult that could be said to an enemy was: "The flesh of your mother sticks between my teeth." With no wood available to cook these new food sources, the Islanders resorted to sugar cane scraps, grass, and sedges to fuel their fires.



All these strands of evidence can be wound into a complete story of a society's decline and fall. The first Polynesian colonists found themselves on an island with fertile soil, abundant food, bountiful building materials, and all that they needed for comfortable living. They prospered and multiplied.

Eventually Easter's growing population was cutting the forest more rapidly than the forest was able to grow back. As the forest disappeared, the Islanders ran out of timber and rope to transport and erect their statues. Life became more uncomfortable—springs and streams dried up, and wood was no longer available for fires.

People found it harder to fill their stomachs as land birds, large sea snails, and many seabirds disappeared. Because timber for building canoes vanished, fish catches declined and porpoises disappeared from the table. Crop yield also declined, since deforestation allowed the soil to be eroded by rain and wind, dried by the sun, and its nutrients to be leached from it. Intensified chicken production and cannibalism replaced only parts of those lost foods. Preserved statuettes with sunken cheeks and visible ribs suggest that people were starving.

Surviving Islanders described to early European visitors how local chaos replaced organized government and a warrior class took over from the chiefs. By around 1700, the population began to crash toward between one-quarter and one-tenth of its former number. People took to living in caves for protection against their enemies. Around 1700 rival clans started to topple each other's statues, breaking their heads off. By 1864 the last statue had been thrown down and destroyed.

As we try to image the decline of Easter's civilization, we ask ourselves, "Why didn't they look around, realize what they were doing, and stop before it was too late? What were they thinking when they cut down the last palm tree?"

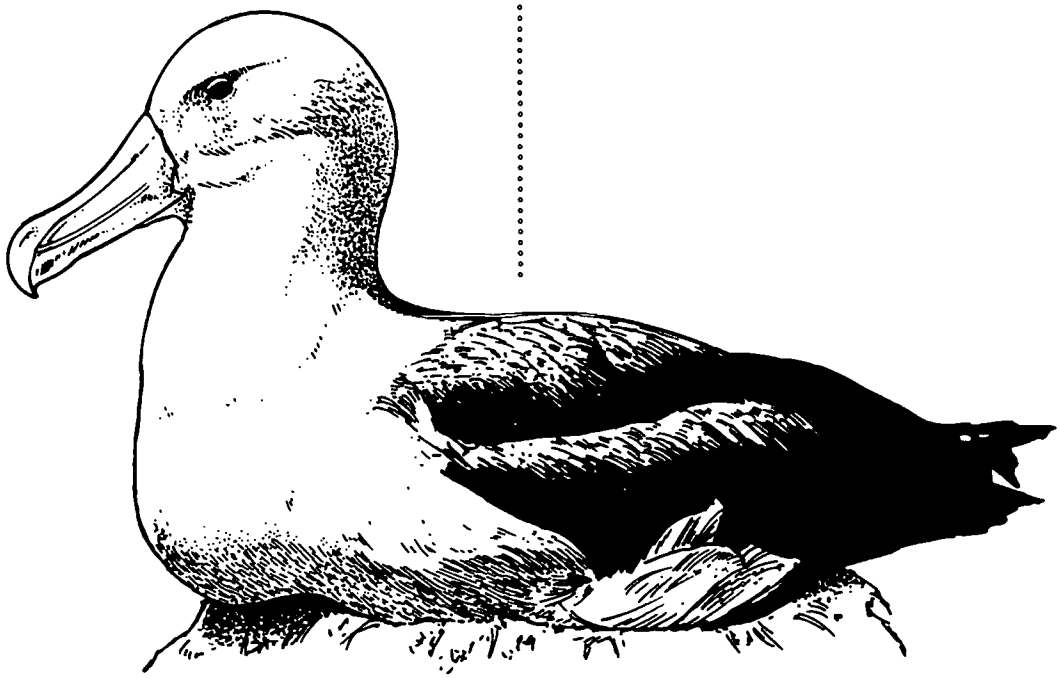
I suspect, though, that the disaster happened not with a bang but with a whimper. After all,

EASTER'S END (Cont'd.)

there are those hundreds of abandoned statues to consider. The forest the Islanders depended on for rollers and rope didn't simply disappear one day—it vanished slowly, over decades. Perhaps war interrupted the moving teams; perhaps by the time the carvers had finished their work, the last rope snapped. In the meantime, any Islander who tried to warn about the dangers of deforestation would have been overridden by carvers, bureaucrats, and chiefs, whose jobs depended on continued deforestation. The changes in forest cover from year to year would have been hard to detect: Yes, this year we cleared those woods over there, but trees started to grow back again on this abandoned garden site here. Only older people, recollecting their childhoods decades earlier, could have recognized a difference. Their children could no more have understood their parents' tales than my eight-year-old son today can understand my wife's and my tales of what Los Angeles was like 30 years ago.

Gradually trees became fewer, smaller, and less important. By the time the last fruit-bearing adult palm was cut, palms had long since ceased to be of importance. That left only smaller and smaller palm saplings to clear each year, along with other bushes and treelets. No one would have noticed the felling of the last small palm.

It would be easy to close our eyes or give up in despair. If mere thousands of Easter Islanders with only stone tools and their own muscle power managed to destroy their society, how can billions of people with metal tools and machine power do better? But there is one crucial difference. The Easter Islanders had no books and no histories of other doomed societies. Unlike the Easter Islanders, we have histories of the past—information can save us. My main hope for my son's generation is that we may now choose to learn from the fates of societies like that of Easter Island.



Easter Island Close Read

Text Dependent Questions Reread the comic to find determine the answer to these questions. Your answer must be in YOUR OWN WORDS or it is plagiarism.	Comic Box # used to support your answer
1. How did the Polynesians move the giant stone statues?	
2. Describe two different methods scientists used to figure out what Easter Island originally looked like.	
3. How did the disappearance of the trees affect the rest of the ecosystem on the island? Explain why these events were connected.	

SAUSD Common Core Lesson Planner **Teacher:**

<table>
<tr><td>Unit:
Biodiversity
Day: 7
Lesson: 5</td><td>Grade Level/Course:
Grade 7/Life Science</td><td>Duration: 1 class period
Date:
Threat to Biodiversity: Non-Native Organism & Human Impact</td></tr>
<tr><td colspan="3">Big Ideas:
All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:
• How are organisms dependent on their interactions with other organisms and with nonliving factors?
• How does human activity influence the sustainability of an ecosystem and its natural resources?
• Why is biodiversity loss a concern?</td></tr>
<tr><td>Common Core and Content Standards</td><td colspan="2">Content Standards:
LS2.A Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
LS4.D Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on.
LS2.C Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Reading Standards for Literacy in Science and Technical Subjects:
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
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.
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Writing Standards for Literacy in Science and Technical Subjects:
1. Write arguments focused on discipline-specific content.

Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):
1. Students 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 other's ideas and expressing their</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">own clearly
9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">Student Resource: 5.1 Root Word Tree
Student Resource: 5.2 Catch That Toad Quick Write
Teacher Resource: 5.2a Video Clip – “Catch that Toad”
Student Resource: 5.3 Three Step Interview about quick write
Student Resource: 5.4 Priority Pyramid handout
Teacher Resource 1.5a Bill Nye Video Clip (In Lesson 1)
Student Resource: 5.5 Priority Pyramid blocks to cut out
Teacher Resource 5.6 “Midway Island” video
Supplemental Resource: Build on and Challenge Sentence Starters</td></tr>
<tr><td>Objectives</td><td>Content:
Students will be able to describe how human actions affect an ecosystem by examining the dynamic interconnected relationships between various populations of organisms as well as the relationship between biotitic and abiotic factors.</td><td>Language:
Students will summarize verbally and in writing their individual and group member’s opinion.

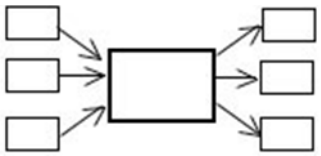
Students will engage in a collaborative discussion in order to express their biodiversity priorities.</td></tr>
<tr><td>Depth of Knowledge Level</td><td colspan="2">☐ Level 1: Recall ☒ Level 2: Skill/Concept
☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
<tr><td>College and Career Ready Skills</td><td colspan="2">☒ Demonstrating independence ☐ Building strong content knowledge
☒Responding to varying demands of audience, task, purpose, and discipline
☐ Comprehending as well as critiquing ☐Valuing evidence
☒Using technology and digital media strategically and capably
☒ Coming to understand other perspectives and cultures</td></tr>
<tr><td>Common Core Instructional Shifts</td><td colspan="2">☒ Building knowledge through content-rich nonfiction texts
☒ Reading and writing grounded from text
☐ Regular practice with complex text and its academic vocabulary</td></tr>
</table>

Academic Vocabulary (Tier II & Tier III) / TEACHER PROVIDES SIMPLE EXPLANATION	KEY WORDS ESSENTIAL TO UNDERSTANDING	WORDS WORTH KNOWING
	Invasive Biodiversity Native Non-Native	Priority Impact Exotic Transplanted
Pre-teaching Considerations	This unit is designed to be self-contained. However student familiarity with ecosystems and the relationship between biotic and abiotic factors will greatly affect the pacing as well as the level of guided practice needed. Note that the focus of this unit is the impact of human behaviors on biodiversity including species populations as well as environmental resources. A homework assignment due at the end of the week is included as an optional extension activity for teachers who regularly assign homework as part of their class routines. If you plan to use it, be sure to give students sufficient time to complete the homework.	
Lesson Delivery		
Instructional Methods	**Check method(s) used in the lesson:** ☒**Modeling** ☒**Guided Practice** ☒**Collaboration** ☐ **Independent Practice** ☒**Guided Inquiry** ☒ **Reflection**	
Lesson Contin / **Lesson Open-ing**	**Preparing the Learner** Prior Knowledge, Context, and Motivation: **Root Word Breakdown (~5 mins)** 1. Write the word "native" on the board with the root "nat" in one color and "ive" in a different color. Explain to students that a word dissection can often help bring meaning to complex or unfamiliar words. 2. The root "nat / nasc" has to do with birth, life/home, and origin. It comes from the Latin word nacor. Latin roots are often the base for science words and students may see them in Spanish and in English words. *Example, "native" means being the place or environment in which a person was born or a thing came into being: one's native land."Nacer" is Spanish for "to be born" or "birth."* 3. Draw/project the outline of a large tree on the board. Write the roots "nat/nasc" on the trunk of the tree. Make the connection of roots as the origins of a tree, or life and as origins of words. 4. Ask students to help you fill up the "branches" of the Root Word Tree handout that have the root "nat or nasc" in them. Remind students that root words can be found towards the beginning of words, may have prefixes in front of them or suffixes after them. Students can refer to dictionaries, if necessary. It's okay if they don't know what the word	

		means when they offer it. If students offer words in Spanish, write it in a different color of ink. **Possible "nat/nasc" words:** native, nature, natural, nation, national, nationality, international, unnatural, supernatural, innate, nativity, nacer, natal, prenatal, naturalize, naturalization, non-native Teacher may also explain related words: renaissance –rebirth, naiveté-quality of being childishly simple, navidad –Christmas/birth of Jesus 5. Now ask students to look back at the first word you wrote: **Native**. *An organism that is **nat**ive to an area or that lives in its **nat**ive environment is in its **nat**ural environment (where it is naturally supposed to be).* Have students add a definition for **nat**ive to their Root Word Tree for future reference. 6. Ask students what they think "non-**nat**ive" means? Accept ideas, but you **don't** need to define the word yet! **"Catch that Toad" Video (15 min)** 1. **First View**: The teacher will briefly introduce an unencumbered view (watch without writing or directed instruction) the "Catch that Toad" video (5:20 mins). 2. Following this video, have students double check their definition of "non-native." The term native and invasive are introduced in the video, but ask students to help clarify what these terms mean. You might give the example of someone invading your seat on the bus or the couch to show that invasive organisms are not usually welcome and are **potentially** harmful (not all) to the original organisms in the area. 3. **Second View**: Students look at the two quick write questions before watching. They will share their responses in teams afterwards so the quick write is an individual activity. 4. Give students 4 minutes after the video to complete both quick writes. (Sampled Responses: Non-native organisms are moved frequently by humans either on purpose or by accident; organisms stow away on ships, cars, planes etc; float in the wind; float in the water; are eaten by birds who fly away and "drop" the seeds in new locations; **Interacting with the concept/text:** **"Catch that Toad": Three Step Interview (~20 min)** 1. Assign groups of 4 students a letter A, B, C, or D. Students write their name and group letter onto the Three Step Interview Template. 2. Partners A and B pair up while C and D pair up. ***NOTE**: The easiest way to facilitate this is to walk students through this as they progress rather than explaining the whole thing upfront.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	<u>*Step 1*</u>: Simultaneously, Student A interviews student B while student C interviews student D about the first quick write question. Partners B and D share their responses. And partners A and C take notes on B and D's responses. (1-2 minutes) **Project language supports for students**: • "I think a non-native organism might be moved because…" • "My partner described..." • "According to my partner, one reason an organism could be transplanted is…" • "One way a plant/animal could be moved is…" <u>*Step 2*</u> - Students then reverse roles with B interviewing A and D interviewing C while taking notes. (1-2 minutes) <u>*Step 3*</u>: Now all 4 students in the group work together with each student orally describing to the group what they heard their partner say during their interview. (2 min/per person) **NOTE**: This is a great time for students to assess if their partners really heard what they said and represented their ideas accurately. If an inaccurate statement is made, the student <u>must let the partner finish</u>, but should then politely clarify his/her actual response. Students are often surprised at how difficult it is to listen closely and re-present information. 3. After the 3 Step Interview, ask students if they can think of the ultimate invasive species? Hint: it's us. 4. Before moving into the Priority Pyramid, have students focus on the Essential Questions of the lesson and Big Idea of the unit. • How are organisms dependent on their interactions with other organisms and with nonliving factors? • How does human activity influence the sustainability of an ecosystem and its natural resources? • Why is biodiversity loss a concern? **Preparing the Learner: (~10mins)** The focus of these activities is to start considering the role humans play in affecting biodiversity. 1. **Discuss** with students: Every choice we make has a consequence. Do you drop garbage on the ground or put it in your pocket to throw away later? Do you recycle your paper and plastic or throw it away? Do you have a place to recycle at home or at school? Do you turn the water off when you brush your teeth or just let it run? Do you dry your hands with 1, 2, 3 paper towels?	**Students needing additional supports:** Print out the language supports and place them on the table to support academic conversation. Homogenous grouping to increase the group rigor or to level the playing field. Heterogeneous grouping to provide immediate support to students. Teacher circulation for immediate support and feedback. Access the "Catch that toad" video and the "midway" video on youtube and enable closed captioning. Extend writing time for quick write.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Priority Pyramid Activity:** (Resource 5.4 and Resource 5.5) **Priority Sort: (10-15mins)** 1. Students look at the different boxes (Resource 5.5) on the priority pyramid and rank them with 1 being the most important and 15 as the least important for realizing their vision of Earth when they are 50. ***NOTE**: Most topics are self-explanatory, but students may not remember/know why bees are important to our future. Explain that bees are essential for pollination of many of our food crops like fruits, vegetables, and nuts. Without bees, we would need to artificially pollinate plants making food more expensive and some foods impossible to grow. 2. Students can write in how they ranked the priorities OR cut the blocks out and glue them in on resource 5.4 3. Justify in writing how they ranked #1 and #15. Emphasize that there is no correct order just student logic. **Discussion:** **"Save The Last Word for Me" (~15mins)** **Overview:** In groups of 3-5, students are going to take turns sharing how they selected their most important or least important priority block and then comment on each other's priorities. Students will comment using the "Building on and Challenging" sentence starters. **Model using sentence starters if necessary.** 1. First student shares their #1 or #15 ranked priority block to the group, but does NOT say why it is ranked this way. 2. Going in a circle, the rest of the group comments one at a time on the priority's rank, explaining if they agree or disagree with its order and saying why they think so. "Building on and Challenging" sentence starters (Supplemental Resource) should be used to guide and prompt conversation. 3. Last up, after all other students have commented, the first student explains how they decided on this ranking for the priority. Repeat until all students have shared. **Extending Understanding** 1. Bring students back to the essential questions of the day, focusing on • *How does human activity influence the sustainability of an ecosystem and its natural resources?* • *Why is biodiversity loss a concern?* 2. With these questions in mind, play the second part of the Bill Nye video (resource 1.5 from lesson 1) clip from minute 6:29 to 11:15.

		3. Have students begin the "Cause & Effect" mini thinking map (resource 5.4) to help students focus on their ability to make a difference and to stop the loss of biodiversity. **Model** how an action (cause) can lead to an increase in biodiversity which can in turn lead to a positive change or outcome. ***Ex:*** *Turning the water off when brushing my teeth →helps protect biodiversity→ saves the city/my family money because water is not wasted*  4. Follow this up with the video "Midway Island." The purpose of this video, about an island 2000 miles from the nearest body of land, is that we don't always see or understand the consequences of our actions, but that doesn't excuse us from making poor decisions. Scientists went to this atoll thinking it would be a pristine and untouched island (a bit like explorers thought Easter Island would be) and found a place covered in garbage. Students may feel this is an enormous and depressing issue. It is, but emphasize that they can make a difference both individually and by encouraging their family members and friends to step it up too. 5. Give students 2 more minutes to add to their "Cause & Effect" thinking map. They can work in pairs or as a class. Share out how these actions will create positive after effects as a class **Optional Extension** • Ask groups from Save the Last Word for Me to collaborate and create one new pyramid that all of them agree on. **Optional Extension: Cause & Effect** • Have students keep a "future log" for a day. Explain that the point of the log is to focus on how their activities, behaviors, and even their thoughts can affect the future. • In the log they should simply write down what they do, think, say, and so forth just as they would in a diary. In the log, however, they should use "bullet style" instead of paragraphs. • At the end of the day, they should think about and write down how each "bullet" affects the world around them, either positively or negatively, and what the ramifications could be for the future. • Have the students add ways that they can do more to create a positive future by changing their daily actions.
Lesson Reflection		
Teacher Reflection Evidenced by Student Learning/ Outcomes		

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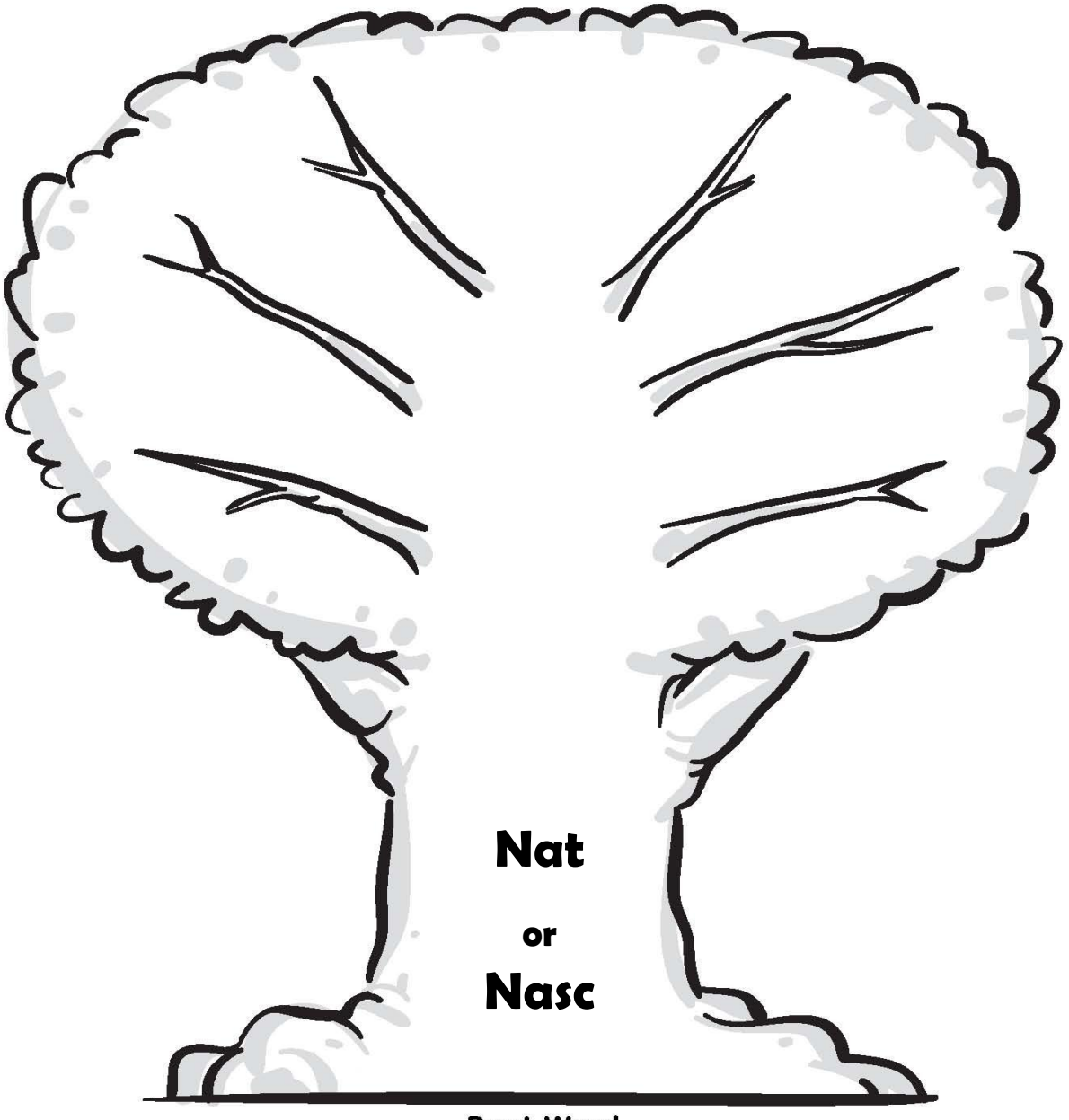
Name _____ **Date** _____

Root Word Tree

Write a root at the base of the tree. On the branches write six or more words that use that root.



Fill in the branches with words containing the root "nat" or "nasc" in English or Spanish. Roots can be found at the beginning of words, with prefixes before them or suffixes after them. Words with the root nat/nasc have to do with birth, start of life, and home. For example, "**nat**ive" means 'Belonging to something by birth." Add more branches if you can think of more words!

Catch That Toad! Quick Write

1. Think up three ways non-native or invasive organism might get transplanted or moved from their original native home to a different spot in the world. Discuss ways that one plant/seeds and one animal besides the Cane Toad might get moved.

Animal:_____

_____

_____

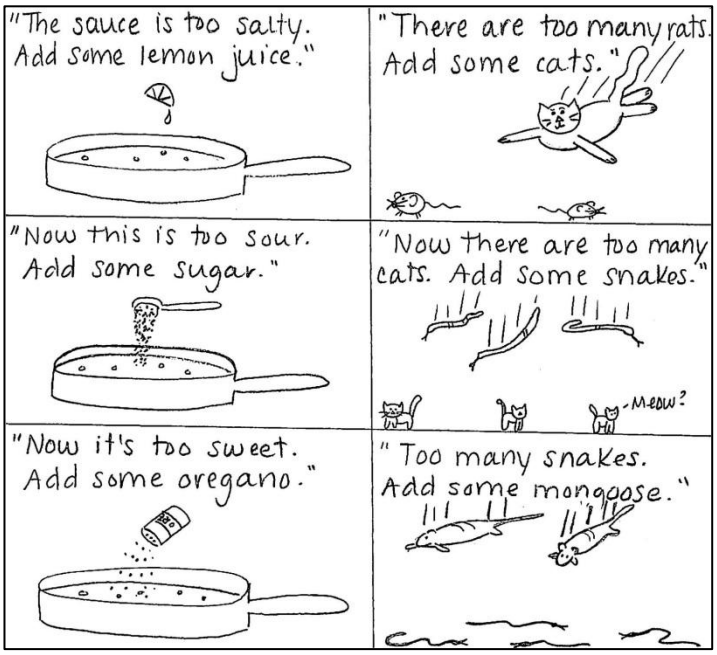
Plant/Seeds:_____

_____

_____

Part 2:

2. Look at the two comics to the right. How is the description of making a sauce similar to what happened in Australia with the Cane Toad?



_____

_____

_____

_____

_____

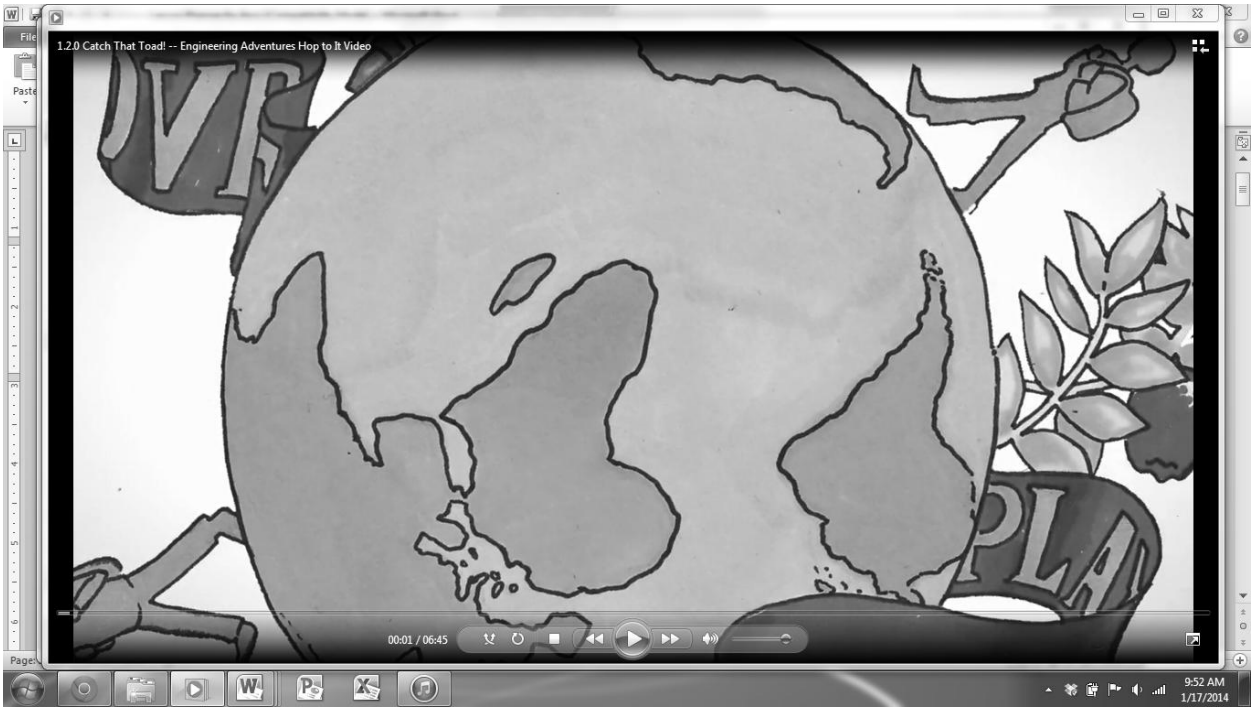
_____

_____

_____

Cane Toad Invasion

❝Engineering Adventures Hop to It Video"



Length: Stop at 5:20 or the video goes into a discussion (40 seconds) about designing a trap to catch the Cane toad. This is a great extension for a quick write or for extra credit, but may distract your students if you continue the video and then don't let them do this.

Source: http://www.eie.org/content/hop-it "Engineering is Elemental"

Summary: The video discusses the Cane Toad who was brought to Australia in the 1930s by farmers who needed help combatting a problem with beetles eating their sugar cain crops. The problem is the Cain toad, (from South America) didn't eat the beetles and their population exploded because nothing can eat the Cain toad without dying almost immediately because the toad's skin is full of toxins.

Non-Native Species 3 Step Interview

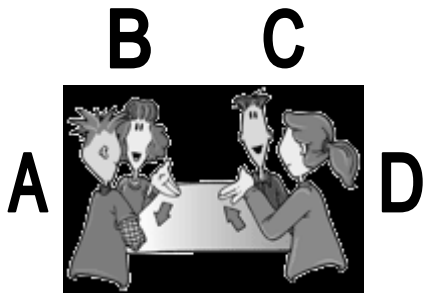
Circle one: I am Partner A B C D My name is:_____

Directions: Share your response to the quick write about how a non-native species might get transplanted from their native environment to a new location. Listen closely to your partner's response as you will need to share what they say with the rest of the team.

My partner is A B C D Their name is _____ My notes while listening to my partner that I will be sharing with others:	
My notes while listening to my 3rd partner	My notes while listening to my 4th partner

Three Step Interview:

How it Works



Step One: A interviews B by asking the quick write question

while

C interviews D

Step Two: B interviews A asking the quick write question

while

D interviews C

Step Three: 1. A reports to the whole group about B

2. B reports to the whole group about A

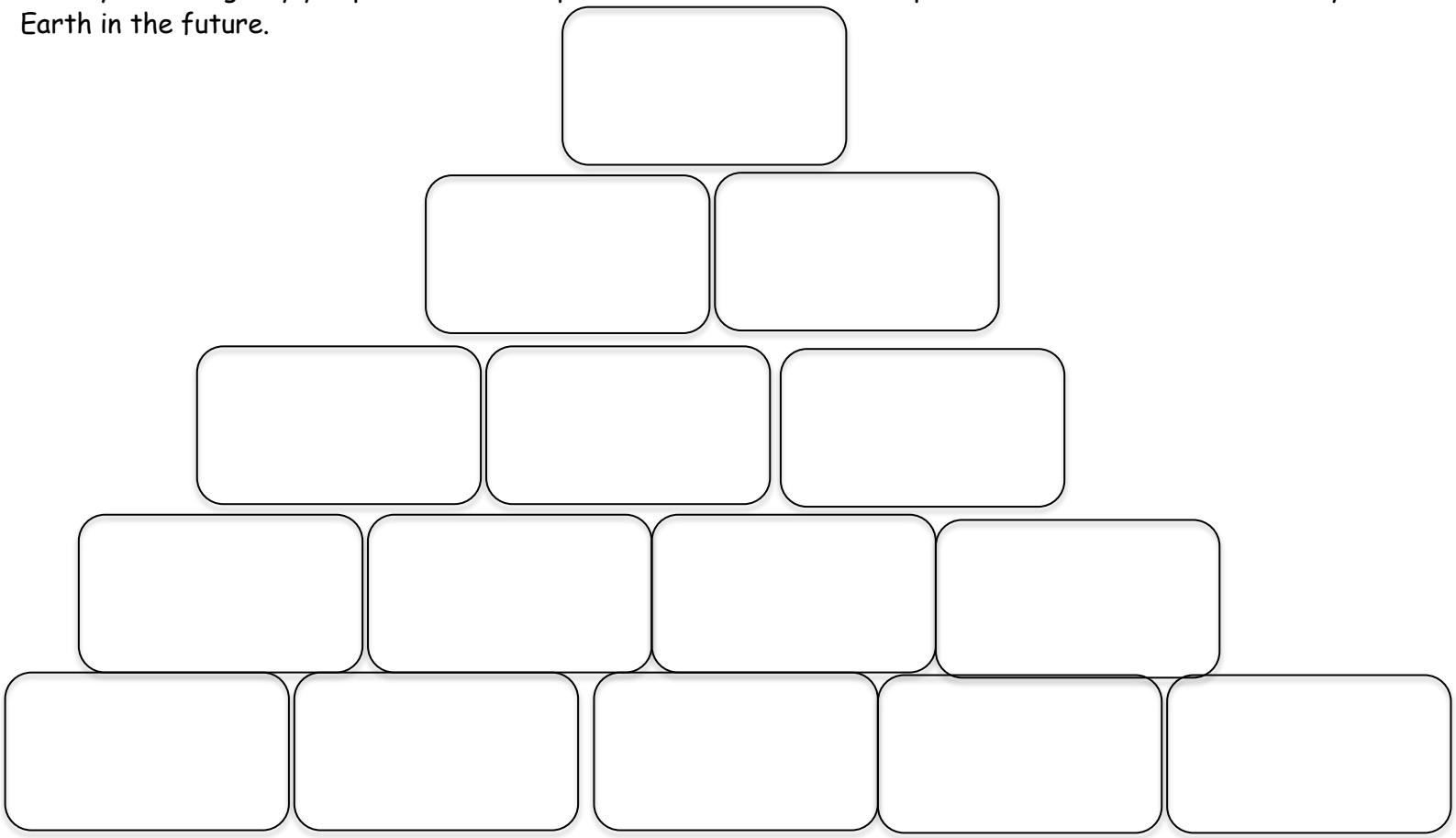
3. C reports to the whole group about D

4. D reports to the whole group about C

Priority Pyramid

How do you envision Earth and its biodiversity when you are 50 years old? What are the most important elements to make your plan a reality? Look at the priority pyramid blocks and consider how each plays a role in shaping the future.

1. Carefully consider the 15 blocks and rank them 1-15 with #1 being the MOST important to your vision and #15 being the least important.
2. Arrange them to make a pyramid with #1 at the top.
3. Justify in writing why you put #1 at the top and #15 at the bottom. Explain how it is essential or not to your vision of Earth in the future.



Priority Pyramid

Justify your choices: "I placed _____ in spot #___ because..."

Block #1: _____

_____

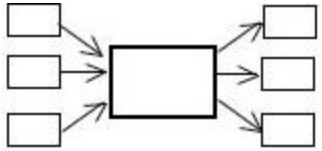
_____

Block #15: _____

_____

_____

Cause & Effect: Write all the positive changes you and your family can make RIGHT NOW to increase and protect biodiversity. Om the right side, write down all of the benefits of your actions. Your final thinking map will look like the image on the right but with many more ideas!



CAUSES/THINGS YOU CAN DO

EFFECTS OF YOUR ACTIONS/BENEFITS

Increase and/or Protection of Biodiversity

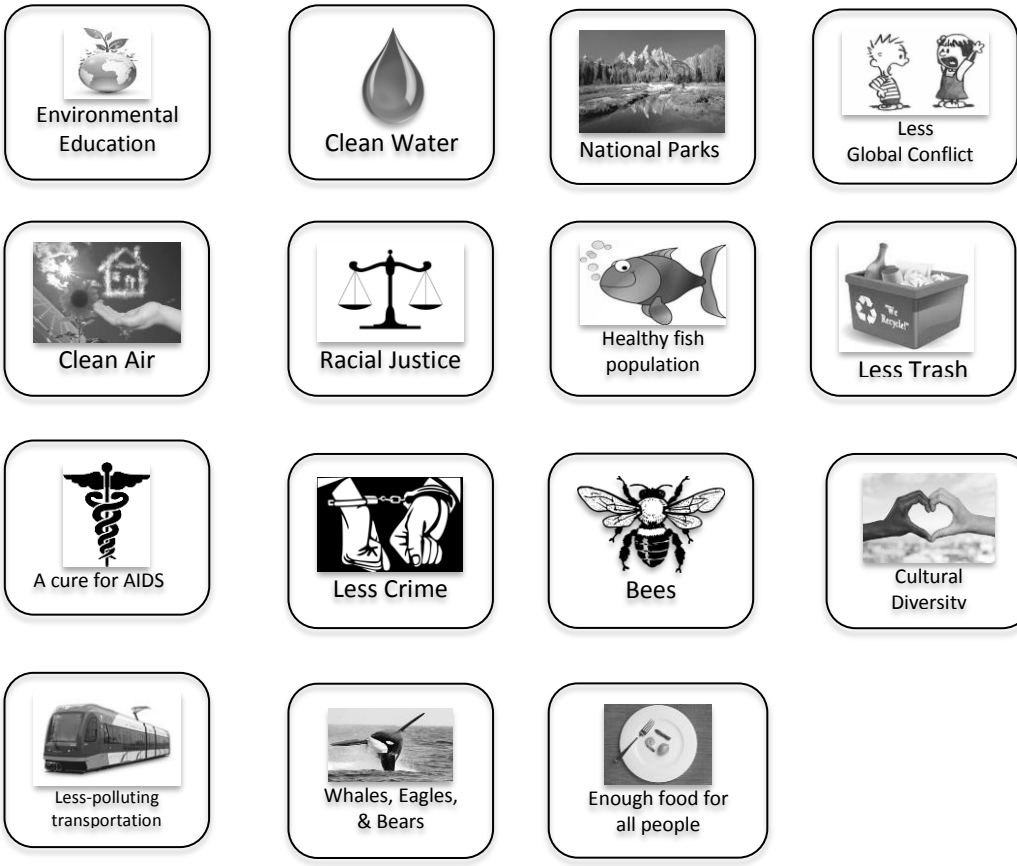
Bill Nye & Biodiversity

Lesson 5: Where do people fit into the biodiversity equation?

Second Clip: 6:29-11:15

Summary: Bill takes a look at the choices and decisions have made and how those have affected our local ecosystems. It discusses the cause and effect

Priority Pyramid



Midway Island, in the Pacific North West

SAUSD Common Core Lesson Planner **Teacher:**

Unit: BIODIVERSITY **Day: 8-10** **Lesson 6**	**Grade Level/Course:** 7TH Grade Life Science	**Duration: 3 day** **Date:** **Threats to Biodiversity: Invasive Species**

Big Idea: All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:

- How does human activity influence the sustainability of an ecosystem and its natural resources?
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- Why is biodiversity loss a concern?

Common Core and Content Standards	**Content Standards:** **LS2.A** Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. **LS4.D** Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on. **LS2.C** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations. **MS-LS2-2**. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **Reading Standards for Literacy in Science and Technical Subjects**: **Bundled Reading Informational Text Standard(s):** 2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. 8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. **Writing Standards for Literacy in Science and Technical Subjects**: **Bundled Writing in Science Standard(s):** 1. Write arguments focused on *discipline-specific content*. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. e. Provide a concluding statement or section that follows from and supports the argument presented.

<table>
<tr><td></td><td colspan="2">Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):

9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">Student Resource 6.1 “What is a panther” article
Supplemental Resource: Panther Files “Panther File Cards
Teacher Resource 6.2: Video “The Florida Panther”
Optional Teacher Resource 6.2a “Panther Solution”
Student Resource: 6.3 “HIPPO Matrix”
Student Resource 6.4 HIPPO “threats to biodiversity”
Student Resource 6.5 “HIPPO video Notes
Teacher Resource 6.5a “Invasive Species Spreading Across America”
Student Resource 6.6 “Jigsaw Matrix for invasive species articles”
Student Resource 6.6a “Burmese Python”
Student Resource 6.6b “Fruit Flies”
Student Resource 6.6c “Goldfish”
Student Resource 6.6d “Kudzu”</td></tr>
<tr><td>Objectives</td><td>Content:
Students will be able to understand how invasive species are a threat to biodiversity and to an ecosystem as a whole.</td><td>Language:
Students will extract the central idea from texts in order to discuss invasive species in a group and whole-class setting</td></tr>
<tr><td>Depth of Knowledge Level</td><td colspan="2">☒ Level 1: Recall ☒ Level 2: Skill/Concept
☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
<tr><td>College and Career Ready Skills</td><td colspan="2">☒ Demonstrating independence ☒ Building strong content knowledge
☒Responding to varying demands of audience, task, purpose, and discipline
☒ Comprehending as well as critiquing ☐Valuing evidence
☐Using technology and digital media strategically and capably
☐ Coming to understand other perspectives and cultures</td></tr>
<tr><td>Common Core Instructional Shifts</td><td colspan="2">☒ Building knowledge through content-rich nonfiction texts
☒ Reading and writing grounded from text
☒ Regular practice with complex text and its academic vocabulary</td></tr>
</table>

Academic Vocabulary (General & Domain Specific)	**TEACHER PROVIDES SIMPLE EXPLANATION**	**KEY WORDS ESSENTIAL TO UNDERSTANDING**	**WORDS WORTH KNOWING**
		Habitat Invasive species Introduced species Pollution Population growth Over-consumption	DDT pesticide
	STUDENTS FIGURE OUT THE MEANING	Habitat fragmentation	Dilemma
Pre-teaching Considerations		Before the unit • Check that all videos open and function correctly. • Be sure to have the Panther File cards cut out and ready for each group. (20 sets for pairs). You may want to laminate before using to extend life of cards. • Chart Paper maybe helpful for presenting the HIPPO dilemma.	
Lesson Delivery			
Instructional Methods		**Check method(s) used in the lesson:** ☐**Modeling** ☒**Guided Practice** ☒**Collaboration** ☒ **Independent Practice** ☒**Guided Inquiry** ☒ **Reflection**	
Lesson Continuum	**Lesson Open-ing**	**<u>Preparing the Learner (~5 minutes)</u>** Prior Knowledge, Context, and Motivation: 1. Ask students to think in pairs, what is the biggest type of "cat" that naturally lives in the United States? If they are stuck, tell them that a lion and a tiger are kinds of cats, but are not native to the US. (The cat family is called the *Felidae* family in the scientific community.) 2. Ask groups to share out and accept all answers. **Interacting with the concept/ text: (~40 mins)** 3. Tell students that today they are going to be learning about the "Panther." In California, we usually call this a mountain lion. Read aloud to students the "Panther Problem" short article. 4. Ask students to read the prompt for the quick write (Resource 6.1) before showing the video about the Florida panther (a 6 minute video) 5. Give students 3 minutes to answer the quick write questions after the video. If students are stuck, you can show the video again or ask them to brainstorm in partners.	

Lesson Continuum

Lesson Open-ing

Interacting with the concept/ text continued

6. Chart student responses on the board (*Ex*. Forests were cleared, limiting natural habitat. Panthers were a source of food. Panthers were large predators that people killed out of fear. Invasive species limited panther's source of food. Human population expanded and limited the native environment of the panther).

7. Discuss with students that there are many reasons for the decline of the Florida panther. Give each group of two students a set of "Panther File" cards. Have students reach each card out loud in their groups.

8. Next have pairs organize the cards into four or five major categories of threats to the Florida panther. Tell students that there is no right or wrong way to sort their cards, some categories may only have one or two cards in them, and some cards may seem to fit into more than one category. Have students name the categories of threats they used.

9. **Discuss as a class the threats to the Florida panther.** Have groups share out the threats they came up with and the problems that fit into those threats. Record ideas on the board. After all groups have participated, have the students compare the categories the groups came up with. Are there any categories that can be lumped together? You may want to draw lines to connect similar categories.

10. **Explain and discuss the H.I.P.P.O. dilemma.** To understand the role people are playing in biodiversity loss, it helps to think of something called the HIPPO dilemma. This term doesn't refer to hippopotamuses; rather, it's an acronym for the main threats to biodiversity.

11. Have the students read over the H.I.P.P.O. matrix handout. Use the Vocabulary in Context (QTEL) discussion frames below to lead students through the reading of the matrix/chart. Post the language supports on the board to prompt students.

Review each of the categories with the students:

H—habitat loss, I—invasive species, P—pollution, P—population growth of humans, O—over-consumption.

Working with Vocabulary in Context- The H.I.P.P.O. Dilemma

Possible language supports for partner interaction or whole class discussion

- What is one effect of the environmental threat _____?
- One effect of the environmental threat _____ is that it affected the environment by_____.
- What does the letter "_____" in the H.I.P.P.O. dilemma refer to?
- The letter "___" in the H.I.P.P.O. dilemma is about_____.
- What is one detail or example of the environmental threat _____?
- One detail or example of the environmental threat _____is _____.

12. T e

them practice with the H.I.P.P.O "Threats to Biodiversity" resource. Have students work in pairs and then check their answers with another pair of students.

HIPPO Threat ANSWERS: these may vary depending on how students interpret each category.

A = Habitat loss
B = Invasive species
C = Pollution
D = Population growth of humans
E = Over-consumption of natural resources

1. D; 2. E; 3. E; 4. B; 5. D; 6. E; 7. B;

8. E or D; 9. C; 10. A; 11. E; 12. C 13. D

Discussion: Ask your students to compare the HIPPO categories to the categories they came up with. How are they similar? Different? Can they think of any other endangered animals or plants that are affected by one or more of the HIPPO problem?

Extending/Transferring Understanding: (~10 minutes)

1. **Students will now resort their Panther File cards** according to the HIPPO Dilemma categories. There is some flexibility in these categories as students may interpret the card or category differently. Check for understanding but accept reasonable alternatives.

Panther File Sort: Sample Answers

Habitat loss: A, B **I**nvasive species: F **P**ollution: E
Population growth of Humans: C, G, H , J, L
Over-consumption of natural resources: D, I, K

2. **Discussion**: Ask students to describe ways that one type of threat can be related to another. For example, invasive species can cause habitat loss and human population growth can increase pollution and overuse of natural resources.

OPTIONAL EXTENSION/ or HW:

- Read with your students the "Panther Solutions" which quickly discusses several ways that humans are taking action to help the panthers recover.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Day 2-3** **Preparing the Learner: (~3 minutes)** 1. Review the previous day by discussing the H.I.P.P.O categories again, telling students that the focus of today is invasive species. There are invasive species in every state in the US. This video "Invasive Species Spreading Across America" gives an overview of what these are and how they got here. NOTE: Distinguish between "exotic" and "invasive exotic" for students if they don't catch it. Exotic species are non-native, but not necessarily damaging to an ecosystem. An invasive exotic species is a significant threat to the native ecosystem because it reproduces uncontrollably. **Interacting with the text:** 2. Students need the "H.I.P.P.O Video Notes" resource in front of them during this video. As they watch, they will categorize examples from the video into the H.I.P.P.O categories. 3. In groups of 2-4, students will select one of the following questions to respond to: • Why are invasive species a problem? • What challenges are faced by people who work to eliminate invasive species? • How are people trying to control and remove invasive species? 4. Students will use the rubric to monitor their discussions and use the "Sentence Starters" to drive their discussion. Give 3-4 minutes for this discussion then students record their teams' response. **Interacting with text:** (Jigsaw of 4 different readings) **Overview**: Base groups will include four students, each reading a different article. Students can read articles independently in the base group or move to their expert groups to read where everyone is reading the same article. There are four expert groups for this jigsaw. When all work in the expert group is completed, students will move back into their base groups. The teacher will assign each student one of the four invasive species; fruit fly, kudzu, python or goldfish and distribute articles appropriately. Students should then leave their base group and go sit with their expert group.	**Students needing additional support:** · Post a chart of the HIPPO threats in plain view in the front of the room for EL students to refer to as needed. · Teacher proximity and heterogeneous grouping to support students needing immediate feedback. · Article differentiation by ability and interest · Homogeneous grouping for more advanced learners ·Allow students to take the videos home and watch them multiple times to support note taking ·Extending time for jigsaw note taking

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	1. **First read: Unencumbered**. The teacher will invite students to independently read as much of their article as they can in the time provided (4 min). Remind them that if they finish early, they should go back and reread it. Also, assure slower readers that it is fine if they do not finish with in the time provided. They will have additional opportunities. At the end of four minutes, the teachers should direct the students to look at the 5 questions on the left side of the Invasive Species Jigsaw Matrix. This might be a good point for the teacher to read the questions out loud. 2. **Second read: Individually, read the article, underlining the answer to at least 3 of the 5 questions.** The teacher should invite the students to reread the article, this time looking for and underlining the answers to at least 3 of the 5 questions on the Jigsaw Matrix. Allow 4 minutes, reassuring slower readers they will have additional opportunities to finish. At the end of 4 minutes, excuse students to go to the section of the room where their expert group will be working. In this case, you will need 4 areas, 1 for each of the 4 invasive species. 3. **Third read: With a partner, compare answers, and, when ready, complete your section of the Jigsaw Matrix (12 min).** When students are settled in their expert group area, instruct them to compare their underlined answers with a partner. If their answers differ or are incomplete, they should reread the article to find evidence for their answer. Both partners should agree on the answer before writing on their Jigsaw Matrix. Ideally, this is a great time to circulate through the room to do a quality control check before sending the "experts" back to their base groups. While you can't get to all 20 groups of two, make sure you do a thorough read through of at least one group from each of the 4 expert groups. Groups sitting nearby will benefit from hearing you verbally praise good answers while gently encouraging a return to the text in the case of inaccurate answers. Basically, you want to ensure the highest percentage of correct answers before letting them head back to their base groups. **Direct Students to go back to their Base Group to complete the Jigsaw Matrix (8-10 min).** The group member with the longest last name will begin by sharing the information on their section of the Jigsaw Matrix. Other members of the base group will listen and record a summary of what was said on the Jigsaw Matrix. Each group member will share until all four members have spoken and all members have completed their Jigsaw Matrix. Monitor the groups to make sure they are listening and then writing- not copying the information from each other's papers.
Lesson Reflection		
Teacher Reflection Evidenced by Student Learning/ Outcomes		

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The Panther Problem

1. Have you ever heard of mountain lions? What about cougars? Pumas? Catamounts? Panthers? All of these names describe the same species of large cat that has the scientific name *Felis concolor*. Why does this big cat have so many different common names? The reason is that these predators are found all over North and South America, and people in different places have called these cats different names.

2. Across their vast range of native habitat, these cats live in a variety of biomes-from moist forests and cool mountains to steamy swamps. In some areas, small populations of these cats have become isolated from the general population. And over time, they have developed traits that are different enough from the general population to cause scientists to classify them as a subspecies.

3. Stalking the swamps and forests at the tip of Florida is one of these subspecies, the Florida panther, which has the scientific name *Felis concolor coryi*. Before European settlers came to North America, Florida panthers were found throughout the southeastern United States. These sleek, brown cats were once the top predator in the Florida ecosystem, feeding on deer and other large prey. In the late '80s, there were only 30 to 50 of them left in the wild. But their numbers are starting to In 2013, there numbers there are 160

http://www.youtube.com/watch?v=t-TiDWndD-4

http://www.youtube.com/watch?v=aOG6uTMgpas

What happened?

Quick Write: Describe three things/events that contributed to the significant decrease in the Florida panther population.

_____

_____

_____

PANTHER SOLUTIONS

22 The Case of the Florida Panther

There are many ways people are trying to save the Florida panther. Here's a list of some of them.

- Federal and state laws, such as the federal Endangered Species Act and the Florida Panther Act of 1978, are designed to keep people from killing, disturbing, injuring, harming, or harassing panthers. People who violate these laws can wind up paying a large fine and may find themselves in jail.

- In 1989, the Florida Panther Wildlife Refuge was established in southern Florida. This special refuge protects 24,000 acres of panther habitat. The Big Cypress National Preserve and Fakahatchee Strand State Preserve, formed in 1974, also protect large areas of panther habitat.

- About 53 percent of the panther's range in Florida is on private land. Officials are working closely with private landowners to encourage them to preserve panther habitat on their land.

- Scientists captured wild panther kittens in 1991 to begin a captive breeding program. When these kittens grow up and have their own young, the young will be released into the wild. The ultimate goal is to have two new panther populations. The captive breeding program also helps scientists manage genetic diversity within the small Florida panther population. Another way scientists have tried to increase genetic diversity is by releasing cougars from Texas into southern Florida. Before the Florida panther became isolated in southern Florida, Texas cougars and Florida panthers interbred.

- Between 1981 and 1991, 43 panthers were fitted with special collars that helped scientists track the panthers' movements. The information gathered from this research has been used to protect the areas that panthers use and to begin the captive breeding program.

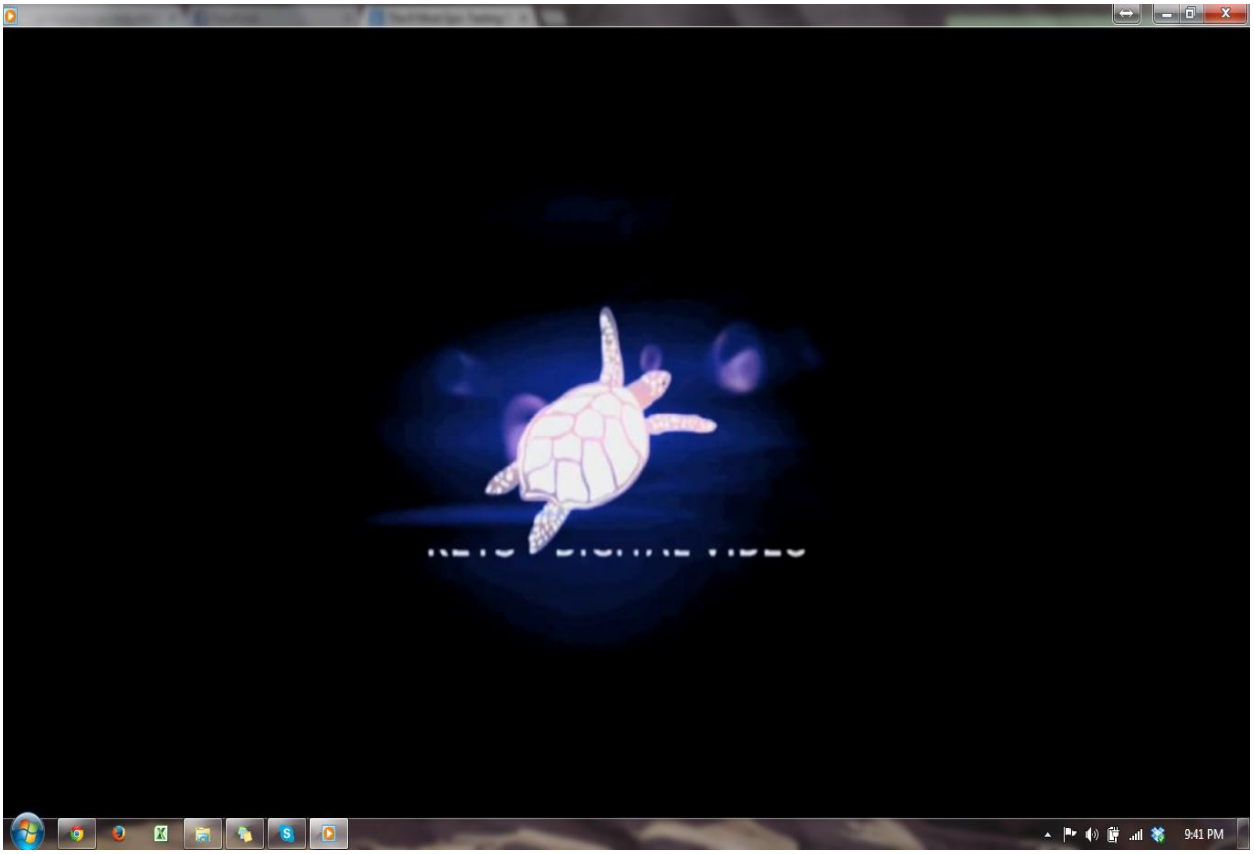
- People are working to restore the Everglades by undoing some of the changes people have brought to the area. For example, they are removing some of the canals so water can flow naturally through southern Florida just as it used to do. They are creating giant marshes near agricultural areas. These marshes will help to filter out pollutants from water that runs off agricultural fields before the water flows into the Everglades. There are also plans to buy back some agricultural lands and turn them into wildlife refuges.

- In 1982, the panther was adopted as the state animal of Florida. Florida residents can now buy a panther license plate for their car. The money raised from the license plate sales goes to education programs that help the public learn about the habitat needs of the Florida panther.

- Workers are digging up Melaleuca trees and other introduced plant species from areas throughout southern Florida. They are also setting controlled fires to kill introduced plants and to help the return of native plants that make up the panther's preferred habitat.

- Between 1979 and 1991 almost half the Florida panthers that died were killed by cars. However, when State Route 84 was converted to Interstate 75—one of the main roads running through panther country—36 special wildlife "tunnels" were built under it. No panthers have been killed by cars on Interstate 75 since the tunnels were built.

Florida Panther National Wildlife Refuge



Length: 0:50- 7:59

Summary: A look at the history of the Florida panther. Wide spread habitat destruction due to farm land. Panther were hunted and their food source was eliminated. Resource managers in the Florida wildlife refuge are closely monitoring panthers in the wild. In the late ‘80s there were only 20-30 panthers, but due to conservation efforts the numbers are up to 160. You may need to explain that male panthers with “no descended testicles” means panthers were no longer going to be able to reproduce.

The video goes into the rundown gene pool of the panthers due to inbreeding. Panthers were on the brink of extinction and so a close relative was brought in to add diversity to the gene pool. A more viable panther cross was produced and numbers began increasing.

Printed with permission from *Windows on the Wild WWF*

The H.I.P.P.O. Dilemma

Environmental Threats	Examples of Threats	Possible Effects on Ecosystem
• **H = Habitat Loss** • Habitats (where plants and animals live) • Necessities for Life (food, water, sunlight, air and other essentials) • Species Adaptation (changing over time to survive in specific areas) 	• Deforestation (cutting down the trees in the forest for fuels and timber) • Wetland Conversion (wild areas converted for farming, city or water projects such as dams and irrigation) • Farming (food production, including cattle over-grazing)	• Habitat loss affects millions of species around the world, and is considered the greatest threat to survival of species. • Land Loss=species lost • Urban Growth (Human Development) • Soil Erosion
• **I = Invasive Species** • Plants or animals brought to places where they don't naturally occur. 	• Invasive Species arrive by: • ***Accidental*** (spread as human travel) • ***Intentional*** –on purpose (species • introduced to control pests)	• No natural predators to control population of invasive species • Invasive species spread diseases and parasites • Invasive species prey on native species
• **P = Pollution** • Human-caused change in  the environment	• Smog, air pollution and acid rain • Pesticides in soil or water • Oil spills • Overflowing landfills for trash • Toxins spread to oceans	• Health concerns • Water quality • Air quality
• **P =Population growth of Humans** • Total number of humans 	• Over 7 billion humans on Earth today • Expected population about 10 billion by 2050	• Not enough resources to support human necessities • Clear-cutting of forests to make way for homes and roads
• **= Over-consumption of natural resources** • Excessive use of natural resources 	• Loss of fossil fuels, forest, minerals • Loss of fresh water	• Unfair balance of resources used by developed countries • Events like the Dust Bowl occur due to over-farming and removal of topsoil

H.I.P.P.O. "Threats to Biodiversity"

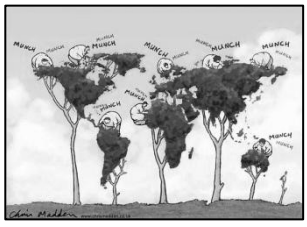
A = Habitat loss
B = Invasive species
C = Pollution
D = Population growth of humans
E = Over-consumption of natural resources

Directions: Use the H.I.P.P.O matrix to review each "threat to biodiversity" category and determine which category the following real-life scenarios belong to. Write the letter to match each threat.

1. _____ The demand for beachfront property near large cities is reducing wetlands and mangrove forests.
2. _____ Leopard skin coats were popular in the 1960s.
3. _____ When industries use water from rivers and bays, the water may go back into waterways at a higher temperature, killing organisms that can't tolerate warmer water.
4. _____ The multifora rose, an invasive species in the Unites States, destroyed many native plants in Midwestern fence rows.

5. _____ More people are moving from urban areas to the "country" where there is more "natural scenery."
6. _____ Demand for mahogany and teak woods destroys many acres of rain forests each year.
7. _____ More than 60 percent of the animal life on the Hawaiian Islands is not native.
8. _____ In the United States, the deer population in many states is larger now than in any other period of recorded history because natural predators have been destroyed by people who hunt or fear these larger predators.
9. _____The number of eagles, peregrine falcons, and ospreys dropped steeply in the late 1960s because of a pesticide called DDT that farmers sprayed on crops. DDT moved through the food chain as insects ate the pesticide covered plants and birds ate the insects. The DDT caused the birds to lay eggs with soft shells which cracked before the eggs could develop and hatch.

10. _____



11. _____

12. _____

13. _____

H.I.P.P.O Video Notes

Use with "Invasive Species Spreading Across America"

Part 1: Directions: As you watch the video, write down examples of the H.I.P.P.O dilemma in the chart below. Be prepared to discuss the video and your responses afterwards.

Topic	Examples from the Video Clip
H Habitat Loss	
I Invasive Species	
P Pollution	
P Population growth of humans	
O Over-consumption of resources	

Part 2: Pick one of the questions below to discuss with your group: **Circle** the question you are responding to.

- Why are invasive species a problem?
- What challenges are faced by people who work to eliminate invasive species?
- How are people trying to control and remove invasive species?

Use the Sentence Starters start your discussion

GATE	Comment Frames	Question Frames
 Language of Discipline	The term _____ helped to explain _____. It was interesting when the scientist said, "____" because ___.	What does the term ____ mean? Why did the scientist say _____?
 Details	A detail that confused me was __. The part that was most interesting was ____.	Why did the scientists _____? What was important about ____?
 Patterns	I saw a repeating of _____. The scientist kept saying _____.	What did _____ have to do with __? How many times did we see ___?
 Trends	Each _____ has the same ___. As _____ increased, _____ decreased.	What affected the _____? What was the result of _____?

Response: _____

_____

_____

_____

_____

DISCUSSION RUBRIC	Excellent	Acceptable	Non-acceptable
Quality of Comments	Appropriate, thoughtful comments; responds to other student's remarks.	Mostly appropriate comments with clear thoughtfulness and reflection.	Does not participate and/or provides one-word or off topic answers.
Use of Sentence Starters	Consistently uses comment starters or question frames to begin discussion.	Frequently uses comment starters or question frames to begin discussion.	Does not use sentence starters. Provides one-word or off topic answers.
Active Listening	Sits up straight and demonstrates respect and attentiveness to others.	Listens to others most of the time, but gets distracted.	Sits passively or does not respond to group discussion.

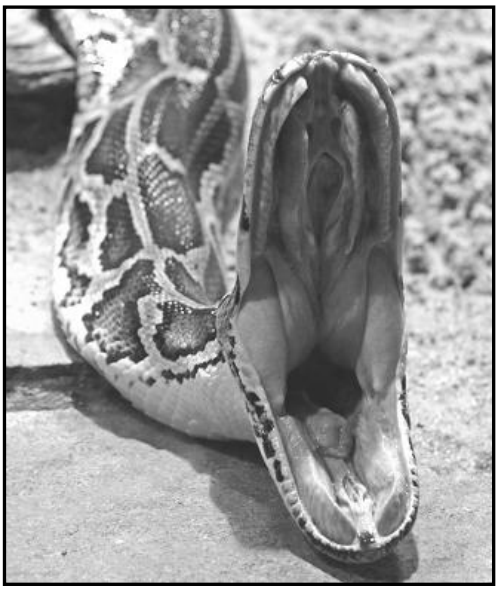
Invasive species spreading across America

Length: 0-9:46 min

Jigsaw Matrix – Invasive Species

	Burmese Python Article A	Fruit Fly Article B	Goldfish Article C	Kudzu Article D
Describe the organism.				
What is the problem?				
How have humans been part of the problem?				
Describe how the problem be reversed or slowed down.				
What is one interesting fact from your article?				

Pythons Eating Through Everglades Mammals at "Astonishing" Rate



1. From rabbits to deer to even bobcats, invasive Burmese pythons appear to be eating through the Everglades' supply of mammals, new research shows. Since the giant constrictors took hold in Florida in 2000, many previously common mammals have plummeted in number—and some, such as cottontail rabbits, may be totally gone from some areas.

2. More than a dozen years ago, Burmese pythons found their way into the wilds of Florida and started breeding. Once household pets imported from Southeast Asia, the mainland around Everglades National Park now contain tens of thousands of the snakes… which often feast on rare and endangered species. These snakes, which can grow to lengths of 20 feet and weigh up to 200 pounds, have either escaped or been dumped into the wild.

3. Burmese Pythons have no local competition and thrive in Florida's tropical climate. The pythons' rapid and widespread invasion is helped by their ability to eat everything from mice to deer, a long lifespan (15-25 years), high reproductive output, and the ability to move long distances on land and water.

4. A 2012 study is "the first to show that pythons are having impacts on prey populations—and unfortunately those impacts appear to be pretty dramatic," said study leader Michael Dorcas, a herpetologist at Davidson College in North Carolina. "We started the study after we realized, Man, we're not seeing a lot of these animals around anymore," Dorcas said. But "when we did the calculations, we were pretty astonished."

Burmese Pythons Causing "Severe Declines"

5. For the study, Dorcas and colleagues conducted nighttime surveys of live and dead animals on roads between 2003 and 2011. Such numbers provide estimates of how many animals of a certain species are present in a given area. Before 2000 it was common to see mammals such as rabbits, red foxes, gray foxes, Virginia opossums, raccoons, and white-tailed deer on roadways after dark, the team says. But the survey revealed "severe declines" in mammal sightings. Raccoon observations dropped by 99.3 percent, opossum by 98.9 percent, and bobcat by 87.5 percent. The scientists saw no rabbits or foxes at all during their surveys!

6. Also worrisome is what could be happening to species that were already rare—and thus more difficult to research, Dorcas noted. For instance, it's unknown whether the snakes are putting the squeeze on the Florida panther, a subspecies of cougar deemed endangered by the U.S. Fish and Wildlife Service. But "it's not unreasonable to assume that a really large python could consume a Florida panther," he said—the snakes are known to eat leopards in Southeast Asia.

7. To reduce the spread of these snakes, the U.S. Department of the Interior announced a new law in 2012 banning importation and interstate transport of four species of invasive snakes, including the Burmese python. There's no single solution to this conservation challenge, but banning the importation and interstate transport of these invasive snakes is a critical step.

8. Additionally, some snakes are captured and a tracking device is placed on them. When researchers know where Burmese pythons are located, what types of habitats they use, and how they move, capture and removal efforts become more effective. When pythons are captured, they are euthanized by US Park Rangers. All python nests found in South Florida are also destroyed.

Article by Christine Dell'Amore, National Geographic News and *Burmese Pythons in South Florida: Scientific Support for Invasive Species Management*, Rebecca G. Harvey

Invasive Fruit Fly Raising Berry Growers' Concerns Across Region

1. A new invasive insect is raising concerns among fruit growers across the US.

2. The Spotted Wing Drosophila fruit fly was first discovered in California in 2008 and by the following year it had spread to Florida. In 2011, it was detected in New England. Agriculture officials across the region expect more reports of damage caused by the insect this year. Most at risk are late season soft fruits like raspberries and blueberries, along with blackberries, elderberries, grapes, peaches and cherries. University of Vermont Extension Vegetable and Berry Specialist Vern Grubinger warns the potential for damage on those crops is extremely high.

Spotted Wing Drosophila Photo Credit Bob Koch/Minnesota Dept of Agriculture

3. While most common fruit flies are attracted to over-ripe fruit, Cornell University Berry Extension Support Specialist Cathy Heidenreich explains that's not the case with this new species. And that's why the Spotted Wing Drosophila is a concern.

4. Some Oregon growers reported losing 20 percent of their berries and up to 80 percent of late-variety peaches. Within weeks, researchers determined the fly was present in 15 counties, from Jackson County in southern Oregon, up the Willamette Valley, east through Hood River and Wasco counties and as far as Umatilla County.

5. The fly is unusual because it attacks ripe and ripening fruit, while most fruit flies are attracted to rotting produce. Its name comes from the distinctive spot at the tip of males' wings.

6. Female flies, equipped with a saw-toothed ovipositor (for reproducing), cut into the fruit skin and lay eggs just below the surface. The pinprick damage goes undetected until the larvae hatch and begin feeding, and the fruit collapses in a gooey mess. Thin skinned cherries, blueberries and raspberries are among the fruit and berries susceptible to attack.

7. Crop damage is a serious economic issue. Oregon's blueberry crop alone was valued at $117 million in 2011 and $108 million in 2012. The cherry crop value was $77 million two years ago and $74 million last year.

8. Farmers have been able to kill the fly with pesticide sprays they use for other fruit flies, but each spraying adds to costs and reduces profit, according to Eric Mortenson of the Oregonian News. Early harvest of fruit can be important in reducing exposure of fruit to the pest. Early harvests and continuing to remove fruit as soon as it ripens can help prevent the spread.

9. The invasive fruit fly has no natural predators here. Native to Asia, including northern Japan, it has adapted to colder northern climates like the U.S. Northeast.

Invasive Fruit Fly Raising Berry Growers' Concerns Across Region by Pat Bradly, New York News

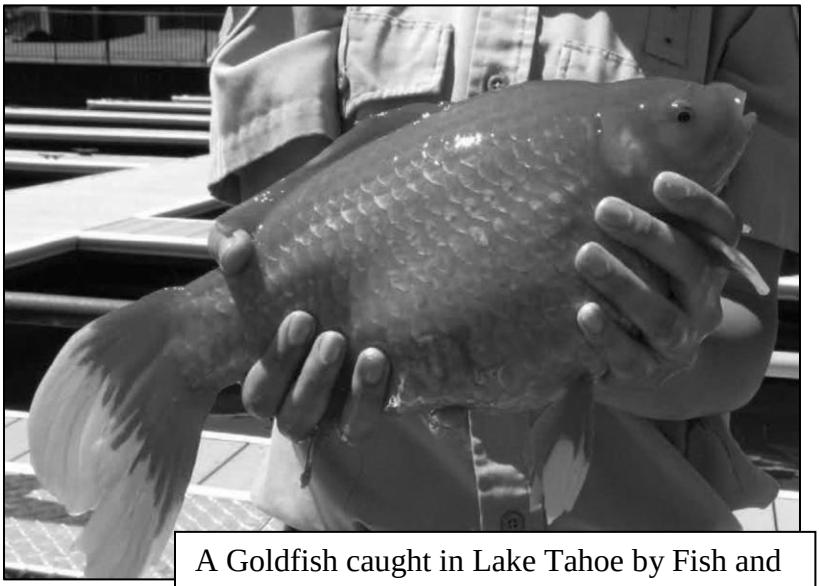
Do You Know This Is Invasive?
Goldfish—Carassius auratus

1. Goldfish are one of the most common aquarium pets. Sometimes owners find themselves unable to care for their goldfish and release them into local lakes, ponds, or streams, thinking the goldfish will be better off in the wild. What these well-intended pet owners don't realize is that when released, some of these goldfish become invasive by impacting local native fish and their habitats.

2. Aquarium goldfish are usually only a couple inches in length. However, in the wild, goldfish can grow over 16 inches and weigh over than 6 pounds. Wild goldfish can be bright orange in color, like the aquarium types, but may also be olive-green, silver, or bronze. They can be found in many habitats, including ponds, reservoirs, lakes, sloughs, and backwaters of streams and rivers. They can tolerate a wide range of environmental conditions such as high levels of turbidity (full of dirt), temperature fluctuations, low levels of dissolved oxygen, and brackish, or slightly salty, water.

3. When feeding, goldfish disturb bottom sediments, increasing turbidity and removing vegetation, which damages the habitat of native fish. Additionally, goldfish compete for food and space with naive fish species, including important sport fish populations. Goldfish originated from China, and have been selectively bred for bright colors for centuries. Goldfish became established in California in the 1860s.

4. Today, they can be found in numerous waterbodies throughout California, with large populations in southern California reservoirs and in canals, sloughs, and reservoirs of the Central Valley. Goldfish have also recently been discovered in Lake Tahoe.



A Goldfish caught in Lake Tahoe by Fish and Wildlife services.

5. The California Department of Fish and Wildlife and University of Nevada Reno, cooperation with other entries, remove goldfish and other non-native fish from Lake Tahoe as a part of the Lake Tahoe Warm Water Fish Control program. Additionally, entities throughout the state may conduct goldfish removal at other waterbodies.

6. Fish removal programs are costly and may take multiple efforts to be effective. The best way to manage invasive species such as goldfish is to prevent their introduction in the first place. Don't release your goldfish or other pets into the wild. For information regarding options other than release, visit the Habitattitude Program.

KUDZO and Invasive plant

1. An estimated 2 million acres of forest land in the southern United States is covered with kudzu. Kudzu was promoted as a forage crop (food for horses or cattle) and an ornamental plant (used for decoration) when it was introduced to the U.S. at the Philadelphia Centennial Exposition in 1876. Many southern farmers were encouraged to plant kudzu for erosion control from the mid 1930's to the mid 1950's. In 1953, kudzu was removed from the US Department of Agriculture's list of permissible cover plants due to its recognition as a pest species. Currently in Florida, kudzu has been documented in 14 counties and is listed as a Category I invasive species.

2. Kudzu is a climbing, semi-woody, perennial vine in the legume family that has the potential to reach up to 100 feet in length. Stems can reach the diameter of ½ to 4 inches, but there are reports of old 'stumps' nearly 12 inches across in Georgia. Alternately arranged leaves have three broad leaflets up to 4 inches across. Leaflets may be entire or deeply 2-3 lobed with hairy margins. Flowers are ½ inch long, purple, highly fragrant and borne in long hanging clusters. Flowering occurs in late summer, followed by the production of brown, hairy, flattened, seed pods that contain three to ten seeds.

3. The spread of kudzu in the U.S. is thought to be primarily runners and vines that root at the nodes. Kudzu may also spread by seeds. Kudzu has a massive tap root: 7 inches or more in diameter, 6 feet or more in length, weighing as much as 400 pounds! There can be as many as thirty vines growing from a single root crown.

4. Kudzu will grow over anything in its path (other plants, buildings, road signs) and eventually kills other plants it covers because it blocks out sunlight. Kudzu will also girdle (surround and squeeze) stems and tree trunks, break branches, and uproot trees and shrubs through the masses of vegetation produced. Kudzu has been reported to grow roughly one foot per day once established.

5. Total eradication of kudzu is necessary to prevent re-growth. Kudzu is a really tricky plant to get rid of. Unless you remove all of the Kudzu, a single plant will spread out and keep growing because it has no plant competition.

6. Young colonies can be eradicated (removed) in three to four years if plants are overgrazed or repeatedly cut back during the hottest temperatures of summer. Close grazing for three to four years can totally eliminate kudzu when at least 80% of the vegetative growth is continuously eaten by livestock.

***Identification and Biology of Nonnative Plants in Florida's Natural Areas* – Second Edition, K.A. Langeland, H.M. Cherry, et al. University of Florida-IFAS Pub SP 257. 2008.**

SAUSD Common Core Lesson Planner **Teacher**

Unit: **BIODIVERSITY** **Day:** 11-13 **Lesson:** 7	**Grade Level/Course:** 7TH Grade Life Science	**Duration:** 3 days **Date:** **Threats to Biodiversity: Human Impact & Water Filtration**

Big Idea: All living things exist in a balance with other living things and physical factors.

Enduring Understanding: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:

- How does human activity influence the sustainability of an ecosystem and its natural resources?
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?

Common Core and Content Standards	**Content Standards:** **LS2.A** Interdependent Relationships in Ecosystems – Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. **LS4.D** Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines as well as ecosystem services that humans rely on. **LS2.C** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruption to any physical or biological component of an ecosystem can lead to shifts in all its populations. **MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **Reading Standards for Literacy in Science and Technical Subjects**: **Bundled Reading Informational Text Standard(s):** 1. Cite specific textual evidence to support analysis of science and technical texts. 8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. 9. Compare/contrast information from experiments, simulations, video, or multimedia with that gained from reading a text on the same topic. **Writing Standards for Literacy in Science and Technical Subjects**: **Bundled Writing in Science Standard(s):** 1. Write arguments focused on *discipline-specific content*. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

<table>
<tr><td></td><td colspan="2">d. Establish and maintain a formal style.
e. Provide a concluding statement or section that follows from and supports the argument presented.
Speaking and Listening Standards (ELA):
Bundled Speaking and Listening Standard(s):
9. 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.</td></tr>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">7.1 Teacher Resource: Water facts PowerPoint
7.2 Student Resource: Why is water so important article
• plastic cups*****not provided by district (and not essential to lesson)
• two gallons water****not provided by district (and not essential to lesson)
7.3 Student Resource: Lab report handout
-labels for lab materials and equipment****not provided by district
7.3a Teacher Resource: Video Ted talk; “Michael Pritchard: how to make filthy water drinkable.”
7.3b Teacher Resource: Video “oil spills: how to help affected animals.”
7.4 Student Resource: Ecological society of America article
7.5 Student Resource: Collaborative annotation chart
7.6 Student Resource: Personal Water Audit Worksheet

<u>Materials: (per lab group)</u>
Clear funnel or clear plastic soda bottle with the bottom cut off and label removed
Clear plastic cup
Tall jar or flask****not provided by district
Cotton balls
Activated charcoal
Sand
Potting soil
Water
Feather
Oil (any type –motor, baby, cooking)</td></tr>
<tr><td>Objectives</td><td>Content:
Students will bridge their personal experiences and knowledge of the water cycle and necessities of life to the environmental problem of water pollution.

Students will conduct hands-on, scientific inquiry to complete an investigation to develop content knowledge of abiotic factors and environmental issues of water pollution and its relation to biotic factors in ecosystems and ecosystem services.</td><td>Language:
Students will gain a deeper understanding of discipline specific content-related vocabulary of scientific process and water quality tests by conducting a water filtration activity.

Students will read and comprehend step-by-step procedural, informational texts.

Students will participate in collaborative conservations using academic language.</td></tr>
</table>

<table>
<tr><td>Depth of Knowledge Level</td><td colspan="3">☒ Level 1: Recall ☒ Level 2: Skill/Concept
☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
<tr><td>College and Career Ready Skills</td><td colspan="3">☒ Demonstrating independence ☒ Building strong content knowledge
☒ Responding to varying demands of audience, task, purpose, and discipline
☒ Comprehending as well as critiquing ☒ Valuing evidence
☐ Using technology and digital media strategically and capably
☒ Coming to understand other perspectives and cultures</td></tr>
<tr><td>Common Core Instructional Shifts</td><td colspan="3">☒ Building knowledge through content-rich nonfiction texts
☒ Reading and writing grounded from text
☒ Regular practice with complex text and its academic vocabulary</td></tr>
<tr><td rowspan="3">Academic Vocabulary (General & Domain-Specific)</td><td>TEACHER PROVIDES SIMPLE EXPLANATION</td><td>KEY WORDS ESSENTIAL TO UNDERSTANDING</td><td>WORDS WORTH KNOWING</td></tr>
<tr><td></td><td>Scientific conclusions
Ecosystem Services
Water filtration
Filter
Detoxify
Soil Erosion</td><td>Soil
Mixture
Mineral
Particles
Pollination
Experimental design
Flood Control</td></tr>
<tr><td>STUDENTS FIGURE OUT THE MEANIN</td><td>Floating</td><td>Fertilizer
Pesticide
Contaminant</td></tr>
<tr><td colspan="2">Pre-teaching Considerations</td><td colspan="2">Before the lesson
If you want to have students drink water during the water PowerPoint, be sure to bring in clear plastic cups and 2 gallons of water (if you do not have running water in your classroom.)
Be sure to make easy-to-read labels for the lab materials and equipment.</td></tr>
<tr><td colspan="4">Lesson Delivery</td></tr>
<tr><td colspan="2">Instructional Methods</td><td colspan="2">Check method(s) used in the lesson:
☒Modeling ☒Guided Practice ☒Collaboration
☒Independent Practice
☒Guided Inquiry ☒ Reflection</td></tr>
</table>

Lesson Continuum	**Lesson Open-ing**	**<u>Day One: Preparing the Learner (~50 minutes)</u>** Prior Knowledge, Context, and Motivation: 1. If you decide to provide water and cups, pass the cups out, one per student, each filled with a few ounces of water. Ideally, have a large clear plastic cup filled with ice water for you to sip on throughout the water lecture. Explain they are welcome to enjoy the water during the lecture. This is not essential to understanding and interacting with the concepts in the PowerPoint, but it does reinforce the importance of water. 2. Lead the students through the interactive **Water Facts PowerPoint**. When you begin, let the students know that anything written in BLUE font requires a written response from them. Anything written in RED font requires they copy that information down, as is. 3. If you finish early, begin to familiarize the students with the lab equipment (see Day Two below). **Day Two:** **Interacting with the text: <u>Water Filtration Lab (~50 minutes)</u>** 1. Begin class by asking a few questions from yesterday's PowerPoint, like, "How would your life be different if you did not have easy access to clean water?" and "What is one fact that stood out to you from any of the 3 videos we watched yesterday?" Most likely, only your more adventurous students will volunteer to respond. However everyone will have had multiple opportunities to verbalize their thoughts the previous day. 2. Explain that today we will be investigating how water gets cleaned, or purified. Show, name, and label the materials to be used in the lab. It would be helpful to ELs and Special Needs students for teacher to have an "equipment gallery". Use large note cards or word strips to write the name of each piece of equipment to be used. Tape the labels to a sample of each piece of equipment and display on a table/ teacher's demonstration area. Leave the labeled equipment gallery out for the next two days. 3. Direct students to the Background section of the Lab Report Handout. Invite students to independently read as much as they can of the first paragraph in the time you allow (1-2 min). At the conclusion of the silent reading time, read the paragraph out loud so that students can hear a proficient reader's pronunciation and inflection. 4. Allow students another 1-2 min to silently read the Purpose, Question and Hypothesis sections. 5. Instruct students to make selections in the Hypothesis section.

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	6. Direct students to go sit with their lab group and compare hypothesis's with each other. 7. Explain they will be working together to build a water filtration system using the materials provided. Explain that Earth has natural filtration systems that clean water for animals, but that the presence of humans stresses Earth's resources or contaminate once clean water, making filtration systems more important than ever. These are expensive and many people do not have access to clean water (**783 million according to the UN. 2.5 billion do not have access to adequate sanitation. 6 to 8 million people die annually from the consequences of disasters and water-related diseases**) 8. Teacher should pass out the materials and allow students a few minutes of free exploration with the materials, they will want to touch and look closely at everything. After a few minutes of free exploration, teacher should tell students that their lab groups will have approximately 15 minutes to set up their equipment and begin the filtration process by following the step-by-step procedure. 9. During this time the teacher should circulate throughout the room, asking guiding questions of groups that may need assistance. 10. If time and materials permit, allow students to experiment with building filtration systems with different stratification and composition. 11. Once the filtration is set up and on-going, students should draw and label the apparatus in the section provided in the lab report handout. **<u>Extending/Transferring Understanding continued: (10min)</u>** 1. If any groups were able to build a filtration system with a different stratification or composition, invite them to share their results on the document camera. 2. After the filtration and drawings are complete, the teacher should draw student's attention to the analysis questions 3. Direct students to work with their lab groups to discuss responses and record their answers on the Lab Report. 4. If time permits, show the Ted Talk, "Michael Pritchard: How to make filthy water drinkable." (9 min).	**Students Needing Additional Support** Use realia to teach about lab materials, have note cards labeled with each of the names of the materials. Tape note cards to the different supplies and have the materials out in plain view in the front of the room for EL students to refer to as needed. Make lab groups heterogeneous or homogenous depending on classroom needs. Have special needs students participate in the physical manipulation of lab equipment. Add pH testing component to the lab for accelerated learners. Circulate continuously.

Lesson Continuum

Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding

Day 3 Water Pollution- Oily Feathers: Oil Spill Quick Lab(~15 min)

1. Direct students to follow the procedures and answer the questions in the Oil Spill lab section.

2. Show the video clip "Oil spills: How to help affected animals." (2.18 min)

Interacting with the Concept/Text: Complex Text (~25 min)

1. When students have finished the lab procedures and answered the questions, direct them to the article "How much is an Ecosystem Worth?"

2. Direct the students to number the paragraphs.

3. Direct students to skim through the article by reading the titles and subtitles.

4. Teacher will now ask student's to read through the article using the collaborative annotation chart.

5. Allow students time to select 6 comments/questions/or responses to record on their annotation chart.

6. In groups of two, direct students to share 3 or their 6 comment/responses/questions and write down a summary of their partner's responses.

7. Next, have the students read through the Text-Dependent Questions at the end of the article while the teacher reads the questions aloud. Students should work in groups of two to find and record answers to the Text-Dependent Questions while citing evidence (paragraph #) from the text.

Alternative Options

- Instead of having them answer all of the Extension Questions, allow them to choose 3 of the 6 to answer.
- Instead of having them answer both of the Personal Viewpoint Questions, let them choose one.

Students Needing Additional Support

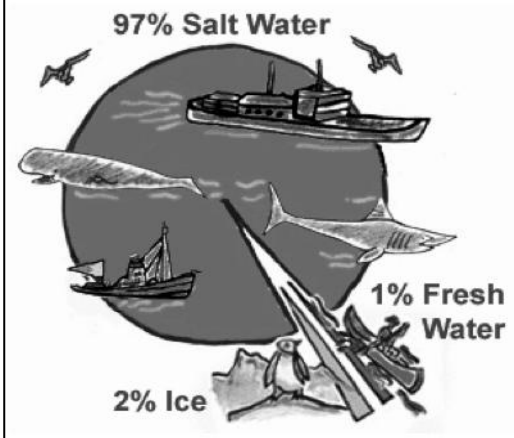
On large poster paper, chart a list of Ecosystem Services discussed in the article and post in plain view in the front of the room for EL students to refer to as needed

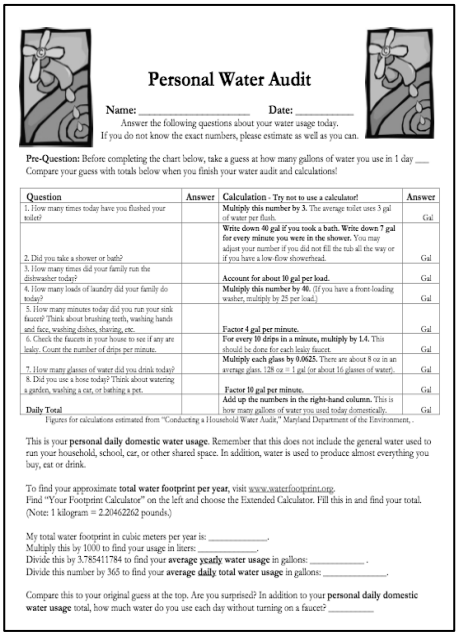
May need modified or chunk the article or reduced length of the reading. Focus students on key questions, reducing overall number.

Text dependent questions could be completed individually

Extending/Transferring Understanding: (~10 minutes)

1. If time allows, for closure of the topic of water & water pollution, have students carefully study the following graphic:
2. Either as a class or in groups, dyads or individually have students complete the "Personal Water Audit"





Personal Water Audit

Name: _____ Date: _____

Answer the following questions about your water usage today.
If you do not know the exact numbers, please estimate as well as you can.

Pre-Question: Before completing the chart below, take a guess at how many gallons of water you use in 1 day ___
Compare your guess with totals below when you finish your water audit and calculations!

Question	Answer	Calculation - Try not to use a calculator!	Answer
1. How many times today have you flushed your toilet?		**Multiply this number by 3.** The average toilet uses 3 gal of water per flush.	Gal
2. Did you take a shower or bath?		**Write down 40 gal if you took a bath. Write down 7 gal for every minute you were in the shower.** You may adjust your number if you did not fill the tub all the way or if you have a low-flow showerhead.	Gal
3. How many times did your family run the dishwasher today?		**Account for about 10 gal per load.**	Gal
4. How many loads of laundry did your family do today?		**Multiply this number by 40.** (If you have a front-loading washer, multiply by 25 per load.)	Gal
5. How many minutes today did you run your sink faucet? Think about brushing teeth, washing hands and face, washing dishes, shaving, etc.		**Factor 4 gal per minute.**	Gal
6. Check the faucets in your house to see if any are leaky. Count the number of drips per minute.		**For every 10 drips in a minute, multiply by 1.4.** This should be done for each leaky faucet.	Gal
7. How many glasses of water did you drink today?		**Multiply each glass by 0.0625.** There are about 8 oz in an average glass. 128 oz = 1 gal (or about 16 glasses of water).	Gal
8. Did you use a hose today? Think about watering a garden, washing a car, or bathing a pet.		**Factor 10 gal per minute.**	Gal
Daily Total		**Add up the numbers in the right-hand column.** This is how many gallons of water you used today domestically.	Gal

Figures for calculations estimated from "Conducting a Household Water Audit," Maryland Department of the Environment, .

This is your **personal daily domestic water usage**. Remember that this does not include the general water used to run your household, school, car, or other shared space. In addition, water is used to produce almost everything you buy, eat or drink.

To find your approximate **total water footprint per year**, visit www.waterfootprint.org.
Find "Your Footprint Calculator" on the left and choose the Extended Calculator. Fill this in and find your total.
(Note: 1 kilogram = 2.20462262 pounds.)

My total water footprint in cubic meters per year is: _____.
Multiply this by 1000 to find your usage in liters: _____.
Divide this by 3.785411784 to find your **average yearly water usage** in gallons: _____ .
Divide this number by 365 to find your **average daily total water usage** in gallons: _____.

Compare this to your original guess at the top. Are you surprised? In addition to your **personal daily domestic water usage** total, how much water do you use each day without turning on a faucet? _____

Lesson Reflection

Teacher Reflection Evidenced by Student Learning/ Outcomes

Water Facts Video
First View: Just watch it.

2nd View: Write down one fact from the video that stands out to you.

Water Article

1st Read: Read the "Why is water so Important" article.

2nd Read: Reread the article, this time looking for one fact you consider to be interesting or surprising.

Underline that sentence.

Many people do not have access to clean water.
First View: Just watch it.

2nd View: Write down one fact that stands out to you.

Can You Live with Dirty Water?
1st View: Just Watch It.

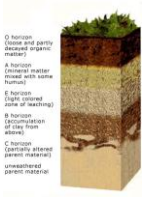
2nd View: How does watching this video make you feel?

3rd View: What would change in your daily routine if dirty water came out every time you turned on the faucet?
Outline a day in your life if you only had access to dirty water.

--Look back at your notes from the 3 videos and the article.
--Choose one fact answer, or idea to share with your partner.

- The partner with the longest hair speaks first.
- When listening to your partner, summarize what they say on your paper.
- "My partner, their name, chose the following fact, "….".
- "With out access to clean water, my partner, their name, noted that their daily routine would change in the following ways; ….."

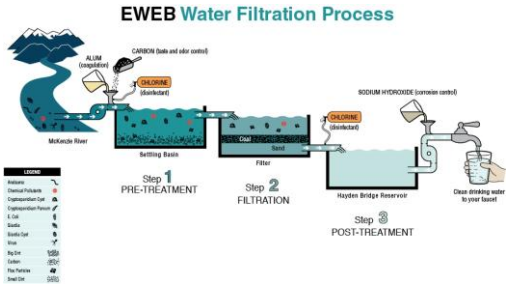
When a raindrop reaches the ground, what happens to it?



When a raindrop reaches the pavement, what happens to it?

Gutters and water canals carry water to Water Treatment Plants.

Water Treatment plants are very expensive.



Layers in the soil naturally clean and filter water for us, for free!

Why is Water So Important?

Did you know that you are mostly water? Two-thirds of your body is made up of water. You probably drink six to eight cups of water, milk, fruit juice, or soda each day. Animals and plants are almost all water too. So we don't just use water, we *are* water.

Three quarters of the earth is covered with water, and although most of it can't be used by people, plants or animals, water makes life on earth possible. You depend on water for drinking, cleaning, growing and processing food, growing cotton for cloth, swimming, fishing, boating, cooking, and putting out fires and generating electricity through hydropower dams. Try to think of one item or action that doesn't involve water in some way!

Water also connects us to the rest of the natural world. Plant and animals communities depend on water in many of the same ways; for food, water and shelter. Since every drop is used again and again, water is the ultimate in recycling itself. Water is naturally filtered through layers of dirt, gravel, and sand. When the water travels through the layers it is cleaned. When rainfall lands on natural areas like forests, desserts, and wetlands, the water soaks into the ground. When it soaks into the ground it is cleaned through the layers of the soil. However, in a city or town, much of the water lands on roofs or roads so it does not soak into the ground. From there the water flows into a gutter or drain and then into the local waterway. When it rains in the city, the rain water picks up pollutants from the ground such as

- Fertilizers and pesticides from crops
- Detergent from cleaning products
- Motor Oil from vehicles
- Pet waste not properly cleaned up

These pollutants then get washed into the nearby streams (or washes), where they pollute the watershed like lakes, rivers, and the ocean. It's important to protect this precious resource because we share it with all other living things, past, present and future.

Unfortunately, people have not always used water wisely. We've over used it to carry away our waste. We've put hazardous material in or on the ground where they seep into groundwater. We've often used more water than we need. Yet we can improve our water resource by conserving water at home, cleaning waste from industries and cities before it returns to rivers or lakes, and preventing pollutants from homes and farms from washing into waterways with the rain. Some communities have already begun to help!

One of the ways we can have a big effect on improving our water quality now and protecting it from future pollution is changing the small ways that people affect water. What you do in your community, or in your house, yard, road, park, business, school or farm can conserve water and improve its quality. You've already started to make a difference by learning about water!

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Ecosystem Services – Water Filtration Lab

Background:

Ecosystem services include water purification, nutrient recycling and prevention of soil erosion.

Soil is a mixture of mineral particles, air, water, microorganisms and other organic matter (material coming from living things). The materials that make up soil form layers. Hundreds of years may be required to form just a few inches of soil. Soil helps purify water by filtering out some of the suspended solids (floating "dirt" particles) as they flow through the different soil layers. The makeup of the soil determines how well it will act as a filter. Soil also helps to remove chemical contaminants such as fertilizers and pesticides. Many minerals in the soil can chemically bond with contaminants, which are then stored in the soil and prevented from flowing into nearby waterways. As a result of chemical reactions, the soil can also help "detoxify" certain chemicals, making them less harmful to living things.

Purpose:
In this lab you will purify water by removing contaminants from dirty water.

Question: How do the materials used in a filtration affect the quality of the water recovered?
Filtration materials may be:
Stratification: layered, multilayered, less layered
Composition: pure, single type or mixed, made of a variety of materials

Hypothesis: I believe materials that are __*(more layered/less layered)* *(pure or made of only one type/ composed of a variety of materials)*_ will be _*(more effective/less effective)* at producing higher quality water than other materials.

Materials:

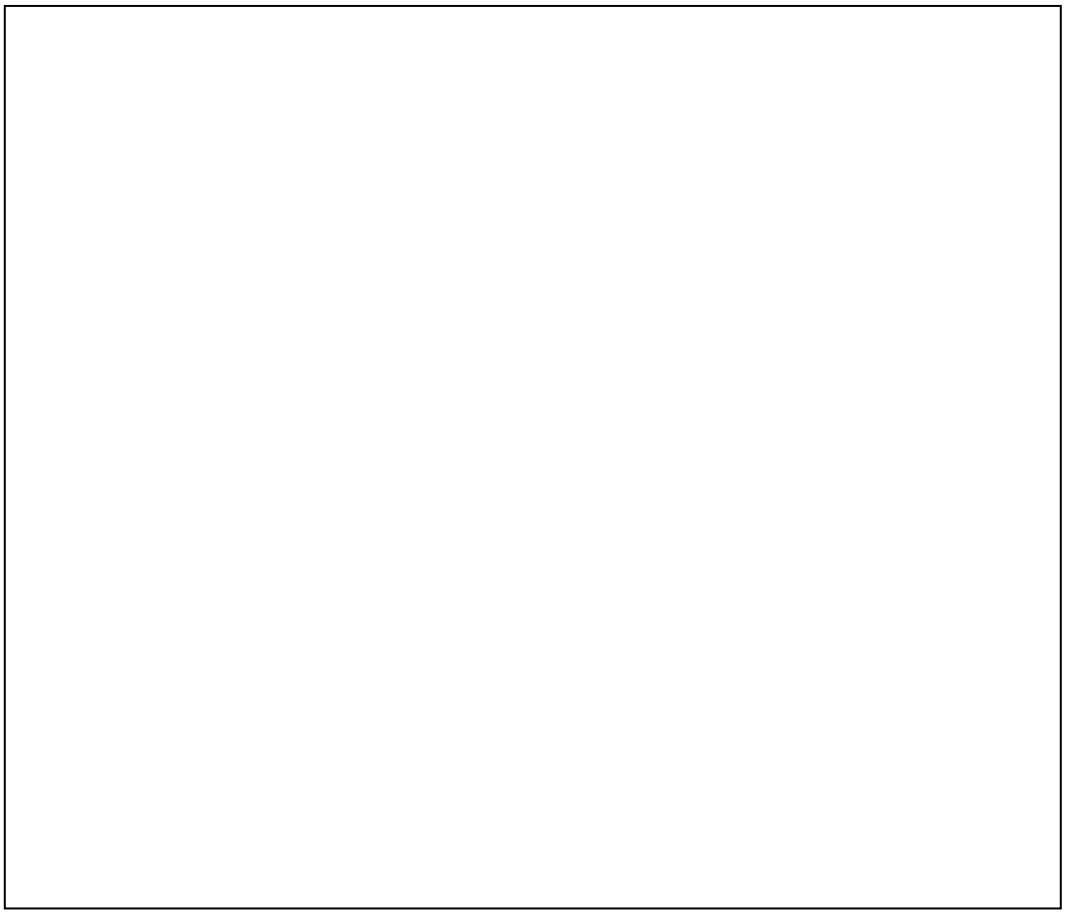
Clear funnel or clear plastic soda bottle with the bottom cut off and label removed
Clear plastic cup
Tall jar or flask
Cotton balls or toilet paper
Activated charcoal
Sand
Potting soil
Water

Procedure:

1. Pack the funnel approximately one-third full with cotton balls.
2. Place a layer of charcoal on top of the cotton balls. Then place a layer of sand on top of the charcoal.
3. Place the funnel into the jar or flask. The mouth of the jar should be small enough to keep the funnel off the bottom of the jar.
4. Mix one-fourth cup of potting soil with one-half cup of water in the plastic cup. Then slowly pour the water into the funnel.

Data:

Draw the set up for your water filtration lab below. Label the following parts: clear funnel or plastic soda bottle, dirty water, sand, activated charcoal, cotton or toilet paper, clear jar or flask, filtered water.



Analysis:

Describe the appearance of the water after filtering and any changes that you can see.

Look at the different layers in your funnel. Where did most of the large soil particles get trapped? Where did the fine particles get trapped?

What do you observe about the samples?

Conclusion: (Write a paragraph responding to the following)
How do you explain the results of the experiment?
Why do you think some materials are more effective filters than others?
How would you describe the "services" that soils provide?

_____

_____

_____

_____

_____

_____

_____

Humans extract billions of gallons of oil from the ground every year. As this oil is transported and harvested around the world, accidents occur and oil may spill onto land or into the ocean where it is far more difficult to clean up. Contamination of water is not only a problem for humans, but a problem for all the animals and organism that live in the aquatic biome.

Water Pollution- Oily Feathers: Oil Spill Quick Lab

Students should complete the following procedure:

1. Submerge a feather in a cup of water.
2. Pull the feather out of the water, and dry it with a paper towel.
3. Now, place a drop or two of oil into the cup of water.
4. Submerge the feather again.
5. Pull the feather out of the water, and try to dry it with the paper towel.
6. Record any noticeable observations: _____
7. How difficult was drying the feather with oil compared with drying the feather without oil? _____
8. Explain how you think oil in the ocean (one form of water pollution) affects wildlife that depends on the ocean.

_____

_____

_____

_____

Video: "Michael Pritchard: How to make filthy water drinkable"

Source: http://www.youtube.com/watch?v=rXepkIWPhFQ

Oil Spills: How to help affected animals (2:18 min)

Source: http://www.youtube.com/watch?v=aYCSmhrcrT0

From the Ecological Society of America (ESA)

Human civilization depends on healthy ecosystems.

Have you ever considered that the cereal you eat is brought to you each morning by the wind, or that the glass of clear, cold, clean water drawn from your faucet may have been purified for you by a wetland or perhaps the root system of an entire forest? Trees in your front yard work to trap dust, dirt, and harmful gases from the air you breathe. The bright fire of oak logs you light to keep warm on cold nights and the medicine you take to ease the pain of an ailment come to you from Nature's warehouse of services. Natural ecosystems perform fundamental life-support services upon which human civilization depends. Unless human activities are carefully planned and managed, valuable ecosystems will continue to be impaired or destroyed.

What are ecosystem services?

Ecosystem Services: processes by which the environment produces resources.

Ecosystem Services are the processes by which the environment produces resources that we often take for granted such as clean water, timber, and habitat for fisheries, and pollination of native and agricultural plants. Whether we find ourselves in the city or a rural area, the ecosystems in which humans live provide goods and services that are very familiar to us.

These services are extensive and diverse … affecting the quality of our land, water, food, and health.

Ecosystems provide "services" that:

- moderate weather extremes and their impacts
- disperse seeds
- mitigate, or lessen the effects of drought and floods
- protect people from the sun's harmful ultraviolet rays
- cycle and move nutrients
- protect stream and river channels and coastal shores from erosion
- detoxify and decompose wastes
- control agricultural pests
- maintain biodiversity
- generate and preserve soils and renew their fertility
- contribute to climate stability
- purify the air and water
- regulate disease carrying organisms
- pollinate crops and natural vegetation

What is an ecosystem?

Ecosystems are nature's support systems for life.

An ecosystem is a community of animals and plants interacting with one another and with their physical environment. Ecosystems include physical and chemical components, such as soils, water, and nutrients that support the organisms living within them. These organisms may range from large animals and plants to microscopic bacteria. Ecosystems include the interactions among all organisms in a given habitat. People are part of ecosystems. The health and wellbeing of human populations depends upon the services provided by ecosystems and their components — organisms, soil, water, and nutrients.

What are ecosystem services worth?

Nature's services have financial value.

Natural ecosystems and the plants and animals within them provide humans with services that would be very difficult to duplicate. While it is often impossible to place an accurate monetary amount on ecosystem services, we can calculate some of the financial values. Many of these services are performed seemingly for "free," yet are worth many trillions of dollars, for example:

About 78% of the top medicines used in the U.S. come from nature.

Much of the Mississippi River Valley's natural flood protection services were destroyed when adjacent wetlands were drained and channels altered. As a result, the 1993 floods resulted in property damages estimated at twelve billion dollars partially from the inability of the Valley to lessen the impacts of the high volumes of water.

80% of the world's population relies upon natural medicinal products. Of the top 150 prescription drugs used in the U.S., 118 originate from natural sources: 74% from plants, 18% from fungi, 5% from bacteria, and 3% from one vertebrate (snake species). Nine of the top 10 drugs originate from natural plant products.

Over 100,000 different animal species — including bats, bees, flies, moths, beetles, birds, and butterflies — provide free pollination services. One third of human food comes from plants pollinated by wild pollinators. The value of pollination services from wild pollinators in the U.S. alone is estimated at four to six billion dollars per year.

It would cost Orange County billions to duplicate nature's water filtration system.

New York City is a case in point. Before it became overwhelmed by agricultural and sewage runoff, the watershed of the Catskill Mountains provided New York City with water ranked among the best in the Nation by Consumer Reports. When the water fell below quality standards, the City investigated what it would cost to install an artificial filtration plant. The estimated price tag for this new facility was six to eight billion dollars, plus annual operating costs of 300 million dollars — a high price to pay for what once was free. New York City decided instead to invest a fraction of that cost ($660 million) in restoring the natural capital it had in the Catskills watershed. In 1997, the City raised an Environmental Bond Issue and is currently using the funds to purchase land and halt development in the watershed, to compensate property owners for development restrictions on their land, and to subsidize the improvement of septic systems. Orange County has faced similar obstacles and has met the challenges in the same manner by

preserving the natural supply of fresh water below Fountain Valley and Anaheim through the conversion of sewage water into clean drinking water. Factor in Southern California's near chronic drought, the county's projected growth (another 300,000 to 500,000 thirsty people by 2020) and the rising cost of importing water from the Colorado River and from Northern California, and rebranding sewage as a valuable resource became a no-brainer. (For more on this, read http://www.nytimes.com/2008/08/10/magazine/10wastewater-t.html?pagewanted=all)

How are ecosystem services "cut off"?

Overpopulation and over-consumption threaten ecosystems.

Ecosystem services are so fundamental to life that they are easy to take for granted and so large in scale that it is hard to imagine that human activities could destroy them. Nevertheless, ecosystem services are severely threatened through

- growth in the scale of human enterprise (population size, per-capita consumption, and effects of technologies to produce goods for consumption)
- a mismatch between short-term needs and long-term societal well-being

Many human activities disrupt, impair, or reengineer ecosystems every day including:

- runoff of pesticides, fertilizers, and animal wastes
- pollution of land, water, and air resources
- introduction of non-native species
- overharvesting of fisheries
- destruction of wetlands
- erosion of soils
- deforestation
- urban sprawl

Ecology and ecosystem services

Many questions remain unanswered about the workings of ecosystem services.

Ecologists work to help us understand the interconnection and interdependence of the many plant and animal communities within ecosystems. Although substantial understanding of many ecosystem services and the scientific principles underlying them already exists, there is still much to learn. The tradeoffs among different services within an ecosystem, the role of biodiversity in maintaining services, and the effects of long and short-term perturbations are just some of the questions that need to be further explored. The answers to such questions will provide information critical to the development of management strategies that will protect ecosystems and help maintain the provisions of the services upon which we depend.

Conclusion: The future depends on wise eco choices today.

Conclusion

The choices we make today in how we use land and water resources will have enormous consequences on the future sustainability of earth's ecosystems and the services they provide.

How much is Ecosystem Worth? Text-Dependent Questions

Article Content Questions

1. What is an ecosystem?

2. List three services provided by ecosystems.

3. Give some statistics on the value of services provided by ecosystems.

4. Name some threats to ecosystems.

5. Are ecosystems well understood by scientists? Explain.

Extension Questions

1. Select one ecosystem service and predict the likely effect if this service is lost.

2. How does a natural ecosystem control agricultural pests?

3. Why is climate stability important?

4. What makes humans different from the rest of the ecosystem?

5. How is it possible for pollination services to be so valuable? How would we replace this service if the pollinators were lost?

6. Construction companies are often required to create new wetlands or plant trees when they have destroyed natural habitats during a project. What is the reasoning behind this requirement?

Personal Viewpoint Questions

1. Whose responsibility should it be to preserve and protect ecosystem services? Who should pay for preservation?

2. Does it make a difference if we can replicate an ecosystem service artificially for the same or lesser cost?

Collaborative Annotation Chart

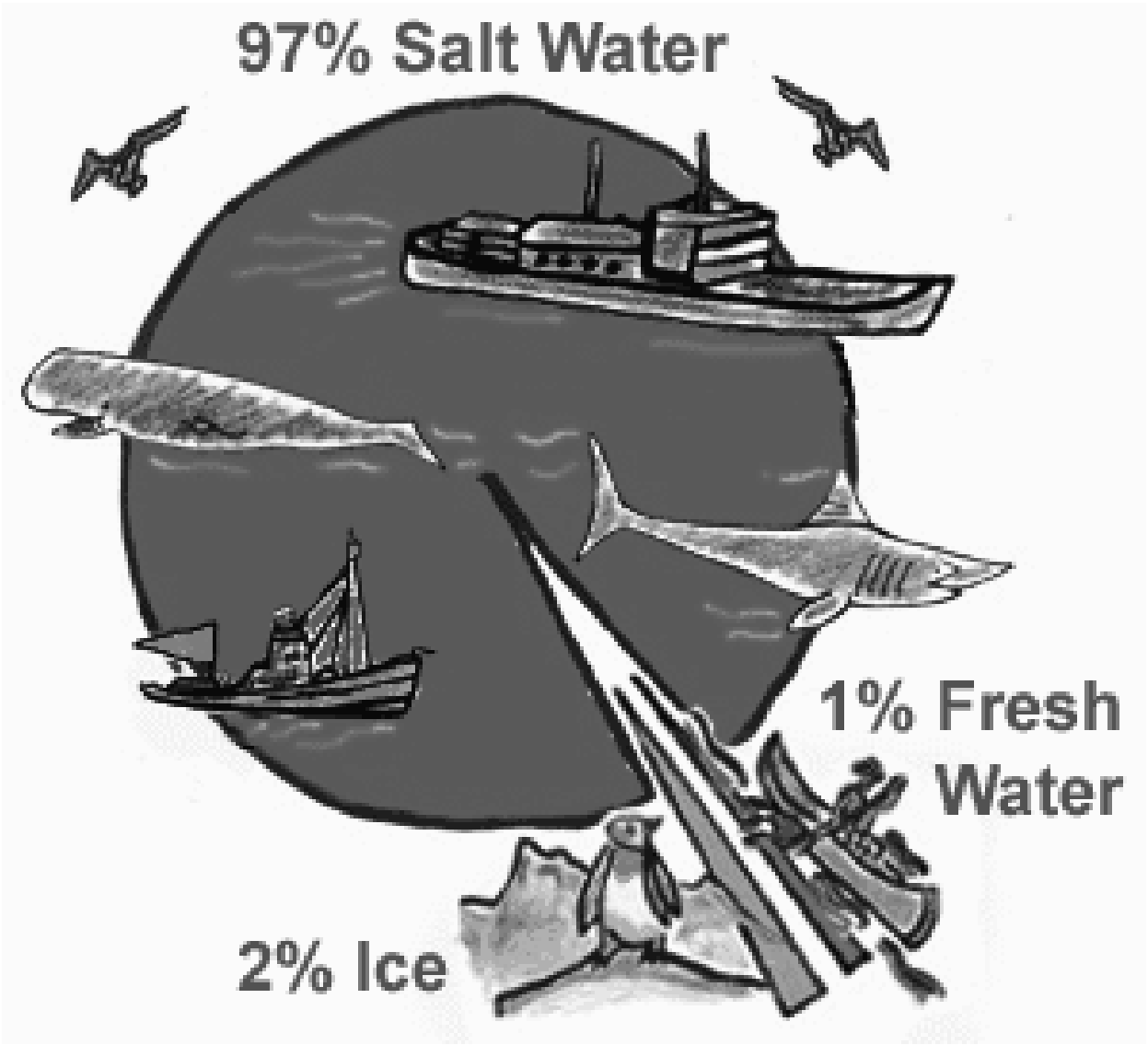
Directions: As you read the article, stop when you encounter an idea that is confusing or surprising, or when you find a key idea in the passage. Use the specific symbol to indicate why you picked this passage. When you finish reading and annotating, go back and select 6 marked passages and fill in the chart below. Write down your comment/question/or response to the passage to use in discussion.

Now share with your partner. First identify the quote or passage. Then, share your remark using a "Sample Language Support" to get your discussion flowing. Record your partner's response before moving on to the next passage.

Symbol/ Section	Comment/ Question/ Response	Sample Language Support
?	▪ Questions I have ▪ Wonderings I have ▪ Confusing parts for me	▪ The statement, "…" is confusing to me because… ▪ I am unclear about the following sentence(s) ▪ I don't understand what s/he means when s/he states…
*****	▪ Key ideas expressed ▪ Author's main points	▪ One significant idea in this text is… ▪ The author is trying to convey…
!	▪ Surprising details/claims ▪ Emotional response	▪ I was surprised to read that… ▪ How can anyone claim that…

Symbol/ Section	Page/ line #	Your Comment/ Question/ Response to marked passage	Partner's Comment/ Question/ Response

How Much of the Earth's Water Can We Use?



Personal Water Audit

Answer the following questions about your water usage today. If you do not know the exact numbers, please estimate as well as you can.

Pre-Question: Before completing the chart below, take a guess at how many gallons of water you use in 1 day_____. Compare your guess with totals below when you finish your water audit and calculations.

Question	Answer	Calculation. Try not to use a calculator!	Answer
1. How many times today have you flushed your toilet?		**Multiply this number by 3.** The average toilet uses 3 gal. of water per flush.	Gal
2. Did you take a shower or a bath?		**Write down 40 gal. if you took a bath. Write down 7 gal for every minute you were in the shower**. You may adjust your number if you did not fill the tub all the way or if you have a low flow showerhead.	Gal
3. How many times did your family run the dishwasher today?		**Account for about 10 gal. per load.**	Gal
4. How many loads of laundry did your family do today?		**Multiply this number by 40.** (If you have a front loading washer, multiply by 25 per load.)	Gal
5. How many minutes today did you run your sink faucet? Think about brushing teeth, washing hands and face, washing dishes, shaving etc.		**Factor 4 gallons per minute.**	Gal
6. Check the faucets in your house to see if any are leaky. Count the number of drops per minute.		**For every 10 drips in a minute, multiply by 1.4.** This should be done for each leaky faucet.	Gal
7. How many glasses of water did you drink today?		**Multiply each glass by 0.0625.** There are about 8 oz. in an average glass. 128 oz.= 1 gal. (or about 16 glasses of water).	Gal
8. Did you use a hose today? Think about watering a garden, washing a car, or bathing a pet.		**Factor 10 gallons per minute.**	Gal
Daily Total		**Add up the numbers in the right hand column.** This is how many gallons of water you used today domestically.	Gal

Figures for calculations estimated from "Conducting a Household Water Audit" Maryland Department of the Environment

This is your **personal daily domestic water usage**. Remember that this does not include the general water used to run your household, school, car, or other shared space. In addition, water is used to produce almost everything you buy, eat or drink. To find your **approximate total water footprint per yea**r, visit www.waterfootprint.org. Find "Your Footprint Calculator" on the left and choose the Extended Calculator. Fill this in and find your total. (Note: 1 kilogram = 2.20462262 pounds)

My total water footprint in cubic meters per year is_____.
Multiply this by 1000 to find your usage in liters:_____.
Divide this by 3.785411784 to find your **average yearly water usage** in gallons:_____.
Divide this number by 365 t find your **average daily total water usage** in gallons_____.
Compare this to your original guess at the top. Are you surprised? In addition to your **personal daily domestic water** usage total, how much water do you use each day without turning on a faucet?_____

SAUSD Common Core Lesson Planner **Teacher:**

Unit: BIODIVERSITY **Day: 14-17** **Lesson: 8**	**Grade Level/Course:** 7TH Grade Life Science	**Duration:** 4 Class Periods **Date:**

Big Ideas: All living things exist in a balance with other living things and physical factors.
Enduring Understandings: Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

Essential Questions:

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?
- Why is biodiversity loss a concern?

Common Core and Content Standards	**Content Standards:** MS-LS2-1 Analyze and interpret data to provide evidence 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. **Disciplinary Core Ideas:** Ecosystems are dynamic in nature; their characteristics can vary over time. Distributions to any physical and biological component of an ecosystem can lead to shifts in all its populations. **Reading Standards for Literacy in Science and Technical Subjects**: 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text 8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. **Writing Standards for Literacy in Science and Technical Subjects**: 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task. **Speaking and Listening Standards (ELA):** 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

<table>
<tr><td>Materials/ Resources/ Lesson Preparation</td><td colspan="2">8.0 Teacher Resource Lesson 8 Planner
1.2 Student Resource Extended Anticipatory Guide
8.1 Student Resource Vocabulary Jigsaw Answer Sheet
8.1a Teacher Resource Vocabulary Jigsaw Cards
8.2 Student Resource Final Project Directions
8.2a Teacher Resource Day 14-18 Powerpoint
8.3 Student Resource Presentation Notes
** If computer time is a problem, you can “make do” with one day. If students walk into the computer lab with a clear idea of what they are going to research, they can use the time in the lab to print out pertinent articles to use in class the following day.</td></tr>
<tr><td>Objectives</td><td>Content:

Students will create an engaging and scientifically accurate explanation of one or more aspects of the importance of biodiversity.</td><td>Language:

Students will collaborate to create text, graphics, or a script to explain some aspect of the importance of biodiversity.

Students will listen to their peers and evaluate the scientific accuracy of their presentations.</td></tr>
<tr><td>Depth of Knowledge Level</td><td colspan="2">☐ Level 1: Recall ☒ Level 2: Skill/Concept
☒ Level 3: Strategic Thinking ☒ Level 4: Extended Thinking</td></tr>
<tr><td>College and Career Ready Skills</td><td colspan="2">☒ Demonstrating independence ☒ Building strong content knowledge
☒Responding to varying demands of audience, task, purpose, and discipline
☒ Comprehending as well as critiquing ☒Valuing evidence
☒Using technology and digital media strategically and capably
☐ Coming to understand other perspectives and cultures</td></tr>
<tr><td>Common Core Instructional Shifts</td><td colspan="2">☒ Building knowledge through content-rich nonfiction texts
☒ Reading and writing grounded from text
☒ Regular practice with complex text and its academic vocabulary</td></tr>
<tr><td>Academic Vocabulary (General & Domain-Specific)
TEACHER PROVIDES SIMPLE EXPLANATION</td><td>KEY WORDS ESSENTIAL TO UNDERSTANDING</td><td>WORDS WORTH KNOWING</td></tr>
<tr><td></td><td>Invasion
Population
Invasive</td><td>Threat
Cause and effect
Crisis
Imported</td></tr>
</table>

	STUDENTS FIGURE OUT THE MEANING	Eradicate Feasible Economy Transported	Kudzu Asian Carp Emerald ash borer "Under attack"
Pre-teaching Considerations		**Before the lesson** Depending on computer resources at your school site, you may need to sign up for the computer lab. If scheduling permits, two to three days in the computer lab would be ideal. If you plan on letting students use cell phones or iPad for creating presentations, double check with your principal for permission. The decision to allow cell phones in class for academic purposes is a site-level decision. If you want to have students create stop motion videos, explore these free apps options before students download them "Lapse It" "IMotion HD." Have students download these at home a day ahead so they have the app ready to use in class. You may want to create a rubric for the final assessment task. Rubistart.org is a great resource for finding prefabricated (but editable) rubrics. It would be great to do a Gallery Walk of the final assessment projects with another 7th grade class. If classes complete their projects within 2 or 3 days of each other, try to arrange this interesting and eye-opening experience. One student from each team will need to stay behind to explain the project.	
Lesson Delivery			
Instructional Methods		**Check method(s) used in the lesson:** ☐**Modeling** ☒**Guided Practice** ☒**Collaboration** ☐ **Independent Practice** ☒**Guided Inquiry** ☒ **Reflection**	
Lesson Continuum	**Lesson Open-ing**	**Day 1 Preparing the Learner: ~3 mins** 1. Begin with 8.2a Teacher Resource Day 14-17 PowerPoint. 2. Show the first slide. Allow the students a few moments to read the definition of Biodiversity. Then show them the short video clip. **Day 2 Preparing the Learner:~10 mins** 1. Begin with 8.2a PowerPoint, slide 4. 2. Show the short video clips on slides 4-6	

	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding	**Day 1: Interacting with the text: ~ 50 min** 1. Go on to the second slide of 8.2a PowerPoint. 2. Students will review for their final assessment by going back to the **Extended Anticipatory Guide** and adjusting their answers by finding supporting pieces of text in the student resource booklet. Students can work independently or in teams to find this evidence. *Emphasize to students that they need to be writing the information in their OWN WORDS (paraphrasing) and not copying exact sentences from the book. Paraphrasing is not only more concise, but it demonstrates students understand and can process and transfer the text without losing its meaning. They should also cite their source.* **Vocabulary Review Jigsaw** 3. Go on to the third slide of 8.2a PowerPoint. Students will continue their review by completing the Review Vocabulary Jigsaw. 4. Direct students to SR 8.1 Vocabulary Review Jigsaw. Using a "fishbowl" approach, demonstrate how this works by having 3 students join you at the front of the class. 5. Using the 4 Vocabulary Review Jigsaw Cards, model how each group member participates by reading their clue. Model how to fill out the Vocabulary Review Jigsaw Answer sheet, by displaying it on the document camera. 6. Work through #1 of the Vocabulary words so that all class members have a clear idea of how this strategy works. 7. Students should work in groups of 4. The teacher should give each group of 4 a set of the Vocabulary Review Jigsaw cards. To get set up: • Student 1 will be holding Card A • Student 2 will be holding Card B • Student 3 will be holding Card C • Student 4 will be holding Card D 8. To begin - Student 1 will select a number (1-12). All group members will circle that number on their Vocabulary Review Jigsaw worksheet. Student 1 will read that clue out loud to the group. Each group member will write the clue on their worksheet. This pattern will continue until the group has attempted to correctly identify all 12 vocabulary words. 9. To conclude - have each group choose one group member's worksheet to be graded (perhaps the person's worksheet with the best printing or handwriting). Direct groups to pass their paper to another group to be graded. 10. Go over the correct answers with the class, while reading the correct definitions out loud. Collect the graded worksheets to be recorded in the grade book if you wish. *****NOTE: ALTERNATIVE VERSION FOR HIGHER EL LEVEL***** Instead of providing students with the clues for the vocabulary words, have each group create four different clues for the terms. Encourage students to create more genuine clues for each term rather than guiding prompts related to syllables or starting/ending letter. Have groups swap clues with another group and continue with steps #7-10 as listed above.	**Students Needing Additional Supports** Provide the prompt at the start of the unit for extended processing and brainstorming time Encourage students to work on presentation materials at home

Lesson Continuum	Activities/Tasks/ Strategies/Technology/ Questioning/Engagement/Writing/Checking for Understanding		
		Days 2-4 Bust the Myth: Biodiversity is not Important It is envisioned that students will have two full class periods to work on this project (up to three days maximum). 1. Have students turn to the final assessment task "Bust the Myth: Biodiversity is not important." Have students do a one minute silent close read of the directions and then go over them as a class. 2. Have students write in the due date for their project. 3. Have students look at the heading "An Excellent Project" and discuss those categories and have students brainstorm 2 or 3 other characteristics of an excellent projects. You may choose to focus specific content you want included an interactive component. Additionally, consider if you want students to all contribute orally to this or do a write up of their piece if they create a video or song. 4. Have students share their project or present it to the class. If it is a recording, show the video to the class. If videos are "trapped" on smartphones, you can show them on the document camera and plug the speakers into the phone. This can be done as a Gallery Walk or as individual team presentations. 5. If possible, arrange a Gallery Walk with another 6th grade class to see how projects and ideas differ in another classroom. Each group will need to leave behind one narrator to explain their project to the visiting class 6. Keep a close eye on student teams so they stay on task and meet the deadline. 7. If you choose to have students present in front of the class, use 8.3 Presentation Notes.	**Students Needing Additional Supports** Choose groups for students to balance ability and focus Provide PPT review slides to students struggling to find and cite evidence. Teacher proximity to ensure students are actively contributing and not stuck
Lesson Reflection			
Teacher Reflection Evidenced by Student Learning/ Outcomes			

Biodiversity Review Vocabulary Jigsaw Answer Sheet

- Work with your teammates to identify the correct vocabulary word.
- You can look back through the articles, labs, and notes you took during the unit.
- Remember to shift the cards one person to the right after figuring out each word.

1.	
2.	
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9.	
10.	
11.	
12.	

Biodiversity
Vocabulary Review Jigsaw

Card A

1.	This word starts with the letter	E
2.	This word starts with the letter	G
3.	This word starts with the letter	B
4.	This word starts with the letter	B
5.	This word starts with the letter	N
6.	This word starts with the letter	E
7.	This word starts with the letter	A
8.	This word starts with the letter	I
9.	This word starts with the letter	E
10.	This word starts with the letter	S
11.	This word starts with the letter	N
12.	This word starts with the letter	B

Biodiversity

Vocabulary Review Jigsaw

Card B

1. This word has 3 syllables.
2. This word has 1 syllable.
3. This word has 2 syllables.
4. This word has 6 syllables.
5. This word has 2 syllables.
6. This word has 4 syllables.
7. This word has 4 syllables.
8. This word has 3 syllables.
9. This word has 2 syllables.
10. This word has 4 syllables.
11. This word has 3 syllables.
12. This word has 3 syllables.

Biodiversity
Vocabulary Review Jigsaw

Card C

1.	The last letter in this word is	c
2.	The last letter in this word is	n
3.	The last letter in this word is	e
4.	The last letter in this word is	y
5.	The last letter in this word is	e
6.	The last letter in this word is	m
7.	The last letter in this word is	c
8.	The last letter in this word is	e
9.	The last letter in this word is	t
10.	The last letter in this word is	e
11.	The last letter in this word is	e
12.	The last letter in this word is	c

Biodiversity
Vocabulary Review Jigsaw

Card D

1. It means “of foreign origin or character; not native; introduced from abroad.”
2. It means “designed to protect the environment or to limit damage to the environment.”
3. It is “an area of the world that has a particular type of weather and contains particular plants and animals.”
4. It is “the variety of different types of plant and animal life in a particular region.”
5. It is “living things that have always existed in a place.”
6. It is “a system formed by the interaction of a community of organisms with their environment.”
7. It is “the absence of life or living organisms.”
8. It means “of or relating to an invasion, intrusion, etc.”
9. It means “no longer in existence; ended or died out.”
10. It means “capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage.”
11. It means “plants or animals not originally from the area in which they are currently living.”
12. It means “of or relating to living organisms.”

Biodiversity
Vocabulary Review Jigsaw

Answer Sheet

1. Exotic
2. Green
3. Biome
4. Biodiversity
5. Native
6. Ecosystem
7. Abiotic
8. Invasive
9. Extinct
10. Sustainable
11. Non-native
12. Biotic

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Bust the Myth: Biodiversity is Not Important!

Meet Fred and Jenny. They are in fourth grade at Madison Elementary School. They think that all the fuss about "taking care of the earth" and being conscious of water usage is silly. They think that the earth is here to be used and it really does not matter what we do, the earth will be just fine! You know this is NOT true and you want to teach them how living things exist in a balance with other living things and physical, abiotic factors. You also want them to know that biodiversity benefits us in many ways. You want Patrick and Jenny to understand that it is in our best interest to understand and protect biodiversity.

Your task is to create an informational piece to dispel the myth that "biodiversity is not important!" It needs to be interesting, engaging, and factually accurate. Include diagrams and color. Get creative!

When everyone is done, you will share or perform your presentation so get ready.

Timeline: _____ class periods

Due Date: _____

1. Choose ____ essential question(s) below to answer in your informational piece.

Essential Questions:

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?
- Why is biodiversity loss a concern?

2. Ideas:

- Write a skit (be prepared to act it out)
- Make a stop motion video with a phone or ipad (ask your teacher if this one is okay)
- Write a story or puppet show and present it
- Write a song and record it
- Make a poster or brochure
- Newscast presentation
- Write a talkshow interview
- Create a board game

3. An Excellent Project.

- Clearly and logically explains how the Earth is tilted and connects to seasons
- Uses pictures, diagrams or models to help clarify the concept
- Busts the misconception and makes sure it is clearly understood why distance to sun cannot explain the cause of the seasons
- Is colorful, neat, and well thought out
- _____
- _____
- _____

Team Members' Names: _____; _____
_____; _____

Brainstorm your ideas below:

What did you find interesting in the Biodiversity unit?

What Essential Questions did you choose to answer?

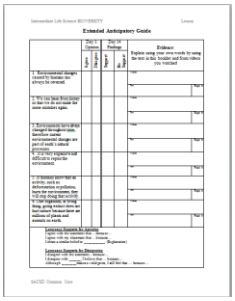
What materials in your student resource book will help you answer these questions?

How will you explain these things to Fred and Jenny?

Biodiversity-diversity among and within plant and animal species in an environment.

[redacted]

Go Back to your Extended Anticipatory Guide from Day 1.

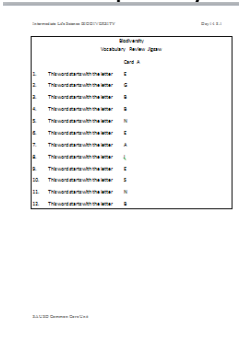


Based on what you have learned in the unit, select "Support" or "No Support" in the Day 14 Findings Column.

Using text and video from our unit, provide EVIDENCE for your Day 14 Findings.

If you need more room, use the back of your Extended Anticipatory Guide.

Work with your team members to Complete your Vocabulary Jigsaw.



You may use all the resources in this unit to help you figure out the 12 answers.

Try to get all 12 answers correct!

Shhh! Don't let the groups around you hear (or see) your answers.

Days 15-17 Final Project

[redacted]

We have learned a great deal about the importance of Biodiversity.

Bust the Myth: Biodiversity is not Important!

Meet Fred and Dana. They are in fourth grade at Madison Elementary School. They think that all the fuss about "living uses of resources" and being conscious of water usage is silly. They think that the earth is here to be used and it really does not matter what we do, the earth will be just fine! You know this is NOT true and you want to teach them how living things exist in a balance with other living things and physical factors. You also want them to know that biodiversity benefits us in many ways. You want Patrick and Danny to understand that it is in our best interest to understand and protect Biodiversity.

Your task is to create an informational piece to dispel the myth that Biodiversity is not important! It needs to be interesting, engaging, and factually accurate. Include diagrams and color. Be creative!

When everyone is done, you will share or perform your presentation to get ready.

Timeline: 2 or 3 class periods

Due Date:_____

1. Choose _____ essential question(s) below to answer in your informational piece.

Essential Questions:

- What is biodiversity and who/what does it affect?
- How does human activity influence the sustainability of an ecosystem and its natural resources?
- Describe physical or biological changes in an ecosystem that could alter the organisms that live in it.
- How are organisms dependent on their interactions with other organisms and with nonliving factors?
- What is the economic value of biodiversity?
- Why is biodiversity loss a concern?

Now you have a chance to focus in on a part of the unit that you found to be especially interesting.

Biodiversity is important. Prove it.

Final Assessment Peer Presentation Notes

Directions: During the transitions between groups you will need to paraphrase each group's presentation. Your paraphrase must touch on the main ideas that the group presented and be written in complete sentences.

Title of Presentation: _____
Type of Presentation: _____
Paraphrase of main ideas:

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Title of Presentation: _____
Type of Presentation: _____
Paraphrase of main ideas:

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Title of Presentation: _____
Type of Presentation: _____
Paraphrase of main ideas:

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Title of Presentation: _____
Type of Presentation: _____
Paraphrase of main ideas:

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Type of Presentation: _____
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Type of Presentation: _____
Paraphrase of main ideas:

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Type of Presentation: _____
Paraphrase of main ideas:

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Title of Presentation: _____
Type of Presentation: _____
Paraphrase of main ideas:

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