Lesson 5 - Analyzing the Impact

Learning Goals

- Students will describe how a **food web** shows the movement of energy through an **ecosystem**.
- Students will analyze **data** tables and graphs in order to better understand the impact of the Burmese python in the Florida Everglades.
- Students will construct an explanation for the **population** decline of the marsh rabbit in the Everglades.

Equity Spotlight

In this lesson, students have the opportunity to make connections and make their own sense of data. The teacher embraces the different perspectives that surface, highlighting the difficulty of this work while mentioning that even scientists sometimes disagree about how to interpret data.

Preparation

- Supporting Science Explorations: If your students haven't had prior experience with food chains or webs, see these suggestions for ways to introduce the concept before this lesson.
- Analyzing the Impact Visuals: Make sure you are able to display the visuals in your classroom, and plan to distribute print or digital copies to each student or small group for this lesson.
- See, Think, Wonder: Familiarize yourself with this routine. Students will use this thinking routine to analyze and interpret data in the Main Activity.
- What Makes You Say That?: Familiarize yourself with this routine. Students will use this thinking routine to help them build an explanation of what is causing a population decline of the marsh rabbit in the Everglades.
- The STEM Teaching Tool How can I promote equitable sensemaking by setting expectations for multiple perspectives? provides resources and suggestions for supporting students as they develop and share their understandings.
- Home Link Choice Board: Review the Home Links for this collection and identify any you might want to encourage students to do. Consider establishing a routine that allows students to share what they have done at home throughout the collection and module.
- Watch PD Video #6 to learn more about how certain UDL and CRP teacher practices are integrated into this lesson in alignment with Project-Based Learning elements.

Links

For teachers:

- **Supporting Science Explorations**
- **Analyzing the Impact Visuals**
- **See, Think, Wonder**
- **What Makes You Say That?**
- **Video #6: PBL Step 2** - PD resource
- **Video #7: PBL Step 3** - PD resource
- **Video #8: PBL Step 4** - PD resource
- **Video #11: PBL Step 7** - PD resource

For students:

- **Home Link Choice Board**

Vocabulary

- **Data** - Information that scientists have collected to help answer a question
- **Ecosystem** - All of the living and nonliving things in a place
- **Food chain** - A diagram that shows how energy is transferred from one organism to another
- **Food web** - A diagram that shows where many of the organisms in an ecosystem get their energy (what they eat); a food web is made up of multiple food chains
- **Organism** - Any living thing, including plants, animals, fungi, and microbes
- **Population** - A group of organisms living in a particular place

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Teaching Guide

Warm Up (10 minutes)

Equitable Teacher Practices		
	**2.UDL.b**	Represent content in multiple ways (i.e.,pictures, text, audio).
	3.UDL.b	Provide guidance for use of assistive technologies to access content (i.e., screen readers, switches).
	**4.CRP.c**	Discuss professionals who represent marginalized groups.
	7.CRP.d	Highlight and embrace diverse student perspectives to solve problems.

- Display the food web featuring **organisms** in the Florida Everglades (slide 1 in Analyzing the Impact Visuals). Tell students that this diagram shows plants and animals that live in a place called the Everglades.
- Display a map (physical or digital) of North America. Locate the Everglades (in southern Florida) on the map. Google Maps or Google Earth provide good digital options.
- Ask: *Do you think this location will have the same or different organisms relative to where we live? Why?* [Accept all reasonable answers at this time. Answers likely depend on where your school is located.]
- Return to the food web visual, and have students turn and talk with a partner about the following questions:
    - What do you notice?
    - What do you think the arrows mean?
    - What might they be telling us about the plants and animals in this place?
- Have students share some of the ideas they discussed. Ask questions to elicit the following ideas:
    - The arrows show how energy moves in an ecosystem. An ecosystem is a system of living things that interact with each other and with the nonliving parts of their environment.
    - Plants get energy from the sun and use it to make their own food.
    - Some animals eat plants for energy. Some animals eat other animals for energy. Some animals eat both plants and other animals for energy.
    - If students don't suggest this, tell them that this diagram is called a *food web*. It shows ways that food chains are interconnected in the ecosystem.
- Ask students how a food web is both similar to and different from a flowchart. Expect answers that include the following:
    - Both have arrows.
    - The flowchart has words, while the food web has pictures.
    - Flowcharts have questions with *yes* or *no* answers. You follow the arrows to answer a question or follow a process.
    - Food webs have arrows to show the flow of energy in an ecosystem.
- Ask: *What might cause changes in an ecosystem, either one like the Florida Everglades or one like where we live?* Encourage students to consider both natural changes as well as changes caused by people and to make connections to changes they have seen in their own community. Ask: *Are there non-living things that remind you of invasive species - that are non-native or new to a place and cause harm to people, plants, or the environment?*

Teacher Note: *This conversation may surface ideas that students have strong feelings about or that cause some disagreement. For example, students may bring up new roads, buildings, businesses, factories, pollution, guns, or new technologies. Be ready to carefully facilitate this conversation, helping students express their own ideas as well as to listen to different perspectives on these issues. Being able to think critically about society is an important part of culturally responsive education.*

- Tell students that today, they will investigate changes that happened in the Everglades ecosystem by looking at data—information that scientists have gathered. They will think about the data and interactions between organisms to help them consider what might have caused the changes in the ecosystem over time.

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Main Activity (25 minutes)

Equitable Teacher Practices		
	**2.UDL.c**	Consider how students' lived experiences will impact their understanding of certain concepts.
	**7.CRP.c**	Encourage students to share feedback with one another, including feedback based on their culture.

- Display the graph comparing mammal populations observed in the Everglades from 1993–1999 and 2003–2011 (slide 2 in Analyzing the Impact Visuals). Provide time for students to make sense of the data with the following guiding questions from the See, Think, Wonder routine:
    - What do you see?
    - What do you think about it?
    - What does it make you wonder?

  Model noticing and wondering for students if needed: *I see that the light green bars are all longer than the dark green bars. It makes me wonder what happened to all of the rabbits?*
- The class will likely identify at least one question about why there were so many fewer mammals observed in the later time period. Highlight this wondering when it surfaces, as it will drive the rest of the lesson.
- As a class, brainstorm what types of things could cause a population to die out. [Sample responses: Students may mention disease, change in weather, increase in predators, or lack of food.] Record students' ideas to refer to later.
- Ask: *What other information might you need in order to figure out what happened to the marsh rabbits?*
- Tell students that scientists who study the Everglades gathered information about other species as well, in particular about the Burmese python, which is not native to the Everglades. Provide groups with the following additional resources:
    - Graph of the number of Burmese pythons captured each year (slide 3 in Analyzing the Impact Visuals)
    - List of prey found inside Burmese pythons (slide 4 in Analyzing the Impact Visuals)
- Remind students of the class's norms and expectations for working in groups.
- Ask each group to use these sources of evidence to answer the following questions, drawn from the What Makes You Say That? routine.
    - *What's going on with the decline of the marsh rabbit population? What caused the decline?*
    - *What evidence did you see that makes you say that?* Each group should discuss these questions and be ready to share their thinking, as well as the evidence that supports it.
- Facilitate a conversation for groups to share their ideas. As each group shares, at least one other group should offer a question or an affirmation to the sharing group.
- Students may seem critical of the data - asking questions about the source or the intentions of the data collection, or about what data might be missing. Encourage students to consider what information is **not** shown. Ask: *Why might some information be missing? What kinds of information might further support your claim? What kinds of information might cause you to question or doubt your claim?*

Wrap Up (15 minutes)

- Look back at the Everglades food web from the Warm Up (slide 1 in Analyzing the Impact Visuals). Facilitate a synthesizing discussion using the following questions:
    - *How did the introduction of the Burmese python impact the ecosystem?* [Sample answers: The pythons ate many of the animals that were native to the Everglades.]
    - *Where would you add the Burmese python to the food web illustration? What animals would have arrows to the Burmese python?* [Sample answer: Any or all of the animals in the list of prey on Slide 4 should have arrows that lead to the Burmese python.]
    - *What other impacts might result from this?* [Sample answers: Alligators/other predators might not

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have enough to eat. The plants that marsh rabbits and other small mammals eat might increase in population.)
    - *Do you think the Burmese python is an invasive species? Why or why not?* Prompt students to use the Invasive Species Flowchart from Lesson 2 (When Species Invade), if needed. (Students should be able to use evidence to support the fact that the Burmese python *is* an invasive species.)
- Refer back to the Need to Know chart of student questions created in Lesson 2 (When Species Invade). Ask students how today's lesson might help them answer any of these questions. They should recognize that they now have more information about how an introduced species can impact its new environment—it can disrupt the food web and throw off the balance that existed previously. Determine where and how the class can keep track of questions that have been answered. You might check them off the list, move them to a new location, or record answers someplace.
- Remind students that the more they learn about a topic, the more questions they might have. Encourage students to add new questions to the chart or to refine existing questions throughout the module.

Supporting Science Explorations

- If your students are unfamiliar with food chains and food webs, consider an activity Intended to introduce these concepts prior to teaching this lesson. One example is Lesson 1: Everglades Food Chains from the Everglades Literacy Project.
- To provide another perspective on the impact of an invasive species on the food web (from the "bottom" of the web), have students consider the invasive plant Amur honeysuckle. Show a food web of an oak savanna ecosystem, and explain that Amur honeysuckle competes with plants like sumac for sunlight. If it reduces the population of sumac in this ecosystem, what impact might this have on other plants and animals there?

Give anonymous feedback on this lesson. (optional)

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