NYC Companion Lesson

Reading "The Amazing Variety of Life in a Coral Reef"

Overview

Students have been figuring out how changes to one population can affect other populations in an ecosystem. The article "The Amazing Variety of Life in a Coral Reef" builds on these ideas and introduces the concept that when there is greater biodiversity in an ecosystem, it is more likely to remain stable, even when one population within that ecosystem changes in size. Following the Active Reading approach, students first read and annotate the article on their own, then they discuss their annotations with a partner. To deepen their understanding, students reread a section of the article that describes why biodiversity in a coral reef helps maintain the stability of the coral reef ecosystem. The purpose of this lesson is for students to learn that ecosystems with greater biodiversity are generally more stable and that humans can impact biodiversity in both positive and negative ways.

Recommended Placement: *Populations and Resources*, after Lesson 3.4
Suggested Time Frame: 60 minutes (first and second reads can be spread across two class periods)

NYS P–12 Science Learning Standards

Performance Expectations	• **MS-LS2-5:** Evaluate competing design solutions for maintaining biodiversity and protecting ecosystem stability.
Disciplinary Core Ideas	• **LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** ° (NYSED) Biodiversity describes the variety of species found in Earth's ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5) • **LS4.D: Biodiversity and Humans:** ° (NYSED) Humans impact biodiversity both positively and negatively. (secondary to MS-LS2-5)

Science and Engineering Practices	• **Practice 1:** Asking Questions • **Practice 8:** Obtaining, Evaluating, and Communicating Information
Crosscutting Concepts	• Stability and Change

Vocabulary

- biodiversity
- consumer population
- ecosystem
- resource population
- species

Materials & Preparation

Materials

For the Class

- Reading "The Amazing Variety of Life in a Coral Reef" copymaster
- Annotation Tracker
- 1 large index card*
- marker*

For Each Student

- Student Edition: "The Amazing Variety of Life in a Coral Reef" article
- student sheets*
  - Reading "The Amazing Variety of Life in a Coral Reef"
  - Second Read of "The Amazing Variety of Life in a Coral Reef"

*teacher provided

Preparation

1. **Print Reading "The Amazing Variety of Life in a Coral Reef" copymaster.** Locate the Reading "The Amazing Variety of Life in a Coral Reef" copymaster on the New York City Resources webpage: www.amplify.com/amplify-science-new-york-city-resources. Make one copy of all pages for each student.
2. **Create and post vocabulary card on the classroom wall.** With a marker, write "biodiversity" in large print on a large index card. Post this card on the classroom wall.
3. **Prepare for Active Reading.** Before class, preview the "The Amazing Variety of Life in a Coral Reef" article. Review the first few sentences carefully as you prepare to model Active Reading. For a full

Preparation (continued)

description of preparing for an Active Reading day, see *Populations and Resources* Lesson 3.1, Lesson Brief, Preparation. It is highly recommended to have students annotate the Student Editions directly with sticky notes in order to achieve the full benefits of this approach.

4. **Print one copy of the Annotation Tracker for each class.** A blank copy is available in your digital teacher's guide in *Populations and Resources* Lesson 3.1, Lesson Brief, Digital Resources. If you plan to use the Annotation Summary Sheet to track students' annotations or wish to review the Annotation Tracker Instructions, these are also available in Lesson 3.1, Digital Resources.

5. **Make sure the Active Reading Guidelines are clearly visible.** If they are not posted on your classroom wall, write them on the board before class. (See Active Reading Guidelines on the Reading "The Amazing Variety of Life in a Coral Reef" student sheet.)

6. **Plan to model Active Reading.** To model the Active Reading approach, you will need to have students follow along as you read aloud the first few sentences of the article. If you have a document camera in your classroom, consider projecting and annotating the article as you read aloud. Alternatively, you can project the article from the PDF available on the New York City Resources webpage.

7. **Prepare for On-the-Fly Assessment.** The second read section of this lesson provides an opportunity to informally assess students' understanding of biodiversity and ecosystem stability. Refer to the On-the-Fly Assessment in the Assessment section of this lesson for details about what to look for and how you can use the information to maximize learning by all students.

8. **Immediately before the lesson, have on hand the following materials:**
   - "The Amazing Variety of Life in a Coral Reef" article
   - student sheets
   - Annotation Trackers

Science Background

Biodiversity can refer to the variation in traits at different levels of biological systems—within a species, species within an ecosystem, or ecosystems within a region. This lesson focuses on the variety of different species within an ecosystem and defines biodiversity as the amount of variety among the living things in an ecosystem. Stable ecosystems are ecosystems where the populations stay about the same size. In addition, when there is a change to one population, other populations do not experience strong ripple effects, so the ecosystem is better able to recover. Biodiversity helps maintain stability in an ecosystem. In an ecosystem with a lot of biodiversity, there are many resource populations and consumer populations. If the size of one resource population decreases, the consumer population is not as impacted because there are other resource populations. The ecosystem can then easily recover from the initial population decrease.

Instructional Guide

First Read of "The Amazing Variety of Life in a Coral Reef"

1. **Introduce the article and make a connection to students' background knowledge.**

   You have been investigating the Glacier Sea ecosystem, which is an example of an unstable ecosystem. In stable ecosystems, population sizes don't change very much, but in Glacier Sea, there were big changes. Today, you will read about stability and change in a coral reef ecosystem by reading an article called "The Amazing Variety of Life in a Coral Reef."

   Ask students to share what they know about coral reefs and what types of things live in coral reefs.

2. **Model Active Reading.** Read the first few sentences of the article aloud. Ask questions and make connections as you model the Active Reading process.
3. **Review Active Reading Guidelines.** Before students begin reading, point out the Active Reading Guidelines on the classroom wall.
4. **Distribute the Reading "The Amazing Variety of Life in a Coral Reef" student sheets.**
5. **Prompt students to read and annotate independently.** Direct students to "The Amazing Variety of Life in a Coral Reef" article in their Student Editions. Circulate as students read, providing support as needed.
6. **Review the process for discussing annotations.** When most students have finished reading and annotating, explain that students will choose one or two annotations to share with a partner. They should select questions or connections that they find interesting or those that will help them better understand what they read.
7. **Provide a moment for students to select the annotations that they will share with their partners.**
8. **Prompt partners to discuss annotations.** Circulate as pairs discuss, using the Annotation Tracker and listening for questions and connections that you would like to invite students to share during the class discussion.
9. **Prompt partners to prepare for class discussion.** Ask them to choose an interesting or unanswered question or connection that they would like to share with the class. Explain that they can discuss the same annotations that they shared with their partners if the questions are still unresolved.
10. **Facilitate a brief class discussion about annotations.** Invite students to share their questions and connections. Encourage students to respond to one another and to look back at the article in order to answer their peers' questions.

11. **Highlight exemplary or noteworthy annotations.** Refer to your Annotation Tracker and invite students to share those annotations that you noted. Provide specific, positive feedback as students share and noting when annotations show evidence of Active Reading. Examples might include annotations that make a connection to science ideas, use vocabulary from the unit, or instances in which students were able to answer their own questions.

Second Read of "The Amazing Variety of Life in a Coral Reef"

12. **Introduce the vocabulary word *biodiversity*.**

    Biodiversity is the amount of variety among the living things in an ecosystem.

    Point out that the vocabulary word is posted on the classroom wall. Remind students that they can also find the definition in the glossary at the back of their Student Editions.

13. **Set purpose for rereading "The Amazing Variety of Life in a Coral Reef."** Explain that students will reread paragraphs 2 and 3 of the article in order explain why an ecosystem with greater biodiversity is more stable than an ecosystem with less biodiversity.
14. **Distribute the Second Read of "The Amazing Variety of Life in a Coral Reef" student sheets and direct students to complete Part 1.**
15. **Have partners share information that they found.** Partners should discuss information that helps them explain why an ecosystem with greater biodiversity is more stable than an ecosystem with less biodiversity.
16. **Lead a brief class discussion about Part 1.** Ask students to share information that they found. Highlight responses that refer to ecosystems with lots of different species having many consumer populations and many resource populations. This helps the ecosystem maintain stability, even when a population changes in size. For instance, if there is a change to one population's resource population, they can eat more individuals from another resource population.
17. **Discuss negative human impacts on coral reefs.**

    Although the biodiversity of coral reefs helps keep the reefs stable and healthy, human activities have caused coral reefs to become unstable.

    Ask students to share how humans have negatively impacted coral reefs. [Pollution, overfishing, and climate change stress coral reefs, which causes losses in biodiversity.]

    Explain how losses in biodiversity are a sign that a coral reef ecosystem is no longer healthy. When populations in the coral reef die out, the ecosystem is no longer stable.

18. **Discuss the positive human impacts on coral reefs.** Ask students to share how humans can positively impact coral reefs. [Reduce problems that apply stress. Add healthy coral

back to the ecosystem.] Explain that reducing stress helps an ecosystem be more resilient and can prevent further losses in biodiversity. Adding healthy coral increases biodiversity, so the ecosystem can regain its health and stability.

19. **Direct students to complete Part 2.**
20. **Have partners share ideas.** Partners should discuss which ecosystem will be most affected by the decreasing snowshoe hare population. Circulate as partners discuss so you can listen to their responses.
21. **On-the-Fly Assessment: Students' Understanding of Biodiversity and Ecosystem Stability.** For further suggestions on how to support students' understanding of biodiversity and ecosystem stability, refer to the On-the-Fly Assessment in the Assessment section of this lesson.
22. **Lead a brief discussion of Part 2.** Invite students to share their ideas. If it does not come up, help students understand that Ecosystem 1 has more biodiversity. This means that a greater number of species make up the ecosystem. When the snowshoe hare population dies out, the ecosystem will remain stable because the snowshoe hare's consumer population still has a resource population and the snowshoe hare's resource population still has a consumer population.

On-the-Fly Assessment: Students' Understanding of Biodiversity and Ecosystem Stability

Look for:

Students should be building the understanding that an ecosystem with greater biodiversity is better able to maintain stability. As students discuss, listen for students to determine that Ecosystem 1 will stay more stable. Students should note that in Ecosystem 1, the snowshoe hare population is not the only resource population for the gray wolf and the red fox populations, as it is in Ecosystem 2. Look for students to explain that because of this, a change to the snowshoe hare population will not affect the stability of the consumer populations as much and therefore, the whole ecosystem will be better able to maintain stability.

Now what?

If students aren't showing the understanding that an ecosystem with greater diversity is better able to maintain stability, guide students in closely examining each food web diagram. Remind students that a stable ecosystem is one where the sizes of the populations do not change very much.

- First, have students examine the diagram for Ecosystem 2 and cross out the snowshoe hare. Ask students what would happen to the gray wolf and red fox populations if snowshoe hares were to disappear. [Wolves and foxes would also die out because they lost their source of food/resource population.] Have them cross out the gray wolf and red fox on the Ecosystem 2 diagram.
- Next, have students examine the diagram for Ecosystem 1 and cross out the snowshoe hare. Ask students how getting rid of the snowshoe hare would affect the gray wolf and red fox populations. [Those population may decrease in size, but they wouldn't die out because they still have other sources of food/resource populations.]
- Now, have students compare the diagrams and ask them which ecosystem had a bigger change in population. [Ecosystem 2.] Explain that in Ecosystem 2, there were more drastic changes to the populations, so it is unstable. Because the gray wolf and red fox in Ecosystem 1 had other resource populations, the entire ecosystem had a smaller change in population. With this smaller change, it is better able to return to being stable.

Reading "The Amazing Variety of Life in a Coral Reef"

1. Read and annotate the "The Amazing Variety of Life in a Coral Reef" article.
2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.
3. Now, choose and mark a question or connection, either one you already discussed or a different one that you would like to discuss with the class.
4. Answer the reflection question below.

Rate how successful you were at using Active Reading skills by responding to the following statement:

As I read, I paid attention to my own understanding and recorded my thoughts and questions.

- ☐ Never
- ☐ Almost never
- ☐ Sometimes
- ☐ Frequently/often
- ☐ All the time

Active Reading Guidelines

1. Think carefully about what you read. Pay attention to your own understanding.
2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
3. Examine all visual representations carefully. Consider how they go together with the text.
4. After you read, discuss what you have read with others to help you better understand the text.

Possible Student Responses

Second Read of "The Amazing Variety of Life in a Coral Reef"

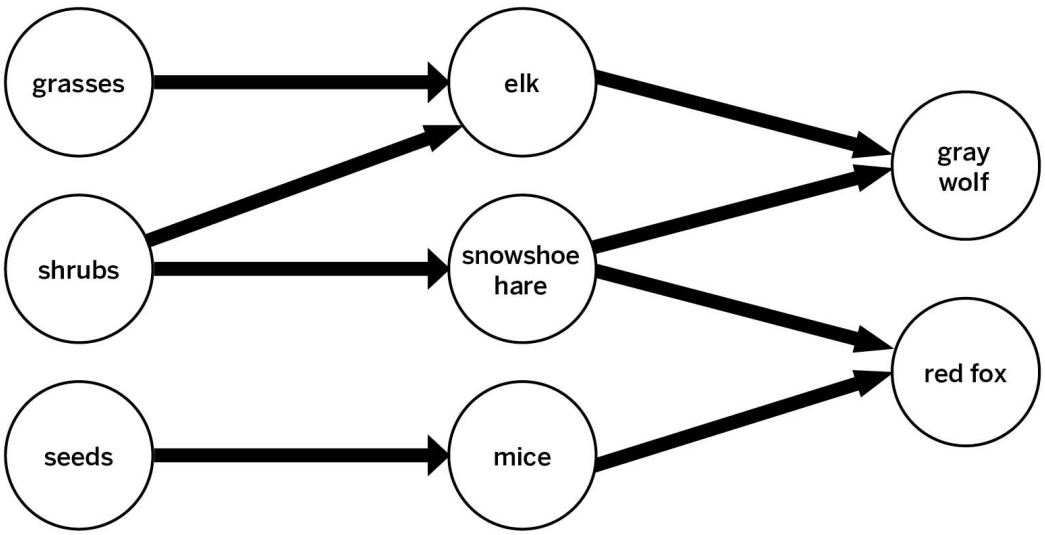
Part 1

Reread paragraphs 2 and 3 of the article "The Amazing Variety of Life in a Coral Reef." As you read, highlight information that helps you explain why an ecosystem with greater biodiversity is more stable than an ecosystem with less biodiversity. You will use that information to help you answer the questions in Part 2.

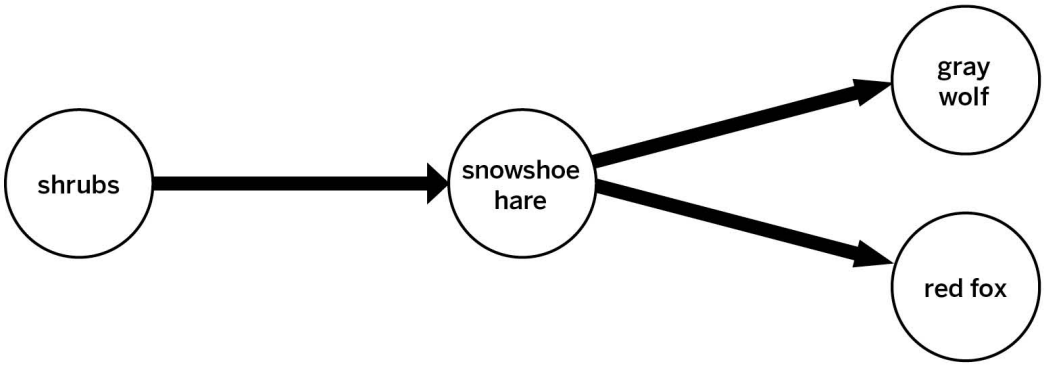
Part 2

The food webs below show two different ecosystems. In each ecosystem, the snowshoe hare population is decreasing. Use these food webs to answer the question on the next page.

Ecosystem 1



Ecosystem 2



Second Read of "The Amazing Variety of Life in a Coral Reef"
(continued)

Which ecosystem will remain more stable, and why?

Ecosystem 1 will stay more stable. This is because there is more biodiversity. In Ecosystem 2, the snowshoe hare is the only resource population for both the red fox population and the wolf population. If the snowshoe hare population decreases, these consumer populations will also decrease a lot or die out because they will not have enough to eat. However, in Ecosystem 1, the wolves and the red fox have other resource populations, so their populations would stay more stable.