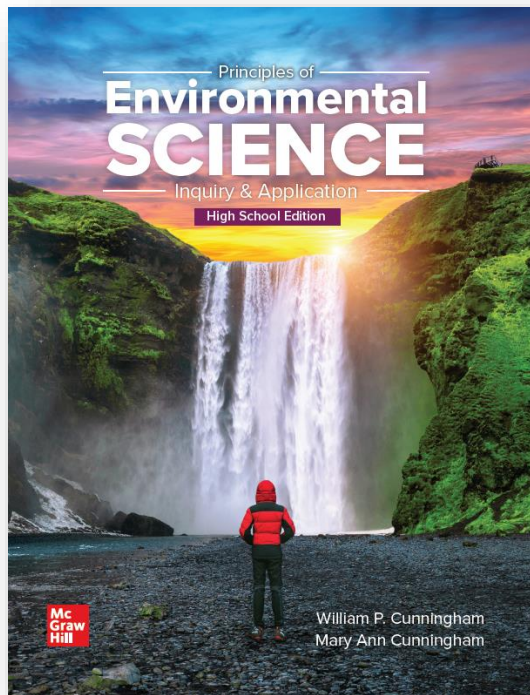


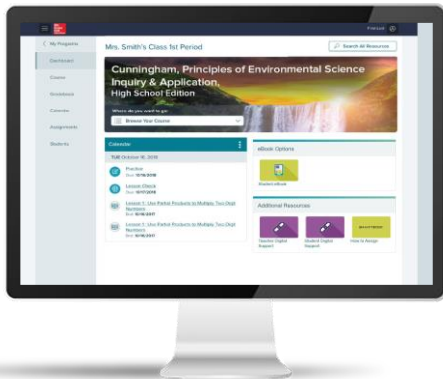
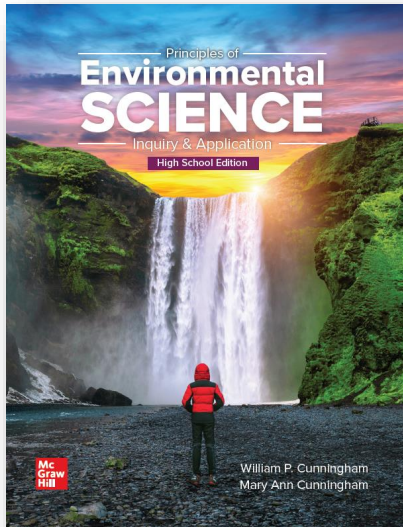


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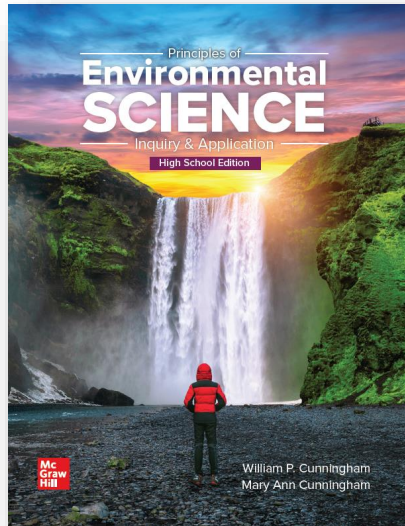
Principles of Environmental Science: Inquiry & Application

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- Up-to-date, introductory view
- Engaging & accessible presentation
- Student lab manual & virtual labs
- SmartBOOK **McGraw Hill Difference**
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Unit Organization

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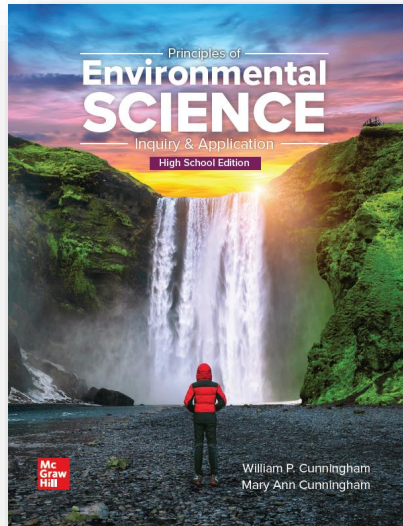
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Unit Openers

UNIT 2 Ecology and the Natural World



Healthy environment: How do we solve complex problems?

Global challenges are often too large and complex to address as a single problem. When viewed as collections of challenges that are smaller in scope, the grander problems can feel more approachable, with solutions more achievable. Some solutions might need simultaneous implementation, while others might need to be completed in a step-wise fashion.

GO ONLINE to break down one of the many marine challenges currently facing society into a more approachable problem. In this project, you will break a complex real-world problem facing the marine environment down into identified sub-problems and identify their stakeholders and constraints through research.

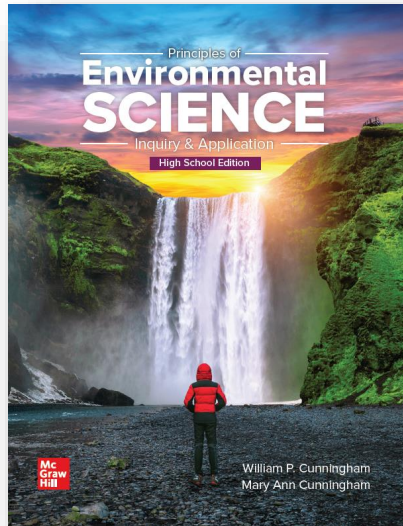
Environmental Career Focus: Ecologist

During your education, have you found yourself specifically interested and curious about how life is intricately connected to other organisms and the environment around it? For example, if you have wondered how a chameleon has evolved very specific defense mechanisms that allow it to change the color of its body to match the immediate environment around it, you may enjoy studying ecology. Evolution, species interactions, biodiversity, and population dynamics are a few of the topics that ecologists study. Ecologists work in fields such as environmental consulting, education, and public service. Students interested in ecology benefit from the pursuit of a bachelor's degree in areas such as biology, chemistry, and environmental science. Filling the role as a volunteer or student assistant in a lab are great ways to learn about the practical application of ecology and to gain experience in the field.

Charles Darwin is considered by some to be the greatest biologist and contributor to ecology that we know. From his experiences on the famous HMS Beagle voyage, Darwin developed the theory of evolution through natural selection. Darwin's story is an excellent testament to the inherent necessity of observation required in ecology.

GO ONLINE to explore more environmental science careers with the Career Focus Inquiry Activities.

- Chapter 3** Environmental Systems: Matter, Energy, and Life
- Chapter 4** Evolution, Species Interactions, and Biological Communities
- Chapter 5** Human Populations
- Chapter 6** Biomes and Biodiversity



Chapter Openers

6.1 TERRESTRIAL BIOMES

Guiding Questions

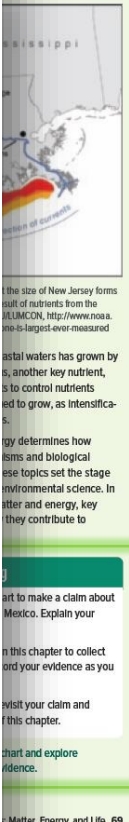
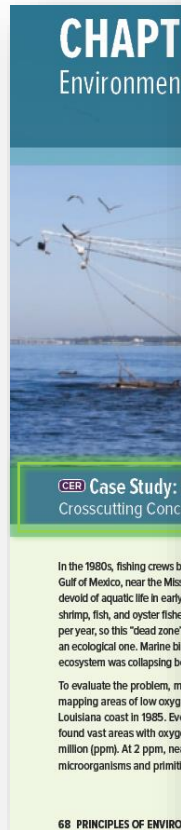
What are nine major terrestrial biomes, and what environmental conditions control their distribution?

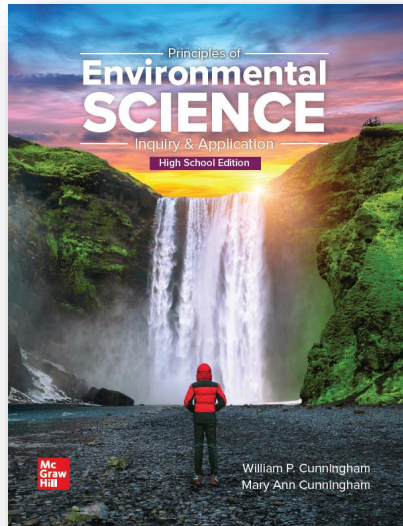
Use the Practices

Obtaining, Evaluating, and Communicating Information: What terrestrial biome are you located in? Create a graphic organizer to show which biome(s) you are located in and closest to, the climatic conditions of the biome or biomes, and the most common species found in the biome.

Biological communities are strongly shaped by temperature ranges and the availability of moisture. As we evaluate potential effects of environmental change, it's useful to start by examining how these factors influence general patterns of plant and animal distribution. **Biome** is a term we use to describe these broad classes of biological communities. If we know the range of temperature and precipitation in a particular place, we can generally predict what kind of biome is likely to occur there, in the absence of human disturbance (fig. 6.3).

An important characteristic of each biome is its **biodiversity**, or the number and variety of biological species that live there. Species not only create much of the structure and functions of an ecosystem but, as we discussed in chapter 3, also





Real-World Connections

What Exploring Science

Gene Editing

Humans have kn

Restoring Coral Reefs

Coral reefs are among the richest and most endangered biological communities on earth, the marine equivalent of tropical rainforests in diversity, productivity, and complexity.

survive much warmer water than most corals can tolerate. Natural selection has produced this unusual population, as heat-tolerant individuals survived but intolerant ones did not.

MATH Connection Examining Climate Graphs

Among the nine types of terrestrial biomes you've just read about, one of the important factors is the number of months when the average temperature is below freezing (0°C). This is because most plants photosynthesize most actively when daytime temperatures are well above freezing—and when water is fluid, not frozen (see chapter 3). Among the biome examples shown, how many sites have fewer than 3 months when the average temperature is above 0° ? How many sites have all months above freezing? Look at figure 6.3. Do all deserts have average yearly temperatures above freezing? Now look at figure 6.4. Which biome do you live in? Which biome do most Americans live in?

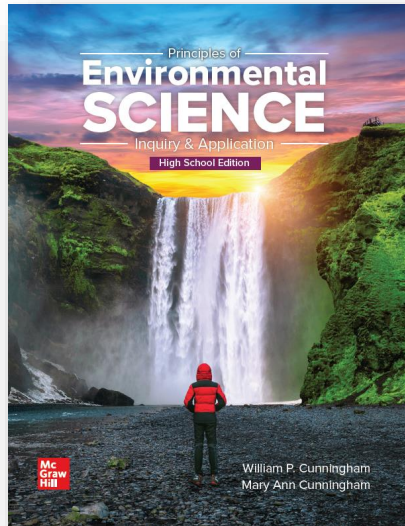
now operate worldwide, and tens of thousands of small corals have been transplanted to damaged or depleted reefs.

Focusing on genetic variants might increase the success of restoration efforts. In a lagoon in American Samoa, corals have been found that can

FIGURE 1 Fragments of staghorn and elkhorn coral can be cultivated in nurseries and used to replenish damaged reef systems.



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Engaging Visuals

Key Concepts

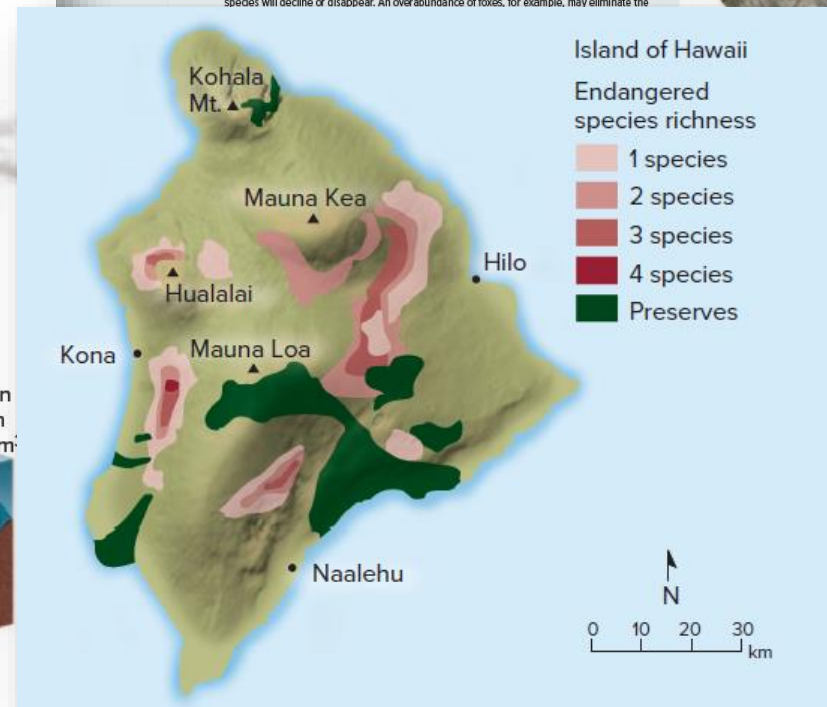
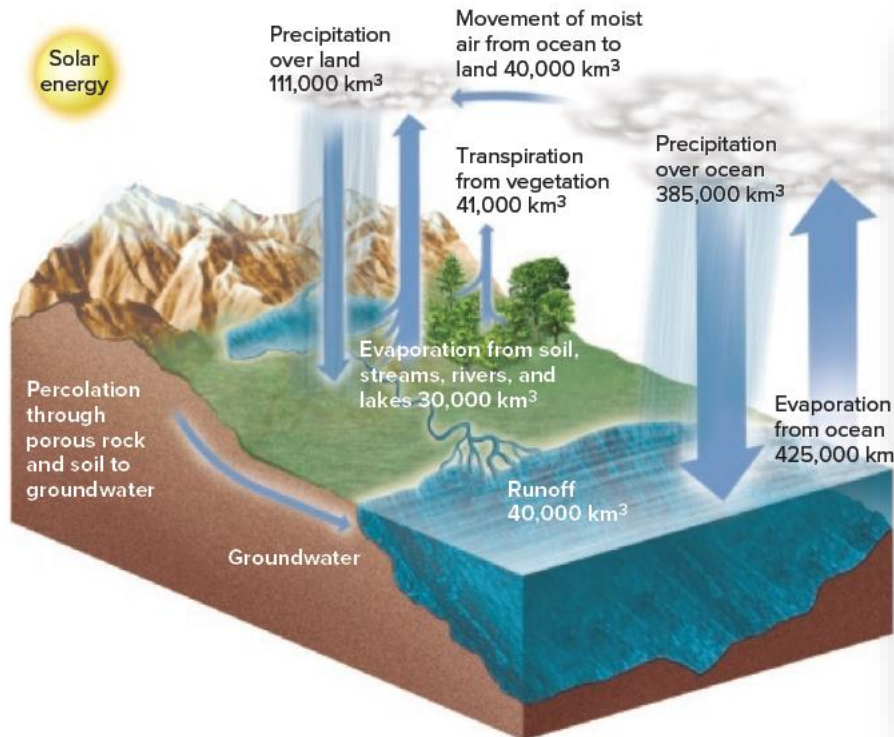
How do energy and matter move through systems?

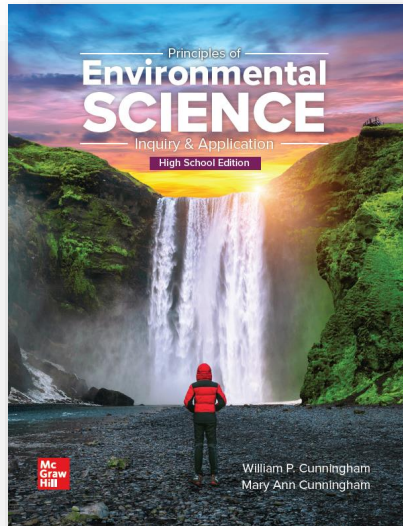
Movement of energy and matter unites the parts of a system. In the Gulf of Mexico (opening case study), movement of water and nutrients supports photosynthesis, which supports the ecosystem. But excess nutrients can trigger so much algal and bacterial growth that the system becomes unstable. For ecosystems in general, it is helpful to group organisms by trophic levels (feeding levels). In general, *nutrients* move through an ecosystem that *nutrients* remain matter, mainly from plants and consumed by herbivores and decomposers.

What happens if the pyramid is disrupted?

Ecosystems undergo many types of disturbances and disruptions. Often ecosystems recover in time; sometimes they shift to a new type of system structure. Forest fire is a disturbance that eliminates primary production for a short time. Fire also accelerates movement of nutrients through the system, so that nutrients once locked up in standing trees become available to support a burst of new growth.

Removal of other trophic levels also disturbs an ecosystem. If there are too many predators, prey species will decline or disappear. An overabundance of foxes, for example, may eliminate the



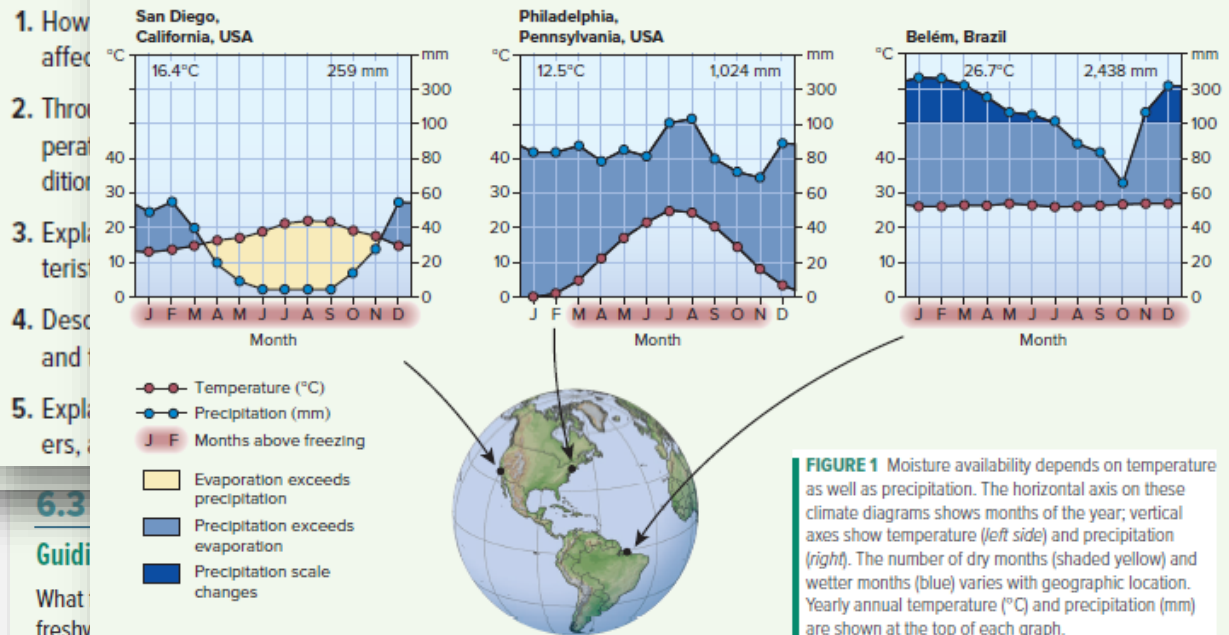


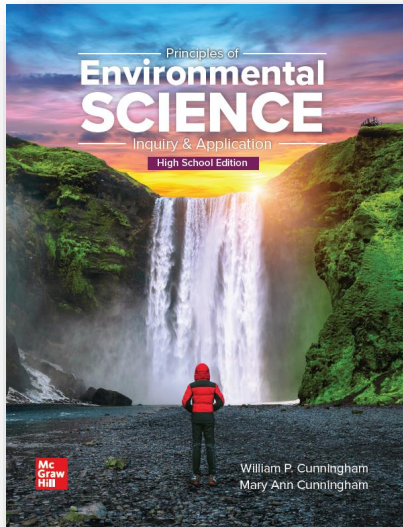
Reviews and Assessments

Go Further: Data Analysis Lab

Climatologists, geographers, biologists, and others often want to explain differences in biodiversity, or in water resources, for example. To describe and compare regional climate conditions, they use climographs, graphs that plot precipitation and temperature variation over a year. If you take a few minutes to make sure you understand these graphs, they will be useful in helping you remember and explain differences in the biomes discussed in this chapter.

- Which area has the wettest climate? Which is driest?
- How do the maximum and minimum monthly rainfalls in San Diego and Belém compare? Note that the axis scale changes for Belém, because there's no room to plot such high numbers.
- What would a climate graph look like where you live? Sketching one out, then compare it to a graph for a biome similar to yours in this chapter.





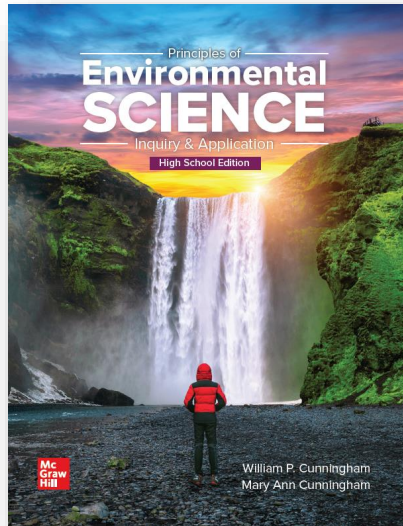
Student Lab Manual

- 33 Lab Activities
- Modeling Exercises, Experiments, and Simulations
- Guided Inquiry and Open Inquiry Labs

Environmental **SCIENCE**

LABORATORY MANUAL





Virtual Labs

MICROSCOPY • POND WATER WET MOUNT [FEEDBACK] [SUBMIT]

INTRODUCTION LABORATORY SIMULATION

Question [X]

What are advantages to using a wet mount slide preparation?
Select all that apply

☒ A. The specimen could be viewed moving.

My Notes [Print] [X]

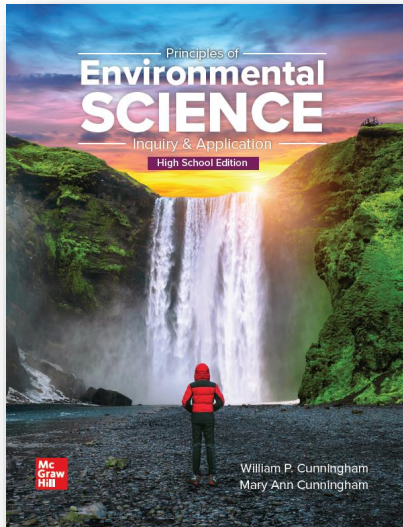
1. Using pipette, obtain drop of pond water and place at center of slide
2. Using tweezers, add cover slip. Be careful to avoid air bubbles trapped between the slide and cover slip
3. Place slide onto microscope stage
4. Use fine focus knob to adjust image. When focused, a question will appear

PHASE 1: Create Wet Mount

Complete the following steps:

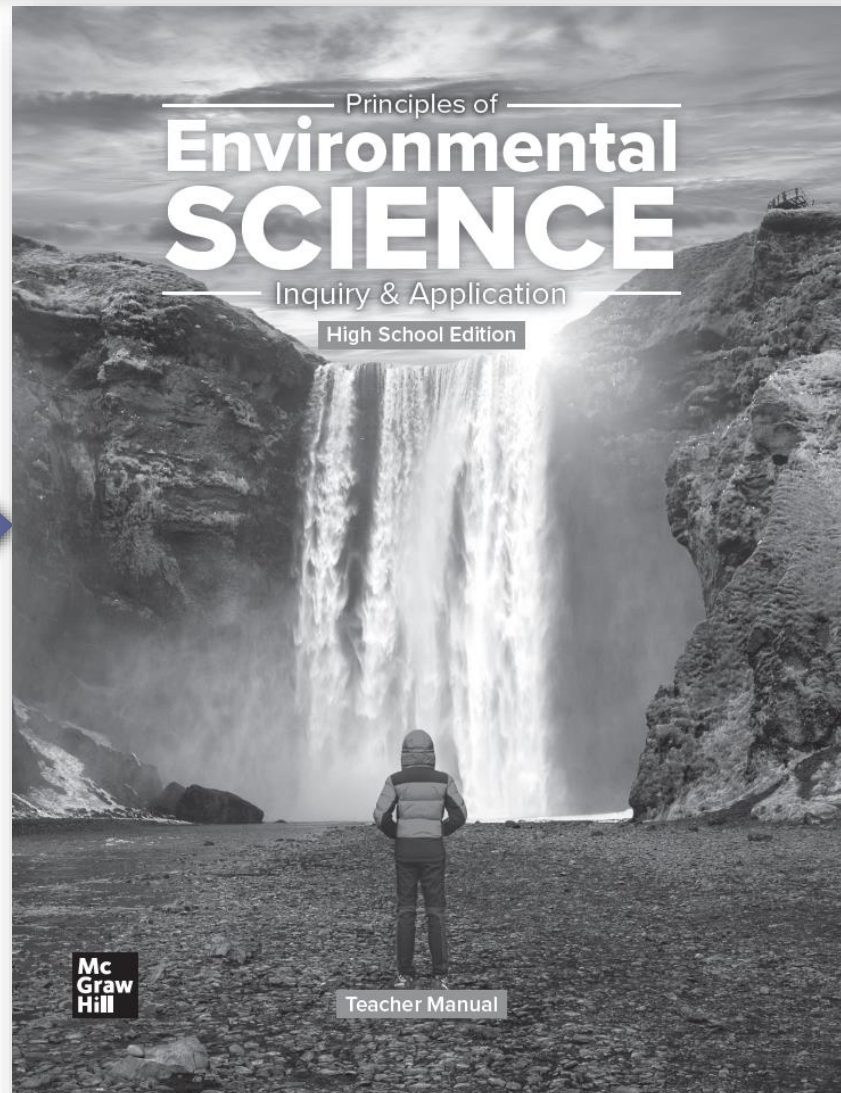
1. Using pipette, obtain drop of pond water and place at center of slide
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3. Place slide onto microscope stage
4. Use fine focus knob to adjust image. When focused, a question will appear

Fine focus [Left Arrow] [Right Arrow]



Robust Teacher Resources

- Pacing guides
- Suggested approach
- Classroom activities with differentiated instruction
- ELL support



Interactive eBook

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Page 79

The ecological consequences of ocean acidification are profound, though not as well understood as the chemistry behind the process. Corals and certain groups of plankton, such as pteropods (Fig. 3.20), are most vulnerable because of the type of calcium carbonate they make. Plankton communities are likely to be radically altered, especially in the Southern Ocean where scientists use pteropods as an indicator of ecosystem health. As acidification becomes more severe, it will affect other important plankton, such as foraminifera. Ocean acidification might enhance the growth of plankton that remove CO₂ from the atmosphere or foster the formation of cooling clouds and thus help mitigate climate change. It is also possible that acidification might reduce the ocean's CO₂ uptake and accelerate climate change by increasing its release to the atmosphere. If it ends up negatively impacting plankton, all marine ecosystems will be affected, because plankton form the basis of the food web in most of these ecosystems.

Healthy shell (normal pH)



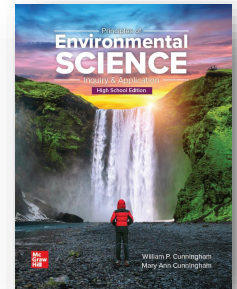
Damaged shell (lower pH)



Smooth ridges

Clear shell

Ragged

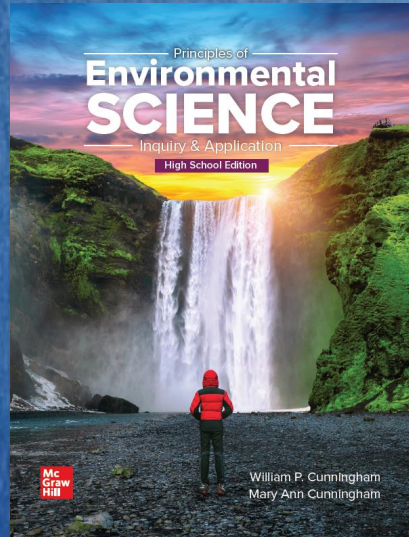


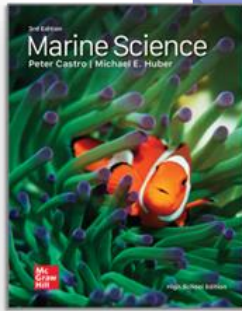
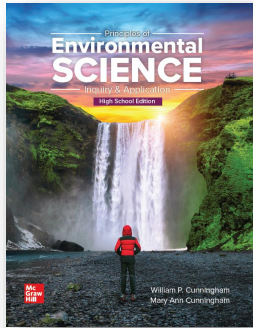
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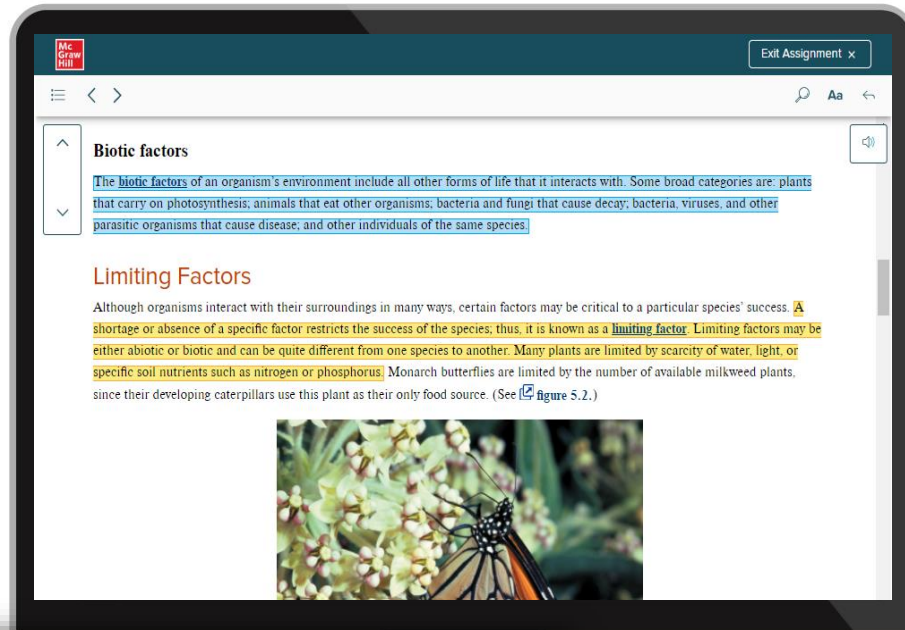


Phone, iPad, Chromebook, or Tablet

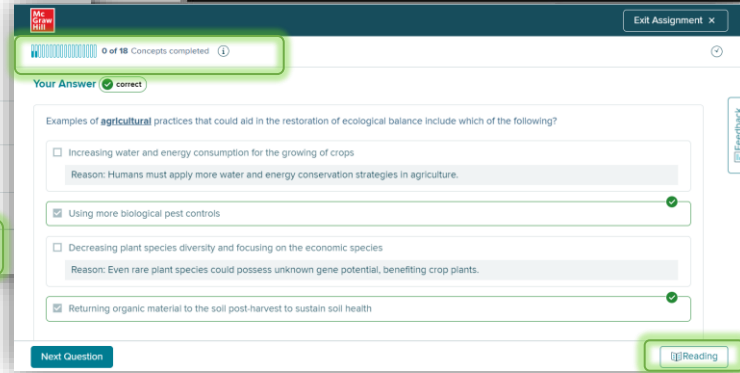
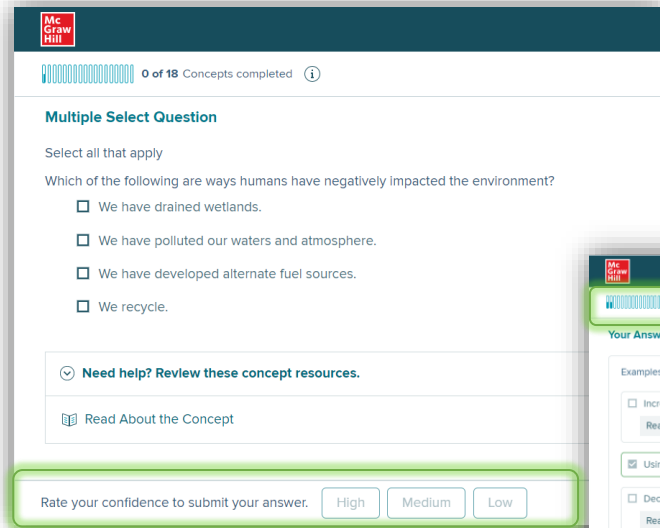




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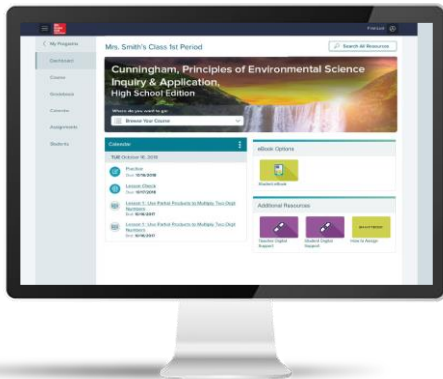
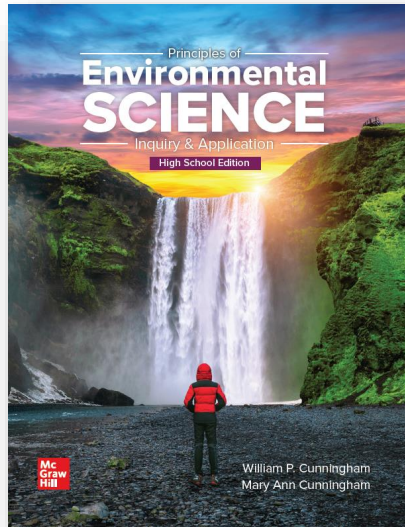


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