

## CHAPTER

## 2

# Ecosystems

## Lesson Objectives

- Define ecosystem.
- Discuss how biotic and abiotic factors play a role in ecosystems.
- Explain what a niche is and its importance in an ecosystem.
- Describe what a habitat is and how an organism is adapted to live in the habitat.

## Check Your Understanding

- What is a community?
- What are the different types of community interactions?

## Vocabulary

- habitat
- niche

## What is an Ecosystem?

The next level after community is an ecosystem. An ecosystem consists of all the biotic factors (plants, animals and micro-organisms) interacting with all of the abiotic factors (water, soil, and air, for instance) in the same area.

You can find an ecosystem in a large body of freshwater or in a small piece of dead wood. Other examples of ecosystems include the coral reef, the Greater Yellowstone ecosystem, the rainforest, the savanna, the tundra, the desert and the urban ecosystem (**Figure 2.1**).

Ecosystems need energy. They mostly get their energy in the form of sunlight. Matter is also recycled in ecosystems. Recycling of nutrients is important so they can always be available. Elements like carbon, nitrogen, and water are used over and over again by organisms. Human ecosystems could be a household, neighborhood, college, or even a nation. Human ecosystems interact with each other. Since humans live virtually all over the planet today, nearly all ecosystems could be considered human ecosystems.

In 2005, the largest assessment ever conducted of the earth's ecosystems was done by a research team of over 1,000 scientists. The study concluded that in the past 50 years, humans have altered the earth's ecosystems more than any other time in our history.

## Biotic and Abiotic Factors

Biotic factors of an ecosystem include all living parts. Examples of biotic factors include bacteria, fungi, unicellular and multicellular plants, and unicellular and multicellular animals.

Abiotic factors are non-living chemical and physical factors in the environment. The six major abiotic factors are water, sunlight, oxygen, temperature, soil and climate (such as humidity, atmosphere, and wind). Other factors include carbon dioxide, geography, and geology.

Abiotic and biotic factors interact within ecosystems and also between ecosystems. For example, water may be recycled between ecosystems, by the means of a river or ocean current. Some species, such as salmon or freshwater eels, move between marine and freshwater ecosystems.

**FIGURE 2.1**

An example of a desert ecosystem in Baja California, showing Saguaro cacti.

## Niche

Each organism plays a particular role, or niche, in its ecosystem. A **niche** is the role a species or population plays in the ecosystem. In other words, a niche is how an organism “makes a living.” A niche will include the food of an organism and how it obtains its food and space. Different species can hold similar niches in different locations. The same species may occupy different niches in different locations. Species of the Australian grasslands have the same niche. Once a niche is left vacant, other organisms can fill that position. When the tarpan, a small, wild horse found mainly in southern Russia, became extinct in the early 1900s, the niche was filled by a small horse breed, the konik (Figure 2.2).

**FIGURE 2.2**

The konik horse, which filled the niche left by the tarpan, a horse that became extinct in the early 1900s in southern Russia.

When plants and animals are introduced, either intentionally or by accident, into a new environment, they can occupy

new niches or the existing niches of native organisms. Sometimes new species out-compete native species. They can even become a serious pest.

For example, kudzu, a Japanese vine, was planted in the southeastern United States in the 1870s to help control soil loss. Kudzu had no natural predators, so it was able to out-compete native species of vine and take over their niches (**Figure 2.3**).

**FIGURE 2.3**

Kudzu, a Japanese vine, introduced intentionally to the southeastern United States, has out-competed the native vegetation.

As discussed in the previous lesson, the competitive exclusion principle states that if niche overlap occurs, either one species will be excluded, character displacement will happen (as in Darwin's Finches), or the species will go extinct.

## Habitat

The **habitat** is the environmental area where a particular species lives (**Figure 2.4**). Abiotic factors are used to describe a habitat. The average amount of sunlight received each day, the range of annual temperatures, and average yearly rainfall can all describe a habitat. These and other factors will affect the kind of traits an organism must have in order to survive there (**Figure 2.5** and **Figure 2.6**).

Habitat destruction means what it sounds like - a species' habitat is destroyed. Habitat destruction can cause a species' population to decrease. If bad enough, it can also cause species to go extinct. Clearing large areas of land for housing developments or businesses can cause habitat destruction. Poor fire management, pest and weed invasion, and storm damage can also destroy habitats.

National parks, nature reserves, and other protected areas all preserve habitats. The *Environmental Problems* chapter will discuss habitat destruction in further detail.

Habitats can also be examined from a human point of view. The environments where we live, work, and reproduce are our habitats.

## Lesson Summary

- An ecosystem consists of all the biotic and abiotic factors interacting together in an area.





**FIGURE 2.4**

Santa Cruz, the largest of the northern Channel Islands, has the most diverse of habitats in the sanctuary, including a coastline with steep cliffs, coves, gigantic caves, and sandy beaches.



**FIGURE 2.5**

Another example of a type of habitat, showing a meadow and representative vegetation.

- Biotic factors include all living components of an ecosystem. Abiotic factors are the non-living chemical and physical factors in the environment.
- The niche concept is one of the most important ideas associated with ecosystems.
- If niche overlap occurs, then the competitive exclusion principle comes into play.
- The habitat is the area where a particular species, species population, or community lives.
- Habitat destruction is a major cause of population decrease, leading to possible extinction.
- Both the ecosystem and habitat can be looked at from a human point of view.

## Review Questions

### Recall

1. Give three examples of ecosystems.
2. List the six most common abiotic factors.

**FIGURE 2.6**

The above image shows wetland reeds, another type of habitat.

3. What is a niche?
4. Give an example of an organism filling a vacant niche.
5. What is a habitat?

### Apply Concepts

6. Why might a newly introduced species become a pest?
7. Name three abiotic factors that can be used to describe a habitat.
8. Give one example of an organism and its niche that is not included in the chapter.

### Critical Thinking

9. Species that travel distances between important areas for their survival, like migrating birds, may be particularly vulnerable to habitat destruction. How might the creation of multiple national parks or nature reserves help such species?

### Further Reading / Supplemental Links

- Unabridged Dictionary, Second Edition. Random House, New York, 1998.
- <http://www.kidsgeo.com/geography-for-kids/0164-ecosystems.php>
- <http://en.wikipedia.org/wiki>

### Points to Consider

- Now that you understand what makes up an ecosystem, what additional factors do you think might be added to get to the next level, the biome?
- How do you think what you have learned about abiotic and biotic factors might be applied to the classification of different biomes?