

Biodiversity in Ecosystems

FIGURE 7: Coral reefs are marine ecosystems where many different species live.



Coral reefs make up a small percentage of marine habitats, but contain most of the oceans' species diversity. The more diverse an ecosystem is, the more likely it is to remain stable over the long term. If a disturbance, such as pollution or a fire, affects an ecosystem, recovery can happen more quickly if that ecosystem has more biodiversity.

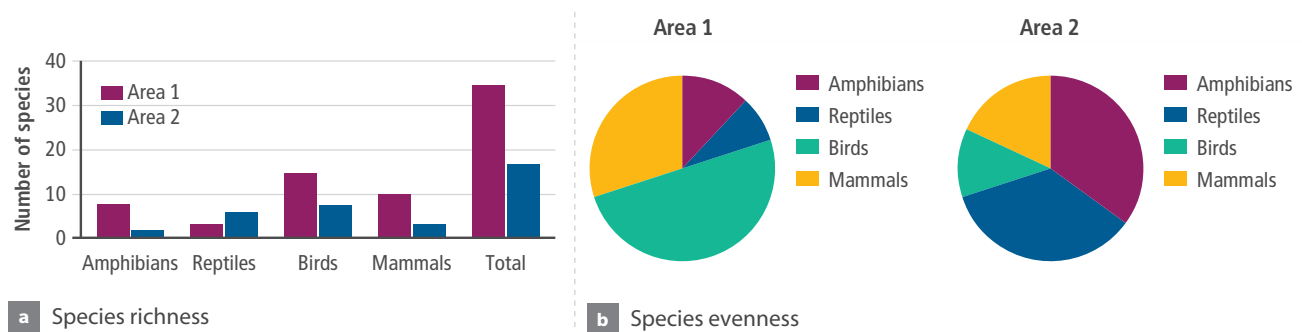
Biodiversity

The complexity of an ecosystem indicates its biodiversity level. **Biodiversity** refers to the variety of species within an ecosystem. Note that biodiversity measures the number of different species, not the number of individual organisms living in an area. An area with a high level of biodiversity, such as a coral reef, has a large assortment of species living near one another. Biodiversity depends on many factors, such as moisture and temperature. The complex relationships in ecosystems mean that a change in a single biotic or abiotic factor can have a variety of effects, both small and large, on many different species.



Data Analysis

FIGURE 8: Ecologists analyze species richness (left) and species evenness (right) to evaluate ecosystem biodiversity.



There are many different ways to measure biodiversity in an area. Two factors that ecologists often use are species richness and species evenness. Species richness is the number of species per sample of an area. Areas with a high number of different species have high species richness and therefore high biodiversity. Species evenness measures the abundance of different species that make up the species richness. Species evenness considers the relative distribution of the numbers of species in an ecosystem.

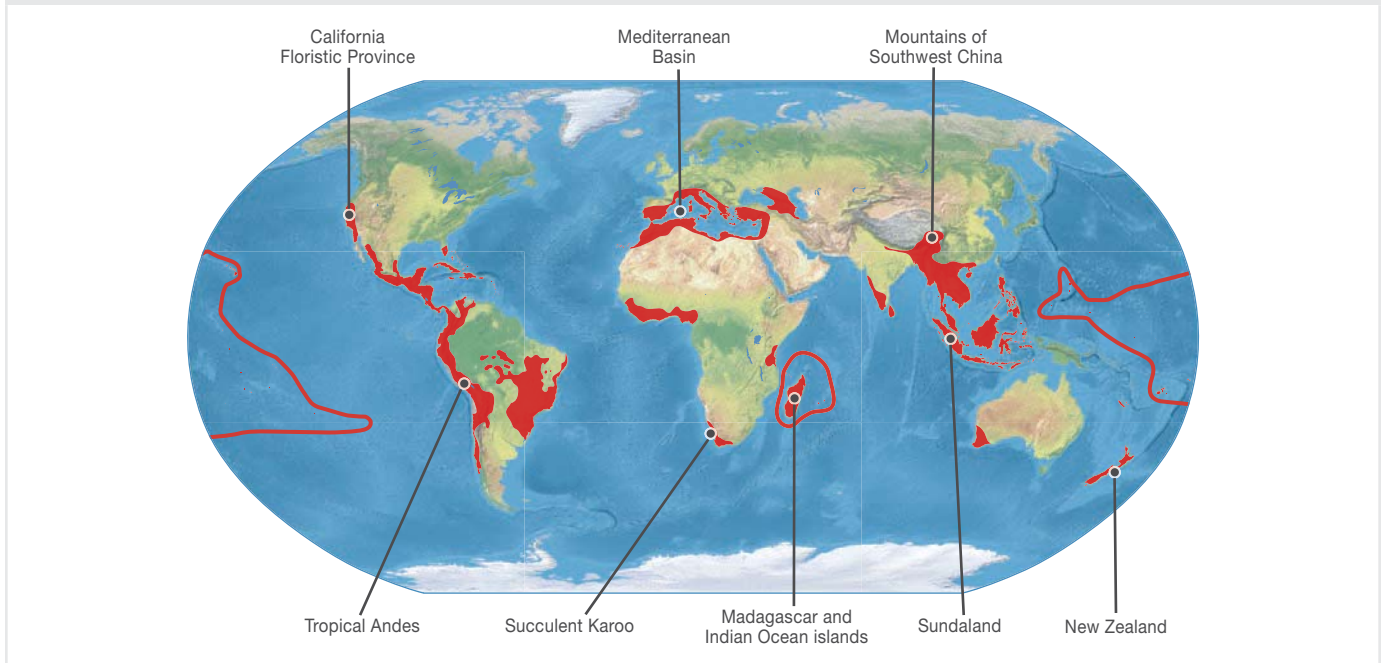


Explain Use the graphs in Figure 8 to answer the following questions:

1. What might happen if a new bird species arrived in Area 1?
2. How could this affect the species richness and species evenness in Area 1?
3. What conclusions can you draw about species richness and species evenness between the two areas?


FIGURE 9: Scientists have identified over 30 biodiversity hot spots around the world.

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A biodiversity hot spot is an area with a particularly high level of biodiversity. Figure 9 shows a global map of biodiversity hot spots. These locations often contain species that are found nowhere else in the world. One hot spot located in North America is the California Floristic Province, an area with a Mediterranean-like climate that is home to giant sequoia and coastal redwood trees.

Scientists are currently working to protect several biodiversity hot spots. Preserving these areas helps to prevent species from going extinct and protects the ecosystem as a whole. Maintaining as much biodiversity as possible makes the entire biosphere healthier and provides a more stable habitat for plants, animals, and other species. These areas also are important, because they may hold clues to new medicines and new resources and may further our understanding of the biosphere.

 **Analyze** Biodiversity hot spots are found around the world. Why can scientists not come up with a single solution to protect all of these areas?



Engineering

Building Artificial Coral Reefs

Earth's coral reefs are critical for the stability of marine ecosystems. Unfortunately, many are classified as threatened because of the effects of human activity. Living corals depend on the limestone deposited by their predecessors to get the minerals necessary to build their own bodies. However, the limestone is being dissolved from existing reefs due to increased ocean acidity caused by climate change. Marine ecologists are now combating this destruction by sinking artificial reefs, such as the one shown in Figure 10, which uses electrical currents to attract the limestone deposits needed by growing coral.



Gather Evidence What is the relationship between biodiversity and ecosystem stability? How do artificial reefs affect a marine ecosystem's stability?

FIGURE 10: Artificial reef



Keystone Species

Sometimes a single species has an especially strong effect on an entire ecosystem. This species is called a keystone species. Whatever happens to this species affects all the other species in that ecosystem. For example, when the beavers shown in Figure 11 built their dam across a stream, it turned a terrestrial ecosystem into a freshwater ecosystem. This killed existing plants and forced land animals to move to new territories. The new pond's inhabitants rely on the beavers to maintain the dam. If the beavers are removed, the dam will eventually fail. The pond will drain and over time the land will return to a terrestrial ecosystem, such as a meadow.



Collaborate With a partner, discuss why protecting a keystone species can protect a habitat as a whole.



FIGURE 11: Beavers are a keystone species that make and maintain pond ecosystems.

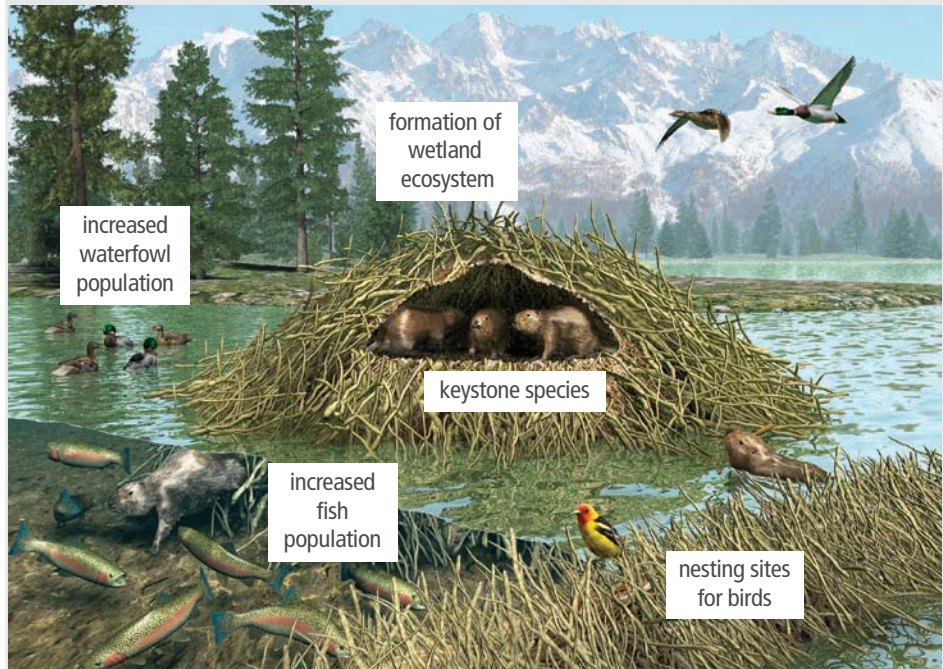


FIGURE 12: Many farmers use pesticides to control insects and weeds to increase the amount of harvested crops.



Factors That Affect Biodiversity

Many factors can reduce biodiversity. Human activities can reduce it very quickly. Humans need food, and much of that food comes from plants, which requires large areas of land to be cleared to make fields to grow crops. Developing agricultural land removes most of the native plant and animal species in a region and replaces them with one or only a few species that are managed as crops. In addition, pesticide use can negatively affect any remaining native organisms. Biodiversity also is lost when land is cleared for human housing and industrial sites.

Introduction of new plants and animals into ecosystems is another serious issue. These species can reduce biodiversity by preying on native species or outcompeting native species for resources, such as food or shelter.



Explain How does a natural phenomenon, such as the eruption of a volcano on an oceanic island, affect biodiversity? Will the biodiversity that returns to the island be the same as it was before?