

What is biodiversity?

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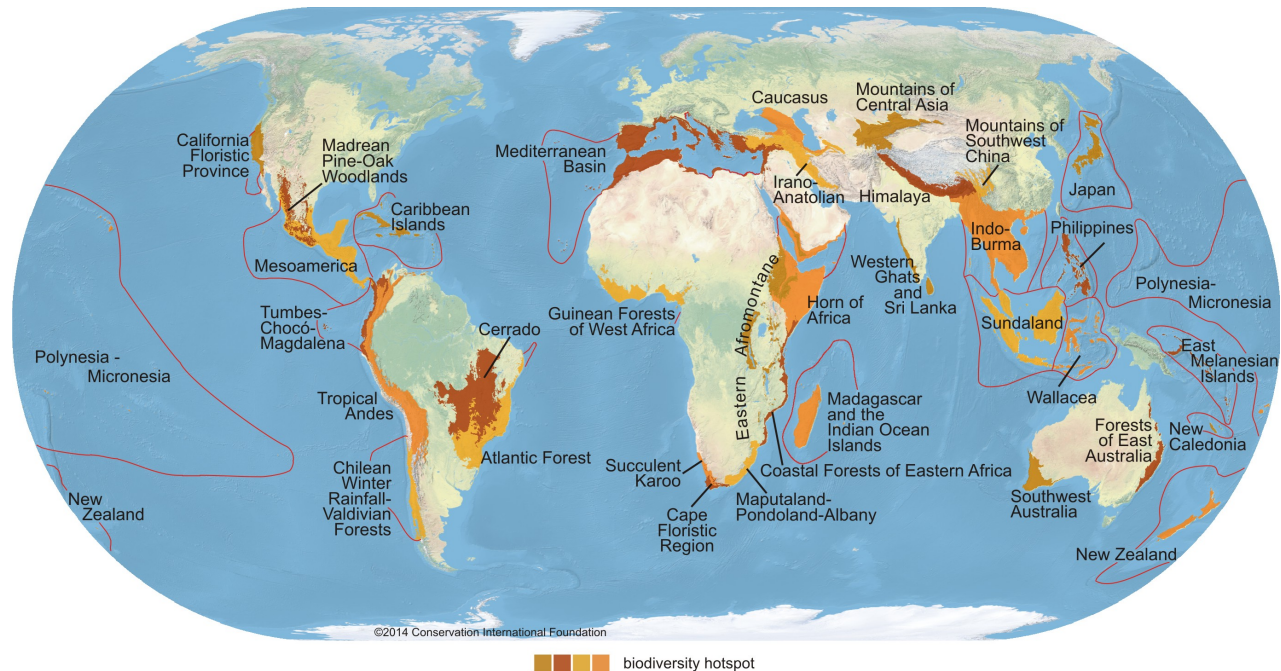
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A toucan in Guanacasta, Costa Rica. Costa Rica is one of the world's most biodiverse countries. Photo by: Flickr

Biodiversity, or biological diversity, refers to the wide variety of life on the planet. Scientists think about it in three ways: the plant and animal life in a particular area, the genetic variation within a species and the numbers of different ecosystems, or communities of life, in a region.



Conservation International (conservation.org) defines 35 biodiversity hotspots — extraordinary places that harbor vast numbers of plant and animal species found nowhere else. All are heavily threatened by habitat loss and degradation, making their conservation crucial to protecting nature for the benefit of all life on Earth.

An area with high biodiversity includes many different species. A biodiverse area will include a number of healthy ecosystems. A high degree of biodiversity makes a system stronger, while decreasing biodiversity means that the area is under environmental stress.

Some areas are more biodiverse than others. Tropical areas are more biodiverse than polar regions and arid deserts, and have more species of plants, animals and microbes per acre. Tropical coral reefs are among the most species-rich areas of the oceans.

The Rise Of Conservation Biology

The idea of biodiversity began in the 1980s. Conservation biology is the study of life on the Earth with the goal of protecting habitats and ecosystems. At the time, plants and animals were going extinct at high rates as the result of human actions, such as cutting down trees in the rain forests and polluting the air and water.

In his landmark book "Biodiversity," American biologist Edward O. Wilson stressed that biodiversity was important for the well-being of humankind. He said that international cooperation could conserve the planet's biodiversity. Wilson likened biodiversity to an insurance policy for an ecosystem. In other words, the more species an ecosystem has, the more likely it is to survive different kinds of threats. In 2011, scientists estimated that 8.7 million species of living organisms inhabited the planet. Of these, 86 percent of land species and 91 percent of ocean species had yet to be discovered.

Threats To Biodiversity

The planet is undergoing an event known as a die-off, that is, a mass extinction. About 65 million years ago, 75 percent of plant and animal species on Earth, including the dinosaurs, suddenly went extinct. Scientists estimate the Earth is experiencing a similar die-off, and species are going extinct at a rate that is about 1,000 to 10,000 times faster than normal. This loss of biodiversity is due to human activities. There are five major reasons responsible for the rapid and large-scale die-off. They are habitat destruction, climate change, invasive species, overexploitation and pollution.



The leading reason for the loss of biodiversity around the world is habitat destruction. When a habitat is destroyed, the area becomes unlivable for the plants and animals. Land is often cleared for housing, commerce and farmland to feed the world's surging population. Vast areas of the

Amazon rain forest, an area of remarkable biodiversity, for instance, have been clear-cut to graze cattle or plant crops. When ecosystems are destroyed, the plants and animals that rely on these ecosystems are threatened.

Climate change is the rise in average global temperatures, which may cause the extinction of up to 25 percent of all land species by 2050. Many species cannot survive outside a narrow temperature or precipitation range. When species fail to adapt to changing temperatures or changing rain amounts, they may die off and threaten the existence of other species that rely on them for food.

The third threat to biodiversity is invasive species. These are plants and animals that have been brought to a region, either intentionally or unintentionally. They have no natural predators and may be more hardy than native species. In the 1800s, settlers introduced many species of animals to Australia, such as cane toads, camels, goats, water buffalo and pigs. They led to a decline of many of the native species of plants and animals found only in Australia.



Overexploitation is when a resource is used so much that it gets completely used up. Examples of overexploited resources include groundwater, fish stocks and old-growth forests. When these resources become scarce, they are no longer able to sustain the ecosystems that rely on them. For instance, when the Maori people of New Zealand hunted the moa, a large flightless bird, to extinction, the Haast's eagle also became extinct because it lost its main source of food.

Finally, an ecosystem can be damaged by pollution. Examples of contaminants, or pollutants, include exhaust from automobiles and other vehicles, chemicals that industrial plants dump into rivers, fertilizer, pesticide and manures from industrial farming operations, and even trash that people toss on the side of the road. Air pollution can lead to acid rain, which changes the chemical makeup of soil, making it difficult for trees and plants to survive. It kills the oceans' coral reefs, which are home to thousands of aquatic plant and animal species. Soil is often polluted by common chemical fertilizers that make large-scale agriculture possible. These fertilizers can end up in rivers, streams and oceans, causing algae growth. The algae deplete oxygen and kill other organisms. This can lead to dead zones, areas with so little oxygen that they cannot support the aquatic ecosystem.

The Convention On Biological Diversity

The Convention on Biological Diversity is an international treaty designed to conserve biodiversity. It calls on countries to create and enforce action plans that halt the spread of invasive species and protect ecosystems through sustainable development. It also calls for the protection of genetic diversity by establishing seed banks.



The convention was opened for signature at the Earth Summit in Rio de Janeiro in 1992. Since then, every nation in the world except the United States has signed and ratified it. It took effect in 1993. To further its goals, the convention adopted the Cartagena Protocol on Biosafety in 2000 and the Nagoya Protocol in 2010. The Cartagena Protocol addresses the issue of genetically modified organisms (GMOs.) It urges governments to adopt practices that require scientific evidence that genetically modified crops, like corn or cotton, are generally safe before they are exported to other countries. The Nagoya Protocol includes a list of 20 biodiversity targets to be met by 2020.

Conserving Biodiversity By Giving It Economic Value

Many conservation biologists believe that the best way to preserve biodiversity is to highlight its economic benefits. In other words, biodiversity is valuable to people. For example, biodiversity impacts the food that we eat and the water that powers some electricity plants. These are just two ways that biodiversity can be useful and valuable to people.

Biodiversity can be valuable in other ways, even though we may not be able to attach a price to something. One example is the opportunity to enjoy amazing places in nature.

According to a study, the benefits of biodiversity amount to many trillions of dollars. In fact, preserving biodiversity is far less expensive than having to adjust to a less biodiverse world. The problem is that it is hard to assign a value in terms of, say, a number of dollars, to all of the benefits healthy ecosystems provide. Payment for ecosystem services (PES) is a system that assigns economic value to the act of conserving natural resources and preserving biodiversity. For example, a government might pay landowners to manage their land in ways that protect natural resources.

People can help protect biodiversity by supporting nonprofit conservation organizations. They also can educate themselves, vote for proposals that maintain biodiversity and support companies that use sustainable practices.

Quiz

- 1 Read the selection from the section "The Rise Of Conservation Biology."

In his landmark book "Biodiversity," American biologist Edward O. Wilson stressed that biodiversity was important for the well-being of humankind. He said that international cooperation could conserve the planet's biodiversity.

The author uses the word "landmark" to mean _____.

- (A) elementary
 - (B) standard
 - (C) historical
 - (D) revolutionary
- 2 Read the selection from the section "The Convention On Biological Diversity."

To further its goals, the convention adopted the Cartagena Protocol on Biosafety in 2000 and the Nagoya Protocol in 2010. The Cartagena Protocol addresses the issue of genetically modified organisms (GMOs.) It urges governments to adopt practices that require scientific evidence that genetically modified crops, like corn or cotton, are generally safe before they are exported to other countries.

Which phrase from the selection explains what the word "protocol" is referring to?

- (A) further its goals
- (B) genetically modified
- (C) urges governments to adopt practices
- (D) generally safe before they are exported

3 Read the paragraph from the section "Threats To Biodiversity."

The planet is undergoing an event known as a die-off, that is, a mass extinction. About 65 million years ago, 75 percent of plant and animal species on Earth, including the dinosaurs, suddenly went extinct. Scientists estimate the Earth is experiencing a similar die-off, and species are going extinct at a rate that is about 1,000 to 10,000 times faster than normal. This loss of biodiversity is due to human activities. There are five major reasons responsible for the rapid and large-scale die-off. They are habitat destruction, climate change, invasive species, overexploitation and pollution.

Why does the author include this paragraph in the article?

- (A) to emphasize the urgent threat to biodiversity that has been created by humans
- (B) to illustrate that humans are able to create solutions to the threats to biodiversity
- (C) to contrast the rate of die-off happening to certain modern species with that of the dinosaurs
- (D) to demonstrate the effects of the loss of biodiversity on historical ecosystems

4 A reader of the article suggested that the author included the section "Conserving Biodiversity By Giving It Economic Value" to explain that investing in conservation makes more financial sense than allowing threats to biodiversity to continue.

Is this accurate? Which line from the article supports your answer?

- (A) Yes; Biodiversity can be valuable in other ways, even though we may not be able to attach a price to something.
- (B) Yes; In fact, preserving biodiversity is far less expensive than having to adjust to a less biodiverse world.
- (C) No; For example, a government might pay landowners to manage their land in ways that protect natural resources.
- (D) No; People can help protect biodiversity by supporting nonprofit conservation organizations.