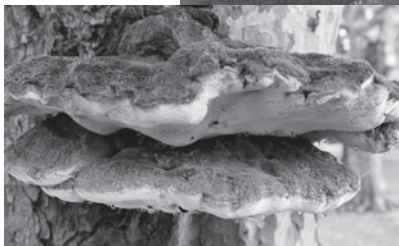


# Biodiversity Background Information for Educators

Biodiversity! Although the term may seem intimidating to some, you couldn't choose a more engaging and stimulating topic—or one as all-encompassing and important for our future.

Biodiversity is the variety of life on Earth. It's everything from the tiniest microbes to the tallest trees, from creatures that spend their entire lives deep in the ocean to those that soar high above the Earth's surface. It's also the word used to describe the wealth of habitats that house all life forms and the interconnections that tie us together. All of Earth's ecosystems and the living things that have evolved within them—including the fantastic range and expression of human cultures—are part of our planet's biodiversity.

organisms. It also includes Earth's ecosystems: its savannas, rain forests, oceans, marshes, deserts, and all the other environments where species evolve and live. And it includes genetic diversity, which refers to various genes within a species. The variety of species, the variety of genes within a species, and the variety of ecosystems are all critical components to understanding the interconnections that support all life on our planet.



## Defining Biodiversity

**Biodiversity** is short for biological diversity. It refers to the variety of life on Earth, and is reflected in the variety of **ecosystems** and **species**, their processes and interactions, and the **genetic diversity** within and among species. The sheer variety of species on Earth—from microscopic bacteria to blue whales—is pretty impressive on its own. But biodiversity isn't limited to the numbers and kinds of

## Why Biodiversity Is Important

We humans are late additions to an incredibly complex and interdependent web of life that has been evolving on this planet for at least 3.5 billion years. And we're just beginning to understand our place in it. We now realize how dependent we are on biodiversity for most if not all of our needs—and how a significant loss of biodiversity could seriously undermine our long-term economic, intellectual, physical, and emotional well-being.

We're learning how a number of species, including humans, may depend on certain **keystone species**. Imagine that a species of wild bee has become extinct. The plants that depend on the bee for pollination and the animals that rely on the plants for food could be adversely affected by such a loss—and so might the farmers whose crops need the bees for pollination. Also at risk are local economies that rely on uninterrupted and bountiful harvests.



*Pacific Yew  
Foliage*

*Pacific Yew Bark: Dave Powell, USDA  
Forest Service, [www.forestryimages.org](http://www.forestryimages.org)*

Or consider the Pacific yew, a small understory tree found only in the dwindling old-growth forests of the American Northwest. The yew is a unique natural source of a potent anticancer drug called Taxol. Researchers around the world are trying to create a synthetic version of Taxol, which has provided what some call one of the most significant advances in cancer therapy. But if the last of the forests had fallen before the discovery of natural Taxol, there might currently be no model for the creation of a synthetic version. And cancer research might not have come as far as it has to date.

What other useful compounds remain undiscovered in wild species living in threatened habitats around the world? Could an obscure grass, now hanging onto survival in North America's remaining patches of tallgrass prairie,

contain the genes needed to make corn resistant to a new disease? Or could a fungus found only in a tropical rainforest hold the key to a new antibiotic? What we do know is that we're just beginning to understand the wealth to be found in the life all around us.

Only a small percentage of the forms of life on Earth have been studied. How many different forms of life exist? The process of determining the number is not easy. The United Nations Environment Programme's Global Biodiversity Assessment estimates the number of described species at approximately 1.75 million. Because there are differences in the way organisms are classified and named, this number will likely always be an estimate. An even greater mystery is how many species may exist on Earth today. Estimates for the total number of species on the planet range from 5 million to more than 30 million.

If our well-being is so dependent upon biodiversity, why aren't we more aware of it? The answer may be partly a result of our loss of intimacy with other living things. As we have moved from walking the land to hurtling past it on paved roads, from hunting and growing our food to buying it at a store, from dipping water from a stream to turning on a faucet, we've lost contact with the natural foundations on which our lives are built. Most of us can now get along just fine without knowing about weather patterns, soil conditions, water sources, or the migration patterns of game.

Some say it's okay to lose our knowledge of nature because it's not relevant to modern life. But others say our ignorance is catching up with us. They suggest that we may be oblivious to the incremental—but important—changes in the health of our natural environment, and that we're thus letting biodiversity slip away without realizing the value of what we're losing.

## Determining Biological Importance

Certain ecosystems around the world harbor especially large numbers of species. The most familiar are tropical rainforests. The forests of New Guinea, for example, are home to about



the same number of bird species as the United States and Canada combined—yet the island covers less than 3 percent of that area. Other incredibly diverse ecosystems include coral reefs, large tropical lakes, and parts of the deep-ocean floor. In general, scientists consider ecosystems with naturally large numbers of species to be among the most important ones to focus on in the effort to conserve biodiversity. But the number of species is just one measure of an ecosystem’s importance. Another factor is the uniqueness of an area—from the types of species that live there to the physical landscapes within it. Still another factor is whether the ecosystem performs a key function, such as flood control or water purification. Scientists also consider whether an ecosystem is threatened when determining its biological importance.

## Biodiversity—from Distant Rainforests to Your Town

Many scientists use the term “hotspots” when referring to those areas of the world that are not only rich in biodiversity, but also unique and threatened. Those hotspots include ecosystems that have the greatest variety of species, such as rainforests and coral reefs. But they also include ecosystems that have a large number of **endemic** species—those that are found nowhere else on Earth. Islands in particular, both large and small, are rich in endemic species. Madagascar—with its incredible diversity of lemurs—is a classic example of island uniqueness.

Although scientists are justifiably concerned about saving unique ecosystems or those with

the most diversity, many also agree that it is important to conserve the biodiversity remaining in our most settled or disturbed regions, such as vacant city lots, suburban backyards, and heavily cultivated farmland.

The value that biodiversity provides does not decrease in areas where human activity has already taken its toll. In fact, where biodiversity has been lost, the remaining species may become that much more precious. And where we have done the most damage, perhaps ethics demand that we are even more obligated to preserve what is left and to restore what was once there.



## Our Important Role in Protecting Biodiversity

One of the greatest challenges we face in protecting biodiversity is how to balance the needs of the present without jeopardizing those of the future. We’re finding that there’s no one way to address this challenge—in part because there’s no one reason that we’re losing biodiversity. Ensuring the survival of species, genes, and ecosystems will require a combination of many approaches, as well as the collective thinking of people from all disciplines and backgrounds.

## Stewardship, Citizenship, and Democracy

One of the most important things that we can do to conserve biodiversity is to get involved—in our roles as parents, community members, educators, landowners, voters, employees, employers, politicians, and business leaders. For many, that involvement means changing the way we educate our children and ourselves about what it means to be a citizen in a democracy. As Frances Moore

Lappé and Paul Martin DuBois say in *The Quickening of America*, “Democracy requires a lot more of us than being intelligent voters. It requires that we learn to solve problems with others—that we learn to listen, to negotiate, and to evaluate. To think and speak effectively. To become partners in problem solving.”

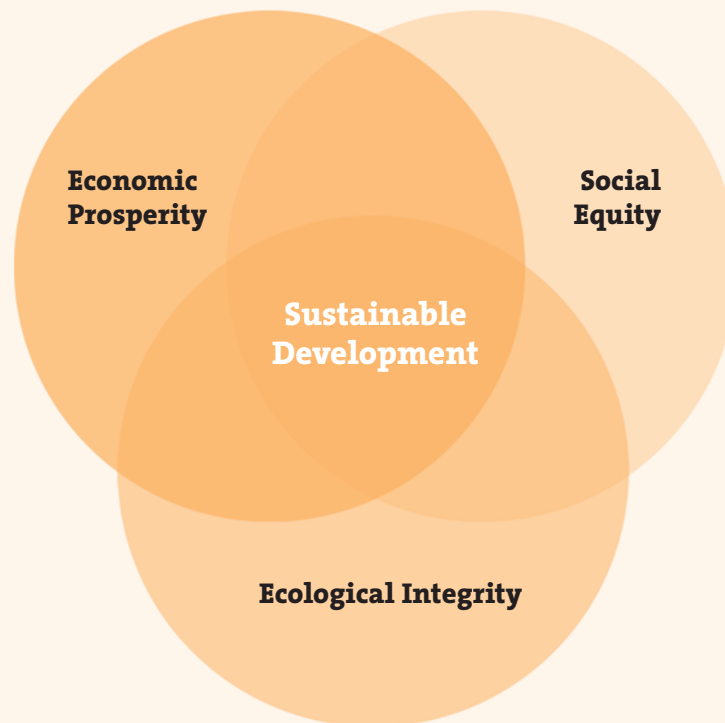
There are thousands of examples of individuals and communities working together to solve biodiversity problems. They’re forming citizen groups to restore habitats, writing letters to elected officials, lobbying on biodiversity issues, taking action as company shareholders, using the media for communication campaigns, raising money for environmental and social organiza-

tions, educating fellow employees, conducting workshops on consumer issues, setting up information clearinghouses, volunteering for conservation organizations, and forming community stewardship councils. But many people agree that we still have a long way to go before the majority of U.S. citizens have the confidence, the know-how, the opportunity, and the commitment to bring about changes that ensure the conservation and restoration of biodiversity.

### Living Sustainable Lifestyles

Conserving biodiversity and finding solutions to the intricately connected problems of environmental degradation, social decline, and economic

## One View of Sustainable Development



**“Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs. Choosing to be sustainable in businesses, schools, government institutions, and our individual lives demands a national commitment to the nation’s economic prosperity, ecological integrity, and social equity.” Source: President’s Council on Sustainable Development, April 1995.**

instability will mean feeling, thinking about, and doing things different from the ways we have before. It will mean fostering more compassion for other species and a kind of reverence for living systems that are too complex for us ever to understand fully. It will mean educating ourselves about the connections among all elements of biodiversity and between a healthy natural environment and a healthy human society. And it will mean coming to terms with the consequences of our behavior for other people and other species.

Conserving biodiversity will require us to incorporate the concepts of social equity and ecological integrity into how we do business. It will challenge us, in every aspect of our lives, to work toward creating a more sustainable society—one in which human needs are in balance with the needs of other living things. And it will mean developing not only a conservation ethic but also an entire belief system that honors the integrity of the Earth and of ourselves.

### Why Study Biodiversity?

The diversity of life on Earth shapes and nourishes every facet of our existence. But because those connections are seldom obvious, we humans have often pursued our short-term interests with limited regard for the well-being of other species and the places they live. At the same time, social and economic forces have caused some people to exploit resources to meet their basic needs. As a result, biodiversity is rapidly declining. If we want to ensure the long-term health of the planet, we need to develop an informed and motivated citizenry that understands what biodiversity is and why it's important. And we need citizens who have the skills and confidence to rise to the challenge of protecting biodiversity and who feel empowered to do so. Education, we believe, is one of the best tools we have for achieving that goal.

Through the study of biodiversity, students will start to see more clearly the invisible connec-

tions that bind our lives to other life forms. As they come to understand those connections, perhaps they will gain a new perspective on their place in the natural world. And in the process, they may learn not only how to better protect the living things on which they depend, but also how to create a more sustainable and responsible society.

We also believe that biodiversity is an important and powerful issue that draws learners in. As a theme, it cuts across many disciplines and provides real-world contexts and issues that promote critical and creative thinking skills, citizenship skills, and informed decision making. Biodiversity also illustrates the complexity of environmental issues and makes plain that there are many perspectives as well as much uncertainty.



*Information for this background and the accompanying activities has been reprinted or modified with permission from **Windows on the Wild: Biodiversity Basics** by the World Wildlife Fund, 1999, published and distributed by [Acorn Naturalists](#), 17821 East 17th Street, #103, Tustin, CA 92780.*