

- BIODIVERSITY BASICS
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**TEACHING
TOOLS
ABOUT**





WILD CLASSROOM

WWF's Wild Classroom connects educators and parents with the tools and resources they need to help kids explore and understand the world around them. Visit wildclassroom.org to choose from a growing library of animal- and nature-related teacher's guides, fact sheets, and activity plans that you can use to enhance your science, writing, art, and other lessons.

BIODIVERSITY

● Biodiversity Basics

- Biodiversity is all the different kinds of life you will find in one area. It encompasses all of the animals, plants, fungi, bacteria, habitats, and genetic material that work together in ecosystems to maintain balance and support life.
- When studying an area's biodiversity, scientists look at different criteria to help them evaluate its current status, as well as how it has changed or improved:
 - The number of different types of species found (composition)
 - The actual count of individuals of each species (abundance)
 - How spread out the individuals are (distribution)
 - How many of these species have been identified as threatened or endangered (extinction risk)
- Forests are home to 80% of the world's biodiversity on land. One square kilometer of forest may be home to more than 1,000 species. The most biologically diverse and complex forests on Earth are tropical rain forests, such as the Amazon.
- The ocean covers more than two-thirds of our living planet's surface and is home to a spectacular array of ecosystems and wildlife. About 90% of life in the ocean is found in the shallow seas close to the coasts.
- Less than 1% of the world's water is fresh and accessible, yet freshwater habitats such as lakes, rivers, and wetlands are home to more than 10% of all known animals and almost 50% of all known fish species.
- One quarter of all life on Earth can be found beneath our feet. Soil biodiversity consists of a huge underground community of life forms such as fungi, bacteria, nematodes, tardigrades, ants, termites, earthworms, moles, and many more. These species play a huge role in helping to reduce the effects of climate change by regulating greenhouse gases, as well as cycling nutrients through the ground so that they may be used by plants. Without these underground workers, entire ecosystems would crumble. Soil biodiversity is currently facing many threats, including pollution, agriculture, and erosion.



- Humans have only been around for 200,000 years, a tiny fraction of the 4.5 billion years of our planet's history. Yet we have had a greater impact on the Earth than any other species. As humans continue to put pressure on the planet, we are upsetting the balance of ecosystems and losing biodiversity. Three-quarters of the land-based environment and about 66% of the marine environment have been significantly altered by human actions. Wetlands are most affected, having lost 87% of their coverage in the past era.
- Almost 20% of the Amazon rain forest, one of the most biologically diverse places in the world, has disappeared in the past 50 years.
- Populations of fish, birds, mammals, amphibians, and reptiles have declined by 60% in just over 40 years because of human activity such as overharvesting and illegal hunting of animals, agriculture, and land conversion/degradation of habitats.
- Around 1 million animal and plant species—more than ever before in human history—are now threatened with extinction. This includes 40% of all amphibians, 25% of mammals, 34% of conifers, 14% of birds, 31% of sharks and rays, 33% of reef corals, and 27% of crustaceans. The current rate of species extinction is 100 to 1,000 times higher than nature intended.
- Biodiversity is resilient. If humans reduce the pressure we're putting on the planet and manage resources better, in time, ecosystems will adapt. Nature and biodiversity will recover.
- In nature, everything is connected. The ripple effect of any change touches every part of our planet. In order for both people and wildlife to thrive, now and in the future, we need a healthy planet with a rich variety of plants and animals and vibrant ecosystems.



Galápagos sea lion swimming near mangroves, Floreana Island, Galapagos, Ecuador.



● Why Biodiversity and Nature Matter

They provide for us

Biodiversity supports everything in nature that we need to survive. Food, raw materials, fresh water, and medicine come from nature. Nature is responsible for replenishing the fresh water that underpins all agriculture and economic activity. The International Union for Conservation of Nature (IUCN) Medicinal Plants Specialist Group estimates that there are between 50,000 and 70,000 known medicinal and aromatic plants used by humans for medicine or other purposes. Engineers and designers also study wildlife and develop improvements to current technology, such as the means of communication and sources of renewable energy, based on practices observed in nature (called biomimicry).

They control natural processes

Nature, under normal conditions, is capable of taking care of itself. It is responsible for regulating air quality, climate, water, erosion, waste treatment, pollination, and disease. Nature also moderates extreme weather events such as hurricanes and blizzards. Rain forests breathe moisture into the atmosphere: that moisture is then transformed into rain that waters crops thousands of miles away. Wetlands are responsible for filtering water and recharging aquifers, providing us with plenty of healthy, clean water. Healthy, natural systems can help reduce the damage caused by rising sea levels, extreme rainfall, and the higher incidence of frequent droughts and storms, all caused by climate change. But when natural habitats like forests and wetlands get destroyed, greenhouse gases are released, making climate change more intense.

They support from the ground up

In order to provide essentials such as food and water, nature has to first support the basis for all life. This includes enabling healthy soil to take shape and allowing photosynthesis and plant growth to occur. The soil is responsible for the cycling of nutrients through the ground, on which the health of all ecosystems depends. Pollinators such as bees and butterflies help continue the process of allowing soil and plants to provide for us. About 87% of all flowering plant species are pollinated by animals, and crops that are pollinated by animals account for 35% of global food production.

They offer cultural benefits

Nature has proven effects on our mental and physical health, provides recreation and ecotourism, and supports spiritual and religious beliefs. Research shows that being in natural areas improves our physical well-being, and there is growing evidence to show that spending time in nature can also help maintain and promote psychological well-being.



● Threats to Biodiversity

The greatest threat to biodiversity is human activity. We have overfished the oceans, cleared forests, polluted our water sources, and caused climate crises. Overharvesting and agriculture continue to have the most dramatic impact on biodiversity. Over the past 50 years, our consumption of natural resources has increased by about 190%.

Agriculture

Changing the environment where a species lives is a huge threat to biodiversity. This can happen in a few different ways: completely removing the habitat (such as happens with deforestation), fragmenting the habitat (such as by building dams through rivers), or degrading the habitat (such as by damaging the soil quality). Agriculture is still the number one driver of habitat loss in forests and grasslands. The growing human population and increasing demand for food increase pressure to convert forests and grasslands to farms and pastures. More than one-third of the world's land surface is currently dedicated to agriculture. As habitats disappear and the health of the remaining habitat declines, the plants and animals living within are critically impacted. Even a minimal amount of habitat loss can have devastating effects on biodiversity, particularly in tropical rain forests. Rain forests are home to more species—many of which are rare and endangered—than any other land habitat. Large areas of these forests have been cleared to grow palm oil, an ingredient used in packaged products all over the world. This conversion of rain forest fragments the habitat and threatens the survival of many plant and animal populations.

This shift to agriculture has also affected the quality of soil in many parts of the world. Half of the topsoil on the planet has been lost in the past 150 years. This has had a domino effect on all the species relying on soil and what grows in that soil to survive. It has led to the decline of bees and other insects that help pollinate 75% of the food crops we grow.

Overharvesting

To overharvest or overexploit a resource means that you are using it excessively and to a damaging degree. Currently, humans are implementing these harmful practices in natural areas all over the world, including oceans and forests. When fishing vessels catch fish faster than the fish can reproduce and replenish their populations, it's called overfishing. Overfishing is one of the most significant factors in the decline in ocean wildlife populations. According to the latest data available, 33% of assessed marine fish stocks were being harvested at unsustainable levels and 60% were fully fished, meaning these populations are likely unable to withstand an increase in fishing. This left only 7% of fish stocks able to support greater



catches. Almost 6 billion tons of fish and invertebrates have been taken from the world's oceans since 1950. Fish are a part of many marine food webs, so by depleting the ocean of its fish, we're impacting all the species that depend on fish to survive. Overfishing is also closely connected to bycatch—the accidental capture of sea life while fishing for a different species. Bycatch has caused countless unintended deaths of fish, sea turtles, sharks, and dolphins. Bycatch is the leading threat to whales and dolphins around the world, estimated to cause at least 300,000 deaths per year.

Forests are also at risk, impacted by illegal and unsustainable logging usually as a result of the global demand for inexpensive wood and paper products. This illegal removal of timber causes the health of the forests to decline as vegetation is damaged, rivers are polluted, and the stability of the soil weakens.

Climate change

Changes in climate and extreme weather events are already affecting biodiversity across the globe. Life cycles of certain species (such as flowering plants) are being altered, impacting the other members of the ecosystem that depend on them. Species' migrations and breeding seasons also fluctuate, as they are often climate dependent. The availability of food and water is shrinking, creating more competition. As winters get warmer and shorter, pests and diseases spread. The increased ocean temperatures have caused coral reefs to expel the algae they depend on to survive, which results in the corals turning white (bleaching) and often dying. Coral reefs are some of the most biologically diverse ecosystems in the world, and as they become bleached, they're no longer able to support all the species that rely on them for food and habitat. In just three years, around 75% of the world's tropical coral reefs experienced heat stress severe enough to trigger bleaching, and 30% of these corals died.

The effects of climate change are being felt at the poles twice as fast as on the rest of the planet. Sea ice helps protect our planet by reflecting much of the sun's energy back into space, helping regulate climate. With greenhouse gases trapping heat within our atmosphere, the sea ice is melting, causing less of the sun's energy to be reflected back into space and more to be absorbed into the ocean. This warming ocean only contributes to the melting of the sea ice, creating a cycle of melting and warming that accelerates sea level rise. Sea ice not only helps protect us by acting as a sun shield, but also provides essential habitat and feeding grounds for species such as polar bears and walrus. The ice also supports the growth of tiny algae, which are the base of the food web and the source of food for fish and krill. As our planet continues to heat up, the sea ice will continue to disappear, as will the species that depend on it.



Poor water quality and scarcity

All life on land needs fresh water. Unfortunately, pressures from humans such as water overuse/misuse and pollution are contributing to the decline in quality and quantity of the fresh water that we all depend on. Agriculture uses the highest percentage of fresh water (nearly 70%) and is the leading source of pollution in many countries. Use of pesticides and fertilizers on farms can poison the air and soil, as well as the fresh water that leads into marine ecosystems, decreasing biodiversity everywhere. In addition to this chemical runoff pollution, plastic pollution is also a threat to biodiversity. Plastics have been found from shorelines and surface waters all the way down to the deepest parts of the ocean, including the bottom of the Mariana Trench. According to scientists, plastic particles can be found in 90% of the world's seabirds.

Freshwater habitats are also being impacted by dams that are disconnecting rivers, creating a buildup of sediment that causes waterways to clog and prevents fish and other aquatic species from migrating and reproducing. Freshwater ecosystems such as rivers, lakes, and wetlands provide habitat for more than 125,000 species. These ecosystems also provide us with water to drink and to grow food, so it is essential for them to remain free-flowing and healthy. Increasing human populations result in growing demand and pressure on our fresh water. With more people impacting their watery homes, freshwater species are declining at an alarming rate.

Wildlife trade

Poaching wildlife for illegal trade is an urgent threat facing hundreds of the world's most beloved species, such as elephants, rhinos, and tigers. These animals are illegally hunted for their fur, tusks, horns, bones, and other parts. Illegally obtained animal parts and products are trafficked by international criminal networks, much like illegal drugs and weapons. This business continues to skyrocket due to an increasing demand, particularly in Asia where these animal parts are often seen as a status symbol and used in medicine or carved into trinkets. In addition to elephants, rhinos, and tigers, countless other species such as sea turtles, pangolins, birds, reptiles, primates, and timber trees are similarly illegally exploited.



Polar bear mother and cubs walking on ice flow in Svalbard, Norway.



● What WWF (and the World) is Doing

WWF is part of the global effort helping to identify the threats to the most pressured areas of the world and work to address them by finding innovative solutions.

The Convention on Biological Diversity's Aichi Targets

The Convention on Biological Diversity (CBD) was established in 1992 by 150 government leaders dedicated to promoting the concept that biodiversity is about more than just plants and animals—it's about people and our need for food, medicine, fresh air and water, shelter, and a clean and healthy environment in which to live. The vision of the CBD is that by 2050, biodiversity will be valued, conserved, restored, and used wisely, and ecosystems will be maintained to support a healthy planet and deliver benefits essential for all people. To refocus this vision, the convention revised and updated its Strategic Plan for Biodiversity in 2010 to include 20 "Aichi Biodiversity Targets" to be achieved by 2020. These target goals include cutting the rate of natural habitat loss in half and preventing the extinction of/improving the status of threatened species.

United Nations' Sustainable Development Goals

In 2015, the member states of the United Nations established the 2030 Agenda for Sustainable Development. This agenda is a set of plans designed to significantly improve the level of peace and prosperity for people and the planet, now and into the future. The agenda contains 17 sustainable development goals that call for action by all countries to improve practices such as how we use forest and ocean resources and how we tackle food and water scarcity.

With the deadlines set by these global initiatives approaching, world leaders are making key decisions on our environment, climate, and sustainable development. WWF is working to influence these decisions and send a message that we can no longer afford to destroy nature. In order to protect the wildlife and wild places we love, we must rebuild the web of biodiversity that supports them. WWF is collaborating with universities, conservation organizations, and governments to help achieve these ambitious goals by:

- **Engaging individuals and communities** to understand what's at risk and do their part by rethinking how they use natural resources and making more conscious choices.
- **Pushing governments** to set aside protected lands and end illegal use of resources from forests and oceans.
- **Working with companies** to ensure the products we use every day are produced responsibly.
- **Leading global efforts** to end wildlife crime and illegal wildlife trade.



● What Kids Can Do

To stop the decline of the natural systems that support us and all other species on the planet, we need real change around the world. This means every person of every age must take action!

Speak out! Talk with your friends, family, and teachers about the importance of protecting nature. Draw their attention to biodiversity and share what you've learned about why it's so important.

Start a movement in your school or community to help the planet by planting trees or saving energy.

Save energy. Turn off unnecessary lights and appliances. Bike or walk when you can, rather than using a car. Talk to your family and school about switching to renewable energy and energy-efficient appliances.

Think about the food you eat. The ways in which we grow and produce our food have a massive impact on the planet. Reduce the amount of food and water you waste. Also, remember to eat a balanced diet and follow the recommended nutritional guidelines.

Shop smart. When buying wood or paper products, look for a logo indicating the product is certified by the Forest Stewardship Council (FSC) as being made sustainably from responsibly managed forests. When buying seafood, look for a similar label from the Marine Stewardship Council (MSC) to be sure it was fished for sustainably and produced responsibly. Do your research on products that contain palm oil and check the label the next time you purchase them. And be alert, especially when traveling; don't buy souvenirs made from animal parts.

Write a letter to a local politician or business and tell them about an environmental issue that you are concerned about. And don't be afraid to ask questions!

Grow plants that attract bees, butterflies, and other pollinators. You can also create backyard wildlife habitats, such as rotten logs for beetles or bug hotels.

Use less plastic—especially single-use items such as straws—and remember to reuse and recycle whenever possible.

Buy things that last for a long time and can be repaired or recycled. Things such as bicycles and clothes can be restored or mended.

Enjoy and discover the wonders of **nature** around you, but always be respectful of your surroundings and remember to clean up after yourself. Leave nature as pristine as you found it!



● More Biodiversity Teaching Tools

Biodiversity learning activities

Within the Biodiversity Toolkit, you'll find six fun, engaging activities designed to help students learn about the importance of biodiversity and nature:

Biodiversity Mosaic—Arts Education

Students will create an artwork piece that reflects their interpretation of biodiversity. After learning about all that biodiversity encompasses, as a group, they will then piece their artwork together to create a large collaborative representation of healthy biodiversity on Earth.

***This Just In* News Report—Language Arts**

Students will deliver a news report to inform their peers of the current state of our planet's biodiversity, using facts and statistics from the [Living Planet Report 2020: Youth Edition](#).

Biomimicry Design Challenge—STEM

Upon learning how scientists are using adaptations found in nature to devise products that use Earth's resources more sustainably, students will then use their creativity to develop an idea for a product that is healthier for the planet by mimicking the behavior of an animal or plant.

The Future of Species—Math

Using data on threatened or endangered species, students will create a graph and draw inferences on the probability of these species' survival on this planet if we don't make serious changes.

Biodiversity Audit—Social Studies

Students will perform a biodiversity audit of their local grounds, following similar steps as scientists in the field. Based on their findings, they will evaluate the property based on how well it can support species and devise a plan for how they can increase its biodiversity score.

The Connections Between Us—Science

To understand the interdependence of living things, students will participate in a role-playing activity that demonstrates the vast impacts of threats to our planet's biodiversity and the ways in which biomes and species are connected.

Living Planet Report 2020: Youth Edition

Since 1998, the [Living Planet Report](#), a science-based assessment of the health of our planet, has been tracking the state of global biodiversity. This special youth edition provides a summary of the 2020 findings.