



TERRESTRIAL BIODIVERSITY - LAND AHOY



EXPLORING LAND-BASED ECOSYSTEMS,
FROM DEEP IN THE SOIL
TO HIGH IN THE MOUNTAINS

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As you know by now, **biodiversity** can be classified in three different ways (refer to Chapter 1). In Chapter 5 we learned that one way to classify it is by **ecosystems**, which includes the important category of terrestrial biodiversity. It might sound a bit creepy, but guess what: you're part of it! And so am I. That's right – unless you happen to be a fish, or maybe some super-intellectual seaweed (in which case you really should be on TV), you count as a member of this group. So who are they (uh, we) anyway?



TYPES OF **TERRESTRIAL** BIODIVERSITY



Terrestrial biodiversity refers to animals, plants and micro-organisms that live on land, and also land **habitats**, such as forests, deserts and wetlands.

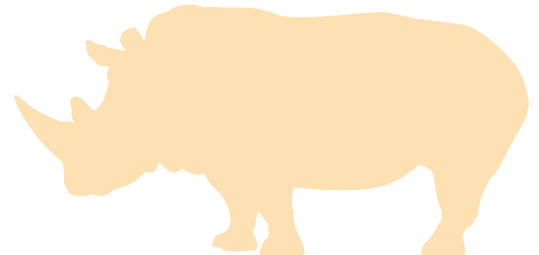
Not so creepy after all!
At least... not always.

Terrestrial biodiversity is mind-bogglingly vast. Each animal and plant **species**, and the ecosystem in which it lives, has a unique contribution to our world, and plays a part in keeping the delicate balance of things intact. Let's take a closer look at some of the different kinds of terrestrial biodiversity, why they are important and the threats they are facing.



A DOMINICAN LIZARD.
© Chad Nelson

A BLACK AND WHITE JUMPING SPIDER.
© Godfrey R. Bourne/nsf.gov



FORESTS

Forests are one of the Earth's greatest treasures – rich habitats teeming with animal and plant species, herbs, fungi, micro-organisms and soils. They provide people with food, wood, medicine, fresh water and clean air, and millions of the world's poorest people rely on forests for their livelihoods. To say that forests help to nurture all life on the planet is no exaggeration.

Forests also influence nature's capacity to cope with natural hazards. Their destruction could cause altered rainfall patterns, soil erosion, flooding of rivers and the potential **extinction** of millions of species of plants, animals and insects.

As if all this weren't enough, forests are also huge storehouses of carbon, which means they absorb carbon from the atmosphere and convert it into plant tissue. This is very important for reducing the impact of **climate change**, a change in the overall state of the Earth's climate caused by a build-up of greenhouse gases in the Earth's atmosphere. Widespread deforestation, therefore, may increase global warming.

WELCOME TO THE JUNGLE!
Forests are home to about 80 percent of the world's land-based animals and plants. Around 300 million people around the world live in forests!

FOREST IN AZERBAIJAN.
© FAO/Marzio Marzot

IT'S A FACT!
The Canadian boreal forest stores an estimated 186 billion tonnes of carbon, which is equal to 27 times the world's carbon emissions in 2003 from the burning of fossil fuels.

Source: International Boreal Conservation Campaign



WHAT'S THREATENING FORESTS?

Although trees are a **renewable resource** that can replenish themselves, they are being cut down faster than they can grow back. There are many factors behind this problem, for example:

- **Clearing forested land to grow crops:** for many poor people, it is a tricky situation. They cut down trees to meet their short-term needs, but in the long run, they lose their forests, and therefore their **livelihoods**, as a result of deforestation. Economic incentives often convince forest owners to sell their land, cut down forests, and grow export items such as coffee and soybeans. However, the once-forested land is often poor in nutrients unless it is managed very carefully, so farmers are only able to use it for a few years before they must move to a different area of the forest and clear it for farming. Sometimes the abandoned area is used to raise livestock, but it takes 2.4 hectares of pastureland in the tropics to feed just one cow. That's the size of six football pitches! You can see that raising livestock in tropical rainforests is not very **sustainable**!
- **Cutting down trees for wood:** people need wood for many reasons including for fuel, building homes and making furniture. When individuals or timber companies cut down trees in an irresponsible way, the process can harm the surrounding areas and wildlife. Illegal logging is also a big problem.
- **Other threats** to forests include mining, settlements and infrastructure development. Climate change may increase the impacts of pests and diseases. Climate change is also predicted to result in more extreme climatic events in many places, such as through floods and droughts, which will harm forest plant and animal populations and could cause more wildfires. Also, changes in rainfall and temperature will force species to migrate – which may not be possible if there is no suitable habitat for them or if they are slow moving (or, in the case of a tree, can't move at all). Climate change also alters the **phenology** of many species (the timing of biological events such as flowering and fruiting).



© FAO/Roberto Faldutti

RAINFORESTS

Rainforests can be either temperate or tropical. Both kinds have a few things in common: high rainfall all year round, and very lush, dense and tall vegetation. Both are also rich in plant and animal species, although the diversity is greater in tropical rainforests. Tropical rainforests are warm and moist; while temperate rainforests are cool and moist.

Because of human activities, rainforests are disappearing at an alarming rate: a few thousand years ago, over 15.5 million square kilometres of tropical rainforest existed worldwide. Today, only 6.7 million square kilometres are left. Not only is this a terrible loss to the Earth's natural beauty and diversity, it will also hurt people's lives and well-being.

Tropical rainforests contain more biodiversity than any other ecosystem on Earth. They cover less than two percent of the Earth's total surface area, and are home to 50 percent of the Earth's described plants and animals! Like all forests, rainforests play a huge role in reducing atmospheric carbon dioxide levels.

Also, with their millions of plants, they regulate temperatures through a process called **transpiration**, in which plants return water to the atmosphere. Transpiration increases humidity and rainfall, and has a cooling effect for miles.

Another way in which the rainforest provides tremendous value to the world is through its medicinal plants. It is estimated that one out of four ingredients in our medicine comes from rainforest plants; and so far, less than one percent of the tropical rainforest species has been analysed for their medicinal value!



URUCAN SEEDS FROM THE BRAZILIAN AMAZON. THE SEEDS ARE USED BY LOCALS TO PRODUCE A RED POWDER THAT IS MIXED WITH VEGETABLE OIL AND APPLIED TO THEIR SKIN, LIKE SUNSCREEN, TO PROTECT IT FROM THE SUN. IT IS ALSO USED AS AN INSECT REPELLENT.

© Igor Castro da Silva Braga/World Bank



MOUNTAINS

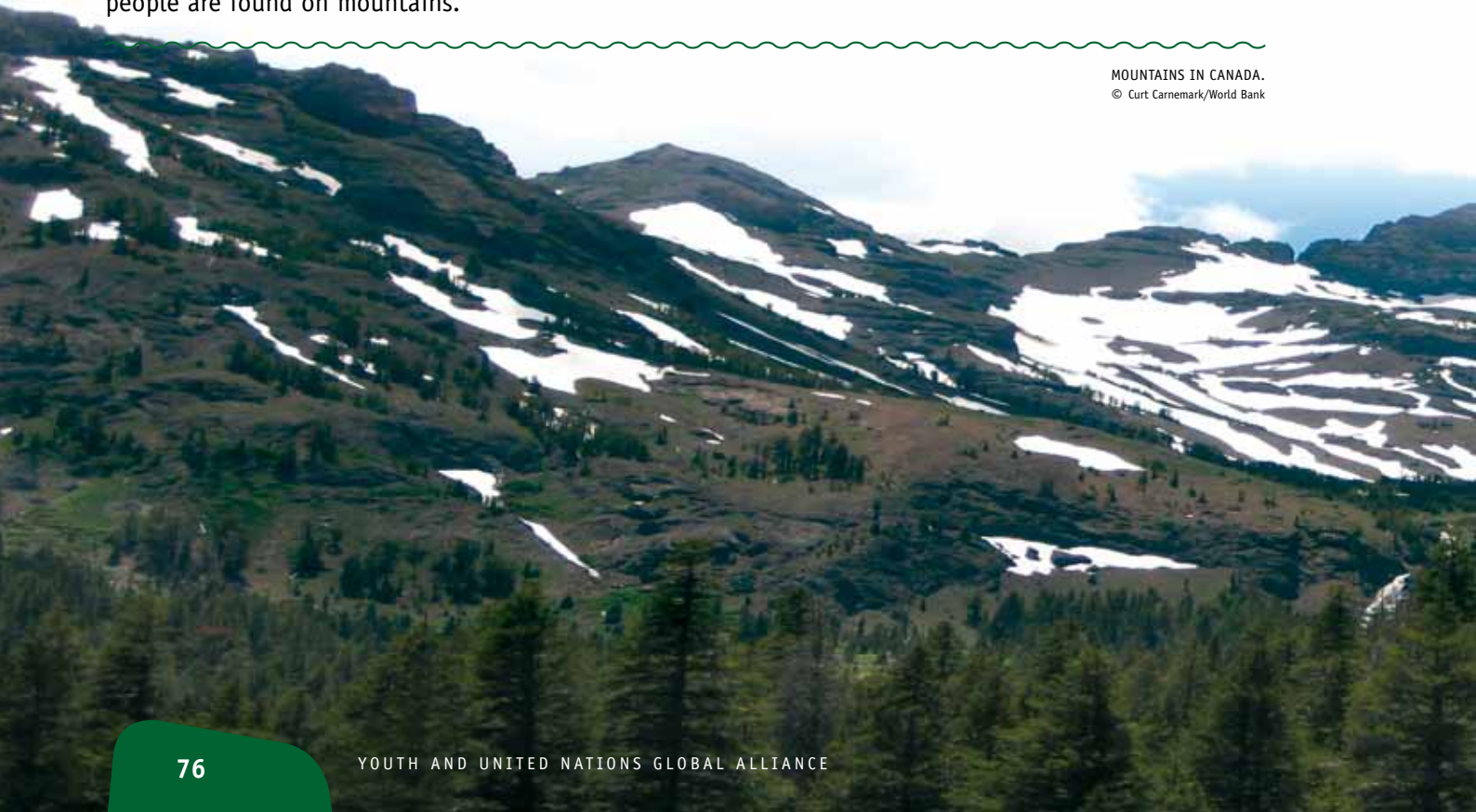
Mountains don't just *look* big and tall – their contribution as ecosystems is sky high too! They supply fresh water to almost half of the world's population, and on every continent (except Antarctica), they provide mineral resources, energy, forest and agricultural products. Vegetation on mountains provides a range of environmental benefits.

FOOD FOR THOUGHT...

Of the 20 plant species that supply 80 percent of the world's food, six (maize, potatoes, barley, sorghum, tomatoes and apples) originated in mountains!

For example, it influences the water cycle by capturing moisture from the air. Snowfall in the high mountains is stored until the snow melts in the spring and summer, providing essential water for settlements, agriculture and industries in the surrounding lowlands. Mountain vegetation helps to control this water flow, preventing soil erosion and flooding. Vegetation on mountains also helps to reduce climate change through carbon storage. Many of the herbs, game and other foods that sustain people are found on mountains.

MOUNTAINS IN CANADA.
© Curt Carnemark/World Bank



WHAT'S THREATENING MOUNTAINS?

Mountain areas are facing a loss of diversity due to a number of factors, including the uphill expansion of agriculture and human settlements and logging for timber and fuelwood.

LIVING THE HIGH LIFE

Mountains cover 25 percent of the Earth's land surface. They are home to 12 percent of its people.

The illegal trade in animal parts and medicinal herbs is also contributing to biodiversity loss on mountains. Climate change is another factor that is threatening several species with extinction. Many plant species are moving uphill, partly due to climate change, which reduces available land area for those **organisms** already living there and increases competition for space and other important resources. Also, those species which already live at the top of mountains can't move further up to get to colder conditions.

Watch a slideshow about species migration in the Amazon:
digitalmedia.worldbank.org/SSP/youthink/amazon





SOIL BIODIVERSITY

It might not sound like an exciting place to live, but you'd be surprised how many living things chose soil as their home! Soil contains a myriad of organisms, such as earthworms, ants, termites, bacteria and fungi. In fact, a typical handful of garden soil contains *billions to hundreds of billions of tiny soil micro-organisms!*

Together, soil organisms contribute with a wide range of services to their ecosystems, such as improving the entry and storage of water, preventing erosion, improving plant nutrition, and breaking down organic matter. In addition, soil biodiversity influences the environment indirectly in many ways. For example, it helps regulate pest and disease occurrence in agricultural and natural ecosystems, and can also control or reduce environmental **pollution**. Soil is the second biggest carbon storehouse, after forests, with some soils, such as peat, actually storing more carbon than forests on a hectare-by-hectare basis.

WOMAN HOEING IN TANZANIA.
© Scott Wallace/World Bank



DID YOU KNOW?
Antibiotics such as penicillin and streptomycin are derived from soil organisms.

WHAT'S THREATENING SOIL BIODIVERSITY?

The diversity of soil organisms is under threat from pollution, unsustainable agriculture, overgrazing, vegetation clearing, wildfires and poor management of irrigation. Converting grasslands or forests to cropped land results in rapid loss of soil carbon, which indirectly enhances climate change. Urbanisation and soil sealing – covering of land for housing, roads or other construction work – are also threats, because concrete ends up killing the life present in the soil beneath.

There are many other types of terrestrial biodiversity, including biodiversity in dry and sub-humid lands (see box: “Drylands Biodiversity”) and in **wetlands** (see Chapter 7). They each play an important part in our ecosystems’ healthy and productive functioning, and keep our Earth diverse and beautiful.

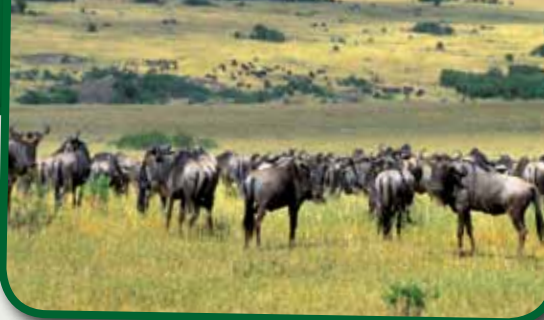
A DOWN TO EARTH LIFESTYLE...

Plant roots are also soil organisms because of their beneficial **symbiotic relationships** and interactions with other soil dwellers. They prevent soil erosion and help drain water from the soil, keeping it from becoming too wet. Conversely, they can help to hydrate the soil when it becomes too dry. Roots also help to make soil, by splitting rocks into tiny pieces that eventually become soil.



DRYLANDS BIODIVERSITY

Jaime Webbe, CBD



WILDEBEEST OR GNU IN THE DRYLANDS OF KENYA.
© Curt Carnemark/World Bank

Dry and subhumid lands, also known as **drylands**, cover about 47 percent of the Earth's land surface and include everything from deserts to savannas to Mediterranean landscapes. Although drylands are commonly imagined to be barren, dead landscapes, they contain a number of important, well-adapted species. The Serengeti grasslands in sub-Saharan Africa, for example, support an annual migration of approximately 1.3 million blue wildebeests, 200 000 plains zebra and 400 000 Thomson's gazelles. The rocky, shrub-dominated Mediterranean Basin in Europe and North Africa, contains 11 700 **endemic** plant species that are unique to these areas.

Biodiversity in dry and subhumid lands is critical for human survival. For example, some of the world's most important food crops originated

in drylands including wheat, barley and olives. Dryland biodiversity also provides genetic sources for one third of the plant-derived drugs available in the United States alone. Finally, the traditional knowledge associated with livelihoods in drylands, including from pastoral peoples, is important for **sustainable development**, a long-term process of enlarging people's choices and freedom.

Unfortunately, the biodiversity of dry and subhumid lands is facing a number of threats from human activities.

Between six and 12 million square kilometres of dry and subhumid lands are affected by **desertification** – that is, the degradation of land to such an extent that production is reduced. Already at least 2 311 species are threatened or endangered in drylands, while at least 15 species have

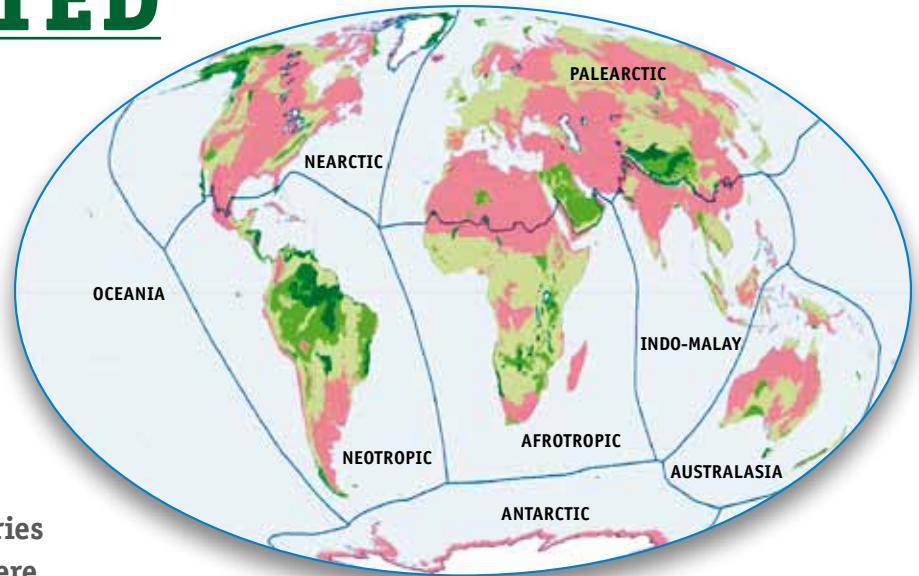
disappeared completely from the wild. This trend shows no sign of reversing as drylands are among the most vulnerable regions to the negative impacts of climate change. In sub-Saharan Africa, for example, between 25 and 40 percent of mammals in national parks may become Endangered while as many as two percent of the species currently classified as Critically Endangered may become Extinct as a result of climate change.

Given the challenges faced by the biodiversity of dry and subhumid lands, it is important to take action now. We need to learn more about these important regions and the value of their biodiversity in providing critical **ecosystem services**. We need to involve native or **indigenous peoples** living in drylands in decision-making. We need to address the global challenges of climate change and desertification.

PROTECTED AREAS

Protected areas are places that receive protection because of their environmental or cultural value. They have many purposes, including the **conservation** and sustainable use of biodiversity. Most countries have protected areas. There are over 100 000 protected sites around the world, covering around 12 percent of the Earth's land surface.

Well-managed protected areas support healthy ecosystems, which in turn keep people healthy. Globally, protected areas meet millions of people's most basic needs by providing essentials such as food, fresh water, fuel and medicines both for the people living in and around protected areas and even for people living hundreds or even thousands of kilometres away. They also benefit local communities by promoting rural development, research, conservation, education, recreation and tourism. Protected areas can also act as buffers against climate change and poverty, and, of course, they are reservoirs of biological richness for present and future generations.



UNDER 10% 10 - 30% 30 - 50% OVER 50%

AT LEAST 10 PERCENT OF OVER HALF THE WORLD'S 825 ECOREGIONS ARE LISTED AS PROTECTED AREAS. THE LIGHTER COLOURING ON THE MAP REPRESENTS ECOREGIONS WITH RELATIVELY LOW LEVELS OF PROTECTION.

Source: UNEP-WCMC in GB0-3, 2010

"If you were to randomly remove parts from a computer or car, everyone knows that both those systems will become less reliable or very likely stop working altogether. The same thing happens to ecosystems when they lose their species."

Shahid Naseem

Director of Science at the Earth Institute's Center for Environmental Research and Conservation.



WHAT CAN YOU DO?

HERE ARE A FEW THINGS YOU CAN DO TO HELP PROTECT TERRESTRIAL BIODIVERSITY:

- :: Learn about biodiversity in your community. Which plants and animals are native to your area? Are they facing any threats?
- :: Help protect natural areas and “green spaces” in your communities, even ones as small as the neighbourhood park.
- :: Try to buy locally grown and organic fruit and vegetables, when possible, but also remember that products sustainably produced in the developing world are important for people’s income and livelihoods.
- :: Buy products from certification schemes, which guarantee that certain environmental and social principles were followed in producing the product. Some examples are the Forest Stewardship Council, Marine Stewardship Council and Fair Trade.
- :: Help keep your environment clean and beautiful; keep an eye out for litter, and choose household products (cleaners, paints, etc.) that do not contain any pollutants.



BEACH CLEAN-UP.
© Danil Nenashev/World Bank



- :: **Ask your parents to avoid using pesticides in your garden. Start a compost pile to reduce waste in your home and to help fertilise the soil in your garden.**
- :: **Reduce your carbon emissions by turning off unused lights, switching to fluorescent light bulbs in your home, and using public transportation or walking and cycling whenever possible. Eating more veggies will help too!**
- :: **Spread the word! Bug your friends, teachers, siblings and parents. Ask them to take these steps in their lives too. Together, we can all keep our Earth healthy, beautiful and full of life!**

LEARN MORE

- :: **Amazon Conservation Association:** www.amazonconservation.org
An organisation dedicated to preserving biodiversity in the Peruvian and Bolivian Amazon.
- :: **Conservation International - Biodiversity Hotspots:** www.biodiversityhotspots.org/Pages/default.aspx
Explore the places on Earth that are the richest in plant and animal life—and also the most threatened.
- :: **Forest Graphics:** grida.no/_res/site/file/publications/vital_forest_graphics.pdf
Learn about the different types of forests in the world and where they are located.
- :: **International Boreal Conservation Campaign:** www.interboreal.org/globalwarming
Read about the boreal forest.
- :: **The Nature Conservancy:** www.nature.org
Find out about conservation projects around the world.
- :: **World Database on Protected Areas:** www.wdpa.org
Discover the world's protected areas.

