



# What is Biodiversity?

Biodiversity = Biological + Diversity

- The diversity of living organisms
  - Within species
  - Between species
  - Within / between ecosystems



Well to begin, I think it is important that we define what Biodiversity is. Biodiversity is actually a shortened way of saying Biological Diversity. What do you think this means?

Well, biological = biology, which means living organisms.

Diversity is the variety, or the many differences among things.

So biological diversity would mean the variety of living things!

This diversity, or these differences between living things, happens at different levels. First we see this variety within a species. For example, what are these pictures of? That's right, butterflies....but are they all the same? What's different about them? Size, shape of the wings, color, habitats, life cycles etc. (Can then give another example: Look around the room at your classmates? What do you see? I see a whole bunch of people, one species, but everyone looks just a little bit different. What are the differences you see? Hair color, eye color, shape, height, weight etc.)

Then we have variety, or diversity between species. That's a really easy one....how many mammals can you guys think of? (children will start naming all sorts of animals) That's right, see, just within the mammals you can see that there are all sorts of different species.

Then the last type of diversity we see is within ecosystems? Does anyone here know what an ecosystem is? An ecosystem is a specific area where we see the biotic, the living parts, and the abiotic, nonliving parts of the environment interact with and depend on each other. The biotic, or living, things in an environment would include plants, animals (this includes people), bacteria, fungi and all other living things. The abiotic or nonliving parts of the environment would include things like sunlight, the soil, atmosphere, climate, nutrients and water. An ecosystem can be small like a puddle in your backyard, with only a few [organisms](#) interacting or it may be large, like a forest with lots of organisms interacting. Can you name some other types of ecosystems?

# Biodiversity

Plants, insects,  
fish...



We know what biodiversity means...so very quickly let's take a look at what it includes. If we were to talk about the Earth's biodiversity, that would include things like: all the plants, fish and insects we see...

# Biodiversity

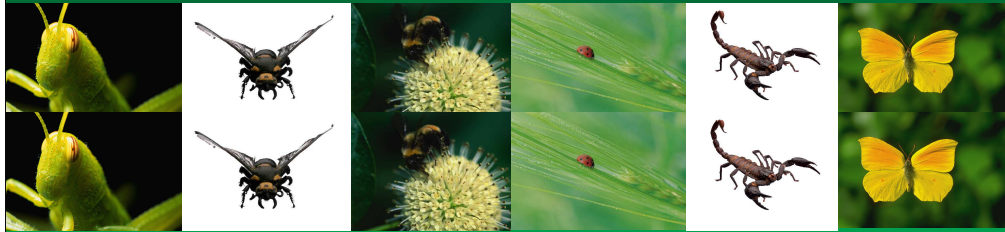
...birds,  
reptiles,  
amphibians  
and mammals



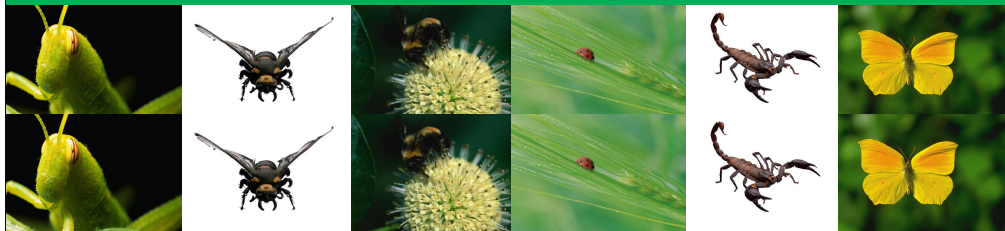
As well as the birds, reptiles, amphibians and mammals. And although we didn't see any pictures of them, bacteria, viruses, fungi are all part of our planet's biodiversity.

If you think about all the animals, or plants, or insects that you've seen or heard about...do you think there are a lot or a few living things on our planet?

# 1.8 million Different Species on Earth



920,000 are Insects



Scientists have found and identified about 1.8 million living species on the planet. The important thing to remember though is that we don't believe we've actually seen every species, so scientists have estimated that there could be anywhere from 30 to 100 million species out there.

But for now, let's look at the species that we do know about...we've identified about 920,000 living insect species. This number doesn't include the insects that we know about but don't exist anymore.





We've identified about 4,675 mammal species. Can you name the animals on the slide here?  
(starting at top left: Leopard seal, Siberian tiger cub, dog, African elephant, bison, giraffe)

# International Day for Biodiversity

## Looking at climate change and biodiversity

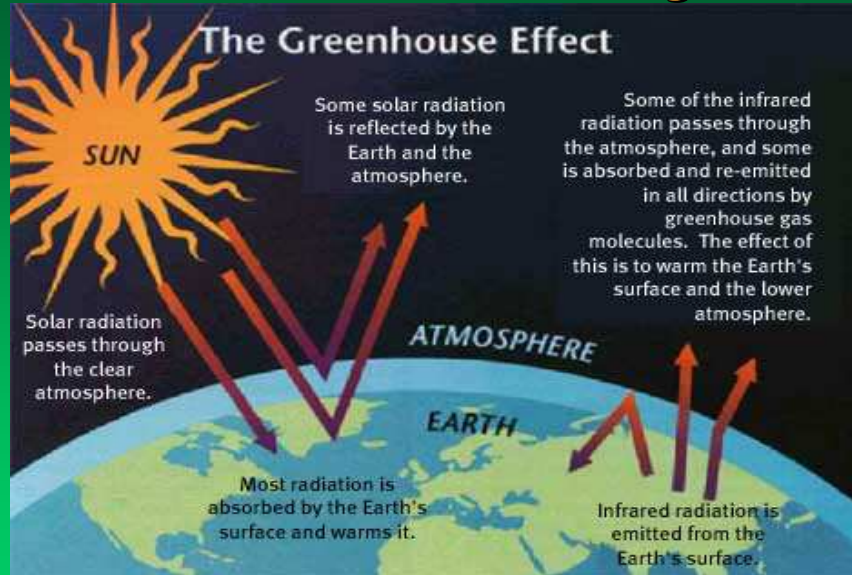


As you've seen there really is a lot of life on earth. Our planet is made up of a wide variety of ecosystems, that are so diverse, so different and unique, that they have led to the creation of millions of different plant and animal species. Our home, Earth, is overflowing with life, ranging from the strange and bizarre to the beautiful and colorful, is a mosaic of skin and scales, fur and feathers, petals and leaves, coming together to create some of the most beautiful places on earth. The living pieces of this mosaic, along with the water, land and air, give our planet its most unique characteristic – life!

The world has recognized the need to celebrate this unique life....and so, every 22 May we celebrate the International Day for Biological Diversity. On this day people all around the world will organize different events and celebrations, which focus on the theme that is chosen for that year.

This year, the theme is "Biodiversity and Climate Change."

# What is climate change?



Does anyone know what climate change is? Really it means that there are changes in the weather in a specific region.

Does anyone know how this happens?

- When sunlight heats the Earth's surface and heat is reradiated (bounced back) to the atmosphere.
- Greenhouse gases absorb this heat and slows the escape back to space, and in some cases reflect the heat back to earth warming it up even more
- Greenhouse gases in the atmosphere include:  
Natural occurring: Water vapor, Carbon dioxide, Methane, Nitrous oxide  
Man made synthetics: Chlorofluorocarbons (CFCs), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur hexafluoride (SF<sub>6</sub>)
- Greenhouse gases occur naturally, but through many of our activities we've increased the amount of greenhouse gases faster than it happens on its own.

So what do you think are some of the effects – or changes – caused by climate change?



# Climate change includes:

## Changes in temperature



## Changes in rainfall



## More frequent storms and droughts



Changes in temperature – many areas have already experienced warmer temperatures

Changes in rainfall – some areas will get more rain other areas will get less rain

Storms may become more frequent (we may have more storms – like hurricanes), but they will also be stronger than before.

These are just general examples, but in the different ecosystems we find on the planet we will see different effects...and do you think that the biodiversity in these areas will be affected the same way? Let's take a closer look at some of these areas.

## In the Arctic

- Temperatures are increasing five times faster than the rest of the world
- The sea ice is melting

**What kind of biodiversity do you think this affects?**



The first ecosystem we will look at is the Arctic. Some of the major changes happening in the Arctic include:

- A rise in temperature five times faster than the rest of the world. During the last century, the temperature has gone up 5 degrees C.
- Melting of the sea ice – which causes a rise in the global sea level, and takes away the home of many arctic animals.

What kind of biodiversity do you think this affects?



**Polar bears:** shorter periods of sea ice coverage endanger the **polar bear's** habitat and existence by giving them less time to hunt. The average weight of adult female polar bears has decreased by more than 20% over the last 25 years. In the 1980s, the average weight of a female polar bear was 650 pounds, and in 2004, their average weight was only 507 pounds. This decreased weight also makes it harder for the females to reproduce and raise healthy offspring.

**Seals:** depend on stable, large pieces of sea ice for sunning, mating and raising pups— melting sea ice means less habitat for all these activities. As the ice recedes, populations of krill and other organisms that form the base of the marine food chain disappear, meaning less food available for the seals in the end.

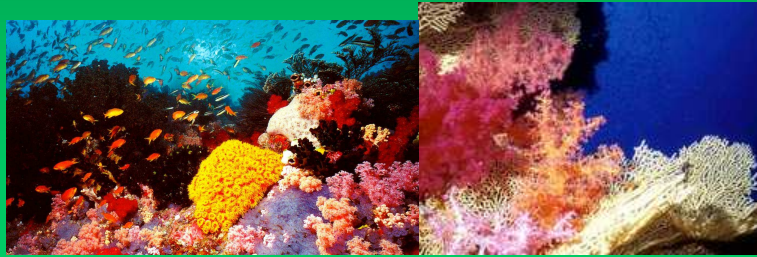
**Beluga whales:** are normally found along the ice edges as their main food sources (fish) feed on the krill and algae that live under the ice. The melting of the ice cover could lead to a major loss of feeding sites for the beluga whale, which can lead to decreases in its populations.

**Caribou:** Changes in temperature, rainfall and snowfall may threaten the food source of the caribou and lead to starvation. During the summer, caribou feed on small tundra shrubs, including willow, and fatten themselves in preparation for the coming winter. The summer is also a crucial period for calving and lactation. All of these activities require lots of energy, and so need lots of food to get that energy. Changes in temperature may increase the numbers of mosquitoes and parasitic flies that harass the caribou and decrease foraging time. Increased winter snow depth and summer insect harassment are likely to reduce food availability, increase energy requirements, and make caribou more vulnerable to predators such as wolves.

## Along Coral Reefs

- Sea temperatures are rising
- Hurricanes are happening more often and are more intense
- The ocean is becoming more acidic

**What kind of biodiversity do you think this affects?**



The next ecosystem we will look at are the coral reefs. Some of the major changes happening here include:

- A rise in sea temperatures
- Storms, hurricanes happening more often and being more intense
- A rise in the acidity of the oceans

What kind of biodiversity do you think this affects?



**Coral Reefs:** are faced with two major problems. The first is a problem called “coral bleaching.” What happens is that as the sea water changes, becomes warmer, corals become stressed and lose many of the symbiotic algae that live in them. These little organisms are what give the coral it’s color and a lot of their food. Without the algae, the corals look white (“bleached”) and may die since they do not get the nutrients they need to survive.

The second problem is with carbon dioxide – one of the greenhouse gases. The more carbon dioxide there is in the air, the more that will get trapped in the oceans. As the carbon dioxide in the oceans increases, the acidity of the water increases and lowers the concentration of something called carbonate. Corals and other marine organisms need this carbonate to help build their skeletons, so without it the corals can’t grow.

**Sea turtles:** Warmer temperatures in the Pacific regions could reduce the number of male sea turtle offspring and threaten turtle populations. The sex of sea turtle hatchlings is dependent on temperature, with warmer temperatures increasing the number of female sea turtles. What do you think happens if there are only female sea turtles?

**Reef fish:** All around the coral reef are a multitude of other organisms including beautiful and colorful species of fish. What do you think will happen to the fish if the corals that form the base of the ecosystem die? The warmer waters also make them more susceptible to infections and disease.



## In the Mountains

- Glaciers are melting
- Lakes are forming where there were no lakes before
- New pests are moving in

**What kind of biodiversity do you think this affects?**



The last type of ecosystem that we will look at is the mountain ecosystem. Some of the changes happening there include:

- The melting of the glaciers found at the top of the mountains as the temperatures warm up
- The water from the melting glaciers has to go somewhere, so it flows down the mountain into valleys and form new lakes where there were none before
- As different animals try to go up to the cooler temperatures at the top of the mountains you end up with new species, sometimes pests, that weren't there before

What kind of biodiversity do you think this affects?



**Forests:** The alpine forests have a seasonal treeline, which is the area on the mountains that separate the forest from the alpine habitat. The elevation of the treeline, how high it is found, is determined by temperature. As the temperature increases, the treeline will move up, which will cause a change in the habitats and species found there. What do you think happens to the plants and trees that get to the top of the mountain?

The other problem that mountain forests face is the same as the caribou that we mentioned earlier. Does anyone remember? As the weather changes, there will be more and more insects. There may even be new species, or species that stay for longer periods of time. Some of these insects are what we call pest species because they attack the trees and destroy the forest.

**Butterflies:** Many butterflies are specialist feeders. What this means is that they eat only particular plants, or parts of plants all the time. As the temperatures in the mountain ecosystems change, the numbers of plants, and the growth time of the plants will change. These changes mean that many butterfly species will not have enough food to survive. Some species, like the Monarch butterfly are migratory species. That means that they fly south to spend the winter in warmer areas, and then north again for the summer. But, if the temperatures change, it becomes too warm or too cold, what will happen to the butterflies and their habitats?

**Bears:** How do you think the bears are impacted by climate change? Changes in the habitat, such as the types of animals and plants found there will change the food available to them. Other changes that we've seen include: 1) as the temperatures have warmed up, and the habitats are moving northward, species like the grizzly that were not seen in certain areas can now be found there. 2) Bears are supposed to sleep during the winter, because frozen weather makes food too hard to find. The sleeping bears, which look like they are hardly breathing, can lose up to 40 per cent of their body weight before warmer springtime weather rouses them back to life. Now, because of the warmer temperatures there is still enough food to be found for the bears to remain active during the winter months.

**Big-horn sheep:** These animals live in very harsh habitats, where there is usually very few plants and very little water. However, they learn to survive by knowing where to food and water at specific times of the year. If the temperature and rainfall changes, how do you think this will affect the sheep? The plants that normally grow where the sheep are found will disappear, causing the sheep to have to find different sources of food. The water that they depend on will disappear, forcing them to look in different areas. This animal, which is adapted to a very specific habitat, is now faced with changes to its unique habitat and it may not be able to survive.

# Climate Change Also Affects People

## The places we live



## The food we eat



## Our cultures



Animals, plants and ecosystems are not the only types of biodiversity affected by climate change...we are as well. People all around the world are struggling to adapt to the changes in temperature, weather and rainfall. Some of the things that affect us include:

- The places we live: in Vanuatu, an island in the South Pacific, entire villages have been forced to move because the sea level rises have threatened to flood their villages.
- The food we eat: The animals and plants we depend on for food are threatened by changes in rainfall, increased temperatures, loss of nutrients from the soil and wildfires in regions that are getting drier
- Our cultures: Many cultures depend on the biodiversity around them to survive. Women in the Cook Islands have noticed a scarcity of pupu shells which are used in local handicrafts. The decline is linked to warming sea temperatures, and these handicrafts provide the villages with much of the money needed to provide food. The Sami people have observed changes in species composition in traditional reindeer grazing lands. These changes are impacting reindeer health. The Sami people depend on the reindeer for food, clothing and other artifacts.

## What is the World Doing?

190 countries have signed the Convention on Biological Diversity (1992); this means that they agree to:

- Conserve biological diversity
- Sustainably use its components
- Equitably share the benefits arising from the use of biodiversity



So what is the world doing about this problem?

The Convention on Biological Diversity, is a pact (or a promise) among the vast majority of the world's governments (190 of them) basically to make sure that as the world continues to develop, the biological resources that we need to sustain life on Earth are not all used up. This balance is called Sustainable Development. We want to make sure that there is enough resources left for the next generations.

In the language of the United Nations, a Convention is an international agreement, or treaty, and the governments who sign it are called Parties to the Convention. And what are the goals of the Convention? They are: the preservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits from the use of genetic resources.

These are very big promises, and not easy to do. Parties not only agree to meet the goals of the Convention when they sign it, but from then on, together, they work out and agree to the ways and means to meet those goals. They make National Plans for their own country and they work together to find ways to preserve biodiversity across regions and worldwide.

The Secretariat of the Convention, the coordinating point of the Convention, is in Montreal, Canada.

But we can't just depend on the governments to do all the work. We, each and every one of us here, can do something to help preserve our world's biodiversity, and limit the impact of climate change. What do you think are things that you can do?



**The three – R's:** reduce, reuse, recycle. We need to start thinking about reducing the amount of things we need. If we don't buy as much, or have as much...maybe we won't waste as much. We also have to start thinking more about reusing and recycling the stuff that we can to avoid destroying more biodiversity, and creating more garbage that we have no where to put. What are some of the things we can recycle?

**Transportation:** One of the major producers of the greenhouse gases that are the cause of climate change is cars/transportation. So instead of always driving, we should think of...? Walking, biking, car-pooling, public transportation, rollerblading, skateboarding etc.

**Conserve:** By having healthier ecosystems, the planet may be able to adapt better to the changes brought on by global warming. But to do that we need to keep these ecosystems healthy. One way we can do that is by conserving water, which in some parts of the world is very, very hard to find. How are some of the ways that we can conserve water? Shorter showers, close the tap when brushing teeth or washing dishes, doing less loads of laundry etc.

**Learn and Share:** the most important thing that we can do is to 1) learn about the problems that our planet is facing. Learn about the ways that we can help and then 2) share it with people so that everyone begins to do their part to help save our planet! Who are some of the people that you can share what you've learnt today with? Parents, friends and family

Thank you....any questions?