

Reflect

A long time ago, the human **population** was very small compared to what it is today. Eventually, humans figured out how to grow crops, which allowed more people to live in a smaller area. People discovered medicine and ways to keep their living spaces clean and free of harmful germs. All of these factors helped humans live longer. About 3,000 years ago, the human population began to grow very quickly. The increase in our population has had an effect on the **environment**. How do humans change the environment? Are all of the changes bad?

population: all the living things that belong to the same group and live in the same area

environment: the living and nonliving things that are around an organism

How can organisms, such as humans, change their environment?

Humans use Earth's resources. We take up space, grow and eat food, breathe air, use energy, and produce waste. Humans have a greater effect on their environment than ever before. What are some ways humans change the environment?

- **Changes to land:** Humans sometimes drain wetlands to build houses and other structures. They sometimes turn fields into landfills for trash. These changes may help humans find shelter and get rid of waste, but they can harm the other living things in the surrounding environment.
- **Changes to water:** Sometimes humans take too much fresh water from their environment. As a result, a river or stream might dry up, which kills the **organisms** that once lived there as well as those that may have depended on that water downstream. Humans also dump trash and harmful chemicals into fresh and saltwater environments, often making the environment unfit for organisms to survive.
- **Changes to air:** Cars, buses, trains, and other types of transportation use fuels that pollute the air. Factories also pollute the air when they burn chemicals and release gases into the air.
- **Changes to living things:** Overhunting and overfishing can harm or destroy populations of organisms. On the East Coast, fish called cod used to be very common. Overfishing caused these populations to decline so much that they are



organisms: living things

Reflect

now very rare in these areas. The larger predatory fish that depended on these fish had to move or find other sources of food. What other affects can you think of? Humans can also accidentally introduce new organisms into ecosystems. These organisms can use up food, space, and water that other organisms need. These animals or plants are called *invasive species*. They often grow faster or use food that the native species depended on. For example, an Asian Tiger Shrimp was introduced to waters here in the United States. It is causing native shrimp populations to decline. The Tiger Shrimp grows to be larger, eats more, and grows faster than the populations that grow naturally in those waters. How do you think this will affect the ecosystem over time?

Look Out!

Humans are not the only organisms that can change the environment. For example, beavers build dams by stacking branches and other materials into large piles. The dams block water flow and can cause flooding in the surrounding areas. But dams can be helpful, too. They create ponds and provide a new place for fish and other water organisms to live. Sometimes though, beavers can cut down so many trees that they destroy their own habitat!

Cows can change the environment too. The waste produced by cows releases a strong gas called methane into the air. Methane is naturally found in air. But scientists believe that an increase in methane is one of the gases related to an increase in air temperatures. In some areas of the country, grazing cattle deplete slower growing natural grasses on the prairies. This makes room for quicker growing non-native plants to take over. Overgrazing can change the healthy grasslands or prairies over time.

What Do You Think?

Not all human activities are bad for the environment. What are some ways that humans help their environment? What can humans do to reduce their impact on other organisms?

What Do You Think?

What happens to organisms if their environment changes? Can you think of good and bad changes?

Life on Earth is a delicate balance. When something in an environment changes, it has an effect on the organisms living in that environment. Sometimes, a change that is good for one organism might be bad for other organisms. An example is the deer population in the United States. Deer have become a problem animal. Humans used to hunt the animals that ate deer, such as wolves, coyotes, and mountain lions. A decrease in the number of **predators** was good for the deer. More deer survived each year, and their population grew. But other organisms suffered as a result. Deer like to eat grass, short bushes, and young trees. Sometimes they may eat all the plants in an area. There is little food left over for other animals. Those animals may starve. When the deer eat young trees, they prevent the trees from growing and replacing old, dying trees. The forest can become bare. Higher populations of deer also increase the number of deer affected by diseases, which then spread among crowded populations. Scientists predict that unless the deer population is controlled, deer will continue to harm other plants and animals.

predators:
animals that hunt
and eat other
animals



Look Out!

Organisms are not the only thing that can change the environment. Sometimes the environment is changed by natural events, such as forest fires, mud slides, droughts, floods, or earthquakes. These changes usually happen much faster than the changes caused by organisms.



Look Out!

How might highways or bridges affect an environment and the organisms that live there?

Imagine that you are trying to walk home from school. All of the sudden, someone puts a wall that is 100 feet tall and 100 feet wide in front of you. It would be pretty hard for you to get to the other side of the wall, right? Highways may seem small to us, but they can seem like very large barriers to other organisms. Suppose a highway is built through a forest. A turtle needs to cross the highway to get to a pond on the other side. But a turtle crossing a highway might get hit by a car or spotted and eaten by a predator. Similar to a highway, a bridge can also have a negative effect on organisms. Chemicals from cars using the bridge may fall into the water beneath the bridge. The sounds and vibrations from traffic might disturb the animals living there. Shade from the bridge could affect plants needing sunlight in the water. However, not all changes are harmful.



Perhaps the bridge provides a new habitat for organisms like barnacles that could otherwise not have lived there. There are many changes that building structures can have on an ecosystem, both helpful and harmful.

Scientists in the Spotlight: Rachel Carson

In the 1950s, people used a chemical called DDT to try to get rid of harmful insects like mosquitoes. DDT was good at killing insects, but people did not know how dangerous it could be to other animals. When animals ate the dead insects, they also ate the DDT.

food chain: the path of food energy from the Sun to organisms in an ecosystem

The dangerous chemical traveled up the **food chain**. Rachel Carson was a scientist who noticed that songbirds were dying because they were eating earthworms and other organisms that were full of DDT. Carson wrote a book about the danger of DDT called *Silent Spring*. Reading the book helped people understand how harmful DDT was to the environment. DDT also caused the eggshells of birds not to harden, meaning the baby birds could not form properly in the egg and did not survive. New laws were made that forced people to stop using DDT. Bird populations increased soon after DDT was banned.

Try Now

How clean is the air around you? Complete this short activity to find out what is in the air you breathe.





1. You will need five index cards, a pen or pencil, a hole punch, five pieces of string (about one foot long each), petroleum jelly, and paper towels.
2. Write the name of a different location around your school or home on each index card. Punch a hole at the top of each card. Tie a piece of string to each hole.
3. Use your finger to cover the cards with petroleum jelly on both sides. Wipe your hands with a paper towel when you are finished.
4. Hang the index cards in the five locations you listed. Leave them in place for two days. After two days, collect the cards. Do not let the cards touch each other.
5. Write down your observations of each card. Here are some questions to guide you:
 - What kinds of materials did you see on the cards? Did you find both natural and manmade substances?
 - Which card had the most material on it? Why do you think that location had the most material in the air?
 - What are some ways you could improve the air quality around your school or home?

What Do You Think?

What do you know?

Many things can happen as a result of environmental changes. Use what you have learned to predict how organisms can change the environment. Read each environmental change described in the chart below and study the images. Predict how the change will affect the organisms in that environment. Write your answers on the right side of the chart. Be creative! There are many correct responses!

What Do You Think?

Change	Effect
<p>A company clears a large area of wetlands to build a new neighborhood.</p> 	
<p>A beaver builds a dam across a stream, causing a pond to form in an area that used to be dry land.</p> 	
<p>A highway is built in the middle of a forest.</p> 	
<p>A logging company promises to plant five trees for every one it cuts down.</p> 	

The Effect of Acid Rain

You may have seen a forest affected by acid rain. The trees are stripped of leaves and branches and the whole forest appears to be dying. Acid rain is caused by air pollution and has a harmful effect on plant life. This activity will simulate the effects of acid rain on plant growth.

1. Gather at least 18 lima beans and soak them in water for about 24 hours.
2. Once the beans are finished soaking, make three liquid solutions: one with tap water, one with half tap water and half vinegar, and one with a quarter tap water and three quarters vinegar.
3. Dip a separate paper towel into each solution. Wring it partly dry, but make sure it is still very moist. Put each paper towel into a separate plastic bag, and label the bag with the type of solution inside (100% water, 50% water/50% vinegar, or 25% water/75% vinegar.)
4. Place six lima beans in each bag on top of the paper towels. Seal the bags with plenty of air inside and place in a warm area. The beans do not need to be in the Sun.
5. Check on the beans each day for one week. Each day, count how many beans have started to sprout. You will notice that some beans in the vinegar solution sprout late or not at all. This is due to the acid in the vinegar, modeling how acid rain can prevent plant growth.

Here are some questions to discuss with students:

1. At the end of one week, how many beans sprouted in each bag?
2. Did some beans fail to sprout? Why do you think this happened?
3. Did all the beans start growing at the same time? What might have caused a delay in growth?
4. What does this experiment tell you about the effect of acid rain on young plants?
5. How might acid rain affect an ecosystem? How can humans reduce acid rain?