Name: Date: Period:

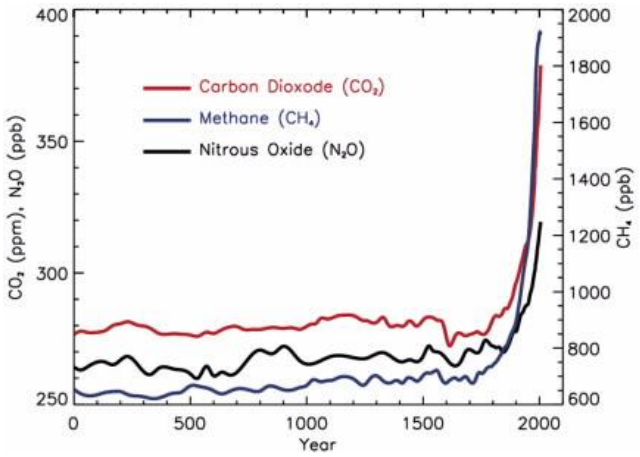
Ecosystems: Final Do Now Packet **(Day 1)**

Human impact on Cycles of Matter

Humans cause environmental problems by interfering with the **water cycle**. We remove large quantities of freshwater from rivers, lakes, and groundwater supplies. In areas where great amounts of people use the water from groundwater supplies, groundwater may be fully depleted. This effect is enhanced by vegetation removal to create new farmland, underground mines, housing, or to build roads. Due to vegetation removal, rainwater washes away, and it no longer infiltrates the ground. Groundwater supplies are not restored. Normally, rainwater infiltrates into the ground & is filtered; this ecological process usually purifies water. Without this process, there is a decrease in available fresh water for all organisms, including humans. Vegetation removal also increases the risk of flooding, soil erosion, and landslides. Finally, people change the quality of water, by adding nutrients and contaminants.

Humans also interfere with the **nitrogen cycle**. When burning fossil fuel, various compounds are released, among which nitrogen oxides (NOx). Nitrogen oxides react with oxygen in air, so that nitrous oxide gas (N2O) is formed. Nitrous oxide is a greenhouse gas, which enhances the Earth's temperature when it is present in the atmosphere too extensively. It can also react with ozone in the atmosphere, so that the ozone layer is broken down. The ozone layer is a kind of shell around the Earth that consists entirely of ozone. This layer protects the Earth and all its life from damaging UV-radiation. When the ozone layer is broken down, humans and animals can experience serious sunburns and skin cancer. Nitrogen dioxide may also react with hydrogen in the atmosphere, to form nitric acid (HNO3). This causes acid rain which damages trees and marine ecosystems due a decline in the pH of soil and water. Humans are also responsible for shortages of nitrogen in certain locations. Humans remove nitrogen, to create fertilizers to apply on farmland. As a result, farmland becomes too rich in nutrients and other areas will suffer nitrogen shortages. Vegetation in these areas depletes.

Humans also have impacted the **carbon cycle**. The removal of forests has caused depletion in plants and trees that absorb carbon dioxide. The burning of fossil fuel creates large emissions of carbon dioxide into the atmosphere. Since the industrial revolution, in the late 1800, carbon dioxide levels in the atmosphere have greatly increased; ***as shown in the graph carbon dioxide and nitrous oxide are both much more abundant in our atmosphere.*** Both are greenhouse gasses, and this means that increasing carbon dioxide and nitrous oxide gas supports the greenhouse effect. Too much of these compounds in the atmosphere can cause the Earth to warm up. Most scientists predict all kinds of negative effects due to global warming, such as droughts, changes in weather patterns, and melting polar ice caps causing flooding of highly populated coastal areas.



1. How does removal of vegetation (plants) have a negative impact on cycles of nature and ecosystems?

2. Is it possible for some locations on Earth to use up their water supply?

3. What is impacted as a result of there being too much nitrous oxide in our atmosphere?

4. What causes acid rain, and how does acid rain negatively affect ecosystems?

5. How does the use of fertilizer disrupt the nitrogen cycle?

6. How do humans negatively impact the carbon cycle?

7. According to most scientists, what will be the effect of increased greenhouse gasses in our atmosphere?

Environmental Problems **(Day 2)**

Maybe you've heard warnings about dirty air, water, and soil. Or you've heard about the destruction of rainforests. Do these warnings mean our environment is in trouble?

In the late 1700s, the Industrial Revolution began. People started to rely more and more on machines. As a result, more harmful substances entered the air, water, and soil.

Pollution

Today, machines don't produce as much pollution as they once did. But there are more sources of pollution today than there once were. **Pollution** is an unwanted change in the environment caused by substances, such as wastes, or forms of energy, such as radiation. Anything that causes pollution is called a *pollutant*. Some pollutants are produced by natural events, such as volcanic eruptions. Many pollutants are human-Ilade, Pollutants may harm plants, animals, and humans.

Vocabulary
pollution: an unwanted change in the environment caused by substances or forms of energy
pollutant: anything that causes pollution
hazardous waste: waste that can catch fire, corrode, or eat through metal, explode or make people sick

Garbage

The average American throws away more trash than the average person in any other nation--about 12 kg of trash a week. This trash often goes to a landfill like the one in **Figure 1**. Other landfills contain medical waste, lead paint, and other hazardous wastes. *Hazardous waste* includes wastes that can catch fire; corrode, or eat through metal; explode; or make people sick. Many industries, such as paper mills and oil refineries, produce hazardous wastes.

Figure 1 *Every year, Americans throw away about 200 million metric tons of garbage.*

Vocabulary
radioactive waste: hazardous wastes that give off radiation.

Figure 2 *Fertilizer promotes the growth of algae. As dead algae decompose, oxygen in the water is used up. So, fish die because they cannot get oxygen.*

Chemicals

People need and use many chemicals. Some chemicals are used to treat diseases. Other chemicals are used in plastics and preserved foods. Sometimes, the same chemicals that help people may harm the environment. As shown in **Figure 2**, fertilizers and pesticides may pollute soil and water.

CFCs and PCBs are two groups of harmful chemicals, Ozone protects Earth from harmful ultraviolet light. CFCS destroy ozone. CFCs were used in aerosols, refrigerators, and plastics. The second group, PCBs, was once used in appliances and paints. PCBs are poisonous and may cause cancer. Today, the use of CFCs and PCBs is banned, But CFCs are still found in the atmosphere. And PCBs are still found in even the most remote areas on Earth.

High-Powered Wastes

Nuclear power plants provide electricity to many homes and businesses. The plants also produce radioactive wastes. *Radioactive wastes* are hazardous wastes that give off radiation. Some of these wastes take thousands of years to become harmless.

Gasses

Earth's atmosphere is made up of a mixture of gasses, including carbon dioxide. The atmosphere acts as a protective blanket. It keeps Earth warm enough for life to exist. Since the Industrial Revolution, however, the amount of carbon dioxide in the atmosphere has increased. Carbon dioxide and other air pollutants act like a greenhouse, trapping heat around the Earth. Many scientists think the increase in carbon dioxide has increased global temperatures. If temperatures continue to rise, the polar ice caps could melt. Then, the level of the world's oceans would rise. Coastal areas could flood as a result.

1. What is pollution?

2. How much garbage does the average American produce in one week?

3. What might pollute soil and water?

    a. How does fertilizer pollute water?

PCB and CFC were often used in the past and did damage to our ecosystems and our own health. Fortunately, there have been agreements to eliminate using these chemicals.

4. How do CFCs (Chlorofluorocarbon) affect the environment?

5. How do PCBs (polychlorinated biphenyl) affect humans and the environment?

6. What waste does nuclear power plants produce? How long does it take for this waste to become harmless?

7. Why do some scientists think that carbon dioxide is harmful to our environment?

Noise **(Day 3)**

Some pollutants affect the senses. These pollutants include loud noises. Too much noise is not just annoying, Noise pollution affects your ability to hear and think clearly. And it may damage your hearing. People who work in noisy environments, such as in construction zones, must protect their cars.

Vocabulary
renewable resource: a natural resource that can be replaced at the same rate at which the resource is consumed
nonrenewable resource: a resource that forms at a rate that is much slower than the rate at which it is consumed

Resource Depletion

Some of Earth's resources are renewable. But other resources are nonrenewable. A **renewable resource** is one that can be used over and over or has an unlimited supply. Solar and wind energy are renewable resources, as are some kinds of trees. A **nonrenewable resource** is one that cannot be replaced or that can be replaced only over thousands or millions of years. Most minerals and fossil fuels, such as oil and coal, are nonrenewable resources.

Nonrenewable resources cannot last forever. These resources will become more expensive as they become harder to find. The removal of some materials from the Earth also carries a high price tag. This removal may lead to oil spills, loss of habitat, and damage from mining, as shown in **Figure 3**.

Renewable or Nonrenewable?

Some resources once thought to be renewable are becoming nonrenewable. For example, scientists used to think that fresh water was a renewable resource. However, in some areas, water supplies are being used faster than they are being replaced. Eventually, these areas may run out of fresh water. So, scientists are working on ways to keep these water supplies from being used up.

Figure 3 *This area has been mined for iron using a method called strip mining.*

Exotic Species

People are always on the move. Without knowing it, people carry other species with them. Plant seeds, animal eggs, and adult organisms are carried from one part of the world to another. An organism that makes a home for itself in a new place outside its native home is an *exotic species*. Exotic species often thrive in new places. One reason is that they are free from the predators found in their native homes.

Exotic species can become pests and compete with native species. In 2002, the northern snakehead fish was found in a Maryland pond. This fish, shown in **Figure 4**, is from Asia. Scientists are concerned

because the northern snakehead eats other fish, amphibians, small birds, and some mammals. It can also move across land. The northern snakehead could invade more lakes and ponds.

Vocabulary
exotic species: an organism that makes a home for itself in a new place outside its native home
overpopulation: the presence of too many individuals in an area for the available resources

Figure 4 *Northern snakehead fish can move across land in search of water. These fish can survive out of water for up to four days!*

Human Population Growth

Look at **Figure 5**. In 1800, there were 1 billion people on Earth. By 2000, there were more than 6 billion people. Advances in medicine, such as immunizations, and advances in farming have made human population growth possible. Overall, these advances are beneficial. But some people argue that there may eventually be too many people on Earth. **Overpopulation** happens when the number of individuals becomes so large that the individuals can't get the resources they need to survive. However, many scientists think that human population growth will slow down or level off before it reaches that point.

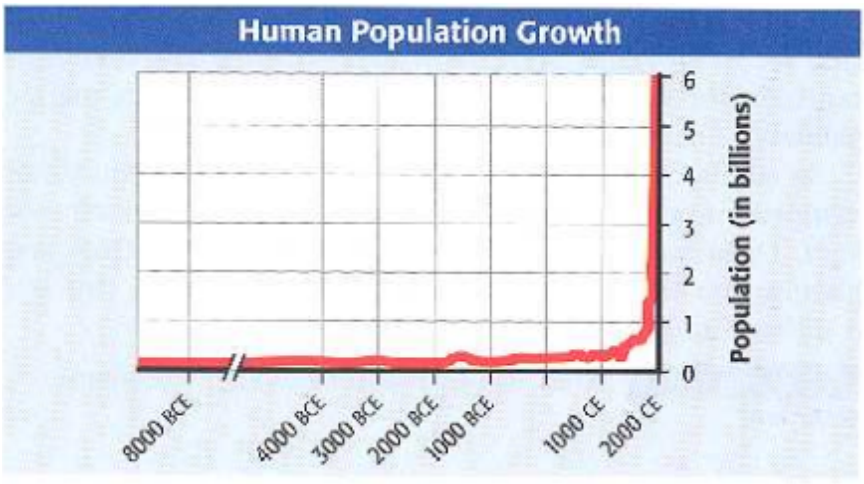


Figure 5 *Recently, the human population has been doubling every few decades.*

1. What is a renewable resource? What are some examples of renewable resources?

2. What is a nonrenewable resource? What are some examples of nonrenewable resources?

3. What is a resource that we once thought to be renewable but now in some places it may not be replaced as quickly as it is being used?

4. What are exotic species and how do they get into an ecosystem?

5. Why are scientists concerned about the Northern Snakehead fish?

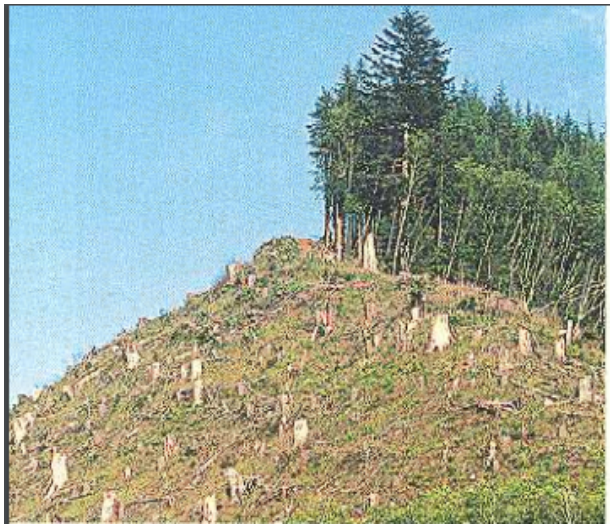
6. What is overpopulation?

Habitat Destruction **(Day 4)**

People need homes. People also need food and building materials. But when land is cleared for construction, crops, mines, or lumber, the top soil may erode. Chemicals may pollute nearby streams and rivers. The organisms that were living in these areas may be left without food and shelter. These organisms may die.

An organism's *habitat* is where it lives. Every habitat has its own number and variety of organisms, or biodiversity. If a habitat is damaged or destroyed, biodiversity is lost.

Figure 6 *Deforestation can leave soil exposed to erosion.*



Vocabulary
biodiversity: the number and variety of organisms in a given area during a specific period of time
habitat: where an organism lives
deforestation: the clearing of forest lands
point-source pollution: pollution that comes from one source
nonpoint-source pollution: pollution that comes from many different sources

Forest Habitats

Trees provide humans with oxygen, lumber, food, rubber, and paper. For some of these products, such as lumber and paper, trees must be cut down. *Deforestation* is the clearing of forest lands, as shown in **Figure 6**. At one time, many of these cleared forests were not replanted. Today, lumber companies often plant new trees to replace the trees that were cut down. However, some biodiversity is still lost.

Tropical rain forests, the most diverse habitats on Earth, are sometimes cleared for farmland, roads, and lumber. But after a tropical rainforest is cleared, the area cannot grow to be as diverse as it once was. Also, thin tropical soils are often badly damaged.

Marine Habitats

Many people think of oil spills when they think of pollution in marine habitats. This is an example of *point-source pollution*, or pollution that comes from one source. Spilled oil pollutes both open waters and coastal habitats.

A second kind of water pollution is *nonpoint-source pollution*. This kind of pollution comes from many different sources. Nonpoint-source pollution often happens when chemicals on land are washed into rivers, lakes, and oceans. These chemicals can harm or kill many of the organisms that live in marine habitats.

In addition to oil and chemicals, plastics are also sometimes dumped into marine habitats. Animals may mistake plastics for food. Or animals may become tangled in plastics. Dumping plastics into the ocean is against the law. However, this law is difficult to enforce.

Effects on Humans

Trees and marine life are not the only organisms affected by pollution and habitat destruction. Pollution and habitat destruction affect humans, too. Sometimes, the effect is immediate, Polluted air affects people with respiratory problems. If you drink polluted water, you may get sick. Sometimes, the damage is not apparent right away. Some chemicals cause cancers many years after a person is exposed to them. Over time, natural resources may be hard to find or used up. Your children or grandchildren may have to deal with these problems.

Anything that harms other organisms may eventually harm people, too. Caring for the environment means being aware of what is happening now and looking ahead to the future.

1. Why are habitats destroyed, and what does habitat destruction cause?

2. What do some lumber companies do to avoid habitat destruction?

3. Why does the tropical rainforest not regrow if it is cleared?

4. What is point-source pollution? What is an example of a point-source pollution?

5. What is nonpoint-source pollution? What is an example of a nonpoint-source pollution?

6. Which type of pollution might you have inadvertently done in your life? Point-source pollution or nonpoint-source pollution?

7. Why is it so important for humans that our environment is not polluted?