

College Guild
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ENVIRONMENTAL ISSUES

UNIT 4 OF 5

Land Use and Biodiversity

Land Use

The first part of this unit is about dirt. Or to use a more technical term, it's about soil. The writer and farmer, Wendell Berry, has this to say on the subject:

“The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life.”

- 1. How is soil “the source and destination of all” and “the healer and restorer and resurrector”? Try to put that into your own words.**
- 2. Do you agree with what Berry says in the final sentence in this statement, (“Without proper care for it ...)? Why or why not?**

Our species, *homo sapiens*, first appeared on earth about 200,000 years ago, evolving from earlier primates, but it was only between 11,000 and 12,000 years ago that humans began to practice agriculture. Before that, people led nomadic existences, constantly moving from one area to another in search of wild game and edible plants. Farming allowed, indeed it required, people to stay in one place. This, in turn, led to the growth of cities, where farmers could market their crops, and also to the development of complex social structures. In some ways, this was a good development. People had greater, more reliable access to nutritious food, for example. But there was also a downside – one that we are only now beginning to recognize.

- 3. How would you feel about living a nomadic existence, one in which you were always moving about with no permanent residence? Provide at least one advantage and one disadvantage to living this way.**

Originally, most farmers practiced subsistence agriculture, growing crops primarily to feed themselves and their families and, perhaps, bartering anything left over with their neighbors. As more efficient methods were developed, however, it became possible to produce substantial surpluses for sale to complete strangers in central markets. This whole process unfolded over several thousand years, but the pace of change ramped up considerably in the mid-20th Century with the rise of *industrial agriculture*. This approach to farming consists of devoting thousands of acres to a single crop, such as corn, soybeans or wheat.

Industrial agricultural practices have increased yields greatly and done much to reduce hunger, especially in the developing world. At the same time this approach has led to long term problems. Growing the same crop on a piece of land year after year – a practice known as monoculture - can strip the soil of essential nutrients and result in decreasing productivity.

Farmers may try to combat this by using large amounts of chemical fertilizers and pesticides. Traces of these chemicals can be found in the food we eat and, as we saw in Unit 3, can also travel downstream to the oceans where they create dead zones. This photograph shows a typical industrial farm.



Crop rotation – planting different crops from one year to the next on a predetermined schedule – is a more effective way of maintaining soil fertility and protecting against pests and weeds. Allowing livestock to graze on land not currently being used to grow crops is another way of providing natural fertilization.

- 4. Should farmers be required by law to rotate their crops and reduce the amount of pesticides they use? Why or why not?**
- 5. If your answer to Question 4 is “yes”, should they be compensated for any extra expense involved in complying with the law? If your answer to Question 4 is “no”, how would you encourage farmers to adopt these environmentally friendly practices?**

Meat production has also been industrialized, with the animals prepared for slaughter in large buildings called Combined Animal Feeding Operations (CAFO). In these buildings, they are kept in very crowded conditions and fed high calorie, grain-based diets, supplemented by antibiotics and hormones to promote rapid growth. These supplements produce anti-biotic resistant bacteria in the animals. After we eat the animals, these bacteria show up in our own bodies, thus reducing the effectiveness of the anti-biotics we take for medicinal purposes. Also, animal waste, rather than serving as a natural fertilizer, becomes an environmental problem and often winds up in nearby streams.

- 6. What should be done to prevent animals being raised for slaughter from being treated inhumanely?**
- 7. Write a letter to the editor of a local newspaper to persuade people to buy meat from animals that have been raised humanely, even if it costs more.**

A picture of a typical Confined Animal Feeding Operation (CAFO) appears on the next page.



8. Historically, most people in the United States lived on farms or in small, rural towns. Now the situation is reversed, with a substantial majority living in metropolitan areas. What are some of the benefits to this trend?

9. What are some of the drawbacks?

10. Write a dialogue between a person from an urban area and one from a rural area. Include at least two questions from each person about the other’s lifestyle, along with the other person’s responses.

Biodiversity

The term biodiversity is a shortened form of “biological diversity” and refers to the number and variety of plant, insect, and animal species in a given ecosystem. A species is a group of organisms that is capable of reproducing itself. We humans are members of the species known as *homo sapiens*. Ecosystem is short for “ecological system.” An ecosystem consists of all the living organisms in a given area, along with such non-living factors as a specific type of soil, the annual temperature range, and the amount of rainfall. Ecosystems can be small, such as a pond; mid-sized, such as a lake or a meadow; or large, such as the Amazon rainforest.

11. Describe a small or mid-sized ecosystem with which you were familiar at some time in your life, (such as a meadow, mountain, swamp, vacant lot).

12. Name three organisms (that is plants, insects, or animals) found in that ecosystem. How do they benefit or harm each other?

The point to remember is that all of the elements of a specific ecosystem – living and non-living alike – interact with each other in some way. When a species disappears from a specific ecosystem, or goes extinct entirely, that ecosystem is

affected. The same is true when a new species – a so called invasive species – is introduced into the ecosystem. Here is a typical chain of events:

Species A, an animal, relies on species B, a plant, as its primary source of food. Because the ecosystem is a healthy, balanced one, species B grows quickly enough so that there is always enough for A to eat.

The climate gradually becomes warmer and less rainy, causing species B to gradually disappear from the ecosystem.

Species A switches to species C, a less nutritious plant, as its primary food source. Smaller animals which had relied on species C now must find other sources of food. Some are successful, others less so. Meanwhile, species A is weaker now because of its new diet. It may or may not survive in the ecosystem.

Species D, an animal which is not native to the area, is introduced to the ecosystem. This can happen in any of several ways. For example, it might have extended its range to this ecosystem as its former home became too warm for it. Or some local humans may have brought it in as a pet and then grown tired of caring for it and released it into the wild.

In any case, species D competes with Animal A, either by killing it for food or simply by eating the plants which A relies upon. As a result, neither species A nor species B remains in the area. It's a substantially different ecosystem.

13. Invent an ecosystem and describe a chain of events with at least three links. The initial event should be caused by human action.

14. Invent another ecosystem and describe another chain of events with three or more links. This time, the initial event should be a natural one such as a flood or severe storm.

You may be wondering why the loss, or substantial alteration, of an ecosystem is a problem. After all, change occurs all the time in nature. This is true, but ecosystems and those creatures that live in them often perform vital services which may not be appreciated by those of us who benefit from them. For example, wetlands filter and purify water that may have been polluted by an industrial or agricultural source upstream. Most medicines were initially derived from specific plants that were known by indigenous people to have healing powers. Many farmers rely on bees to pollinate their apples, blueberries, almonds and other crops.

Before the rise of agriculture, approximately one quarter of all the land on earth was grassland. These areas are especially fertile and provide habitat for a wide variety of plant and animal species. They also absorb large amounts of carbon dioxide from the atmosphere, thus reducing the impact of global warming. Conversion of this land to agricultural uses, especially when the purpose is to devote thousands of acres to one crop such as corn or soybeans, destroyed much of this biodiversity and sharply reduced the land's ability to absorb carbon dioxide.

Another threat to ecosystems is deforestation – permanent destruction of forests to make the land available for other purposes. These purposes may include housing development and general urbanization, as well as creation of large cattle ranches. Trees, like grasslands, fight global warming by absorbing large amounts of carbon dioxide.

15. Sometimes areas in the poorer countries of the world become deforested because local people need the wood for cooking, heating and similar activities. What are some ways in which the basic needs of these people can be met without destroying the forest?

The picture below shows a tea plantation in the Asian country of Sri Lanka on land that used to be heavily forested.



An ecosystem that lacks biodiversity - one in which there are only a few species - is at risk when it is attacked by a disease which targets those species. For example, the Great Famine in Ireland during the 1840's was caused in part by a disease, commonly known as the Potato Blight, that destroyed the potato crop for several years in a row. One third of the Irish population died and another third emigrated to England, North America or Australia.

Complex animals have existed on Earth for about 500 million years. During that time, there have been five major "extinction events" – periods when a large percentage of the animal species on the planet have gone extinct. The causes of these events are difficult to determine, but most scientists who study these things believe that massive volcanic eruptions and collisions with large comets or asteroids were the culprits. These same scientists believe that we are in the middle of a "Sixth Extinction". This time, though, it is human activity – ocean acidification, deforestation, agricultural and industrial pollution, etc. - that is responsible. The rate at which species are going extinct is rising. In the 17th Century, only five species are **known** to have gone extinct. In the 20th Century, there were 438 such extinctions. It should be noted though that there may be thousands of other species, located in remote areas, which have also gone extinct with nobody noticing.

Scientists who study these sorts of things are concerned about any species that is in danger of going extinct because they know, in theory at least, that each one has a role to play in the world's ecosystems. Most people, though, have their favorite animals and plants. (And, in some cases, insects.) We may like the warm, cuddly ones like cats and dogs that have been domesticated for centuries. Or we may prefer the majestic, dangerous ones like lions and tigers. Or our closest relatives like

chimpanzees and gorillas. If one of these species were to be threatened with extinction, there would be a huge outcry, followed by demands that something be done to stop it. Some obscure worm or fungus? Not so much.

Two well-known mammals – the polar bear and the Sumatran elephant – are approaching extinction, although there is still time to turn things around for each of them. Polar bears are born on land, but they spend most of their time on sea ice in the Arctic Ocean. From their perches on floating ice, they can kill seals and eat them, thus building up fat reserves in preparation for the harsh Arctic winters. Because of global warming, the sea ice is melting earlier in the fall, thus driving the bears onto the land and away from their main source of food.

Sumatran elephants are facing two major problems. Their habitat is being destroyed by deforestation, which is taking place in order to develop palm oil plantations. Palm oil has many uses in food preparation and as a source of energy. In addition, the elephants are being killed in large numbers by poachers, who then sell their tusks for their ivory. Fortunately, the general public is becoming increasingly aware of the problems faced by the polar bear and the Sumatran elephant.

16. Pick either the polar bear or Sumatran elephant. Name five steps individuals, businesses, the Federal Government or international leaders could take to save them from extinction.

This is serious business, of course. As the bumper sticker says, "Extinction is forever." But here is a question just for fun.

17. Which species would you be least likely to miss if it were to go extinct? It could be an animal, plant, reptile, insect, any species you can think of.

18. How many other species can you think of that would miss the one you've chosen for extinction?

Remember: First names only & please let us know if your address changes