Ecology and the Environment

Chapter 3: Resources and Living Things

8th Grade

Lesson 1 (Introduction to Environmental Issues)

3 Categories of Environmental Issues:

1. **Population Growth**
   – When a population grows, the demand for resources also grows.
2. **Resource Use**
   – Conflict arises when a natural resource is scarce or is used in a way that people feel is unfair.

<u>**natural resource**</u> – anything that occurs naturally in the environment and is used by people

   Examples: trees, other organisms, water, oil, coal, sunlight, minerals

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3. **Pollution –** the contamination of Earth's land, water, or air
   – Pollution can be caused by wastes, chemicals, noise, heat, or light.

<u>**Point source pollution**</u> – the specific source of the pollution can be identified

   Example: a pipe gushing polluted water into a river

<u>**Nonpoint source pollution**</u> – the specific point of origin cannot be identified

   Examples: Runoff from fields or streets may contain pollutants you cannot see.

   Groundwater may become polluted by some unknown source miles away.

   Pollutants in the air cannot be tied to any one car or factory.

<u>**Environmental science**</u> – the study of natural processes that occur in the environment and how humans can affect them

<u>**Steps in making environmental decisions:**</u>

1. Look at the data provided by environmental scientists.
   – the general conditions of the air, soil, and water within the environment
   – how this environment affects surrounding environments
2. Compare the needs of the environment with the needs of the people.
3. Consider the costs and benefits of making any changes to the environment. (pros and cons)
   – Will jobs be created?
   – Will the local economy benefit?
   – How expensive will the changes to the environment be and where will that money come from?
   – Will there be environmental costs to certain species?
   – Are the costs short-term, compared to long-term benefits?

Lesson 2 (Introduction to Natural Resources)

<u>**Renewable resource**</u> – a resource that is either always available or is naturally replaced in a relatively short time
   – They are only renewable if they are replaced as fast as they are used.

   Examples: wind, sunlight, water, trees, soil, plants, animals, biomass

<u>**Nonrenewable resource**</u> – a resource that is not replaced in a useful time frame
   – Some "renewable" resources can be nonrenewable, depending on how quickly they are replaced. (trees)
   – How long a resource lasts depends on how people use it.
   Examples: coal, oil, minerals, natural gas, metals, sand

<u>**Sustainable use**</u> – the use of a resource in ways that maintain the resource at a certain quality for a certain period of time.

<u>**Ecological footprint**</u> – the amount of land and water that individuals use to meet their resource needs and to absorb the wastes that they produce
   – A high level of resource use means a larger footprint.
   – A low level of resource use means a smaller footprint.

<u>**Conservation**</u> – the practice of using less of a resource so that it can last longer

Lesson 3 (Human Population Growth)

Exponential growth – growth pattern in which individuals in a population reproduce at a constant rate, so that the larger the population gets, the faster it grows
– The human population has grown **exponentially**.

Human birth rate – the number of babies born each year per 1,000 people

Example: If a country had a population of 127,078,979, and had a birth rate of 11.6 last year, about ___1,474,116___ babies were born in that country. (127,079 x 11.6)

Human death rate – number of people who die each year per 1,000 people

Example: If a country had a population of 127,078,979, and had a death rate of 9.4 last year, about ___1,194,543___ died in that country. (127,079 x 9.4)

What is this country's population after last year?
(127,078,979 + 1,474,116 – 1,194,543 = **127,358,552 people**)

Lesson 4 (Forests and Fisheries)

When managed correctly, both forests and fisheries can be renewable resources.

Selective cutting – the process of cutting down only some tree species in an area.
– A mix of tree sizes and a mix species are left behind.

Clear-cutting – the process of cutting down all the trees in an area at once
– All sizes and species of trees are removed.

Advantages of clear-cutting:
– quicker, and therefore cheaper, than selective cutting
– safer than selective cutting as there are no remaining trees to move equipment and logs around
– can provide habitat for organisms that could not live there before

Disadvantages of clear-cutting:
– more damaging to the forest environment than selective cutting
– creates drastic changes to the ecosystem that exposes the soil to rain and wind erosion
– soil washed into streams may harm fish and other living things there

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Sustainable yield – an amount of a renewable resource that can be harvested regularly without reducing the future supply
– A resource must be replaced at the same rate it is used to be **sustainable**.
– In a forest, young trees are planted as older trees are harvested.
– A tree's growth rate must be considered and that tree must be planted frequently enough to keep a constant supply.
– This might mean no harvesting in a certain area for 40-50 years ...... Do we have enough other areas nearby to harvest from?
– Knowing the **sustainable yield** of your resources can help determine **sustainable use**.

Fishery – an area with a large population of valuable ocean organisms

Ways to manage fisheries for sustainable yield :

1. Setting fishing limits
   – Limit what species can be caught.
     (This may change as populations recover.)
   – Limit the number of each species that can be caught.
   – Limit the size that can be kept.
     (This ensures that young fish live long enough to reproduce.)

2. Monitor or regulate fishing methods.
   – Large mesh sizes in nets allow smaller fish to pass through them.
   – Size of nets may be regulated to prevent overharvesting.
   – Types of fishing equipment may be regulated.   (types of nets vs. lines)
   – Return all unintentional catches to the water alive and unharmed.

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3. Develop **aquaculture** techniques**.**

   Aquaculture – the practice of raising fish and other water-dwelling organisms for food

   Advantages:
   – can produce popular food sources that may be in short supply in the environment
   – can bring a food source to an area where it does not occur naturally (shrimp in Iowa)

   Disadvantages:
   – Artificial ponds often displace natural habitats.
   – They are expensive to operate.
     (Cost is passed on to the consumer.)
   – Fish farms can cause pollution.
   – Fish farms can spread disease into wild populations.

4. Find alternative resources**.**
  – More than half the protein eaten by people throughout the world comes from fish.
  – To feed a growing world population, we can fish for new species that may not be as desirable, but are more plentiful. (carp?)
  – Some species are easy to farm. (catfish, tilapia)

Lesson 5 (Biodiversity)

Diverse – showing a great deal of variety; very different

Diversity – a range of different things

Biodiversity – the total number of different species in an area
  – includes species of all living things, not just animals

Importance of Preserving Biodiversity :
1. Wild organisms and ecosystems are a source of beauty and recreation.
2. Biodiversity provides economic value to an area.
  – Living things provide people with food, clothing, medicines, and other products.
  – **Ecotourism** brings people into an area to view the biodiversity, helping the area's economy.
  – Ecotourism also creates jobs within an area.

  Ecotourism – tourism directed toward exotic, often threatened, natural environments, intended to support conservation efforts and observe wildlife

3. Biodiversity provides ecological value to an area.
  – All the species in an ecosystem are connected to one another.
  – A change that affects one species can affect all the others.
  – Some species are **keystone species**.

  keystone species – a species that influences the survival of many other species in an ecosystem

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Factors That Affect Biodiversity :
1. **Climate**
  – Tropical rainforests have the most biodiversity in the world.
  – Scientists believe this is due to constant temperatures and large amounts of rainfall that allow plants to grow year-round, meaning food is always available for other organisms.

2. **Area**
  – A large area will usually contain more different species than a small area.

3. **Niche diversity**
  – Areas that support many different niches enable a greater number of species to live there.

  Niche – the role of an organism in its habitat

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4. **Genetic diversity**
  – It is important for a species to have diverse traits.
  – Organisms of one species share many of the same genes.
  – But each organism also has some genes that are different from others of their species.
  – Both the shared genes and genes that differ make up the total gene pool of that species.
  – Species that lack a diverse gene pool are less able to adapt to and survive changes in the environment.

5. **Extinction**
  – Removal of a species that could not adapt to changes in their environment decreases diversity in an area.

How Humans Affect Biodiversity :
1. **Damaging biodiversity**
  A. **Habitat destruction** – the loss of natural habitat
  B. **Habitat fragmentation** – the breaking of a habitat into smaller, isolated pieces
  C. **Poaching** – illegal killing or removal of wildlife from their habitat
  D. **Pollution** – may endanger organisms, or cause birth defects that can affect survival
  E. **Exotic species** – non-native species introduced to an area can threaten biodiversity by outcompeting or damaging native species

2. **Protecting biodiversity**
  A. **Captive breeding** – the mating of animals in zoos or wildlife preserves
    – Scientists care for the young, then release them into the wild.

B. **Laws and treaties**

Endangered Species Act (United States)

– prohibits trade of products made from threatened or endangered species

– requires the development of plans to save endangered species

Convention on International Trade in Endangered Species of Wild Fauna and Flora

– Eighty nations developed a treaty that lists more than 800 threatened and endangered specie of animals (fauna) and plants (flora) that cannot be traded for any reason anywhere in the world.

fauna – the animals of a particular region, habitat, or geological period

flora – the plants of a particular region, habitat, or geological period

C. **Habitat preservation**

– The most effective way to preserve biodiversity is to protect whole ecosystems.

– This is done by countries establishing and regulating parks and refuges.