

# Environment

- Environment covers all of the external factors affecting an organism.
- All the external factors influencing the life and activities of people, plants, and animals.
- These factors may be other living organisms (biotic factors) or nonliving variables (abiotic factors), such as temperature, rainfall, day length, wind, and ocean currents.
- The interactions of organisms with biotic and abiotic factors form an ecosystem.
- Even minute changes in any one factor in an ecosystem can influence whether or not a particular plant or animal species will be successful in its environment.

- FACTORS THREATENING THE ENVIRONMENT
- Population Growth
- Human population growth is at the root of virtually all of the world's environmental problems. Although the growth rate of the world's population has slowed slightly since the 1990s, the world's population increases by about 77 million human beings each year. As the number of people increases, crowding generates pollution, destroys more habitats, and uses up additional natural resources.

- The Population Division of the United Nations (UN) predicts that the world's population will increase from 6.23 billion people in 2000 to 9.3 billion people in 2050. The UN estimates that the population will stabilize at more than 11 billion in 2200. Other experts predict that numbers will continue to rise into the foreseeable future, to as many as 19 billion people by the year 2200.

- Global Warming
- Like the glass panes in a greenhouse, certain gases in the Earth's atmosphere permit the Sun's radiation to heat Earth. At the same time, these gases retard the escape into space of the infrared energy radiated back out by Earth. This process is referred to as the greenhouse effect. These gases, primarily carbon dioxide, methane, nitrous oxide, and water vapor, insulate Earth's surface, helping to maintain warm temperatures. Without these gases, Earth would be a frozen planet with an average temperature of about  $-18^{\circ}\text{C}$  (about  $0^{\circ}\text{F}$ ) instead of a comfortable  $15^{\circ}\text{C}$  ( $59^{\circ}\text{F}$ ). If the concentration of these gases rises, they trap more heat within the atmosphere, causing worldwide temperatures to rise.

- Depletion of the Ozone Layer
- The ozone layer, a thin band in the stratosphere (layer of the upper atmosphere), serves to shield Earth from the Sun's harmful ultraviolet rays. In the 1970s, scientists discovered that chlorofluorocarbons (CFCs)—chemicals used in refrigeration, air-conditioning systems, cleaning solvents, and aerosol sprays—destroy the ozone layer. CFCs release chlorine into the atmosphere; chlorine, in turn, breaks down ozone molecules. Because chlorine is not affected by its interaction with ozone, each chlorine molecule has the ability to destroy a large amount of ozone for an extended period of time.

- Habitat Destruction and Species Extinction
- Plant and animal species are dying out at an unprecedented rate (*see Endangered Species*). Estimates range that from 4,000 to as many as 50,000 species per year become extinct. The leading cause of extinction is habitat destruction, particularly of the world's richest ecosystems—tropical rain forests and coral reefs. If the world's rain forests continue to be cut down at the current rate, they may completely disappear by the year 2030. In addition, if the world's population continues to grow at its present rate and puts even more pressure on these habitats, they might well be destroyed sooner.

- Air Pollution
- A significant portion of industry and transportation burns fossil fuels, such as gasoline. When these fuels burn, chemicals and particulate matter are released into the atmosphere. Although a vast number of substances contribute to air pollution, the most common air pollutants contain carbon, sulfur, and nitrogen. These chemicals interact with one another and with ultraviolet radiation in sunlight in dangerous ways. Smog, usually found in urban areas with large numbers of automobiles, forms when nitrogen oxides react with hydrocarbons in the air to produce aldehydes and ketones. Smog can cause serious health problems.
- Acid rain forms when sulfur dioxide and nitrous oxide transform into sulfuric acid and nitric acid in the atmosphere and come back to Earth in precipitation. Acid rain has made numerous lakes so acidic that they no longer support fish populations. Acid rain is also responsible for the decline of many forest ecosystems worldwide, including Germany's Black Forest and forests throughout the eastern United States.



- **Water Pollution**
- Estimates suggest that nearly 1.5 billion people worldwide lack safe drinking water and that at least 5 million deaths per year can be attributed to waterborne diseases.
- Water pollution may come from *point sources* or *nonpoint sources*.
- Point sources discharge pollutants from specific locations, such as factories, sewage treatment plants, and oil tankers. The technology exists to monitor and regulate point sources of pollution, although in some areas this occurs only sporadically.
- Pollution from nonpoint sources occurs when rainfall or snowmelt moves over and through the ground. As the runoff moves, it picks up and carries away pollutants, such as pesticides and fertilizers, depositing the pollutants into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water. Pollution arising from nonpoint sources accounts for a majority of the contaminants in streams and lakes.

- **Groundwater Depletion and Contamination**
- Water that collects beneath the ground is called groundwater.
- Worldwide, groundwater is 40 times more abundant than fresh water in streams and lakes.
- In the United States, approximately half the drinking water comes from groundwater.
- Although groundwater is a renewable resource, reserves replenish relatively slowly.
- Agricultural practices depending on this source of water need to change within a generation in order to save this groundwater source.

- **Chemical Risks**

- A number of toxic substances that humans encounter regularly may pose serious health risks. Pesticide residues on vegetable crops, mercury in fish, and many industrially produced chemicals may cause cancer, birth defects, genetic mutations, or death. Many chemicals have been found to mimic estrogen, the hormone that controls the development of the female reproductive system in a large number of animal species. Preliminary results indicate that these chemicals, in trace amounts, may disrupt development and lead to a host of serious problems in both males and females, including infertility, increased mortality of offspring, and behavioral changes such as increased aggression.