

PART III

RESOURCES

Glossary

acid deposition Commonly used when referring to acid rain; primary pollutants, sulfates, and nitrates combine with water in the atmosphere to form sulfuric acid (H_2SO_4) and nitric acid vapor (HNO_3).

active volcano A volcano that is presently erupting, or a volcano that has a large amount of seismic and thermal activity.

acute exposure Intense exposure to pollutants, toxins or radioactive materials occurring over a brief period of time.

adaptations The developed traits that make an organism especially suited to its environment; also called adaptive traits.

aerosols Solid particles and droplets suspended in the atmosphere.

age structure The number of organisms in each age range within a population.

age structure diagrams Used to show the distribution of ages throughout a population and can help to forecast what might happen to a population over time. Also called age pyramids.

Agricultural Revolution Began about 10,000 years ago when humans first started to grow crops and raise livestock.

agriculture The growth of crops and the raising of livestock.

air pollution Any chemical or particulate matter found in the atmosphere at high enough concentrations to harm humans, other animal life, vegetation, rocks, soils, and other building materials.

allergens Substances that overactivate the immune system, stimulating an unwanted or unnecessary response.

allopatric speciation The process of a new species being created over time due to a physical separation of a population and resultant divergent evolution.

altitude The distance above the Earth's sea level.

amensalism A species interaction in which one organism harms another while remaining unaffected itself.

ammonification A step in the nitrogen cycle in which nitrogen is combined with hydrogen to form ammonia (NH_3) during the process of nitrogen being fixed for use by plants.

anthropogenic Describes events that result from human activities.

aphelion The point, in July, at which the Earth is farthest from the sun.

artificial selection The process of humans selecting for desired traits during the breeding of organisms.

asbestos A naturally occurring, fibrous mineral previously used as insulation for pipes, soundproofing, roof tiles, and fire retardant. It is considered a carcinogen.

asthenosphere Found below the lithosphere but above the lower mantle, a plastic-like layer within the Earth that tends to flow.

autotrophs Another term for producers in the environment.

autumnal equinox The date with equal day and night that marks the beginning of fall in the Northern Hemisphere and spring in the Southern Hemisphere, occurring on or about September 23.

background extinction rate The natural rate of extinction, as opposed to the accelerated rate due to human activity.

bioaccumulation The process of a toxin concentrating in muscle tissues of organisms.

biodiversity The total number of types of species in a given area at a specific time.

biogeochemical cycles The natural movement of nutrients and other products through ecosystems (for example, the water or nitrogen cycles).

biological weathering The process of rock material being changed chemically or physically by the activities of living organisms, most commonly splitting due to tree roots but also including reactions with the acids contained in lichens, plants, and/or animals.

biomagnifications The buildup of toxins within an organism through the consumption of other organisms containing toxins (for example, mercury accumulation in tuna).

biomass The total dry weight of all the living organisms that can be supported at each trophic level in a food chain or food web; the dry weight of all the organic material in an ecosystem; plant material and animal waste used as a fuel for energy production.

biome A large ecological area primarily defined by a dominant plant type (for example, a coniferous forest).

biophilia The instinctive connection of humans to nature and other life.

biosphere reserves Protected areas designated with the intention of preserving biodiversity while balancing it with sustainable land use, education, and scientific research.

biotic potential An organism's potential number of offspring.

Black Death The deadliest pandemic in history, it was an outbreak of bubonic plague, peaking in Europe between 1348 and 1350. It is estimated to have killed between 30 percent and 60 percent of Europe's population. It took approximately 150 years for Europe's population to recover.

boreal Another name for the taiga, a forest biome that consists primarily of coniferous trees (pines), located south of the Arctic tundra in North America, Europe, and Asia.

bottom-trawling A method of fishing in which a large net is dragged along the ocean bottom to capture benthic organisms.

Bt-corn Genetically modified corn that contains insecticide, eliminating the need for chemical spraying.

Bt-cotton Genetically modified cotton that contains insecticide, eliminating the need for chemical spraying.

by-catch Fish and other organisms caught unintentionally.

carbon monoxide (CO) A colorless, odorless gas that results when fossil fuels are not fully combusted.

carbonic acid (H₂CO₃) Formed when water reacts with carbon dioxide; used to carbonate soft drinks.

carcinogen A cancer-causing substance.

carnivore An animal that feeds on other animals.

carrying capacity (K) The maximum number of individuals in a population of a species that an environment can support.

cellular respiration The process of converting glucose and oxygen into carbon dioxide and water.

chemical energy The energy stored in the bonds of atoms and molecules.

chemical weathering The process by which rocks are degraded due to chemical reactions borne of interactions with water and atmospheric gases.

chemosynthesis The formation of organic compounds using chemical reactions instead of sunlight.

chlorofluorocarbons (CFCs) Carbon-based compounds that contain chlorine and fluorine, the primary human-made compounds involved in the depletion of ozone. They were commonly used as refrigerants in air conditioners, refrigerators, and aerosol propellants.

chloroplasts The organelles in plant cells involved in photosynthesis that capture the energy in light and convert carbon dioxide and water into glucose and oxygen.

chronic exposure Repeated exposure to toxins or radioactivity over a long period of time, in small doses.

cinder cone volcanoes Violently eruptive volcanoes made of viscous, quartz-rich, extrusive deposits that plug the volcanic neck. When they erupt, cinders are blown into the air; then they settle around the opening of the volcano, forming a small, steep-sided mountain.

clear-cutting The process of removing all trees from an area in a forest. The process of clear-cutting leaves nothing standing.

climate The prevailing weather patterns (temperature, precipitation, and so on) of a region averaged over an extended period of time (usually for at least 30 years).

climate change Any change in the state of the climate (such as temperature) that persists steadily for many years (decades or longer).

clumped distribution Organisms organized in groups, usually gathering around a necessary resource.

coal A solid combustible fossil fuel, used primarily for the production of electricity.

co-evolution The simultaneous evolution of two organisms interacting with one another.

command-and-control strategy A form of pollution control in which legal limits are set and strictly enforced by the government.

commensalism A species interaction in which one organism benefits and the other is unaffected.

community Multiple populations of different species in a given area.

competition A species interaction in which organisms vie for the same resources, resulting in one outperforming the other.

composite volcanoes Tall, symmetrical, steep volcanoes built by alternating layers of ash, cinders, and lava; also called stratovolcanoes.

compressed natural gas (CNG) Natural gas that is compressed to less than 1 percent of the volume it occupies at standard atmospheric pressure; used primarily in cars, trucks, and buses as an alternate, cleaner-burning fuel than gasoline or diesel.

condensation The change in the phase of water from gas to liquid, usually in the form of droplets.

conifers Cone-bearing trees (such as firs, pines, and spruces) that have needle-shaped or scaled leaves; also known as coniferous trees.

consumer Any organism that cannot produce its own food and gets its energy and nutrients by feeding on other organisms.

continental drift The shifting of the continents due to the movement of the tectonic plates upon the asthenosphere.

contour farming Plowing rows into the side of a hill, perpendicular to the slope, following the shape of the land in order to create flat terraces; used to reduce erosion and disperse water evenly throughout crops.

controlled burns See prescribed burns.

convection currents Result from fluids or gases being heated, becoming less dense as they expand, rising, cooling, becoming denser, and sinking. Examples include the rising and sinking currents of magma below the Earth's crust, water in the ocean, and air.

conventional agriculture Large-scale farming and livestock production in which crops are grown for many people with the use of a variety of inputs, such as fertilizer, pesticides, irrigation, seeds, fossil fuels, monoculture, and human power; also called industrial agriculture.

conventional tillage A form of farming in which soil is ploughed and turned, which ultimately can lead to soil erosion and soil compaction in the deeper layers.

convergent plate boundary A zone where tectonic plates move toward each other, sometimes making contact.

core The dense center of the Earth. It is subdivided into the solid inner and liquid outer cores.

Coriolis effect The apparent deflection of a moving object (planetary winds, ocean currents, projectiles) due to rotation of the Earth. These objects are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Corporate Average Fuel Economy (CAFE) Regulations enacted in 1975 that establish fuel economy standards across auto manufacturers' fleet of cars and trucks.

cost-benefit analysis (CBA) Used to assess the costs and benefits of a decision, helping to determine whether a particular action should be taken.

criteria pollutants Six common air pollutants monitored by the Environmental Protection Agency and used as a way to gauge air quality.

crop rotation The alternation of the types of crops grown on a piece of land from year to year or season to season.

crude oil A liquid combustible fossil fuel that is refined into several fuels used in transportation (gasoline, diesel, aviation), heating oils, asphalt, and other chemicals. Many crude oil by-products are used in manufacturing plastics, pharmaceuticals, fertilizers, and other materials.

crust The outermost layer of the Earth and the surface on which we live (or the surface covered by ocean).

cultural eutrophication Ecosystem eutrophication due to excess nutrients added by human activity.

dead zone An aquatic environment devoid of any life.

deciduous Trees that shed their leaves in cold winters or in dry seasons (for example, oaks and maples).

decomposers Bacteria or fungi that absorb nutrients from nonliving organic matter such as plant material, the waste of living organisms, and dead organisms.

deforestation The clearing of forests for other uses, such as agriculture and development.

demographic transition The transition from high birth and death rates to low birth and death rates that accompanies a country's industrialization.

denitrification The process in the nitrogen cycle whereby bacteria convert nitrates into gaseous N_2 , which returns to the atmosphere.

denitrifying bacteria Bacteria that conduct the process of denitrification.

density-dependent factors Factors that limit a population's density, such as disease, availability of mates, and predation.

density-independent factors Limiting factors that do not depend on population density, including natural disasters, extreme temperature fluctuations, or lack of sunlight.

desertification The loss of soil productivity due to erosion, overgrazing, drought, soil compaction, and any other factors that deplete the soil.

detritivores Organisms that derive their energy from consuming nonliving organic matter such as dead plants and animals.

developed country A highly industrialized country with a high per-capita income. There are 38 developed countries, including the United States, Japan, and most of Western Europe.

developing country A country with low to moderate industrialization and low to moderate per-capita income. Most developing countries are in Latin America, Asia, and Africa.

directional selection Natural selection that drives evolution toward an extreme (for example, a population in which successive generations have increasingly long necks).

disruptive selection Natural selection that favors individuals with adaptations at one or the other extreme (for example, a population in which either long or short necks, but not average necks, are adaptive).

divergent plate boundary A zone where tectonic plates move away from one another.

dormant volcano An inactive volcano that could erupt again.

dose The amount or concentration of a substance experienced by an organism.

dose-response relationship The effect of an amount or concentration of a toxin on an organism or population.

doubling time The amount of time it takes for a population to double. Doubling time is commonly calculated by using the Rule of 70, in which 70 is divided by the population's annual percentage growth rate.

drift netting The practice of dragging large nets through the water to catch fish.

Dust Bowl A period in the 1930s in the Midwestern United States during which drought and overuse of the land led to dust storms and desertification.

earthquakes Vibrations in the Earth's crust due to plate movements created by the sudden release of pressure built up at plate boundaries. Localized earthquakes also can be due to magma intrusions in volcanic areas.

ecological pyramids Diagrams that are used to show relative biomass or productivity (and, thus, energy loss) at each trophic level in an ecosystem; also called energy pyramids.

ecological succession The process by which a community of plants and animals replaces a less complex community of plants and animals or develops in an uninhabited area.

economics The production, distribution, regulation, and consumption of goods and services.

ecosystem The interconnected interactions of all living and nonliving things in a specific area at the same time.

ecosystem services Services provided by our ecosystems that help to support life on Earth.

ED₅₀ The dose of a substance at which 50 percent of a test population is affected.

El Niño The warming phase of ENSO in the eastern Pacific Ocean, accompanied by higher air surface pressure in the western Pacific Ocean.

El Niño/La Niña-Southern Oscillation cycle (ENSO) A periodic climate pattern in the tropical Pacific Ocean with an approximately five-year cycle (varying from three to seven years), characterized by variations in the surface temperature of the tropical eastern Pacific Ocean and the air pressure in the tropical western Pacific Ocean.

electric cars Cars that run solely on electricity stored in batteries.

electrical energy Energy produced by the movement of electrons, typically moving through a wire. Usable electrical energy is produced by a generator in which relative motion of coiled copper wire and a magnetic field results in a flow of electrons.

electromagnetic energy Nonmechanical energy that travels in waves, including the entire electromagnetic spectrum, from low-energy radio waves, through microwaves, ultraviolet waves, through the visible light spectrum (ROYGBIV), through the ultraviolet waves, X-rays, and highest-energy gamma rays.

emissions Common term for the gases discharged into the atmosphere from burning of fossil fuels. The primary sources include coal and natural gas electric power plants and emissions from transportation (cars, trucks, buses, trains, and planes).

endemic Localized, or occurring only in one location on the planet; commonly used to describe species that live in only one place.

endocrine disruptor A substance that alters the hormone (endocrine) system by binding to substances that would normally bind specific hormones, thus blocking the hormone and impeding normal reactions.

environmental resistance All limiting factors acting on a population, restricting an organism's biological potential.

epicenter The point directly above the focus of an earthquake.

equinox The time when the sun crosses the ecliptic plane of Earth's equator, making day and night equal length. It occurs twice a year, on or about March 21 and September 23.

erosion The process of soil and sediment being transported from a location via wind or water.

eutrophication The process of excess nitrogen or phosphorous entering an aquatic system, leading to an excessive growth of phytoplankton, algae, and other plants, which commonly consume the system's available oxygen.

evaporation Phase change of liquid to gas, from the surface of water.

even-aged Term used to describe trees that are planted and then harvested at the same time, so they are all the same age.

evolution The change of a population's genetic makeup through generations.

exponential growth Growth at a constant rate. If population increases by a fixed percentage per unit time, the gross rate of population growth increases.

extinct volcano A volcano that is not erupting and most likely will not erupt at any point again.

extirpation The destruction or disappearance of a population from a particular area while populations remain elsewhere.

Ferrel air circulation cell The air circulation cell that causes the temperate convection current (between the tropical convection current and polar convection current).

focus The location from which an earthquake originates within the Earth.

food chain A simple path of energy flow from the producer to the various consumers.

food web Multiple intertwined food chains in which energy from multiple producers flows through many levels of consumers and finally through the decomposers.

forestry The practice of balancing humans' use of wood products with the importance of forests as ecosystems.

fossil fuel Energy sources formed by the decomposition of plants and animals that have been compressed and heated in the Earth's crust for millions of years; they include coal, crude oil, and natural gas.

Freon The DuPont trade name for chlorofluorocarbons (CFCs)

freshwater Naturally occurring water on the Earth's surface that is low in concentrations of dissolved salts and other dissolved particles. Freshwater is primarily found in glaciers, ice sheets, and ice caps, with a relatively small amount found in groundwater, ponds, lakes, rivers, and streams.

generalists Organisms that have a broad tolerance and can adjust to different situations.

genetic engineering The creation of new organisms by changing segments of DNA; also called genetic modification.

genetic pollution The unintended spread of altered genetic information from genetically engineered organisms to natural organisms.

genetically modified organisms (GMOs) Organisms that have altered DNA as a result of genetic engineering.

geologic time scale The 4.54 billion years of Earth's history.

geothermal energy The energy of hot underground rock formations, molten rock, and hot subterranean water; used to turn a water source into steam, which, in turn, drives turbines, creating electricity.

global warming The current steady increase in the average temperature of the Earth's surface that may be caused by man-made greenhouse emissions.

golden rice Genetically modified rice that contains vitamin A, a missing nutrient in many developing countries.

Green Revolution The advent of industrialized agriculture in the mid- and late 20th century, when more effective farming techniques were combined with new methods of increasing crop production to create greater and more efficient output.

green tax A tax placed on any activity considered to be harmful to the environment.

greenhouse effect A naturally occurring atmospheric effect trapping heat that would otherwise reflect into space, which helps warm the Earth's surface temperature. Without the natural greenhouse effect, the Earth's average temperature would be close to -15°C (5°F) instead of 15°C (59°F). In addition to this natural greenhouse effect, an anthropogenic greenhouse effect adds greenhouse gases to this reflective layer in the atmosphere, trapping additional heat energy and resulting in a further increase in temperature.

greenhouse gases Gases in the Earth's troposphere that cause the greenhouse effect. Greenhouse gases include water vapor, carbon dioxide, methane, ozone, chlorofluorocarbons, nitrous oxide, carbon tetrachloride, halons, and others.

ground-level ozone A secondary air pollutant found in the troposphere, usually near the Earth's surface; considered a pollutant and a human health hazard.

groundwater Water that is located beneath the ground's surface, located in the pores of soils and the fractures in rock formations.

growth rate A population's net change in size per 1,000 individuals. The formula used to calculate growth rate is

$$\text{Growth Rate} = (\text{Birth Rate} + \text{Immigration}) - (\text{Death Rate} + \text{Emigration})$$

habitat The environment in which an organism lives, including soil, vegetation, water supply, and many other factors.

habitat destruction The process of making a natural area uninhabitable for plants and animals, primarily as a result of human activities, usually for harvesting the habitat's natural resources (mining, deforestation), agriculture, or urbanization.

habitat fragmentation The division of a habitat into smaller areas between which migration is impossible, usually as a result of human activities.

Hadley air circulation cell The air circulation cell that causes the tropical convection current near the equator, which extends to the temperate convection current.

half-life The time it takes for half of a sample of radioactive material to decay.

halogens Elements of the periodic table in group 17—namely, fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At).

halons A group of chemical compounds that include a halogen.

hazardous waste Waste that is flammable, corrosive, toxic, or reactive.

herbivores Plant-eating organisms.

herbivory A species interaction in which plants are consumed by animals.

HIPPCO The acronym used by biologists to summarize the important causes of the premature extinction of organisms. Initially the acronym was HIPPO, but it was recently changed to HIPPCO. *H* stands for habitat destruction and fragmentation, *I* stands for invasive species, *P* stands for population growth, *P* stands for pollution, *C* stands for climate change, and *O* stands for overharvesting.

host An organism being invaded by a parasite.

hot spots Locations where magma emerges from the Earth; usually at the inner part of a tectonic plate.

hybrid electric vehicles Vehicles with electric motors, which are supplemented as needed by small gasoline engines.

hydrochlorofluorocarbons (HCFCs) A group of manmade compounds that contain hydrogen, chlorine, fluorine and carbon and have the potential to react with stratospheric ozone. Because they have shorter atmospheric lifetimes than chlorofluorocarbons, they tend to break down in the troposphere before delivering reactive chlorine to the stratosphere.

hydroelectric power Power that is produced by dammed water that is allowed to flow over turbines in a controlled fashion, turning the turbines to produce electricity.

hydrofluorocarbons (HFCs) A group of manmade compounds containing carbon, hydrogen, and fluorine. HFCs contain no chlorine and do not directly affect stratospheric ozone. Viewed as an acceptable long-term alternative to CFCs and HCFCs, HFCs may still contribute to global warming.

hydrogen fuel cells Cells that use hydrogen and oxygen in a chemical reaction to produce energy and water.

hypoxic Describes an aquatic environment lacking in oxygen.

ice age A geological period of long-term reduction in the Earth's surface and atmospheric temperature, resulting in the presence or expansion of ice sheets and glaciers.

ice core A sample of ice that is typically drilled and removed from an ice sheet, usually the polar ice caps of Antarctica or Greenland. Layers of the ice core are analyzed for trapped gas and deposits, which give an accurate representation of historical climate and can be used to develop a climate record over a long period of time.

ice sheet A mass of ice that covers an area greater than 50,000 square kilometers (20,000 square miles). Ice sheets also may be referred to as continental glaciers and are now found only in Greenland and Antarctica.

ice-minus strawberries Genetically modified, frost-resistant strawberries.

igneous rock Rock formed from cooling magma or other volcanic action.

Industrial Revolution The period of urbanization starting in the 1700s during which sanitation and medical care improved, and manufacturing started to supplant agriculture as the primary human livelihood.

industrial smog Formed when anthropogenic sulfur dioxide (SO₂) absorbs ultraviolet radiation in the atmosphere.

industrial waste Waste created during industrial processes such as agriculture, mining, consumer goods production, and the extraction and refining of petroleum products.

infiltration The process by which water on the Earth's surface enters the soil.

inner core The solid part of the Earth's core that is mainly made up of nickel and iron.

innocent until proven guilty When addressing a substance's toxicity, the approach that assumes a product to be harmless until proven otherwise.

integrated pest management (IPM) A form of pest control that uses knowledge about the pest's life cycle and environmental interactions in conjunction with other control methods such as biological control, crop rotation, and chemicals when necessary. The goal of IPM is to reduce pest impact while also reducing pesticide use.

intercropping The planting of alternating crops throughout a field (as opposed to monoculture).

International Union for Conservation of Nature (IUCN) An international organization dedicated to the conservation of natural resources. The goal of IUCN is to help find solutions to the most important environmental issues. The organization publishes an influential "Red List" showing the world's most endangered species.

interspecific competition The process by which two different species compete.

intraspecific competition The process by which members of the same species compete.

IPAT model A model proposing that environmental impact (I) is the product of population (P), affluence (A), and technology (T), represented by the formula $I = P \cdot A \cdot T$. Sometimes *S* is added to represent the sensitivity of an ecosystem.

irrigation The practice of supplying water for agricultural purposes.

kinetic energy The energy possessed by a moving object; a form of mechanical energy.

K-selected species Species that have relatively few offspring and devote a large amount of time, energy, and resources toward nurturing and raising their young.

La Niña The cooling phase of ENSO in the eastern Pacific Ocean, accompanied by lower air surface pressure in the western Pacific Ocean.

land pollution See *soil pollution*.

latitude A measurement of distance from the equator, measured in angular degrees by lines that are parallel to each other. The equator is 0°, the North Pole is 90° N, and the South Pole is 90° S.

latitudinal gradient The increase in biodiversity closer to the equator.

laws of thermodynamics The transport of heat and work in the thermodynamic processes. The first law of thermodynamics states that energy is neither created nor destroyed but can change forms. The second law of thermodynamics states that in any conversion of heat energy into useful work some of the initial energy is lost.

LD₅₀ The dose of a substance that is lethal for 50 percent of the test population.

leaching The process by which water, filtering down through the soil, dissolves and transports materials, including naturally occurring minerals and nutrients and man-made toxic substances.

lichen Organisms made up of the symbiotic relationship between a fungus and a photosynthetic organism (usually a green alga) or a cyanobacterium. Lichen are able to colonize nutrient-poor environments and are commonly seen on leaves, tree branches, bare rock, and exposed soil.

light pollution A result of the excessive use of artificial light, which can cause glare, over-illumination, sky glow, and decreased night visibility, while also using excessive amounts of energy.

limiting factors The factors that control a population's growth. These include availability of food, shelter, water, mates, or anything else an organism depends upon for survival.

lithosphere The rigid outer layer of the Earth. It is comprised of the crust and upper mantle.

lithospheric plates See *tectonic plates*.

logistic growth curve Represents a population that grows exponentially and then levels off as it reaches environmental carrying capacity (K).

longitude The east/west location on Earth in relationship to the Prime Meridian, which runs from the poles through Greenwich, England, usually measured in degrees from 0° to 180°. The longitude lines, which are farthest apart at the equator and meet at the poles, are often referred to as meridian lines.

long-lasting tomatoes Genetically modified tomatoes that remain fresh longer.

long-lining The practice of dragging a long fishing line behind a boat or attaching it to an anchor with baited hooks along the length of the line.

malnutrition A condition afflicting people who do not receive enough daily nutrients.

manganese nodules Ball-like structures that form on the ocean floor and contain manganese, along with many other minerals in smaller amounts, such as copper, zinc, and nickel.

mantle The layer of the Earth found below the crust; contains the upper mantle and lower mantle.

marginal benefit An economic term describing the change in additional benefit associated with a change in output level.

marginal costs Costs associated with an increase or decrease in output.

market effect Results that are measurable in dollar amounts.

mass extinction event An extinction that occurs quickly and on a large scale, affecting many species.

mesopause The boundary between the mesosphere and the thermosphere. The lowest temperatures on Earth exist in the mesopause.

mesosphere The third layer of the Earth's atmosphere.

metamorphic rock A rock type formed under extreme heat and pressure, usually deep underground.

mechanical energy Energy possessed by moving objects (kinetic) or energy stored in objects by tension or position (potential).

methane A naturally occurring gas with the chemical formula CH₄; one of the major fossil fuels. Methane in the atmosphere is considered a greenhouse gas.

methane hydrates Recently discovered sources of methane (natural gas) that are locked in ice formed at low temperatures and high pressures, found in the tundra beneath the permafrost or deep in the oceans.

mid-ocean ridge An opening in the Earth's crust beneath an ocean where magma emerges and creates new, elevated sea floor. A mid-ocean ridge appears as a scar along the crust of an ocean bottom.

mobile source pollution Pollution emitted from a moving source such as a car, truck, train, boat, or plane.

monoculture The planting of only one crop over a farmed area.

mountaintop removal A form of mining in which the tops of mountains are blasted off in order to access natural resources.

municipal waste Waste from homes, businesses, schools, hospitals, and other institutions.

mutagen A toxin that causes mutations in the DNA of organisms.

mutualism A species interaction in which all engaged species benefit.

natural gas A gaseous combustible fossil fuel used in the production of electricity and home uses (heating, water heaters, and cooking).

natural selection The process by which genetic traits that strengthen an organism's chance of survival and reproduction are passed on from generation to generation, eventually dominating less successful genetic traits.

neurotoxin A toxin that affects the nervous system, including motor control and brain function.

niche An organism's specific ecosystem position, described by its resources, role in the community, habitat use, food consumption, interactions with other species, shelter, and other factors.

nitrification The stage of the nitrogen cycle during which NH_4^+ is converted into nitrite ions (NO_2^-), and then into nitrate ions (NO_3^-).

nitrifying bacteria Bacteria that conduct nitrification as part of the nitrogen cycle.

nitrogen dioxide (NO_2) A reddish-brown gas with a strong odor created from combustion processes at high temperatures, most commonly in vehicles and electric utilities.

nitrogen-fixing bacteria A type of bacteria that "fixes" atmospheric nitrogen to a form that can be absorbed by plants. Nitrogen-fixing bacteria live in the soil and in nodules on the roots of legumes.

nitrous oxide (NO_x) Gases containing nitrogen and oxygen that play a role in photochemical smog; they include nitrogen oxide (NO) and nitrogen dioxide (NO_2).

noise pollution Any unwanted, disturbing, or harmful sound that causes irritation or harm to humans.

nonmarket effect A result for which a fixed dollar amount cannot be attached.

nonnative species A species that migrates into an ecosystem or is deliberately or accidentally introduced into an ecosystem by humans.

non-point-source pollution Pollution for which it is difficult to identify the main source and that may come from a multitude of smaller sources.

nonrenewable resource A resource with a finite supply that has the potential to be renewed only over hundreds of millions to billions of years. Nonrenewable resources include fossil fuels and metals.

normal fault A fault caused by tectonic plates or rock strata pulling apart.

no-till farming A farming method in which soil is minimally disturbed while it is being prepared for crops.

nuclear energy The energy stored in the nuclei of atoms. It is released by the splitting (fission) or the joining (fusion) of atoms.

nuclear fission The process of an atom splitting into two smaller elements, releasing neutrons and heat energy. In nuclear power generation, fission is caused by bombarding unstable elements with neutrons.

nuclear fusion The process in which the atomic nuclei of two elements are forced together under high pressure, releasing large amounts of energy under conditions present in stars, such as the sun.

oil A liquid fossil fuel derived from crude oil.

oil sands See tar sands.

oil shale Sedimentary rock that is rich in kerogen, an organic compound from which liquid hydrocarbons can be extracted when heated.

old growth A forest prior to its trees ever being harvested.

omnivore An animal that eats both plants and other animals as a source of energy and nutrients.

open pit mining Mining that involves digging up the land in order to reach the desired resource.

ore Rock containing desired mineral elements or molecular compounds.

organic farming Farming or livestock raising that uses no chemicals, including pesticides, hormones, fertilizers, or antibiotics.

outer core The liquid part of the Earth's core; comprised mainly of molten iron and nickel.

overnutrition A condition resulting from people receiving too many calories on a daily basis, leading to obesity and many other health issues.

ozone (O₃) A colorless gas found in both the stratosphere and troposphere. "Good" ozone is located naturally in the stratosphere and protects the Earth from the sun's harmful ultraviolet radiation. "Bad" ozone is located close to the ground in the troposphere, is the main component of smog, and is considered a greenhouse gas.

ozone depletion The loss of ozone in the stratosphere (for example, as a result of CFCs).

ozone hole An area of depletion in the ozone layer that forms over Antarctica and the Arctic and moves toward the equator.

ozone layer The concentration of ozone in the stratosphere that helps protect the Earth from harmful UV radiation.

parasite Any organism that uses another organism for food and nutrients at a cost to the host.

parasitism A species interaction in which one organism uses another organism for food and nutrients, harming the host.

parent material The main component of soil, created from eroded and weathered existing geologic material in a given area.

particulate matter Solid or liquid particles suspended in the atmosphere or in water.

percolation The movement of water through porous soil and rock.

perihelion The orbital point in January when the Earth is closest to the sun.

permit trading The practice in which governments issue certain levels of permits to polluters, who can then trade or sell their permits to other polluters as needed. This promotes more sustainable environmental actions through economic policy.

peroxyacetyl nitrate (PAN) Produced by the reaction of some volatile organic hydrocarbons with oxygen and nitrogen dioxide, partially responsible for some negative effects of smog.

persistence The ability of a substance to remain in the environment for an extended period of time.

petroleum See *crude oil*.

pH Measures hydrogen ion concentrations on a scale of 1 to 14, with 7 being neutral; acidic substances range from 1 to 6.9, and alkaline (or basic) substances range from 7.1 to 14.

photochemical smog Smog formed when nitrogen dioxide (NO_2) reacts with the heat of UV radiation from the sun.

photosynthesis The natural process in which plant chlorophyll converts carbon dioxide (CO_2) and water (H_2O) into glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and oxygen (O_2) in the presence of sunlight.

physical weathering Occurs when rock material is broken down without any chemical change taking place, usually through gravitation, wind, running water, or ice expansion; also called mechanical weathering.

pioneer species The first species to colonize an area that has not previously been colonized. A pioneer species begins the first steps of ecological succession.

placer mining A mineral mining technique that uses water to separate out the heavier minerals from lighter mud and debris.

point-source pollution Pollution emitted from a specific place, such as wastewater from an industrial plant, acid drainage from a mine, noise from a jet plane, or oil from a tank.

polar air circulation cell The air circulation cell that causes the polar convection current, extending north and south from the temperate convection current.

polybrominated diphenyl ethers (PBDEs) Chemicals that are used as flame retardants in household items such as televisions, furniture, fabrics, wire insulation, drapes, small appliances, and other electronics.

population A group of individuals of the same species living in the same area at the same time.

population density The number of individuals in a population per unit area.

population dispersion See population distribution.

population distribution The spatial arrangement of organisms in an area, with types including random, uniform, or clumped distribution. Also called population dispersion.

population size The number of individuals in a population at a given time.

potential energy The energy stored in an object or system; usually a form of mechanical energy, but may originate from atomic or chemical energy.

precautionary principle The principle that a substance is assumed to be harmful until proven otherwise.

precipitation Condensation of atmospheric water vapor that is pulled to the Earth's surface by gravity, usually in the form of rain, snow, sleet, or hail.

predation A species interaction in which one species hunts, captures, kills, and consumes another species.

prescribed burns The burning of forests under controlled conditions, usually to decrease the likelihood of later, larger fires; also called controlled burns.

primary treatment The process by which a sewage treatment system physically removes suspended solids in settling tanks.

producers Organisms that use solar energy (green plants) or chemical energy (cyanobacteria) to manufacture organic compounds needed for their energy and nutrition.

pyramid of biomass A graphical representation showing the biomass at each trophic level in an ecosystem.

radon An extremely toxic, naturally occurring radioactive gas that is produced from the decay of radium, which is, in turn, produced from the decay of uranium.

random distribution Distribution of organisms arbitrarily, with no organization or intention.

rangelands Large expanses of undeveloped land that mainly contain low vegetation such as grasses and shrubs and are suitable for grazing of livestock.

reclamation The restoration of the land after disturbance from mining.

relative abundance The number of each species in an area in relation to other species.

remediation The cleanup of contaminated soil or water.

renewable resource A resource that can be replenished within a human lifetime, including trees, grasses, animals, and water.

reservoir An artificial lake that is used to store water behind a dam; commonly constructed to supply a constant source of water or to prevent downstream flooding; may be combined with a generator to produce hydroelectric power.

resource partitioning The process by which species evolve to divide an area's resources, allowing decreased competition for any one resource.

response The reaction of a plant or animal to a substance.

reverse faults Faults caused from compression of tectonic plates or rock strata.

r-selected species Small organisms that have short gestation times and produce thousands of offspring at one time, therefore having high biotic potential.

Rule of 70 The mathematical method used to determine a population's doubling time. The formula is $\text{Doubling Time} = \frac{70}{r}$, where r is the growth rate of the population in percent. Doubling time is commonly expressed in years.

runoff Water that flows along the Earth's surface without entering the soil; also called surface runoff.

salinization Occurs where salts accumulate on the soil's surface. Evaporation pulls water and its dissolved salts toward the surface from deeper within the soil horizon; when the water evaporates, the salts are left behind on the soil surface.

seafloor spreading The process that keeps the tectonic plates in motion. As magma rises through the midocean ridge, the magma hardens and creates new land. Convection currents in the asthenosphere are pushing apart the plates that create the seafloor.

season A division of the year that is marked by changes in weather, ecology, and sunlight intensity, resulting from the yearly revolution of the Earth around the sun and the tilt of the Earth on its axis. Temperate and polar regions usually experience four seasons (fall, winter, spring, and summer), while tropical and subtropical regions more commonly having only a wet and a dry season or sometimes hot, rainy, and cool seasons.

secondary growth New growth that emerges in a forest after the original, virgin forest has been cut down.

secondary treatment The stage in a sewage treatment system in which oxygen enters the water from continual mixing and movement, encouraging aerobic decomposition.

sedimentary rock Rock formed when sediment from erosion and weathering, biogenic decomposition, or chemical deposition is compressed and/or cemented together, or "lithified."

seed bank A place for housing and preserving many seed types as a way to protect seed diversity and safeguard the food supply in the event of disaster.

seed tree The forestry practice of leaving mature and seed-producing trees standing, providing the seeds necessary for the regrowth of forest trees after harvesting.

selection system A partial harvest method in which only a few trees are harvested from an area at a time.

sex ratio The ratio of number of males to number of females in a population.

shelterbelt A protective border created when tall plants or trees are planted along the edges of fields or farms in order to reduce erosion from wind.

shelterwood system The forestry practice of leaving a few full-grown trees in order to create shelter for emergent seedlings. Cutting is done on a regular basis with select trees taken each time.

shield volcano A slowly erupting volcano with a broad side, gradual slopes, and usually a crater at the top; the least explosive volcano type, with slow-moving liquid lava due to its low silica content.

sink A natural or artificial reservoir that stores an element, such as carbon, for an indefinite period. Natural sinks tend to be much larger than man-made sinks. Natural sinks include water, biomass, fossil fuels, rocks and soil. Artificial sinks include proposed carbon capturing and storage in a process called carbon sequestration.

soil permeability The ability of a liquid to flow through the soil.

soil pollution The contamination of soil by anthropogenic chemicals, commonly including fertilizers, pesticides, oil and fuel spills, leaching of waste from landfills, and the movement of contaminated surface water to subsurface areas; also called land pollution.

soil porosity The amount of open space between soil particles; the ratio of void space to total volume.

soil profile A soil cross-section showing the depths of the layers including (from the surface down) the O Horizon, A Horizon, E Horizon, B Horizon, C Horizon, and R Horizon.

solar Energy coming from the sun.

solstice The date at which the sun is most north or south of the celestial equator. The summer solstice is June 21 and the winter solstice is December 21.

specialists Organisms that are adapted to only one specific environment, making them more vulnerable to any type of ecosystem change.

speciation The process through which new species are created.

species A group of organisms that share particular characteristics and can breed and reproduce to create fertile offspring.

species richness The number of species in an area, related to biodiversity.

stabilizing selection Natural selection in which extreme traits are selected against, creating a population with relatively homogenous traits and low genetic variation.

stratopause The boundary between the stratosphere and the mesosphere.

stratosphere The second layer of the Earth's atmosphere. The ozone layer that protects the Earth from harmful UV radiation is located within the stratosphere.

stratospheric ozone The ozone layer that protects the Earth.

strike slip fault A fault caused by tectonic plates sliding past one another horizontally.

subduction A plate boundary phenomenon resulting from tectonic plate movement, in which a denser oceanic plate is pushed below a lighter continental plate, creating a subduction zone.

subsidy Financial assistance given by the government to a business, person, or economic sector in an effort to support an activity that is thought to be beneficial to the public.

subsistence agriculture A method of crop production resulting in the production of enough food for one family but not for others or for commerce.

subsurface mining A form of mining that uses deep underground shafts to access and extract resources from pockets or seams.

sulfur dioxide (SO₂) Formed when sulfur combusts (usually when burning coal and oil) and the released sulfur reacts with oxygen in the atmosphere.

sulfur oxide (SO_x) The gases containing sulfur and oxygen that play a role in industrial smog. They include sulfur dioxide (SO₂) and sulfur trioxide (SO₃).

Superfund sites Polluted sites that are specified to be part of the federal government's program to clean up hazardous waste.

surface mining A type of mining that removes the soil and rock surface over a large amount of land.

surface water Water that collects on the Earth's surface, usually in the form of streams, rivers, lakes, and oceans.

survivorship curve A graph that represents the number of individuals surviving at each age for a given species. The y -axis shows the number of individuals and the x -axis reflects time or age. There are Type I, Type II, and Type III survivorship curves.

sustainability The nondepletion of resources, usually referring to human use that allows resources to regenerate at a pace commensurate with use.

sympatric speciation A type of speciation that occurs when a population of organisms evolves to use a location's resources in different ways, eventually becoming so distinct that they lose the ability to interbreed.

synfuel Synthetic, liquefied fuel obtained from nonpetroleum sources such as coal, natural gas, oil shale, and biomass; synthetic fuel derived from waste, such as plastic or rubber.

taiga A forest biome composed primarily of coniferous trees (pines), located south of the Arctic tundra in North America, Europe, and Asia; also called the boreal.

tar sands A combination of sand, clay, water, and bituminous sands; also known as oil sands.

tectonic plates The seven major plates and many smaller plates, all in constant motion, that make up the crust of the Earth; also called lithospheric plates.

teratogen A substance that affects embryo development or harms or kills the fetus.

terracing A farming technique used on steep slopes of a mountainous terrain. Often looking like steps, terracing is used to minimize erosion and retain water in areas otherwise unable to be used for crops.

thermal energy Heat energy from the vibration and movement of atoms and molecules within substances.

thermopause The boundary between the thermosphere and the exosphere.

thermosphere The fourth and deepest layer of the Earth's atmosphere, above the mesosphere and below the exosphere.

threshold dose The minimum amount or concentration of a substance that affects an organism or population.

timber plantations Typically, monocultures of fast growth species of trees planted by timber companies in order to maximize an area's economic benefit.

toxin Poisonous or toxic substance.

traditional agriculture Agriculture that uses human power, animal power, and simple tools.

transform plate boundaries Areas where tectonic plates slide past one another.

transgenic A term used to describe an organism that has genetic material artificially transferred from another organism.

transpiration The loss of water vapor from plants, especially in the leaves, but also through stems, flowers, and roots.

trophic level The position an organism occupies on the food chain, defined as the number of energy levels an organism is from the original source of energy. For example, all producers belong to the first trophic level and all herbivores belong to the second trophic level in a food chain or web.

tropopause The boundary between the troposphere and the stratosphere.

troposphere The first layer of the Earth's atmosphere. It contains 75 percent of the Earth's atmospheric mass but is the shallowest atmospheric level.

tsunami A giant wave generated from undersea earthquakes or volcanic eruptions. *Tsunami* is Japanese for "seismic seawave."

tundra A cold biome of restricted tree growth, further divided into arctic and alpine regions. The arctic tundra is located between the ice caps of the North Pole and the boreal forest and is characterized by permafrost. The alpine tundra is located in the higher elevations of the mountains around the world, above the tree line and below the permanent snow line.

ultraviolet radiation (UV) Radiant energy with wavelengths shorter than the minimum that the human eye is able to see.

undernourished A term used to describe people who do not receive enough calories on a daily basis.

uniform distribution Even spacing of organisms.

urbanization The movement of human populations from rural to urban lifestyles.

vernal equinox The date with night and day of equal length that signifies the start of spring in the Northern Hemisphere and start of fall in the Southern Hemisphere, occurring on or about March 21.

volatile organic compounds (VOCs) Unstable substances that can be released as gases from a wide variety of products, including carpeting, paints, aerosol sprays, cleaning products, building supplies, pesticides, printers, glues, wood preservatives, moth balls, and air fresheners.

waste-to-energy A term used to describe waste incineration plants where heat that is generated during waste combustion is captured and used to generate electricity.

wastewater Water that is flushed, goes down the drain, or runs into sewers from streets.

water pollution Any physical or chemical change to the water (surface or groundwater) that can be harmful to living organisms or make it unfit for other uses.

water vapor Gaseous water.

waterlogged A term used to describe soil that has become saturated or oversaturated with water due to over-irrigation and a rising water table, which can ultimately suffocate plant roots, compact soil, and lead to salinization.

weather The short-term description of temperature, wind, and precipitation in a given geographical area.

weathering The process whereby parent material is broken down or eroded by water, wind, sunlight, temperature fluctuations, and living organisms.

wetlands Terrestrial areas with large amounts of water saturating the soils, including marshes, swamps, and bogs.

wind farm A collection of wind turbines used to produce electrical power.

wind power The conversion of wind energy into a useful form of energy, most commonly the turning of wind turbines to produce electricity.