

# APES Vocabulary

**1977 Surface Mining Control and Reclamation Act**- This Act establishes a program for regulating surface coal mining and reclamation activities. It establishes mandatory uniform standards for these activities on state and federal lands, including a requirement that adverse impacts on fish, wildlife and related environmental values be minimized. The Act creates an Abandoned Mine Reclamation Fund for use in reclaiming and restoring land and water resources adversely affected by coal mining practices.

**1<sup>st</sup> Law of Thermodynamics (Energy)** – The principle that energy may not be created or destroyed but is always conserved.

**2<sup>nd</sup> Law of Thermodynamics (Energy)** – A fundamental principle of energy that states that energy always tends to go from a more usable (higher equality) form to a less usable (lower quality) form. When we say that energy is converted to a less useful form we mean that entropy (a measure of the energy unavailable to do useful work) of the system has increased.



**A Horizon**- Horizon that is composed of both mineral and organic materials. The color is often light black to brown.

Leaching, defined as the process of dissolving, washing, or draining earth materials by percolation of groundwater or other liquids, occurs in the A horizon and moves clay and other materials, such as iron and calcium, to the B horizon.

**Abiotic**- The nonliving components of an ecosystem.

**Absorption** - The ability of matter to absorb light energy shined on it. This light energy is converted into heat.

**Accuracy** - The degree of conformity of an indicated value to an accepted standard value, or ideal value.

**Acid Deposition**- A comprehensive term for the various ways acidic compounds precipitate from the atmosphere and deposit onto surfaces. It can include: 1) wet deposition by means of acid rain, fog, and snow; and 2) dry deposition of acidic particles (aerosols).

**Acid Mine Drainage**- Does not refer to an acid mine but to acidic water that drains from mining areas (mostly coal but also metal mines). The acidic water may enter surface water resources, causing environmental damage.

**Acid Rain**- Rain made artificially by pollutants, particularly oxides of sulfur and nitrogen. (Natural rainwater is slightly acidic owing to the effect of carbon dioxide dissolved in the water.)

**Active Solar Energy** - Solar radiation used by special equipment to provide space heating, hot water or electricity.

**Acute Effects (Exposure)** – Effects usually immediate, obvious, short-term responses to exposure to a hazard; they can be localized to one part of the body or they can be systemic.

**Aerobic**- Living or occurring only in the presence of oxygen.

**Aesthetic Justification** (for the conservation of nature) - An argument for the conservation of nature on the grounds that nature is beautiful and that beauty is important and valuable to people.

**African Black Rhinoceros** - The African black rhinoceros is on the endangered species list due to excessive poaching for their horns, which are mostly used in dagger handles as a symbol of wealth in many countries.

**Age Structure (of a population)** – Structure of a population divided into groups by age. Sometimes the groups represent the actual number of each age in the population or proportion of the population of each age.

**Age Structure Diagram** - A representation of the number of individuals in each age group in a population.

**Albedo** - Reflectivity; the fraction of radiation striking a surface that is reflected by that surface.

**Aldehydes** - Very reactive organic compounds that contribute to local and regional ozone production, and also act as the precursors of peroxyacetyl nitrates. Their major atmospheric fate is reaction with hydroxyl radicals or photolysis.

**Alveoli** - Microscopic air sacs in the lungs at the end of bronchioles where gases are exchanged.

**Anaerobic**- Living, active or occurring in the absence of oxygen. Without oxygen.

**Anthracite Coal**- A shiny black hard natural coal that burns slowly and gives intense heat, and the most efficient coal in the deepest parts of the Earth.

**Anthropogenic**- Produced by human activity.

**Aquaculture**- Production of food from aquatic habitats.

**Aqueduct**- A constructed system of canals, channels and/or pipelines to move water from one location to another.

**Area (Non-point) Source**- A source of pollution that cannot always be traced to an exact point of entry.

**Artesian Well**- A well in which the water comes from a confined aquifer and is under pressure.

**Aswan High Dam**- One of the world's largest dams on the Nile River in southern Egypt.

**Atmosphere** – The layer of gases surrounding Earth.

**Autotroph** - An organism that produces its own food from inorganic compounds and a source of energy. There are photoautotrophs (photosynthetic plants) and chemical autotrophs.

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**B Horizon**- Horizon that is enriched in clay, iron oxides, silica, carbonate or other material leached from overlying horizons. This horizon is known as the **zone of accumulation**.

**Baby Boom**- The jump in birthrates in the years after World War Two. “Baby boomers” are the generation born between 1945 and about 1960. In this period, more than 65 million children were born. They grew up in a generally prosperous period in American life, but also experienced as teenagers the uncertainties and conflicts of the 1950s and 1960s.

**Background Extinction** - The continuous, low-level extinction of species that has occurred throughout much of history.

**Background Radiation**- Radiation that comes from natural sources and is always present in the environment. This includes solar and cosmic radiation as well as radioactive elements in the ground, building materials, and the human body. Average annual dose of background radiation for an American is about 360 milligrams.

**Baghouse Filter**- Large fabric bag, usually made of glass fibers, used to eliminate intermediate and large (greater than 20 PM in diameter) particles. This device operates like the bag of an electric vacuum cleaner, passing the air and smaller particles while entrapping the larger ones.

**Bauxite**- The raw material mined from the earth we use to make aluminum.

**Benthos**- The bottom of a sea or lake.

**Bioaccumulation** - A process by which chemical substances are ingested and retained by organisms, either from the environment directly or through consumption of food containing the substances.

**Biodiesel** - An environmentally safe, low polluting fuel for most diesel internal combustion and turbine engines. Can be mixed with petroleum diesel fuel and stored anywhere petroleum is. Made from fresh or waste vegetable oils (triglycerides) that are a renewable energy source. Both commercially and privately made around the world.

**Biodiversity**- The number and variety of living organisms; includes genetic diversity, species diversity, and ecological diversity.

**Biogeography**- The large-scale geographic pattern in the distribution of species, and the causes and history of this distribution.

**Biological Control** – A set of methods to control pest organisms by using natural ecological interactions, including predation, parasitism, and competition. Part of the integrated pest management (IPM).

**Biological Evolution**- The change in inherited characteristics of a population from generation to generation, which can result in new species.

**Biomagnification**- Also called *biological concentration*. The tendency for some substances to concentrate with each trophic level. Organisms preferentially store certain chemicals and excrete others. When this occurs consistently among organisms, the stored chemicals increase as a percentage of the body weights as the material is transferred along a food chain or trophic level. For example, the concentration of DDT is greater in herbivores than in plants and greater in plants in the nonliving environment.

**Biomass** - The amount of living material or the amount of organic material contained in living organisms, both as live and dead material, as in the leaves (live) and stem wood (dead) of trees.

**Biomass Energy** - A new name for the oldest fuel used by humans, that is also called Biomass Fuel. Biomass Energy is organic matter, such as plant material and animal waste, which can be used as a fuel.

**Biome**- A kind of ecosystem. The rain forest is an example of a biome; rain forests occur in many parts of the world but are not all connected with each other.

**Bioremediation** - A method of treating groundwater pollution problems that utilizes microorganisms in the ground to consume or break down pollutants.

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**Biota**- A general term for all the organisms of all species living in an area or region up to and including the biosphere, as in "the biota of the Mojave Desert" or "the biota in that aquarium."

**Biotic**- The living components of an ecosystem.

**Birth Rate**- The rate at which births occur in a population, measured either as the number of individuals born per unit of time compared with the population.

**Bituminous Coal** - A dense, black, soft coal, often with well-defined bands of bright and dull material. The most common coal, with moisture content usually less than 20 percent. Used for generating electricity, making coke, and space heating.

**Board Feet**- The most common measure used to describe log and lumber volume. A board foot is a board measuring 12 x 12 x 1 thick.

**BOD (Biological Oxygen Demand)** - A measure of the amount of oxygen necessary to decompose organic material in a unit volume of water. As the amount of organic waste in water increases, more oxygen is used, resulting in a higher BOD.

**Body Burden** - The amount of concentration of a toxic chemical, especially radionuclides, in an individual.

**Bog**- A bog is a wetland type that accumulates acidic peat, a deposit of dead plant material.

**Breeder Reactor**- A nuclear reactor that manufactures more fissionable isotopes than it consumes. Breeder reactors use the widely available, nonfissionable uranium isotope U-238, together with small amounts of fissionable U-235, to produce a fissionable isotope of plutonium, Pu-239.

**British Thermal Unit (BTU)** - A unit used to measure quantity of heat, defined as the quantity of energy necessary to raise the temperature of 1 lb. of water 1° Fahrenheit.

**Broad Spectrum Pesticide** – Pesticides that kill a wide variety of organisms. Arsenic, one of the first elements used as a pesticide, is toxic to many life-forms, including people.

**Bronchiole** - Small airway (subdivision of the bronchus) that leads to areas of the lung and absorbs oxygen from the air.

**Brownfield**- An abandoned or underutilized property that is not being redeveloped because of fears that it may be contaminated with hazardous substances.

**Buffer**- Materials (chemicals) that have the ability to neutralize acids. Examples include the calcium carbonate that is present in many soils and rocks. These materials may lessen potential adverse effects of acid rain.

**C Horizon**- Horizon is composed of partially altered (weathered) **parent material**; the material could be rock or be alluvial in nature, such as river gravels in other environments. This horizon may be stained red with iron oxides.

**California Condor**- A large, endangered North American bird with the largest wingspan in the western Hemisphere.

**California Water Project** - The California State Water Project (SWP) is one of the largest water development projects in US. The Project was designed to transfer 5.4 BCM from the northern Sacramento River basin to areas of need in central and Southern regions of the State. Also, it is the key means for the State to re-route water among critical regions in times of severe shortages.

**Carbon Cycle**- Combined biochemical cycles of carbon, oxygen, and hydrogen. Carbon combines with and is chemically and biologically linked with the cycles of oxygen and hydrogen that form the major compounds of life.

**Carcinogens** - Any material that is known to produce cancer in humans or other animals.

**Carnivore** - Organisms that feed on other live organisms; usually applied to animals that eat other animals; a meat eater.

**Carrying Capacity**- The maximum abundance of a population or species that can be maintained by a habitat or ecosystem without degrading the ability of that habitat or ecosystem to maintain that abundance in the future.

**Cash Crop**- Crops grown to be traded in a market.

**Catalytic Converter** - An air pollution abatement device that removes pollutants from motor vehicle exhaust, either by oxidizing them into carbon dioxide and water or reducing them to nitrogen.

**CERCLA (The Superfund Act)** - An act that gave EPA the authority to clean up abandoned, leaky hazardous waste sites.

**Chain Reaction**- A self-sustaining series of reactions, in particular those of nuclear fission in which the particles released by one nucleus trigger the fission of at least as many further nuclei.

**Channelization** - An engineering technique that consists of straightening, deepening, widening, clearing, or lining existing stream channels. The purpose is to control floods, improve drainage, control erosion, or improve navigation. It is a very controversial practice that may have significant environmental impacts.

**Chemosynthesis**- Synthesis of organic compounds by energy derived from chemical reactions.

**Chernobyl, Ukraine**- In April 1986 there was an explosive leak, caused by overheating, from a nonpressurized boiling-water reactor, one of the largest in Europe. The resulting clouds of radioactive material spread as far as the UK. Thirty-one people were killed in the explosion, and thousands of square kilometers of land were contaminated by fallout. By June 1992, seven times as many children in the Ukraine and Belarus were contracting thyroid cancer as before the accident, and the incidence of leukemia was rising; it was estimated that more than 6,000 people had died as a result of the accident, and that the death toll in the Ukraine alone would eventually reach 40,000.

**Chlorofluorocarbons (CFCs)**- Highly stable compounds that have been or are being used in spray cans as aerosol propellants and in refrigeration units (the gas that is compressed and expanded in a cooling unit). Emissions of chlorofluorocarbons have been associated with potential global warming and stratospheric ozone depletion.

**Cholera**- An acute intestinal infection caused by ingestion of contaminated water or food.

**Chronic Effects (Exposure)**- Long-lasting results of exposure to a toxin; can be a permanent change caused by a single, acute exposure or a continuous, low-level exposure.

**Cilia** - Short hair-like appendages found on the surfaces of some types of cells and organisms; used for either propelling trapped material out of the body or for locomotion.

**CITES**- stands for Convention on International Trade in Endangered Species (of Wild Fauna and Flora); this organization, which boasts a membership of 145 countries, bans commercial international trade in an agreed-upon list of endangered species, and regulates and monitors trade in others that might become endangered.

**City Park**- A natural, public, recreational area designed for urban cities.

**City Planning**- Conscious design of the growth and development of an urban area.

**Clear-cutting**- In timber harvesting, the practice of cutting all trees in a stand at the same time.

**Climate** - The representative or characteristic conditions of the atmosphere at particular places on Earth. Climate refers to the average or expected conditions over long periods; weather refers to the particular conditions at one time in one place.

**Climax State**- The final stage of ecological succession and therefore an ecological community that continues to reproduce itself over time, or a stage in ecological succession during which an ecological community achieves the greatest biomass or diversity. (The first definition is the classical definition.)

**Closed Systems**- A type of system in which there are definite boundaries to factors such as mass and energy such that exchange of these factors with other systems does not occur.

**Colorado River** - The Colorado River is a river in the southwestern United States and northwestern Mexico, approximately 1,450 mi (2,333 km) long, draining a part of the arid regions on the western slope of the Rocky Mountains. The natural course of the river flows into the Gulf of California, but the heavy use of the river as a fresh water source has desiccated the lower course of the river in Mexico such that it no longer reaches the sea.

**Commensalism**- A relationship between two kinds of organisms in which one benefits from the relationship and the other is neither helped nor hurt.

**Commercial Forestry**- In order to retain biodiversity in commercial forest, they must be managed in ways that simulate disturbances that take place in old-growth forests, such as forest fires and storms. Over time, some of the structural characteristics of old-growth forests, such as old trees, deadwood and deciduous trees, can also be added.

**Commons**- land that belongs to the public, not to individuals. Historically a part of old English and New England towns where all the farmers could graze their cattle.

**Competition**- The situation that exists when different individuals, populations, or species compete for the same resource(s) and the presence of one has a detrimental effect on the other. Sheep and cows eating grass in the same field are competitors.

**Competitive Exclusion Principle**- The idea that two populations of different species with exactly the same requirements cannot persist indefinitely in the same habitat – one will always win out and the other will become extinct. Which one wins depends on the exact environmental conditions. Referred to as a principle, the idea has some basis in observation and experimentation.

**Composting**- Biochemical process in which organic materials, such as lawn clippings and kitchen scraps, are decomposed to a rich, soil-like material.

**Confined Aquifer**- An aquifer that is bound above and below by dense layers of rock and contains water under pressure.

**Contour Farming (Plowing)** – Plowing land along topographic contours, perpendicular to the slope—as much in the horizontal plane as possible, thereby decreasing the erosion rate.

**Control**- control condition: the specimen that is used as an example in the experiment; a standard against which other conditions can be compared in a scientific experiment.

**Control Rod**- A device in the core of a reactor which absorbs neutrons, and is used to control the rate of fission and to stop the chain reaction.

**Controlled Burning**- Using prescribed fire to reduce the risk from wildfires, control tree diseases, increase food and habitat for wildlife, and manage forests for greater production of desirable tree species.

**Controlled Experiment**- A controlled experiment is designed to test the effects of independent variables on a dependent variable by changing only one independent variable at a time. For each variable tested, there are two set-ups (an experiment and a control) that are identical except for the independent variable being tested. Any difference in the outcome (dependent variable) between the experiment and the control can then be attributed to the effects of the independent variable tested.

**Convergent Evolution**- The process by which species evolve in different places or different times and, although they have different genetic heritages, develop similar external forms and structures as a result of adaptation to similar environments. The similarity in the shapes of sharks and porpoises is an example of convergent evolution.

**Convergent Plate Boundary**- Boundary between two lithosphere plates in which one plate descends below the other (subduction).

**Core**- The innermost layer of the Earth, made up of mostly of iron and nickel. The core is divided into a liquid outer core and a solid inner core. The core is the densest of the Earth's layers.

**Cosmopolitan Species**- A species with a broad distribution, occurring whenever in the world the environment is appropriate.

**Cost-Benefit Analysis**- The examination of a public project and the evaluation of its total costs and benefits to all concerned.

**Cracking Tower**- The building structures where the distillation of oil occurs.

**Crude Birth Rate**- The annual number of live births per 1000 population, without regard to age or sex composition.

**Crude Death Rate**- The annual number of deaths per 1000 population, without regard to age or sex composition.

**Crude Oil**- Naturally occurring petroleum normally pumped from wells in oil fields. Refinement of crude oil produces most of the petroleum products we use today.

**Crust**- The outermost layer of rock the Earth.

**Cryptosporidium**- A protozoan (single-celled organism) that can infect humans, usually as a result of exposure to contaminated drinking water.

**Cultural Eutrophication**- Eutrophication of lakes caused by human-induced processes, such as nutrient-rich sewage water entering a body of water, is called cultural eutrophication.

**Curie**- The unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion (3.7 x 10<sup>10</sup>) disintegrations per second, which is approximately the activity of 1 gram of radium. The Becquerel (Bq) has replaced the Ci in the SI system. The Becquerel (Bq) is 1 disintegration per second.

**Cycling Rate**- The amount of time required for a biogeochemical cycle to complete all phases of the cycle.

**Cyclone Collector (Separator)** - Instrument used to remove large particles (diameter greater than 3 μm) from ambient air. The conical geometry of the collector subjects the air to rotation, and the centrifugal force leads to deposition of the particles. The particles can be sampled from the walls of the device for analysis, or simply removed physically from the airflow.

**DDT** – (Dichlorodiphenyltrichloroethane) a pesticide commonly used in the mid-1900s to control insect outbreaks.

Breakdown elements from DDT and other pesticides called chlorinated hydrocarbons accumulated in the upper levels of the food chain. The results of this accumulation proved particularly hazardous for birds of prey and other bird species that eat primarily fish, because high quantities of these chemicals caused an abnormality in calcium production.

**Death rate**- The rate at which deaths occur in a population, measured either as the number of individuals dying per unit time or as the percentage of a population dying per unit time.

**Decomposer** - An organism that obtains its energy and nutritional requirements by feeding on dead organisms; or, a feeder on dead organisms.

**Deductive Reasoning**- Drawing a conclusion from initial definitions and assumptions by means of logical reasoning.

**Deep-well Injection**- A method of disposal of hazardous liquid waste that involves pumping the waste deep into the ground below and completely isolated from all freshwater aquifers. Deep-well disposal is a controversial method of waste disposal that is being carefully evaluated.

**Deforestation**- The removal of forest stands by cutting and burning to provide land for agricultural purposes, residential or industrial building sites, roads, etc., or by harvesting the trees for building materials or fuel.

**Demographic Transition**- The pattern of change in birth and death rates as a country is transformed from undeveloped to developed. There are three stages: (1) in an undeveloped country birth and death rates are high, and the growth rate is low; (2) the death rate decreases, but the birthrate remains high and the growth rate is high; (3) the birthrate drops toward the death rate and the growth rate therefore decreases.

**Demography** - The study of populations, especially their patterns in space and time.

**Denitrification**- The conversion of nitrate to molecular nitrogen by the action of bacteria – an important step in the nitrogen cycle.

**Dependent Variable** - A variable that changes in response to changes in an independent variable; a variable taken as the outcome, or dependent, variable.

**Desalination** - The removal of salts from seawater or brackish water so that the water can be used for purposes such as agriculture, industrial processes, or human consumption.

**Desert**- An area, either hot or cold, where the annual precipitation is less than 25 cm (10 in).

**Desertification**- The process of creating a desert where there was not one before. Farming in marginal grasslands, which destroys the soil and prevents the future recovery of natural vegetation, is an example of desertification.

**Detritus** - Dead or decaying organic matter.

**Developed (less developed) Nations**- A less developed nation is a nation with a low income average, a relatively backwards infrastructure and a poor human development index when compared to the global norm.

**Developed (more developed) Nations**- A more developed nation is a nation that is technologically advanced and that enjoys a relatively high standard of living.

**Dioxins**- An organic compound composed of oxygen, hydrogen, carbon, and chlorine. About 75 types are known today. Dioxin is not normally manufactured intentionally but is a by-product resulting from chemical reactions in the production of other materials, such as herbicides. Known to be extremely toxic to mammals, its effects on the human body are being intensively studied and evaluated.

**Direct Costs** - In economics, costs borne by the producer and passed directly on to the user or purchaser.

**Divergent Evolution**- Organisms with the same ancestral genetic heritage migrate to different habitats and evolve into species with different external forms and structures, but typically continue to use the same kind of habitats. The ostrich and the emu are believed to be examples of divergent evolution.

**Divergent Plate Boundary**- Boundary between two lithosphere plates characterized by the production of new lithosphere; found along oceanic ridges.

**DO (Dissolved Oxygen)** - The amount of oxygen freely available in water and necessary for aquatic life and the oxidation of organic materials.

**Dobson Unit**- Commonly used unit to measure the concentration of ozone. One Dobson unit is equivalent to a concentration of 1 ppb ozone.

**Dodo** - The Mauritius Dodo (*Raphus cucullatus*, called *Didus ineptus* by Linnaeus), more commonly just Dodo, was a meter-high flightless bird of the island of Mauritius. The Dodo, which is now extinct, lived on fruit and nested on the ground.

**Dose**- Refers to the amount of chemical that enters the body.

**Dose-Response Curve**- A graph to show the relation between the dose of a drug and the degree of response it produces, as measured by the percentage of the exposed population showing a defined effect. If the effect determined is death, such a curve may be used to estimate an LD50 value.

**Doubling Time**- The time necessary for a quantity of whatever is being measured to double.

**Dredging**- Removal of mud from the bottom of water bodies. This can disturb the ecosystem and cause silting that kills aquatic life. Dredging of contaminated mud's can expose biota to heavy metals and other toxics.

**Drip Irrigation**- Irrigation by the application of water to the soil from tubes that drip water slowly, greatly reducing the loss of water from direct evaporation and increasing yield.

**E Horizon**- Horizon that is composed of light-colored materials resulting from leaching of clay, calcium, magnesium, and iron to lower horizons. The A and E horizons together constitute the **zone of leaching**.

**Early Successional Species**- Species that occur only or primarily during early stages of succession. With vegetation, these are typically rapidly growing and short-lived with high reproductive rates.

**Easter Island** - One of the greatest mysteries on Earth are the statues which stand on Easter Island. Easter Island is one of the most remote islands on Earth. It is in the southern Pacific Ocean, 2,300 miles west of the coast of Chile and 2500 miles southeast of Tahiti. The closest island is 1400 miles away, and that island is uninhabited. Easter Island is only 15 miles long and 10 miles wide. Yet, Easter Island, which was almost uninhabited when it was discovered on

Easter Day in 1722 by a Dutch captain, is covered with hundreds of giant statues, each weighing several tons and some standing more than 30 feet tall.

**Ecological Island**- An area that is biologically isolated so that a species occurring within the area cannot mix (or only rarely mixes) with any other population of the same species.

**Ecological Justification** (for the conservation of nature)- An argument for the conservation of nature on the grounds that a species, an ecological community, an ecosystem, or the Earth's biosphere provides specific functions necessary to the persistence of our life or of benefit to life. The ability of trees in forests to remove carbon dioxide produced in burning fossil fuels is such a public benefit and an argument for maintaining large areas of forests.

**Ecological Niche**- The general concept is that the niche is a species' "profession"—what it does to make a living. The term is also used to refer to a set of environmental conditions within which a species is able to persist.

**Ecology**- The science of the study of the relationships between living things and their environment.

**Ecosystem**- A community of plants, animals, and microorganisms that are linked by energy and nutrient flows and that interact with each other and with the physical environment. Rain forests, deserts, coral reefs, grasslands, and a rotting log are all examples of ecosystems.

**ED-50** – The effective dose or dose that causes an effect in 50% of the population on exposure to a particular toxicant. It is related to the onset of specific symptoms, such as loss of hearing, nausea, or slurred speech.

**Edge Effect**- An effect that occurs following the forming of a forest island; in the early phases the species diversity along the edge is greater than in the interior. Species escape from the cut area and seek refuge in the border of the forest, where some may last only a short time.

**Electromagnetic Radiation**- Radiation consisting of electric and magnetic waves that travel at the speed of light.

Examples: light, radio waves, gamma rays, x-rays.

**Electromagnetic Spectrum**- Radiation consisting of electric and magnetic waves that travel at the speed of light.

Examples: light, radio waves, gamma rays, x-rays.

**Electrostatic Precipitator**- An electrical device used in removing particles from combustion gases prior to release from a power plant's stack.

**Emigration**- The migration of people out of a country.

**Endangered Species** - A species that faces threats that might lead to its extinction in a short time.

**Endemic Species**- A species that is native to a particular area.

**Endocrine System**- A system of ductless glands that regulates bodily functions via hormones secreted into the bloodstream. The endocrine system includes the hypothalamus, pituitary gland, thyroid, adrenal glands, and gonads (ovaries and testes).

**Energy Efficiency** - A measure of energy produced compared to energy consumed.

**Energy Pyramid**- A representation of the loss of useful energy at each step in a food chain.

**ENSO**- (El Niño-Southern Oscillation) The term currently used by scientists to describe basin-wide changes every 2 to 7 years in air-sea interaction in the equatorial Pacific Ocean. El Niño/La Niña is the oceanic component and the Southern Oscillation is the atmospheric component of the phenomenon.

**Entropy**- A measure in a system of the amount of energy that is unavailable for useful work. As the disorder of a system increases, the entropy in a system also increases.

**Environmental Protection Agency (EPA)** - A federal agency created in 1970 to permit coordinated and effective governmental action, for protection of the environment by the systematic abatement and control of pollution, through integration of research monitoring, standard setting, and enforcement activities.

**Environmental Risk**- Used in discussions of endangered species to mean variation in the physical or biological environment, including variations in predator, prey, symbiotic, or competitor species that can threaten a species with extinction.

**Environmental Science**- The scientific study that uses biological principles to look at the relationships between humans and their environment.

**Epidemiology**- The study of the patterns, causes, and control of disease in groups of people.

**Estimated Reserves** - Estimated quantities of oil and gas which are not supported by geological or engineering data and are simply an educated estimation.

**Eutrophication**- Increase in the concentration of chemical elements required for living things (i.e. phosphorus). Increased nutrient loading may lead to a population explosion of photosynthetic algae and blue-green bacteria that become so thick that light cannot penetrate the water. Plants deprived of light beneath the surface die; as they decompose, dissolved oxygen in the lake is lowered and eventually a fish kill may result. Eutrophication of lakes caused by human-induced processes, such as nutrient-rich sewage water entering a body of water, is called *cultural* eutrophication.

**Even-aged Stands**- Forest area where all live trees began growth from seeds and roots planted in about the same year.

**Experiment**- The act of conducting a controlled test or investigation.

**Exponential Growth**- growth in which the rate of increase is a constant percentage of the current size; that is, the growth occurs at a constant rate per time period.

**Externality**- In economics, an effect not normally accounted for in the cost-revenue analysis of producers.

**Extinction**- Disappearance of a life-form from existence; usually applied to a species.

**Facilitation**- During succession, one species prepares the way for the next (and may even be necessary for the occurrence of the next.)

**Fall Line**- The straightest and steepest line down any slope.

**Fallow**- A field that is allowed to grow with a cover crop without harvesting for at least one season.

**Family Planning**- Controlling reproduction; planning the timing of birth and having as many babies as are wanted and can be supported.

**Famine** – A severe shortage of food.

**Fecal Coliform (Bacteria)** – A standard measure of microbial pollution and an indicator of disease potential for a water source.

**Feedlot Runoff**- Contaminated runoff from a building where livestock are fattened for market or other farms.

**Fisheries**- A fishery (plural: fisheries) is an organized effort by humans to catch fish or other aquatic species, an activity known as fishing. Generally, a fishery exists for the purpose of providing human food, although other aims are possible (such as sport or recreational fishing), or obtaining ornamental fish or fish products such as fish oil. Industrial fisheries are fisheries where the catch is not intended for direct human consumption.

**Floodplain** - Flat topography adjacent to a stream in a river valley that has been produced by the combination of overbank flow and lateral migration of meander bends.

**Food Chain**- The linkage of who feeds on whom.

**Food Web**- A network of who feeds on whom or a diagram showing who feeds on whom.

**Fossil Fuels**- Forms of stored solar energy created from incomplete biological decomposition of dead organic matter. Include coal, crude oil, and natural gas.

**Fractional Distillation**- A process used to separate the parts of a liquid mixture due to differences in boiling points of the constituents.

**Free Market Economy**- A system where resources are owned by households: markets distribute resources through the price mechanism; and income depends upon the value of resources owned by an individual.

**Fuel Rod** - A long, slender tube that holds fuel (fissionable material) for nuclear reactor use. Fuel rods are assembled into bundles called fuel elements or fuel assemblies, which are loaded individually into the reactor core.

**Fungicide**- A chemical that kills fungi.

**Gamma Rays**- One of the three major kinds of nuclear radiation. A type of electromagnetic radiation emitted from the isotope similar to X rays but more energetic and penetrating.

**Gene Pool**- The total genetic information encoded in the total genes in a breeding population existing at a given time.

**Generalist Species**- A species with the ability to live in many different places while tolerating a wide range of environmental conditions.

**Genetic Diversity** - Variation among and within species that is attributable to differences in hereditary material.

**Genetic Drift**- Changes in the frequency of a gene in a population as a result of chance rather than of mutation, selection, or migration.

**Genetic Engineering**- The technique of removing, modifying, or adding genes to a DNA molecule in order to modify a specific organism for the purpose of changing one of its characteristics.

**Genetic Risk**- Used in discussions of endangered species to mean detrimental change in genetic characteristics not caused by external environmental changes. Genetic changes can occur in small populations from such causes as reduced genetic variation, genetic drift, and mutation.

**Geothermal Energy** –The useful conversion of natural heat from the interior of the Earth to useful energy.

**Giant Panda**- A large black-and-white herbivorous mammal of bamboo forests of China and Tibet that has become an endangered species.

**Giga**- one billion or 1,000,000,000

**Glen Canyon Dam**- A dam on the Colorado River at Page, Arizona. The dam has been controversial since its inception, because it caused the flooding of Glen Canyon to create a man-made reservoir, Lake Powell.

**Global Extinction** - Disappearance or extinction of a species everywhere.

**Global Warming** - Natural or human-induced increase in the average global temperature of the atmosphere near the Earth's surface.

**Green Belt**- The idea of locating garden cities in a set connected by undeveloped areas, forming a system of countryside and urban landscapes.

**Green Revolution**- Name attached to post-World War II agricultural programs that have led to the development of new strains of crops with higher yield, better resistance to disease, or better ability to grow under poor conditions.

**Greenhouse Effect**- Process of trapping heat in the atmosphere. Water vapor and several other gases warm the Earth's atmosphere because they absorb and reemit radiation, that is, they trap some of the heat radiating from the Earth's atmospheric system.

**Greenhouse Gases**- Gases that increase the temperature of the earth's surface. They include water vapor (H<sub>2</sub>O), tropospheric ozone (O<sub>3</sub>), chlorofluorocarbons (CFCs), carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), methane (CH<sub>4</sub>) and nitrous oxide (NO).

**Gross Domestic Product (GDP)** - Total value of a country's output, income or expenditure produced within the country's physical borders.

**Gross Production**- Production before respiration losses are subtracted.

**Gross-national product (GNP)** - GNP is the dollar value of all goods and services produced in a nation's economy, including goods and services produced abroad.

**Groundwater Recharge Zone** – Places where surface waters infiltrate the groundwater systems.

**Groundwater**- Water found beneath the Earth's surface within the zone of saturation.

**Growth Rate**- The net increase in some factor per unit time.

**Gypsy Moth**- European race (*Lymantria dispar*) A defoliating insect introduced into North America in 1869. This alien species is a serious pest of hardwoods and its range now includes the Maritimes, Quebec, Ontario, and British Columbia.

**Habitat Fragmentation**- The process by which isolated patches of habitat are created through land clearing and deforestation.

**Habitat Loss**- Habitat destruction is a process of land use change in which one habitat-type is removed and replaced with some other habitat-type. In the process of land-use change, plants and animals which previously used the site are displaced or destroyed. Generally this results in a reduction in biodiversity.

**Habitat**- Where an individual, population, or species exists or can exist. For example, the habitat of the Joshua tree is the Mojave Desert of North America.

**Hazardous Chemicals**- Chemical compounds that are dangerous to human health and/or the environment.

**Hazardous Waste**- Waste that is classified as definitely or potentially hazardous to the health of people. Examples include toxic or flammable liquids and a variety of heavy metals, pesticides, and solvents.

**Heat Island Effect**- Urban areas are several degrees warmer than their surrounding areas. During relatively calm periods there is an upward flow of air over heavily developed areas accompanied by a downward flow over nearby greenbelts. This produces an air-temperature profile that delineates the heat island.

**Heavy Metals** - Refers to a number of metals, including lead, mercury, arsenic, and silver (among others) that have a relatively high atomic number (the number of protons in the nucleus of an atom). They are often toxic at relatively low concentrations, causing a variety of environmental problems.

**Herbicide**- A chemical substances or living organisms (called bioherbicide) used to kill or control vegetation such as brush, weeds, and competing or undesirable trees.

**Herbivore** - An organism that feeds on an autotroph; a plant eater.

**Heterotroph** - An organism that feeds on other organisms and cannot make its own food from inorganic chemicals or a source of energy.

**High-Level Radioactive Waste** - Extremely toxic nuclear waste, such as spent fuel elements from commercial reactors. A sense of urgency surrounds determining how we may eventually dispose of this waste material.

**Hoover Dam** - A concrete gravity-arch dam in the Black Canyon of the Colorado River, on the border between Arizona and Nevada. The dam, located 48 kilometers (30 miles) southeast of Las Vegas, is named after Herbert Hoover, who played an instrumental role in its construction, first as Secretary of Commerce and then later as President of the United States.

**Horizon**- Horizon that is composed mostly of organic materials, including decomposed or decomposing leaves, twigs, and other organic matter. This horizon is often dark brown or black.

**Hydrochlorofluorocarbons**- Compounds containing hydrogen, fluorine, chlorine, and carbon atoms. Although ozone depleting substances, they are less potent at destroying stratospheric ozone than chlorofluorocarbons (CFCs). They have been introduced as temporary replacements for CFCs and are also greenhouse gases.

**Hydrogen Fuel Cell**- An electrochemical device in which hydrogen and oxygen combine in a controlled manner (in contrast to combustion or explosion) to directly produce an electric current and heat.

**Hydroponics** - The practice of growing plants in a fertilized water solution on a completely artificial substrate in an artificial environment such as a green house.

**Hypothesis**- In science, an explanation set forth in a manner that can be tested and is capable of being disproved. A tested hypothesis is accepted until and unless it has been disproved.

**Igneous Rock**- Rock formed from magma (melted rock) that has cooled and solidified.

**Immigration**- The migration of people into a country.

**Immune System**- A complex bodily system that is responsible for distinguishing us from everything foreign to the body, and for protecting it against infections and foreign substances. The immune system works to seek and kill invaders and includes white blood cells and antibodies.

**Incineration** - Combustion of waste at high temperatures, consuming materials and leaving only ash and noncombustibles to dispose of in a landfill.

**Independent Variable**- In an experiment, the variable that is manipulated by the investigator. In an observational study, an independent variable is believed by the investigator to affect an outcome, or dependent variable.

**Indicator Species**- A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.

**Indirect Costs**- In environmental economics, costs associated with the degradation of the environment.

**Indoor Air Pollution**- Air pollutants that occur within buildings or other enclosed spaces. Some examples of indoor air pollutants are tobacco smoke, asbestos, formaldehyde, pesticides, and solvents from pesticides and cleaners, and radon.

**Inductive Reasoning**- Drawing a general conclusion from a limited set of specific observations.



**Industrialized Agriculture**- A form of agriculture that is more centralized and uses technology such as mechanized groundwater irrigation systems and production of fertilizers in order to grow crops.

**Infant Mortality Rate**- The probability of dying between birth and exactly one year of age, expressed per 1,000 live births.

**Inference**- (1) A conclusion derived by logical reasoning from premises and/or evidence (observations or facts), or (2) a conclusion, based on evidence, arrived at by insight or analogy, rather than derived solely by logical processes.

**Infiltration** - The flow of water from the land surface into the subsurface.

**Inhibition**- A restraint on instinctive impulses.

**Inorganic Fertilizer**- Chemically synthesized or manmade fertilizers that efficiently supply the required nutrients for plant growth and are safe for the environment. However, excessive usage can injure plant roots and potentially lead to environmental degradation.

**Insecticide**- A chemical (synthetic or organic) used to kill or repel insects.

**Integrated Pest Management (IPM)** – A term applied to a variety of practices whose overall goal is to contain biological pests through minimum use of artificial chemicals and minimum disruption of natural ecological processes. Biological control typically augments or replaces artificial pesticides.

**Integrated Waste Management (IWM)** - Set of management alternatives including reuse, source reduction, recycling, composting, landfill, and incineration.

**Interference**- During succession, one species prevents the entrance of later successional species into an ecosystem.

For example, some grasses produce such dense and thick mats that seeds of trees cannot reach the soil to germinate.

As long as these grasses persist, the trees that characterize later stages of succession cannot enter the ecosystem.

**Intertidal**- The zone between high and low tide.

**Ionizing Radiation** - Radiation capable of displacing electrons from atoms or molecules, thereby producing ions.

**Iron Pyrite**- A metallic, yellow-to-brown sulfide of iron. This widely occurring mineral is also known as fool's gold. The mineral is cubic in crystal form.

**Island of Biogeography**- The study of rates of colonization and extinction of species on islands or other isolated areas based on size, shape, and distance from other inhabited regions.

**Isle Royale National Park**- Isle Royale National Park is a U.S. National Park in the state of Michigan. Isle Royale, the largest island in Lake Superior, is over 45 miles (72 km) in length and 9 miles (14 km) wide at its widest point<sup>[1]</sup>; it and multiple smaller islands along with all water to 2.5 miles of the outer islands make up the park. Isle Royale National Park was established on April 3, 1940, was designated as a Wilderness Area in 1976 and as an International Biosphere Reserve in 1980. It is a relatively small national park at 894 square miles (2314 km), with only 209 square miles (542 km) above water. Isle Royale National Park is known for its wolf and moose populations which are studied by scientists investigating predator-prey relationships in a closed environment. There are usually around 25 wolves and 1000 moose on the island but the numbers change greatly year to year. In rare years with very hard winters, animals can travel over the frozen lake from the Canadian mainland. To protect the wolves from canine diseases, dogs are not allowed in any part of the park, including the adjacent waters.

**Isotope**- Atoms of an element that have the same atomic number (the number of protons in the nucleus of the atom) but vary in atomic mass number (the number of protons plus the neutrons in the nucleus of an atom).

**J-Curve** – A type of graph predicting the exponential growth of a population.

**John Wesley Powell** - A U.S. explorer of the American West. He is famous for the 1869 Powell Geographic Expedition, a three-month river trip down the Green and Colorado rivers that included the first passage through the Grand Canyon.

**Keystone Species**- Loosely speaking, a species, such as the sea otter, that has a large effect on its community or ecosystem so that its removal or addition to the community leads to major changes in the abundances of many or all other species.

**Kilo**- one thousand or 1,000

**K-strategists**- An organism that is characterized by: Large parental investment in their young. K-strategists reproduce slowly, with long gestation periods, to permit the young to develop more in the womb. After birth, the young are tended until they can be reasonably expected to care for themselves. The ability to utilize stable environmental situations. Once the population of a K-strategist has reached the carrying capacity of its environment, the population size stays relatively constant.

**Kudzu** - A vine, native to China and Japan but imported into the United States; originally planted for decoration, for forage, or as a ground cover to control erosion. It now grows wild in many parts of the southeastern United States.

**Kwashiorkor**- Lack of sufficient protein in the diet, which leads to a failure of neural development in infants and therefore to learning disabilities.

**Lacey Act**- This act, enforced by the US Fish and Wildlife Service, is designed to control environmental releases of injurious fish and wildlife. This law includes species that threaten non-agricultural interests.

**Late Successional Species**- Species that occur only or primarily in, or are dominant in late stages in succession. With plants, these are typically slower growing and longer-lived species.

**LD-50** – A crude approximation of a chemical toxicity defined as the dose at which 50% of the population dies on exposure.

**Leachate** - Noxious, mineralized liquid capable of transporting bacterial pollutants. Leachate is produced when water infiltrates through waste material and becomes contaminated and polluted.

**Leaching**- The process of dissolving, washing, or draining earth materials by chemical weathering processes of groundwater or other liquids and moving the dissolved materials laterally or downward.

**Life Expectancy**- The estimated average number of years that an individual of a specific age can expect to live.

**Lignite** - A low-grade brownish coal of relatively poor heat-generating capacity.

**Limiting Factor** - The single requirement for growth available in the least supply in comparison to the need of an organism. Originally applied to crops but now often applied to any species.

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**Linear Growth** - population growth which is modeled by adding a fixed amount each time period.

**Lithosphere** – The outer layer of Earth, approximately 100km thick, of which the plates that contain the ocean basins and the continents are composed.

**Local Extinction** - The disappearance of a species from part of its range, but continues to persist elsewhere.

**Logistic Growth Curve** - The S-shaped growth curve that is generated by the logistic growth equation. In the logistic, a small population grows rapidly, but the growth rate slows down, and the population eventually reaches a constant size.

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**Love Canal**- In 1920, Love's land was sold in public auction to the City of Niagara Falls, which began using the undeveloped area as a chemical waste disposal site. The city disposed of the waste from its thriving petrochemical industry. Later, the United States Army began using the site as well, burying waste from its experiments in chemical warfare. In 1942, Hooker Chemical and Plastics Corporation, (a subsidiary of Occidental Petroleum) expanded use of the site, and by 1947, acquired the land for its own private use. In the subsequent five year period, the company buried 19,000 cubic yards (14,000 m<sup>3</sup>) of toxic waste in the area. Once the site had been filled to capacity in 1952, Hooker closed the site to further disposal and back-filled the canal. At the time of the closure, the Baby boom was at its height, and Niagara Falls was expanding rapidly. The local school board was desperate for land, and attempted to purchase a portion of the inexpensive property from Hooker Chemical. The board wanted to build a new elementary school in an area of the property that had not yet been used to bury toxic waste. The corporation refused to sell, but the school board pressed on, threatening expropriation. Eventually, Hooker Chemical capitulated, and sold on the condition that the board would buy the entire property for a dollar. In the agreement, Hooker included a seventeen line caveat that explained the dangers of building on the site. Shortly thereafter, the board began construction on the 99th Street School in its originally intended location. The building site was forced to relocate when contractors discovered two pits filled with chemicals. The new location was directly on top of the former chemical landfill. During construction, a clay seal which Hooker had put in to stop the chemicals seeping out was broken through, despite the breaking of several drill bits in the process. In 1957, the City of Niagara Falls constructed sewers for a mixture of low-income and single family residences to be built on lands adjacent to the landfill site. New owners were not warned of the dangers when they were sold the land.

**Low-Level Radioactive Waste**- Waste materials that contain sufficiently low concentrations or quantities of radioactivity so as not to present a significant environment hazard if properly handled.

**Macronutrients**- Elements required in large amounts by living things. These include the big six – carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur.

**Malnutrition (Malnourishment)** – The lack of specific components of food, such as proteins, vitamins, or essential chemical elements.

**Manatee** - A plant-eating aquatic mammal found in the waters of Florida, the Caribbean, and off the coast of West Africa.

**Mantle**- The zone of the earth below the crust and above the core.

**Marasmus**- Progressive emaciation (to become extremely thin) caused by a lack of protein and calories.

**Marginal Costs** - In environmental economics, the cost to reduce one additional unit of a type of degradation; for example, pollution.

**Marsh**- A low-lying wet land with grassy vegetation; usually is a transition zone between land and water.

**Mass Extinction**- The name given to a period of especially high rates of extinction of species. Several such events are seen in the fossil record. Some palaeobiologists suggest that we are on the brink of another mass extinction today, caused by human activities.

**Maximum Sustainable Yield (MSY)** - The maximum usable production of a biological resource that can be obtained in a specific time period. The MSY level is the population size that results at maximum sustainable yield.

**Mega**- one million or 1,000,000

**Mesopause** - Narrow zone of transition between the mesosphere below and the thermosphere above; the top of the mesosphere.

**Mesosphere** - The cooler layer of atmosphere overlying the stratosphere and below the thermosphere.

**Metamorphic Rock**- A rock that has undergone chemical or structural changes, such as heat, pressure, or a chemical reaction. Examples include quartzite, slate, and marble.

**Micro** - one-millionth or 10<sup>-6</sup> or 1/1,000,000.

**Microclimate** - The climate of a very small local area. For example, the climate under a tree, near the ground within a forest, or near the surface of streets in a city.

**Micronutrients**- Chemical elements required in very small amounts by at least some forms of life. Boron, copper, and molybdenum are examples of micronutrients.

**Migration** - Mass movement of animals or humans from one place to another.

**Migration**- The movement of an individual, population, or species from one habitat to another or more simply from one geographic area to another.

**Milli**- one-thousandth or  $10^{-3}$  or 1/1,000

**Mineral Resources**- Elements, chemical compounds, minerals, or rocks concentrated in a form that can be extracted to obtain a usable commodity.

**Minimum Viable Population**- The minimum number of individuals that have a reasonable chance of persisting for a specified time period.

**Mobile Sources**- Sources of air pollutants that move from place to place, for example, automobiles, trucks, buses, and trains.

**Moderator** - A material used in a nuclear reactor to slow neutrons.

**Monoculture** - The planting of large areas with a single species or even a single strain or subspecies in farming.

**Montreal Protocol** - The Montreal Protocol on Substances that Deplete the Ozone Layer (1987) was an international agreement, signed by most of the industrialized nations, to substantially reduce the use of chlorofluorocarbons (CFCs). Signed in January 1989, the original document called for a 50-percent reduction in CFC use by 1992 relative to 1986 levels.

**Moral Justification** (for the conservation of nature) – An argument for the conservation of nature on the grounds that aspects of the environment have a right to exist, independent of human desires, and that it is our moral obligation to allow them to continue or to help them persist.

**Mortality**- A measure of deaths in a given population, location, or other grouping of interest.

**Multiple Use Land** - Literally, using the land for more than one purpose at the same time. For example, forestland can be used to produce commercial timber but at the same time serve as wildlife habitat and land for recreation. Usually multiple use requires compromises and tradeoffs, such as striking a balance between cutting timber for the most efficient production of trees at a level that facilitates other uses.

**Municipal Waste**- Waste products created by a town, city or municipality; as in sewage and garbage, or solid waste.

**Mutagens**- Substances that causes mutation.

**Mutation**- Stated most simply, a chemical change in a DNA molecule. It means that the DNA carries a different message than it did before, and this change can affect the expressed characteristics when cells or individual organisms reproduce.

**Mutualism**- Two species living together in a relationship in which both benefit from the association, also known as symbiosis.

**Narrow Spectrum Pesticide** – Pesticides that kill a wide variety of organisms by attacking a system common to all the organisms, such as the nervous system.

**National Forest**- U.S. National forests are protected forests and woodland areas in the United States. National forests are controlled by the federal government and managed by the United States Forest Service, under the direction of the United States Secretary of Agriculture. The management of these lands focuses on timber harvesting, livestock grazing, water, wildlife, and recreation. Commercial use of national forests is permitted and in many cases encouraged, unlike national parks.

**National Park** - A relatively large area containing representative examples of major natural regions, features, or scenery of national or international significance. National park ecosystems are not heavily altered by humans and they are protected by national governments.

**National Resource Lands**- Lands that are protected to be used as sources for renewable resources, such as timber.

**National Wildlife Refuge**- National Wildlife Refuge is a designation for certain protected areas of the United States managed by the United States Fish and Wildlife Service. The National Wildlife Refuge system is a network of lands and waters managed to protect wildlife and wildlife habitat. The system consists of over 500 refuges across the nation.

**Native Species**- A species that occur naturally in a given area.

**Natural Gas**- Naturally occurring gaseous hydrocarbon (predominantly methane) generally produced in association with crude oil or from gas wells; an important efficient and clean-burning fuel company used in homes and industry.

**Natural Pesticide**- (Botanical Pesticide) Non-synthetic pesticide derived from plants.

**Natural Selection**- A process by which organisms whose biological characteristics better fit them to the environment are better represented by descendants in future generations than those whose characteristics are less fit for the environment.

**Negative Feedback Loop** - A type of feedback that occurs when the system's response is in the opposite direction of the output. Thus negative feedback is self-regulating.

**Net Production** – The production that remains after utilization. In a population, net production is sometimes measured as the net change in the numbers of individuals. It is also measured as the net change in biomass or in stored energy. In terms of energy, it is equal to the gross production minus the energy used in respiration.

**Neurotoxin**- A poisonous chemical that affects the central nervous system. It can destroy, paralyze, or adversely affect nerves or nerve tissue, producing psychological or behavioral abnormalities.

**Nitrates**- A salt or ester of nitric acid, such as potassium nitrate or sodium nitrate, both used as fertilizers, and which show up in water supplies as pollution.

**Nitrification**- Nitrification is the process carried out by specialized bacteria in which ammonium is converted to nitrite and then nitrate.

**Nitrogen Cycle**- A complex biogeochemical cycle responsible for moving important nitrogen components through the biosphere and other Earth systems. This is an extremely important cycle because nitrogen is required by all living things.

**Nitrogen Fixation**- The process by which atmospheric nitrogen is converted to ammonia, nitrate ion, or amino acids. Microorganisms perform most of the conversion but a small amount is also converted by lightning.

**Noise Pollution** - A type of pollution characterized by unwanted or potentially damaging sound.

**Nonnative, Exotic, Introduced or Alien Species**- Species introduced into a new area by human action.

**Non-point source** - A source of pollution that cannot always be traced to an exact point of entry.

**Nonrenewable Resource**- A resource that is cycled so slowly by natural Earth processes that once used, it is essentially not going to be made available within any useful time frame.

**Northern Spotted Owl**- A threatened bird species whose biggest threat is loss of old growth forest habitat, as a result of logging and forest fragmentation. These threats are made even greater by natural disasters, such as fire, volcanic eruptions and wind storms.

**No-Till Agriculture**- Combination of farming practices that include *not* plowing the land, using herbicides to keep down the weeds, and allowing some weeds to grow.

**Nuclear Fission**- The splitting of an atomic nucleus, resulting in the release of large amounts of energy; the basic process a nuclear reactor uses to provide heat for the generation of electricity.

**Nuclear Fusion** - The combination of the nuclei of certain extremely light elements, especially hydrogen, and is also affected by the application of high temperature and pressure. Nuclear fusion causes the release of an enormous amount of heat energy, comparable to that released by nuclear fission. The principal by product of nuclear fusion is helium.

**Ocean Disposal (Dumping)** - The use of various techniques for disposing of hazardous wastes and other wastes in open seas is ocean dumping. Ocean disposal has included bulk disposal of liquid or slurry-type wastes, hazardous sludge from dredged materials and the sinking of containerized hazardous substances.

**Ogallala Aquifer** - The Ogallala Aquifer, also known as the High Plains Aquifer, is a shallow water table aquifer located beneath the Great Plains in the United States. One of the world's largest aquifers, it lies under about 174,000 mi<sup>2</sup> (450,000 km<sup>2</sup>) in portions of the eight states of South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas. It was named in 1899 by N.H. Darton from its type locality near the town of Ogallala, Nebraska.

**Oil Sands**- sand, clay and rock material that contains bitumen.

**Oil Shale** - A fine-grained sedimentary rock containing organic material known as kerogen. On distillation yields significant amounts of hydrocarbons including oil.

**Old Growth Forests**- A nontechnical term often used to mean a virgin forest (one never cut) but also used to mean a forest that has been undisturbed for a long, but usually unspecified, time.

**Oligotrophic**- Referring to bodies of waters having a low concentration of the chemical elements required for life.

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**Omnivore**- Organisms that eat both plants and animals.

**OPEC** - Organization of Petroleum Exporting Countries. Formed in 1960, its member countries are Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela.

**Open Dump**- Area where solid waste is disposed of by simply dumping it. Often causes severe environmental problems, such as water pollution, and creates a health hazard. Open dumps are now illegal in the United States and in many countries around the world.

**Open Pit Mining**- A surface mining method in which overlying rock and soil are removed to expose the ore body, which is then drilled, blasted and loaded into trucks or railroad cars for haulage from the pit.

**Open System**- A type of system in which exchanges of mass or energy occur with other systems.

**Optimum Sustainable Yield (OSY)** - The largest yield of a renewable resource achievable over a long time period without decreasing the ability of the population or its environment to support the continuation of this level of yield.

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**Ore Deposits** - Earth minerals in which metals are concentrated in high concentrations, sufficient to be mined.

**Organic Chemicals**- Chemicals containing carbon that derives from organisms.

**Organic Compounds**- Compounds of carbon; originally used to refer to the compounds found in and formed by living things.

**Organic Farming**- Agricultural production system without or with only limited use of pesticides and synthetic fertilizers, and instead uses natural fertilizers and supplements.

**Organic Fertilizer**- A fertilizer made of natural materials that undergoes little or no processing and includes plant, animal, and/or mineral materials.

**Organic Waste** - Waste material which comes mainly from animal or plant sources.

**Osprey**- A large harmless hawk found worldwide that feeds on fish and builds a bulky nest often occupied for years.

**Overburden**- Material covering a mineral seam or bed that must be removed before the mineral can be removed in strip mining.

**Overdraft**- Groundwater withdrawal when the amount pumped from wells exceeds the natural rate of replenishment.

**Overgrazing**- When the carrying capacity of land for an herbivore, such as cattle or deer, is exceeded.

**Overnutrition (Overnourishment)** – Receiving more than enough calories to move or work from food.

**Oxides of Nitrogen (NO<sub>x</sub>)** - Compounds containing nitrogen and oxygen, such as nitrous oxide (NO) and nitrogen dioxide (NO<sub>2</sub>).

**Oxides of Sulfur (SO<sub>x</sub>)** - Compounds containing sulfur and oxygen, such as sulfur dioxide (SO<sub>2</sub>) and sulfur trioxide (SO<sub>3</sub>).

**Oxygen Sag Curve** - The oxygen sag curve occurs when point source pollution emits harmful substances into a body of water, usually a river or stream. Initially, in Clean Zone, a well aerated, unpolluted stream is relatively free of oxidizable material; the oxygen level is high; and the bacterial population is relatively low. With the addition of oxidizable pollutants, the oxygen level drops because re-aeration cannot keep up with the oxygen consumption (i.e. Decomposition Zone). In this zone, the bacterial population rises. The Septic Zone is characterized by a high bacterial population and very low oxygen levels. The zone terminates when the oxidizable pollutant is exhausted, and then the recovery zone begins. In the Recovery Zone, the bacterial population decreases and the dissolved oxygen level increases until the water regains its original condition (Clean Zone).

**Ozone (O<sub>3</sub>)** - Form of oxygen in which three atoms of oxygen occur together. Is chemically active and has a short average lifetime in the atmosphere. Ozone forms a natural layer high in the atmosphere (stratosphere) that protects us from harmful ultraviolet radiation from the sun. Ozone also is an air pollutant when present in the lower atmosphere above the National Air Quality Standards.

**Ozone Depletion**- Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or-bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

**Ozone Layer (Shield)** - Stratospheric ozone layer that absorbs ultraviolet radiation.

**Parasitism**- A relationship between two organisms in which one organism benefits at the other organism's expense.

**Part per Billion (ppb)** - a measure of the amount of dissolved solids in a solution in terms of a ratio between the number of parts of solids to a billion parts of total volume; Equivalent to microgram per liter in water or 1ppb=1 ug/.

**Part per Million (ppm)** - Unit of concentration equal to one milligram per kilogram or one milligram per liter.

**Particulate Matter**- Solid particles or liquid droplets suspended or carried in the air (e.g., soot, dust, fumes, mist).

**Passenger Pigeon** - A pigeon, *Ectopistes migratorius*, which as late as the mid-19th century was one of the most abundant of North American birds, but now is on the verge of extinction.

**Passive Solar Energy**- Solar energy collected by non active systems e.g. windows, atria, black drapes, etc.

**Pathogens**- Microorganisms that can cause disease in other organisms (i.e., humans, animals, and plants). They may be bacteria, viruses, or parasites and are found in sewage, runoff from livestock farms or areas populated with domestic and/or wild animals.

**PCBs** - A group of commercially produced organic chemicals used since the 1940s in industrial applications throughout the nuclear weapons complex. PCBs are found in many of the gaskets and large electrical transformers and capacitors in the gaseous diffusion plants. They can be toxic to humans and animals.

**Peat**- Partially carbonized decayed vegetable matter saturated with water; can be used as a fuel when dried.

**Pelagic**- A term that refers to fish and animals that live in the open sea, away from the sea bottom.

**Pelagic Whaling**- Practice of whalers taking to the open seas and searching for whales from ships that remained at sea for long periods.

**Per Capita** - Per person.

**Peroxyacyl Nitrates (PANs)** - Powerful respiratory and eye irritants present in photochemical smog. They are formed from a peroxyacid radical and nitrogen dioxide, for example peroxyacetyl nitrate, CH<sub>3</sub>COONO<sub>2</sub>.

**Pest**- An unwanted and destructive animal or plant that attacks food or crops or livestock.

**Pesticide**- Any chemical or biological agent that kills plant or animal pests; herbicides, insecticides, fungicides, rodenticides, etc. are all pesticides.

**Pesticide Treadmill**- The process in which farms endure a variety of pests that gradually become resistant to pesticides, causing farms to adopt new and more potent poisons.

**Petroleum Products**- After being pumped up from the earth, petroleum is refined and turned into many products, including kerosene, benzene, gasoline, paraffin wax, asphalt, plastic and nylon.

**pH** - A measure of the activity of hydrogen ions (H<sup>+</sup>) in a solution and, therefore, its acidity or alkalinity. The pH value is a number without units, usually between 0 and 14, that indicates whether a solution is acidic. A pH of 7 is neutral; a pH of 0 is very acidic; a pH of 14 is very basic.

**Phosphates**- Certain chemical compounds containing phosphorus.

**Phosphorus Cycle**- Major biogeochemical cycle involving the movement of phosphorus throughout the biosphere and lithosphere. This cycle is important because phosphorus is an essential element for life and often is a limiting nutrient for plant growth.

**Photochemical Smog**- Sometimes called L.A.-type smog or brown air and is directly related to automobile use and solar radiation. Reactions that occur in the development of the smog are complex and involve both nitrogen oxides and hydrocarbons in the presence of sunlight.

**Photosynthesis**- Synthesis of sugars from carbon dioxide and water by living organisms using light as energy. Oxygen is given off as a by-product. The chemical equation is

**Photovoltaic Cell**- Technology that converts sunlight directly into electricity using a solid semiconductor material.

**Phytoplankton** - Microscopic floating plants, mainly algae, that live suspended in bodies of water and that drift about because they cannot move by themselves or because they are too small or too weak to swim effectively against a current.

**Phytoremediation** - The process of using plants for pollution clean-up of contaminated soils or water.

**Plantation Agriculture**- Form of agriculture that involves concentrated ownership of land with the means of production in the hands of one family or corporation, the use of hired labor, and a production of a single crop for sale.

**Plate Tectonics**- A model of global tectonics that suggests that the outer layer of Earth, known as the *lithosphere*, is composed of several large plates that move relative to one another. Continents and oceans basins are passive riders on these plates.

**Point Source** - A source of pollution that involves the discharge of wastes from an identifiable point, such as a smokestack or sewage treatment plant.

**Polar Vortex** - Arctic air masses that in the winter become isolated from the rest of the atmosphere and circulate about the pole. The vortex rotates counterclockwise because of the rotation of the Earth in the Southern Hemisphere.

**Population** - A group of individuals of the same species living in the same area or interbreeding and sharing genetic information.

**Population Dynamics** - The study of changes in population sizes and the causes of these changes.

**Population Momentum (or lag effect)** – The continued growth of a population that occurs after achievement of replacement level fertility is reached.

**Population Risk**- Used in discussions of endangered species to mean variation in population rates – birthrates and death rates – possibly causing species in low abundance to become extinct.

**Positive Feedback Loop**- A type of feedback that occurs when an increase in output leads to a further increase in output. This is sometimes known as a vicious cycle, since the more you have the more you get.

**Precision**- The range in which the best estimates of a true value approximates the true value.

**Predation**- Interaction between individuals of two species in which the outcome benefits one and is detrimental to the other. (See Parasitism, # 38)

**Primary Consumer** - An organism which is found near the very bottom of the food pyramid which consumes plant material. Butterflies are primary consumers.

**Primary Environmental Effects**- (The **On-Site** Effect) an environmental effect occurring at the location of the causal factors.

**Primary Pollutant**- Air pollutants emitted directly into the atmosphere. They include particulates, sulfur oxides, carbon monoxide, nitrogen oxides, and hydrocarbons.

**Primary Production** - The production by autotrophs.

**Primary Succession**- The initial establishment and development of an ecosystem that includes the process of creating soil.

**Primary Wastewater Treatment**- Removal of large particles and organic materials from wastewater through screening.

**Producer**- Any of various organisms (e.g., green plant) which produce their own organic compounds from simple precursors (such as carbon dioxide and inorganic nitrogen) and many of which are food sources for other organisms.

**Proven Reserves**- Estimated quantities of oil and gas which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

**Pseudoscience**- Ideas which are claimed to have scientific validity but are inherently untestable and/or lack empirical support and/or were arrived at through faulty reasoning or poor scientific methodology.

**Public Lands**- Any land or land interest owned by the federal government within the 50 states, not including offshore federal lands or lands held in trust for Native American groups.

**Quarries**- Open pits where stone or marble is extracted.

**Rad**- Radiation absorbed dose, a basic unit of absorbed dose of ionizing radiation representing an amount of energy absorbed per unit of absorbing material such as body tissue.

**Radioactive Waste**- Type of waste produced in the nuclear fuel cycle; generally classified as high level or low level.

**Radon Gas**- Naturally occurring radioactive gas. Radon is colorless, odorless, and tasteless and must be identified through proper testing.

**Ranks of Coal** - The classification of coal by degree of hardness, moisture and heat content. The major ranks, from lowest to highest quality, are lignite, subbituminous, bituminous and anthracite.

**RCRA** - A Federal law enacted in 1976 to address the treatment, storage, and disposal of hazardous waste.

**Reclamation**- The restoration of land and environmental values to a mining site after the coal is extracted. Reclamation operations are usually underway where the coal has already been taken from a mine, even as production operations

are taking place elsewhere at the site. This process commonly includes recontouring or reshaping the land to its approximate original appearance, restoring topsoil and planting native grasses, trees and ground covers.

**Recycle** - A part of the three R's of integrated waste management. Integral part of waste management that attempts to identify resources in the waste stream that may be collected and reused.

**Reduce**- To create less trash in the first place; the first and most important of the "3 R's." Buying less and using fewer materials in your daily life are ways to reduce.

**Reflection**- The phenomenon of a propagating wave (light or sound) being thrown back from a surface.

**Renewable Resources**- A resource, such as timber, water, or air, that is naturally recycled or recycled by artificial processes within a time framework useful for people.

**Replacement-Level Fertility**- Fertility rate required for the population to remain a constant size.

**Reproductive Strategies**- Behaviors that evolve to maximize an individual's reproductive success.

**Residence Time**- The average time an element of material spends in a reservoir.

Residents began making repeated complaints of strange odors and "substances" that surfaced in their yards. City officials were brought to investigate the area, but did not act to solve the problem

**Respiration**- The complex series of chemical reactions in organisms that make energy available for use. Water, carbon dioxide, and energy are the products of respiration. The chemical equation is  $C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O + \text{Energy}$  or **Glucose + Oxygen = Carbon Dioxide + Water + Energy**

**Respiratory System** - The bodily system that is involved in breathing. These include the nose, throat, larynx, trachea, bronchi, and lungs.

**Restricted Use Land** - Land that is only allowed limited amounts of recreation, hunting, and other human activities.

**Reuse** - With respect to waste management, reuse refers to finding ways to reuse production and materials so they need not be disposed of.

**Riparian Habitat** - A habitat that is strongly influenced by water and that occurs adjacent to streams, shorelines, and wetlands.

**Riparian Zones** - Thin strips and patches of land and vegetation that border streams.

**Risk** - The potential harm that may arise from some present process or from some future event.

**Risk Assessment** - The process of determining potential adverse environmental health effects to people following exposure to pollutants and other toxic materials. Generally includes the four steps of identification of the hazard, dose-response assessment, exposure assessment, and risk characterization.

**Risk Management** - The process of evaluating and selecting alternative regulatory and non-regulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors.

**Risk-Benefit Analysis** - The comparison of the risk of a situation to its related benefits.

**Rock Cycle**- A group of processes that produce igneous, metamorphic, and sedimentary rocks.

**Rodenticide**- A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc.

**Rotation Time** - Time between cuts of a stand or area of forest.

**Rowland & Molina**- CFCs were so chemically stable that nothing in the earth's lower atmosphere could break them apart. In 1974, however, chemists F. Sherwood Rowland and Mario Molina of the University of California at Irvine theorized that CFCs might in fact attack the ozone layer -- the critical band of ozone in the stratosphere that protects life on earth from harmful ultraviolet radiation. Rowland and Molina suspected that CFCs' nonreactivity, the very quality that made them so useful, would allow CFCs to drift, intact, 10 to 15 miles up above the earth, into the stratosphere. Here, the chemists predicted, short-wavelength ultraviolet radiation -- the powerful rays that the ozone layer absorbs and prevents from reaching the earth -- could break off a chlorine atom from a CFC molecule. This highly reactive, freed chlorine atom would grab onto ozone, setting off a chain reaction that would gobble up ozone molecules in the stratosphere, steadily weakening the ozone layer and exposing the earth and its inhabitants to ultraviolet rays -- radiation that could lead to skin cancer, eye cataracts, and immune system illnesses. Rowland and Molina's findings sparked a federal investigation, and scientists, policymakers, environmentalists and industry embarked on a contentious 13-year debate about ozone depletion. NRDC played a key role from the beginning, spurring state and federal action to ban CFCs in aerosol sprays, which were eliminated in the United States by 1978. But CFC producers and users continued to expand the chemicals' use in their many other applications, and industry fought hard against any further limitations. But scientists discovered that CFCs were powerful "greenhouse gases" that contribute to global warming, along with carbon dioxide and other pollutants. And in the mid-1980s, scientists found shocking proof of Rowland and Molina's theory -- the Antarctic Ozone Hole, a severe annual depletion of the ozone above Antarctica. The depletion above the South Pole was so pronounced, the British geophysicist who first measured it assumed his instruments must be broken and sent them back to England to be repaired. Once the depletion was verified through a series of NASA satellite photos, the Antarctic Ozone Hole became a worldwide symbol of humankind's potential to cause vast and unanticipated damage to the earth's fragile environment.

**r-strategists**- An organism that is characterized by: Small parental investment in the young. The prenatal period is short and postnatal care is minimal. To compensate, an r-strategist produces a large number of offspring, most of whom will not survive long enough to reproduce. The ability to rapidly exploit unpredictable environment opportunities. An example of this is, given a small patch of disturbed soil, dandelions can rapidly fill up the area.

**Ruminant**- Animals having a four-chambered stomach within which bacteria convert the woody tissue of plants to proteins and fats that, in turn, are digested by the animal. Cows, camels, and giraffes are ruminants; horses, pigs, and elephants are not.

**Saltwater Intrusion**- When salt water moves into the freshwater zone of an aquifer, making the water unfit for drinking.

**Sanitary Landfill** - A method of disposal of solid waste without creating a nuisance or hazard to public health or safety. Sanitary landfills are highly engineered structures with multiple barriers and collection systems to minimize environmental problems.

**Scattering** - A light shower that falls in some locations and not others nearby.

**Schistosomiasis** - A tropical disease spread by parasitic trematode worms, known as blood flukes, living in fresh water.

**Scientific Method**- The systematic methods by which scientists investigate natural phenomena, including gathering data, formulating and testing hypotheses, and developing scientific theories and laws.

**Scientific Model** - An approximation or simulation of a real system that omits all but the most essential variables of the system.

**Scientific Theory**- An explanation supported by many tests and accepted by a general consensus of scientists.

**Scrubber**- A chemical used in a process of removing sulfur from gases emitted from power plants burning coal. The gases are treated with a piece of lime and limestone, and the sulfur oxides react with the calcium to form insoluble calcium sulfides and sulfates that are collected and disposed of.

**Second Growth Forests** - Forest that has been clear-cut and re-grown.

**Secondary Consumer** - An organism that feeds on primary consumers, usually a carnivore.

**Secondary Environmental Effect**- (The **Off-Site Effect**) an environmental effect occurring away from the location of the causal factors.

**Secondary Pollutant**- Air pollutants produced through reactions between primary pollutants and normal atmospheric compounds. An example is ozone that forms over urban areas through reactions of primary pollutants, sunlight, and natural atmospheric gases.

**Secondary Production** - The production by heterotrophs.

**Secondary Succession**- The reestablishment of an ecosystem where there are remnants of a previous biological community.

**Secondary Wastewater Treatment** - Use of biological processes to degrade wastewater in a treatment facility.

**Secure Landfill**- A type of landfill designed specifically for hazardous waste. A secure landfill is similar to a modern sanitary landfill in that it includes multiple barriers and collection systems to ensure that Leachate does not contaminate soil and other resources.

**Sediment Pollution**- By volume and mass, sediment is our greatest water pollutant. It may choke streams, fill reservoirs, bury vegetation, and generally create a nuisance that is difficult to remove.

**Sedimentary Rock**- Rock formed from the consolidation of loose sediment or from chemical precipitation, such as sandstone and limestone.

**Seed Bank** - Place where seeds are stored for short-term use in farming or for long-term preservation.

**Seed Tree Cutting**- A logging method in which mature trees with good genetic characteristics and high seed production are preserved to promote regeneration of the forest. It is an alternative to clear-cutting.

**Selective Cutting** - In timber harvesting, the practice of cutting some, but not all, trees, leaving some on the site. There are many kinds of selective cutting. Sometimes the biggest trees with the largest market value are cut, and smaller trees are left to be cut later. Sometimes the best trees are left to provide seed for future generations. Sometimes trees are left for wildlife habitat and recreation.

**Septic Tank** - An underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank.

**Shelterbelts**- Single or multiple rows of trees and/or shrubs planted along roads and field borders to protect open fields from wind and sun.

**Shelterwood Cutting**- A logging method in which dead and less desirable trees are cut first; mature trees are cut later. This ensures that young, vigorous trees will always be left in the forest. It is an alternative to clear-cutting.

**Silent Spring** - Silent Spring was written by Rachel Carson and published in the spring of 1962. The book claimed detrimental effects of pesticides on the environment, particularly on birds. Carson accused the chemical industry of spreading disinformation, and public officials of accepting industry claims uncritically. She proposed instead an alternative biotic approach to pest control.

**Slash-and-Burn Agriculture** - The practice of cutting and burning a forested area to make way for agriculture, and then moving to another forested area after the previous area's agricultural productivity has been depleted.

**Smelting**- A process of heating and melting ores and concentrates and then separating the desirable molten metals such as copper from other elements.

**Societal Risk**- This is an indicator of the probability of multiple simultaneous fatalities occurring as a result of a disaster in a particular location or as a result of a particular high-risk activity, taking into account the number of people typically present in the vicinity of that location or activity.

**Soil Fertility**- The capacity of a soil to supply the nutrients and physical properties necessary for plant growth.

**Soil Salinization**- The build up of salts in soil over time until the soil is so salty (salinized) that seeds will no longer germinate in the soil.



**Solar Power**- The energy received directly and indirectly from the sun, as opposed to energy from primary or secondary energy from fuels.

**Solution Mining**- In the solution mining method of extraction, water is forced under pressure into a cavity which forms in the underground salt bed, as the salt dissolves. This turns the water into brine containing about 30% salt. The saturated raw brine is pumped to the purification plant where calcium, magnesium and other impurities are removed, prior to the evaporation process.

**Specialist Species**- A species with the ability to live in only one type of habitat, eat only a few types of food, or tolerate a narrow range of climatic or environmental conditions.

**Species**- A group of individuals capable of interbreeding.

**Species Diversity**- The number and variety of species found in a given area in a region.

**Species Dominance**- A dominant species is the most abundant, prevalent, or influential species in a given area.

**Species Evenness**- Relative abundance of species.

**Species Richness**- The total number of native species within a particular region.

**Stratopause**- The stratopause is the level of the atmosphere which is the boundary between the stratosphere and the mesosphere. In the stratosphere the temperature increases with altitude, and the stratopause is the section where a maximum in the temperature occurs.

**Stratosphere** - The layer of the atmosphere above the troposphere and below the mesosphere (between 10 km and 50 km), generally characterized by an increase in temperature with height.

**Strip Cutting** - In timber harvesting, the practice of cutting narrow rows of forest, leaving wooded corridors.

**Strip Mining**- Surface mining in which the overlying layer of rock and soil is stripped off to reach the resource. Large strip mines are some of the largest excavations caused by people in the world.

**Subsidence** - A settling or otherwise lowering of parts of the crust of the Earth.

**Subsistence Crop**- Crops used directly for food by a farmer or sold locally where the food is used directly.

**Subsurface Mining** - The extracting ore or minerals from under the Earth's surface.

**Surface Mining** - The removal of a mineral by stripping off the overburden, removing the mineral, and then replacing the overburden and topsoil; the removal of soil, sub-soil, and other strata and then extracting a mineral deposit found fairly close to the earth's surface.

**Survivorship Curve**- Survivorship curves are the graphs of a species survival rate in a given ecosystem.

- Type I survivorship curves are for species that have a high survival rate of the young, live out most of their expected life span and die in old age. Humans are a good example of a species with a Type I survivorship curve.
- Type II survivorship curves are for species that have a relatively constant death rate throughout their life span. Death could be due to hunting or diseases. Examples of species exhibiting a Type II survivorship curve are coral, squirrels, honey bees and many reptiles.
- Type III survivorship curves are found in species that have many young, most of which die very early in their life. Plants, oysters and sea urchins are examples of species that have Type III survivorship curves.

**Sustainability**- With respect to resources, it involves management that has the objective of ensuring that future generations will have the opportunity to use their fair share of resources and will inherit a quality environment. In an economic sense, the concept means development that will not cause irreparable damage to the environment while ensuring that future generations will inherit their fair share of all Earth's resources.

**Sustainable Agriculture**- Environmentally friendly methods of farming that allow the production of crops or livestock without damage to the farm as an ecosystem, including effects on soil, water supplies, biodiversity, or other surrounding natural resources.

**Symbiosis**- An interaction between individuals of two different species that benefits both. For example, lichens contain an alga and a fungus that require each other to persist. Sometimes this term is used broadly, so that domestic corn and people could be said to have a symbiotic relationship—domestic corn cannot reproduce without the aid of people, and some people survive because they have corn to eat. (See **Mutualism** )

**Synergism** - Cooperative action of different substances such that the combined effect is greater than the sum of the effects taken separately.

**Synergistic Effect**- When the change in availability of one resource affects the response of an organism to some other resource.

**Synergy**- The simultaneous joint action of separate parties which, together, have greater total effect than the sum of their individual effects.

**Synfuels**- Synthetic fuels, which may be liquid or gaseous, derived from solid fuels, such as oil from kerogen in oil shale or oil and gas from coal.

**Taiga/Boreal Forest**- A moist sub-arctic coniferous forest that begins where the tundra ends and is dominated by spruces and firs.

**Tailings**- The material that remains after all metals considered economic have been removed from ore during milling.

**Temperate (Deciduous) Forest**- A terrestrial biome with a temperate climate where one or two species of deciduous trees predominate.

**Temperate Grassland**- The grassland biome consists of a 'fire climax' type that would be populated by shrubs either with the absence of fire, or with extensive grazing.

**Temperate Rain Forest**- A type of forest that exists in cool but generally frost-free regions of heavy annual precipitation. It consists mainly of mixed deciduous trees, usually with one dominant species. With the onset of winter the forest becomes dormant and remains so until spring, when it resumes active growth.

**Temperate Shrub Land**- This is a drier vegetation type that encompasses most semi-arid vegetation types from Chaparral to mesquite woodlands to cold, semi-desert sage shrub lands. The actual vegetation associated with this type is very susceptible to variation depending on soils, topography, fire, grazing, and land-use history. Distinctions between shrub-steppe and grassland are sometimes difficult to quantify, given that each usually contains elements of both grass and woody vegetation. The relative abundance of the two functional types is considered in determining the classification, but there are no generally accepted rules to indicate how much woody vegetation is sufficient to label a region a shrub land, or conversely how much grass is required to label it as grassland.

**Temperate Woodlands**- Temperate woodlands are mainly made up of deciduous trees that grow their leaves in the spring and drop them in autumn, shrubs, grasses and many types of ferns and flowers.

**Temperature Inversion**- One of the weather conditions that is often associated with serious smog episodes in some portions of the country. In a temperature inversion, air doesn't rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground.

**Teratogens**- Substances that will cause birth defects or malformations.

**Tertiary Consumer** - A high-level consumer, which is usually the top predator in an ecosystem and/or food chain.

**Tertiary Wastewater Treatment** - Advanced form of wastewater treatment involving chemical treatment or advanced filtration. An example is chlorination of water.

**The Clean Air Act**- A federal law passed in 1970 and amended in 1977 and 1990 which forms the basis for the national air pollution control effort. Basic elements of the act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

**The Mining Law of 1872**- The General Mining Law of 1872 is an antiquated statute that allows mining companies to take valuable hardrock minerals including gold, silver, and uranium from public lands without royalty payment to the taxpayer -- unlike other mining industries that extract coal, oil or natural gas. Signed into law by President Ulysses S. Grant, the law not only gives away public minerals, but it also offers public land for sale at \$5 an acre -- 1872 prices.

**The Rule of 70**- states that to find the doubling time of a quantity growing at a given annual percentage rate, divide the percentage number into 70 to obtain the approximate number of years required to double. For example, at a 10% annual growth rate, doubling time is  $70 / 10 = 7$  years.

**Thermal Pollution** - A type of pollution that occurs when heat is released into water or air and produces undesirable effects on the environment.

**Thermosphere** - The outermost layer of the atmosphere, where gas molecules split apart into ions.

**Thinning**- Thinning is in forestry a type of selective cutting primarily undertaken to make the forest more profitable in an upcoming final felling. Most of the harvest in thinning is pulpwood as only mature trees are suitable for timber.

**Threatened Species** - Species experiencing a decline in the number of individuals to the degree that a concern is raised about the possibility of extinction of that species.

**Three Gorges Dam** - The Three Gorges Dam () spans the Yangtze River (third longest in the world) at Sandouping, Yichang, Hubei province, China. Construction began in 1994. It will be the largest hydroelectric dam in the world when completed in 2009. The reservoir began filling on June 1, 2003, and will occupy the present position of the scenic Three Gorges area, between the cities of Yichang, Hubei; and Fuling, Chongqing Municipality.

**Three Mile Island, Pennsylvania**- Three Mile Island is the location of a U.S. nuclear power plant that, on March 28, 1979, suffered a partial core meltdown. The accident unfolded over the course of five tense days, as a number of agencies at the federal, state, and local level attempted to diagnose the problem (the full details of the accident were not discovered until much later), and decide whether or not the on-going accident required a full evacuation of the population. In the end, the reactor was brought under control. No identifiable injuries due to radiation occurred (a government report concluded that "the projected number of excess fatal cancers due to the accident ... is approximately one."), but the accident had serious economic and public relations consequences, and the cleanup process was slow and costly. It also furthered a minor decline in the public popularity of nuclear power, exemplifying for many the worst fears of nuclear technology, and until the Chernobyl accident seven years later was considered the world's worst civilian nuclear accident.

**Threshold Concentration** - The concentration level in which below the threshold, effects of a drug are not observable and above the threshold, effects become apparent.

**Total Fertility Rate**- Average number of children expected to be born to a woman during her lifetime.

**Toxic** - Meaning harmful, deadly, or poisonous.

**Toxic Waste**- A waste that can produce injury if inhaled, swallowed, or absorbed through the skin.

**Toxicity**- The potential of a substance to exert a harmful effect on humans or animals and a description of the effect and the conditions or concentration under which the effect takes place; The extent, quality or degree of being poisonous.

**Toxicology**- The science concerned with study of poisons (or toxins) and their effects on living organisms. The subject also includes the clinical, industrial, economic, and legal problems associated with toxic materials.

**Traditional Subsistence Agriculture**- Self-sufficient agriculture, usually small-scale and low-tech, primarily for direct consumption by the local population or by the owner's family.

**Tragedy of the Commons** - An excessive use of an open access resource to the point where the resource is damaged or destroyed.

**Transform Fault**- Break in the earth's crust where two plates slide past each other. This is another name for a strike-slip fault.

**Trophic level**- In an ecological community, all the organisms that are the same number of food-chain steps from the primary source of energy. For example, in grassland the green grasses are on the first trophic level, grasshoppers on the second, birds that feed on grasshoppers are on the third, and so forth.

**Trophic-level Efficiency**- The ratio of the biological production of one trophic level to the biological production of the next lower trophic level.

**Tropical Forests**- Tropical forests are found between the Tropic of Cancer and Tropic of Capricorn. Tropical forests are in a climate where there is no winter or frost so the leaves stay on the trees year-round. Tropical forests have only two seasons – wet and dry.

**Tropical Rain Forest**- A type of biome that exists in tropical regions where precipitation is heavy, generally more than 250 cm (98 in.) per year. It consists mainly of a wide variety of lofty trees, which carry profusion of parasitic or climbing plants, and, in some portions, a “jungle” of dense undergrowth near the ground. For lack of marked climatic seasons, growth proceeds throughout the year.

**Tropical Seasonal Forest**- A tropical forest that is characterized by the greatest diversity of species. They occur near the equator, within the area bounded by latitudes 23.5 degrees N and 23.5 degrees S. One of the major characteristics of tropical forests is their distinct seasonality: winter is absent, and only two seasons are present (rainy and dry). The length of daylight is 12 hours and varies little.

**Tropopause** - The boundary between the troposphere and stratosphere, characterized by an abrupt change in temperature lapse rate (temperatures decrease with height in the troposphere, but increase or remain constant with height in the stratosphere).

**Troposphere**- The lowermost portion of Earth's atmosphere and the one in which most weather phenomena occur. The greenhouse effect also occurs in the troposphere.

**Tundra**- The treeless land area in alpine and arctic areas characterized by plants of low stature and including bare areas without any plants and covered areas with lichens, mosses, grasses, sedges, and small flowering plants, including low shrubs.

**U.S. Bureau of Land Management**- The Bureau of Land Management (BLM) is an agency within the United States Department of the Interior which administers America's public lands, totaling 262 million acres (1,060,000 km) or one-eighth of the landmass of the country.

**U.S. Endangered Species Act** - The Endangered Species Act of 1973 instructs federal agencies to carry out programs to conserve endangered and threatened species and to conserve the ecosystems on which these species depend.

**U.S. Fish and Wildlife Service**- The United States Fish and Wildlife Service is a unit of the United States Department of the Interior that is dedicated to managing and preserving wildlife.

**U.S. Forest Service** - The USDA Forest Service, a United States government agency within the United States Department of Agriculture, is under the leadership of the United States Secretary of Agriculture and protects and manages forests in the U.S.

**U.S. National Park Service**- The National Park Service (NPS) is the United States Federal Government agency that deals with all National Parks, many National Monuments, and other conservation properties with various designations.

**Ubiquitous Species**- Species that are found almost anywhere on Earth.

**Ultraviolet Light** - A form of invisible light in sunlight that is responsible for the tanning and burning of skin and can cause cataracts and skin cancer.

**Unconfined Aquifer**- An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.

**Undernutrition (Undernourishment)** – The lack of sufficient calories in available food, so that one has little or no ability to move or work.

**Uneven-Aged Stands** - Forest area with at least three distinct age classes.

**Upwelling**- The movement of nutrient rich waters from the bottom of the ocean to the surface.

**Uranium-235**- The lighter of the two main isotopes of uranium. Uranium 235 makes up less than 1 percent of the uranium that is mined from the ground. It has a half-life of 714 million years. Uranium 235 is the only naturally occurring fissile element.

**Urban Forestry**- The practice and profession of planting and maintaining trees in cities, including trees in parks and other public areas. It involves determining the best species and sites for urban tree planting, taking into account climate, soil, shading from tall buildings, and motor vehicle pollution.

**Urban Sprawl**- The unplanned expansion of development over a large area.

**Urbanization**- Increasing demographic concentration of the human population into cities.

**Utilitarian Justification** (for the conservation of nature) - An argument for the conservation of nature on the grounds that the environment, an ecosystem, habitat, or species, provides individuals with direct economic benefit or is directly necessary to their survival.

**UVA** - The type of ultraviolet radiation that is least energetic form of ultraviolet radiation. It is capable of causing some damage to living cells, is not affected by stratospheric ozone, and is therefore transmitted to Earth.

**UVB**- The type of ultraviolet radiation with an intermediate wavelength and causes damages living cells. Most is absorbed by stratospheric ozone, and therefore the depletion of ozone leads to a significant increase of this radiation. This is the ozone problem.

**UVC**- UVC is the type of ultraviolet radiation with the shortest wavelength and also the most energy. It is strongly absorbed in the atmosphere and negligible amounts reach the surface of the Earth.

**Valdez, Alaska**- On March 24, 1989 the oil tanker Exxon Valdez ran aground on Bligh Reef in Prince William Sound, Alaska, spilling an estimated 11 million gallons of crude oil across 1,300 miles of coastline - a catastrophic event that lead to one of the most thorough examinations of the effects of oil on the environment. While the vast majority of the spill area now appears to have recovered, pockets of crude oil remain in some locations, and there is evidence that some damage is continuing.

**Vector**- An insect or other organism capable of transmitting germs or other agents of disease.

**Visible Light** - Electromagnetic radiation that human eyes can detect, which is also known as the visible spectrum. The visible colors are red, orange, yellow, green, blue, indigo, and violet, along with various combinations and shades of these colors.

**Volatile Organic Compounds (VOCs)** - A principal component in atmospheric reactions that form ozone and other photochemical oxidants. VOCs are emitted from diverse sources, including automobiles, chemical manufacturing facilities, drycleaners, paint shops and other commercial and residential sources that use solvent and paint. The term, volatile organic compound is defined in federal rules as a chemical that participates in forming ozone.

**Water (Hydrologic) Cycle**- Circulation of water from the oceans to the atmosphere and back to the oceans by way of evaporation, runoff from streams and rivers, and groundwater flow.

**Water Logging**- The process when water is applied to a field that is not adequately drained, causing a build up of water in the root zone, which in turn creates conditions unsuitable for plant growth.

**Water Table**- The surface that divides the zone of aeration from the zone of saturation; the surface below which all the pore space in rocks is saturated with water.

**Watershed** - An area of land that forms the drainage of a stream or river. If a drop of rain falls anywhere within a watershed, it can flow out only through the same stream.

**Weather**- Weather is the specific condition of the atmosphere at a particular place and time. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season.

**Wetland** - Comprehensive term for landforms such as salt marshes, swamps, bogs, prairie potholes, and vernal pools. Their common feature is that they are wet at least part of the year and as a result have a particular type of vegetation and soil. Wetlands form important habitats for many species of plants and animals, while serving a variety of natural service functions for other ecosystems and people.

**Whooping Crane** - A rare and endangered North American bird having black-and-white plumage and a trumpeting call that is the tallest bird in North America.

**William Mulholland** - A prominent and influential water-services engineer in Southern California who created the 233-mile Los Angeles Aqueduct, completed in November, 1913. The aqueduct took water from the Owens Valley in Central California in a massive public works project requiring over 2000 workers and 164 tunnels. Water traveling through the aqueduct from the Owens River reached a reservoir in the San Fernando Valley on November 5. At a ceremony that day Mulholland spoke his most famous words about this monumental engineering feat and the fact that the water had been brought to Los Angeles, "There it is. Take it."

**Wind Power**- Alternative energy source that has been used by people for centuries. More recently thousands of windmills have been installed to produce electric energy.

**Yucca Mountain, Nevada**- A site on, and adjacent to, the Nevada Test Site that is being examined to determine whether it is suitable for use as a geologic repository for the Department's high-level wastes and spent fuel from commercial nuclear reactors.

**Zebra Mussel**- An exotic mussel that has infested US water and threatens our fisheries. Looks like zebra stripe little clams, and they attach to boats, trailers, docks, etc. Use care when boating in areas with this creature. Inspect your boat and trailer prior to launching in another body of water.

**Zero Population Growth** - A population in which the number of births equals the number of deaths so that there is no net change in the size of the population.

**Zooplankton** - Small aquatic invertebrates that live in the sunlit waters of streams, lakes, and oceans and feed on algae and other invertebrate animals.