

watershed: The entire area of land from which water drains into a given river.

phosphorus: The chemical elements with 15 protons and 15 neutrons. An abundant element in the lithosphere, a key element in macromolecules, and a crucial plant nutrient.

hypoxia: The condition of extremely low dissolved oxygen concentrations in a body of water.

system: A network of relationships among a group of parts, elements, or components that interact with and influence one another through the exchange of energy, matter, and/or information.

feedback loop: A circular process in which a system's output serves as input to that same system.

negative feedback loop: A feedback loop in which output of one type acts as input that moves the system in the opposite direction. The input and output essentially neutralize each other's effects, stabilizing the system.

positive feedback loop: A feedback loop in which output of one type acts as input that moves the system in the same direction. The input and output drive the system further toward one extreme or another.

dynamic equilibrium: The state reached when processes within a system are moving in opposing directions at equivalent rates so that their effects balance out.

homeostasis: The tendency of a system to maintain constant or stable internal conditions.

emergent properties: A characteristic that is not evident in a system's components.

runoff: The water from precipitation that flows into streams, rivers, lakes, and ponds, and (in many cases) eventually to the ocean.

airshed: The geographic area that produces air pollutants likely to end up in a waterway.

eutrophication: The process of nutrient enrichment, increased production of organic matter, and subsequent ecosystem degradation in a water body.

lithosphere: The outer layer of Earth, consisting of crust and uppermost mantle and located just above the asthenosphere. More generally the solid part of Earth, including the rocks, sediment, and soil at the surface and extending down many miles underground.

atmosphere: The layer of gases surrounding planet Earth.

hydrosphere: All water—salt or fresh, liquid, ice, or vapor—in surface bodies, underground and in the atmosphere.

biosphere: The sum total of all the planet's living organisms and the nonliving portions of the environment with which they interact.

ecosystem: In ecology, an assemblage of all organisms and nonliving entities that occur and interact in a particular area at the same time.

estuary: An area where a river flows into the ocean, mixing fresh water with saltwater.

primary production: The conversion of solar energy to the energy of chemical bonds in sugar during photosynthesis, performed by autotrophs.

gross primary production: The energy that results when autotrophs convert solar energy (sunlight) to energy of chemical bonds in sugars through photosynthesis. Autotrophs use a portion of this production to power their own metabolism, which entails oxidizing organic compounds by cellular respiration.

net primary production: The rate at which net primary production is produced.

secondary production: The total biomass that heterotrophs generate by consuming autotrophs.

productivity: The rate at which plants convert solar energy (sunlight) to biomass. Ecosystems whose plants convert solar energy to biomass rapidly are said to have high productivity.

net primary productivity: The rate at which net primary production is produced.

nutrient: An element or compound that organisms consume and require for survival.

macronutrients: Elements and compounds required in relatively large amounts by organisms.

micronutrients: Elements and compounds required in relatively small amounts by organisms. (zinc, copper, iron)

ecotones: A transitional zone where ecosystems meet.

landscape ecology: The study of how landscape structure affect the abundance, distribution, and interaction of organism. This approach to the study of organisms and their environments at the landscape scale focuses on broad geographic areas that include multiple ecosystems.

patch: In landscape ecology, spatial areas within a landscape. Depending on a researcher's perspective, patches may consist of habitat for a particular organism, or communities, or ecosystems.

mosaic: In landscape ecology, a spatial configuration of patches arrayed across a landscape.

metapopulation: A network of subpopulations, most of whose members stay within their respective landscape patches, but some of whom move among patches or mate with members of other patches.

conservation biology: A scientific discipline devoted to understanding the factors, forces, and processes that influence the loss, protection, and restoration of biodiversity within and among ecosystems.

geographic information system (GIS): Computer software that takes multiple types of data (for instance, on geology, hydrology, vegetation, animal species, and human development) and overlays them on a common set of geographic coordinates. It is used to create a complete picture of a landscape and to analyze how elements of the different datasets are arrayed spatially and how they may be correlated. A common tool of geographers, landscape ecologists, resource managers, and conservation biologists.

model: A simplified representation of a complex natural process, designed by scientists to help understand how the process occurs and to make predictions.

ecological modeling: The practice of constructing and testing models that aim to explain and predict how ecological systems function.

nutrient cycle: The comprehensive set of cyclical pathways by which a given nutrient moves through the environment. (or biogeochemical cycle)

biogeochemical cycles: The comprehensive set of cyclical pathways by which a given nutrient moves through the environment. (or nutrient cycle)

reservoir: (1) An artificial water body behind a dam that stores water for human use. (2) A location in which nutrients in a biogeochemical cycle remain for a period of time before moving to another reservoir. Can be living or nonliving entities.

residence time: (1) In a biogeochemical cycle, the amount of time a nutrient typically remains in a given reservoir before moving to another. (2) In the atmosphere, the amount of time a gas molecule or a pollutant typically remains aloft.

flux: The movement of nutrients among reservoirs in a nutrient cycle.

source: In a nutrient cycle, a reservoir that releases more nutrients than it accepts. (or sink)

sink: In a nutrient cycle, a reservoir that accepts more nutrients than it releases. (or source)

hydrologic cycle: The flow of water—in liquid, gaseous, and solid forms—through our biotic and abiotic environment.

evaporation: The conversion of a substance from a liquid to a gaseous form.

transpiration: The release of water vapor by plants through their leaves.

precipitation: Water that condenses out of the atmosphere and falls to Earth in droplets or crystals.

groundwater: Water held in aquifers underground.

aquifers: An underground water reservoir.

water table: The upper limit of groundwater held in an aquifer.

carbon cycle: A major nutrient cycle consisting of the routes that carbon atoms take through the nested networks of environmental systems.

nitrogen cycle: A major nutrient cycle consisting of the routes that nitrogen atoms take through the nested networks of environmental systems.

nitrogen fixation: The process by which inert nitrogen gas combines with hydrogen to form ammonium ions (NH_4^+), which are chemically and biologically active and can be taken up by plants.

nitrogen-fixing bacteria: Bacteria that live independently in the soil or water, or those that form mutualistic relationships with many types of plants and provide nutrients to the plants by converting gaseous nitrogen to a usable form.

nitrification: The conversion by bacteria of ammonium ions (NH_4^+) first into nitrite ions (NO_2^-) and then into nitrate ions (NO_3^-).

denitrifying bacteria: Bacteria that convert the nitrates in soil or water to gaseous nitrogen and release it back into the atmosphere.

bottleneck: In environmental science, a step in a process that limits the progress of the overall process.

Haber-Bosch process: A process to synthesize ammonia on an industrial scale. The process has enabled humans to double the natural rate of nitrogen fixation on Earth and thereby increase agricultural productivity, but it has also dramatically altered the nitrogen cycle.

phosphorus cycle: A major nutrient cycle consisting of the routes that phosphorus atoms take through the nested networks of environmental systems.