

GLOSSARY

Many of the definitions listed in this section were taken from other Project Learning Tree materials, specifically the *PreK-8 Environmental Education Activity Guide*, *Exploring Environmental Issues: Focus on Forests*, *Exploring Environmental Issues: Biodiversity*, and the *Energy & Society Activity Guide*. Other definitions come directly from three sources available on the Internet: the U.S. Forest Service's *Climate Change Glossary*; and two documents from the U.S. Environmental Protection Agency, *Glossary of Climate Change Terms* and *A Student's Guide to Global Climate Change*. Please see the reference list at the end of this glossary for the full citations for these and other sources consulted and cited.

Adaptation: Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change includes actions taken by humans to avoid, benefit from, or deal with actual or expected climate change impacts. Adaptation can take place in advance (by planning before an expected impact occurs) or in response to changes that are already occurring.

Afforestation: The planting of new forests on lands that historically have not had forests.

Albedo: The fraction of incoming solar radiation that is reflected from an object or surface (State Climate Office of North Carolina, n.d.).

Alleles: The alternative states of a particular gene (McCall, 2012).

Atmosphere: The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen and oxygen, together with a number of trace gases, such as argon, helium, carbon dioxide, and ozone. In addition the atmosphere contains water vapor, clouds, and aerosols.

ATP (Adenosine Triphosphate): A molecule used as an energy source in many biochemical reactions in living things (USFS, 2003).

Balancing feedback loop: A closed sequence of causes and events that tends to resist change in a complex system. Also known as a negative feedback loop.

Best management practices (BMPs): Acceptable and effective practices that can be implemented to prevent or reduce water pollution and promote soil conservation. Usually BMPs are applied as a system of practices rather than a single practice (NCFS, 2011; USFS, 2004).

Biodiversity: The variety and complexity of species present and interacting in an ecosystem and the relative abundance of each.

Biomass: The total weight of all living matter in a particular area at a given moment in time. Some kinds of biomass, such as wood and corn (after conversion to ethanol), can be burned to produce energy.

Carbon cycle: The movement of carbon (flux), in its various forms, from one place (pool) to another through various chemical, physical, geological, and biological processes.

Carbon dioxide (CO₂): A naturally occurring gas that is also a by-product of human activities, such as burning fossil fuels and biomass. Carbon dioxide is a greenhouse gas.

Carbon dioxide equivalent: Basic unit for measuring the global warming potential of emissions that is expressed in terms of the amount of carbon dioxide that would cause the same amount of warming. For example, over a period of 100 years, 1 pound of methane will trap

as much heat as 25 pounds of carbon dioxide. Thus, 1 pound of methane is equal to 25 pounds of carbon dioxide equivalents (BBC, 2010).

Carbon flux: Process or rate by which carbon moves from one pool to another.

Carbon footprint: A measure of how much carbon dioxide a person, organization, or product produces—directly or indirectly—in a certain amount of time (usually a year).

Carbon pool: Any place where carbon can be found, such as plants, soils, the atmosphere, or fossil fuels. Carbon pools can also be called *stocks* or *reservoirs*.


Carbon savings: Reductions in atmospheric carbon dioxide that result from using products, such as wood, which sequester carbon, instead of products that cause more carbon to be put into the atmosphere, such as concrete.

Carbon sequestration: Process of capturing and storing atmospheric carbon dioxide into above- or below-ground carbon pools, such as plant biomass, through photosynthesis or into soils by plant decomposition.

Carbon sink: A carbon pool that absorbs and stores more carbon than it releases over some period of time, which helps to offset greenhouse gas emissions. Examples include the ocean, mature forests, and soil.

Carbon source: A carbon pool that releases more carbon than it absorbs over some period of time. Examples include the burning of fossil fuels, forest fires, and livestock.

Carbon storage: The amount of carbon that exists in a tree's leaves and stem at a particular point in time. This



is the total amount of carbon that is captured from the atmosphere during photosynthesis as well as the amount of carbon sequestered by the tree.

Causal loop diagram: A tool used to visualize and analyze causal relationships in complex systems. Also referred to as a “systems diagram” in this module.

Chromosome: A rod-like body found in the cell nucleus that contains genes (McCall, 2012).

Climate change: Major changes in average temperature, precipitation, or wind patterns, among others, that occur over several decades or longer as a result of changes in Earth’s atmosphere.

Climate: The long-term average weather conditions in a particular location or region at a particular time of the year. Climate is not the same as weather.

Clinometer: An instrument that uses trigonometry to determine the height of a tree.

Composition: The species that constitute a plant or forest ecosystem (SAF, 1998).

Conservation: The use of natural resources in a way that assures a continuing availability to future generations; the intelligent use of natural resources for long-term benefits.

Decomposition: The chemical and mechanical breakdown of matter into simpler parts by bacteria, fungi, and other organisms.

Deforestation: The removal of a forest stand where the land is put to a nonforest use (SAF, 1998).

Diameter at breast height (DBH): The diameter of a tree as measured at breast height. Standard DBH is measured at 1.4 meters (4.5 feet) above the ground.

Dry weight: The weight of the tree when it is dried in an oven and all water was taken out.

Ecosystem: A system of interacting living organisms together with their physical environment. The boundaries of what could be called an ecosystem are somewhat arbitrary, depending on the focus of interest or study. Thus, the extent of an ecosystem may range from very small spatial scales to the entire Earth.

El Niño-Southern Oscillation (ENSO): An atmosphere-ocean phenomenon that results from El Niño, a warm-water current that periodically flows along the coast of Ecuador and Peru, and the Southern Oscillation, a fluctuation of the intertropical surface pressure pattern and circulation in the Indian and Pacific Oceans. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific and affects climate in many other parts of the world.

Emissions: In the climate change context, emissions refer to the release of greenhouse gases, precursors of greenhouse gases, and aerosols into the atmosphere over a specified area and period of time.

Evaporation: A physical change of state in which a liquid is transformed into a vapor or gas.

Exponential growth: An increase that begins slowly and then becomes increasingly more rapid over time.

Extension: A non-formal education program that provides scientific knowledge and expertise to the public, as part of the mission of land-grant universities.

Externality: An impact on a third party caused by a decision made by a producer or consumer. Externalities can be social or environmental and either positive or negative (Biz/ed, 2012).

Family: In the context of the genetic research of pine tree traits, a family consists of individuals that share one or both parents. (This is different from a botanical

“family” which is a classification of related genera and species.)

Flow: A material or information that increases or decreases a stock at some rate over a period of time (Ponto & Linder, 2011).

Forest health: The ability of a forest ecosystem to remain productive, resilient, and stable over time and to withstand the effects of periodic natural or human-caused stresses such as climate changes, disease, drought, flood, insect attack, resource demands, and resource management practices.

Forest management: The practical application of biological, economic, and social sciences to the administration of a forest.

Forest product substitution: The practice (in the building of homes and other buildings, for example) of using wood instead of other products, such as concrete or steel.

Forester: A person professionally trained in and applying principles and practices for managing, using, and enjoying forests.

Fossil fuel: Coal, oil, natural gas, and other energy sources that formed by natural processes in the ground over millions of years from the remains of ancient plants and animals.

Genes: Small parts of DNA that carry the genetic code (McCall, 2012).

Genetic diversity: The genetic variation present in a population or species.

Genetic fitness: The reproductive success of a genotype, usually measured as the number of offspring produced by an individual that survive to reproductive age relative to the average for the population.

Genotype: The genetic makeup of an individual.

Global warming potential

(GWP): A measure of how much heat a substance can trap in the atmosphere. GWP can be used to compare the effects of different greenhouse gases. For example, methane has a GWP of 25, which means over a period of 100 years, 1 pound of methane will trap 25 times more heat than 1 pound of carbon dioxide (which has a GWP of 1).

Global warming: An increase in the average surface temperature on Earth.

Grasslands: A vegetative community in which grasses are the dominant plants.

Green weight: An estimate of the weight of the tree when it is alive. This weight includes all parts of the tree and any water that is in the tree.

Greenhouse effect: The trapping of heat in Earth's atmosphere by gases, such as carbon dioxide, methane, nitrous oxide, and water vapor; that results in an increase in temperature at Earth's surface.

Greenhouse gases: Gases in Earth's lower atmosphere that trap heat and affect the average temperature on Earth. Examples are carbon dioxide, chlorofluorocarbons, ozone, methane, water vapor, and nitrous oxide.

Greenhouse gas emissions: The release of greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, into the atmosphere.

Groundwater: Water that infiltrates through the soil and into clay and limestone layers and is stored in slowly creeping and slowly renewed underground reservoirs called “*aquifers*.”

Habitat: An area that provides an animal or plant with adequate food, water, shelter, and living space in a suitable arrangement.

Harvest: To cut down trees for human use.

Heterozygous: An individual whose alleles for a particular trait are different (McCall, 2012).

Hydrocarbons: Organic compounds that occur in fossil fuels that contain only hydrogen and carbon.

Industrial private forest

landowner: An ownership class of forestland that is administered by entities that are legally incorporated (Butler & Wear, 2011).

Invasive species: A type of plant, animal, or other organism, usually not native to the area it affects, which can spread quickly and can cause harm to the economy, the environment, or human health.

Life cycle assessment (LCA): A technique to assess the environmental aspects and potential impacts associated with all life cycle stages of a product, process, or service. This information can be used by scientists, policymakers, and citizens to make decisions about products to produce and/or purchase (U.S. Environmental Protection Agency, 2006).

Limestone: A type of sedimentary rock that is composed mostly of calcium carbonate and is often formed when ocean sediments, containing the shells of marine animals, are compressed and buried under the ocean floor. Limestone is a long-term carbon sink that can store carbon for hundreds of millions of years (Riebeek, 2011).

Long-lived wood product: Wood products—such as lumber used in housing—that store carbon for many years. The lifespan of lumber in housing is often estimated to be 80 years (Lippke et al., 2012).

Mitigation: A human intervention to reduce the human impact on the climate system. This may include actions and strategies to reduce sources of

greenhouse gases or increase the amount of carbon dioxide being removed from the atmosphere.

Model: A quantitative tool that combines data from many variables and uses mathematical equations to approximate processes and systems over time. Climate models represent the interactions of the atmosphere, oceans, land surface, and ice; can range from relatively simple to quite comprehensive; and can be used to simulate climate and make climate predictions.

Naturally regenerated forest: A forest where trees primarily reproduce from seed, sprouts, or root suckers of trees on or that formerly occupied the land (Virginia Department of Forestry, 2014).

Negative externality: A cost (harmful impact) incurred by a third party due to a decision made by a producer or consumer (Biz/ed, 2012).


Non-industrial private forest

landowner: An ownership class of forestland that is held by families (including trusts, estates and partnerships), individuals, or other unincorporated groupings of individuals, such as recreational clubs, or Native American lands (Butler & Wear, 2011).

Nonrenewable resource: A substance that once used cannot be replaced in this geological age. Examples are oil, gas, coal, copper, and gold.

Nontimber forest products: All forest products except timber. Examples are resins; oils, leaves and bark; fungi; plants that produce berries, fibers, or flowers for human use; and animals or animal products.

Ocean acidification: Increased concentrations of carbon dioxide in seawater that cause a measurable increase in acidity (i.e., a reduction in ocean pH). This reduces calcification



rates of organisms such as corals, mollusks, algae, and crustaceans.

pH: A measure of the acidity or alkalinity of a material. The pH scale is 0 to 14; 7 represents a neutral state; 0, the most acidic; and 14, the most alkaline.

Phenotype: A characteristic of an animal, plant, or other organism that can be seen or measured. Examples are eye color, tree diameter, tree height, or even number of branches (McCall, 2012).

Photosynthesis: The process by which green plants produce oxygen and glucose, a carbon-based molecule, in the presence of carbon dioxide, sunlight, and water.

Plantation: A forest established by planting seeds or seedlings.

Positive externality: A beneficial impact on a third party due to a decision made by a producer or consumer (Biz/ed, 2012).

Precipitation: Water from the atmosphere that falls to the ground. Examples include rain, mist, snow, sleet, and hail.

Prescribed fire: Any planned fire ignited in a natural area by trained professionals under appropriate weather and safety conditions to meet specific objectives, including the reduction of wildfire risk and the maintenance or restoration of fire-dependent ecosystems.

Product life cycle: The many steps that go into creating, using, and disposing of a product. Life cycle includes the acquisition of raw materials, bulk material processing, engineered materials production, manufacture and assembly, use, retirement, and disposal of residuals produced in each stage (U.S. Environmental Protection Agency, 2006).

Productivity: The rate of generation of biomass in an ecosystem.

Progeny: An offspring of a plant or animal.

Projection: Description of how future climate is expected to respond to various scenarios of the factors that might affect climate change, such as population growth, greenhouse gas emissions, and land development patterns.

Recycle: The practice of reprocessing waste materials (such as glass, plastic, paper, and aluminum) so that they can be used to manufacture new products.

Reinforcing feedback loop: A closed sequence of causes and events that tends to amplify change in a complex system. Also known as a positive feedback loop.

Renewable resource: A naturally occurring raw material or form of energy that has the capacity to replenish itself through ecological cycles and sound management practices. The sun, wind, falling water, and trees are examples of renewable resources.

Resilience: The ability of an ecosystem or species to remain whole and functioning as it copes with stress (The Conservation Fund, 2013).

Respiration: The process whereby living organisms extract energy from carbon-containing molecules, releasing carbon dioxide and consuming oxygen.

Scientific uncertainty: The range of values within which the true value is likely to fall (Understanding Science, 2013).

Sea level rise: An increase in the mean level of the ocean.

Sediment: Solid mineral and organic material that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice.

Service learning: A teaching strategy that integrates meaningful community activity with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.

Sequestration: See carbon sequestration.

Short-lived wood products: Wood products, such as paper, that store carbon for a relatively shorter time frame when compared to long-lived wood products such as housing lumber. Carbon is returned to the atmosphere when the product decays or decomposes, which is often estimated to take 45 years (Lippke et al., 2012).

Silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.

Soil Carbon: Carbon stored within soil. Carbon which is transferred to the soil from dead plant and animal material.

Solar radiation: Energy emitted by the sun.

Species: A population of organisms composed of related individuals that resemble one another and freely breed among themselves.

Stock: A quantity that accumulates over time. A stock increases by a flow in (inflow / input) and decreases by a flow out (outflow / output) (Ponto & Linder, 2011).

Structure: The physical and temporal distribution of plants in a forest (SAF, 1998).

Sustainability: Creation and maintenance of conditions under which humans and nature can exist in productive harmony, thus fulfilling social, economic, and other requirements of present and future generations (EPA, n.d.).

System: A set of components interacting with each other and with the environment.

Systems thinking: A set of critical-thinking skills that help students understand complex phenomena.

Thin: The removal of some trees in a managed forest in order to improve the growth and health of the remaining trees.

Timber: Wood, other than fuelwood, potentially usable for lumber (SAF, 1998).

Topography: The natural and manmade features and relief of Earth's surface (State Climate Office of North Carolina, n.d.).

Transpiration: The process by which water moves from the soil through plants, which is driven by the evaporation of water from leaves.

Understory: The layer of trees and plants beneath the forest canopy.

Vegetation: Plants that cover a given area (e.g., trees, shrubs, herbs, grasses, and vines).

Weather: Atmospheric conditions at any given time or place, measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather changes from hour-to-hour, day-to-day, and season-to-season.

Wildfire: Any nonstructural fire on wildlands other than one intentionally set for management purposes.

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