

8 GLOSSARY

A

Abiotic: Absence of living organisms, includes chemical and physical environments and processes.

Aboriginal: The first or earliest known of its kind present in a region.

Above mean sea level (AMSL): Elevation or altitude of any object relative to the average sea level.

Acre-foot: Volume of water, 43,560 cubic feet (ft³) (1,233 cubic meters [m³], 325,851 gallons), that would cover 1 acre to a depth of 1 foot.

Active capacity: Reservoir capacity normally available to store and regulate reservoir inflows to meet established reservoir operating requirements. For Lake Powell, this reservoir storage capacity is nearly 21 million acre-feet (maf).

Active conservation capacity: Reservoir capacity assigned to regulate reservoir inflow for irrigation, power generation, municipal and industrial use, fish and wildlife, navigation, recreation water quality, and other purposes. Also referred to as active storage. For Lake Powell, this is the reservoir storage above the penstock openings at an elevation of 3,490 feet (ft) (1,064 meters [m]).

Active storage: See *active conservation capacity*.

Adaptive management: Method or system for examining alternative strategies for meeting measurable goals and objectives and then, if necessary and in response to new information and/or changing circumstances, adjusting actions according to what is learned.

Adaptive Management Work Group (AMWG): Federal advisory committee to the Secretary of the Interior. Incorporates those stakeholders with interest in the operation of Glen Canyon Dam and downstream resources and continues public involvement in the decision-making process.

Advection: The typically horizontal movement of a mass of fluid, such as water.

Adverse impact: Abnormal, harmful, or undesirable effect that results from taking a particular action.

Aeolian processes: Erosion, transport, and deposition of sediment by the wind. Commonly occurs in areas with sparse or nonexistent vegetation, a supply of fine sediment, and strong winds.

Aerate: To supply or impregnate with gas, usually air.

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action. Also, the chapter in an environmental impact statement (EIS) describing current environmental conditions. A description of the affected environment must include information necessary to assess or understand impacts, must contain enough detail to support the impact analyses, and must highlight environmentally sensitive resources.

Aggradation: Process of filling and raising the level of a streambed, floodplain, or sandbar by deposition of sediment. The opposite of degradation.

Aggregation: A consistent and disjunct group of fish that has no significant exchange of individuals with other aggregations, as indicated by recapture of tagged juveniles and adults and movement of radio-tagged adults.

Air quality: Measure of the condition, including health-related and visual characteristics, of the air. Often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances (i.e., air pollutants).

Air Quality Control Region (AQCR): An interstate or intrastate area designated by the U.S. Environmental Protection Agency for the attainment and maintenance of National Ambient Air Quality Standards.

Albedo (effects): The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Snow-covered surfaces have a high albedo; the albedo of soils ranges from high to low; vegetation-covered surfaces and oceans have a low albedo. The Earth's albedo varies mainly through varying cloudiness, snow, ice, leaf area, and land-cover changes.

Algae: Simple plants containing chlorophyll; most live submerged in water.

Algal bloom: Rapid and flourishing growth of algae.

Allocation, allotment: Refers to a distribution of water through which specific persons or legal entities are assigned individual rights to consume pro-rata shares of a specific quantity of water under legal entitlements. For example, a specific quantity of Colorado River water is distributed for use within each Lower Division state through an apportionment. Water available for consumptive use in that state is further distributed among water users in that state through the allocation. An allocation does not establish an entitlement; the entitlement is normally established by a written contract with the U.S. government.

Alluvial: Formed by the action of running water, such as that related to river and stream deposits.

Alluvium: Sedimentary material (e.g., clay, silt, sand, gravel, or other particulates) transported and deposited by the action of flowing water.

Alternatives: Courses of action that may meet the specific goals and objectives of a proposed action, often by different means and at varying levels of accomplishment, including the most likely future conditions without the project (i.e., no action).

Ambient: Surrounding environment or natural conditions in a given place and time.

American Indian: The indigenous peoples in North America within the boundaries of the present-day continental United States, Alaska, and the island state of Hawaii.

American Indian Tribe: Any extant or historical clan, Tribe, band, nation, or other group or community of indigenous peoples in the United States.

American Indian Religious Freedom Act (P.L. 95-341) (AIRFA): Act requiring federal agencies to consult with Tribal officials to ensure protection of religious cultural rights and practices.

Amphibian: Cold-blooded, smooth-skinned vertebrate animal that has a life stage in water (e.g., hatches as an aquatic larva with gills) and a life stage on land (e.g., transforms into an adult with air-breathing lungs). Includes salamanders, frogs, and toads.

Amphipod: An order of crustacean that is found in almost all aquatic environments.

AMSL: See *above mean sea level*.

AMWG: See *Adaptive Management Work Group*.

Anaerobic bacteria: Bacteria that survive and grow in environments with little or no oxygen.

Ancillary services: Those services necessary to support the transmission of electric power from seller to purchaser given the obligations of control areas and transmitting utilities within those control areas to maintain reliable operations of the interconnected transmission system. See *regulation* and *spinning reserves*.

Anions: Ions that carry a negative charge (e.g., chloride, nitrate, sulfate, and phosphate).

Anoxic: Areas of water that are depleted of dissolved oxygen.

Antecedent: Prior or preceding event, condition, or cause.

Anthropogenic: Created, caused, or produced by humans.

Apportionment: Refers to the distribution of Colorado River water available to each Lower Division state in normal, surplus, or shortage condition years, as set forth, respectively, in Articles II(B)(1), II(B)(2), and II(B)(3) of the 1964 Supreme Court Decree in the case of *Arizona v. California*.

Appropriation: Amount of water legally set apart or assigned to a particular purpose or use.

Aquatic: Living or growing in or on the water.

Aquatic biota: Collective term describing the organisms living in or depending on the aquatic environment.

Aquatic habitat: Bodies of water that provide food, cover, and other elements critical to the completion of an organism's life cycle (e.g., streams, rivers, and lakes).

Aquifer: Permeable water-bearing underground rock formation that readily yields usable amounts of water to a well or spring. The formation could be sand, gravel, limestone, and/or sandstone.

Archaeological and Historic Preservation Act (AHPA): Legislation that amended the Reservoir Salvage Act of 1960, requiring federal agencies to provide for the preservation of historical and archeological data that might otherwise be lost or destroyed as the result of any federally licensed activity or program causing an alteration of terrain.

Archaeological resource: Any material remains or physical evidence of past human life or activities that are of archeological interest, including the record of the effects of human activities on the environment. An archeological resource is capable of revealing scientific or humanistic information through archeological research.

Archaeological Resources Protection Act of 1979 (ARPA): Legislation establishing requirements to protect archaeological resources and sites on public lands and Indian lands and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals.

Archaeological site: A place (or group of physical sites) in which evidence of past activity is preserved (either prehistoric, historic, or contemporary); that has been, or may be, investigated using the discipline of archaeology; and that represents a part of the archaeological record.

Archaic: In American archeology, a cultural stage following the earliest known human occupation in the Americas (about 5500 BC to AD 100). This stage was characterized by a hunting and gathering lifestyle and seasonal movement to take advantage of a variety of resources.

Archaeology: Study of human cultures through the recovery and analysis of their material remains.

Arid: A region that receives too little water to support agriculture without irrigation. Less than 10 in. of rainfall a year in a region is typically considered arid.

Arroyo: Gully or channel cut by an ephemeral stream.

Arthropod: Any of the invertebrate animals (such as insects, spiders, or crustaceans) having an exoskeleton, a segmented body, and jointed limbs.

Artifact: Object produced or shaped by human beings and of archaeological or historical interest.

Aspect: The direction in which a feature faces.

Assemblage: A collection or community of plants or animals characteristically associated with a particular environment, which can be used as an indicator of that environment.

Attainment Area: An area considered to have air quality as good as or better than the National Ambient Air Quality Standards for a given pollutant. An area may be in attainment for one pollutant and in nonattainment for others.

Attenuation: Gradual loss of strength or intensity.

Authorization: Act by the Congress of the United States that sanctions the use of public funds to carry out a prescribed action.

Automatic generation control (AGC): Computerized power system regulation to maintain scheduled generation within a prescribed area in response to changes in transmission system operational characteristics.

Available hydropower (AHP): The monthly capacity and energy that is actually available based on prevailing water release conditions.

Average peak annual discharge: Found by generating a list of the single highest value of discharge from each year and calculating the mean.

B

Backwater: A relatively small, generally shallow area of a river with little or no current. See *return-current channel*.

Bald and Golden Eagle Protection Act: Law passed in 1940 that prohibits anyone without a permit issued by the Secretary of the Interior from taking bald or golden eagles, including their parts, nests, or eggs.

Bank storage: Water absorbed and stored in the banks of a stream, lake, or reservoir, and returned in whole or in part as the level of the water body surface falls.

Base flow: Portion of stream or river discharge that is derived from a natural storage source (i.e., groundwater recharge).

Baseline: Information identified or found at the beginning of a study or experiment that serves as a basis against which subsequent findings are measured or compared.

Baseload: Minimum load in a power system over a given period of time.

Baseload plant: Energy plant or powerplant normally operated to produce the minimum amount of power required to meet some or all of a given region's continuous energy demands. Consequently, it operates essentially at a constant load.

Basin: Area of land that drains to a particular stream, river, pond, or lake.

Basin States: In accordance with the Colorado River Compact of 1922, the Colorado River Basin is comprised of those parts of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming within and from which waters drain naturally into the Colorado River. These seven states are referred to as the Basin States. See *Colorado River Compact of 1922*.

Bathymetric: Pertains to the study of the underwater depth of a lake, ocean, or reservoir floor.

Beach: Sandbar that generally is considered to have recreational value. See *sandbar*.

Bed elevation: Height of streambed above a specified level. Change in bed elevation in pools of the Colorado River commonly is used as a measure of change in the amount of sediment stored on the riverbed.

Bedload: Sediment moving on or near the streambed and frequently in contact with it.

Bed material: Unconsolidated material of which a streambed is composed.

Bedrock: Native consolidated, solid rock foundation underlying the surface. Above it is usually an area of loose, broken, and weathered unconsolidated deposits of soil, sand, clay, or gravel.

Benthic: Living in or occurring at the bottom of a body of water.

Biodiversity: Number and kinds of organisms per unit area or volume; the composition of species in a given area at a given time.

Biological Assessment: Document prepared for the Endangered Species Act of 1973 (ESA) Section 7 process to determine whether a proposed major construction activity under the authority of a federal action agency is likely to adversely affect listed species, proposed species, or designated critical habitat.

Biological control: The use of living organisms, such as predators, parasitoids, and pathogens, to control pest insects, weeds, or diseases. Typically involves some human activity.

Biological Opinion (BO): Document stating opinion of the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

Biological response: Reactions or changes in cells, tissues, organs, and/or entire organisms resulting from chemical, physical, or environmental agents and stressors.

Biomass: Total amount of combustible solid, liquid, or gas derived from biological processes (e.g., living organisms) in a particular area or environment.

Biota: Living organisms (e.g., plants and animals) in a given region.

Blue-ribbon fishery: Designation made by the U.S. government and other authorities to identify recreational fisheries of extremely high quality. The designation is typically based on water quality, quantity, and accessibility; natural reproduction capacity; angling pressure; and the specific species present.

Bryophytes: Group of non-vascular, seedless plants including mosses, liverworts, and hornworts.

Bypass tube: Conduits that are used to release water in addition to the releases made through the powerplant. See *jet tube*.

C

Campable area: Areas suitable for recreational camping.

Candidate species: Plant or animal species about which sufficient information on biological status and threats is known to propose them as endangered or threatened. Undergoing status review by the FWS, but not yet officially listed as threatened or endangered under the ESA.

Capacity: In power terminology, the load for which a generator, transmission line, or system is rated; expressed in kilowatts. In this document, also refers to powerplant generation capability under specific operating conditions and the amount of marketable resource under such conditions.

Carbon dioxide (CO₂): A colorless, odorless, nonpoisonous gas that is a normal part of the Earth's atmosphere. Carbon dioxide is a product of fossil fuel combustion, but is also exhaled by humans and animals and absorbed by green growing things and by the sea. It is the most prominent greenhouse gas that traps heat radiated into the atmosphere.

Carbon monoxide (CO): Colorless, odorless gas that is toxic if breathed in high concentrations over an extended period. Listed as a criteria air pollutant under Title I of the Clean Air Act (CAA).

Carnivore: Any flesh-eating or predatory organism.

Carrying capacity: Maximum density of wildlife or population of a specific species that a particular region can sustain without deterioration of the habitat or hindering future generations' ability to maintain the same population.

Catch and release: Practice within recreational fishing intended as a conservation measure in which captured fish are unhooked and returned to the water before experiencing serious exhaustion or injury.

Cations: Ions that carry a positive charge (e.g., sodium, magnesium, calcium, iron, and aluminum).

Cenozoic age: Era extending from about 65 million years ago to the present.

Census block group: Geographic entities consisting of groups of individual census blocks. Census blocks are grouped together so that they contain between 250 and 550 housing units.

Channel: Natural or artificial watercourse with a definite bed and banks to confine and conduct continuously or periodically flowing water.

Channel margin bar: Narrow sand deposits that continuously or discontinuously line the riverbank.

Chemocline: Boundary or gradient between water masses of different chemical composition (e.g., salinity).

Chironomid: Group of two-winged flying insects that live their larval stage underwater and emerge to fly about as adults.

Cladocera: An order of small crustaceans commonly called water fleas.

Cladophora: Filamentous green alga that is very important to the food chain in the Colorado River below Glen Canyon Dam.

Class I scenic resource: Classification of areas within Glen Canyon that have outstanding scenic quality such as intricately carved landscapes, unique canyons, and unique geological features.

Class II scenic resource: Classification of an area within Glen Canyon that has superior quality or a diversity of form and color.

Clay: Fine-grained soil, rock, or mineral fragment that has a diameter of less than 0.002 millimeters (mm). Clay is often made up of one or more minerals (e.g., hydrous aluminum phyllosilicates, sometimes with iron, magnesium, alkali metals, alkaline earths, and other cations) with traces of metal oxides and organic matter.

Clean Air Act (CAA): Comprehensive federal law that regulates air emissions. This act establishes national ambient air quality standards (NAAQS) that protect public health and the environment. Under this act, construction and operating permits, as well as reviews of new stationary emissions sources and major modifications to existing sources, are required. It further requires facilities to comply with emission limits or reduction limits stipulated in State Implementation Plans (SIPs) and prohibits the federal government from approving actions that do not conform to SIPs. Originally passed in 1963, the national air pollution control program is actually based on the 1970 version of the law. The 1990 CAA amendments, in large part, were intended to deal with previously unaddressed or under-addressed problems such as acid rain, ground level ozone, ozone depletion, and air toxics.

Clean Water Act (CWA): Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under the CWA, the U.S. Environmental Protection Agency (EPA) has implemented several pollution control programs, such as setting wastewater standards for industry and requiring National Pollutant Discharge Elimination System (NPDES) permits for discharges of effluents to surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. “Clean Water Act” became the Act’s common name with amendments in 1972.

Climate change: Significant and lasting change in the statistical distribution of weather conditions and patterns over periods of years, ranging from decades to millions of years.

Clovis technological complex: A widespread, distinctive early Paleoindian culture defined by a distinct form of fluted stone projectile points named for Clovis, New Mexico, the city near which they were found. Clovis technology dates to around 13,500 years ago.

Cobble: Loose particles of rock or mineral (sediment) that range in size from 64 to 256 mm in diameter. Cobbles are larger than gravel, but smaller than boulders.

Code of Federal Regulations (CFR): Codification and compilation of the general and permanent rules published in the *Federal Register* by the departments and agencies of the United States Federal Government. It is divided into 50 subject matter titles that represent broad areas subject to federal regulation. Each title contains one or more individual volumes, which are updated once each calendar year, on a staggered basis.

Cohort: A group of fish that were generated in the same spawning season and are born at the same time.

Coldwater fish: Species of fish that require relatively cold water (50–60°F, or 10–15°C) to survive. Cold water can hold more dissolved oxygen than warm water, so these species generally inhabit deeper lakes and ponds in northern regions, spring-fed streams and lakes with a constant cold water supply, or lakes in high altitudes that are cold. Rainbow trout is an example of a coldwater species.

Colorado River Basin: All areas that drain to the Colorado River and its tributaries.

Colorado River Basin Project Act of 1968 (CRBPA): Act that authorized construction of a number of water development projects, including the Central Arizona Project (CAP), and required the Secretary of Interior to develop the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs, or Long-Range Operating Criteria (LROC).

Colorado River Basin Salinity Control Act: Law enacted by Congress in 1974 that directed the Secretary of the Interior to proceed with a program to enhance and protect the quality of water available in the Colorado River for use in the United States and Republic of Mexico.

Colorado River Compact of 1922: Provides for the equitable division and apportionment of the use of the waters of the Colorado River System between the Upper Basin and Lower Basin states.

Colorado River Ecosystem: Community of aquatic, riparian, and terrestrial fauna and flora of the Colorado River mainstream corridor and its tributaries, along with that system's processes and environments. In general, the CRE encompasses the Colorado River primarily from the forebay of Glen Canyon Dam to the western boundary of Grand Canyon National Park and includes the area where the Glen Canyon Dam operations impact physical, biological, recreational, cultural, and other resources.

Colorado River Simulation System (CRSS): Operational model of the Colorado River Basin based on a monthly time step.

Colorado River Storage Project Act (CRSPA) of 1956: Authorized comprehensive development of the water resources of the Upper Basin states (Colorado, New Mexico, Utah, and Wyoming) by providing for long-term regulatory storage of water, including construction of Glen Canyon Dam, to meet the entitlements of the Lower Basin states (Arizona, California, and Nevada).

Commercial river trip: Trip organized by a boating company that conducts tours and recreational outings for paying passengers.

Community: All members of a specified group of species present in a specific area at a specific time; a group of people who see themselves as a unit.

Compact: Agreement between states apportioning the water of a river basin to each of the signatory states.

Compact point: Lee Ferry, Arizona, the reference point designated by the Colorado River Compact dividing the Colorado River into two sub-basins, the Upper Basin and the Lower Basin.

Concentration: Amount of a chemical in a particular volume or weight of air, water, soil, or other medium.

Concrete-arch dam: Dam design often used in a narrow, steep-sided rock canyon with curvatures in both horizontal and vertical directions. The safety of an arch dam is dependent on the strength of the side wall abutments and the strength and elasticity of the concrete used in its construction.

Conductivity: Measure of the ability of water to pass an electrical current. Conductivity is an indicator of the amount of dissolved salts in a stream, and is often used to estimate the amount of total dissolved solids (TDS) rather than measuring each dissolved constituent separately. Conductivity in water is also affected by temperature.

Confluence: Meeting point of two or more rivers.

Consolidated Decree: Entered by the United States Supreme Court on March 27, 2006, in the case of *Arizona v. California*, 547 U.S. 150 (2006). In 1963, the Supreme Court reached a Decision in the case of *Arizona v. California*. The 1964 Supreme Court Decree in the case of *Arizona v. California* implemented the 1963 Decision. This 1964 Supreme Court Decree was supplemented over time after its adoption and the Supreme Court entered a Consolidated Decree in 2006 incorporating all applicable provisions of the earlier-issued Decisions and Decrees.

Consumptive water use: Total amount of water used by vegetation, human activities, and natural cycling processes (e.g., evaporation, transpiration, incorporation) that is not available for other uses within the system.

Continental climate: A climate lacking marine influence and characterized by more extreme temperatures than marine climates; therefore, it has a relatively high annual temperature range for its latitude.

Continental Divide: Drainage divide that separates the Atlantic and Pacific watersheds of North America.

Contingent valuation: Survey method asking for the maximum values that users would pay for access to a particular activity.

Control area: Part of a power system, or a combination of systems, to which a common electrical generation control scheme is applied.

Convection: Motions in a fluid that result in the transport and mixing of the fluid's properties.

Cooperating Agency: With respect to the National Environmental Policy Act of 1969, as amended (NEPA), process, an agency that has jurisdiction by law or special expertise concerning an aspect of a proposed federal action, and that is requested by the lead agency to participate in the preparation of an Environmental Impact Statement.

Coordinated operation: Generally, the operation of two or more interconnected electrical systems to achieve greater reliability and economy. As applied to hydropower resources, the operation of a group of hydropower plants to obtain optimal power benefits with due consideration for all other uses.

Copepods: Small crustaceans that live in virtually all marine and freshwater habitats.

Cosmology: Set of beliefs regarding the origin and structure of the universe.

Council on Environmental Quality (CEQ): Established by NEPA, CEQ regulations (40 CFR Parts 1500–1508) describe the process for implementing NEPA, including preparation of Environmental Assessments and EISs, and the timing and extent of public participation.

Cover: Vegetation, rocks, or other materials used by wildlife for protection from predators or weather.

Creel census: Angler survey to collect data on the harvest, size, and distribution of various species of fish.

Criteria air pollutants: Six common air pollutants for which NAAQS have been established by the EPA under Title I of the CAA. Included are sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O₃), particulate matter (PM_{2.5} and PM₁₀), and lead (Pb). Standards were developed for these pollutants on the basis of scientific knowledge about their health effects.

Critical habitat: Specific areas within the geographical area occupied by the species that have physical or biological features essential to the conservation of a listed endangered or threatened species and may require special management considerations or protection. These areas are legally designated via *Federal Register* notices.

Cross-sectional area: Area of a stream, channel, or waterway, usually measured perpendicular to the flow.

Crustacean: Aquatic animals with hard external skeletons and segmented limbs, belonging to the class Crustacea; includes cladocerans, shrimp, crayfish, fairy shrimp, isopods, amphipods, lobsters, and crabs.

Cubic foot per second (cfs): As a rate of streamflow, a cubic foot of water passing a reference section in 1 second. A measure of a moving volume of water (1 cfs = 0.0283 m³/s).

Cultural modification: Any human-caused change in the land form, water form, or vegetation, or the addition of a structure that creates a visual contrast in the basic elements (e.g., form, line, color, or texture) of the naturalistic character of a landscape.

Cultural property: The tangible evidence or expression of cultural heritage such as works of art, buildings, or their ruins.

Cultural resource: Any sites, districts, buildings, structures, objects, or features significant in history, architecture, archeology, culture, or science. Also, Native American sacred sites or special use areas that provide evidence of the prehistory and history of a community.

Cumulative impact: Impact assessed in an EIS that results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal), private industry, or individual undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cyanobacteria: Blue-green algae, prokaryotic, photosynthetic organisms that generally have a blue-green tint and lack chloroplasts.

Cyprinids: Largest family of freshwater fish, commonly called the carp family or minnow family.

D

Daily fluctuation: Difference between daily maximum and minimum releases from the dam. These scheduled fluctuations are used to maximize efficiency of power generation.

Dead capacity: Reservoir capacity from which stored water cannot be evacuated by gravity. At Glen Canyon Dam, this is the Lake Powell storage below the river outlet works openings at an elevation of 3,374 ft (1,028 m).

Debris fan: Sloping mass of water and debris, including boulders, cobbles, gravel, sand, silt, clay, and organic material (e.g., tree limbs), formed by debris flows at the mouth of a tributary.

Debris flow: Mixture of rocks, sediment, and organic material containing less than 40% water by volume that flows downslope under the force of gravity (e.g., flash flood).

Defoliation: Process by which a plant, shrub, or tree loses its leaves. Possible causes include insect activity, disease, chemicals, or the coming of autumn.

Degradation: Process wherein elevation of streambeds, floodplains, and sandbars is lowered by erosion. The opposite of aggradation.

Delivery: The amount of water delivered to the point of use.

Delta: Flat alluvial area formed at the mouth of some rivers and streams (e.g., Colorado River) where the mainstream flows into a body of standing water, such as a sea or lake (e.g., Lake Powell or Lake Mead), and deposits large quantities of sediment.

Depletion: Loss of water from a stream, river, or basin resulting from consumptive use.

Deposition: Settlement of material out of the water column and on to the streambed or flooded areas. Occurs when the energy of flowing water is unable to support the load of suspended sediment.

Desiccation: Process of drying out.

Desired future condition (DFC): Measurable target or value, established for any resource area that is of interest to managers; provides a reference point for evaluating treatment effectiveness and the need to implement additional treatments or management actions.

Detritivore: An organism that feeds on dead and decomposing matter.

Detritus: Loose natural materials, such as rock fragments or organic particles, that result directly from disintegration of rocks or organisms.

Diatom: Microscopic, single-celled, or colonial algae having cell walls of silica.

Diel fluctuations: Changes or fluctuations that occur in a 24-hour period that usually includes a day and the adjoining night.

Diptera: Order of insects that includes all true flies.

Direct effect (impact): Effect on the environment caused by an action; occurs at the same time and place as the initial action.

Direct impact: See *direct effect*.

Discharge (flow): Volume of water that is released from the dam at any given time or that passes a given point within a given period of time. Usually expressed in cubic feet per second (cfs).

Dispatch: The operating control of an integrated electric system whose job it is to (1) assign generation to specific generating plants and other sources of electric supply to effect the most reliable and economical supply as the total of the significant area loads rises or falls; (2) control operations and maintenance of high-voltage lines, substations, and equipment, including administration of safety procedures; (3) operate the interconnection; and (4) schedule energy transactions with other interconnected electric utilities.

Dissolved oxygen (DO): Amount of free oxygen found in water expressed as a concentration, milligrams per liter (mg/L), or as percent saturation (the amount of oxygen the water holds compared to the maximum amount it could absorb at that temperature). Low DO levels adversely affect fish and other aquatic life. The ideal dissolved oxygen for fish life is between 7 and 9 mg/L; most fish cannot survive when DO falls below 3 mg/L.

Dissolved solids: See *total dissolved solids (TDS)*.

Divert: To direct a flow away from its natural course.

Downstream: Situated or moving in the direction of a stream or river's current.

Drainage: Process of removing surface or subsurface water from a soil or area.

Drawdown: Lowering of a reservoir's water level; process of depleting reservoir or groundwater storage.

Drift: Food organisms dislodged and moved by river current. Can include algae, plankton, invertebrates, and larval fish.

Driftwood: Remains of trees that have been washed onto a shoreline by the action of winds, tides, or waves.

Drought: Period of unusually persistent dry weather that persists long enough to cause serious problems such as crop damage and/or water supply shortages.

Dune: Wind-deposited sand body, usually a rounded hill, ridge, or mound.

E

Ecological resource: Animals, plants, and the habitats in which they live, which may be land, air, or water.

Ecological restoration: Process of assisting in the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Ecology: The relationship between living organisms and their environments.

Ecoregion: A geographically distinct area of land that is characterized by a distinctive climate, ecological features, and plant and animal communities.

Ecosystem: Complex system composed of a community of fauna and flora and that system's chemical and physical processes and environment.

Ecosystem management: Approach to natural resource management that seeks an understanding of the interrelationships among important physical, chemical, biological, cultural, political, and social processes in order to conserve resources and sustain ecosystems to meet both ecological and human needs of current and future generations.

Ectoparasitic: Living on the exterior of another organism, the host, obtaining nourishment from the latter.

Eddy: Current of water moving against the main current in a circular pattern. See *recirculation zone*.

Effect: Environmental consequences (the scientific and analytical basis for comparison of alternatives) that occur as a result of a proposed action. See *direct effect* and *indirect effect*.

Efficiency: Ratio of useful energy output to total energy input, usually expressed as a percentage.

Electric power system: Physically connected electric power generating, transmission, and distribution facilities operated as a unit under one control.

Electrical demand: Energy requirement placed upon a utility's generation at a given instant or averaged over any designated period of time.

Electrofishing: Application of a direct electric current to attract and temporarily immobilize fish for easy capture. See *mechanical removal*.

Embayment: a recess or an indentation in a shore line that forms an area with low flow.

Emergent marsh plants: Plants that are rooted in soil with basal portions that typically grow beneath the surface of the water but whose leaves, stems, and reproductive organs are above the water.

Emissions: Substances that are discharged into the air from industrial processes, vehicles, and living organisms.

Empirical: Based on experimental data rather than theory.

Encroachment: Act of advancing, intruding, or extending beyond established, usual, or proper limits.

Endangered species: Species or subspecies (plant or animal) whose survival is at risk of extinction throughout all or a significant portion of its range because it is either few in numbers or threatened by changing environmental or predation parameters. Requirements for declaring a species endangered are found in the ESA.

Endangered Species Act of 1973 (ESA): Provides a federal program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. Requires consultation with the FWS and/or the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service to determine whether endangered or threatened species or their habitats will be affected by a proposed activity and what, if any, mitigation measures are needed to address the impacts.

Endemic: Native to and restricted to a particular geographic region.

Energy: Electric capacity generated and/or delivered over time; usually measured in kilowatt-hours.

Environmental Assessment (EA): Concise public document that a federal agency prepares under NEPA to provide sufficient evidence and analysis to determine whether a proposed action, or its alternatives, may have significant environmental effects on the human environment. In general, an EA must include brief discussions on the need for the proposal, the alternatives, the environmental impacts of the proposed action and alternatives, and a list of agencies and persons consulted. If significant effects may occur, an EIS is prepared instead of an EA.

Environmental Impact Statement (EIS): Detailed document required of federal agencies under NEPA for major proposals or legislation that will or could significantly affect the environment. An EIS is prepared with public participation and must disclose significant issues and impacts on the human environment that may result from the proposed action or its alternatives. An EIS includes the following: the environmental impact of the proposed action; any adverse impacts that cannot be avoided by the proposed action; alternative courses of action; relationships between local short-term use of the human environment and the maintenance and enhancement of long-term productivity; and a description of the irreversible and irretrievable commitment of resources that would occur if the action were accomplished.

Environmental justice: Fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Ephemeral stream: Stream that flows briefly only in direct response to precipitation and whose channel is, at all times, above the water table.

Epilimnion: Top layer of a thermally stratified lake or reservoir that exhibits essentially uniform warmer temperature. See *stratification*.

Epiphyte: A plant that derives its moisture and nutrients from the air and rain and grows on another plant for support.

Equalization flow: Dam releases made to balance water storage between Lake Powell and Lake Mead. Pursuant to the Interim Guidelines, these flow events are carried out if (1) the end of the water year storage forecast for Lake Powell is greater than that of Lake Mead; and (2) the storage forecast for the end of the water year in the Upper Basin reservoirs is greater than the quantity of storage required by Section 602(a) of the CRBPA (602[a] storage) for that same date.

Equalization tier: Operation elevation that applies when Lake Powell's projected January 1 elevation is above the elevation in the equalization table of the Interim Guidelines. The tier provides for Lake Powell releases of more than 8.23 maf during the water year until the content of the lakes equalizes or certain elevations are attained.

Erosion: Gradual destruction or wearing away of a material (e.g., rock or sand) or object (e.g., beach) by water, wind, or other natural agents.

Ethnobotany (ethnobotanical): The plant lore and agricultural customs of a people; the study of such lore and customs.

Ethnohistory: The use of both historical and ethnographic data such as maps, music, paintings, photography, folklore, and oral tradition to understand a culture on its own terms and according to its own cultural code.

Euphotic zone: The superficial layer of a water body within the range of effective light penetration for photosynthesis.

Eutrophication: Enrichment of a body of water as a result of high concentrations of minerals and organic nutrients (especially nitrogen and phosphorus) that stimulate and promote the proliferation of aquatic plant life, thus reducing the dissolved oxygen content of the water.

Evaporation: Water vapor losses to the atmosphere from land areas, bodies of water, and all other moist surfaces.

Evapotranspiration: Sum of water transpired or used by plants and evaporated from surfaces (e.g., water bodies and soils) in a specific time period; usually expressed in depth of water per unit area.

Exceedance: Measured level of an air pollutant that is higher than the national or state ambient air quality standards. Also applies to water volume, flow, or energy generation that is above a particular percentage (exceedance level).

Excess capacity: Power generation capacity available on a short-term basis in excess of the firm capacity available through long-term contracts.

Executive Order (EO): President's or governor's directive or declaration that implements or interprets a federal statute, a constitutional provision, or a treaty. It has the force of law and is usually based on existing statutory powers; requires no action by Congress or a state legislature.

Existence value: Value people place on simply knowing an area or feature continues to exist in a particular condition.

Exotic species: Nonnative plant or animal deliberately or accidentally introduced into a new habitat where it is able to reproduce and survive.

Experimental flow: Investigational releases (e.g., high-flow experiments) that are designed to explore, test, and assess the relationships between dam operations and downstream resources in and along the Colorado River within the Grand Canyon National Park (GCNP) and Glen Canyon National Recreation Area (GCNRA).

Experimental population: Specific reintroduced populations of listed species under the ESA. The FWS determines whether an experimental population is "essential" or "nonessential" to the continued existence of the species.

Exposure: Contact of an organism with a chemical, radiological, or physical agent.

Extinct species: Species having no living members, such that it is no longer in existence.

Extirpated species: Species that no longer exists in a given region or area.

Extirpation: Elimination of a species or subspecies from a particular area, but not from its entire range.

F

Fan-eddy complex: An assemblage of geomorphic features created by a debris fan that projects into a stream or river and creates an area of recirculation (eddy) just downstream of the debris fan.

Fauna: Animals in a specific region or habitat, considered as a group.

Feature: Large, complex artifact, or part of a site, such as a hearth, cairn, housepit, rock alignment, or activity area.

Fecal coliform bacteria: Group of organisms common to the intestinal tracts of humans and animals. The presence of fecal coliform bacteria in water is an indicator of pollution and of potentially dangerous bacterial contamination.

Fecundity: Number of produced eggs or offspring; reproductive capability.

Federal Register: Official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents; published by the Office of the Federal Register, National Archives and Records Administration (NARA).

Filamentous algae: Plant that forms a greenish mat on the water surface.

Finding of No Significant Impact (FONSI): NEPA document issued by a federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment if implemented. This finding is based on the results of an EA and other factors in the public planning record for a proposed action.

Fine sediment: Soil particles, typically defined as less than 1–2 mm in diameter (e.g., clay and silt), that are naturally filtered from coarser fractions and carried by water.

Firm energy or power: Uninterruptible energy and power guaranteed by the supplier to be available at all times except for reasons of uncontrollable forces or continuity of service provisions.

Fishery: Specified waters or area where fish or other aquatic animals are reared and caught.

Flash flood: Sudden high-flow event through a valley, canyon, or wash, following a short-duration, high-intensity rainfall.

Flatwater boating: Form of low-speed boating (e.g., canoeing or kayaking) that relies on flat waters (e.g., lakes, gorges, or slow-moving rivers), as opposed to rapids or white water.

Flood: Relatively high flow or inundation of water, as measured by either gage height or discharge quantity, that overtops the natural or artificial banks in any reach of a river and threatens or causes damage.

Flood Control Act of 1944: Act authorizing the construction of certain public works on rivers and harbors for flood control and other purposes.

Flood control capacity: Reservoir capacity assigned for the sole purpose of regulating flood inflows to reduce flood damage downstream.

Flood control pool: Reservoir volume above the active conservation and joint-use pool that is reserved for flood runoff and then evacuated as soon as possible to keep that space in readiness for the next flood. See *reservoir capacity*.

Flood flows: In this report, water releases from Glen Canyon Dam in excess of powerplant capacity (i.e., 31,500 cfs).

Floodplain: Mostly level, low-lying land adjacent to a water body that is subjected to inundation and submersion during high flow or rainfall events. The relative elevations of floodplain areas determine their frequency of flooding, which ranges from rare, severe, storm events to flows experienced several times a year.

Flora: Community of plants in a specific region or habitat, considered as a group.

Flow: Volume of water passing a given point per unit of time. See *instream flow requirements*, *minimum flow*, *peak flow*, *ponding flow*, *spike flow*, and *steady flow*.

Flow regime: Flow variation through time resulting from operations of the Glen Canyon Dam.

Fluctuating flows: Water released from Glen Canyon Dam that varies in volume, usually within a given range (e.g., 1,000 to 31,500 cfs), over a 24-hour period.

Fluctuation zone: Area of a sandbar or vegetation zone that is within the range of fluctuating flow.

Fluvial: Pertaining to a river or stream; indicates the presence or interaction of a river within an area or landform.

Fluvial geomorphology: Study and examination of stream and river channels, both in their natural setting and their response to human-induced changes in a watershed. Includes the processes that operate in river systems and the landforms they create or have created.

Folsom technological complex: A widespread, distinctive early Paleoindian culture defined by a distinct form of fluted stone projectile points named for Folsom, New Mexico, the city near which they were found. Folsom technology dates to between 11,500 and 10,000 years ago.

FONSI: See *Finding of No Significant Impact*.

Food chain: Succession of organisms in a community in which food energy is transferred from one organism to another as each consumes a lower member and in turn is consumed by a higher member.

Food web: Complex system or network of interrelated and interdependent food chains that describes how food energy is passed throughout an ecological community.

Food base: Substances or materials that provide living things with the nutrients they need to provide energy, grow, and sustain overall life.

Forage fish: Generally, small fish that produce prolifically and are consumed by predators.

Forced outage: Nonscheduled shutting down of a generating unit or other facility for emergency or other unforeseen reasons.

Forebay: Impoundment immediately above a dam or hydroelectric powerplant intake structure.

Fossil fuel: An energy source formed in the Earth's crust from decayed organic material. Common fossil fuels are petroleum, coal, and natural gas.

Fragmentation: Process by which habitats are increasingly subdivided into smaller units, resulting in their increased insularity as well as losses of total habitat area.

Fry: Life stage of fish between the egg and fingerling stages.

Fugitive dust: The dust released from any source other than a definable point source such as a stack, chimney, or vent. Sources include construction activities, storage piles, and roadways.

Full pool: Volume of water in a reservoir at maximum design elevation. At Lake Powell this is at an elevation of 3,700 ft (1,130 m). Total volume is 27 maf; this volume is decreasing as the lake fills with sediment.

G

Gage: Device or instrument used for measuring or testing.

Gated spillway: Overflow section of dam restricted by use of gates that can be operated to control releases from the reservoir to ensure the safety of the dam.

Gaging station: Specific location on a river or stream where systematic observations and measurements of hydrologic data are obtained through mechanical or electrical means.

Generation (power): Process of producing electrical energy by transforming other forms of energy. Also, the amount of electric energy produced.

Generator: Machine that converts mechanical energy into electrical energy.

Geology: Science that deals with the study of the materials, processes, environments, and history of the Earth, including rocks and their formation and structure.

Geomorphology: Geological study of the configuration and evolution of landforms and earth features.

Gigawatt-hour (GWh): One billion watt-hours of electrical energy.

Glen Canyon Dam: Second highest concrete arch dam in the United States. Constructed to harness the power of the Colorado River to provide for the water and power needs for people in the western United States.

Glen Canyon Dam Adaptive Management Program (GCDAMP): Provides an organization and process for cooperative integration of dam operations, downstream resource protection and management, and monitoring and research information, as well as to improve the values for which the GCNP and GCNRA were established.

Glen Canyon Environmental Studies (GCES): Program started by the Bureau of Reclamation in 1982 to collect scientific evidence on the positive and negative impacts on downstream environmental and cultural resources as a result of daily fluctuating releases from the dam.

Glen Canyon National Recreation Area (GCNRA): Area that encompasses hundreds of square miles from Lees Ferry in Arizona to the Orange Cliffs of southern Utah for water-based and backcountry recreation.

Global warming: Increase in the near-surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is today most often used to refer to the warming that many scientists predict will occur as a result of increased anthropogenic emissions of greenhouse gases.

Gradient: See *slope*.

Grand Canyon Monitoring and Research Center (GCMRC): Science provider for the GCDAMP. Operated by the U.S. Geological Survey, the GCMRC provides relevant scientific information about the status and trends of natural, cultural, and recreational resources found in those portions of the GCNP and GCNRA affected by Glen Canyon Dam operations.

Grand Canyon National Park (GCNP): A National Park since 1919, the area contains unique combinations of erosional forms. It is 277 river miles long and up to 18 miles wide. The area encompasses 1,218,375 acres and lies on the Colorado Plateau in northwestern Arizona, with land that is semiarid and consists of raised plateaus and structural basins.

Grand Canyon National Park Enlargement Act: An act of Congress enacted in 1975 to further protect the Grand Canyon by enlarging the park in the state of Arizona.

Grand Canyon Protection Act of 1992 (GCPA): Directs the operation of Glen Canyon Dam in compliance with existing law to protect, mitigate adverse impacts on, and improve the values for which the GCNP and GCNRA were established, including, but not limited to, natural and cultural resources and visitor use.

Green algae: Members of the plant phylum Chlorophyta, which possess the green pigment chlorophyll that they use to capture light energy to fuel the manufacture of sugars. This diverse group of algae consists primarily of freshwater eukaryotic organisms, which serve as food and oxygen sources for other aquatic organisms.

Greenhouse effect: Increasing mean global surface temperature of the Earth caused by gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbon). The greenhouse effect allows solar radiation to penetrate, but also absorbs infrared radiation returning to space.

Greenhouse gases (GHGs): Heat-trapping gases in the atmosphere that contribute to global warming and temperature gain near the Earth's surface. Natural and human-made GHGs include water vapor, carbon dioxide, methane, nitrogen oxides, ozone, and fluorinated gases (e.g., chlorofluorocarbons).

Gross generation: Total amount of electrical energy produced by a generating station or stations, measured at generator terminals.

Groundwater: Supply of water found beneath the Earth's surface, usually in porous rock formations (i.e., aquifers), which may supply wells and springs.

Gully: Landform that erodes sharply into soil, typically on a hillside; caused by running water. Gullies are similar to ditches or small valleys, but they are typically only 3 to 30 ft (0.9 to 9 m) wide and deep.

H

Habitat: Area or place, including physical and biotic conditions, where a plant or animal lives.

Hanging garden: Unique biological feature formed when spring water flows through cracks in the sandstone and seeps out through the canyon walls, allowing plants to grow vertically.

Harvest: In a recreational fishery, refers to numbers of fish that are caught and kept.

Head: Height of water above a specified point.

Headwater: Source and upper part of a stream or lake inflow.

Heavy metal: Metallic elements with high atomic weights (e.g., lead, mercury, cadmium, chromium, and arsenic) that are generally toxic in relatively low concentrations to plant and animal life.

Herbaceous: The plant strata that contain soft, not woody, stemmed plants that die to the ground in winter.

Herbivore: Animal that feeds on plants.

Herpetofauna: General grouping for reptiles and amphibians.

High flow: Pulses or temporary influxes of water that typically occur after periods of precipitation and are contained within the natural banks of the river (i.e., do not cause flooding). In a river, these events can lead to a temporary reduction in downstream temperature and increases in salinity, dissolved oxygen, and turbidity. High flows suspend and deliver large amounts of sediment and organic matter downstream, which can redeposit on sandbars and beaches. They can also restore and enhance riparian vegetation and can prevent undesirable vegetation from invading river channels. In addition, high-flow events can work to reshape and maintain native fish habitats, stimulate food base production, and suppress numbers of nonnative fish.

High-flow experiment (HFE): High-volume test releases (31,500 to 45,000 cfs) from the Glen Canyon Dam that are performed under sediment-enriched conditions. HFEs are specifically designed to benefit downstream resources; this includes maintaining and rebuilding sandbars and beaches in downstream reaches. Also referred to as a high-flow test.

High-flow test: See *high-flow experiment*.

Historic: The time period after the appearance of written records. In the New World, this generally refers to the time period after the beginning of European settlement at approximately 1600 AD.

Historic property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the *National Register of Historic Places* maintained by the Secretary of the Interior. They include artifacts, records, and remains that are related to and located within such properties.

Historic resource: In the United States, material remains and the landscape alterations that have occurred since the arrival of Europeans.

Human environment: Natural and physical environment and the relationship of people with that environment including all combinations of physical, biological, cultural, social, and economic factors in a given area.

Hydraulic: Powered by water.

Hydroelectric plant: Electric powerplant using falling water as its motive force.

Hydroelectric power: Electricity produced by water.

Hydrogen sulfide (H₂S): A colorless, flammable, and extremely hazardous gas that occurs naturally in crude petroleum, natural gas, and hot springs.

Hydrograph: Graph showing, for a given point in a stream, the discharge, stage, velocity, or other property of water with respect to time.

Hydrologic budget: An accounting of the inflow to, outflow from, and storage change in a hydrologic unit such as an aquifer or drainage basin.

Hydrologic cycle: Continuous circulation of water in all of its phases (gas, liquid, solid) from the atmosphere to Earth by precipitation, and from Earth to the atmosphere by evaporation and transpiration. The land phase includes infiltration, runoff, and exchange between surface water and groundwater.

Hydrology: Science dealing with the occurrence, properties, distribution, circulation, and transport of water, including groundwater, surface water, rain, and snow.

Hydropower: See *hydroelectric power*.

Hypolimnetic: Pertaining to the lower, colder portion of a lake or reservoir, which is separated from the upper, warmer portion (epilimnion) by the thermocline.

Hypolimnion: Non-circulating bottom layer of a thermally stratified lake or reservoir that exhibits essentially uniform colder temperature and low dissolved oxygen.

Hypoxia: depressed levels of dissolved oxygen in water, usually resulting in decreased metabolism.

I

Igneous rock: A crystalline rock formed by the cooling and solidification of molten or partly molten material (magma). Igneous rock includes volcanic rock (rock solidified above the Earth's surface) and plutonic rock (rock solidified at considerable depth).

Impact: Effect, influence, alteration, or imprint caused by an action. See *adverse impact*, *cumulative impact*, *direct impact*, and *indirect impact*.

Impoundment: Body of water created by a dam, dike, floodgate, or other barrier.

Inactive capacity: Reservoir capacity that can be released from the dam but is normally not available (i.e., for power generation) because of operating agreements or physical restrictions. At Glen Canyon Dam, this is the reservoir storage above the river outlet works openings at elevation 3,374 ft (1,038 m) and below the penstock openings at elevation 3,490 ft (1,064 m), which is about 3.9 maf.

Indian trust assets: Lands, natural resources, or other assets held in trust or restricted against alienation by the United States for Native American Tribes or individual Native Americans.

Indian trust resource: Those natural resources, either on or off Indian lands, retained by or reserved by or for Indian Tribes through treaties, statutes, judicial decisions, and Executive Orders, which are protected by a fiduciary obligation on the part of the United States.

Indigenous: Native to an area.

Indirect effect (impact): Effect that occurs away from the place of action with effects that are related to, but removed from, a proposed action by an intermediate step or process. An example would be changes in surface-water quality resulting from soil erosion at construction sites.

Indirect impact: See *indirect effect*.

Inflow: Amount or rate of water flowing into a body of water. In this report, the water flowing into Lake Powell from the Colorado River and/or its tributaries; or water entering the Colorado River from tributaries between Glen Canyon Dam and Lake Mead; or water flowing into Lake Mead, mainly from the Colorado River.

Infrastructure: Basic facilities, utilities, services, and transportation framework needed to meet public and administrative needs for the functioning of an organization, system, or community.

In-situ: In its natural position or place; unmoved, unexcavated, remaining at the site or subsurface.

Insolation: Solar energy that is received on a given surface area during a given time.

Instream flow requirements: Amount of water flowing through a stream course needed to sustain instream values.

Intake: Structure in a dam, reservoir, or river through which water can be drawn into an outlet pipe or waterway.

Interconnected systems: System consisting of two or more individual power systems normally operating with connecting tie lines.

Interflow: Lateral movement of water in the upper layer of soil.

Interim shortage criteria/interim guidelines: Operational guidelines and coordinated reservoir management strategies (established in 2007) to address operations of Lake Powell and Lake Mead, particularly under drought and other low reservoir conditions. These criteria also provide a greater degree of certainty to U.S. Colorado River water users and managers of the Colorado River Basin by detailing information on when, and by how much, water deliveries will be reduced under specified reservoir conditions.

Intermittent stream: Stream that flows only at certain times of the year when the ground-water table is high; occasionally is dry or reduced to a pool stage when losses from evaporation or seepage exceed the amount of inflow.

Inundate: To cover with impounded waters or floodwaters.

Invasive species: Nonnative plant or animal, including noxious and exotic species, that is an aggressive colonizer and can out-compete other species. Their introduction causes or is likely to cause economic or environmental harm or harm to human health.

Invertebrate: Animal without a spinal cord, usually replaced by a hard exoskeleton or shell. Examples include insects, spiders, crayfish, snails, or clams.

Ion: Atom or molecule that carries either a positive or negative electrical charge.

Irretrievable commitments of resources: Those resources that are lost or lose value for a period of time and cannot be restored as a result of an action, such as temporary loss of power productivity due to of modified operations.

Irreversible commitments of resources: Those resources that cannot be regained, restored, or returned to their original condition within a reasonable time frame, such as the extinction of a species.

Irrigation district: A cooperative, self-governing public corporation set up as a subdivision of the state government, with definite geographic boundaries; organized and having taxing power to obtain and distribute water for irrigation of lands within the district; created under the authority of a state legislature with the consent of a designated fraction of the landowners or citizens.

J

Jeopardy opinion: FWS or NMFS opinion that an action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat.

Jet tube: A Glen Canyon Dam outlet that releases water below the level of penstocks. Four jet tubes with a combined release capacity of 15,000 cfs are not equipped with generation capability, but allow for a total release of about 45,000 cfs when used in combination with maximum releases from each of the eight penstocks.

Juvenile: Young organism older than 1 year but not having reached reproductive age.

K

Kaibab formation: The rock that makes the canyon rims and is the youngest of the Grand Canyon's geologic layers.

Kilovolt (kV): 1,000 volts (V).

Kilowatt (kW): Unit of electric power capacity equal to 1,000 watts (W), or about 1.34 horsepower (HP).

Kilowatt-hour (kWh): Basic unit of electric energy equaling an average of 1 kW of power applied over 1 hour.

L

Lake Mead National Recreation Area (LMNRA): American's first national recreation area; encompasses Lake Mead and Lake Mohave.

Lake Powell: Reservoir created by the completion of the Glen Canyon Dam on the Colorado River in 1963.

Landform: Any feature of the Earth's surface having a distinct shape and origin. Landforms include major features (such as continents, ocean basins, plains, plateaus, and mountain ranges) and minor features (such as hills, valleys, slopes, drumlins, and dunes).

Landmark (historic): Significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States.

Landmark (visual): Type of reference point external to the observer. Usually a simply defined physical object that can be seen from many angles and distances over the tops of smaller elements and used as a radial reference.

Landscape: Traits, patterns, and structure of a specific geographic area including its biological composition, its physical environment, and its anthropogenic or social patterns.

Larva, larvae (pl.): The immature stage between the egg and pupa of insects having complete metamorphosis where the immature differs radically from the adult (e.g., caterpillars, grubs).

Larval fish: First life stage of fish after hatching. Larvae are not able to feed themselves, and carry a yolk-sac that provides their nutrition.

Latitude: Angular distance north or south of the equator, measured in degrees.

Law of the River: As applied to the Colorado River, the collective set of documents that apportion the Colorado River waters and regulates the use and management of the Colorado River among the seven Basin States and Mexico. It is comprised of numerous operating criteria, regulations, and administrative decisions included in federal and state statutes, interstate compacts, court decisions and decrees, an international treaty, and contracts with the Secretary of the Interior.

Lead (Pb): A gray-white metal that is listed as a criteria air pollutant. Health effects from exposure to lead include brain and kidney damage and learning disabilities. Sources include leaded gasoline and metal refineries.

Lead agency (or agencies): Federal agency (or agencies) either preparing or taking primary responsibility for preparing the NEPA compliance documents.

Lee Ferry: Reference point marking division between the Upper and Lower Colorado River basins. The point is located in the mainstream of the Colorado River 1 mi below the mouth of the Paria River in Arizona.

Lees Ferry: The historic location of Colorado River ferry crossings (1873 to 1928) and the current site of the U.S. Geological Survey stream gage above the Paria River confluence.

Limnology: Scientific study of the physical, chemical, meteorological, and biological aspects of freshwater bodies.

Listed species: Species, subspecies, or distinct population segments that have been added to the federal list of endangered and threatened wildlife and plants and receive legal protection under the ESA.

Load: Amount of electrical power or energy delivered or required at a given point.

Load-following: A pattern of hydropower generation that reacts instantaneously to change in demand for power.

Loam: Soil consisting of an easily crumbled mixture of clay, silt, and sand.

Low flow: Flow releases from the dam at a rate of 8,000 cfs or less.

Lower Basin: Those parts of the states of Arizona, California, Nevada, New Mexico, and Utah, within and from which waters drain naturally into the Colorado River below Lee Ferry, Arizona; defined by the Colorado River Compact of 1922.

Lower Colorado River Multi-Species Conservation Plan (MSCP): 50-year multi-stakeholder federal and non-federal partnership set up to protect the lower Colorado River environment while ensuring the certainty of existing river water rights and power operations; address the needs of threatened and endangered native species and their habitats in compliance with state and federal endangered species laws; and reduce the likelihood of listing additional species along the lower Colorado River.

Lower Division: Division of the Colorado River system that includes the states of Arizona, Nevada, and California; area defined by Article II of the Colorado River Compact of 1922.

Lower-elevation balancing tier: Operation elevation that applies when Lake Powell's projected January 1 elevation is below 3,525 ft (1,074 m) AMSL. The tier provides for attempting to balance the contents of Lake Mead and Lake Powell, if possible, within the constraint that the release from Lake Powell would be not more than 9.5 maf and no less than 7.0 maf.

M

Macroinvertebrate: Animal without vertebrae, usually with a hard exoskeleton or shell, of a size large enough to be seen by the unaided eye.

Macrophyte (aquatic): Aquatic plant that is large enough to be observed with the naked eye. Grows in or near water.

Main channel: Deepest or central part of the bed of a stream or river, containing the main current.

Mainstem: Main course of a stream or river.

Mainstream: Principal or largest stream or river of a given area or drainage basin; in this document, the Colorado River.

Major federal action: Proposed federal undertaking entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies that has the potential for significant impacts on the human environment and is thus subject to federal control and responsibility.

Mammal: Air-breathing animal whose skin is more or less covered with hair or fur and has mammary glands. Young are born alive (except for the platypus and echidna) and are nourished with milk. Mammals include humans, dogs, cats, deer, mice, squirrels, raccoons, bats, opossums, whales, seals, and others.

Management action: Decision-making response carried out to achieve a specific purpose.

Meander: Bends and loops in a river channel as the river snakes through a flat land area.

Mechanical removal (fish): Use of electrofishing, nets, and other gear types to physically remove fish from an ecosystem. See *electrofishing*.

Median: Middle value in a distribution, above and below which lie an equal number of values.

Megawatt (MW): One million watts of electrical power.

Megawatt-hour (MWh): One million watt-hours of electrical energy.

Memorandum of Understanding (MOU): Document structuring the collaboration among federal agencies and other stakeholders (e.g., Tribes, local governments) and describing an intended common line of action.

Mesa: A broad, flat-topped elevation with one or more steeply sloping to vertical sides.

Mesozoic age: An era of geologic time between the Paleozoic and the Cenozoic eras, spanning the time between 251 and 65 million years ago. The word Mesozoic is from Greek and means “middle life.”

Metalimnion: Middle layer of a thermally stratified lake or reservoir where there exists a rapid decrease in temperature with depth. Also called thermocline.

Meteorology: Study of the Earth's atmosphere, particularly its patterns of climate and weather.

Metric ton: Unit of mass equal to 1,000 kilograms.

Microclimate: The climate of a small area, particularly that of the living space of a certain species, group, or community.

Mid-elevation tier: Operation elevation that applies when Lake Powell's projected January 1 elevation is below 3,575 ft (1,090 m) AMSL and at or above 3,525 ft (1,074 m) AMSL. The annual releases in this tier are either 7.48 maf or 8.23 maf, depending upon the projected elevation of Lake Mead being above or below 1,025 ft (312 m) AMSL, respectively.

Midge: A very small, non-biting, two-winged insect, related to deer flies, mosquitos, and craneflies.

Mill: Monetary cost and billing unit used by utilities; equal to 1/1,000 of a U.S. dollar (equivalent to 1/10 of one cent).

Milligram per liter: Equivalent to one part per million.

Million acre-feet (maf): Unit of volume; the volume of water that would cover 1 million acres to a depth of 1 foot.

Mineral: Naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal morphology, and physical properties such as density and hardness. Minerals are the fundamental units from which most rocks are made.

Minimum flow: The lowest flow that occurs during the day, month, or year.

Mitigation: Action implemented to eliminate, avoid, minimize, or reduce the severity of an adverse impact on a particular resource resulting from the proposed action or its alternatives. Mitigation can include one or more of the following: (1) avoiding impacts; (2) minimizing impacts by limiting the degree or magnitude of an action; (3) rectifying impacts by restoration, rehabilitation, or repair of the affected environment; (4) reducing or eliminating impacts over time; and (5) compensating for the impact by replacing or providing substitute resources or environments to offset the loss.

Modified low fluctuating flow (MLFF): Current operating flow regime for the Glen Canyon Dam. The MLFF regime was established as the preferred alternative in the 1995 EIS and subsequent 1996 Record of Decision (ROD). In general, MLFF combines reduced daily flow fluctuations below the historic pattern of releases with high steady releases of short duration, intended to protect or enhance downstream resources while allowing limited flexibility for power operations. Established flows included minimum flows of no less than 8,000 cfs between 7 a.m. and 7 p.m., and 5,000 cfs at night; maximum rate of release limited to 25,000 cfs during fluctuating hourly releases; and releases of greater than 25,000 cfs (other than for emergencies) made steady on a daily basis in response to high inflow and storage conditions.

Monoculture: the cultivation or growth of a single crop or organism, especially on agricultural or forest land.

Monsoon: Rain event caused by a change in atmospheric circulation (e.g., wind direction) that results in stormy conditions, including excessive rainfall.

Morphology: Form and structure of an object (e.g., biological organism or rock formation) or any of its parts.

Mortality: Relative incidence or prevalence of death in a population.

Mouth (river): Natural opening, as the part of a stream or river, that empties into a larger body of water (e.g., another river, lake, bay, or ocean).

Myxozoa: Group of small parasitic animals that live in aquatic environments; one species in this group, *Myxobolus cerebralis*, is the parasite that causes whirling disease in rainbow trout.

N

National Ambient Air Quality Standards (NAAQS): Air quality standards established by the CAA, as amended. The primary NAAQS specify maximum outdoor air concentrations of criteria pollutants that would protect the public health within an adequate margin of safety. The secondary NAAQS specify maximum concentrations that would protect the public welfare from any known or anticipated adverse effects of a pollutant.

National Environmental Policy Act of 1969 (NEPA): Act passed by Congress in 1969 that sets national policy, procedures, tools, and compliance measures to support environmental protection, including encouraging productive harmony between people and their environment; promoting efforts that will prevent or eliminate damage to the environment and the biosphere and simulate the health and welfare of people; enriching the understanding of the ecological systems and natural resources important to the nation; and establishing a Council on Environmental Quality. It requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies prepare one of the following: a categorical exclusion, an EA, or an EIS.

National Historic Preservation Act (NHPA): Federal law providing that property resources with significant national historic value be placed on the *National Register of Historic Places*. It does not require permits; rather, it mandates consultation with the proper agencies whenever it is determined that a proposed action might affect a historic property.

National Register of Historic Places (NRHP): Official list of the nation's cultural resources worthy of preservation. Authorized under the NHPA, the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the NRHP include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.

Native: Species of plants or wildlife that originated in the particular area or region in which they are growing or living.

Native American: See *American Indian*.

Native American Graves Protection and Repatriation Act (NAGPRA): Act that established the priority for ownership or control of Native American cultural items excavated or discovered on federal or Tribal land after 1990 and the procedures for repatriation of items in federal possession. The act allows for the intentional removal or excavation of Native American cultural items from federal or Tribal lands only with a permit or upon consultation with the appropriate Tribe.

Natural condition: State or status of resources that would occur (to the extent practicable) in the absence of human activities and/or dominance over the landscape.

Natural flow: The flow of any stream or river as it would be if unaltered by upstream diversion, storage, import, export, or change in upstream consumptive use caused by human activities.

Natural resource: Features and values that are inherently supplied by nature and considered to have value, including plants and animals, water, air, soils, topographic features, geologic features, and paleontological resources.

Natural Zone: An area managed for the conservation of natural resources and ecological processes while providing for their use by the public, as established by the National Park Service.

Nearshore: Area located between the boundary of the mainstem current and the shoreline. These regions are typically characterized by low water velocities (compared to the mainstem) and reduced turbulent mixing.

Nematode: An elongated, cylindrical worm parasitic in animals, insects, or plants, or free-living in soil or water.

Neotropical migratory bird: Bird that breeds in North America (i.e., Canada and the United States) during the spring and summer months and spends the winter months in Mexico, Central America, South America, or the Caribbean islands.

New High Water Zone (NHWZ): The area located next to the river, corresponding to river flows of 25,000 to 40,500 cfs, colonized with vegetation since the construction of Glen Canyon Dam; typically composed of riparian species, both native and nonnative.

Nitrate (NO₃): Naturally occurring plant nutrient that is essential to all life. It commonly enters water supply sources from decaying plants, manures, fertilizers, or other organic residues.

Nitrogen dioxide (NO₂): Toxic reddish brown gas that is a strong oxidizing agent, produced by combustion (as of fossil fuels). It is the most abundant of the oxides of nitrogen in the atmosphere and plays a major role in the formation of ozone. NO₂ is one of the six criteria air pollutants specified under Title I of the CAA. See *nitrogen oxides*.

Nitrogen oxides (NO_x): Includes various nitrogen compounds, primarily nitrogen dioxide and nitric oxide. They form when fossil fuels are burned at high temperatures and react with volatile organic compounds to form ozone, the main component of urban smog. They are also precursor pollutants that contribute to the formation of acid rain.

No action alternative: An alternative required by CEQ to be included in all EAs and EISs, representing conditions that would occur if the agency did not take the proposed action being considered. The environmental effects resulting from taking no action are compared to the effects of permitting the proposed action or any other action alternative to go forward.

Nonattainment area: The EPA's designation for an air quality control region (or portion thereof) in which ambient air concentrations of one or more criteria pollutants exceed NAAQS.

Non-firm power: Power that is not available continuously and may be interruptible; may be marketed on a short-term basis.

Nonnative: Species of plants or wildlife that did not originate in the particular area in which they are growing or living and that often interfere with natural biological systems.

Non-use valuation: The process of assigning a non-use value to a resource.

Non-use value: The economic benefit that arises from the knowledge that a resource exists (existence value), has been preserved for potential use in the future (option value), and will be available for use by one's heirs (bequest value). Non-use value is theoretically and conceptually distinct from use value. Contingent valuation is the only technique currently available for estimating non-use value.

Normal condition: As it relates to the Colorado River, when the Secretary of the Interior has determined that there is available water for annual releases totaling 7.5 maf to satisfy consumptive use in the Lower Division states pursuant to Article II(B)(1) of the Consolidated Decree.

Notice of Intent (NOI): Announcement published in the *Federal Register* that an EIS will be prepared and considered. Includes description of the proposed action and alternatives; provides time, place, and descriptive details of the proposed scoping process; and identifies the lead agency (or agencies) contact person.

NPS-28, Cultural Resource Management Guidelines: National Park Service guidelines that elaborate on policies and standards and offer guidance in applying them to establish, maintain, and refine park cultural resource programs.

Nutrients: Chemical elements or compounds that are essential to plant and animal growth and development, such as nitrogen and phosphorus. Nutrients are measured in milligrams per liter (mg/L).

O

Obligate species: Restricted to a particular condition of life; for example, dependent on a particular habitat to be able to breed.

Off-peak energy: Electric energy supplied during periods of relatively low system demand.

Old High Water Zone (OHWZ): Area of vegetation above the level corresponding to flood flows of about 120,000 to 125,000 cfs; typically composed of native tree species.

On-peak energy: Electric energy supplied during periods of relatively high system demand.

Operating tier: Pursuant to the Interim Guidelines established in 2007, coordinated operations of Lake Powell and Lake Mead defined four operation tiers: (1) Equalization Tier, (2) Upper Elevation Balancing Tier, (3) Mid-Elevation Tier, and (4) Lower Elevation Balancing Tier. See specific tiers for additional information.

Organic matter: Material derived from living plant or animal organisms.

Organochlorine pesticide: Pesticide containing a compound of carbon, chlorine, and hydrogen that does not break down easily and is stored in fatty tissues of any animal ingesting it. Accumulates in animals in higher trophic levels.

Oscillatoria: Genus of benthic (bottom-dwelling) cyanobacteria or plankton (blue-green algae) occurring in blooms in fresh water.

Ostracod: Group of small crustaceans with a bivalved carapace that can be closed to completely cover the body; important planktonic fish food.

Outage (power): Period during which a generating unit, transmission line, or other facility is out of service and power is not available.

Outflow (hydrology): Amount or rate of water flowing out of or from a body of water. In this report it refers to water leaving Lake Powell by way of Glen Canyon Dam.

Outlet works: Device, usually consisting of one or more bypass pipes or tunnels through the embankment of the dam, used to release and regulate water flow from a dam. These structures are similar in purpose to spillways, but outlet works can provide a lower volume and more controlled release. See *jet tube*.

Ozone (O₃): Strong-smelling, reactive, toxic gas consisting of three oxygen atoms chemically attached to each other. Ozone is formed in the atmosphere by chemical reactions involving NO_x and volatile organic compounds (VOCs) in the presence of sunlight. Ozone is one of the six criteria air pollutants under the CAA and is a major constituent of smog.

P

Paleoclimate: a climate prevalent at a particular time in the geologic past.

Paleoindian period: A late Pleistocene stage of cultural evolution in the Americas at the end of the last ice age, when the first traces of human activity begin to appear in the archaeological record characterized by big-game hunting and the use of fluted projectile points.

Paleozoic: An era of geologic time, from the end of the Precambrian to the beginning of the Mesozoic, or from about 542 to 251 million years ago; also, the rocks deposited during this time.

Parasite: Organism that lives on or in an organism of another species (i.e., host) in a way that harms or is of no advantage to the host. Parasites rarely kill their hosts, instead, they obtain nutriment from the host body to live, grow, and multiply.

Particulate matter (PM): Fine solid or liquid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions that stick to lung tissue when inhaled. The size of the particulates is measured in micrometers (µm), which is 1 millionth of a meter (0.000039 in.). Particle size is important because the EPA has set standards for PM_{2.5} and PM₁₀ particulates, both of which are criteria air pollutants under the CAA. See *PM_{2.5}* and *PM₁₀*.

Pathogen: Bacterium, virus, or other microorganism that can cause disease in other living microorganisms or in humans, animals, and plants.

Peak demand: See *peak load*.

Peak flow: Maximum instantaneous flow in a specified period of time.

Peak load: Maximum electrical demand in a stated period of time.

Peak load plant: Powerplant that normally is operated to provide power during maximum load periods.

Peaking power: Powerplant capacity typically used to meet the highest levels of demand in a utility's load or demand profile.

Penstock: Conduit pipe used to convey water under pressure from a storage reservoir to the turbines of a hydroelectric powerplant.

Per capita income: The average income per person in a given group.

Perennial stream: Stream that flows continuously throughout the year because it lies at or below the groundwater table, which constantly replenishes it.

Periphyton: Complex mixture of algae, cyanobacteria, other microbes, and detritus that is attached to submerged surfaces in most aquatic ecosystems. It serves as an important food source for invertebrates, tadpoles, and some fish.

pH: A measure of the relative acidity or alkalinity of a solution, expressed in a scale of 0 to 14, with a neutral point at 7. Acid solutions have pH values lower than 7, and basic (i.e., alkaline) solutions have pH values higher than 7.

Phantom Ranch: Constructed in 1922, the Phantom Ranch is the only accommodation for hikers in the inner Grand Canyon. It consists of a cluster of guest houses and a canteen lying between Bright Angel Creek and the Colorado River in GCNP.

Phosphorous: Essential chemical food element that can contribute to the eutrophication of lakes and other water bodies. Increased phosphorus levels result from discharge of phosphorus-containing materials into surface waters.

Photosynthesis: Process in which chlorophyll-containing cells convert light into chemical energy, forming organic compounds from inorganic compounds.

Phreatophyte: Any plant, typically living in the desert, that obtains its water from long taproots that reach the water table.

Physiography: The physical geography of an area or the description of its physical features.

Phytoplankton: Microscopic, single-celled photosynthetic organisms that live suspended in water.

Piscivorous: Habitually feeding on fish.

Plankton: Tiny plant (phytoplankton) and animal (zooplankton) organisms with limited powers of locomotion usually living free in the water away from substrates.

Plano technological complex: Distinctive early Paleoindian culture defined by a range of unfluted stone projectile points. Plano technology dates to 11,000 to 8,000 years ago.

PM₁₀: Particulate matter with a mean aerodynamic diameter of 10 µm (0.0004 in.) or less. Particles with diameters smaller than this can be inhaled and accumulate in the respiratory system. PM₁₀ is one of the six criteria pollutants specified under Title I of the CAA.

PM_{2.5}: Particulate matter with a mean aerodynamic diameter of 2.5 µm (0.0001 in.) or less. Particles with diameters smaller than this can lodge deeply in the lungs. PM_{2.5} is one of the six criteria pollutants specified under Title I of the CAA.

Pollinator: Agent, such as an insect or bird, that moves pollen from the male anthers of a flower to the female stigma of a flower to accomplish fertilization.

Pollutant: Any material entering the environment that has undesired effects.

Ponding flow: Relatively high flows that produce warm low-velocity slackwater areas at tributary mouths that provide thermal refuges for drifting larvae and young warmwater fish (e.g., humpback chub).

Pool: Deep area of a stream or river between rapids or where the current is slow.

Post-dam: Period of time after the completion of Glen Canyon Dam in 1963.

Power demand: Rate at which electric energy is required and delivered to or by a system over any designated period of time.

Power marketing: Process by which Western Area Power Administration sells power generated at Glen Canyon Dam and other Colorado River Storage Project facilities. Subject to a number of requirements established under statutory criteria.

Power operations: Physical operations of a large electrical power system, including hydropower generation, control (operational flexibility, scheduling, load following, and reserves), and transmission.

Power pool: Two or more interconnected electric systems that operate on a coordinated basis to achieve economy and reliability in supplying their combined loads.

Powerplant: Structure that houses turbines, generators, and associated control equipment related to the generation of electrical power.

Powerplant capacity: For Glen Canyon Dam, maximum flow that can pass through the turbines when Lake Powell is full (33,200 cfs). Also refers to the electrical capacity of the generators; total nameplate generating capacity for the powerplant is 1,021,248 kilowatts.

Pre-dam: Period of time before the completion of the Glen Canyon Dam in 1963.

Predation: Act of preying or plundering, specifically the interaction between species when one animal (predator) captures and eats another animal (prey).

Predatory: Relating to or characteristic of organisms that survive by preying on other organisms for food.

Preference customer: In accordance with congressional directives, publicly owned systems, and nonprofit cooperatives that have preference over investor-owned systems for purchase of power from federal projects.

Preferred alternative: Alternative the lead agency (or agencies) believes would fulfill its statutory mission and responsibilities under NEPA, giving consideration to economic, environmental, technical, and other factors.

Prescribed fires: Application of fire (by planned or unplanned ignitions) to fuels in either their natural or modified states, under specified conditions, to allow the fire to burn in a predetermined area while producing the fire behavior required to achieve certain management objectives.

Prevention of significant deterioration (PSD): A federal air pollution permitting program intended to ensure that air quality does not diminish in attainment areas that meet NAAQS.

Primitive: Belonging to or characteristic of an early age of development.

Productivity (ecology): Rate of biomass generation by an individual, population, or community within an ecosystem. Also, the fertility or capacity of a given habitat or area.

Programmatic Agreement (PA): Document that records the terms and conditions agreed upon to resolve the potential adverse effects of a federal agency program, complex undertaking, or other situations in accordance with Section 800.14(b), "Programmatic Agreements," of 36 CFR Part 800, "Protection of Historic Properties."

Project area: Area in which a proposed action would occur and directly affect the environment. The project area for the LTEMP EIS is Lake Powell, Lake Mead, and the Colorado River and its corridor in between.

Proliferation: Rapid growth or increase in production of new parts or offspring.

Proposed action: An action proposed by an agency, subject to a NEPA analysis.

Proterozoic era: Final era of the Precambrian, spanning the time between 2.5 billion and 544 million years ago. Fossils of both primitive single-celled and more advanced multicellular organisms begin to appear in abundance in rocks from this era. Its name means "early life."

Protohistoric: Period between prehistory and history, during which a culture or civilization has not yet developed writing but other cultures have already noted its existence in their own writings. The protohistoric culture may also be in the process of developing its own writing techniques and creating its own written record.

Public involvement: Process of obtaining public input into each stage of development of planning documents. Required as a major input into any EIS.

R

Radionuclide: Unstable nuclide that undergoes radioactive decay.

Ramp rate: Rate of change (cfs/hr) in instantaneous dam releases. The ramp rate is established to prevent undesirable effects due to rapid changes in loading or, in the case of hydroelectric powerplants, discharge.

Range: Geographic region in which a given plant or animal normally lives or grows.

Rapid: Turbulent section of a river. Fast-flowing current typically is caused by a relatively steep descent in the riverbed or a constriction of the main channel.

Reach: Any specified length of a stream or river.

Rearing: Bringing up from the early stages of life, through maturity, until fully grown.

Reattachment bar: Sandbar located where downstream flow meets the riverbank at the downstream end of a recirculation zone. An element of a fan-eddy complex.

Recirculation zone: Area of flow composed of one or more eddies immediately downstream from a constriction in the channel, such as a debris fan or rock outcrop. An element of a fan-eddy complex.

Reclamation Project Act of 1939: This act provides a comprehensive plan for the variable payment of construction charges on U.S. reclamation projects.

Record of Decision (ROD): Document separate from but associated with an EIS that publicly and officially discloses the responsible agency's decision on the EIS alternative to be implemented.

Recovery: Return to or regaining of any former and better state or condition. As it relates to ESA, recovery is the process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival (including the ecosystem upon which they depend) are neutralized, so that its long-term survival in nature can be ensured.

Recruitment: Survival of young plants and animals from birth to reproductive age or a life stage less vulnerable to environmental change.

Redd: Depression, or spawning nest, dug by fish (especially trout or salmon) in river- or lakebed for the deposition of eggs.

Redeposition: Formation into a new accumulation, such as the settlement of sedimentary material that has been picked up and moved (reworked) from the place of its original deposition.

Refuge: Protection or shelter, as from something dangerous, threatening, harmful, or unpleasant.

Refugia: Locations or areas where conditions remain suitable to allow a species or a community of species to survive following extinction in surrounding areas. Plural of refugium.

Region of influence (ROI): Area occupied by affected resources and the distances at which impacts associated with a proposed action may occur.

Regulation: Capacity devoted to providing the minute-by-minute change in generation above and below a generator's operating set point. It is needed to maintain a constant voltage within a power control area given variation in generator units. Regulation results in instantaneous deviations above and below the mean hourly flow within each hour that do not affect the mean hourly flow over a full hour. In the United States, regulating capacity is controlled by computers (via automatic generation control).

Reptile: Cold-blooded vertebrate of the class Reptilia whose skin is usually covered in scales or scutes. Reptiles include snakes, lizards, turtles, crocodiles, and alligators.

Reserve generating capacity: Extra generating capacity available to meet unanticipated capacity demand for power in the event of generation loss due to scheduled or unscheduled outages of regularly used generating capacity.

Reservoir: Natural or artificially impounded body of water, commonly created by the building of a dam, that is used for the storage, regulation, and control of water.

Reservoir capacity: Total or gross storage capacity of the reservoir at full supply level.

Restoration: Manipulation of the physical, chemical, or biological characteristics of a resource or site with the goal of improving or returning its natural/historic functions to any former and better state or condition.

Return-current channel: Channel excavated by upstream eddy flow that forms behind a reattachment bar. See *backwater*.

Riffle: Stretch of choppy water caused by an underlying rock shoal or sandbar.

Riparian: Along a river, pond, lake, or tidewater.

Riparian zone: Area encompassing the alluvial sediment deposits where river and alluvial groundwater supplement that available from local precipitation.

Risk: Likelihood of suffering a detrimental effect as a result of exposure to a hazard.

River basin: Land area surrounding one river from its headwaters to its mouth. The area drained by a river and its tributaries.

River corridor: River and the area of land adjacent to it, including the talus slopes at the bases of cliffs, but not the cliffs themselves.

River mile (RM): Unit of measurement (in miles) that quantifies distance (or length) in miles along a river from its mouth or other reference point. On the Colorado River, River Mile 0 is located at the U.S. Geological Survey gage at Lees Ferry, Arizona; points downstream are positive values while those upstream are negative.

River runner: Individual who recreationally navigates a moving body of water, typically a whitewater river, using a raft, kayak, or other type of boat. See *whitewater rafting*.

River stage: Water surface elevation of a river above a reference datum.

Riverine: Of, resembling, relating to, or situated on a river or riverbank.

RiverWare: Commercial river system simulation computer program that was configured to simulate operation of the Colorado River for this EIS.

Rotifer: Microscopic, multicellular invertebrates from the class Rotifera; common in freshwater.

Runoff: Portion of the precipitation, melted snow, or irrigation water that flows across ground surface and eventually is returned to surface water sources. Runoff can pick up pollutants from the air or land and carry them to the receiving waters.

S

Sacred landscape: Natural places recognized by a cultural group as having spiritual or religious significance.

Sacred site: Any specific, discrete, narrowly delineated location on federal land that is identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the Tribe or appropriate authoritative representative of an Indian religion has informed the agency of the existence of such a site.

Salinity: Degree of dissolved minerals (e.g., salts) in water. Also commonly referred to as total dissolved solids (TDS). See *total dissolved solids*.

Salmonid: Of, belonging to, or characteristic of fish belonging to the Salmonidae family, which includes salmon, trout, and whitefish.

Salt Lake City Area Integrated Projects (SLCA/IP): Part of an interconnected generation and transmission system that includes federal, public, and private power-generating facilities.

Sand: Rock or mineral fragment of any composition that has a diameter ranging from 0.5 to 2.0 mm. Sand has a gritty feel.

Sand budget: Management tool used to analyze and describe the various sand and sediment inputs (sources) and outputs (sinks) within a defined system; can be used to predict morphological change over time.

Sand load: See *sediment load*.

Sand mass balance: Difference between the mass of sand being transported into an area and the mass of sand being transported out of the area. A positive sand mass balance indicates that sand is accumulating in the area, whereas a negative sand mass balance indicates that the mass of sand is decreasing in the area.

Sandbar: Any of the fine-grained alluvial deposits that intermittently form the riverbank. These fine-grained deposits are in contrast to the rocky surfaces predominately found throughout the Grand Canyon. See *beach*.

Sandstone: Sedimentary rock composed primarily of sand-sized (0.0025 to 0.08 in.) grains.

Scheduled outage: Shutdown of a generating unit or other facility for inspection or maintenance, in accordance with an advance schedule.

Scheduling: Matching of daily system energy and capacity needs with available generation.

Schist: Metamorphic rock formed from many types of rocks. Minerals in the rocks include micas, chlorite, talc, hornblende, and garnets. The minerals are characteristically platy and foliated (layered), indicating they were subjected to intense compression.

Scope: Range of actions, alternatives (including no action), and impacts to be considered in an EIS.

Scoping: Process required by NEPA to solicit input, issues, and information from within the agency, other agencies, and the public related to the proposed action prior to preparation of an EIS. Scoping assists the preparers of an EIS in defining the proposed action, identifying alternatives, and developing preliminary issues to be addressed in an EIS.

Scour: Erosion in or along a stream bed caused by high flow velocities.

Secretary: Secretary of the Department of the Interior (DOI) and duly appointed successors, representatives, and others with properly delegated authority.

Sediment: Unconsolidated solid material that is washed from land (e.g., from weathering of rock) and is carried by, suspended in, or deposited by water or wind. Sediment varies in size and includes clay, silt, sand, gravel, and cobble.

Sediment augmentation: Adding sand-, silt-, or clay-size sediments to the Colorado River to increase turbidity or sediment supply.

Sediment load: Mass of sediment passing through a stream cross-section in a specified period of time.

Sediment transport: Movement of sediment in a downstream direction caused by flowing water.

Sedimentary rock: Rock formed at or near the Earth's surface from the consolidation of loose sediment that has accumulated in layers through deposition by water, wind, or ice, or organisms. Examples are sandstone and limestone.

Sedimentation: Removal, transport, and deposition of sediment particles by wind or water.

Seep: Moist or wet place where groundwater slowly exits through soil or rock.

Seepage: Relatively slow movement of water through a medium such as sand.

Semi-arid: Moderately dry region or climate where moisture is normally greater than under arid conditions but still limits the production of vegetation.

Sensitive species: Plant or animal species listed by the state or federal government as threatened, endangered, or a species of special concern. The list of sensitive species typically varies from state to state, and the same species can be considered sensitive in one state but not in another. Also, a species that is adversely affected by disturbance or altered environmental conditions. See also *special status species*.

Separation bar: Sandbar located at the upstream end of a recirculation zone, where downstream flow becomes separated from the riverbank, creating an eddy.

Shoal: Shallow area in a body of water.

Shortage condition: When the Secretary has determined that there is available for annual release less than 7.5 maf to satisfy consumptive use in the Lower Division states pursuant to Article II(B)(3) of the Consolidated Decree.

Silt: Fine rock fragments or mineral particles of any composition between sand and clay in size that have diameters ranging from 0.002 to 0.05 mm.

Simulid: Group of two-winged flying insects who live their larval stage underwater and emerge to fly about as adults.

Sinuuous: Ratio of the length of a river's thalweg to the length of the valley proper. A measure of a river's meandering.

Site: In archeology, any location of past human activity.

Slope: Change in elevation per unit of horizontal distance.

Socioeconomic: Social and economic conditions in the study area.

Solar radiation: Electromagnetic radiation emitted by the sun.

Soundscapes: Sound or combination of sounds that forms or arises from an immersive environment.

Spawn: To lay eggs, especially fish.

Spawning beds: Places where eggs of aquatic animals lodge or are placed during or after fertilization.

Special status species: Any plant or animal species that is listed or proposed for listing as threatened or endangered by the FWS or NMFS under the provisions of the ESA. Also any species designated by the FWS as “candidate,” “sensitive,” or a “species of concern”; or a species listed by a state in a category implying potential endangerment or extinction (e.g., sensitive or rare).

Species of special concern: Species that may have a declining population, a limited occurrence, or low numbers for any of a variety of reasons.

Spike flow: Natural or experimental increase in the flow of water for a short duration.

Spills: Water releases from Glen Canyon Dam that do not pass through the turbines for the generation of electricity.

Spillway: Overflow channel of a dam to provide a controlled release.

Spinning reserves: Extra generating capacity that is available for immediate use in response to system problems or sudden load changes by increasing the power output of generators that are already connected to the power system. Within minutes or less, reserves allow for increases in the water release rates at Glen Canyon Dam to increase power generation, up to a limit known as the spinning reserve requirement, to compensate for the loss in generation elsewhere in the grid.

Spring: Point at which groundwater meets the Earth’s surface, causing water to flow from the ground.

Stage: See *water-surface elevation*.

Stakeholder: Person, group, or organization that has direct or indirect investment, share, or interest in an organization or project because it can affect or be affected by related actions, objectives, and/or policies.

State Historic Preservation Office(r) (SHPO): The state officer charged with the identification and protection of prehistoric and historic resources in accordance with the NHPA.

Steady flow: Flow released from the dam at any volume that does not vary beyond a small percentage over a 24-hour period.

Stewardship: Conducting, supervising, managing, or protecting something considered of value or worth caring for and preserving. The concept of stewardship has been applied in diverse areas, including the environment, economics, health, property, information, and religion.

Strata: Single, distinct layers of sediment or sedimentary rock.

Stratification: Thermal layering of water in lakes and streams. Lakes usually have three zones of varying temperature: epilimnion—top layer with essentially uniform warmer temperature; metalimnion—middle layer of rapid temperature decrease with depth; and hypolimnion—bottom layer with essentially uniform colder temperatures.

Stratigraphy: Layers of sediments and rocks that reflect the geologic history of an area. With respect to cultural resources and archaeological sites, the relative stratigraphic locations of human artifacts help determine the sequence in which past human activities took place.

Stream: Natural water course. See *ephemeral stream*, *intermittent stream*, and *perennial stream*.

Stream flow: Volume or rate, expressed in cubic feet per second (cfs), of water moving in a stream or river, at any given time.

Stream gage: Active, continuously functioning field measuring device for which stream flow is computed or estimated.

Subadult: Fish that are less than 3 years of age.

Subsistence: The practices by which a group or individual acquires food, such as through hunting and gathering, fishing, and agriculture.

Substrate: Surface on which a plant or animal grows or is attached.

Sulfur dioxide (SO₂): Colorless gas released from many sources, especially burning fossil fuels. Sulfur dioxide is one of the six criteria air pollutants specified under Title I of the CAA.

Sulfur oxides (SO_x): Compounds containing sulfur and oxygen, such as sulfur dioxide (SO₂) and sulfur trioxide (SO₃). Pungent, colorless gases that are formed primarily by fossil fuel combustion, notably from coal-fired powerplants. Sulfur oxides may damage the respiratory tract, as well as plants and trees.

Surface water: Water on the Earth's surface that is directly exposed to the atmosphere, as distinguished from water in the ground (groundwater).

Surplus condition: When the Secretary has determined that there is available for annual release more than 7.5 maf to satisfy consumptive use in the Lower Division states pursuant to Article II(B)(2) of the Consolidated Decree.

Surplus energy: Energy greater than that of contracted firm load that may be available for a short-term period to serve additional load; usually attributed to favorable, but unanticipated, hydrologic conditions.

Suspended solids: Small particles of sand, silt, clay, and organic material moving with the water or along the bed of the stream that are not in true solution (i.e., can be removed by filtration or settling).

Suspension: Heterogeneous mixture of fine solid particles in a liquid or gas, such as sand in water. The suspended particles will settle over time, if left undisturbed, or can be removable by filtration.

Sustainable hydropower (SHP): Fixed level of long-term capacity and energy available from SLCA/IP facilities during summer and winter seasons; this amount is the minimum commitment level for capacity that Western will provide to all SLCA/IP customers.

Sweat lodge: In Native American culture, a ceremonial event of traditional prayers and songs that are held in a lodge constructed of a wood frame covered with blankets, with hot stones that release steam when water is poured on them.

T

Tailwater: Reach of river immediately downstream of a dam, where the water is more similar to that in the reservoir than farther downstream.

Talus: Sloping accumulation of rock debris; also, rock fragments at the base of a cliff as the result of sliding or falling.

Taxa: Taxonomic unit or category within the biological system of classification to which organisms are assigned, including species, genus, family, order, class, and phylum.

Technical Work Group (TWG): Subcommittee comprised of technical representatives of the Adaptive Management Work Group (AMWG) to develop criteria and standards for monitoring and research programs.

Temperate: Moderate climate that lacks extremes in temperature.

Temperature control device (TCD): Apparatus used to modify the dam's penstocks to allow for selective withdrawal from the reservoir, as to influence the temperature of the release water (e.g., warm surface water versus cold deep water).

Temporal: Of, relating to, or limited by time.

Temporary structure: Any structure that can be readily and completely dismantled and removed from the site between periods of actual use. It may or may not be authorized at the same site from season to season or from year to year.

Terrace: Surface form of a high sediment deposit having a relatively flat surface and steep slope facing the river.

Terrain: Topographic layout and features of a tract of land or ground.

Terrestrial: Pertaining to plants or animals living on land rather than in water.

Texture: Visual manifestations of light and shadow created by the variations in the surface of an object or landscape.

Thalweg: Line connecting the deepest points along the length of a valley or riverbed.

Thermal: Of, relating to, affected by, or producing heat.

Thermocline: Zone of maximum change in temperature in a water body, separating upper (epilimnetic) from lower (hypolimnetic) zones.

Threatened species: Any species or subspecies that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Requirements for declaring a species threatened are contained in the ESA of 1973.

Toe: Point at which the bottom of a slope or embankment intersects the natural ground, such as the upstream or downstream toe of the dam or the downstream toe of a landslide or debris fan.

Topography: Physical shape of the ground surface; the relative position and elevations of natural and human-made features of an area.

Total dissolved solids (TDS): Dissolved materials in the water including ions such as potassium, sodium, chloride, carbonate, sulfate, calcium, and magnesium. In many instances, the term TDS is used to reflect salinity, since these ions are typically in the form of salts. See *salinity*.

Toxicity: Harmful effects on an organism caused by exposure to a hazardous substance. Environmental exposures are primarily through inhalation, ingestion, or contact with the skin.

Trace (hydrology): Sequence of flows over a specified period of time.

Traditional Cultural Property (TCP): Site or resource that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are (1) rooted in that community's history, and (2) important in maintaining the continuing cultural identity of the community.

Traditional use area: Broad landscapes over which contemporary people and their ancestors have hunted, fished, and gathered.

Translocation: Intentional capture, movement, and release of individuals of a species from one location or area to another. This type of transfer is typically done to prevent harm to the individuals or to establish additional populations elsewhere.

Transmission line: Facility for transmitting electrical energy at high voltage from one point to another point.

Travertine: Sedimentary rock formed by the precipitation of carbonate minerals from solution in ground and surface waters, and/or geothermal hot springs.

Tribal land: In the NAGPRA, tribal land is defined as: (1) all lands within the exterior boundaries of any Indian reservation; (2) all dependent Indian communities; and (3) any lands administered for the benefit of Native Hawaiians pursuant to the Hawaiian Homes Commission Act, 1920, and section 4 of Public Law 86-3. In the NHPA, Tribal land is defined as (1) all lands within the exterior boundaries of any Indian reservation, and (2) all dependent Indian communities.

Tribe: Term used to designate a federally recognized group of American Indians and their governing body. Tribes may be comprised of more than one band.

Tributary: River or stream that flows into another stream, river, or lake.

Trigger: Condition-dependent or environmental cues that determine management actions.

Trophic: Of, relating to, or pertaining to nutrition, food, or feeding. For example, the feeding habits or food relationship of different organisms in a food chain.

Trout: Prized game fish native to the Northern Hemisphere, that has been widely introduced (i.e., it is nonnative) across the globe, including the Colorado River below Glen Canyon Dam (with exception of the native cutthroat trout). These fishes feature a streamlined, speckled body with small scales and soft fins, although their individual coloring and appearance can change depending on the specific surroundings and environment in which they live. Typically smaller than the related salmon, trout are usually found in cool (50–60°F, 10–16°C), clear freshwater streams and lakes. Trout are an important food source for humans and wildlife including brown bears, birds of prey (e.g., eagles), and other animals. However, their existence threatens many native fish species and their habitats owing to competition, displacement, and predation.

Trout management flow (TMF): Special type of fluctuating flow designed to reduce the recruitment of trout by disadvantaging young-of-the-year (YOY) trout.

Turbidity: Measure of the water clarity or the ability of light to pass through water. Affected by the amount of suspended particles, dissolved solids, and colloidal materials that are suspended in water.

Turbine: Device or machine for generating rotary mechanical power from the energy of a stream of fluid (such as water, steam, hot gas, or wind). Turbines convert the kinetic energy of fluids to mechanical energy through the principles of impulse and reaction, or a mixture of the two. Turbines are considered the most economical means of turning large electrical generators.

Turbulent: Marked or characterized by disturbances, changes, and unrest, such as unsteady motion and agitation of water.

U

Upper Basin: Those parts of the states of Arizona, Colorado, New Mexico, Utah, and Wyoming, within and from which waters drain naturally into the Colorado River above Lee Ferry, Arizona; defined by the Colorado River Compact of 1922.

Upper Colorado River Commission: Commission established by the Upper Colorado River Basin Compact with five appointed members, one from each of the Upper Division States (Colorado, New Mexico, Utah, Wyoming) and one representing the United States of America. Its purpose is to administer the Upper Colorado River Basin Compact.

Upper Division: Division of the Colorado River system that includes the states of Colorado, New Mexico, Utah, and Wyoming; area defined by Article II of the Colorado River Compact of 1922.

Upper-elevation balancing tier: Operation elevation that applies when Lake Powell's projected January 1 elevation is below the elevation in the equalization table of the Interim Guidelines, but above 3,575 ft (1,090 m) AMSL. The tier defines several different operations for attempting to balance the contents of Lake Mead and Lake Powell, if possible, that may occur based on the projected elevations of each lake, within the constraint that the release from Lake Powell would be not more than 9.0 maf and no less than 7.0 maf.

Upstream: Toward the source of a stream or river, against the normal direction of water flow.

Use value: Economic benefit associated with the physical use of a resource, usually measured by the consumer surplus or net economic value associated with such use. The contingent value method is one technique used to estimate use value.

V

Varial zone: Portion of the river bottom that is alternately flooded and dewatered.

Velocity: Rate of flow of water or water-sediment mixture.

Vertebrate: Animal species with a backbone. Includes fish, amphibians, reptiles, birds, and mammals.

Visibility degradation: Scattering and absorption of light by fine particles with a secondary contribution by gases; cumulative emissions of air pollutants from a myriad of sources.

Visitor day: Use of a site or area for 12 visitor hours, which may be aggregated by one or more persons for a single continuous or intermittent use (e.g., multiple visits).

Visitor use: Usage of recreation and wilderness resources by people for inspiration, stimulation, solitude, relaxation, education, pleasure, or satisfaction.

Visual contrast: Opposition or unlikeness of different forms, lines, colors, or textures in a landscape.

Visual impact: Any modification in land forms, water bodies, or vegetation, or any introduction of structures that negatively or positively affect the visual character or quality of a landscape through the introduction of visual contrasts in the basic elements of form, line, color, and texture.

Visual resource: Refers to all objects (manmade and natural, moving and stationary) and features such as landforms and water bodies that are visible on a landscape.

Volatile organic compound (VOC): Broad range of organic compounds that readily evaporate at normal temperatures and pressures. Sources include certain solvents (e.g., acetone), degreasers (e.g., benzene), and fuels (e.g., gasoline). VOCs also react with other substances (primarily nitrogen oxides) to form ozone. They contribute significantly to photochemical smog production and certain health problems.

W

Warmwater fish: Species of fish that grow best in water at least 80°F (27°). Warm water holds less DO than cool or cold water, so warmwater species, such as largemouth bass, catfish, and bluegill, require less oxygen to survive.

Wash: Normally dry streambed that occasionally conveys flowing water.

Water column: Hypothetical “cylinder” of water from the surface of a water body to the bottom, within which physical and chemical properties can be measured.

Water quality: Term used to describe the chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose.

Water right: Legal entitlement of an individual or entity to extract water from a water source (surface water or groundwater) for a beneficial use (e.g., potable water supply, irrigation, mining, livestock).

Water table: Upper level of groundwater below which soil and rock are saturated with water.

Water year: Period of time beginning October 1 of one year and ending September 30 of the following year and designated by the calendar year in which it ends.

Waterfowl: Water birds, usually referring to ducks, geese, and swans.

Watershed: Region or area from which all water entering a particular water body drains. Also known as a basin.

Water-surface elevation (stage): Height, or elevation, of a water surface above or below an established reference level, such as sea level.

Weed: Plant considered undesirable, unattractive, or troublesome, usually introduced and growing without intentional cultivation.

Western Area Power Administration (WAPA): One of four power marketing administrations of the U.S. Department of Energy that markets and delivers reliable, renewable, cost-based hydroelectric power and related services within a 15-state region of the central and western United States.

Western Electricity Coordinating Council (WECC): Regional entity responsible for coordinating and promoting bulk electric system reliability in the Western Interconnection.

Wetlands: Federally protected areas that are saturated or flooded by surface or groundwater frequently enough or long enough to support plants, birds, and animals adapted to live in wet environments. Generally include swamps, marshes, bogs, estuaries, wet meadows, river overflows, mud flats, natural ponds, and other inland and coastal areas.

Wheeling: Occurs when two indirectly connected utilities agree to purchase or sell power to each other.

Whirling disease: Disease caused by a parasite; results in neurological damage to young fish, causing them to swim in a corkscrew pattern. Affected fish are unable to feed properly and are vulnerable to predators.

Whirlpool: Water moving rapidly in a circle so as to produce a depression.

Whitewater boating: See *whitewater rafting*.

Whitewater rafting: Recreational navigation of a moving body of water (e.g., river) characterized by fast-flowing rough water or rapids, using a raft, kayak, or other type of boat.

Wild and Scenic Rivers Act: Primary river conservation law enacted in 1968. The Act was specifically intended by Congress to balance the existing policy of building dams on rivers for water supply, power, and other benefits with a new policy of protecting the free-flowing character and outstanding values of other rivers.

Wilderness: Undeveloped land retaining its primeval character without permanent improvements or human habitation, and that generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.

Wilderness Act of 1964: Legislation enacted in 1964 to designate wilderness areas, with Congressional approval, to ensure that these lands are preserved and protected in their natural condition.

Wilderness areas: Areas and lands designated by Congress and defined by the Wilderness Act of 1964 as places "where the earth and its community are untrammelled by man, where man himself is a visitor who does not remain." Designation is aimed at ensuring that these lands are preserved and protected in their natural condition.

Wilderness characteristics: Wilderness characteristics include (1) naturalness: the area generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) outstanding opportunities: the area has either outstanding opportunities for solitude, or outstanding opportunities for primitive and unconfined types of recreation; (3) size: the area is at least 5,000 acres (20 km²) of land, or is of sufficient size to make practicable its preservation and use in an unimpaired condition; and (4) values: the area may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Willingness to pay: Method of estimating the value of activities, services, or other goods, where value is defined as the maximum amount a consumer would be willing to pay for the opportunity rather than do without. The total willingness to pay, minus the user's costs of participating in the opportunity, defines the consumer surplus and benefits.

Wind rose: Circular diagram, for a given locality or area, showing the frequency and strength of the wind from various directions over a specified period of record.

World Heritage Site: Area identified by the World Heritage Committee of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as having outstanding universal value for cultural and natural heritage.

X

Xeric: Low in moisture. Dry environmental conditions. Habitats or sites characterized by their limited water availability.

Y

Young-of-year (YOY): Young (usually fish) produced in the current calendar year. Also referred to as age 0.

Z

Zooplankton: Small, usually microscopic animals (such as protozoans), found in lakes and reservoirs. Zooplankton can be permanent (i.e., rotifers or cladocerans) or temporary, as with the early life stages (i.e., eggs, larvae, juveniles, and adults) of many fish and invertebrate species.