FINAL TECHNICAL REPORT

Klamath Hydroelectric Project
(FERC Project No. 2082)

Water Resources

PacifiCorp
Portland, Oregon

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CONTENTS

Tables

Figures

Appendices

PREFACE

In the course of study and in the interim between the draft technical report and this final technical report, PacifiCorp made a few changes to the proposed Klamath Hydroelectric Project (Project). The newly proposed Project begins at the J.C. Boyle Development and continues downstream to the Iron Gate Development. The Spring Creek diversion is now included in the Fall Creek Development. The East Side, West Side, and Keno developments are no longer part of the Project. Keno dam will remain in operation, but is not included in the Federal Energy Regulatory Commission (FERC) Project because the development does not have generation facilities, and its operation does not substantially benefit generation at PacifiCorp's downstream hydroelectric developments.

LIST OF ABBREVIATIONS AND ACRONYMS

ACEC	Area of Critical Environmental Concern
ac-ft	acre-feet
ACHP	Advisory Council on Historic Preservation
ACS	Aquatic Conservation Strategy
AD	accretion/depletion
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ADCP	Acoustic Doppler Current Profiler
AINW	Archaeological Investigations Northwest
AMS	accelerator mass spectrometry
ANOVA	analysis of variants
APE	area of potential effect
ARPA	Archaeological Resources Protection Act
ATV	all-terrain vehicle
AUM	animal unit month
AW	American Whitewater
AWG	Aquatics Work Group
BAOT	boats at one time
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMF	bedrock milling feature
BMTS	Bird Mortality Tracking System
BNRR	Burlington Northern Railroad
BO	Biological Opinion
BOD	biochemical oxygen demand
B.P.	before present
BSL	Bureau of Labor Statistics
BVNWR	Bear Valley National Wildlife Refuge
°C	degrees Centigrade
CALTRANS	California Department of Transportation

CCS	cryptocrystalline silicate
CDBW	California Department of Boating and Waterways
CDF	California Department of Finance
CDFG	California Department of Fish and Game
CDO	community development ordinance
CDP	census designated place
CDPR	California Department of Parks and Recreation
CDSOD	California Division of Safety of Dams
CDWR	California Department of Water Resources
CEII	Critical Energy Infrastructure Information
CES	constant effort stations
CFM	constant fractional marking
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHRIS	California Historical Resources Information System
CLBP	California Lentic Bioassessment Procedure
CLNP	Crater Lake National Park
cm	centimeter
cms	cubic meters per second
CNDDB	California Natural Diversity Database
COC	chain of custody
COPCO	California Oregon Power Company
CPRC	Center for Population Research and Census
CPUE	catch per unit effort
CRC	Confluence Research and Consulting
CRM	cultural resources management
CRWG	Cultural Resources Work Group
CS	culturally sensitive
CSBP	California Stream Bioassessment Procedure
C shasta	*Ceratomyxa shasta* fish disease
CSWRCB	California State Water Resources Control Board
CWHRS	California Wildlife Habitat Relations System
CWP	coarse woody debris

CWT	coded wire tag
DCA	detrended correspondence analysis
dbh	diameter at breast height
DO	dissolved oxygen
DTM	Digital Terrain Model
DTR	Draft Technical Report
EC	electrical conductivity; existing conditions
EDT	Ecosystem Diagnosis and Treatment, a fish production modeling program
E_H	redox potential
EIS	environmental impact statement
ELV	elevation
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPT	ephemeroptera, plecoptera, and trichopera
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
ESU	evolutionarily significant unit
E/W	east/west
°F	degrees Fahrenheit
FEAM	Fishery Economic Assessment Model
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFA	Flood Frequency Analysis
FGDC	Federal Geographic Data Committee
FIC	field inventory corridor
FL	fork length
FLA	final license application
FLIR	forward-looking infrared
FLPMA	Federal Land Policy and Management Act
FLRMP	Forest Land and Resource Management Plan

FNF	Fremont National Forest
FPA	Federal Power Act
FPC	Federal Power Commission
FPD	fire protection district
fpm	feet per mile
fps	feet per second
FR	Federal Register
FSCD	First Stage Consultation Document
ft^2	square feet
ft-lb/s/ft^3	foot-pounds per second per cubic foot
FTR	Final Technical Report
FTS	fisheries technical subcommittee
FTU	formazin turbidity unit
FYLF	foothill yellow-legged frog
GDP	gross domestic product
GIS	geographic information system
GLO	General Land Office
GMU	grazing management unit
GPS	global positioning system
GSG	geomorphology subgroup
ha	hectare
HBI	Hilsenhoff Biotic Index
HDPE	high-density polyethylene
HEC	Hydrologic Engineering Center
HPMP	Historic Properties Management Plan
HRA	Historical Research Associates
HRWA	Horseshoe Ranch Wildlife Area
HSC	habitat suitability criteria
HSI	Habitat Stability Index
I-5	Interstate 5

I&E	interpretation and education
IFG	Instream Flow Group (now called U.S. Geological Survey [USGS] Aquatic Systems and Technology Application Group)
IFG-4	empirical log and log formula developed by the IFG
IFIM	instream flow incremental methodology
IK	inflatable kayak
IQR	interquartile range
KBAO	Klamath Basin Area Office
KBO	Klamath Bird Observatory
KCF	Klamath County Flycasters
KCSO	Klamath County Sheriff's Office
KFNWR	Klamath Forest National Wildlife Refuge
KFRA	Klamath Falls Resource Area
KFWTP	Klamath Falls Wastewater Treatment Plant
kHz	kilohertz
KlamRas	a fish production modeling program
km	kilometer
KMC	Klamath Mixed Conifer
KMZ	Klamath Management Zone
KNF	Klamath National Forest
KOP	key observation point
KRBFTF	Klamath River Basin Fisheries Task Force
KRITFWC	Klamath River Inter-Tribal Fish and Water Commission
KRP	Klamath River Project
KSD	Klamath Straits Drain
KSWR	Klamath State Wildlife Refuge
kV	kilovolt
kW	kilowatt
KWA	Klamath Wildlife Area
kWh	kilowatt-hour
LAC	limits of acceptable change
lb	pound

LBNM	Lava Beds National Monument
LDD3	Land Development Desktop 3
LKNWR	Lower Klamath National Wildlife Refuge
LRDC	Lost River Diversion Channel
LWCFA	Land and Water Conservation Fund Act
LWD	large woody debris
µg/L	microgram(s) per liter
µS/cm	microSiemen(s) per centimeter
m	meter
MANSQ	a channel conveyance method
MAR	mean annual runoff
MASCA	Museum Applied Science Center of Archaeology
mb	millibar
mgd	million gallon(s) per day
mg/L	milligram(s) per liter
MHO	Montane Hardwood Oak
MHOC	Montane Hardwood Oak-Conifer
MHOJ	Montane Hardwood Oak-Juniper
MHz	megahertz
mm	millimeter
MNI	minimum number of individuals
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	miles per hour
MPS	Multiple Property Submission
m/s	meters per second
msl	mean sea level
mv	millivolt
MW	megawatt
MWh	megawatt-hour
NAD	North American Datum

NAGPRA	Native American Graves Protection and Repatriation Act
NCASI	National Council for Air and Stream Improvement
NCCP	Natural Community Conservation Planning
NCRWQCB	North Coast Regional Water Quality Control Board
NEC	New Earth Company
NEPA	National Environmental Policy Act
NGO	nongovernment organization
NHPA	National Historic Preservation Act
NISP	number of individual species
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRA	National Recreation Area
NRHP	National Register of Historic Places
NRPA	National Recreation and Parks Association
N/S	north/south
NTU	nephelometric turbidity unit
NWFP	Northwest Forest Plan
NWI	National Wetland Inventory
NWSRA	National Wild and Scenic Rivers Act
NWSRS	National Wild and Scenic Rivers Study
O&CR	Oregon and California Railroad
O&M	operations and maintenance
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
ODWR	Oregon Department of Water Resources
OHP	Office of Historic Preservation
OHV	off-highway vehicle
ONHP	Oregon Natural Heritage Program

OPRD	Oregon Parks and Recreation Department
ORP	oxidation reduction potential
ORS	Oregon Revised Statute
ORV	outstanding remarkable value
OSMB	Oregon State Marine Board
OSSW	Oregon State Scenic Waterway
OSU	Oregon State University
OWRD	Oregon Water Resources Department
PA	Programmatic Agreement
PAH	polyaromatic hydrocarbon
PAOT	people at one time
PCB	polychlorinated biphenyl
PCR	polymerase chain reaction
PCT	Pacific Crest National Scenic Trail
PFMC	Pacific Fishery Management Council
PFO	Palustrine Forested Wetland
PG&E	Pacific Gas and Electric Company
PGT	Pacific Gas Transmission
ph	powerhouse
pH	hydrogen (ion) concentration
PHABSIM	Physical Habitat Simulation
PM&E	protection, mitigation, and enhancement
PPL	Pacific Power and Light
P-R	Pittman-Robertson [Act]
PRIA	Public Rangelands Improvement Act
PVC	polyvinyl chloride
PWC	personal watercraft
PWHMA	Pokegama Wildlife Habitat Management Area
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control

RA	resource area
rcy	radiocarbon years
RD	recreation day
RERP	Raptor Electrocution Reduction Program
RFS	Riparian Focal Species
RHABSIM	River Habitat Simulation
RHJV	Riparian Habitat Joint Venture
RL	reporting limit
RM	Riparian Mixed Deciduous-Coniferous Habitat; river mile
RMA	recreation management area
RMP	resource management plan
ROD	record of decision
ROI	Rapid Ornithological Inventories
ROR	run-of-river
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RRA	Redding Resource Area
RRMP	recreation resource management plan
RV	recreational vehicle
RVD	recreation visitor days
RWG	Recreation Work Group
S/C	side channel
SCORP	South Central Oregon Regional Partnership [as defined in the Land Use, Visual, and Aesthetic Resources FTR]
SCORP	Statewide Comprehensive Outdoor Recreation Plan [as defined in the Recreation Resources FTR]
SCR	sensitive cultural resources
SCS	Soil Conservation Service
SCWQCP	State of California Water Quality Control Plan
SF	steady flow
SHPO	State Historic Preservation Office
SIAM	System Impact Assessment Model
SL	standard length

SLOM	System Landscape Options Matrix
S/M	survey and manage
SMET	stream margin edge types
SMP	shoreline management plan
SOD	sediment oxygen demand
SONC	southern Oregon/northern California
SOP	standard operating procedure
SPC	specific conductance; split channels
spp.	species
SPRR	Southern Pacific Railroad
SR	state route
SRMA	Special Resource Management Area
SRNF	Six Rivers National Forest
SSD	South Suburban Sanitation District
STU	subsurface testing
SV	screening value
SWDU	Statements of Water Diversion and Use
SWG	socioeconomic work group
SWRCB	State Water Resources Control Board
SZF	stage-at-zero-flow
TAF	thousand acre-feet
TCL	traditional cultural landscape
TCP	traditional cultural properties
TCR	traditional cultural riverscape
TDG	total dissolved gas
TDML	total maximum daily load
TDS	total dissolved solids
TES	threatened, endangered, or sensitive
THPO	Tribal Heritage Preservation Officer
TKN	total Kjeldahl nitrogen
TMDL	total maximum daily load
TPLA	Topsy/Pokegama Landscape Analysis

TRPA	Thomas R. Payne and Associates
TRWG	Terrestrial Resources Work Group
TSS	total suspended solids
UGB	urban growth boundary
UKL	Upper Klamath Lake
UKNWR	Upper Klamath National Wildlife Refuge
U of O	University of Oregon
UPL	Utah Power and Light
URDC	Urban Research Development Corporation
USACE	U.S. Army Corp of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	universal transverse Mercator
VAF	velocity adjustment factor
VAOT	vehicles at one time
VES	visual encounter survey
VQO	visual quality objective
VRM	visual resource management
VRMC II	visual resource management class II
WDF	Washington Department of Fisheries (renamed as WDFW in 1996)
WDFW	Washington Department of Fish and Wildlife
WNF	Winema National Forest
WOP I	without-Project I scenario
WOP II	without-Project II scenario
WQRRS	Water Quality for River-Reservoir Systems (a model)
WQS	Water Quality Standards

W&SR	Wild and Scenic River
WSEL	water surface elevation
WTA	wild trout area
WTP	wild trout program
WUA	weighted usable area
XRF	x-ray fluorescence
YOY	young-of-the-year
YTHPO	Yurok Tribal Heritage Preservation Officer

GLOSSARY

Abandonment	The loss of water rights through nonuse.
Abutment	Part of a valley or canyon wall against which a dam is constructed. Right and left abutments are those on respective sides of an observer looking downstream.
Acre-foot	The amount of water required to cover 1 acre to a depth of 1 foot. An acre-foot equals 326,851 gallons or 43,560 cubic feet. This volume measurement is used to describe a quantity of storage in a reservoir.
Affecting	Means "will or may have an effect on," as defined by 40 Code of Federal Regulations (CFR) 1508.3.
Afterbay	A channel for conducting water away from a power plant after it has passed through it.
Aggradation	The raising of a riverbed because of sediment deposited.
Allocation	The amount of water guaranteed to a jurisdiction under an agreement.
Alluvium	Sediments deposited by erosional processes, usually by streams.
Alternatives	A given agency's duty is to consider "alternatives as they exist and are likely to exist" (CEQ No. 8, 1981). Range of alternatives Includes all reasonable alternatives, which must be rigorously explored and objectively evaluated, as well as other alternatives, which are eliminated from detailed study with a brief discussion of the reasons for eliminating them. (40 CFR 1502.14) Reasonable alternatives Alternatives that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. (CEQ No. 2a, 1981) No Action Alternative 40 CFR 1502.14(d) requires the alternatives analysis in an environmental assessment (EA) or environmental impact statement (EIS) to "include the alternative of no action." There are two distinct interpretations of "no action" that must be considered. The first situation addresses plans and continuing actions. The second is relative to where "no action" would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward (CEQ No. 3, 1981).

Anadromous	Type of fish that ascend rivers from the sea to spawn (lay their eggs). Fish that hatch in freshwater, migrate to the ocean, mature there, and return to freshwater to spawn. Salmon and steelhead are examples.
Annual operating plan	A yearly plan for operating reservoirs on the Columbia River. Such a plan is specifically required by the Columbia River Treaty and by the Pacific Northwest Coordination Agreement.
Approach velocities	Water velocities at or near the face of a fish screen.
Appropriate	To authorize the use of a quantity of water to an individual requesting it.
Appropriation	Doctrine of Prior With respect to water, refers to the system western states use to assign and distribute quantifiable amounts of water, in the form of water rights; system operates on a first-in-time, first-in-right basis. Process Water Refers to the system a state has established to issue and keep track of water rights. Applies only to states that have adopted the doctrine of prior appropriation of water rights.
Appropriative rights	Those rights to the use of water that result from the doctrine of prior appropriation of water rights.
Appurtenant	Existing as part of a broader property right. For instance, a surface water right may exist as part of the rights associated with ownership of land bordering a body of water.
Aquatic microphyte	A plant living in water, large enough to be seen with the naked eye.
Aquatic plants	Plants that grow in water either floating on the surface, growing up from the bottom of the body of water, or growing under the surface of the water.
Aquifer	A porous layer of rock that can hold water within it.
Arch dam	A dam construction method used in sites where the ratio of width to height between abutments is not great and where the foundation at the abutment is solid rock capable of resisting great forces. The arch provides resistance to movement. When combined with the weight of concrete (arch-gravity dam), both the weight and shape of the structure provide great resistance to the pressure of water.
Armored riverbed	A riverbed from which easily removed sediment has been eroded, leaving a surface of cobbles or boulders.

Attraction	Drawing fish to dam fishways or spillways through the use of water flows.
Augmentation (of streamflow)	Increasing streamflow under normal conditions, by releasing storage water from reservoirs.
Average megawatt (aMW)	The average amount of energy (in megawatts) supplied or demanded over a specified period of time; equivalent to the energy produced by the continuous operation of 1 megawatt of capacity over the specified period.
Average streamflow	The rate at which water passes a given point in a stream, usually expressed in cubic feet per second (cfs).
Bank	The margins or sides of a river. Banks are called right or left as viewed when facing in the direction of the flow.
Bank storage	Water that is absorbed and stored in the soil cover of the bed and banks of a watercourse and is returned to the watercourse in whole or in part as the water level falls.
Barrel	A liquid measure defined as 42 U.S. gallons.
Barrier	A physical block or impediment to the movement or migration of fish, such as a waterfall (natural barrier) or a dam (human-made barrier).
Base load	In a demand sense, a load that varies only slightly in level over a specified time period. In a supply sense, a plant that operates most efficiently at a relatively constant level of generation.
Base river flow	Also referred to as minimum flow. The minimum river flow required to sustain aquatic life. Often prescribed in Federal Energy Regulatory Commission (FERC) license articles.
Basin	A land area having a common outlet for its surface water runoff.
Beneficial use	Traditionally, the use of water for such utilitarian benefits as agriculture, mining, power development, and domestic water supply.
Benefit-cost analysis	An accounting framework designed to characterize the expected economic outcomes of a decision to allocate scarce economic resources, in the form of benefits and costs to each component part of the economy, and summed to determine whether or not total benefits exceed total costs.
Benefit-cost ratio	The ratio of the present value of the benefit stream to the present value of the project cost stream used in economic analysis.

Benthic region	The bottom of a body of water. This region supports the benthos, a type of life that not only lives on, but also contributes to the character of the bottom.
Benthos	The plant and animal life whose habitat is the bottom of a sea, lake, or river.
Best management practices	State-of-the-art practices that are efficient and effective, practical, economical, and environmentally sound.
Biome	An area that has a certain kind of community of plants and animals.
Biota	All the species of plants and animals occurring within a certain area.
Blackout	The disconnection of the source of electricity from all the electrical loads in a certain geographical area brought about by an emergency forced outage or other fault in the generation, transmission, or distribution system serving the area.
Blocked areas	Areas in the Columbia River Basin where hydroelectric projects have created permanent barriers to anadromous fish runs. These include the areas above Chief Joseph and Grand Coulee dams, the Hell's Canyon complex, and other smaller locations.
Bonneville Power Administration	The sole federal power marketing agency in the northwest and the region's major wholesaler of electricity. Created by Congress in 1937, Bonneville sells power to public and private utilities, direct service customers, and various public agencies in the states of Washington, Oregon, Idaho, Montana west of the Continental Divide (and parts of Montana east of the Divide), and smaller adjacent areas of California, Nevada, Utah, and Wyoming. The Northwest Power Act charges Bonneville with additional duties related to energy conservation, resource acquisition, and fish and wildlife.
Breach	A break or opening in a dam.
British thermal unit (Btu)	A standard unit for measuring the quantity of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit.
Brownout	The partial reduction of electrical voltages. A brownout results in lights dimming and motor-driven devices slowing down.
Bus	A conductor or group of conductors that serves as a common connection for two or more circuits. In power plants, bus work consists of the three rigid single-phase connectors that interconnect the generator and the step-up transformer(s).

Buttress dam	A dam consisting of a watertight upstream face supported at intervals on the downstream side by a series of buttresses. They are usually in the form of flat decks or multiple arches. Many were built in the 1930s.
Bypass reach	That section of a river from which water is removed to generate hydropower. Water is often diverted from the river at the dam, transported through channels or penstocks downstream, and released back in the river at the powerhouse. Bypass reaches can be as short as a few hundred feet to as long as several miles.
Bypass system	A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.
Canal	A constructed open channel for transporting water.
Capacity	The production level for which an electrical generating unit or other electrical apparatus is rated, either by the user or manufacturer. Capacity is also used synonymously with capability. • Dependable capacity—the load-carrying ability of a station or system under adverse conditions for a specified time period. • Installed capacity—the total manufacturer rated capacities of such kinds of equipment as turbines, generators, condensers, transformers, and other system components. • Peaking capacity—the maximum sustainable capacity of generating equipment intended for operation only during the hours of highest daily, weekly, or seasonal loads. • Reserve generating capacity—extra generating capacity available to meet peak or abnormally high demands for power and to generate power during scheduled or unscheduled outages.
Capillary Fringe	The unsaturated zone immediately above the water table containing water in direct contact with the water table.
Catadromous	Fish that mature in freshwater but migrate to seawater to spawn (lay their eggs). The American eel is an example.
Catchment	(1) The catching or collecting of water, especially rainfall. (2) A reservoir or other basin for catching water. (3) The water thus caught.

Channel	An open conduit either naturally or artificially created which periodically or continuously contains moving water or forms a connecting link between two bodies of water. River, creek, run, and tributary are among the terms used to describe natural channels. Canal and floodway are among the terms used to describe artificial channels.
Check dam	A small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel erosion, promote deposition of sediment, and divert water from a channel.
Circuit breaker	Any switching device that is capable of closing or interrupting an electrical circuit.
Clean Water Act	Common name for the Federal Water Pollution Control Act, as amended. Its purpose is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters," whether on public or private land. It authorizes the U.S. Environmental Protection Agency (EPA) to set water quality criteria for states to use to establish water quality standards.
Climatic year	The 12-month period used in collection of precipitation data. Climatic years begin July 1 and end the following June 30, and are designated by the calendar year in which the water year ends.
Code of Federal Regulations (CFR)	A compilation of the general and permanent rules of the executive departments and agencies of the federal government as published in the Federal Register. The Code is divided into 50 titles that represent broad areas subject to federal regulation. Title 18 contains the FERC regulations. FERC regulations are cited as 18 CFR (FERC).
Collection and bypass system	A system at a dam that collects and holds the fish approaching the dam for later transportation or moves them through or around the dam without going through the turbine units.
Computable General Equilibrium (CGE) Model	A general equilibrium mathematical representation of an economy; a formulation of the interrelationships of the various sectors of an economy that depends on well-functioning markets (no surplus or shortages) and where responses to market price changes are accounted for.
Conservation	The care and protection of natural resources. Also used in energy conservation management plans to describe increasing the efficiency of energy and water use, production, or distribution.
Consulting team	Scientific consultants retained by licensees. The consulting team serves as a source of scientific expertise to appropriate work groups.

Consumer surplus	The difference between the amount of money one would be willing to pay for a given quantity of a good or service and the price required by the market, hence the fullest measure of the benefit one receives from having or consuming the good or service.
Consumptive use	Nonreusable withdrawal of water where the water is evaporated, transpired by plants, incorporated into products or crops, or consumed by humans or animals.
Coordinated operation	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 to all other uses.
Coordination	The practice by which two or more interconnected electric power systems augment the reliability of bulk electric power supply by establishing planning and operating standards; by exchanging pertinent information regarding additions, retirements, and modifications to the bulk electric power supply system; and by joint review of these changes to assure that they meet the predetermined standards.
Creek	A small stream of water which serves as the natural drainage course for a drainage basin of nominal or small size. The term is relative to size. Some creeks in a humid region might be called rivers if they occur in an arid region.
Crest	(1) The highest stage or level of a flood wave as it passes a point; (2) The top of a dam, dike, spillway, or weir, to which water must rise before passing over the structure.
Critical areas	Areas of ecological significance. This term is frequently used as a modifier to describe government programs that concentrate on the conservation and protection of natural resources that are fragile or sensitive to development, and that are of great importance in overall state efforts to conserve and protect the natural resource environment.
Cryptogam	Plant that reproduces by spores, not by flowers or seeds. For example, ferns.
Cubic feet per second (cfs)	A measurement of water flow representing 1 cubic foot of water (7.48 gallons) moving past a given point in 1 second. One cfs equals about 2 acre-feet per day.

Cumulative impact	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)
Cupules	Small (1 to 3 inches in diameter), round depressions that have been pecked into the surface of a rock with a hammerstone. They are typically ½ inch to 1 inch deep.
Cycling	Power plant operation to meet the intermediate portion of the load (9 to 14 hours per day).
Dam	A concrete or earthen barrier constructed across a river and designed to control water flow or create a reservoir.
Dam failure	Event characterized by the sudden, rapid, and uncontrolled release of impounded water because of a breach in the dam.
Dead storage	That part of a reservoir that lies beneath the elevation of the bottom of the dam's lowest outlet.
Decommissioning	The act of retiring or dismantling a dam.
Deflector screens/ diversion screens	Wire mesh screens placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.
Degradation	The lowering of a riverbed because of erosion.
Delta	An alluvial deposit, often in the shape of the Greek letter "delta," which is formed where a stream drops its debris load on entering a body of water (lake or ocean).
Demand	The rate at which electric energy is delivered to or by a system, part of a system, or a piece of equipment. It is expressed in kilowatts, kilovoltamperes, or other suitable units at a given instant or averaged over any designated period of time. The primary source of "demand" is the power-consuming equipment of the customers.
Descaling	A condition in which a fish has lost a certain percentage of scales.
Design head	The head at which the full gate of the turbine equals the manufacturer-rated generator capacity.
Designated	Given formal statutory recognition, as in a federal or state river system.
Dewatering	Elimination of water from a lake, river, stream, reservoir, or containment.

Dike	(1) (Engineering) An embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee; (2) A low wall that can act as a barrier to prevent a spill from spreading; (3) (Geology) A tabular body of igneous (formed by volcanic action) rock that cuts across the structure of adjacent rocks or cuts massive rocks.
Direct effects	Caused by the action and occurring at the same time and place.
Discharge	Volume of water released from a dam or powerhouse at a given time, usually expressed in cubic feet per second. Discharge is often used interchangeably with streamflow.
Discount rate	The rate at which future economic values are reduced to make them economically equivalent to today's value; a rate used to convert a future value to present value.
Dissolved gas concentrations	The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).
Dissolved oxygen (DO)	The amount of oxygen in the water available to aquatic organisms, measured in mg/L or percent salination.
Diversion	The taking of water from a stream or other body of water into a canal, pipe, or other conduit.
Diversion dam	A barrier built to divert part or all of the water from a stream into a different course.
Docket	A formal record of a FERC proceeding. Dockets are available for inspection and copying by the public. Dockets for hydroelectric projects can be accessed through the FERC CIPS website.
Downstream slope	The slope or face of the dam away from the reservoir water. This slope requires some kind of protection from the erosive effects of rain or surface flow.
Draft	Release of water from a storage reservoir.
Drawdown	The lowering of a reservoir's surface elevation and water volume by releasing (spilling or generating) the reservoir's water at a rate that is greater than the rate of water flowing into the reservoir. Typically used for power generation, flood control, irrigation, or other water management activity.
Drift	The phenomenon of aquatic insects drifting downstream each evening.

Earthfill or earth dam	An embankment dam in which more than 50 percent of the total volume is formed of compacted, fine-grained material. A homogeneous earthen dam is constructed of similar earthen material throughout. This is the most common type of dam because its construction involves using materials in the natural state, requiring little processing.
Easement	Limited right of ownership of one's land conveyed by deed to another for a special purpose.
Ecological impact	The total effect of an environmental change, either natural or human-made, on the ecology of the area.
Ecology	The interrelationships of living things to one another and to their environment or the study of such interrelationships.
Ecosystem	The interacting system of a biological community and its nonliving environment.
Ecotone	Border between two biomes, where the plants and animals of those biomes mingle.
Ecotourism	Tourism that focuses on the enjoyment of wildlife and other ecological resources.
Effects	Effects and impacts as used in the Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations are synonymous. Effects are ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. (CEQ regulations, 40 CFR 1508.9)
Efficiency	The ratio of useful energy output to total energy input, usually expressed as a percent.
Effluent	Treated wastewater discharged from sewage treatment plants.
Electric Consumers Protection Act of 1986	The Electric Consumers Protection Act of 1986 (ECPA) brought about significant changes and imposed new requirements to both procedural and substantive aspects of project licensing and relicensing under the Federal Power Act (FPA). The FPA was amended to require FERC to give equal consideration to energy conservation, fish and wildlife protection, enhancement and preservation of recreational opportunities, and other aspects of environmental quality. These requirements are described in the discussion of the Federal Power Act below.

Electric magnetic field (EMF)	An electric or magnetic field, or a combination of the two, as in an electromagnetic wave.
Electric power system	Physically connected electric generating, transmission, and distribution facilities operated as a unit under one control.
Elevation	Height in feet above sea level.
Embankment	Fill material, usually earth or rock, placed with sloping sides and usually with length greater than height.
Embankment dam	A dam structure constructed of fill material, usually earth or rock, placed with sloping sides and usually with a length greater than its height.
Emergency Action Plan (EAP)	Predetermined plan of action for reducing the potential for property damage and loss of life in an area affected by a dam break or excessive spillway. Required for certain licensed FERC projects.
Eminent Domain	Governmental power to take private property for a public use, usually government acquisition of land for such purposes as parks, roads, schools, or public buildings.
Endangered Species	An animal, plant, or insect species whose numbers are so low, compared to historical levels, that it is in danger of extinction, and that is awarded protection under the federal Endangered Species Act. (See Public Law [P.L.] 93-205 for legal definition, Endangered Species Act, sec. 3(6).)
Energy	The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy). Energy has several forms, some of which are easily convertible and can be changed to another form useful for work. Most of the world's convertible energy comes from fossil fuels that are burned to produce heat that is then used as a transfer medium to mechanical or other means in order to accomplish tasks. Electrical energy is usually measured in kilowatt-hours, while heat energy is usually measured in British thermal units. Energy is measured in calories, joules, kilowatt-hours (kWh), BTUs, megawatt-hours (MW-hours), and average megawatts (MWs).
Energy conservation	The more efficient use of energy resources. Energy conservation seeks to reduce energy invested per unit of product output, service performed, or benefit received through waste reduction.
Energy content curves (ECC)	A set of curves that establishes limits on the amount of reservoir drawdown permitted to produce energy in excess of firm energy load carrying capability (FELCC).

Entrainment	The incidental trapping of fish and other aquatic organisms in the water—for example, used for cooling electrical power plants or in waters being diverted for irrigation or similar purposes.
Environment	The sum of all external conditions and influences affecting the life, development, and, ultimately, the survival of an organism.
Environmental Assessment	(a) A concise public document for which a federal agency is responsible that serves to: Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact Aid an agency's compliance with the Act when no environmental impact statement is necessary Facilitate preparation of an environmental impact statement when one is necessary (b) Shall include brief discussions of the need for the proposal, of alternatives as required by section 102(2)(E), of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted. (CEQ regulations, 40 CFR 1508.9) Because the EA is a concise document, it should not contain long descriptions or detailed data that the agency may have gathered. Rather it should contain a brief discussion of the need for the proposal, alternatives to the proposal, the environmental impacts of the proposed action and alternatives, and a list of agencies and persons consulted. (40 CFR 1508.9(b))
Environmental Impact Statement	A detailed written statement as required by section 102(2)(C) of the National Environmental Policy Act. (CEQ regulations, 40 CFR 1508.10)
Ephemeral flow	When water flows in a channel only after precipitation.
Epilimnion	The surface area of a lake or reservoir.

Equal consideration	Does not mean treating all potential purposes equally or requiring that an equal amount of money be spent on each resource value, but it does mean that all values must be given the same level of reflection and thorough evaluation in determining that the project as licensed is best adapted. In balancing developmental and nondevelopmental objectives, the FERC will consider the relative value of the existing power generation, flood control, and other potential developmental objectives in relation to present and future needs for improved water quality, recreation, fish, wildlife, and other aspects of environmental quality.
Erosion	The wearing away of the land surface by wind or water. Erosion occurs naturally from weather or runoff but is often intensified by land-clearing practices.
Estuarine waters	Deepwater tidal habitats and tidal wetlands that are usually enclosed by land but have access to the ocean and are at least occasionally diluted by freshwater runoff from the land (such as bays, mouths of rivers, salt marshes, and lagoons).
Estuarine zone	The area near the coastline that consists of estuaries and coastal saltwater wetlands.
Estuary	The thin zone along a coastline where freshwater systems and rivers meet and mix with a salty ocean (such as a bay, mouth of a river, salt marsh, or lagoon).
Eutrophication	The process by which a body of water is enriched by nutrients.
Evaporation	The physical process by which a liquid (or a solid) is transformed to the gaseous state. In hydrology, evaporation is vaporization that takes place at a temperature below the boiling point.
Evapotranspiration	Water transmitted to the atmosphere by a combination of evaporation from the soil and transpiration from plants.
Face	The external surface of a structure, such as the surface of a dam.
Facilitator	An independent third party whose role is to help participants reach lasting agreement (among as many of participants as possible on as many issues as possible.) The facilitator can help participants to identify goals, identify issues, develop and maintain critical paths, accomplish creative problem solving, and resolve issues (facilitate and mediate as necessary).
Federal Emergency Management Agency (FEMA)	An agency of the federal government responsible for hazard mitigation. FEMA also administers the National Flood Insurance Program.

Federal Energy Regulatory Commission (FERC)	A quasi-judicial independent regulatory commission established in 1977 (replacing the Federal Power Commission) within the U.S. Department of Energy. FERC issues and regulates licenses for construction and operation of nonfederal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects. FERC is composed of five commissioners appointed by the President. No more than three can be from any one political party.
Federal Power Act	Enacted in 1920, the FPA, as amended in 1935, consists of three parts. The first part incorporated the Federal Water Power Act administered by the former Federal Power Commission. It confined FPC activities almost entirely to licensing nonfederal hydroelectric projects. With passage of the Public Utility Act, which added parts II and III, the Commission's jurisdiction was extended to include regulating the interstate transmission of electric energy and rates for its sale at wholesale in interstate commerce. Section 4(c) Authorizes FERC to cooperate with state and federal agencies in its activities, and directs federal departments and agencies to furnish records and information to FERC when requested (16 U.S.C. 797 (c)). Section 4(e) As stated in the act of March 3, 1921 (41 Stat. 1353)), authorizes FERC to issue licenses to citizens of the United States, or to any association of such citizens, or to any corporation organized under the laws of the United States or any State thereof, or to any State or municipality for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, power houses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from or in any of the streams or other bodies of water over which Congress has jurisdiction under its authority to regulate commerce with foreign nations and among the several States, or upon any part of the public lands and reservations of the United States (including the Territories), or for the purpose of utilizing the surplus water or water power from any Government dam, except as herein provided: Provided, that licenses shall be issued within any reservation only after a finding by the Commission that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired, and shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation.

Section 10(a)

Under Section 10(a), FERC is required to ensure that a hydropower project is "best adapted" to a comprehensive plan for improving or developing a waterway or waterways, for the use or benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses (including irrigation, flood control, water supply, and recreational and other purposes)(16 U.S.C. 803(a)). To ensure a project is best adapted, under Section 10(a)(2), FERC must consider the extent to which the project is consistent with a comprehensive plan (where one exists) for improving, developing, or conserving a waterway or waterways affected by the project, and the recommendations of federal and state agencies exercising administration over relevant resources and recommendations of Indian tribes affected by the project. Section 10(a)(3) states that upon receipt of an application for a license, the Commission shall solicit recommendations from the agencies and Indian tribes charged with the authority to prepare comprehensive plans and exercising administration over flood control, navigation, irrigation, recreation, cultural and other relevant resources of the state in which the project is located, and the recommendations (including fish and wildlife recommendations) of Indian tribes affected by the project.

Section 10(j)

Under Section 10(j), in each hydropower license issued, FERC must include recommended conditions for the protection, mitigation and enhancement of fish and wildlife resources (16 U.S.C. 803(j). Such conditions shall be based on recommendations received pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) from the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS), and state fish and wildlife agencies. FERC must base license conditions on these agency recommendations unless it finds that the recommendations may be inconsistent with the purposes or requirements of the FPA or other applicable law. In cases where FERC and the agencies disagree on specific license conditions submitted under 10(j), these entities will attempt to resolve the inconsistency, giving due weight to the recommendation, expertise, and statutory responsibility of the federal or state resource agency in question. If a compromise cannot be reached and FERC decides to use its own recommendations, it must demonstrate that the agency recommendation is inconsistent with the FPA or other applicable laws and that FERC's recommended mitigation measures will adequately protect the fish and wildlife resources of concern.

In Order 533-A, issued November 22, 1991, FERC adopted a six-step consultation procedure:

- Submittal of fish and wildlife recommendations supported by a statement of the agency's "understanding of the resource issues presented by the proposed facilities and the evidentiary basis for the recommended terms and conditions."
- Clarification of recommendations.
- FERC issues preliminary determination of any inconsistency with applicable law and provides a 45-day comment period.
- Agency and other party respond to determination.
- Meetings with agencies and affected parties. These meetings, with the exception of extraordinary circumstances, are to take place within 75 days of the date that FERC issues its preliminary determination of any inconsistency with applicable law (30 days after agency comment due).
- Issuance of license, including terms and conditions.

Section 18

Under Section 18, FERC must provide for the construction, operation, and maintenance of any mandatory "fishway" prescribed by the Secretary of the Interior (through the U.S. Fish and Wildlife Service) or the Secretary of Commerce (through the National Marine Fisheries Service) for the safe and timely upstream and downstream passage of fish (16 U.S.C. 811). As with Section 4(e), the fishway conditions submitted by the relevant resource agency must be supported on the record before FERC with substantial evidence. FERC must include the Secretary's prescription for fishway as conditions in a license, if a license is issued.

This section applies to any project that may impact the life stages or passage of any fish species present in a project area and where a project may affect passage of a species planned for introduction in the area. Also applicable to fishway prescriptions in both upstream and downstream passage; not limited to anadromous or other migratory species. (P.L. 102-486, 1701(b)(1992))

Federal project operators and regulators	Federal agencies that operate or regulate hydroelectric projects in the Columbia River basin. They include the Bonneville Power Administration, the Bureau of Indian Affairs, the Bureau of Reclamation, the U.S. Army Corps of Engineers, and FERC.
Fill dam	Any dam constructed of excavated natural materials or industrial wastes.

Final Order	A final ruling by FERC which terminates an action, decides some matter litigated by the parties, operates to divest some right, or completely disposes of the subject matter.
Finding of No Significant Impact (FONSI)	A document by a federal agency briefly presenting the reasons why an action, not otherwise excluded (Sec. 1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared. It shall include the environmental assessment or a summary of it and shall note any other environmental documents related to it (Sec 1501.7(a)(5)). If the assessment is included, the finding need not repeat any of the discussion in the assessment but may incorporate it by reference. (CEQ regulations, 40 CFR 1508.13)
Firm energy	The amount of energy that can be generated given the region's worst historical water conditions. It is energy produced on a guaranteed basis.
Firm energy load carrying capability (FELCC)	Firm energy load carrying capability is the amount of energy the region's generating system, or an individual utility or project, can be called on to produce on a firm basis during actual operations. FELCC is made up of both hydro and nonhydro resources, including power purchases.
Fish and wildlife agencies	The U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the state agency in charge of administrative management over fish and wildlife resources of the state in which a proposed hydropower project is located. (FERC regulations, 18 CFR 4.30(b)(9)(i))
Fish and Wildlife Coordination Act (FWCA)	The Fish and Wildlife Coordination Act, as amended, requires federal agencies granting a license or permit for the control, impoundment, or modification of streams and waterbodies to first consult with the U. S. Department of the Interior, U.S. Fish and Wildlife Service, and the appropriate state fish agencies regarding conservation of these resources (16 U.S.C. 661-667e). Under the FWCA, the Secretary of the Interior is authorized to provide assistance to, and cooperate with federal, state, and public or private agencies and organizations in developing, protecting, and stocking all wildlife and their habitat; controlling losses from disease; minimizing damages from overabundant species; and carrying out other necessary measures. The act also provides that wildlife conservation receives equal consideration with other features of water resource development through planning, development, maintenance, and coordination. Under the requirements of the Electric Consumers Protection Act of 1986, (ECPA), FERC is directed to not only consult with the FWS and the state agencies but also to include in each license conditions for the protection, mitigation, and enhancement of fish and wildlife. Those conditions are to be based on recommendations received pursuant to the FWCA from the NMFS, the USFWS, and state fish and wildlife agencies.

Fish and wildlife recommendations	Recommendation designed to protect, mitigate damages to, or enhance any wild member of the animal kingdom, including any migratory or nonmigratory mammal, fish, bird, amphibian, reptile, mollusk, crustacean, or other invertebrate, whether or not bred, hatched, or born in captivity, and includes any egg or offspring thereof, related breeding or spawning grounds and habitat. A "fish and wildlife recommendation" includes a request for a study which cannot be completed prior to licensing, but does not include a request that the proposed project not be constructed or operated, a request for additional prelicensing studies or analysis or, as the term is used in 4.34(e)(2) and 4.34(f)(3), a recommendation for facilities, programs, or other measures to benefit recreation or tourism. (FERC regulations, 18 CFR 4.30(b)(9)(ii))
Fish flows	Artificially increased flows in the river system called for in the fish and wildlife program to quickly move the young fish down the river during their spring migration period. (See also water budget.)
Fish guidance efficiency (FGE)	The proportion of juvenile fish passing into the turbine intakes that are diverted away from the turbines and into bypass facilities.
Fish ladder	A structure which enables fish to swim upstream, either around or over a dam.
Fish passage	Features of a dam that enable fish to move around, through, or over a dam without harm. Typically an upstream fish ladder or a downstream bypass system.
Fish Passage Center	Part of the water budget program, the center plans and implements the annual smolt monitoring program; develops and implements flow and spill requests; and monitors and analyzes research results to assist in implementing the water budget. (See also water budget.)
Fish passage efficiency (FPE)	The proportion of juvenile fish passing a project through the spillway, sluiceway, or juvenile bypass system, as opposed to passing through the turbines.
Fish passage facilities	Features of a dam that enable fish to move around, through, or over without harm. Generally an upstream fish ladder or a downstream bypass system.
Fish passage managers	Located at the Fish Passage Center, the two fish passage managers are responsible for the specific planning, implementation, and monitoring activities of the center aimed at helping fish on their migratory routes in the Columbia River basin. One manager is designated by a majority of the federal and state fish and wildlife agencies, and the other manager is designated by a majority of the Columbia River basin Indian tribes. (See also Fish Passage Center.)

Fish screen	A screen across the turbine intake of a dam, designed to divert the fish into the bypass system.
Fishway	A device made up of a series of stepped pools, similar to a staircase, that enables adult fish to migrate up the river past dams.
Fixed drawdown period	The late summer and fall when the volume of the next spring runoff is not yet known, and reservoir operations are guided by fixed rule curve based on historical streamflow patterns.
Flash flood	A flood which follows within a few hours (usually less than 6 hours) of heavy or excessive rainfall. A dam or levee failure, or the sudden release of water impounded by an ice jam, is also considered a flash flood.
Flashboards	Temporary structures installed at the crest (top) of dams, gates, or spillways for the purpose of temporarily raising the water surface elevation, and hence the gross head of a hydroelectric generating plant, thus increasing power output. Normally, flashboards are removed either at the end of the water storage season or during periods of high streamflow, or for the purpose of temporarily increasing flood control.
Flood	The inundation of a normally dry area caused by high flow, or overflow of water in an established watercourse (such as a river, stream, or drainage ditch), or ponding of water at or near the point where the rain fell. This is a duration type event with a slower onset than flash flooding, normally greater than 6 hours.
Flood cropping	Farming dependent on the moisture and nutrients from floods.
Flood management	(1) Reducing risk by building dams or embankments or altering the river channel. (2) Reducing flood risk by actions such as discouraging floodplain development, establishing flood warning systems, protecting urban areas, and allowing the most flood-prone areas to remain as wetlands.
Flood stage	Height at which a watercourse overtops its banks and begins to cause damage to any portion of the river valley. Flood stage is usually higher than or equal to bankfull stage.
Floodplain	The land area of a river valley that becomes inundated with water during a flood.

Floodwall	A long, narrow concrete, or masonry embankment usually built to protect land from flooding. If built of earth the structure is usually referred to as a levee. Floodwalls and levees confine streamflow within a specified area to prevent flooding.
Floodway	That portion of a natural floodplain that is regularly inundated during the normal annual flood cycles of a river or stream.
Floodway fringe	That portion of the natural floodplain that is above the floodway in elevation, but still floods during the highest of regular floods at a frequency of once every 1 to 5 years.
Flow	The volume of water passing a given point per unit of time.
Flow augmentation	Water released from a storage reservoir added to increase river flow, particularly to aid fish migration.
Flume	(1) A narrow gorge, usually with a stream flowing through it; (2) An open artificial channel or chute carrying a stream of water, as for furnishing power, conveying logs, or as a measuring device.
Forced outage	The occurrence of a component failure or other condition which requires that a unit be removed from service immediately, in contrast to a planned or scheduled outage.
Forebay	The impoundment immediately above (upstream from) a dam or hydroelectric plant intake structure. The term is applicable to all types of hydroelectric developments (storage, run-of-river, and pumped storage).
Forebay guidance net	A large net placed in the forebay of a dam to guide juvenile fish away from the powerhouse.
Fossil fuel plant	A plant using coal, oil, gas, or other fossil fuel as its source of energy.
Fossil fuels	Materials found in the earth's crust and formed from organic matter as a result of geological processes occurring over many millions of years. The conventional forms of energy in wide use today—coal, petroleum, and natural gas—are all fossil fuels.
Freedom of Information Act (FOIA)	Under FOIA, the public may request and obtain Commission documents that may otherwise be inaccessible. Certain internal working documents and other data may be exempt, under the law, from disclosure. Documents of other agencies may also be obtained under FOIA.
Free-flowing	Undammed and unchannelized, as defined by the National Wild and Scenic Rivers Act.

Fry	The brief transitional stage of recently hatched fish that spans from absorption of the yolk sac through several weeks of independent feeding.
Full pool	The maximum level of a reservoir under its established normal operating range.
Gallery	(1) A passageway within the body of a dam or abutment; hence the terms grouting gallery, inspection gallery, and drainage gallery; (2) A long and rather narrow hall, hence the following terms for a power plant: valve gallery, transformer gallery, and busbar gallery.
Gallons per minute (gpm)	A unit used to measure water flow.
Gas supersaturation	The overabundance of gases in turbulent water, such as at the base of a dam spillway. Can cause a fatal condition in fish similar to the bends.
Gaseous supersaturation	The condition of higher levels of dissolved gases in water owing to entrainment, pressure increases, or heating.
Gate	A device that is moved across a waterway from an external position to control or stop flow.
General equilibrium analysis	An economic analysis of a particular market where effects on related markets are fully accounted for.
Generation	(1) The process of producing electric energy by transforming other forms of energy; (2) the amount of electric energy produced, expressed in kilowatt-hours.
Generator	A machine that changes water power, steam power, or other kinds of mechanical energy into electricity.
Gigawatt (GW)	One billion watts.
Gigawatt-hour (Gwh)	One billion watt-hours.
Global warming	The possible result of an increase in atmospheric concentrations of carbon dioxide, methane, chlorofluorocarbons, and other “greenhouse gases” that trap additional heat in the atmosphere. The increase in greenhouse gases is caused by the combustion of fossil fuels (coal, petroleum, and natural gas), land use modification, and the release of agricultural and industrial gases into the atmosphere.
Gravity dam	A dam constructed of concrete or masonry that relies on its weight for stability.

Gravity feed system	A system that provides flow in a channel or conduit through the use of gravity.
Gross generation	The total amount of electric energy produced by a generating station or stations, measured at the generator terminals.
Groundwater	Water within the earth that supplies wells and springs; water in the zone of saturation where all openings in rocks and soil are filled, the upper surface of which forms the water table. The supply of freshwater under the earth's surface in an aquifer or soil that forms the natural reservoir for human use.
Habitat	The sum total of environmental conditions of a specific place that is occupied by an organism, a population, or a community.
Hard water	A water quality parameter that indicates the level of alkaline salts, principally calcium and magnesium, and expressed as equivalent calcium carbonate. Hard water is commonly recognized by the increased quantities of soap, detergent, or shampoo necessary to raise a lather.
Head	The vertical height of water in a reservoir above the turbine. The more head, the more power that is exerted on the turbine by the force of gravity.
Headgate	The gate that controls water flow into irrigation canals and ditches. A watermaster regulates the headgates during water distribution and posts headgate notices declaring official regulations.
Head pond	The reservoir behind a run-of-river dam.
Headwaters	Streams at the source of a river.
Headworks	A flow control structure on an irrigation canal.
Horsepower	A unit for measuring the rate of work (or power) equivalent to 33,000 foot-pounds per minute or 746 watts.
Human environment	Interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See also effects.) (CEQ regulations, 40 CFR 1508.14)
Hydraulic head	The vertical distance between the surface of the reservoir and the surface of the river immediately downstream from the dam.
Hydro	Electric power produced by flowing water.
Hydroelectric energy	The production of electricity from kinetic energy in flowing water.

Hydroelectricity (hydroelectric power)	The production of electric power through use of the gravitational force of falling water.
Hydroelectric plant	A plant in which turbine generators are driven by falling water.
Hydrograph	A graph showing the water level (stage), discharge, or other property of a river volume with respect to time. For example, an annual hydrograph charts the varying river levels over the course of 1 year.
Hydrologic budget	An accounting of the inflow to, outflow from, and storage in, a hydrologic unit (such as a drainage basin, aquifer, soil zone, lake, reservoir, or irrigation project).
Hydrologic cycle	The natural pathway water follows as it changes between liquid, solid, and gaseous states.
Hydrology	The applied science concerned with the waters of the earth and their occurrences, distribution, and circulation through the unending hydrologic cycle of evaporation, transpiration, precipitation, infiltration, storage, and runoff.
Hydropower	The harnessing of flowing water to produce mechanical or electrical energy.
Hydropower system	The hydroelectric dams on the Columbia River and its tributaries.
Hypolimnion	Pertaining to the lower, colder portion of a lake, separated from the upper, warmer portion (epilimnion).
Impacts	See definition of effects.
Impoundment	A body of water, such as a pond, confined by a dam, dike, floodgate, or other barrier.
Indian tribe	In reference to a proposal to apply for a license or exemption for a hydropower project, an Indian tribe which is recognized by treaty with the United States, by federal statute, or by the U. S. Department of the Interior in its periodic listing of tribal governments in the Federal Register in accordance with 25 CFR 83.6(b), and whose legal rights as a tribe may be affected by the development and operation of the hydropower project proposed (as where the operation of the proposed project could interfere with the management and harvest of anadromous fish or where the project works would be located within the tribe's reservation). (FERC regulations, 18 CFR 4.30(b)(10))

Indirect effects	Effects that are caused by an action but occur later in time or farther removed in distance, yet are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. (CEQ regulations, 40 CFR 1508.8(b))
Inflow	Water that flows into a reservoir or forebay during a specified period.
Initial license	The first license issued for a water power project under either the Federal Water Power Act of 1920 or the Federal Power Act of 1935.
In-lieu energy	Energy provided by a reservoir owner instead of water to which a downstream party is entitled.
Input-output model	A special form of a general equilibrium mathematical representation of an economy; a formulation of the interrelationships of the various sectors of an economy that depends on well-functioning markets (no surplus or shortages) but where responses to market price changes are not accounted for.
Instream flow	The water flowing in a riverbed, which excludes water diverted from the river for human use.
Instream right	A water right in which water is kept in a stream and not removed and for which the legally required "beneficial use" is identified as fish and wildlife, riparian habitat, recreation, or some related protection.
Instream use	The use of water that does not require withdrawal or diversion from its natural watercourse; for example, the use of water for navigation, recreation, and support of fish and wildlife.
Intake	The entrance to a turbine at a dam, diversion works, or pumping station.
Intake traveling screens	See definition of turbine intake screens.
Interested parties	People or entities that are interested in the relicensing of a hydroelectric project. To the extent desired by an individual interested party, the interested parties will remain informed about and provide input regarding the relicensing process.
Interim spill	The spilling of water over a dam.
Interruptible demands	Those demands that, by contract, can be interrupted in the event of a capacity deficiency on the supplying system.

Intervenor	A person, institution, or organization admitted as a participant to a proceeding.
Inundation map	A map that delineates the areas that would be flooded by particular flood events.
Irrigation	The controlled application of water to arable lands to supply water requirements not satisfied by rainfall.
Just compensation	Payment for the full value of land or other property taken for public use by the government.
Juvenile	The early stage in the life cycle of anadromous fish when they migrate downstream to the ocean.
Juvenile transportation	Collecting migrating juvenile fish and transporting them around the dams using barges or trucks.
KAF	A thousand acre-feet, same as .504 thousand second-foot days.
kcfs	A measurement of water flow equivalent to 1,000 cubic feet of water passing a given point for an entire second.
kcfs-month	One kcfs-month is a flow of 1,000 cubic feet per second for 1 month or 0.0595 million acre-feet.
Key observation point (KOP)	An important location from which project facilities or operations are visible to the public, based on frequency of use and other factors.
Kilowatt (kW)	A unit of power equal to 1,000 watts or 1.3414 horsepower. It is a measure of electrical power or heat flow rate and equals 3,413 Btu per hour. An electric motor rated at 1 horsepower uses electric energy at a rate of about 3/4 kilowatt.
Kilowatt-hour (kWh)	1,000 watts of electrical energy, operating for 1 hour. Electrical energy is commonly sold by the kilowatt-hour.
Kjeldahl nitrogen	Organic nitrogen as determined by the Kjeldahl method, which entails quantitative analysis of organic compounds to determine nitrogen content by interaction with concentrated sulfuric acid; ammonia is distilled from the NH_4SO_4 formed.
KSFD	A volume of water equal to 1,000 cubic feet of water flowing past a point for an entire day. Same as 1.98 FAF.

Levee	A long, narrow, earthen embankment usually built to protect land from flooding. If built of concrete or masonry, the structure is referred to as a floodwall. Levees and floodwalls confine streamflow within a specified area to prevent flooding.
License	Authorization by FERC to construct, operate, and maintain nonfederal hydro projects for a period of up to 50 years.
Licensee	Any person, state, or municipality licensed under the provisions of section 4 of the Federal Power Act, and any assignee or successor in interest thereof. (Federal Power Act, Sec. 3 (5))
Littoral zone	The area on or near the shore of a body of water.
Live storage	That part of a reservoir that lies above the elevation of the bottom of the dam's lowest outlet.
Load	The amount of electric power or gas delivered or required at any point on a system. Load originates primarily at the energy consuming equipment of the customers.
Load factor	The ratio of average load to peak load for a specified period, usually expressed as a percentage.
Load factoring operation	A hydropower project operation that uses the generating equipment and reservoir impoundment capacity to store water and then provide power during daily, weekly, or seasonal periods of peak power demand.
Load shaping	The adjustment of storage releases so that generation and load are continuously in balance.
Lock	A chambered structure on a waterway closed off with gates for the purpose of raising or lowering the water level within the lock chamber so ships, boats, and tugs or barges can move from one elevation to another along the waterway.
Losing stream	A stream reach in which the water table adjacent to the stream is lower than the water surface in the stream, causing infiltration from the stream channel, recharging the groundwater aquifer, and decreasing the stream flow.
Low-head dam	A dam at which the water in the reservoir is not high above the turbine units.
MAF	Million acre-feet. The equivalent volume of water that will cover an area of 1 million acres to a depth of 1 foot. One MAF equals 1,000 KAF.

Mainstem	The principal river in a basin, as opposed to the tributary streams and smaller rivers that feed into it.
Mainstem passage	The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.
Mainstem survival	The proportion of anadromous fish that survive passage through the dams and reservoirs while migrating in the Columbia and Snake rivers.
Maintenance expenses	That portion of operating expenses consisting of labor, materials, and other direct and indirect expenses incurred for preserving the operating efficiency or physical condition of utility plants used for power production, transmission, and distribution of energy.
Maintenance outage	The removal of a unit from service to perform work on specific components which could have been postponed past the next weekend.
Major hydro project	Those projects with a capacity greater than 1.5 megawatts (MW).
Mandatory conditions	The authority of resource agencies to impose conditions on a FERC-licensed project. See also the definition of Federal Power Act, where mandatory conditioning authority is identified in boldface at definitions of pertinent sections.
Mano	A stone used as the upper millstone for grinding foods by hand in a metate (see definition of metate).
Masonry dam	A dam constructed mainly of stone, brick, or concrete blocks that may or may not be joined with mortar. A dam having only a masonry facing should not be referred to as a masonry dam.
Mean annual flood	The arithmetic mean of the highest peak discharge during each year of record.
Mechanical bypass systems	See definition of bypass system.
Megawatt	A unit of electrical power equal to 1 million watts or 1 thousand kilowatts. A megawatt will typically serve about 1,000 people. The Dalles Dam produces an average of about 1,000 megawatts.
Megawatt-hour (MWh)	A unit of electrical energy that equals 1 megawatt of power used for 1 hour.
Metate	A stone with a concave upper surface used as the bottom millstone for grinding foods.
Microcatchments	Small basins used to collect rainwater.

Mid-Columbia dams	Dams owned by the mid-Columbia Public Utility Districts. They include Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams.
Mid-Columbia Public Utility Districts (PUDs)	Public Utility District No. 1 of Grant County, Public Utility District No. 2 of Chelan County, and Public Utility District No. 1 of Douglas County.
Mill	A monetary cost and billing unit used by utilities; it is equal to 1/1,000 of the U.S. dollar (equivalent to 1/10 of one cent).
Minimum flow	The minimum river flow sufficient to support fish and other aquatic life, to minimize pollution, or to maintain other instream uses such as recreation and navigation.. Often required at a hydroelectric dam as a condition of the dam owner's operating license.
Minimum operating pool	The lowest water level of an impoundment at which navigation locks can still operate.
Mitigation	The act of alleviating or making less severe. Generally refers to efforts to alleviate the impacts of hydropower development to the Columbia Basins salmon and steelhead runs. 1. Avoiding the impact altogether by not taking a certain action or parts of an action. 2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation. 3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment. 4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action. 5. Compensating for the impact by replacing or providing substitute resources or environments. (CEQ regulations, 40 CFR 1508.20)
Mitigation measures	A. Mitigation measures discussed in a NEPA document must cover the range of impacts of the proposal. Mitigation measures must be considered even for impacts that by themselves would not be considered "significant." Once the proposal itself is considered as a whole to have significant effects, all of its specific effects on the environment (whether or not "significant") must be considered, and mitigation measures must be developed where it is feasible to do so. (40 CFR 1502.14(f), 1502.16(h), 1508.14)

	B. All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the Records of Decision (RODs) of these agencies (40 CFR 1502.16(h), 1502.2(c)). This will serve to alert agencies or officials who can implement these extra measures, and will encourage them to do so (46 FR 18032).
Monitor	To systematically and repeatedly measure conditions in order to track changes.
Mortality	The number of fish lost or the rate of loss.
Multipurpose dam	A barrier constructed for two or more purposes such as storage, flood control, navigation, power generation, or recreation.
Multipurpose reservoir	A reservoir that can be used for more than one purpose, such as flood control, hydroelectric power development, and recreation.
Navigability	The ability of a body of water to be traveled by water craft.
Navigable Waters	Those parts of streams or other bodies of water over which Congress has jurisdiction to regulate commerce with foreign nations and among the several states, and which either in their natural or improved condition notwithstanding interruptions between the navigable parts of such streams or waters by falls, shallows, or rapids compelling land carriage, are used or suitable for use for the transportation of persons or property in interstate or foreign commerce, including therein all such interrupting falls, shallows, or rapids, together with such other parts of streams as shall have been authorized by Congress for improvement by the United States or shall have been recommended to Congress for such improvement after investigation under its authority. (Federal Power Act, Sec. 3(8))
NEPA	National Environmental Policy Act, as amended (42 U.S.C. 4321, et.seq.).
Net environmental benefit analysis	An assessment of the impact of an economic decision on flow of ecological services provided by natural resources.
New license	Any license, except an annual license issued under section 15 of the Federal Power Act, for a water power project that is issued after the initial license for that project. (FERC regulations – 18 CFR 4.30(b)(19))
Nitrogen supersaturation	A condition of water in which the concentration of dissolved nitrogen exceeds the saturation level of water. Excess nitrogen can harm the circulatory system of fish.

Nondegradation	A term in the Clean Water Act that indicates a standard of water quality for which certain water bodies are to be managed so as to prevent any degradation.
Nonpoint Source Pollution	A term in the Clean Water Act also called "polluted runoff," water pollution produced by diffuse land-use activities. Occurs when runoff carries fertilizer, animal wastes, and other pollution into rivers, streams, lakes, reservoirs, and other bodies of water.
Northwest Power Act	The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power Planning Council and directed it to develop this program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries.
Northwest Power Pool Coordinating Group	An operating group made up of Bonneville Power Administration, the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and public and private generating utilities in the northwest. One of the group's functions is administering the Pacific Northwest Coordination Agreement.
Nutrient cycling	Circulation or exchange of elements such as nitrogen and carbon between nonliving and living portions of the environment.
Nutrients	Animal, vegetable, or mineral substance that sustains individual organisms and ecosystems.
Off-highway vehicle (OHV)	A vehicle commonly used for traversing terrain other than paved roads.
Off-peak energy	Electric energy supplied during periods of relatively low system demands.
Off-peak hours	Period of relatively low demand for electrical energy, as specified by the supplier (such as the middle of the night).
On-peak energy	Electric energy supplied during periods of relatively high system demands.
Operating year	The 12-month period from August 1 through July 31.
Opportunity costs	The value of the opportunity foregone by the chosen economic decision, such as the value of the job given up (foregone) when choosing one's current job.
Original cost	The cost of the property at the time it was first placed in public service.
Outage	The period during which a generating unit, transmission line, or other facility is out of service.

	• Forced outage—the shutdown of a generating unit, transmission line, or other facility, for emergency reasons • Scheduled outage—the shutdown of a generating unit, transmission line, or other facility, for inspection or maintenance, in accordance with an advance schedule
Outflow	The water that is released from a project during the specified period.
Overdraft	Pumping of groundwater for consumptive use in excess of safe yield.
Oviposition	Egg laying; egg deposition; egg dropping. Typically used in reference to a specific behavioral trait or adaptation that a species employs when depositing its eggs.
Pacific Northwest Utilities Conference Committee (PNUCC)	A group formed by Pacific Northwest utilities officials in order to coordinate policy on Pacific Northwest power supply issues and activities. PNUCC lacks contractual authority, but it plays a major role in regional power planning through its Policy; Steering; Fish and Wildlife; and Lawyers committees, and the Technical Coordination Group. PNUCC publishes the Northwest Regional Forecast, containing information on regional loads and resources.
Paedomorphic	Characteristic of certain amphibians: becoming sexually mature and active in the aquatic (larval) form before metamorphosing into the terrestrial (adult) form.
Partial equilibrium analysis	An economic analysis of a particular market where effects on related markets are ignored.
Participants	Individuals or parties who have chosen to be actively involved in the relicensing process (by participating at meetings, working to collaboratively develop solutions, providing written comments, or otherwise providing input). Includes PacifiCorp, FERC, state and federal resource agencies, Indian tribes, and nongovernmental organizations actively involved in the filing activities for the project.
Passage	The movement of migratory fish through, around, or over dams, reservoirs, and other obstructions in a stream or river.
Peak flow	Refers to a specific period of time when the discharge of a stream or river is at its highest point.
Peak load	The maximum demand for electrical power that determines the generating capacity required by a public utility.
Peaking facilities	Hydroelectric plants that typically increase project discharge to maximize generation during highest electric demand.

Penstock	A conduit used to convey water under pressure to the turbines of a hydroelectric plant.
Perennial flow	Year-round flow
Permeability	The ability of a material to transmit water though its pores when subjected to pressure.
Petroglyph	A carving or inscription on a rock.
Pictograph	An ancient or prehistoric drawing or painting on a rock wall.
Plant	A station at which are located prime movers, electric generators, and auxiliary equipment for converting mechanical, chemical, or nuclear energy into electric energy.
Plant factor	The ratio of the average load on the plant for the period of time considered to be the aggregate rating of all the generating equipment installed in the plant.
Pluvial	In hydrology, anything that is brought about directly by precipitation.
Point source pollution	Pollution into bodies of water from specific discharge points such as sewer outfalls or industrial-waste pipes.
Potable water	Water of a quality suitable for drinking.
Power	The rate at which work is done. The rate at which energy is transferred. The watt is a typical unit of power measured in units of work per unit of time.
Power peaking	The generation of electricity to meet maximum instantaneous power requirements; usually refers to daily peaks.
Powerhouse	A primary part of a hydroelectric dam where the turbines and generators are housed and where power is produced by falling water rotating turbine blades.
Prefiling consultation process	Includes activities performed in order to address FERC and other statutory and regulatory requirements in preparing the Applications for New Licenses. The prefiling period continues until the formal filing of the applications with the FERC.
Probable maximum flood	The largest flood considered reasonably possible at a site as a result of meteorological and hydrological conditions.

Producer surplus	The difference between the amount of money it would cost to produce a given quantity of a good or service and the price available in the market; hence, the fullest measure of the benefit one receives from producing the good or service.
Production (electric)	Act or process of producing electrical energy from other forms of energy; also, the amount of electrical energy produced expressed in kilowatt-hours.
Production expenses	Costs incurred in the production of electric power and conforming to the accounting requirements of the Operation and Maintenance Expense Accounts of the FERC Uniform System of Accounts.
Productivity	The quality of creating something of value.
Project outflow	The volume of water per unit of time released from a project.
Protection, Mitigation, and Enhancement (PM&E) measures	PM&E measures will be expressed in the new license in Articles that define the affected resources and describe measures to be taken during the term of the new license.
Public lands	Lands and interest in lands owned by the United States that are subject to private appropriation and disposal under public land laws. It shall not include "reservations," as hereinafter defined. (Federal Power Act, Sec. 3(1))
Public review file	The formal written record of the prefiling consultation process.
Public trust doctrine	A legal, court-developed doctrine by which a state can hold and manage all lands in state ownership (including the lands underlying navigable waters) in trust for the citizens of that state.
Public utility	A private business organization, subject to government regulation, that provides an essential commodity or service, such as water, electricity, transportation, or communications, to the public.
Public utility district (PUD)	A government unit established by voters of a district to supply electric or other utility service.
Pumped storage plant	A hydroelectric power plant that generates electric energy to meet peak load by using water pumped up into an elevated storage reservoir during off-peak periods. Often associated with nuclear power plants or other generating facilities that have a high base load of power that cannot be fully used in off-peak periods. Pumped storage facilities allow storage of part of this excess power (less power needed to pump the water to the upper reservoir).

Quantification	Defining the amount and timing of a water right.
Rainwater Harvesting	A farming technique that conserves water by collecting rainwater run-off behind earth or rock embankments in small basins.
Ramping	The process by which streamflows are gradually increased or decreased to protect streambeds and stream life from erosion and downstream flushing.
Ramping rate	The maximum allowable rate of change in outflow from a power plant. The ramping rate is established to prevent undesirable effects resulting from rapid changes in loading or, in the case of hydroelectric plants, discharge.
Rating	A manufacturer's guaranteed performance of a machine, transmission line, or other such equipment, based on design features and test data. The rating will specify such limits as load voltage, temperature, and frequency. The rating is generally printed on a nameplate attached to equipment and is commonly referred to as the nameplate rating or nameplate capacity.
Reach	The distance between two specific points outlining a portion of a stream or river.
Recharge	To add water to an aquifer; also, the water added to an aquifer.
Regional Economic Impact Analysis	Economic analysis of individual economic regions, such as a county, city, or metropolitan area, made up of all the individual sectors of the economy, and accounting for the interrelationships among the sectors.
Regulated river	A river whose natural flow pattern is altered by a dam or dams.
Regulations	FERC carries out its regulatory functions, including procedures and practice, through rulemaking and adjudication. Under rulemaking, the Commission may propose a general rule or regulation change. By law, it must issue a notice of the proposed rule and a request for comments in the Federal Register, and publish any final decision. Alternatively, the Commission considers, on a case-by-case basis, applications submitted by regulated companies. If there is an objection to a particular proposal and a settlement cannot be reached, the proposal must, by law, be presented at a hearing presided over by an agency administrative law judge. A decision by a judge may be adopted, modified, or reversed by the Commission. An aggrieved party may petition for a rehearing, and may appeal a decision to the United States Court of Appeals and ultimately, to the United States Supreme Court.
Reliability	The probability that a device will function without failure during a specified time period or amount of usage.

Relicensing	The administrative proceeding in which FERC, in consultation with other federal and state agencies, decides whether and on what terms to issue a new license for an existing hydroelectric project at the expiration of the original license.
Reregulating facility	A dam and reservoir, located downstream from a hydroelectric peaking plant, with sufficient storage capacity to store the widely fluctuating discharges from the peaking plant and to release them in a relatively uniform manner downstream.
Reregulation	Storing erratic discharges of water from an upstream hydroelectric plant and releasing them uniformly from a downstream plant.
Reservation	National forest, tribal lands within Indian reservations, military reservations, and other lands and interests in lands owned by the United States, and withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws; also lands and interests in lands acquired and held for any public purposes; but shall not include national monuments or national parks. (Federal Power Act, Sec. 3.(2) 16 U.S.C. 796.2)
Reservation of water right	At the state level, the reservation of a water right means that the state declares its authority to stop certain water diversions in the event that a river runs dangerously low.
Reservoir	A body of water collected in an artificial lake behind a dam and used for the storage, regulation, and control of water.
Resident fish	Fish species that reside in freshwater throughout their lives.
Resource agency	A federal, state, or interstate agency exercising administration over the areas of flood control, navigation, irrigation, recreation, fish and wildlife, water resource management (including water rights), or cultural or other relevant resources of the state or states in which a project is or will be located. (FERC regulations, 18 CFR 4.30(b)(27))
Riffles	Shallow, turbulent portions of a stream or river.
Riparian	Pertaining to a river (for example, the riparian zone).
Riparian habitat	The habitat found on streambanks and riverbanks, where semiaquatic and terrestrial organisms mingle.
Riparian zone	The habitat found on stream banks and river banks, where semiaquatic and terrestrial organisms mingle.

Riparian-use doctrine	Legal rights belonging to the owner of land bordering on a given stream. The riparian owner is entitled to the reasonable use of the water in the bordered stream provided that use does not unreasonably diminish the rights of downstream users.
River	A natural stream of water emptying into an ocean, lake, or another river.
River basin	The total area drained by a river and its tributaries.
River left	Left bank when facing downstream.
River mouth	The place where a river ends by flowing into another body of water such as a lake, ocean, or another river.
River right	Right bank when facing downstream.
Riverine ecosystem	The zone of biological and environmental influence of a river and its floodplain.
Rockfill dam	An embankment dam in which more than 50 percent of the total volume consists of compacted or dumped pervious natural or crushed rock.
Rolled-fill dam	An embankment dam of earth or rock in which the material is placed in layers and compacted by using rollers or rolling equipment.
Rule curves	Water levels, represented graphically as curves, that guide reservoir operations.
Rulemaking	The authority delegated to administrative agencies by Congress to make rules that have the force of law. Frequently, statutory laws passed by Congress that express broad terms of a policy and are implemented more specifically by administrative rules, regulations, and practices.
Runner	The rotating part of a turbine.
Runoff	Water in excess of what can be absorbed by the ground and which runs off the land into streams, rivers, or lakes.
Run-of-river	Hydroelectric facilities whose operation cannot be regulated for more than a few hours from storage at or above the site, but are controlled mainly by the volume of water flowing in the stream. These volumes must be used as they occur or be wasted.
Safe yield	The rate of surface water diversion or groundwater extraction from a basin for consumptive use over an indefinite period of time. Such a yield can be maintained without producing negative effects.
Salinization	The accumulation of salt in soil or water to a harmful level.

Scenic river	Defined in the National Wild and Scenic Rivers Act as "those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."
Sector analysis	Economic analysis of individual components or sectors of the economy, such as agriculture, commercial fishing, or municipal water supply services.
Sediment	Particles of material that are transported and deposited by water, wind, or ice.
Sediment flushing	A method of reservoir operation in which the reservoir is temporarily lowered so that fast-flowing water can erode accumulated sediments on the reservoir bed.
Sediment load	The amount of sediment carried by a river.
Sediment sluicing	A method of reservoir operation in which the reservoir is lowered at the start of the flood season, speeding the movement of water through the reservoir and hence reducing its capacity to trap sediment.
Selective withdrawal structures	Devices which permit releases from a reservoir over a wide range of depths, temperatures, or water quality.
Service list	In FERC terms, this is the official list of parties to a proceeding once a formal filing has been made.
Settlement agreement	FERC encourages applicants to prepare and file settlement agreements. Most measures in settlement agreements are included in license articles; however, FERC cannot include measures that are in conflict with the Federal Power Act or other federal statutes.
Shaping	The scheduling and operation of generating resources to meet seasonal and hourly load variations.
Silt	Sediment composed of particles between 0.004 millimeters (mm) and 0.06 mm in diameter.
Sluice	A structure with a gate for stopping or regulating flow of water.
Sluiceway	An open channel inside a dam designed to collect and divert ice and trash in the river (e.g., logs) before they get into the turbine units and cause damage. (On several of the Columbia River dams, ice and trash sluiceways are being used as, or converted into, fish bypass systems.)

Smolt	A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.
Socioeconomic analysis	Analysis of the provision of public goods and services such as public schools, roads, and other government services that contribute to the economic well-being of the community, and of equity considerations in the distribution of economic benefits among various classes of people.
Spawning	The releasing and fertilizing of eggs by fish.
Specific yield	The fraction of the saturated bulk volume consisting of water which will drain by gravity when the water table drops.
Spill	Water passed over a dam without going through turbines to produce electricity. Spills can be forced, when there is no storage capability and flows exceed turbine capacity, or they can be planned—for example, during a powerhouse maintenance event.
Spillway	The channel or passageway around or over a dam through which excess water is released or "spilled" past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam, while maintaining the reservoir level below some predetermined maximum level.
Spillway crest elevation	The point at which the reservoir behind a dam is level with the top of the dam's spillway.
Spinning reserves	The unused capacity in an electric system in generator units that are not in operation but can be called on for immediate use in case of system problems or sudden load changes.
Standby reserves	The unused capacity in an electric system in machines that are not in operation but are available for immediate use if required.
Station use	Energy used in a generating plant for the production of electricity. It includes energy consumed for plant light, power, and auxiliaries regardless of whether such energy is produced at the plant or comes from another source.
Storage	The volume of water in a reservoir at a given time.
Storage plant	A hydroelectric plant with reservoir storage capacity for power use.

Storage reservoir	A reservoir that has space for retaining water—from springtime snowmelts, for example. Retained water is released as necessary for various uses, including power production, fish passage, irrigation, and navigation.
Stratification	Thermal layering of water in lakes and streams. Lakes usually have three zones of varying temperature: epilimnion (top layer); metalimnion or thermocline (middle layer of rapid temperature change); and hypolimnion (bottom layer).
Stream adjudication	A judicial process to determine the extent and priority of the rights of all persons to use water in a river system.
Streambed	The channel or bottom of a river or stream.
Stream reach	A specific portion of the length of a stream.
Streamflow	The rate at which water passes a given point in a stream, usually expressed in cubic feet per second. This term is often used interchangeably with discharge.
Subimpoundment	An isolated body of water created by a dike within a reservoir or lake.
Submersible traveling screen	A wire mesh screen that acts like a conveyor belt when installed in the intakes of turbines at dams guiding and transporting juvenile fish into bypass channels.
Substation	An assemblage of equipment for the purposes of switching, changing, or regulating the voltage of electricity.
Supersaturation	See definition of dissolved gas concentrations.
Surface water	Water on the earth's surface exposed to the atmosphere as rivers, lakes, streams, and the oceans.
Tailrace	A pipe or channel through which water is returned from the powerhouse into a river or other receiving water.
Tailwater	The water surface immediately downstream from a dam or hydroelectric power plant.
Tainter gate	A spillway gate whose face is a section of a cylinder. The cylinder rotates on a horizontal axis downstream of the gate. With this design, the gate can be closed using its own weight.
Taking	The transfer of dominion or control of property from a private owner to the government against his or her consent.
Talus	Rock rubble at the bottom of slope or cliff.

Thermal pollution	A human-caused change in water temperature that results in damage to aquatic life.
Threatened species	Any species that has the potential of becoming endangered in the near future (See Endangered Species Act, P.L. 93-205 for legal definition, sec. 3(20)).
Transmission	The movement or transfer of electric energy over an interconnected group of lines and associated equipment. The movement or transfer occurs between points of supply and points at which the energy is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end when the energy is transformed for distribution to the consumer.
Trap and haul program	A program to collect fish at a given point, transport them to a different point, and release them.
Tributary	A stream or river that flows into another stream or river and contributes water to it.
Turbidity	A measure of the extent to which light passing through water is reduced owing to suspended materials.
Turbine	A machine for generating rotary mechanical power from the energy in a stream of fluid (such as water, steam, or hot gas). Turbines convert the kinetic energy of fluids to mechanical energy through the principles of impulse and reaction, or a mixture of the two.
Turbine intake screens	Large screens, which may have moving or nonmoving parts, designed to be placed in a dam's turbine intake at an angle to deflect juvenile fish from the intakes into a bypass system.
Uncontracted water	A volume of water in a storage reservoir that is not assigned for other purposes, such as irrigation.
Underflow	Groundwater flow within a streambed below a surface stream.
Velocity barrier	A physical structure, such as a barrier dam or floating weir, built in the tailrace of a hydroelectric powerhouse, which blocks the tailrace from further adult salmon or steelhead migration to prevent physical injury or migration delay.
Wasteway	An open ditch or canal that discharges excess irrigation water or power plant effluent into the river channel.
Water banking	An administrative system for renting surplus water.

Water budget	A provision of the Columbia River Basin Fish and Wildlife Program that calls for increasing Columbia and Snake river flows during the spring fish migration with the intent of increasing downstream survival of migrating juvenile salmon and steelhead.
Water demand	The amount of water used over a period of time at a given price.
Water quality	The condition of water as determined by measurements of such factors as suspended solids, acidity, turbidity, dissolved oxygen, and temperature, and by the presence of organic matter or pollution chemicals.
Water quality criteria	The levels of pollutants that affect the suitability of water for a given use. Generally, water use classification includes public water supply; recreation; propagation of fish and other aquatic life; and agricultural and industrial use.
Water quality standard	Water quality standards are numeric criteria or narrative statements used to address: (1) the benficial uses that water resources provide to people and the environment; (2) allowable concentrations of specific pollution or pollutants in a waterbody, established to protect the beneficial uses; (3) narrative statements of unacceptable conditions in and on the water; and (4) provision for antidegradation of existing high-quality or unique waters.
Water rights	Priority claims to water. A legal right to use a specific amount of water from a natural or artificial body of surface water for general or specific purposes such as irrigation, mining, power, domestic use, or instream flow. In western states, water rights are based on the principle “first in time, first in right,” meaning older claims take precedence over newer ones.
Water table	The upper level that groundwater reaches in an aquifer, or the surface of groundwater.
Water year	The 12-month period for which the U.S. Geological Survey (USGS) reports surface water supplies. Water years begin October 1 and end the following September 30, and are designated by the calendar year in which the water year ends.
Watercourse	A natural stream channel that, depending on the season, may or may not contain water.
Watershed	All the land drained by a given river and its tributaries. An entire drainage basin including all living and nonliving components of the system.
Watt	A measure of the rate at which energy is produced, exchanged, or consumed. The rate of energy transfer is equivalent to 1 ampere of current flowing at 1 volt at unity power factor.

- Ampere—the unit of measurement of electrical current produced in a circuit by 1 volt acting through a resistance of 1 ohm
- Ohm—the unit of measurement of electrical resistance. The resistance of a circuit in which a potential difference of 1 volt produces a current of 1 ampere.
- Volt—the unit of measurement of voltage, electrical force, or pressure. The electrical force that, if steadily applied to a circuit with a resistance of 1 ohm, will produce a current of 1 ampere.

Weir	(1) A low dam built across a stream to raise the upstream water level. Called a fixed-crest weir when uncontrolled. Other types of weirs include broad-crested, sharp-crested, drowned, and submerged; (2) A structure built across a stream or channel for the purpose of measuring flow (measuring or gauging weir).
Wetland	An area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances supports, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (U.S. Army Corps of Engineers and EPA definition). Wetlands must have the following three attributes: (1) at least periodically, the land supports predominately hydrophytes; (2) the substrate is predominately undrained hydric soil; and (3) the substrate is on soil and is saturated with water or covered by shallow water at some time during the growing season of each year.
Wild and Scenic Rivers Act	1968 federal law (Public Law 90-542) establishing and setting forth the procedure for including outstanding river segments in a national system of free-flowing, protected rivers.
Wild River	Defined in the National Wild and Scenic Rivers Act as "those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, within watersheds or shorelines essentially primitive and water unpolluted. These represent vestiges of primitive America."
Winter's Doctrine	A legal document arising from the case "Winters v. U.S., U.S. Supreme Court, 1908, 207 US 564," that holds that, upon the creation of a federal reservation on the public domain, the reservation has appurtenant to it the right to divert as much water from streams within or bordering it as is necessary to serve the purposes for which the reservation was created.